

CAM - D DEW Line Site Phase III Environmental Site Assessment, Materials Audit and Geotechnical Investigation

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Phase III Environmental Site Assessment, Materials Audit and Geotechnical Investigation
Final Report

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CAM-D DEW LINE SITE
PHASE III INVESTIGATION AND WASTE AUDIT

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1.0 EXECUTIVE SUMMARY

CAM-D is a former DEW Line site located at 68°35' N, 91°57' W on the Boothia Peninsula between Sheppard Bay and Pelly Bay, 120 km Southeast of the community of Taloyoak (Spence Bay), Nunavut (Figure 1.0). The DEW Line station was constructed in 1957, operated until 1963, at which point it was abandoned. In 1965, responsibility for the site was assumed by the Department of Indian Affairs and Northern Development (DIAND). The site consists of a Main Station, Airstrip, Freshwater Lakes Area, Simpson Lake Area and a Borrow Source Area. Elevation of the main station area is approximately 370 m above sea level and the shoreline of Simpson Lake is approximately 50 m above sea level. The Main Station Area is where the majority of the infrastructure at the CAM D site is located.

In order to assist in the development of a remedial action plan for the CAM-D site, Northern Contaminated Site Remediation Group – Public Works and Government Services Canada (PWGSC) has been charged with the task of further assessing the site. The assessment includes the completion of a Phase III ESA, Waste Audit and geotechnical investigation and to delineate areas of environmental concern, determine volumes of hazardous and non hazardous waste materials and assess potential borrow sources, landfill locations and the condition of the site access roads and airstrip. The fieldwork for this program was completed between August 22 and August 31, 2005.

The Phase III investigation included the assessment of five (5) main areas (Main Station Area, Airstrip Area, Freshwater Lakes Area, Simpson Lake Area and a Borrow Source Area) of the site in order to delineate previously identified contaminated areas and to confirm the presence of contaminants in areas that had not been previously identified.

Based on the findings of the Phase III Assessment, the following table presents a summary of the areas with soils requiring remedial action at the CAM-D DEW Line site using the INAC Abandoned Military Sites Remediation Protocol.

Table 1.1 – Summary of Areas Requiring Additional Remedial Action

Location	Contaminant Exceeding CCME and/or INAC Criteria	DCC I	DCC II	CCME CWS for PHC	Comments
		m^3	m^3	m^3	
Garage	**PHC**s			289	Complete delineation of impacted area not achieved to the west and south
Electrical Cabinet Area	**Metals**		16		
Burn Pit Area	**PHCs**			39	Complete delineation of impacted area not achieved to the south
POL Tank	**PHC**s			112	Complete delineation of impacted area not achieved to the south
	PAHs & PHCs			778	Impacted area is co-contaminated and complete delineation of impacted area not achieved to the south
Outfall	**Metals & PCB**s	3			Impacted area is co-contaminated
Pallet Line	**PHCs**			470	
Portable Fuel Tanks	**PHCs**			495	Complete delineation of impacted area not achieved to the west
	PAHs & PHCs			266	Impacted area is co-contaminated and complete delineation of impacted area not achieved to the west

		DCC I	DCC II	CCME CWS for PHC	
Airstrip Vehicle and Debris Area	**Metals & PHCs**		10		Impacted area is co-contaminated
Plumbers Dump	**Metals**		13		Impacted area not delineated
Simpson Lake	**Metals**		3		Soils in the vicinity of the battery in the noted debris area
	Total Estimated Volumes	**3**	**42**	**2449**	The majority of the total estimated volume is co-contaminated, with more than one contaminant exceeding the applied criteria

A detailed Waste Audit was also completed in order to determine the volumes of hazardous and non-hazardous materials. The following table briefly summarizes the quantities of the major categories for each waste type.

Table 1.2 – Summary of Waste Volumes

Waste Type	Items	Estimated Volume	Unit
Non Hazardous	Heavy Equipment, Barrels (9054), Scrap Metal, Scrap Wood, Concrete and Buried Debris.	2355	m^3
Hazardous	Asbestos Containing Materials	17	m^3
	POL	16.4	m^3
	Batteries	1	m^3
	PCB Painted Materials	8	m^3
	Lead Painted Materials	50	m^3
	Total	**2447.4**	**m^3**

Based on the scope of work for the Phase III Environmental Assessment, Waste Audit and geotechnical investigation that was completed at the CAM-D DEW Line site the following conclusions were made.

Phase III ESA:

- The Phase III investigation included the assessment of 18 locations in five main areas of the site in order to delineate previously identified contaminated areas and to confirm the presence of contaminants in areas that had not been previously identified.
- The total volume of hydrocarbon, metal and PCB contaminated material found to be contaminated was estimated at 2492.8 m^3. Of this, 42 m^3 exceeded the DCC Tier II criteria for Metals and PCBs, 2448 m^3 exceeded the CCME, Canada Wide Standard for Petroleum Hydrocarbons/BTEX and Polycyclic Aromatic Hydrocarbons and 3 m^3 exceeded the DCC Tier I for PCB impacted soils (significantly lower than other Intermediate DEW Line sites previously assessed). Due to site conditions, full delineation for metals and hydrocarbon contaminated soils was not achieved in some locations. Also, co-contaminated soil exists in most impacted areas.
- Background soils were all below the applied INAC Abandoned Military Site Remediation Protocol Criteria.
- Several minor Heavy Metals exceedances of the applied CCME Water Quality Guidelines were measured in surface waters collected on site. The areas where exceedances were noted are a significant distance away from any possible fish habitats. It must also be noted that the volumes of surface water where the exeedances were noted are minimal. It is not anticipated that contamination noted on site is adversely affecting water sources down gradient and off site.

Waste Audit:

- A Waste Audit was completed on site and yielded approximately 2500 m^3 of non hazardous waste and approximately 94.4 m^3 hazardous materials. The vast majority of this material is located in accessible areas.
- A total of 9,054 empty barrels were identified at the site. It is recommended that subsurface soil conditions below the barrels be determined following their removal.
- A total of 15 full to partially full barrels containing various types of product were identified on the site. Analytical results suggest the fluids are aviation fuel, gasoline and diesel.
- Approximately 8 m^3 of material was observed to be painted with PCB containing paint. The majority of the paint products on metal substrates was in poor condition (peeling) and may require some form of abatement prior to removal of the painted components. Wood materials painted with PCB containing paint were typically weathered and peeling. It is recommended that the painted materials be removed by a contractor following a waste reduction process. There are also two buried piles of debris near the warehouse foundation. Soil samples taken from areas surrounding the burried debris piles at the main station area do not indicate the presence of lead or PCBs in the soil. For this reason it is assumed if there is lead and PCB painted materials in the buried debris piles, the lead and PCB contaminants are not mobile. However, it is recommended that the buried debris piles be monitored to ensure their condition does not change and that the potential contaminants inside the buried waste piles do not become mobile.

Geotechnical Investigation:

The scope of work for the geotechnical portion of this project included the following:

- Identify borrow sources and potential locations for engineered landfills on-site.
- Evaluate the condition of site access roads and airstrip.
- Complete a detailed site survey of all important geotechnical features.
- Document all information in written reports and present geotechnical and hydrological data including a photographic record.

Borrow sources were identified as per their material characteristics and grain size. In brief there were various borrow sources identified namely drumlin, moraine, and sand deposits near Murchison River (former borrow area); gravel, silts and clays at main station area; esker enroute to Simpson Lake; and, former borrow area on north shore of Simpson Lake.

Of these borrow sources volumes of soils were determined for use in decommissioning of CAM D. Estimated volumes include:

- Former Main Station: 1,500,000 m^3 fine grained wet silts and clay (Type 5, Borrow Source #1).
- Former Main Station: 7,700 to 9,100 m^3 of sandy gravel soils (Type 3, Borrow Source #1).
- Drumlin on route to Murchison River: 14,671 m^3 clay and silt (boulder clay, Type 5, Borrow Source #3).

- Gravel Stockpile Area Near Murchison River: 17,700 m^3 gravel stockpiled in previously stripped area (Type 2 and Type 4, Borrow Source #3).
- Gravel Deposit Near Murchison River: 27,225 m^3 sandy gravel soils (Type 3).
- Sand Deposit Near Murchison River: 9,500 m^3 well sorted sand (Type 5, Borrow Source #3).
- Boulders and Cobbles Near Murchison River: 500 m^3 (Type 1, Borrow Source #3).
- Esker Enroute to Simpson Lake:22,500 m^3 sandy gravel soils (Type 3, Borrow Source #4).
- Former Borrow Source on N. Shore of Simpson Lake: 1,125,000 m^3 (Types 1 through 4, Borrow Source #5).

Roads on the CAM D site were assessed and only the main road from the airstrip up to the turn off to the Short Range Radar site is in fair condition. The remainder of the roads beyond the turn off and all other site roads have been stripped of gravel and/or are damaged from erosion and lack of up keep.

Landfill and landfarm locations were sited and four suitable locations were investigated at the summit of the main site. Another landfill location is suitable adjacent the drumlin enroute to the Murchison River. The drumlin location is an alternative to bringing the landfill construction material to the source of debris by bringing the debris and contaminated soil to the landfill construction material source.

The airstrip was investigated and due to the lack of quality control, during the construction of the airstrip, a more detailed assessment of the airstrip and its load bearing capacity is recommended. Aircraft larger and heavier than the Shorts Skyvan used in the August 2005 site visit are not recommended as a more detailed engineering assessment of the airstrip and the in-situ conditions are conducted with a Boeing Penetrometer.

Earth Tech Canada Inc., on behalf of DIAND and at the request of Northern Contaminated Sites Remediation Group - Public Works and Government Services Canada (PWGSC), has been charged with the task of completing a Phase III Site Assessment, Hazardous and Non-Hazardous Materials Audit and Geotechnical Evaluation of the CAM-D intermediate DEW Line site. The following is the Earth Tech Phase III Site Assessment, Hazardous and Non-Hazardous Materials Audit, and Geotechnical Evaluation Report based on the field work that was completed between August 22 and August 31, 2005.

2.0 INTRODUCTION

The Department of Indian Affairs and Northern Development (DIAND), as the caretaker of federal lands in Canada's north is responsible for the care and management of contaminated sites that are no longer maintained by the original owner/operator. These sites are often a result of mining, oil and gas activities, as well as government military activities, which took place before environmental impacts were a major concern. Through the Contaminated Sites Program (CSP), DIAND has made it a priority to assess, prioritize and mitigate/remediate the environmental impacts of contaminated Sites in Canada's North. CAM-D (Figure 1, Appendix A) is a former Intermediate Distant Early Warning (DEW) Line site and is one of these sites.

2.1 Background Information

CAM-D is a former DEW Line site located at 68°35' N, 91°57' W on the Boothia Peninsula between Sheppard Bay and Pelly Bay, and 120 km Southeast of the community of Taloyoak (Spence Bay), Nunavut (Figure 1.0, Appendix A). The community of Gjoa Haven is approximately 100 kilometers to the east of CAM-D and the community of Kugaaruk is approximately 120 kilometers to the west of CAM-D. The DEW Line station was constructed in 1957 and operated until 1963 at which point it was abandoned. In 1965, responsibility for the site was assumed by DIAND. The site consists of a Main Station Area, Airstrip Area, Freshwater Lake, Simpson Lake and a Borrow Source Area. Elevation at the main site is approximately 370 m above sea level and the shoreline of Simpson Lake is approximately 50 m above sea level. The Main Station Area is where the majority of the infrastructure is located.

Terrain at CAM-D is characterized by rolling grassy hills cut by faulted and fractured granite outcrops. Several lakes and rivers are also located in the area. Permafrost is present at approximately 1 to 1.5 m below ground surface. Sedges, willows, grasses, mosses, and flowering herbs, characterize the vegetation at the site. Fauna in the area includes Caribou, Arctic Hare, Arctic Fox, Arctic Ground Squirrels and several species of birds.

2.2 Previous Site Investigations

2.2.1 General

The following is a brief summary of the background report that was available to Earth Tech for review. The scope of work for the 2005 investigation completed at the CAM-D DEW Line site was based on the findings and conclusions of this background report.

2.2.2 Environmental Study of Abandoned DEW Line Sites, One Auxiliary and Eight Intermediate Sites in the Canadian Arctic, Royal Roads Military College, Victoria British Columbia, 1994

The Royal Roads Military College (RRMC) Environmental Sciences Group (ESG) conducted an Environmental Assessment of nine abandoned DEW Line sites, including the CAM-D intermediate DEW Line Site, in 1994. The main observations reported were that most of the facilities were demolished and a large numbers of barrels were scattered throughout the site. Approximately 15 barrels full or partially full of product were noted at the pallet line area. The RRMC assessment of CAM-D included visual observations/inspections of buried debris, barrel dumps and station facilities. The media sampled for analysis included soil, water and plant specimens. Over 9000 barrels were estimated to be onsite and several stained areas were noted. One hundred and three (103) soil/sediment samples were collected to investigate the presence,

migration and dispersal of contamination resulting from previous site activities. Eighty (80) samples were analyzed for PCBs and Inorganic Elements (heavy metals), eleven (11) for pesticides, ten (10) for Poly-Aromatic Hydrocarbons (PAHs), and five (5) for Acid/Base/Neutral (ABN) extractables. Two (2) surface water samples were collected for PCBs and Metals, and forty-six (46) plant samples were collected and analyzed for PCBs (28) and Metals (28). Also, wall swabs and floor tiles were sampled to investigate the presence of hazardous materials. The analytical results indicated that only four soil (4) samples, one of them a duplicate, were found to exceed the DCC criteria for Metals and two (2) sample field duplicates were found to exceed the DCC Tier I criteria for PCBs. It was concluded that there was contamination at CAM-D that could migrate offsite, as well as areas with signs of contamination that require further investigation. The scope of work of the ESG investigation did not include the assessment of hydrocarbon contamination.

2.3 Scope of Work and Objectives

Earth Tech was retained by the Northern Contaminated Sites Remediation Group PWGSC to conduct a Phase III Environmental Site Assessment (ESA), Hazardous and Non-hazardous Materials Audit, and Geotechnical Evaluation for CAM-D DEW Line site in Nunavut, as outlined in the Terms of Reference (Appendix B). The site investigation was multidisciplinary and included the following components:

- Geotechnical Assessment:
    - assessment of available borrow materials,
    - assessment of potential landfill locations and
    - assessment of the airstrip and site roadways
- Phase III ESA:
    - delineation and quantification of areas of environmental concern,
    - identification and delineation of all contaminated overburden,
    - collection of traditional knowledge regarding past and present land use and
    - elevation of community and Inuit involvement in the CAM-D assessment and remediation program.
- Materials Audit – determination of volumes of hazardous and non-hazardous materials.
- Detailed Site Survey – completion of a site survey including topography, location of existing infrastructure, as well as sampling locations from the Phase III material and geotechnical assessments.
- Documentation of all information in a written report to be used for the development of a remedial action and site restoration plan.

The fieldwork for this project was completed between August 22 and August 31, 2005. The reporting was completed following the receipt of the analytical data.

3.0 EARTH TECH WORK COMPLETED

In total Earth Tech collected one hundred and seventeen (117) soil samples to a maximum depth of up to 1.5 m below ground surface (bgs). Soil samples were sent to the lab for analysis of contaminants including Heavy Metals, Polychlorinated Biphenyls (PCB), Petroleum Hydrocarbon (PHC) and Polycyclic Aromatic Hydrocarbons (PAH).

Three sediment samples were retrieved from Simpson Lake, all of which were sent to the laboratory for Heavy Metals, PCB and PHC analysis.

Surface water samples were also collected at various locations around the site. A total of 8 water samples were taken and submitted to the laboratory for Heavy Metals, PCB, PAHs and/or PHC analysis.

Suspect hazardous materials were sampled from the Module Station debris, Warehouse and Garage areas. In total, sixteen (16) samples were collected and submitted to the lab for Asbestos, PCBs and/or lead analysis.

3.1 Methodology

3.1.1 Site Survey

A full survey of the site was completed using a Trimble 5800 Real Time Kinetic (RTK) GPS Surveying System equipped with an SCS 900 data collector. The list of items surveyed includes ESG sample locations, Earth Tech sample locations, building locations, miscellaneous debris piles, buried debris, major water courses, barrels, barrel dumps, borrow source extents, soil staining, potential landfill locations and other notable areas of concern. Topographic information and surveyed points were used to generate volume estimates for dump sites, borrow source volumes and potential landfill volumes. The survey coordinates measured were tied into a local coordinate system with various control points. The main control point was the southeast bolt on the Warehouse foundation shown in Photos 4 and 5 of Appendix C. The bolt was assigned an arbitrary coordinate value of 5000 N and 5000 E and elevation of 300 m.

3.1.2 Soil Sampling

In preparation for the field sampling, the past ESG investigation was reviewed to identify areas where lateral and vertical delineation was required. Proposed testpit and borehole locations were plotted on old site plans. Once onsite, the location of past sample points were located by conducting a reconnaissance of the area. Although this was found to be challenging in some cases, due to stakes either missing or found dislodged from their original locations, most locations had a satisfactory amount of markers to properly map out the areas of concern. The proposed testpit locations were then reviewed to determine whether site influences such as topography and geology would suggest moving the test pits and boreholes to a more suitable location. Once the test pit and borehole locations were finalized, an Earth Tech survey pin with a numbered tag was placed in the ground at the desired sample location.

Soil sampling was designed to identify and delineate heavy metal, hydrocarbon, PAH and PCB contamination. Although heavy metals cannot easily be identified in soils using visual observations, they are often associated with hydrocarbon staining. Surface staining was used as an aid to identify the outer limits of contaminated soils, and delineation sample locations.

In most cases, a small shovel and/or hand auger was used to retrieve the soil samples. In areas where a significant backfill layer was present, a quad with a small backhoe attachment was used to advance testpits to the point of backhoe refusal. The sampling instruments were cleaned between sampling points to prevent cross contamination between sample locations.

Samples collected for heavy metals analysis were placed in sealable plastic bags and labeled. Samples collected for PCBs, PHCs and PAHs were placed in laboratory supplied glass jars with Teflon-lined lids immediately after retrieval to prevent volatilization of the contaminants. The jars were filled such that no head-space was present, to prevent oxidation and subsequent volatilization of contaminants prior to laboratory analysis. Samples were placed in ice chilled coolers and left outside to keep cool. Prior to sealing the coolers for transportation from the site to Norwest Laboratories in Edmonton, Alberta, fresh ice packs, bubble wrap and completed chain of custody forms were packed in the coolers along with the samples.

3.1.3 Sediment Sampling

The field sampling program included the collection of three sediment samples from Simpson Lake. The samples were collected from the lake at locations where drainage courses that ran near or by impacted areas identified by the previous investigation entered the lake. All sediment samples were collected with an Eckman Sediment dredge. Samples were placed in sealable plastic bags or glass jars, and prepared for transport in the same manner as the soil samples. Analysis conducted on the sediment samples included PCBs heavy metals and hydrocarbons.

3.1.4 Water Sampling

Eight (8) surface water samples were collected from various locations at the site and were submitted to the lab for analysis. The surface water samples were obtained from potentially impacted areas. Locations of surface water samples are shown on the figures located in Appendix A. Samples were obtained by submerging clean laboratory supplied plastic and/or glass bottles in the water source, and then packing the bottles into chilled coolers to limit sample degradation. Samples were analyzed for heavy metals, PCBs, PAHs and/or petroleum hydrocarbons.

3.1.5 Asbestos Sampling

All samples collected for suspected asbestos containing materials (ACM) conformed to the "Bulk Sampling Collection Procedures" as outlined in Annex C of Practice, Appendix 6, in the PWGSC Document *DP 057*, *1997-12-03, Asbestos Management*. Potential ACM were sampled using "adequately wet" procedures to prevent the release of fibers during sampling. Half-mask respirators were worn when warranted. Samples were placed in double bagged sealable plastic bags and labeled as required. Photographs of the sample material and its location were taken for future reference.

3.1.6 Paint and Concrete Sampling

Investigations conducted at other DEW Line sites have identified PCB contaminated concrete and paint, as well as lead contaminated paint, on and in the building materials of DEW Line facilities. Paint on concrete was scraped off utilizing wire brushes and an industrial grade abrasive scraper. Concrete samples were collected using a chisel, hammer and/or a pickaxe. Substrate materials were also recorded for each sample taken. Samples were placed in sealable plastic bags and labeled accordingly. Concrete samples were analyzed for PCB contamination, and paint samples were analyzed for lead and PCB contamination.

3.1.7 Geotechnical Investigation (methodology)

Geotechnical information was retrieved through visual observations in the field, test pitting and grab samples. Samples were analyzed for grain size, moisture content, Atterberg limits etc. Potential areas for landfill construction and burrow sources were located and surveyed. Survey data assisted in determining potential landfill volumes and available amounts of burrow material. All geotechnical samples were sent to EBA Engineering for Laboratory Analysis.

3.1.8 Airstrip Roadway and Site Access Evaluation

The airstrip was assessed by the Summit Air pilots that piloted the sky van to and from the CAM D site. It was confirmed by the Summit Air Pilots that the airstrip was suitable for use during this investigation. Earth Tech also took grab samples from the airstrip and submitted the samples for analysis of California Bearing Ratio (Soaked and Unsoaked) to identify load bearing capacities of the airstrip for various aircraft.

3.1.9 Traditional Knowledge of Site, Inuit and Community Involvement

Traditional knowledge of the CAM – D (Simpson Lake) DEW Line site was gathered throughout the investigation process by speaking with Michael Tuqtoo (President of the Spence Bay Hunters and Trappers Organization in Taloyoak), Ema Quaggutaq (Representative of the Kurtairujuark Hunters and Trappers Organization in Kugaaruk), the bear monitors from Taloyoak (Patrick Lyall, and Josh and Steve Aquaqq) and informal conversations with local Taloyoak residents.

The majority of the Taloyoak elders were on the water hunting whale and seals as is the case in late August. Information received from elders was gathered second hand from conversations with the children of the elders.

4.0 RESULTS OF SITE INVESTIGATION

4.1 Summary of Investigated Areas

Investigative efforts of the Earth Tech team were focused on achieving lateral and vertical delineation of the previously identified contaminated areas, as well as additional areas of concern identified while on site. The CAM-D DEW Line site consists of five (5) separate areas; the Main Station Area, Airstrip Area, Freshwater Lakes Area, Simpson Lake Area and the Borrow Source Area as indicated in Figure 2.0 of Appendix A.

It should be noted that some of the levels of contamination within samples Taken by Earth Tech and Samples Taken by ESG were not consistent. This is attributed to the fact that Earth Tech includes slightly more sub-surface soils in their surface samples as a result of their sampling technique. In areas where ESG samples indicate contamination and the Earth Tech sample does not, it is assumed that only the upper 15 cm of soil is contaminated and requires removal/remediation.

4.2 Background Conditions

Tables 1 and 2 (Appendix D) present a summary of the background metal concentrations in soil samples taken from the 2005 investigation as well as the 1994 investigation completed by RRMC Environmental Sciences Group. The background values from the 1994 investigation were based on the analysis of seven samples (one of the samples being a field duplicate). During the 2005 program, a total of nine background samples, one of which was divided in two and analyzed as a duplicate, were collected by Jacques Whitford. Background samples were collected from locations up to 4 km from the Main Station Area. Background sample analysis results from both assessments were found to be comparable between the two investigations (2005 and 1994).

4.3 Main Station Area

The Main Station Area is located on a hill approximately 300 m above and 4.5 km Southwest of Simpson Lake (Figure 2.0). Past and present facilities in the area include; a module building train, warehouse, garage, Inuit house, Quonset huts, POL (Petroleum, Oils, Lubricants) tanks and pumphouse, sewage outfall, radar antenna tower, as well as several dumpsites, debris piles and barrel caches. Location of the specific study areas within the Main Station Area are outlined in Figure 3.0. The majority of the facilities at CAM-D have been demolished and partially buried. The Garage, one POL tank, fuel pump shed, and the warehouse foundation are all structures that remain in place as shown in photos 1 to 5 of Appendix C. The majority of the gravel fill used to construct the main station area was removed and used for the construction of the adjacent Short Range Radar (SRR) which is part of the North Warning System (NWS). So much gravel was removed that the remaining buildings and foundations are left standing on steep mounds of gravel (Photo 6). Outside the gravel pads, soils consist of sand and gravel, with silty clays. Organic matter is present in low lying, wet areas. Environmental concerns in this area include; contaminated soils in the vicinity of the facilities, large stains located throughout the area, the hazardous materials and surface water drainage from the impacted areas.

4.3.1 Garage

The Garage, shown in Photo 6 (Appendix C), is one of the few structures that remain in place at CAM-D. The Garage is constructed with structural steel beams and columns a concrete foundation, and corrugated steel for the roof and siding. The building layout consists of three rooms; a service bay with pull through overhead doors, a fuel storage room equipped with two day tanks, and a furnace/boiler room.

Work completed during past investigations was limited to a single sample obtained from the gravel slope at the east side of the building. No exceedances were detected; however the sample was not analyzed for PHCs. The 2005 investigation was focused on obtaining lateral and vertical delineation of any potential hydrocarbon contamination located at the Garage, as well as inspecting potential heavy metal contamination in other areas surrounding the Garage.

Soil Investigation

Seven testpits were advanced at the Garage, as shown by the sample locations indicated in Figure 3.1. Three testpits, ET118 to ET120, were advanced on the slope north of the building. ET121 was advanced east of the building, ET122 was located on the southeast corner of the building and two testpits, ET123 to ET124, were positioned near the top of the slope on the west side on the building. ET118, located immediately north of the building at the top of the slope, was advanced to the point of auger refusal to achieve vertical delineation. ET119 and 120 were placed near the toe of the slope and advanced to 0.3 m bgs in an attempt to obtain lateral delineation. All samples retrieved from the testpits were all analyzed for Petroleum Hydrocarbons (PHCs), and select samples were analyzed for Polyaromatic Hydrocarbons (PAHs) and Metals. Results are shown in Tables 3 to 5 (Appendix D).

There were no exceedances of PAH guidelines, whereas six exceedances of the PHC guidelines were measured. Potential hydrocarbon contamination north of the Garage was indicated by the presence of a damaged fuel line which appeared to have been leaking for quite sometime, indicated by the extensive surface staining (Photo 7). The potential contamination in the vicinity of the piping was assessed by advancing a testpit within the impacted area (ET118) and two testpits near the perimeter of the stained area (ET119 and ET120). Samples from all depths in testpit ET118 (0-0.30, 0.4-0.8, and 0.9-1.1 m bgs) were found to contain high concentrations of F2 fraction PHCs. Due to auger refusal, (shallow bedrock and permafrost interfaces) vertical delineation beyond 1.1 m bgs was not possible; however it is not expected that the hydrocarbon contamination extends into the permafrost. PHC concentrations from ET119 and ET120 were not in exceedance of applicable criteria, which provides the lateral extent of the hydrocarbon contamination to the north as illustrated in Figure 3.1. East of the Garage, sample ET121 at a depth of 0.4-0.9 m bgs and a surface sample (0-0.3 m bgs) from ET122 were found to contain PHC concentrations in exceedance of F2 and F3 fractions, respectively. As shown in Photo 8, testpits ET121 and ET122 were located in stained areas north and south of the east overhead door, respectively. Also shown in the forefront of Photo 8 is ESG 01; as mentioned earlier, the sample was not analyzed for PHCs. Similar to the samples on the east side of the Garage, testpits ET123 and ET124 were placed to the south and north, respectively, of the overhead door on the west side of the building (Photo 9). A surface sample (0-0.3 m bgs) from ET123 was measured to contain F3 fraction PHCs in exceedance of specified criteria. The full extent of hydrocarbon contamination below the garage floor slab and to some extent south and east of the building is unknown. The estimated contamination plume is sketched in Figure 3.1. Based on

the extensive staining and thick layer of oily sludge on the garage floor and the potential for the garage slab to be cracked (unable to confirm condition of slab due to thick oily layer), the contamination plume is estimated to incorporate the soils below the garage floor, as shown in Figure 3.1. Information gained from the delineatory testpits ET119 and ET120 suggests that the hydrocarbon contamination in the soils surrounding the garage has a low mobility and therefore is not anticipated to extend beyond a few meters from the surface staining. This principle was applied to the soils surrounding ET121, ET122 and ET123. Based on the results and assumptions stated, the estimated plume area is 262 m^2, which relates to a volume of 289 m^3 when assuming a maximum depth of 1.1 m.

Results for Heavy Metals analysis completed on the samples retrieved from the Garage testpits are provided in Table 5. There were no exceedances of the applied heavy metal criteria in samples obtained during the Earth Tech 2005 investigation.

4.3.2 Electrical Cabinets

The Electrical Cabinet Area, shown in Photo 10, is a storage area located northeast of the Garage where all the electrical equipment from the demolished facilities was placed. The majority of the electrical components were removed from the cabinets and the previous ESG investigation identified cadmium concentrations in the soil in exceedance of INAC/DCC Tier II criteria. The previous soil investigation was restricted to surface soils and lateral delineation of the heavy metal contamination was not achieved.

Soil Investigation

A total of four testpits were advanced in the soils surrounding the electrical cabinets, as illustrated by the sample locations in Figure 3.2. Vertical delineation in the area of known cadmium contamination was obtained by advancing a test hole (ET174) directly adjacent to ESG 5 and obtaining samples from various depths below 0.3 m. Lateral delineation to the north-northwest, west-southwest and southeast was achieved by obtaining surface and depth samples from ET138, ET139 and ET140, respectively. Due to soil conditions restricting access for the quad mounted excavator, only testpit ET138 was completed using the backhoe. All other test holes in this area were advanced using the hand auger. Samples obtained from the testpits were analyzed for Heavy Metals and Polycyclic Chlorinated Biphenyls (PCBs). The results from the laboratory analysis are shown in Tables 6 and 7 of Appendix D.

Results for heavy metals in the soils are shown in Table 6. No exceedances were measured in any Earth Tech samples; therefore, the contamination is limited both vertically and laterally to the area in the vicinity of ESG 5. The resulting metals contamination plume at the Electrical Cabinet Area is illustrated in Figure 3.2. The approximate plume area is 51.7 m^2, which correlates to a volume of 15.5 m^3 assuming a depth of 0.3 m.

Table 7 provides the results from the PCB in soils analysis. No exceedances of the INAC Tier I (1 ppm) or Tier II (5 ppm) criteria for total PCBs were measured in any of the samples obtained from the Earth Tech testpits. Therefore no PCB contamination is present at the Electrical Cabinet Area.

4.3.3 Burn Pit

Located between the Electrical Cabinet Area and the POL tank is an area thought to be the location where fuel and debris was burned, indicated by the surface scaring and staining. The

area, referred to as the Burn Pit Area, is shown in Photo 11 of Appendix C and drawn on Figure 3.3 of Appendix B. Based on the fact that no previous investigative activities were conducted in this area and the area was obviously impacted by past land use, potential contaminants included Metals, PCBs, PHCs and PAHs.

Soil Investigation

A total of four testpits were advanced in this area. ET134 was advanced through the center of the impacted area using the quad mounted excavator. Heavy, black staining and treated/burned timbers, among other debris were discovered in ET134 can be seen in Photo 12. It was noted that the heavy staining and impacted soils were present at the surface to a depth of approximately 0.6 to 0.7 m bgs, at which point the stratigraphy changed to a native, grey coloured clay with trace gravels. Figure 3.3 illustrates the location of ET134, along with the delineatory test holes ET135, ET136 and ET137 placed along the perimeter of the impacted area. A total of five (5) samples were obtained and were analyzed for Heavy Metals, PCBs, PHCs and PAHs. The results from the laboratory analyses are shown in Tables 8-11, respectively.

Results for Heavy Metals and PCB concentrations in the soils at the Burn Pit Area are shown in Tables 8 and 9. There were no exceedances of the applied criteria and therefore no Heavy Metal or PCB contamination plumes are shown on Figure 3.3.

Results from samples analyzed for PHCs are shown in Table 10. Two exceedances, one of which was a field duplicate, were noted in samples obtained from the Burn Pit Area. The surface samples (0-0.3 m bgs) from testpit ET134 and ET137 were found to contain F2, F3 and F4 fraction PHCs in exceedance of the CWS for fine-grained surface soils. Considering the fact that ET134 is located close to the centre of the stained area, the remaining testpits (ET135, ET136 and ET137) can be used as delineatory locations when estimating the hydrocarbon contamination plume (Figure 3.3). Although ET137 was found to contain PHCs in exceedance of the applicable criteria, this testpit was placed slightly inside the impacted zone, whereas ET135 and ET136 were located slightly outside of the impacted area. As illustrate in Figure 3.3, the hydrocarbon plume closely follows the boundary of the buried debris and is approximately 56 m^2 in size. Based on the non-exceedance of the sample obtained from a depth of 1.2-1.4 m bgs in ET134, vertical delineation of the hydrocarbon contamination at the Burn Pit Area was limited to a depth of approximately 0.7 m bgs. This depth also correlates well to the depth at which the stratigraphy changes from heavy, dark staining to native clay material. Based on a calculated area of 56 m^2 and a depth of 0.7 m, the volume of hydrocarbon impacted soils at the Burn Pit Area is estimated to be 39 m^3.

Results for PAHs in soils at the Burn Pit Area are shown in Table 11. It should be noted that no exceedances were measured and therefore no PAH contamination plume is shown on Figure 3.3.

4.3.4 Former Module Train

The Former Module Train was located west of the Warehouse and northwest of the Garage. It was used as the living and working quarters while CAM-D was in operation. The building has since been demolished and the estimated location of the building footprint is shown on Figure 3.4. The footprint location was estimated using previous site drawings as well as the locations of ESG 14 and 15 as reference points. What appears to be the building material from the Former Module Train was sited east of the original building location in a partially buried pile. This debris pile, referred to as the Buried Station Debris, is discussed below in the following section.

Previous work at the Former Module Train did not identify any contamination in the soils; however the investigation was limited to Heavy Metals and PCBs. It is anticipated that the location of ESG 14 and ESG 15 were in the vicinity of the former exterior staircases, which has traditionally been the location of soil contamination surrounding the module train facilities on other DEW Line sites. It was assumed that if there was any soil contamination in the vicinity of the staircases it would have been identified from past investigations and consequently Earth Tech did not sample for Metals or PCBs. Based on knowledge gained from past DEW Line assessments, Earth Tech did however sample for PHCs in the vicinity of the Former Module Train where fuel lines servicing the building are typically located.

Soil Investigation

A total of four testpits were advanced in the soils surrounding the Former Module Train, as illustrated in Figure 3.4. All testpits were advanced to the point of backhoe refusal using the quad mounted excavator. Samples obtained from the testpits were analyzed for Petroleum Hydrocarbons (PHCs) and the results from the laboratory analysis are shown in Table 12. It should be noted that no exceedances were measured in soils surrounding the Former Module Train and therefore no PHC contamination plumes are shown on Figure 3.4.

4.3.5 Warehouse and Buried Debris Areas

East of the Former Module Station is the Warehouse and two buried debris piles, referred to as Buried Station Debris and Buried Warehouse Debris as shown in Photo 13. Much of the Warehouse has been demolished or otherwise destroyed. All that remains are some interior wall steel supports and the concrete foundation. No previous investigations have been conducted in the vicinity of the Warehouse building and due to the reworked or totally stripped gravel from around the foundation and a lack of staining in the immediate vicinity of the Warehouse, no investigations were warranted. On the other hand, the debris piles were found to contain potentially hazardous materials and showed signs of impacted soils, therefore testpits were advanced within and surrounding the partially buried Station Debris and Warehouse Debris. Samples obtained from the test holes were analyzed for Heavy Metals and PCBs.

Soil Investigation

A total of four testpits were advanced using a shovel and hand auger in the soils at the Buried Station Debris, as illustrated in Figure 3.5. Testpit ET155 (Photo 14) was located within the top of the debris pile where most of the partially buried debris was situated. ET156 and ET157 were sited at the base of the debris in areas where visual signs of impacted soils were observed. ET155, ET156 and ET157 were located to identify potential contamination sources and to provide delineation in the event contamination was identified in the adjacent test holes. ET158 was located outside the debris area boundary to provide lateral delineation to the northeast. Results for ESG 7 and ESG 8 from the previous investigation were used to provide delineation east and southeast of the debris area. Topography and drainage in this area promotes contaminant migration towards the east, therefore it is assumed that ET158, ESG 7 and ESG 8 are satisfactory to achieve lateral delineation of the area. Samples obtained from testpits at the Buried Station Debris were analyzed for Heavy Metals and PCBs and the results from the laboratory analysis are shown in Tables 13 and 14. No exceedances of the DCC Criteria were measured and therefore no contamination plumes are illustrated in Figure 3.5.

The investigation procedure of the Buried Warehouse Debris (Photo 15) was similar to the procedure used to assess the Buried Station Debris. Test pits were advanced within and surrounding the debris area. A total of three test holes, one of which was located within the debris pile (ET159) and two located outside the debris boundary to the east and northeast (ET160 and ET161), were dug. The topography at this location was also similar to that of the Station Debris, such that migration and drainage was towards the east and consequently the location and number of testpits was considered adequate to delineate potential soil contamination. Samples obtained from the soil investigation were submitted for Heavy Metals and PCB analysis. As shown in Tables 15 and 16, concentrations of Metals and PCBs in soils at the Buried Warehouse were all well below applicable criteria, and therefore no contamination plume is shown in Figure 3.5.

4.3.6 POL Tanks

Located on the north perimeter of the Main Station gravel pad is a 75,700 litre petroleum, oil and lubricants (POL) bulk storage tank and a pump house, fabricated with metal siding (Photo 16). A second POL tank has since been demolished and or removed. Topography and surficial geology at the POL Area, consists of a mounded gravel area over which the tank and pump house are situated (Photo 17), with a relatively flat area to the south (Photo 18) that is graded downward around the tank and pump house to the north (Photo 17). As with all other facilities in the Main Station Area of CAM-D, the majority of the gravel surface that was once present has since been stripped and relocated to the SRR site. Previous soil investigations in this area were limited to Heavy Metals and PCBs, therefore due to the nature of products stored in the POL tanks, the 2005 investigation was focused on hydrocarbon contamination.

Soil Investigation

A total of nine testpits were advanced in the vicinity of the POL tanks, as illustrated in Figure 3.6a. One testpit, ET125, was advanced between the POL tank and the pump house to obtain samples from the location of the potential contamination source, two testpits (ET126 and ET127) were located in the gravel area to the south, and the remaining six (ET128 – ET133) were located in an array around and downgradient of the POL tank and pump house. Testpits ET125 (shown in the upper left portion of Photo 18) and ET128 - ET130 (shown from left to right in Photo 17) were advanced using the quad mounted excavator to the point of backhoe refusal. Boreholes ET131 to ET133 were completed using a shovel and hand auger and positioned to provide lateral delineation downgradient of the potential contamination zone. Samples obtained from the testpits were analyzed for PHCs and PAHs. The results from the laboratory analysis are shown in Tables 17 and 18.

Strong hydrocarbon odours were noted during the advancement of most testpits at the POL Area. As shown in Photo 19 a sheen was present on water discharging and draining from soils immediately downgradient from the POL Area. The sheen did not exhibit the multicolored property of hydrocarbon sheens. Surface water samples from standing water near the observed sheen were below detection limits and it is assumed that the sheen is the result of naturally occurring organics sheen. Based on the observations, samples from all testpits were submitted to the laboratory for hydrocarbon analysis. Results from the PHC analysis are located in Table 17. Several exceedances of the CCME Residential Criteria and Canada Wide Standards for PHCs in soil were measured in samples retrieved from testpits ET125 – ET127, ET129 and ET130. The results show that highest concentrations were measured in testpit ET129, which suggests that if the POL Tanks are the source for the contamination, the contamination plume has migrated slightly to the north. The full extent of hydrocarbon contamination is somewhat unknown and heavily influenced by bedrock topography and soil stratigraphy. Higher PHC concentrations from the samples obtained at depth indicate it is likely that the hydrocarbon contamination plume is contained in the lower reaches of the fill layer, and is migrating down gradient along the fill/bedrock and/or fill/permafrost interface to the north. Figure 3.6 illustrates the estimated hydrocarbon and PAH contamination plumes located at the POL Area. The depth of impacted soil is not easily estimated, due to the undulating topography, varying depth to permafrost and geological formations present at the POL Area; however it is assumed that the depth of impacted soils is 1.5 m bgs. As shown in the figure, the contamination area is approximately 593 m^2, which correlates to a volume of 890 m^3 of hydrocarbon impacted soils at the POL Tanks.

Due to the nature of products stored in the POL tanks, samples were also submitted for PAH analysis. As shown in Table 18, PAH concentrations in four samples collected at the POL Area were found to exceed the applied criteria for PAHs in soil. These included samples obtained from the base of test holes ET126 and ET127, and both the surface and at depth samples from ET129. As was the case with PHCs, highest concentrations for PAHs were obtained from the base of ET129. The approximate area of PAH contaminated soil is 519 m^2. These areas correlate to a total PAH impacted soil volume of 778 m^3 at the POL Area.

Results for Heavy Metals and PCB concentrations in the soils at the POL Area are shown in Tables 19 and 20, respectively. There were no exceedances of the applied criteria for neither PCBs nor Metals.

4.3.7 Sewage Outfall

Located northwest of the Former Module Train is the Sewage Outfall. As shown in Photo 20, although the outfall pipe is no longer in place the location remains apparent by the pipe shaped indentation in the surface soils. The outfall drained in to a natural, localized drainage channel which is visible in Photo 21. PCB and metals contaminated soils are often associated with sewage outfalls on DEW Line sites, and are therefore the contaminants of concern in this area.

Soil Investigation

The ESG investigation at the sewage outfall identified PCB and Heavy Metal contamination near the point where the effluent exited the outfall pipe. Duplicate samples obtained from ESG 10 were found to contain copper, zinc, arsenic and PCBs in exceedance of the DCC criteria. Localized drainage and topography in the vicinity of ESG 10 would suggest that soil contamination is likely contained within the small low lying area from which ESG 10 was obtained. Therefore, Earth Tech advanced a testpit immediately beside ESG 10 to provide vertical delineation and three testpits to the side and downgradient of the contaminated area to provide lateral delineation to the east (ET110) and north (ET112 and ET113) of the impacted area. The testpit locations are shown in Photo 21 and illustrated in Figure 3.7. It is anticipated that the presence of an elevation drop and lack of surface soils to the south and west would limit the possibility of contaminated soils in that direction. Analysis for Heavy Metals and PCB concentrations in soil are shown in Tables 21 and 22, respectively.

No exceedances of the applied criteria for Heavy Metals or PCBs were measured in Earth Tech testpits at the Sewage Outfall. Consequently, the soil contamination is limited to the area in direct vicinity of ESG 10. Using the Earth Tech test pits and localized features for lateral delineation, the Heavy Metals and PCB contamination plumes at the Sewage Outfall are estimated to cover an area of 16.2 m^2 (Figure 3.7). The sample obtained from ET110 at a depth of 0.3-0.4 m was used to provide vertical delineation of the Metals and PCB impacted soils, which made possible the assumption of total contaminated soil depth of 0.2 m. Therefore 3.2 m^3 of soil is contaminated with Heavy Metals and PCBs at the Sewage Outfall Area.

4.3.8 Pallet Line

Located approximately 200 m northeast of the Main Station Area is the Pallet Line Area (Photo 22). The Pallet Line Area appears to be where the partially full barrels of fuel, lubricating oil, waste oil or other hydrocarbon based products were sent for treatment and sorting. This region is arranged with three treatment areas that run east-west and three rows of empty barrels that run north-south. It is estimated that approximately 1000 barrels are stockpiled in this area. The treatment areas, shown in the forefront of Photo 22, were comprised of well sorted sandy topsoil on which partially full barrels laid on their side. Heavy and dark surface staining covered the majority of the sandy fill and to some extent, neighboring areas (Photo 23). Consequently, contaminant investigation in this area was related to the extensive surface staining of the treatment areas. The previous soil investigation was limited in number of samples and restricted to Heavy Metal and PCB contamination. Therefore, the 2005 investigation focused on potential PHC and PAH contamination, as well as obtaining additional information for Heavy Metal contamination.

Soil Investigation

Thirteen test pits (ET141 to ET149, and ET170 to ET173) were advanced in the soils within and surrounding the Pallet Line Area. As illustrated in Figure 3.8, test pits ET141, ET145-ET149, and ET171-ET173 were sited around the perimeter of the treatment areas and stockpiled barrels. Boreholes ET142-ET144 were advanced within the treatment areas. All samples obtained from the test pits were analyzed for PHCs and PAHs, and samples from select locations were submitted for Heavy Metals analysis. The results from the laboratory analysis are shown in Tables 23 to 25. Results from the Earth Tech sampling was then compiled with the previous investigation to produce contamination plumes for Heavy Metals, PCBs and hydrocarbons, as shown in Figure 3.8.

Heavy staining and the presence of a hydrocarbon odour as the test pits were completed suggested that all samples should be analyzed for PHCs. Four samples, including a duplicate sample from ET144, were found to contain several PHC parameters in exceedance of the CWS for PHCs in fine grained soil (Table 23). Concentrations of F2-F4 fractions of PHCs in test pits ET142 and ET144 were found to be significantly higher than the applicable criteria; in fact most parameters were measured to be greater than 10 times the criteria. Results for the samples collected from testpit ET143 were not as anticipated. ET143 was placed within the southern most treatment area and therefore it was anticipated that this sample would be contaminated. Although the chances are somewhat unlikely, a possible explanation for the non-exceedance is that this exact location may not have had barrels overturned on or near it. Short of advancing dozens of testpits in a grid pattern covering the treatment areas, an assumption must be made based on the field observations and the results obtained from samples submitted for PHC analysis. It is assumed that all treatment areas, including the underlying soils to a depth of 0.6 m, are considered contaminated with PHCs. Consequently, the estimated PHC contamination plume covers an area of 784 m^2 as shown in Figure 3.8. Assuming the depth of 0.6 m, the total volume of PHC impacted soils at the Pallet Line Area is calculated to be 470 m^3.

Samples from all Earth Tech testpits at the Pallet Line Area were also submitted for PAH analysis. As shown in Table 24, there were no exceedances of CCME criteria and therefore no PAH contamination plume is shown in Figure 3.8.

Heavy metals are often associated with waste oil generated from waste oil and consequently, Earth Tech submitted select samples for Heavy Metal analysis (Table 25). Although the metals were of measurable concentrations, they were below INAC criteria. Therefore there is no Heavy Metals contamination plume at the Pallet Line Area, as indicated in Figure 3.8.

4.3.9 Portable Fuel Tanks

Along the road to the Main Station Area from the Airstrip and SRR is a small depression with two large diesel fuel tanks located on a cat train skid. The area, shown in Photo 24, is referred to as the Portable Fuel Tanks Area. Although no diesel fuel remains within the tanks, the lack of vegetation in the area would suggest that the tanks leaked for a period of time since they were deposited here. A single test hole (ESG 28) was all that was included in the past investigation in this area, and the sample was only analyzed for Heavy Metals and PCBs. Therefore the focus at the Portable Fuel Tanks for the 2005 Investigation included vertical and lateral delineation of potential PHC and PAH contamination.

Soil Investigation

Eight testpits were advanced in the soils within and surrounding the Portable Fuel Tanks. ET152 – ET154 were completed using the quad mounted excavator to the point of auger refusal, whereas ET165 – ET169 were advanced using a hand auger. As illustrated in Figure 3.9a, Earth Tech testpits are as follows; ET166 was placed directly between and below the south wall of the two tanks; ET152, ET153, ET154 and ET165 were sited around the northeast, east, southwest and northwest boundary of the surface impacted soils; and ET167, ET168 and ET169 were placed between 5 to 10 m towards the east, south and west, respectively. In most case, samples were obtained from the surface and at depth, to provide lateral and vertical delineation of potential soil contamination. All samples were submitted for PHC and PAH analysis and the results are provided in Tables 26 and 27.

Concentrations of PHCs in samples obtained either at surface, at depth or both from six of the eight testpits at the Portable Fuel Tank Area were found to be in exceedance of the applied criteria (Table 26). Surface samples from ET152-ET154, ET165 and ET166 were found to contain Ethylbenzene and/or F2-F3 fraction PHCs in exceedance of the CCME and CWS for PHCs in Soil. Whereas, samples from ET154, ET165, ET166 and ET169 were found to exceed the criteria for Ethylbenzene, Xylenes and/or F1-F2 PHCs. The extent of PHC contamination at the Portable Fuel Tanks Area is illustrated in Figure 3.9. It is believed that topography and local site features, such as the roadway to the south and higher topography to the north and east, play a major role in the extent of PHC contaminant migration. Also, with higher PHC concentrations from the samples obtained at depth it is likely the hydrocarbon contamination plume is concentrated and is migrating down gradient along the permafrost surface to the west. With the former roadway to the south, it is likely that the compacted underlying materials would act as a partially impenetrable barrier and therefore limit the extent and direction of hydrocarbon contaminant migration. Consequently the estimated PHC plume is illustrated such that it is contained within the low lying area with the former roadway as the southern boundary and the high ground north of ESG29 acting as the northern boundary. Despite not submitting surface samples from ET169 and the possibility that surface soils in the vicinity are not impacted with hydrocarbons, for the purpose of estimating the volume of contaminated soil at the Portable Fuel Tank Area, it was assumed that the surface soils would match the contamination plume at depth in the vicinity of ET169 and consequently the total depth of contaminated soil is approximately 1.0 m. The estimated area of PHC impacted soils is 761 m^2 which correlates to a volume of 761 m^3

Samples from all Earth Tech testpits were also submitted for PAH analysis (Table 27). Five (5) samples, including a duplicate sample, from three testpits were found to contain concentrations of Naphthalene in excess of the CCME guideline. As was the case with PHCs, the results for PAH sampling suggest that they too are contained along the permafrost interface as four of the five samples that exceeded criteria were obtained from depth (Table 27). Consequently the contamination plume in surface soils is concentrated around ET166, where as the plume at depth covers a much larger area to include the contamination at ET154, ET165 and ET166, as shown in Figure 3.9. For the purpose of estimating contaminated soil volume, it is assumed that the depth of impacted material is 1.0 m. The estimated PAH plume covers an area of 266 m^2 and accounts for a total volume of 266 m^3.

4.3.10 Main Dump

Approximately 200 m north of the Pallet Line Area is a site known as the Main Dump Area (Photo 25). Waste found in this area includes domestic debris, heavy equipment, and approximately 2000 empty barrels. The debris in this area is concentrated along the south edge of a shallow concave depression in the topography. The previous investigation identified elevated Lead and Zinc concentrations in ESG 53 and ESG 57; however results were below DCC Tier I and II criteria.

Soil Investigation

Two testpits were advanced at the Main Dump area. ET150 and ET151 were advanced using the quad mounted excavator to the point of back hoe refusal, however based on the lack of visual signs of impacted soils at depth only surface samples were sent for Heavy Metals and PCB analysis. In an attempt to obtain additional information regarding potential heavy metal contamination at the Main Dump, ET150 was sited between ESG 53 and ESG 57 and ET151 was advanced in a small clearing amidst the debris (Figure 3.10). Results are shown in Tables 28 and 29.

As indicated by the results, no exceedances of the INAC criteria for Heavy Metals or PCBs were measured in samples obtained from the Earth Tech investigation. Therefore, no contamination plumes are shown on Figure 3.10.

4.3.11 Vehicle Dump

A small collection of derelict vehicles, heavy machinery and miscellaneous equipment is located approximately 150 m southeast of the Garage at an area referred to as the Vehicle Dump (Photo 26). Previous investigations were focused on Heavy Metals and PCBs, with no exceedances of INAC criteria detected. Figure 3.11 illustrates the sampling points from past investigations. Due to the lack of surface staining and other indicators of impacted soils, no test pits were advanced and no samples were submitted for analysis. This area requires only sorting of the hazardous and non-hazardous materials, which are listed and discussed in the Materials Inventory section of this report.

4.3.12 Main Barrel Dump

Located approximately 75 m northeast of the Vehicle Dump is the Main Barrel Dump (Photo 27). It is estimated that 5100 empty barrels are stacked in this area. All barrels inspected were found to be empty or contained rusty water. Figure 3.11 provides the location of several samples obtained during previous investigations at the Main Barrel Dump. It should be noted that no exceedances for Heavy Metals or PCBs were detected. That, combined with the lack of staining in the area, resulted in no additional sampling or testpitting in this area during the 2005 investigation.

4.4 Airstrip Area

There are two debris areas located on the north side of the Airstrip, on each side of the road to the Main Station Area northeast of the airstrip apron (Figure 4.0). The area to the west contains various heavy equipment piled off the side of the apron on a bedrock outcropping, and the area to the east contains a large crane atop the gravel apron.

4.4.1 Airstrip Vehicle and Debris Area

The Vehicle and Debris Area at the Airstrip, shown in Photo 28, is located on the north bank of the airstrip near the road to the Main Station Area (Figure 4.0). The material at the Vehicle and Debris Area consists of heavy machinery, a small collection of barrels and other scrap metals. The past investigation did not include an examination of the soil within the debris; instead, samples were obtained from drainage courses that came from the debris area. There was one location within the equipment and debris that had staining on the ground that warranted test pitting and sampling.

Soil Investigation

Two testpits were advanced in the vicinity of the stain at the Vehicle and Debris Area. Locations of the testpits at are shown on Figure 4.1. The stain, shown in Photo 29, appears to originate below the dump truck and has migrated northwest down the slope, impacting the soils below the bombardier. Testpit ET108, shown in the background of Photo 29, was advanced to a maximum depth of 0.4 m using a combination of a shovel and hand auger within the stained area. ET109 was sited outside the southwest extent of the stain. It was anticipated that ET108 would provide vertical delineation of the potential contamination, whereas lateral delineation would be obtained from using ET109 and ESG 67. Samples retrieved from the testpits were analyzed for Heavy Metals, PCBs, PHCs and PAHs. Results are located in Tables 30 to 33 of Appendix D.

Results for heavy metal concentrations in soils at the Vehicle and Debris Area at the Airstrip area are shown in Table 30. The surface sample from ET108 was found to contain metal concentrations in exceedance of applied criteria for copper and zinc. Delineation of the metals contamination is achieved in all directions with ESG 67 and ET109 providing delineation to the north and west, respectively, and the extent of contamination to the south and east is limited by a steep, rocky slope. The estimated metals contamination plume located in this area is shown in Figure 4.1 and covers an approximate area of 52 m^2. Vertical delineation of the contaminated soils has shown that the contamination is restricted to a depth of 0.2 m. The soil depth and contaminant area correspond to 10 m^3 of metals contaminated soils at the Vehicle and Debris Area.

As shown in Table 31, no exceedances of the PCB criteria were measured in samples retrieved from Vehicle and Debris Area testpits.

Results from PHC analysis are provided in Table 32 and from PAHs are shown in Table 33. There was one sample that exceeded the PHC guidelines and no exceedances for PAHs. The surface sample from testpits ET108 was found to be contaminated with PHCs, with the concentration of the F3 fraction measure at greater than 30 times the criteria. As was the case with the heavy metal contamination in this area, the estimated PHC plume covers an area of 52 m^2, as shown on Figure 4.1, and correlates to a volume of 10 m^3 of impacted soils.

4.4.2 Airstrip Crane Area

The Crane Area, shown in Photo 30, is located on the east edge of the apron, north of the Airstrip. Several testpits were completed in this area during the past investigation in the vicinity of the former buildings and around the crane as portrayed in Figure 4.2. No exceedances were previously identified; however the samples were only analyzed for Heavy Metals and PCBs.

Soil Investigation

Three testpits were completed at the Crane Area, as shown in Figure 4.2. Test pits ET105 and ET106 were advanced in soils below the engine on the crane (Photo 30), and testpits ET107 was located down gradient of the other test pit locations. Previous investigations in this area did not identify Heavy Metal or PCB contamination and samples from the 2005 investigation testpits were submitted for PHC and PAH analysis.

Results for PHCs are provided in Table 32 and for PAHs in Table 33. There were no exceedances of applied criteria for PHCs or PAHs. Despite the heavy staining in this area, it does not appear that the soils are impacted with PHC or PAH contamination and thus no contamination plumes are illustrated in Figure 4.2.

4.5 Simpson Lake

Approximately 4.7 kms northeast of the Airstrip, on the southern shore of Simpson lake, is a site that was used in the winter months as a staging area for the winter airstrip. The trail or path used to get between Simpson Lake and the Airstrip is completely degraded and marked only by sporadic marker barrels. Debris in this area consisted of approximately 300 barrels that were randomly stacked in small piles and scattered about the shoreline approximately 1 km to the east of the winter staging area. There was also a small amount of domestic debris, consisting mostly of the remains of a small shack and cot. There was a single 12 volt DC battery identified in this area. Previous investigations identified an exceedance of zinc in a sample retrieved close to the battery (ESG 84).

Sediment Sampling

A total of three sediment samples were obtained from Simpson Lake. Locating suitable areas for sampling was somewhat tedious as the majority of the shoreline was rocky and therefore deficient of suitable sediments. Sediment samples were submitted for Metals, PCBs and PHC analysis and the results are provided in Tables 34-36. No exceedances of the DCC criteria for Heavy Metals and PCBs, and of the CWS and CCME for PHCs were detected in samples obtained from the 2005 investigation.

Soil Investigation

A total of three testpits were advanced surrounding ESG 84, which was the location where zinc was found to be in exceedance of INAC criteria. Earth Tech samples ET-ESG 84 A, B and C were obtained to the south, southeast and south of the original ESG 84 sampling point (Figure 5.0). The samples collected were analyzed for Heavy Metals and the results are provided in Table 36.

No exceedances of the DCC criteria for Heavy Metals were measured in samples obtained in the vicinity of ESG 84 (Table 37). As a result the contamination plume illustrated in Figure 5.0 contains the soils in direct vicinity of ESG 84 and the Earth Tech testpits (ET-ESG 84 A, B and C) along with ESG 85 were used to delineate the extent of zinc contamination in the area. Soils in this area are restricted to a maximum depth of 30 cm with a shallow bedrock underlying. The plume area is estimated to be 10 m^2, which corresponds to an impacted soil volume of 3 m^3.

4.6 Plumbers Dump

Along the north shore of a small lake, and to the southwest of the Freshwater Lake, is an area referred to as The Plumbers Dump (Figure 6.0). The Plumbers Dump area is situated approximately 1500 m southwest of the Airstrip area. There is no record of previous investigations being completed in this area. The site appears to have been a drop point for supplies that were never transported to the main station area. The debris is approximately 10 m from the shoreline of the lake on a gentle upward slope as indicated by Figure 6.2. Waste found at this location, are discussed in greater detail in the Materials Inventory Section of this report.

Soil Investigation

A single testpit, ET162, was completed during the 2005 investigation at the Plumbers Dump. Figure 6.2 shows the locations of Earth Tech test pit ET162. The sample was retrieved adjacent to the small electrical transformers in the centre of the debris pile and analyzed for Heavy Metals and PCBs. The area of debris is approximately 30 m by 15 m in size. Photo 31 shows the sample location and typical debris located in this area.

Results from Heavy Metals analysis are shown in Table 38. With the exception of the Cadmium exceedance above criteria, all concentrations were relatively low. It is anticipated that the Cadmium contamination is restricted to the area identified by surface scaring; however additional testing, for lateral and vertical delineation, should be conducted at the time of remediation to ensure contamination is limited to the stained area. The estimated plume follows the land scarring that was noted in the area of the sample. The estimated plume area is 42 m^2 and a depth of 0.3 m, corresponds to 13 m^3 of Metal contaminated soils at the Plumbers Dump.

PCB results for soils at the Plumbers Dump site are shown in Table 39. There were no exceedances of the DCC criteria. Therefore, there is no PCB contamination plume sketched in Figure 6.2.

4.7 Surface Water Sampling

A total of seven surface water samples were obtained from various locations at CAM-D. Surface water samples were retrieved from drainage courses downgradient of areas with known or potential contamination. The main study areas from which surface water samples were collected include the POL Tank Area (Figure 3.6), the Outfall Area (Figure 3.7), the Pallet Line Area (Figure 3.8), the Portable Fuel Tanks Area (Figure 3.9), the Main Dump (Figure 3.10), the Vehicle Dump Area (Figure 3.11), the Freshwater Lake (Figure 6.1), and Simpson Lake (Figure 5.0). Locations for the sampling points are shown on the Figures of the specific areas. Results for Heavy Metals, PCB, PHC and PAH analyses are shown in Tables 40 to 43.

No exceedances of the CCME Water Quality Guidelines for the Protection of Aquatic Life were detected in several surface water samples analyzed for PCBs, PHCs and PAHs. However, several exceedances for Heavy Metals were measured. Samples from the POL, Outfall, Pallet Line and Main Dump were found to exceed the CCME guidelines for various metal parameters. On the other hand, samples from the Vehicle Dump Area, the Freshwater Lake and Simpson Lake were below criteria, and in most cases below detection limits of the laboratory analyses. Cadmium and copper levels at the POL Area were found to be 2 and 3 times the guideline, respectively. Concentrations of cadmium, copper and zinc in water samples collected from the Outfall Area were found to exceed the guideline. It was observed that the surface waters draining from the Pallet Line area continue downgradient eventually dissecting the Main Dump area. Upon comparison of the metals concentration in surface water samples from the Pallet Line area to

those collected below the Main Dump, it should be noted that the concentrations are diluted relatively quickly when the water travels from the pallet line to the main dump area. Most concentrations are diluted by a factor of 3 or 4, and in some cases by a greater amount. The areas where exceedances were noted are a significant distance away from any possible fish habitats. It also must be noted that the volumes of surface water where the exeedances were noted are minimal. It is not anticipated that contamination noted on site is adversely affecting water sources downgradient and off site and it is expected that removal of the source contamination (contaminated soils) would address the problem.

4.8 QA/QC

To determine the precision of the reported laboratory analytical results, Duplicate sample results were evaluated using the USEPA Relative Percent Difference Method.

$$\text{Relative percent Difference (RPD)} = \frac{(X_1 - X_2) \times 100}{(X_1 + X_2)/2}$$

Tables 44 to 47 in Appendix D presents the QA/QC calculations for the 4 different parameters analyzed for (Metals, Hydrocarbons, PCBs and PAHs).

Six parameters from the background samples exceeded the recommended RPD value of 20% for metals (arsenic, chromium, cobalt, copper, nickel and zinc). The RPD exceedances may be attributed to non-homogeneous contaminant dispersion within the soil that was sampled twice for duplication.

One parameter from FT-ET165 exceeded the recommended RPD value of 40% for PHCs (%C50+). The RPD exceedance for %C50+ may be attributed to non-homogeneous contaminant dispersion within the soil that was sampled twice for duplication.

No parameters exceeded the recommended RPD value of 40% for PAHs or PCBs.

The laboratory QA/QC, which included duplicates and surrogate spike recoveries, were all within acceptable limits for all parameters analyzed.

5.0 MATERIALS INVENTORY

The RRMC report for the CAM – D DEW Line site at Simpson Lake discussed partial inventories for both hazardous and non-hazardous materials. Non-hazardous materials were described as inert or dry material that could be disposed of on site and would not have a negative impact on the environment. Hazardous materials were described as wet or leachable materials that if left on site or not properly contained may pose a threat to the environment.

The 1994 ESG report discussed the general location of the material, whether it was hazardous or not, type of material, and estimated quantities. For continuity purposes, the format for the 2005 investigation follows a similar format and has increased detail. Keeping with the format of the report, there are six main areas discussed; the main dump, the main station area, the airstrip area, the freshwater lakes area, the Simpson lake area and the borrow source area. Occasional materials located outside of these six main areas will be incorporated into the discussion of the area closest to where they were encountered.

Non Hazardous Material is reported in crushed or cut 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). Discussion as to the estimated method of remediation for hazardous material has not been made due to the many possible methods of accomplishing this (i.e., stripping hazardous paint or leaving it on the substrate to be shipped off site or placed in hazardous materials landfill). As a general note, all barrels inspected at the CAM-D site were found to be empty or containing small amounts of rusty water, with the exception of approximately fifteen (15) barrels (approximately 2.5 m^3 of POL) at the pallet line area. This fact does not ensure that all barrels on site are empty or contain just rusty water as all (approximately 9054 barrels) were not inspected. During any cleanup activities all barrels must be approached using the DLCU barrel protocol.

The following paragraphs present a brief description of each area. A comprehensive table of estimated material weights and volumes is included in tables 48 and 49 of Appendix D.

5.1 Main Dump

The main dump is located to the north of the main station area. The dump material is spread over a 2.6 hectare (6.5 acre) area. The majority of the dump material is concentrated in the bowl of a rock outcrop towards the south end of the dump area with the remaining material (mostly barrels) scattered sparsely to the north (Figure 3.10 of Appendix A).

5.1.1 Hazardous Material

The waste in this dump is mostly non hazardous with the exception of items which may be painted with PCB and Lead contaminated paint. Remnants of lead-acid batteries (complete batteries and battery components) were noted during the site inspection.

5.1.2 Non-Hazardous Material

The main dump is comprised of waste that was used during the operation of the site. The material noted includes barrels, vehicles, various heavy equipment, scrap metal, scrap wood, waste concrete and domestic waste items.

5.2 Main Station Area

The main station area is located on a hill (Ross Hills) approximately 230 m above and 3.5 km south of Simpson Lake (Figure 2) and directly south of the main dump area. The majority of the site buildings have been demolished and the engineered grade material has been removed to construct the short range radar station (SRR) shown 1 km east of the Main Station Area (Figure 2). Sub areas include; a pallet line area, Inuit house, Petroleum, Oil, Lubricants (POL) Tank area, portable fuel tanks, sewage outfall, burn pit, warehouse building foundation area, electrical cabinet area, former module building train area, a barrel dump, a garage and a vehicle dump (Figure 3). The only remaining structures are the large POL tank, associated pump shed, the garage and the warehouse concrete foundation. There are also two buried debris piles near the warehouse area. The debris appears to be from the demolition of some of the main structures at the main station area. Soil samples taken from areas surrounding the debris piles at the main station area do not indicate the presence of lead or PCBs in the soil. For this reason it is assumed if there is lead and PCB painted materials in the buried debris piles, the lead and PCB contaminants are not mobile. However, it is recommended that the buried debris piles be monitored to ensure their condition does not change and that the potential contaminants inside the buried waste piles do not become mobile. There is also a derelict shed southeast of the existing SSR station and northwest of some old construction trailers. There are several compressed gas cylinders, barrels and fuel tanks around the shed and pails/buckets of unknown fluids inside the shed. The shed, associated hazardous materials and construction trailers are related to the construction of the short range radar station and are not part of this assessment as they were not related to the operation of the CAM-D DEW line site.

5.2.1 Hazardous Material

Materials of concern in this area are asbestos containing materials (ACM), PCB and Lead contaminated paint, general hazardous wastes such as aerosols, paints, lubricants, fuels and compressed gas tanks. Estimated quantities of hazardous and non-hazardous materials at the Main Station are listed in the waste audit detailed summary tables (Tables 48 and 49, Appendix D).

5.2.1.1 Asbestos

ACM's at the main station area include floor tile, pipe insulation, fire door insulation, transite board and soil containing vermiculite (vermiculite containing asbestos). The floor tile and pipe insulation are inside the garage and also scattered throughout the main station area in piles of debris and demolition waste. Pictures of asbestos containing and non-asbestos containing floor tiles are shown in photos 34 and 35 of Appendix C. It is estimated that there is approximately 17 m^3 of ACM scattered throughout the main station area in various debris piles. The asbestos sampling results are located in Table 50 of Appendix D. It should be noted so that the ACM can be separated from the non-hazardous material using approved abatement methods and disposed of in an engineered landfill on site in accordance with the Abandoned Military Site Remediation Protocol.

5.2.1.2 PCBs and Lead

Earth Tech sampled the PCB content in paint and concrete by scraping and chipping away at potentially contaminated surfaces. Results from paint and concrete sampling at the main station are shown in Tables 51 and 52 of Appendix D.

PCB paint and lead paint was found throughout the main station area. PCB contaminated paint (paint containing greater than 50 ppm PCBs) was found in the paint on the garage building deck and the grey garage interior paint.

Lead contaminated paint was found in the orange and grey garage interior paint, the orange and white downed antenna paint and in the POL pump shed silver exterior paint. The paint on the interior of the garage is severely weathered and flaked. The volume of material estimated to be covered with lead contaminated paint is to be 58 m^3. It should also be noted that, compared with other waste assessments at different DEW Line sites, the amount of identified PCB and Lead contaminated materials is relatively small. It is assumed that a lot of the PCB and Lead painted construction materials have been buried in the buried debris piles near the warehouse foundations. Soil samples taken from areas surrounding the debris piles do not indicate the presence of lead or PCBs in the soil. For this reason it is assumed if there is lead and PCB painted materials in the buried debris piles, the lead and PCB contaminants are not mobile.

The concrete floor in the garage was also sampled for PCB contamination and the sample results indicated no PCB contamination.

5.2.1.3 General Hazardous Wastes

General hazardous wastes encountered at the main station area include POL fluids in barrels (pallet line area), POL fluid in the large POL tank, lead-acid batteries (crushed and whole) and compressed gas cylinders.

Fifteen full barrels of petroleum products were noted at the pallet line area. It was also noted that the large silver POL tank contained free product up to the bottom of the original valve flange. The portable fuel tanks at the east end of the main station area were noted to be empty. Based on the carbon chain histograms located in Appendix G, the product in the POL tank is presumed to be aviation fuel. The histograms for the barrels at the pallet line area indicate the fluids to be gasoline and diesel. All POL fluids must be sampled to determine their metal content and disposal method (incineration or off-site disposal).

Batteries and battery components were noted throughout various locations at the CAM-D site during the materials inspection. All batteries and battery components must be segregated and treated as hazardous waste.

Approximately 20 compressed gas cylinders were noted at the main station area, inside the garage and in scattered debris pile throughout the site. Many of the markings and labels were worn off of the compressed gas cylinders. During clean up activities it shall be assumed that the cylinders contain flammable compressed gas and vented prior to disposal in accordance with the Abandoned Military Site Protocol.

5.2.2 Non-Hazardous Material

The only notable structures still standing at the main site area are the garage, the remaining POL tank and associated pump shed and the warehouse building foundation. It should also be noted that based on site observations underground piping appears to be removed from the Main Station Area. The newly constructed Short Range Radar Station (SRR) is 1 km to the east.

The non hazardous debris at the main station area consists of piles of demolition waste, buried debris, empty barrel caches, piping, scrap metal, waste concrete, random pieces of heavy equipment and scrap wood.

The pallet line contains three main barrel caches (688 barrels) and sand/gravel pads. The Inuit house was destroyed in a fire and the remains have since been bulldozed. The POL tank area has the remaining tank and associated octagon concrete foundation. The pump shed and its concrete foundation and the associated piping are still present. The second POL tank has been demolished but the octagon concrete foundation is still there. Buried debris was also discovered at the POL area. The estimated extents of the waste were measured and the noted buried debris included mainly empty barrels and scrap metal. The portable fuel tanks, at the east end of the main station area, are surrounded by scattered barrels and derelict cat track components. The portable fuel tanks are also empty.

The warehouse foundation is on piles and there are two buried debris piles near it. There is one debris pile to the south (Buried Station Debris) and one debris pile to the north (Warehouse Buried Debris). It is apparent that the buried debris is demolition debris from the demolition of the Main Station area structures (Module Train, Warehouse, etc.). The estimated extents of the waste were measured and the noted buried debris included mainly empty barrels, scrap metal and demolished building materials. The electrical cabinet area contains the remaining electrical cabinets with their components removed. The cabinets are surrounded by scattered barrels, miscellaneous debris and standing water.

The garage is still in tact but no longer functional as the main doors are damaged and the majority of the fill around the garage has been used in the construction of the SRR station. The downed antenna (southwest of the garage) is comprised of the antenna itself and its associated support cables and concrete anchor bases.

South east of the garage is where the vehicle dump and main barrel dump is located. The vehicle dump contains scattered debris, structural steel, a few empty barrels, derelict cat track components and several trucks and truck chassis. The previous ESG estimate puts the empty barrel count in the barrel dump (east of the vehicle dump) at 5100.

5.3 Airstrip Area

The airstrip area is 1 km southeast of the main station area as noted on Figure 2.0. Batteries and battery components were noted during the materials inventory. Non-hazardous material included culvert piping, barrels, abandoned vehicles including; a tracked bombardier, a tracked crane, a truck, two wood building foundations and scattered debris.

5.4 Freshwater Lake Area

The freshwater lake area is 0.75 km south of the airstrip area. The freshwater lake (larger and closer to the airstrip) has scattered debris all along its western shoreline. The debris includes homemade wooden boats and rafts, barrels, derelict cat tracks, a large dump truck box, a water heater, a large electrical cabinet and scattered domestic debris. The second lake (smaller and further south) has a small dumpsite (Plumber's Dump, Figure 6.2) on the western shore. Material noted includes scattered barrels, wooden crates, valves and fittings, pipe, toilets, sinks, and domestic debris as shown in Photo 31. Mercury lamp transformers (3) were removed from the dump and stockpiled in the garage at the main station area by Earth Tech during the Phase III investigation activities, 2005.

5.5 Simpson Lake Area

The path taken to Simpson Lake is shown on Figure 2.0. The Simpson Lake area is approximately 4.5 km northeast of the main station area. Materials noted at the Simpson Lake area were scattered barrels, domestic waste, batteries and battery components. A small cache of empty barrels were also noted approximately 150 m to the west of the Simpson Lake area.

5.6 Borrow Source Area

The borrow source area is 3 km south of the main station area and contains various potential borrow sources. No hazardous material was noted in the area. Non-hazardous material was limited to caches of empty barrels (approximately 200 barrels).

6.0 GEOTECHNICAL INVESTIGATION

6.1 Introduction

The Earth Tech team of soil scientists, engineers, and surveyor were on site the last week of August 2005. During this time, the environmental soil scientist and engineers recorded soil conditions, hydrology, erosion patterns, site access, airstrip condition, and looked for borrow sources and possible landfill sites.

The environmental sampling program provided an opportunity to predetermine soil conditions around the site prior to the execution of the geotechnical scope of work. The environmental test pit locations were logged both for environmental parameters and geotechnical parameters. Soil logs of test pits advance on the site are provided in Appendix F. Upon completion of the environmental soil sampling program and geotechnical reconnaissance, specific geotechnical test pits and site investigations were conducted in areas where more geotechnical information was required. More specifically, the scope of work for the geotechnical portion of this project includes the following:

- Identify borrow sources and potential locations for engineered landfills on-site.
- Evaluate the condition of site access roads and airstrip.
- Complete a detailed site survey of all geotechnically important features.
- Document all information in written reports and present geotechnical and hydrological data including a photographic record.

The fieldwork for this project was completed between August 22 and August 31, 2005. The reporting was completed following the receipt of the analytical data.

6.1.1 Previous Site Investigations

The Royal Roads Military College (RRMC) conducted an Environmental Assessment of nine abandoned DEW Line sites in 1994, including CAM-D. The RRMC report indicated that the 1964 air photos of the site showed severe scarification around the site. The Scarified areas have since been covered with vegetation. Most of gravel on site has been removed to construct the SRR and road to the SRR. A culvert on the road from the airstrip to the site was noted as washed out but was still passable. The report also mentioned the airstrip and road from the airstrip were still in good condition.

The 1986 report mentioned that a small borrow source was located near the Murchison River, and a badly eroded road leading to the river was identified. Apparently the main borrow sources (two) for construction of the site were located northwest of the site at Simpson Lake. The Simpson Lake borrow sources were not investigated during the 2005 site visit and are visible in the 1993 air photo located Appendix C (Photo #51). To the best of Earth Tech's knowledge, a detailed geotechnical evaluation of the site has not been completed since the site was constructed.

6.1.2 Site Visit

Earth Tech completed a general site reconnaissance while completing the environmental scope of work from August 24 to August 31. Earth Tech's Don Roy of Edmonton conducted the geotechnical evaluation. At this time general features of geotechnical importance or construction access were noted for further investigation later on in the site visit. This provided an opportunity to match the on site features with the previously written reports and field determine items of significant importance. Test pits were advanced either with a small hydraulically operated excavator mounted on an ATV or by hand with pick and shovel. Hand auger holes were also utilized where softer clay conditions allowed and/or non sloughing soils existed.

Upon completion of this preliminary information gathering and geo-environmental test pit logging, a detailed test pit program to determine the construction characteristics of the air strip was completed. This was carried out with the small excavator on site and with shovels. Test pits were advanced to depths of refusal at permafrost (approximately 1.0 to 1.5 m in depth). A total of 30 test pits were advanced for the purposes of the site geotechnical investigation. Test pit logs are presented in Appendix F while an overall site plan showing the areas of interest and sub areas is presented on Figures 7.0 and 7.1 in Appendix A. Figures 7.2 to 7.9a show sub areas of interest.

Upon completion of the airstrip investigations, potential engineered landfill areas were identified. Shallow test pits to confirm their geologic conditions were then advanced and samples for grain size analyses were retrieved. Photographs 37 to 61 are of the geotechnical areas investigated and are located in Appendix C.

It should be noted that due to the remoteness and difficult access of the gravel borrow site located across Simpson Lake, this site was not investigated.

6.1.3 Scope of Work and Objectives

The scope of work for the geotechnical portion of this project includes the following:

- Identify borrow sources and potential locations for engineered landfills on-site.
- Evaluate the condition of site access roads and airstrip.
- Complete a detailed site survey of all geotechnically important features.
- Document all information in written reports and present geotechnical and hydrological data including a photographic record.

The objectives for the geotechnical portion of this project include the following:

- To determine a reasonable location or locations for engineered landfill placements that will not adversely affect the site drainage or surrounding ecosystem.
- To determine the closest possible and best source or granular fill material for site remedial work including road stabilization, construction pads, landfill capping and berm material. Sources least likely to affect the ecosystem are to be given favored consideration.
- Assess that during environmental clean up of the site, as areas become remediated and/or reclaimed, if any useable gravel in the area can be used as engineered fill (i.e., removal of old roads, building pads, etc.).

6.2.1 Site Description

The site is situated at the summit of a hill within the Ross Hills some 4.5 km's south of Simpson Lake. The elevation of the site is approximately 370 m above sea level making access by aircraft difficult due to fog and mist conditions common in the Arctic. The location of the site is $68^0$35' north and $91^0$57' west. The site is accessible by fixed wing and rotary aircraft. Previous winter airstrips have been constructed on Simpson Lake during site occupation.

The site has one building left standing which is the former garage and has been heavily stripped of gravel leaving the garage, former warehouse (foundation only remains), and POL area "perched" on the original site grade.

The site overlooks the airstrip and freshwater lake to the southeast and far off in the distance to the southeast, the Murchison River Valley. Rolling hills and rock outcrops can be seen to the south, west and north while Simpson Lake can be seen from the far northeastern tip of the air strip.

6.2.2 Terrain

Terrain at CAM-D is characterized by rolling grassy hills cut by faulted and fractured granite outcrops and random frost wedging. Several lakes and rivers are also located in the area. Permafrost is present at approximately 1 to 1.5 m below ground surface. There are occasional granular deposits, however none are located in the immediate proximity of the site. The site is constructed on the upper flat plateau of a gentle hill on tundra with occasional bedrock outcrops. Typical native soils on site consist of wet/soft silty-clays with varying amounts of sand. An access road from the air strip to the upper plateau of the site/hill exists with a fork leading to the SRR site.

Any access roads that may have been in place to Simpson Lake have deteriorated to the point of being non existent and vegetated over (only used to access winter airstrip on lake). Access to the Murchison River appears to have been also completed in winter however there is a plowed and leveled "path" to the river that may have had some imported gravel placed in thin lifts.

6.2.3 Hydrology

The main site is situated at the summit of a hill where there is a relatively flat plateau. Site drainage is on all four sides but is predominantly due northeast towards Simpson Lake and due southwest towards the Murchison River. As mentioned previously, the DEW Line site main area gravel was used in the construction of the Short Range Radar Station (SSR) east of the site. This mining of gravel has left numerous ponded water areas on site and small drainage patterns that have created minor erosion channels.

Drainage patterns generally associated with rolling hill topography are usually long, wide, and can be somewhat undefined during dry seasons. The drainage to the southeast of the site can be described as dendritic while other areas draining away from the site are more similar to a radial pattern. Most lakes in the area are situated between hills and are fed with melt water run off. There are also small deltas along the shoreline of Simpson Lake as result of shallow drainage valley run off. The drainage pattern leading into the Murchison River grades into a significant outwash valley with moderate banks and seasonal erosion is apparent along the sides of the valley.

6.2.4 Topography

The site rises above the landscape in gentle slope patterns typical of the Ross Hills. There are no major escarpments or changes in elevation in the immediate site area. The site is approximately 30 m above the air strip, 75 m above the fresh water lake, and 230 m above the Murchison River. Topographic elevations are indicated on Figure 2.0 located in Appendix A.

6.3 Site Investigation

As per the Terms of Reference, the site has several areas requiring investigation. For decommissioning of the site, several sources of gravel would be required. To construct an on site engineered landfill, suitable areas and soils required identification and quantification. The airstrip required assessment for load bearing capacity, and the roads and access needed to be assed for construction vehicle travel.

6.3.1 Summary of Investigation Areas

The sites of interest are described in brief below as to what their geotechnical significance is in relation to the site and future decommissioning activities:

Current Main Dump Site. This area encompasses a large area of scattered debris and was originally thought to be a good location for locating an engineered landfill due to having partial bedrock controlled ridges.

Area of former Main Station. The area of the main station encompasses several sub areas including warehouse, former module train, garage, POL tanks, electrical cabinets (removed from Module train), storage shack area, vehicle dump and main barrel cache. There are several areas within the Main Station area that may be suitable for a positioning an engineered landfill and or landfarm.

Area near Murchison River. This area was investigated to be the closest source of granular fill material. A graded surface for a winter road already exists, and minor repairs to the existing surface to replace washed out culverts would be required for future use of the road.

Air Strip and Roads. The air strip is a vital part of the site and subsequent remediation plan as the condition of the strip will dictate what size aircraft can be utilized to bring supplies during the site remediation activities. The roads are required to the get from the airstrip to the site and to move equipment and material around during remedial activities.

Esker enroute to Simpson Lake. This area is visible from the air and could be a source of granular material. This was not identified in previous reports.

Historical Borrow Source, Northwest Side of Simpson Lake Shoreline. This area is visible from the air and could be a source of granular material. This was identified in previous reports but could not be accessed during the Earth Tech site visit due to the remote location and lack of a rotary wing aircraft.

6.4 Borrow Sources

Borrow sources were sought out to determine the material type and available volume to aid in the eventual decommissioning and remediation of the site. The main area around CAM-D had very little native granular material. Granular fill was very thin across the site as a result of previous site stripping completed to construct the SRR site. Shallow veneers of sand and gravel remain on the road ways and site proper while greater thicknesses remain beneath the foundations of the garage, warehouse, and POL tank area.

Historically, based on the 1964 air photo (#61), the site appears to have had a "ring road" constructed around its exterior to service the outlying buildings. The center of the main site does not appear to have been regarded with gravel. The only access roads visible are the road from the air strip to the site and the ring road on the site. These roads and the foundation pads for the buildings and POL storage area covered approximately 126,600 m^2. This area from the bend in the road at the former Inuit House up to and including the site is shown on Figure 7.7. Given the area, if 1 m of gravel (a conservative estimate) was in this area it would have been approximately 126,622 m^3. Most of this gravel has been used for the construction of the SRR and is discussed further within this section of the report.

There are various granular borrow sources that may be utilized for road restoration, landfill construction, land farm construction, backfilling of areas, and remediation of debris areas. Particle size distributions have been assigned five different granular material types for the following uses as outlined in the following table. For consistency purposes the soil types are graded for use, similar to the soil types presented in the 2004 EBA Engineering report "DEW Line Clean Up Project FOX-C (Ekalugad Fjord) DEW Line Site, 2004 Geotechnical Investigation, EBA Engineering Consultants Ltd., March 2005".

Table 1. Description of Granular Soil Types and Possible Uses

Material "Size"	Type	Description	Possible Use
Large Granular Material	Type 1	Course gravel, cobbles, and boulders.	Construction of berms for above grade landfills, slope stability and erosion control.
Moderate Granular Material	Type 2	Course gravel and sand with occasional cobbles.	Construction of berms, site regrading, general fill, general construction.
Moderate granular fill with some fines.	Type 3	Course gravel and sand with varying amounts of silt.	May require drying prior to placement depending on moisture content. Minimum degree of saturation of 90% is acceptable. Material may be used to for construction of containment berms and backfilling trench locations.
Small Granular Material	Type 4	Rounded gravel and sand with fines.	Construction of bedding for synthetic liner at bases of landfills. Can be used as intermediated cover in land fills.
General fill	Type 5	Wet silty sand with trace clay and occasional granular material.	Primary used as intermediate fill in landfills as material is typically poorly graded with a variety of fine grain sizes. Max. grains size should be less that 150 mm with less than 8% of the material, by weight passing the 0.08 sieve.

The particle size distribution descriptions are listed below and outline the distribution limits for granular soil types 2, 3, and 4.

Type 2 Granular Fill	
Particle Size (mm)	**% Passing**
200	100
50	60-90
5	30-75
.425	10-30
0.08	5-20

Type 3 Granular Fill	
Particle Size (mm)	**% Passing**
100	100
50	80-100
12.5	55-95
5	45-90
2	35-80
.425	25-70
0.08	20-40

Type 4 Granular Fill	
Particle Size (mm)	**% Passing**
25	100
12.5	75-100
5	50-100
2	30-60
.425	10-40
0.08	0-8

At least two previously existing borrow areas were identified at CAM D and three other possible sources were also identified. The two existing areas include the previous borrow source area near the Murchison River and the area on the northwest shore of Simpson Lake. The three potential new areas include the clay drumlin enroute to the Murchison River, the gravel and sand esker enroute to Simpson Lake, and the main site and surrounding area (for type 5 soils only). The locations of each borrow area are shown on Figures 7.0 and 7.1 located in Appendix A. Soil logs for each borrow area are provided in Appendix F.

6.4.1 Area of Former Main Station (Fine Grain Soil, Borrow Source #1)

Type 5 Soils

The area of the main station is generally flat with no visible rock outcrops. The native soils in this area are generally a wet-soft, silty clay. For this reason the site was constructed on thick gravel pad, most of which has been stripped from the site to construct the nearby SRR. Description of the granular material follows in subsequent paragraphs within this section. Permafrost was encountered from 1 to 1.5 m below grade and soils above the permafrost were saturated. Should a source of fine grained material be required for construction purposes, there is silty clay in abundance throughout the site proper and surrounding areas. The geotechnical test pit locations and relevant site features are presented on Figures 7.0, 7.1, and 7.6.

The silty sand with trace clay could be used to construct landfill berms, but would be susceptible to erosion if not covered with granular material. This material is very saturated and soft making it difficult to mold. It could be used for this purpose but would likely need to be dried out prior to working. After construction, due to its nature of water retention after thaw cycle, the soil would likely under go solifluction which is the flow of wet material at the surface that takes place when the ground in a permafrost area is partially unfrozen. Fine grained soil in this area can be on seen in Photos 37 and 38 located in Appendix C. Laboratory results are presented in Appendix G.

Test pits were advanced in this area to refusal and/or permafrost. Test pits were advanced with a small hydraulic excavator mounted to an ATV. The soils had some gravel and sand. Particle size analyses for samples collected in this area are summarized in the table below:

Sample ID	Depth (m)	% Moisture	% Silt	% Sand	%Gravel
Main Dump	0-0.9	10.2	51	46	3
Module Station	0-0.9	14.3	48	47	5
NW Pallet Area	0-0.9	10.3	13	78	9
South Diesel	0-0.9	6.9	46	44	10

Of the four samples submitted, all contained 25 mm maximum particle sizes however particles of up to 150 mm were within some test pit areas. Photo 37 show cobbles present within the test pit area. Volume of Type 5 material within the Main Station Area is well in excess of 250,000 m^3.

Type 3 Soils

The Main Station and roads on the site were constructed on the native soil and thus originally had large amounts of Type 2 and 4 granular fill. When the SRR site was constructed, most of the readily available (easily accessible) gravel was mined from the site. The following Photos located in Appendix C show the descriptions.

- Photo 4, Warehouse, depicts typical mining around foundation of warehouse.
- Photo 6, Garage, shows large thickness of gravel removed (+ 3 m thick).
- Photo 7, Garage, shows typical grain size.
- Photo 12, Burn Pit Area, shows thin veneer of gravel remaining (< 300 mm).
- Photo 17 and 18, POL Tank Area, large thickness removed (+ 2 m thick in some areas).
- Photo 24, Diesel Fuel Tanks Area, shows remains of gravel road to the left (south) of the tanks. Not erosion that has taken place.
- Photo 37, Former Module Train Area, shows very thin veneer of gravel remaining of building was originally situated.

The 1964 air photos show the mining-stripping scars on the land surface. Based on the air photos, the original site surface area is approximately 1,500,000 m^2 but not the entire main site was covered with gravel. Only the ring road around the main site, the building foundation areas, and the road leading up to the site contained a significant amount of gravel. If an estimated 8% of the site proper was historically graveled (as per air photo) there would have historically been in excess of 126,622 m^3 located on the road from the Inuit house to the main site, and the main site itself (as shown in Figure 7.7). This volume is based on an estimated average thickness of 1 m. Typical grain sizes are shown in Photo 44.

Assuming this same area has been thoroughly stripped and only thin veneers remain along with what is beneath the garage, warehouse, and POL foundations, an estimated 7,700 to 9,100 m^3 of type 3 granular material remains on the main site. It should be noted that this gravel may not be ready for immediate use as some of the road infrastructure would be needed to support construction and demolition equipment during site remediation activities. Also of note, that unless there will be no remedial activity in an area still containing some gravel, that the gravel not be removed in order to prevent equipment from sinking and rutting the site. Areas requiring soil remediation (burn pit, POL, pallet line area, etc.) may require additional gravel brought in to stabilize the area for construction equipment (e.g., rubber tired trucks, etc.).

6.4.2 Area Enroute to/at Murchison River (Soil Types 1 to 5)

This area was investigated to be the closest source of granular fill material that contained few fines and had a variety of grain size gradation. The Murchison River site is accessible via a roughly graded winter road. This road has some small amounts of imported gravel and has a several culverts (washed out) along the route. It appears that the road was leveled with a bulldozer, and the low spots and culverts were filled in to allow smoother construction of the winter road. There are cobbles and boulders as well as rutting, along the sides of the road. The road, test pit locations, and general site features are presented on Figure 7.0 and 7.2. The road can be partially be seen in the 1993 air photo presented as Photo 51a and a closer view showing road wash outs can be seen in the 1964 air photo 51b. Additional scarring that appears to be an extension of this winter road perhaps used to bring granular stock to the east end of the runway can be seen in Photo 53.

Drumlin (Borrow Source #2)

The route to the Murchison River follows a shallow valley and is essentially a drainage course that may have been formed by glacial action. This is more apparent in close proximity to the river. Approximately 1 km east of the river, signs of lateral moraine are visible. On the south side of route (approximately several hundred metres) there is a drumlin of boulder clay deposits (till) of nearly pure clay with trace sand and no silt. This is visible from the runway on the site as a grey mound/hill. Photos 39 and 40 show the drumlin and Figures 7.1 and 7.2.

The clayey soils are of significant importance as they represent a well graded source of Type 4 material for lined landfill construction. The soils within the drumlin differ than soils on site mainly due to being well graded and cohesive making them more workable for structural purposes. A hand dug test pit was advanced in this area (Clay Stock) and Laboratory results are presented in Appendix G.

A single test pit was advanced in the drumlin with a field shovel. The silt and clay soil had almost no visible signs of sand. The material appeared moist and not wet. Initial hand rolling field tests indicated poor plasticity but the addition of moisture greatly increased the plasticity. Particle size analyses indicated the sample tested consisted of:

Sample ID	Depth (m)	% Moisture	% Silt	% Sand	% Clay
Clay Stock	0-0.6	32.2	59	1	40

The area of the drumlin is approximately 14,671 m^2 as per Figure 7.2 and assuming a thickness of the 1.0 m thick, would yield a volume of material within the drumlin of approximately 14,671 m^3.

Additional material may be available at deeper depths however these soils would expect to be frozen thus requiring increased effort to access and remove (i.e., ripping and thawing). Surface water does not appear to be problem if this material were to be used.

Moraine (Borrow Source #3)

Again, along the south side of the drainage course, approximately 500 m east from the Murchison River, there is what appears to be a terminal moraine deposit of sands, gravels, cobbles and some boulders. Along this drainage course towards the river, there are several small barrel dumps and scattered barrels that have been carried by water flowing action. It is believed the barrels are remnants of the mining activities used to strip granular material from the terminal moraine described above.

General site features are presented on Figure 7.1. The materials located here are predominantly moderately graded sandy gravels with some cobbles and trace boulders. Photos 41 to 48 show the moraine deposits and their setting.

The gravel soils are of significant importance as they represent a moderately graded Type 2, 3, and 4 soils with some availability of Type 1 granular material. Several hand dug test pits were advanced in this area and shown as Gravel #1, Sand #1, and Gravel #2 on Figure 7.1. Laboratory results are presented in Appendix G.

The area has a small gravel stockpile that appears to have been created during the construction of the site. Heavy surface scaring is evident around the gravel stockpile. This appears to represent the stripping of material in the area used for the construction of CAM-D. Other areas appear natural or have been grown over with light vegetation. From north to south in Photo 51, there is the small gravel stockpile, a deposit of gravel and sand, a deposit of what appears to be mostly sand, and two more deposits of gravel/sand.

Test pits were advanced in this area to refusal and/or permafrost. Particle size analyses indicated the sample consisted of:

Sample ID	Depth (m)	% Moisture	% Silt	% Sand	%Gravel
Gravel #1	0-0.6	10.4	43	37	20
Gravel #2	0-0.6	3.5	34	38	28
Sand #1	0-0.6	6.1	6	90	4

Of the three samples submitted, they contained 25 mm maximum particle sizes however particles of up to 200 mm were within the test pit areas for Gravel #1 and Gravel #2 with maximum particle sizes of 100 mm within Sand #1. Photos 43 to 48 show the average material sizes and sorting.

As per Figure 7.5 the approximate area of the gravel stockpile area where sample Gravel #1 was retrieved, is 11,785 m^2 and assuming an average thickness of the area where the stockpiled graved is located, and the stockpile itself, this area would represent an approximate volume of Type 2 and 4 material of 17,700 m^3.

As per Figure 7.3 the approximate area of the terminal moraine gravel deposit that has had its upper elevations previously mined, (sample Gravel #2) is 18,150 m^2 and assuming an average thickness of 1.5 m, this area would represent an approximate volume of Type 2 and 4 material of 27,225 m^3.

As per Figure 7.4, the approximate area of the sand deposit (sample Sand #1) is 6,360 m^2 and assuming an average thickness of 1.5 m, this area would represent an approximate volume of Type 4 material of 9,500 m^3.

The volume of Type 1 material in this area will vary with the amount mined and screened. Currently there appears to be approximately 500 m^3 of boulder/cobble type material readily available in this area.

6.4.3 Esker Enroute to Simpson Lake (Soil Type 3 and 4, Borrow Source #4)

The winter road/route to Simpson Lake is not marked and reaching Simpson Lake from the site was first attempted following the natural drainage pattern leading due northeast to the lake. This drainage pattern is not accessible off the end of the runway as shown on the 1994 ESG map but rather from the south end of the airstrip near the middle-south apron. Although difficult to see, the 1964 air photo shows a single set of tracks in this area as well.

Once in the shallow drainage valley, one is lead to believe this was the route of the former winter road to Simpson Lake due to the occasional barrels encountered along the drainage course. It is believed that these are not marker barrels, but rather have likely been transported here by wind, ice and water run off. Following this drainage pattern leads to a delta on the south shore of Simpson Lake. This Delta is approximately 1.0 km further east than winter airstrip staging area at Simpson Lake. The terrain leading to the lake is either sharp angular frost-split bedrock or very soft muskeg/tundra.

While attempting to locate the shortest possible route to Simpson Lake, an esker was encountered. There did not appear to any surface markings or scaring indicating the esker had been depleted by past site activities. There is very little to no vegetation on the esker as shown in Photo 49 and 50. The esker measures approximately 200 m x 75 m wide and is approximately 5 m in thickness. The location of the esker is shown on Figure 7.0 and was not surveyed due to time restraints and weather limitations.

The soils are predominantly sand with trace amounts of gravel and silt. Occasional cobbles and boulders are present in area as well. A single test pit was advanced in the esker with a field shovel. The sandy soil had almost no visible clay. The material appeared damp to moist. Particle size analyses indicated the sample tested consisted of:

Sample ID	Depth (m)	% Moisture	% Silt	% Sand	% Clay
Simpson Borrow #1	0-0.6	7.2	7	79	14

The area of the esker is approximately 15,000 m^2, and assuming a thickness of the 1.0 m thick, would yield a volume of material within the esker of is approximately 22,500 m^3.

Additional material may be available at lower depths however these soils would expect to be frozen thus requiring increased effort to access and remove (i.e., ripping and thawing). Surface water does not appear to be problem if this material were to be used. However access to this material would be limited to winter travel via constructed ice road.

6.4.4 Former Borrow Source on North Shore of Simpson Lake (Borrow Source #5)

This area is visible from the air and could be a source of granular material. This was identified in previous reports but could not be accessed during the Earth Tech 2005 site visit. The site and winter road are shown on Photo 51.

6.4.5 Summary of Granular Borrow Sources

The above mentioned granular borrow sources are located at or within 5 kms of CAM-D main station area. Due to the abundance of glacial deposits, there does not appear to be a requirement for blasting and/or crushing on site. There will be requirement for screening to maintain some quality within the material (i.e., stripping or screening of boulders and cobbles if needed.) With the exception the saturated Type 5 soils located at the main site, most of the available materials should be within workable moisture contents with some drying or blending possibly required.

Some granular sources may fit the soil type in general but may require blending of other grain sizes to meet specification requirements. Of the five soil types, Type 1 (representing the larger cobbles and boulders) is of least abundance. Table 2 below summarizes the CAM-D Granular Borrow Sources.

Table 2. Summary of Granular Fill, CAM D Borrow Sources

Borrow Area	Available Type of Fill	Area (m^2)	Exc. Depth (m)	Volume Estimate (m^3)	Comments
Former Main Station (Borrow Source #1)	5	1,500,000	1.5	1,500,000 Type 5 fine grained	Type 5 soils are beneath imported fill in some areas (under roads and buildings) and would require striping prior to use. Type 5 material is saturated and would require drying and/or blending for structural construction use.
Ring Road around Main Station (Borrow Source #1)	2 and 4	126,622	0.1 m on average	7,700 to 9,100	Road and building pads have been previously mined. Some material remaining and will likely contain some moss and roots.
Drumlin Enroute to Murchison River (Borrow Source #3)	3	14,671	1	14,671	Material is predominantly clay and silt and could be used for Type 3 material if protected from erosion. Boulder clay within drumlin is likely driest source of Type 3 soils on entire site.
Gravel Stockpile Area Near Murchison River (Borrow Source #3)	2 and 4	11,785	1.5	17,700	Some gravel stockpiled in previously stripped area. Variety of soil types (1 through 4) if screened. Type 2 and 4 material are in abundance. Type 4 soils would require some level of screening. Type 5 soils would be more economical to excavate nearer to CAM D site.

Borrow Area	Available Type of Fill	Area (m^2)	Exc. Depth (m)	Volume Estimate (m^3)	Comments
Gravel Deposit Near Murchison River (Borrow Source #3)	2 and 4	18,150	1.5	27,225	Some gravel previously stripped in this area. Variety of soil types (1 through 4) if screened.
Sand Deposit Near Murchison River (Borrow Source #3)	3	6,360	1.5	9,500	Sand is well sorted.
Boulders and Cobbles Near Murchison River (Borrow Source #3)	1	Varies	Varies	500	Limited amounts available. Type 1 granular material is limited and is best collected through screening process for other soils.
Esker Enroute to Simpson Lake (Borrow Source #4)	2 and 4	15,000	1.5	22,500	Soils vary throughout esker and screening would be required to obtain uniform material. No road to esker, ecologic factors will require consideration.
Former Borrow Source on N. Shore of Simpson Lake 9Borrow Source #5)	1 – 4	750,000	1.5	1,125,000	Soils likely vary here as this appears to be large borrow area in air photo. Area is not accessible in summer months due to Murchison River. Ecological considerations. Winter access.

6.5 PROPOSED NEW LANDFILL LOCATIONS

Several landfills will possibly be required to achieve site remediation. These landfills may be sites for debris, that may include hazardous or non hazardous building materials and surface debris (non hazardous, barrels, materials from on site dump sites, demolition, etc.) A landfill site or land farming area used for hydrocarbon impacted soils may also be required.

Locations for these sites were sought out with the minimization of haul distances in mind. For this reason more than one land fill location has been proposed. Several factors aid in determining a possible landfill location including:

- Area available
- Slope of area (topography)
- Drainage of area
- Underlying Native Soils
- Proximity to Water Body and /or drainage courses
- Wildlife habitats
- Ground conditions that could allow permafrost to penetrate landfill and
- A minimized thaw location.

The volume of waste material to be land filled dictates the size of the landfill. For the CAM-D Site, the environmental assessment has estimated that approximately 2,500 m^3 of non hazardous debris, approximately 100 m^3 of hazardous debris, and approximately 2500 m^3 of contaminated material exists. With the above suggested volumes, there is more than sufficient space and materials to construct both types of landfills and a soil land farming area if required.

Five locations were chosen for debris and or soil disposal/placement. A potential land farming area for hydrocarbon impacted soil has also been identified as shown in Figures 7.9 and 7.9a.

6.5.1 Debris Landfills

Design Considerations

Waste going into debris landfills (newly constructed) will require characterization to ensure waste only consists of non-hazardous debris. Descriptions of non vs. hazardous debris are further described in Section 4 and 5 of this report.

Surface water run-on and run-off control will be necessary through proper grading to positively shed water to prevent ponding and seepage into the landfill. Consideration to the landfill cap angles must be designed as to not to encourage erosion of capping material.

Leachate control should be accomplished by control measures (rather than elimination such as synthetic liner cover). Design factors to consider include the placement of only dry waste, short summers limit seasonal precipitation, well compacted and properly graded cover to promote run off without erosion, and placement in an area with little or no surface runoff.

Frost jacking occurs when voids are present and the debris is subject to seasonal freezing and thawing. Other factors contributing to frost jacking include use of fine grained soils for fill and if the debris is allowed to be accessed (penetrated into fill) by free water. Fill material should be "frost stable" and placement outside of high groundwater or constant surface water area recharge area.

Biological odour control is not an issue on the site as most if not all the biological waste on site has likely long since decomposed. The seasonal mean temperature for this area being very low also limits the amount of off gas that could be generated within the debris.

Settling of the landfill surface should be avoided by placing thin lifts (0.15 m) and compacting/vibrating to fill voids.

There are sufficient materials at CAM D to construct berms and cover for the landfills. The landfills should be constructed at grade to prevent water infiltration, constructability issues, and permafrost disturbance. Outside berms should be constructed at 3H:1V and inside berms at 1.5H:1V. The top of the berm should have a minimum width of 2 m. Since the berm material will be erodible, the berms should have a minimum 0.5 m thick cover of gravel and cobbles.

The reduction of surface settlement over the landfill should be completed by ensuring all debris voids are filled in and the total debris thickness in the landfill does not exceed 3 m. The landfill cap should be compacted to 95% of the maximum density. A minimum thickness of 1 to 2 m is usually required to achieve freeze back. Should the material in the landfill be stable and not readily leachable, then a thinner surface cap of 0.75 m may be acceptable to achieve freeze back. The surface should be graded to a slope of 1 to 4% and contoured to match the surrounding land use.

6.5.2 Possible Debris Landfills Locations

The landfill locations were chosen based on their suitable constructability and proximity to the debris to reduce hauling distances. Five options are presented below and a visual overview of three of five locations located near the main station is presented in Photo 52 and 53. These areas are also outlined in Figure 7.9 (Landfill areas 1 to 4) and Figure 7.9a (Landfill area #5) of Appendix A.

- Landfill Location #1: Area of former Main Station Module Train. Silty-Sand with trace clay base that is moist to wet and soft to firm. This area is favored for it being the relatively highest point on the site/summit and is flat with no major drainage courses in the vicinity. Soils could be pushed E-W and N-S with ease and debris is close by limiting hauling distances. This proposed area is area shown in Photo 53 and Figure 7.9.
- Landfill Location #2: Current Main Dump Site. Silty-Sand base that is very soft and wet. This area is not favored for several factors including having to move the debris currently stockpiled in the dump requires to be moved twice, removing and temporarily stockpiling any contaminated soils at its base during construction, and most importantly, it is situated near a drainage course with the seasonal water table at the surface. Photos 54 to 57 show surface water issues in this area. It should be noted that, a large majority of the debris on the CAM D site is close by limiting hauling distances. The area has some minor relief that will require consideration during the design of the north retaining berm. There is a small bedrock outcrop in this area and with further test pits; a pinch ridge may be established to create a natural berm.
- Landfill Location #3: Area west of Pallet Line. Silty-Sand base that is soft and moist. This area is located on gentle northward slope and is favored for several factors including not having to move any debris to construct it, the ease of creating a retaining berm along the north side, and a having a fine-grained soil base. The current drainage courses are along the east and west sides of this area that measures ~ 120 x 70 m in dimension. Debris is close by limiting hauling distances. Photo 58 taken facing east shows this location as well as Figure 7.0.
- Landfill Location #4: Area South of Portable Diesel Storage Tanks and North of Main Barrel Cache. Silt and sand with trace clay base that is moist to wet and soft to firm. This area is located on gentle southward slope and is favored for it being a relatively high point, with very little drainage through the area. Soils could be pushed E-W and N-S with ease and debris is close by limiting hauling distances. Photo 59 facing south shows location of proposed (favored) location of landfill.
- Area near Murchison River. This may be an option in the event that that waste and debris are brought closer to the source of granular cover, rather than bring granular cover to the source of debris/waste. As this valley is a drainage course leading to the river, careful consideration needs to be given prior to choosing this location. Erosion prevention will be a key factor if this location is chosen. This area is the least probable for ecological reasons, safety (e.g., spilling of waste enroute), and location within a major drainage drainage course. Photo 60 depicts the general layout of the proposed landfill area in this area located on the south side of the drumlin identified enroute to the Murchison River. The proposed shape and location of the disposal area is shown in Figure 7.9a.

6.5.3 Possible Soil Disposal Facility

The area chosen for the soil disposal facility is the summit of the site in the centre of the Main Station area, west of the Pallet Line area as shown in Photo 53. This location was chosen for its proximity to the source of contaminated soil, short haul routes, minimal ecological damage, and no adverse affect on the drainage patterns on the site. The area is approximately 20,000 m^2 or more and is adequate to accommodate the estimated 2,500 m^3 of non-hazardous contaminated soils on site. The area is flat and is located some 2.2 km away (north) from the near significant source of water (freshwater lake).

The soil disposal facility should be lined to prevent leachate from escaping prior the facility reaching a stage of freeze back. The area should also be covered with a liner and soil material that will protect the area, prevent erosion and encourage freeze back.

Constructability of the facility into the active permafrost layer below grade should be carefully looked at as soils above the permafrost layer are very moist, and an abundance of ice crystals are present in the permafrost. This may contribute to settling of the area.

6.5.4 Soil Landfarm Facility

Should the option of land farming hydrocarbon impacted soil be pursued, the same area west of the pallet line area could be used. This area is large enough to accommodate both the soil disposal facility and land farming area if required.

6.6 Access Road Evaluation

There is only one main "road" on the CAM D site that leads from the air strip staging area uphill to the turn off to the SRR site and then continues on towards main station area of CAM D. Once at the main station area, there are only the remains of the old road system. Other "roads" in the area only consist of the graded area leveled for access to the borrow area adjacent the Murchison River.

The roads throughout the site and surrounding area are mostly passable with an ATV and in some areas with a 4x4 pick up truck. There are some areas where leaving the road area onto the tundra is required to avoid wash out or over-mined gravel areas. These areas on the soft wet tundra would not be suitable for a 4x4 pick up truck. Work requiring regarding, backfilling eroded areas, and stabilizing the base will be required if rubber tired vehicles and heavy machinery are used during site remediation activities. The existing roads are very narrow and should two-way traffic be required, traffic control at both ends of the road will be required or pull-out areas will require construction.

6.6.1 Air Strip Road

This road leads from the airstrip to the main site and has an easterly component added to access the SRR site. It has several "soft" areas that will require regrading and additional gravel added. This is the result of long term run off over years of site neglect and is easily repaired with grading and the addition of some gravel. There are several culverts along the road namely near the base at the airstrip apron and the further up the road towards the site. Both roads are in reasonable condition and will require only minimal stabilization where the culvert ends are exposed on either side of the road.

The road from the airstrip is only for single lane traffic and is badly deteriorated from vehicle traffic and resulting erosion beyond the turn off to the SRR.

6.6.2 Road to SRR

This road leads from the main airstrip to main site road to access the SRR site. It has several washed out areas. The road is very narrow and only for single lane quad traffic. It is not wide enough or stable enough to accommodate a 4 x4 pick up truck.

6.6.3 Road at Main Site

This road originates at the airstrip and is nearly non existent beyond the turn off to the SRR. It is badly deteriorated from mining traffic and resulting erosion beyond the turn off to the SRR. Several culverts on the east to west portion are in poor shape resulting from insufficient cover during site mining practices and long term erosion. Photo 63 taken near the diesel storage tanks, shows typical deterioration of the culvert location.

The damaged or plugged culverts have contributed to ponding water on the north side to the access road resulting in road wash outs from run off. This can be repaired with the upgrading of the current culverts, the addition of granular material, and regrading.

6.6.4 Road to Murchison River

There is no apparent starting point to the road from the site or airstrip. Access is very broad (likely due to the delivery of granular material for both the main site and airstrip construction) and is heavily eroded. This is clearly evident in Photos 51 B and 51 C.

The remainder of the road west beyond the drainage pattern, appears to have been either a very poorly constructed summer road with minimal gravel importation (likely only used for site construction), or is roughly graded winter road. The road is not prevalent but can be located by following drainage ditches, elevated surface contours, and evidence of washed out culverts. As shown in Photos 51A and 51B, there is significant road wash out along this route. Photo 64 shows a typical washout after years of run off.

The gravel on this route the Murchison River borrow area is likely too thin to support the weight of rubber tired vehicles fully loaded with gravel. Due the washouts that range from steep to broad in shape, access is limited to quad or ATV and regrading and culvert installation will be necessary to rebuild the road for 4 x 4 pick passage or larger rubber tired vehicles.

6.7 Air Strip Evaluation

The air strip is a vital part of the site and subsequent remediation plan as the condition of the strip will dictate what size aircraft can land to bring supplies in and material out during site remediation activities. Earth Tech advanced several test pits and submitted soil samples for grain size analyses and calculated California Bear Ratio for load determination. The pilots of the Summit Air Shorts Skyvan also assisted in the air strip evaluation and inspected the entire airstrip and provide opinions and observations.

6.7.1 General Condition of Airstrip

The air strip is situated in a northeast to southwest orientation and is not perfectly flat. The strip is approximately 1,500 m in total length with approximately 1,100 m of useable length. The width is approximately 30 m of useable space not including the slopes and sides of airstrip. Total surface area of the airstrip including side slopes is approximately 75,000 m^2 (50 m W x 1500 m L) and total useable surface area is approximately 33,000 m^2 (30 m W x 1100 m L). The southwest of the airstrip has a bearing of 222 ^{0}T and the northeast end has a bearing of 042 ^{0}T.

There are two ramps on the airstrip approximately in the center. One is located on the south side of the strip and the other on the north which is also the beginning of the road to the site. The surface of airstrip is contoured somewhat like a shallow arc sloping towards the southwest and northeast. Drainage around the airstrip is based from the north side ramp towards the southwest and northeast. Photo 65 shows the arc of the airstrip, north ramp, and some drainage. Figure 7.8 shows the details of the airstrip surface assessment.

The airstrip appears to have been constructed by placing fine grained clays and silts along both sides to provide “containment windrows” for the granular material in the middle of the two windrows. This was likely completed due to the abundance of the fine grained (Type 5) material in the vicinity of the airstrip. The granular material between the two fine-grained “containment windrows” is primarily sand with gravel. This is further defined within the test pit logs located in Appendix F. Photo 65 also shows what appears to be a sign of the clay “containment windrows” for the granular material in the centre of the airstrip.

There is some vegetative growth occurring on the surface in particular where low areas have been identified and in particular the southwest end of the airstrip where is appears there are more fines mixed in the granular soil. There is what appears to be a set of vehicle tracks across the strip near the centre as a result of what appears to be a tracked vehicle crossing at this location. There are several shallow depressions toward the northeast and some rutting in the centre. The ruts appear to be the result of increased moisture content in this location. Rutting and the depressing areas can be seen in Photos 66, 67, and 68. At the northeast end there are exposed gravel areas with no sand or fines present as a result of minor erosion. This area was not recommended to be used by the Summit Air Pilots.

6.7.2 Summary of Airstrip Test Pits

Four test pits were advanced in the airstrip (AS TP 1 to 4) from the northeast end to the southwest end. Soil descriptions are provided in the logs in Appendix F and test pit locations are located on Figure 7.8 in Appendix A.

The northeast end of the airstrip appears to have an increased sand content and the southeast end appears to have more silt. In brief from northeast to southwest across the airstrip soils were:

AS TP #1 Test Pit on NE end of Airstrip Near Edge

Sand, brown, poorly sorted, fine to course grain, some gravel, trace silt, occasional cobbles, moist, dense, water infiltration near 1.2 m depth. Frozen and refusal at 1.3 m.

AS TP #2 Test Pit on NE end of Airstrip Near Edge

Sand, brown, poorly sorted, fine to course grain, clayey, some silt, trace gravel and occasional cobbles, wet, compact, water infiltration near 0.2 m depth.

Clay, brown, silty, sandy, trace gravel with occasional cobbles, wet, soft, low plasticity. Frozen and refusal at 0.8 m.

AS TP #3 Test Pit on SW end of Airstrip Near Edge

Same as AS TP #2.

AS TP #4 Test Pit on SW end of Airstrip In Centre of Airstrip

Sand/Gravel, brown, poorly sorted, fine to course grain, trace silt, occasional cobbles, moist to wet, dense.

Clay, grey, silty, sandy, trace gravel with occasional cobbles, moist, firm, low to medium plasticity. Frozen and refusal at 0.9 m. Water infiltration near 0.7m depth. Frozen and refusal at 1.1 m.

The soils are predominantly sand at the surface with varying amounts of gravel and silt. Occasional cobbles and boulders are present on the edges of the airstrip on sloped areas. The test pits were advanced with a small hydraulic excavator mounted on an ATV (quad). There was an increasing clay and silt content with depth. Particle size analyses indicated the samples tested consisted of:

Sample ID	Depth (m)	% Moisture	% Silt	% Sand	% Gravel
AS TP 1	0-1.3	2.7-14.6	12	80	7
AS TP 2	0-0.8	10.7-16.1	6	86	8
AS TP 4	0-1.1	9.8-12.2	26	72	2

Soil in the ramp located on the north side or the airstrip appeared to have more fines and was not as well sorted. This soil also appeared to be somewhat softer and more susceptible to rutting. Photograph 69 shows the location of Apron Sample #1, while Photos 70 and 71 show typical soils found in test pits AS TP #1 and #2.

The soils at the aprons are predominantly sand at the surface more gravel and silt than the airstrip. Occasional cobbles and boulders are present within the sample areas. The test pits were advanced with a small hydraulic excavator mounted on an ATV (quad). Particle size analyses indicated the samples tested consisted of:

Sample ID	Depth (m)	% Moisture	% Silt	% Sand	% Gravel
Apron #2	0-0.9	9.1	36	39	25

6.7. Summary of Aircraft Load Rating (ALR) for Airstrip

An aircraft load rating (ALR) can be best described as the rating in which a pavement structure within an airstrip can accept different types of aircraft landing on it. This of course presents itself with a host of variables but for comparison purposes the aircraft are considered in both loaded and unloaded state (i.e., minimum and maximum weights applied to landing gear.). Variables to consider include:

- Length and width of aircraft vs. airstrip dimensions
- Tire size of aircraft (i.e. tundra tires vs. normal pavement tires)
- Tire pressure
- Weight of aircraft and number of tires
- Frequency of landing and take off
- Factors in weather (rain soaked or spring thaw conditions affecting moisture content)
- Gravel thickness
- Gravel strength.

For safety reasons, test pits could not be advanced in the middle of the airstrip without jeopardizing the integrity of the airstrip. It is for this reason the pilots were present during the assessment so they could indicate where it was safe to advance the test pits.

Since the soil samples retrieved from site represent insitu sample information as opposed to optimum conditions, the California Bearing Ratios (CBR) were completed using estimated existing conditions and not laboratory calculated maximum or optimum conditions. Estimated existing conditions were used to assess the "as is" condition of the airstrip. It is recommended that a Boeing Penetrometer test be conducted on the airstrip if aircraft larger then the Shorts Skyvan.

Two of the airstrip samples were selected for analyses and determination of CBR. The results of this information is presented in Table 3 below and are compared (for reference only) to several aircraft that may be used to access the site in the future. It should be noted that these numbers are merely estimates based on lab data for a few select samples and do not represent a complete airstrip assessment. It is not recommended to land any aircraft larger or heavier than a fully loaded Shorts Skyvan at the site without a detailed assessment of in situ conditions (Boeing Penetrometer). Transport Canada Aircraft Load Rating Tables and laboratory data for CBR's is provided in Appendix G for reference.

Since there were various depths to the samples (0-30, 30-60, and 60-90 cm's) the samples were combined to make up sufficient sample to complete the proctor analyses. The samples have been broken down into Sample "A" which has few fines and primarily sand. Sample "B" which represents the edge of the runway which is comprised of finer material and is primarily silt.

1. Sample "A" Retrieved from AS TP 1 and is primarily sand with trace gravel and silt. Average moisture of 10.2 %.

   Compacted to 96.4 % yielded CBR values of:

   0.1" = Unsoaked 22.4, Soaked 21.7
   0.2" = Unsoaked 26.8, Soaked 26.8

2. Sample "A" Retrieved from AS TP 1 and is primarily sand with trace gravel and silt. Average moisture of 10.2 %.

   Compacted to 98.2 % yielded CBR values of:

   0.1" = Unsoaked 38.1, Soaked 24.8
   0.2" = Unsoaked 49.9, Soaked 38.0

3. Sample "B" Retrieved from AS TP 4 and TP 2 and is primarily sandy silt with trace gravel and clay. Average moisture of 12.9 % (approximately 1.5 x over optimum).

   Compacted to 96.4 % yielded CBR values of:

   0.1" = Unsoaked 0.3, Soaked 0.2
   0.2" = Unsoaked 0.2, Soaked 0.2

Table 3. CRR Flexible Pavement Subgrade for Select Aircraft

		Flexible Pavement Subgrades CBR			
Aircraft	**Weight (kN) Max/Min**	**High "A" 15**	**Medium "B" 10**	**Low "C" 6**	**Very Low "D" 3**
DC-3	147 80	5 3	7 4	10 5	12 7
DC-4	335 200	12 6	15 8	17 9	21 11
DC-6 and 6B	480 300	20 11	21 13	25 14	30 17
DHC6 Twin Otter Series 300	56 56	2 2	2 2	3 3	5 5
DHC7 Dash 7	209 120	10 5	12 6	13 7	15 8
Beech King Air 100, 200 Series	56 56	2 2	3 3	3 3	4 4
Beech King Air 300, 300C 350, 350C	67 56	3 2	3 3	4 3	4 4
Hercules (Military) C130, 082, 182, 282, 382	778 360	29 12	34 14	37 15	43 17
Shorts 360	121 77	7 5	9 6	10 7	11 7
Shorts Sherpa	114 80	7 5	8 6	10 7	10 7
Shorts Skyvan	67 56	2 2	3 3	4 4	6 5

In most cases the flexible pavement structure (airstrip) is designed to accommodate the type of aircraft. Since there is no way to quickly amend the pavement structure on the CAM D site, the initial aircraft brought to the site must be chosen to accommodate the existing pavement structure.

Given the lack of actual in-situ data, Earth Tech cannot recommend any aircraft larger than the Shorts Skyvan with tundra tires to land at the airstrip at CAM D. Other permissible choices of similar weighted aircraft include DHC6 Twin Otter Series 300, Beech King Air 100, 200 Series, and Beech King Air 300, 300C 350, 350C all equipped with larger tires suitable for gravel runway landings.

7.0 CAM-D TRADITIONAL KNOWLEDGE, COMMUNITY INVOLVEMENT

CAM – D and the Simpson Lake area are used often by the residents of Kugaaruk for fishing and hunting. Many of the residents from Taloyoak find the site to be remote, with the terrain leading to the site being rugged and difficult to reach by land (Quad or Sled Access). Several Taloyoak residents stated that they have gone to the site via float plane and also stated that the fishing is excellent in the area. The majority of the Nunavut residents visiting Simpson Lake come from the Pelly Bay (Kugaaruk) area. During investigation activities at the Freshwater Lake Area, a small homemade boat and raft were noted on the shoreline. It is assumed that these items were used for fishing.

It was also mentioned by Inuit that the Simpson lake area has a white stone used by traditional carvers to make ceremonial pipes and other traditional art. Prior to remedial activities the stone should be identified and any discovery of the stone during remedial activities should be noted and recorded. If the stone must be removed it should be stockpiled separately and if possible brought back to the residents of the local communities. No inukshuks or burial area markers were noted during the site investigation and no information was given by interviewees regarding this subject.

During the stay in Taloyoak, Earth Tech attended a traditional drum dance and community gathering, during which the Earth Tech team conversed with the elders and children about the CAM-D site and their concerns. The main concern was PCB contamination. The people interviewed had a general understanding of the contaminant and its tendency to bioaccumulate. It was also discovered that the local youth participate in an environmental retreat lead by the elders of the community. The youth and elders spend 3-7 days on the tundra every year learning about traditional practices, the land, and other traditional knowledge relating to hunting, fishing and respect for the land.

During a conversation with Ema Quaggutaq, from the Kurtairujuark Hunters and Trappers Organization, it was discovered that able bodied residents from the Kugaaruk community often take day trips to the Simpson lake area for hunting and fishing in the winter and early spring. Typically the hunts are for caribou, wolves, wolverines and foxes, as well as fishing from Simpson lake. Caribou are found onsite during the spring when their migration paths cross the Simpson lake area. It was not known if there are resources, claims, spiritual or other special reasons the Simpson lake area is important to the residents.

8.0 REGULATORY CRITERIA

The following presents a summary of the media specific criteria that had been selected to be used for comparison purposes.

- Soil – The results of the laboratory analyses for metals and PCBs were compared to the criteria that was developed for the Department of National Defence to support their DEW Line clean up projects (DCC Tier I and Tier II criteria). For metals that were not included in the DCC criteria, the most recent edition of the *CCME Canadian Environmental Quality Guidelines* - Residential/Parkland Criteria was used for comparison. Hydrocarbon analysis was compared to the *CCME Canadian Wide Standards* for Hydrocarbons.
- Water – *CCME Canadian Environmental Quality Guidelines* Freshwater Aquatic Life Criteria
- Sediments – *CCME Canadian Environmental Quality Guidelines* Freshwater
- Tissues – *CCME Canadian Environmental Quality Guidelines*
- Asbestos

9.0 NCS SITE CLASSIFICATION SUMMARY

The national Classification System for Contaminated Sites (NCS) was developed by the CCME for the review and classification of contaminated sites in Canada. The NCS is a standardized method that uses site characteristics, site location and contaminant information to prioritize and classify the potential for adverse impacts. All relevant site information is stored in a national database in an effort to ensure funding for contaminated site clean up is allocated to sites with respectively higher potentials for adverse effects and impacts.

As requested in the Terms of Reference for this project, a NCS Classification was determined based on the findings of the investigation. In summary the NCS score determined by Earth Tech is 72.5, indicating a Class 1 site. A copy of the NSC score is included as Appendix H.

10.0 SUMMARY OF INVESTIGATION ACTIVITIES

10.1 Phase III Site Investigation

During the time period of August 22 to 31, 2005, Earth Tech completed a detailed Phase III ESA, materials inventory and a geotechnical investigation of the CAM-D DEW Line Site. The purpose of the Phase III ESA was to help determine the extent and volumes of contaminated materials in order to support the development of a remedial plan for the site.

Based on the findings of the 2005 Phase III Assessment, coupled with previous site investigations, the following table presents a summary of the areas requiring remedial action at the CAM-D DEW Line Site.

Table 10.1 – Summary of Areas Requiring Remedial Action

Location	Contaminant Exceeding CCME Criteria (Max Concentration ppm)	DCC I	DCC II	CCME CWS for PHC	Comments
		m^3	m^3	m^3	
Garage	**PHC**s (F2, 4380; F3, 3650)			289	Complete delineation of impacted area not achieved to the west and south
Electrical Cabinet Area	**Metals** (Cd: 9.3)		16		
Burn Pit Area	**PHC**s (F2, 1840; F3, 11300; F4, 13300)			39	Complete delineation of impacted area not achieved to the south
POL Tank	**PHC**s(Benzene, 0.17; Toluene, 4.77; Ethylbenzene, 4.29; Total Xylenes, 39.4; F1, 1300; F2, 16700; F3, 1250)			111.5	Complete delineation of impacted area not achieved to the south
	PHCs & PAHs (Naphthalene, 37)			777	Impacted area is co-contaminated and complete delineation of impacted area not achieved to the south
Outfall	**Metals**s (As, 60; Cu, 131; Zn, 1370) **PCB**s (1.5)	3			Impacted area is co-contaminated
Pallet Line	**PHCs** (F2, 3340; F3, 28300; F4, 7590)			470.3	
Portable Fuel Tanks	**PHCs** (Ethylbenzene, 0.44; Total Xylenes, 5.85; F1, 970; F2, 3260; F3, 4590)			495	Complete delineation of impacted area not achieved to the west
	PHCs & PAHs (Naphthalene, 3.64)			266	Impacted area is co-contaminated and complete delineation of impacted area not achieved to the west
Airstrip Vehicle and Debris Area	**PHCs** (F2, 830; F3, 25500; F4, 6780) **Metals** (B, 2.4)		10		Impacted area is co-contaminated
Plumbers Dump	**Metals** (Cd, 5.13)		13		Impacted area not delineated
Simpson Lake	**Metals** (Zn, 540)		3		Soils in the vicinity of the battery in the noted debris area
	Total Estimated Volumes	**3**	**42**	**2447.8**	The majority of the total estimated volume is co-contaminated, with more than one contaminant exceeding the applied criteria.

10.2 Waste Audit

A detailed Waste Audit was completed to 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 waste type.

It should be noted that the volume of materials containing PCB painted should be considered as a rough estimate as this volume is dependant on the amount of volume reduction completed by a contractor. In some locations the paint had substantially peeled away. It is envisioned that some amount of abatement will be required in the field prior to the removal of the substrate materials.

Approximately 2,355 m^3 of non hazardous material is located on the site and approximately 138 m^3 of hazardous material. Based on the location and nature of these materials, all of the materials could be removed from the site.

Table 10.2 – Summary of Waste Volumes

Waste Type	Items	Estimated Volume	Unit
Non Hazardous	Heavy Equipment, Barrels (9054), Scrap Metal, Scrap Wood, Concrete and Buried Debris.	2355	m^3
Hazardous	Asbestos Containing Materials	17	m^3
	POL	16.4	m^3
	Batteries	1	m^3
	PCB Painted Materials	8	m^3
	Lead Painted Materials	50	m^3
	Total	**2447.4**	**m^3**

11.0 CONCLUSIONS

Based on the scope of work of the Phase III Environmental Assessment, Waste Audit and Geotechnical Investigation that was completed at the CAM-D DEW Line site the following conclusions are made.

Phase III ESA:

- The Phase III investigation included the assessment of 18 locations in five main areas of the site in order to delineate previously identified contaminated areas and to confirm the presence of contaminants in areas that had not been previously identified.
- The total volume of hydrocarbon, metal and PCB contaminated material found to be contaminated was estimated at 2492.8 m^3. Of this, 42 m^3 exceeded the DCC Tier II criteria for Metals and PCBs, 2448 m^3 exceeded the CCME, Canada Wide Standard for Petroleum Hydrocarbons/BTEX and Polycyclic Aromatic Hydrocarbons and 3 m^3 exceeded the DCC Tier I for PCB impacted soils (significantly lower than other Intermediate DEW Line sites previously assessed). Due to site conditions, full delineation for metals and hydrocarbon contaminated soils was not achieved in some locations. Also, co-contaminated soil exists in most impacted areas.
- Background soils were all below the applied INAC Abandoned Military Site Remediation Protocol Criteria.
- Several minor Heavy Metals exceedances of the applied CCME Water Quality Guidelines were measured in surface waters collected on site. The areas where exceedances were noted are a significant distance away from any possible fish habitats. It also must be noted that the volumes of surface water where the exeedances were noted are minimal. It is not anticipated that contamination noted on site is adversely affecting water sources down gradient and off site.

Waste Audit:

- A Waste Audit was completed on site and yielded approximately 2500 m^3 of non-hazardous waste and approximately 94.4 m^3 hazardous materials. The vast majority of this material is located in accessible areas.
- A total of 9,054 empty barrels were identified at the site. It is recommended that subsurface soil conditions below the barrels be determined following their removal.
- A total of 15 full to partially full barrels containing various types of product were identified on the site. Analytical results suggest the fluids are aviation fuel, gasoline and diesel.
- Approximately 8 m^3 of material was observed to be painted with PCB containing paint. The majority of the paint products on metal substrates were in poor condition (peeling) and may require some form of abatement prior to removal of the painted components. Wood materials painted with PCB containing paint were typically weathered and peeling. It is recommended that the painted materials be removed by a contractor following a waste reduction process. Soil samples taken from areas surrounding the debris piles at the main station area do not indicate the presence of lead or PCBs in the soil. For this reason it is assumed if there is lead and PCB painted materials in the buried debris piles, the lead and PCB contaminants are not mobile. However, it is recommended that the

buried debris piles be monitored to ensure their condition does not change and that the potential contaminants inside the buried waste piles do not become mobile.

12.0 CLOSURE

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

13.0 REFERENCES

1. Abandoned Military Site Remediation Protocol, Indian and Northern Affairs Canada, March 2005
2. Environmental Study of Abandoned DEW Line Sites, II. Six Intermediate Sites in the Eastern Arctic. Environmental Sciences Group, Royal Roads Military College, March 1994.
3. DEW Line Clean up Project FOX-C (Ekalugad Fjord) DEW Line Site, 2004 Geotechnical Investigation, EBA Engineering Consultants Ltd., March 2005.
4. http://climate.weatheroffice.ec.gc.ca/climate_normals, Cambridge Bay

APPENDIX A

FIGURES



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Date: FEBRUARY 28 , 2006

NORTHERN CONATMINATED SITE REMEDIATION GROUP – PWGSC

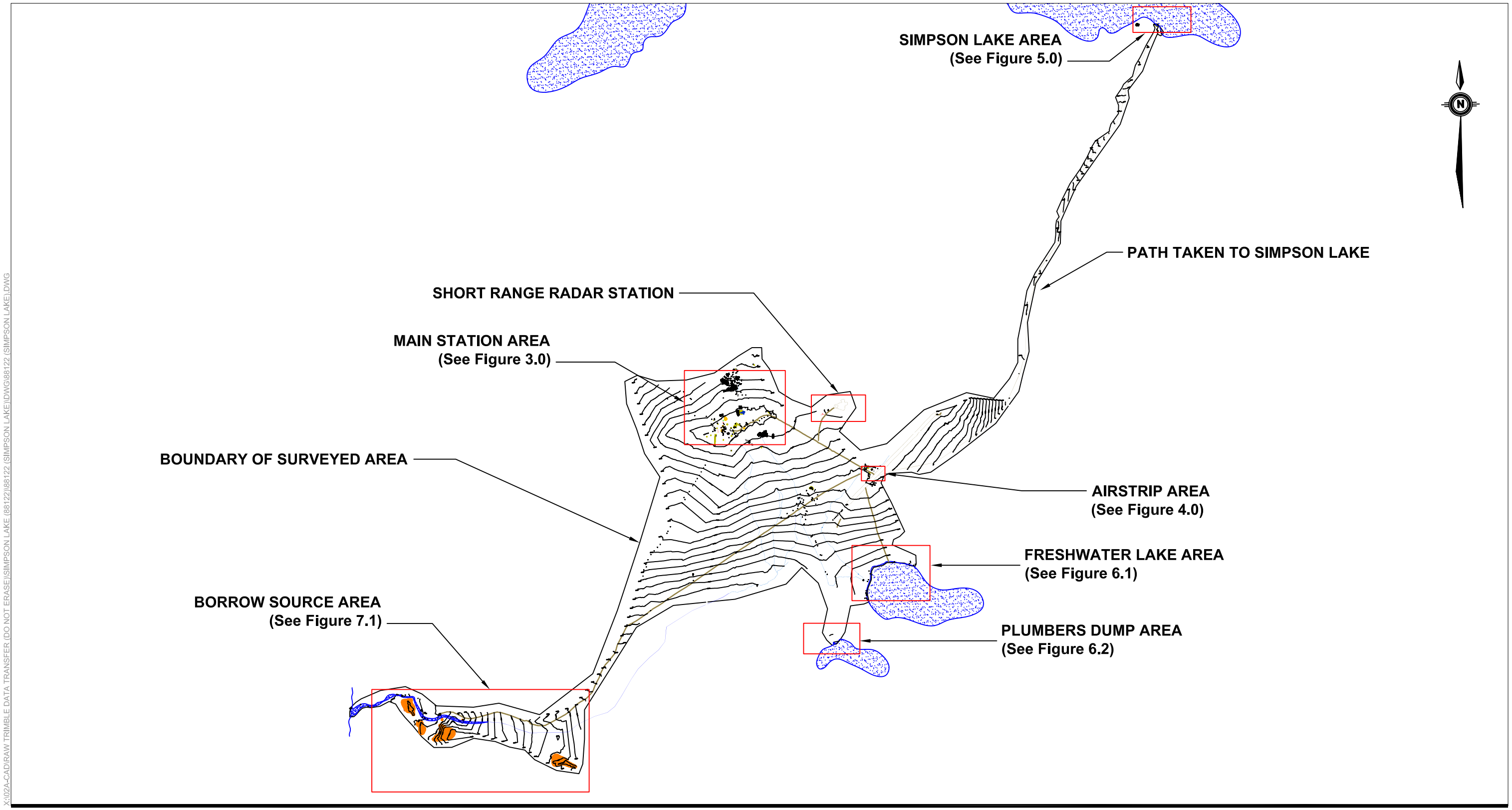
SIMPSON LAKE – DEW LINE SITE

CAM–D LOCATION

Figure 1.0

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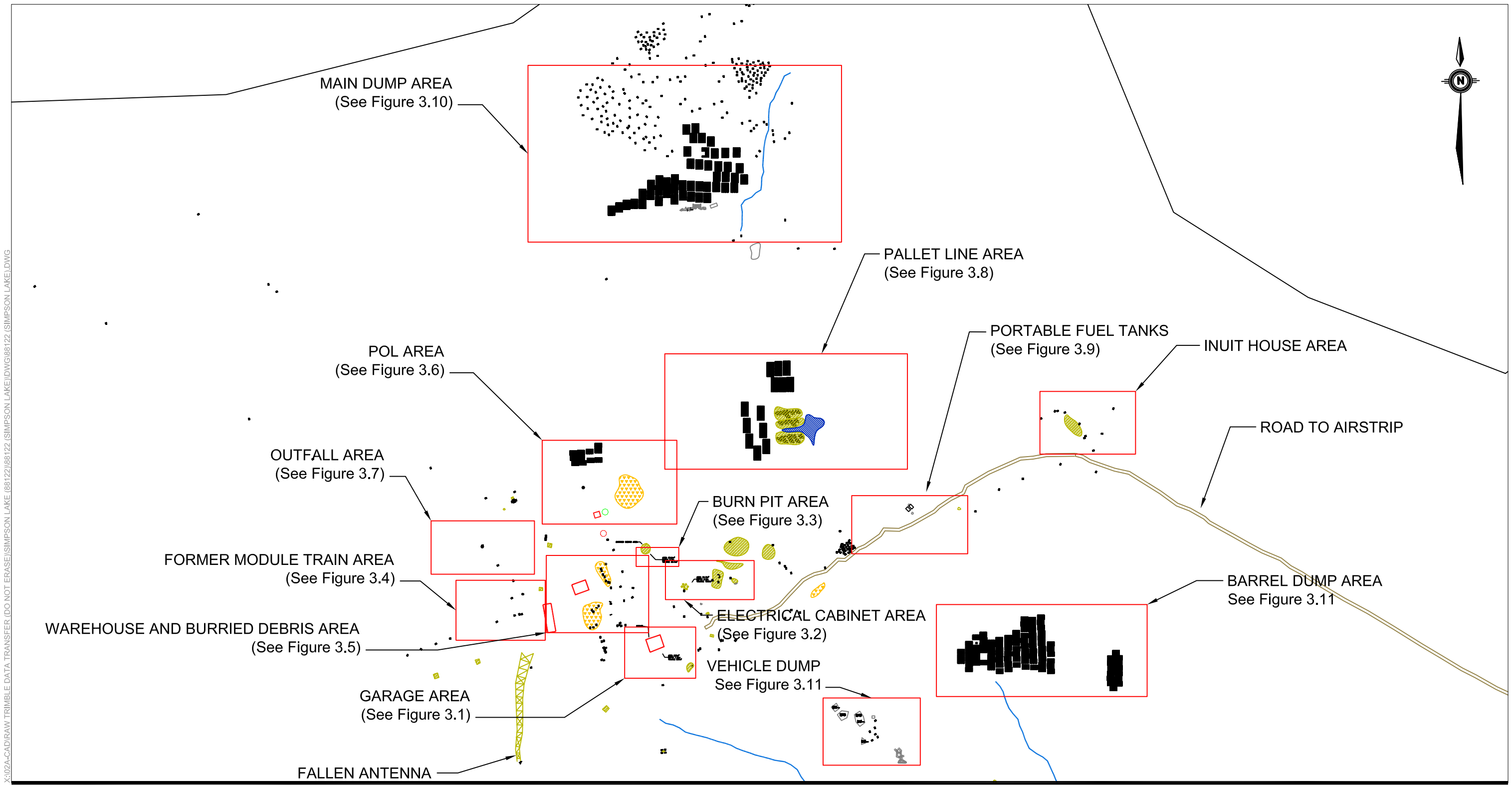
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PWGSC
CAM–D DEW LINE
SITE PLAN
Figure 2.0



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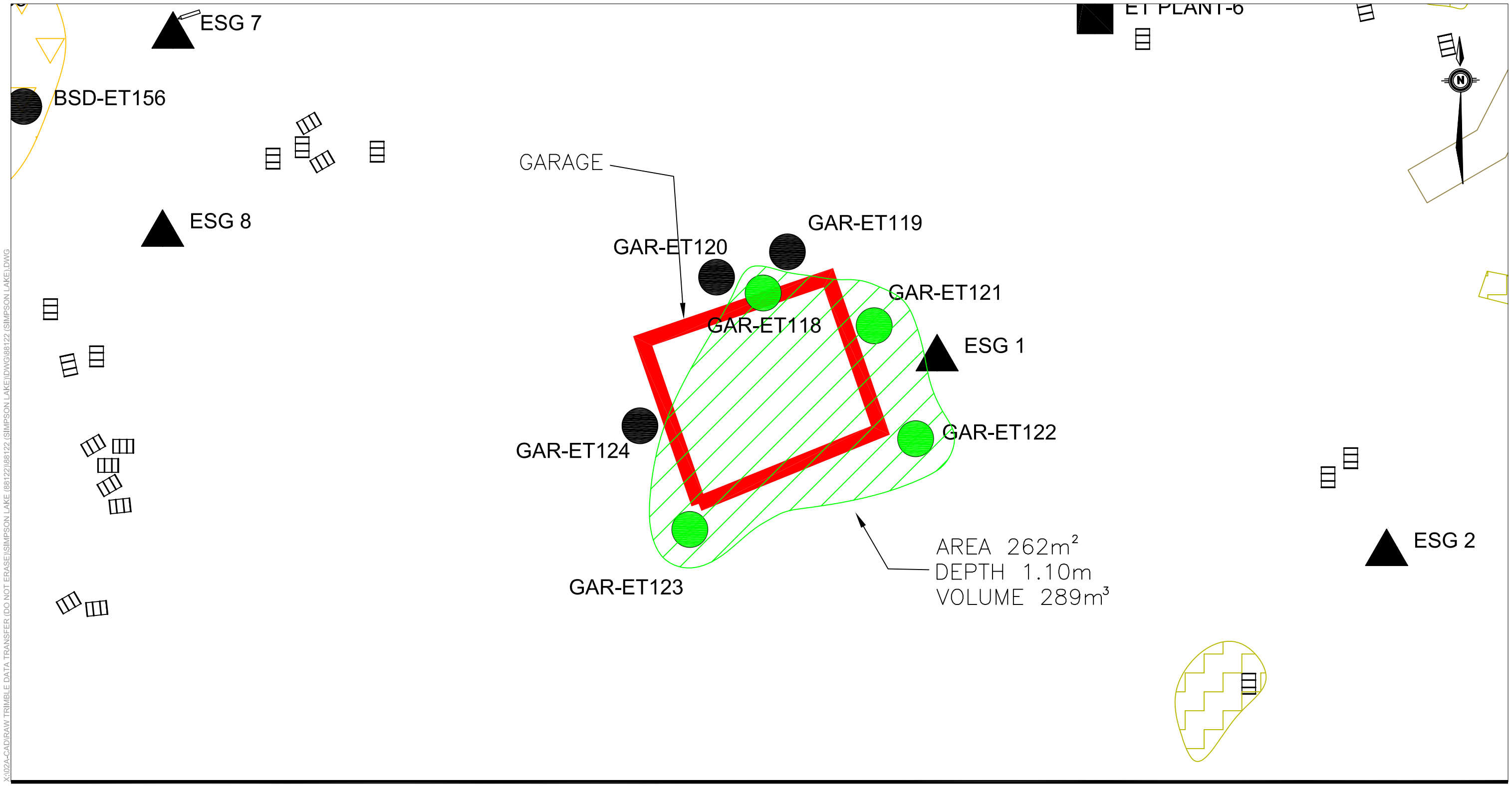
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EarthTech
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PWGSC
CAM–D DEW LINE
MAIN STATION AREA
Figure 3.0



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Date: FEBRUARY 28, 2006
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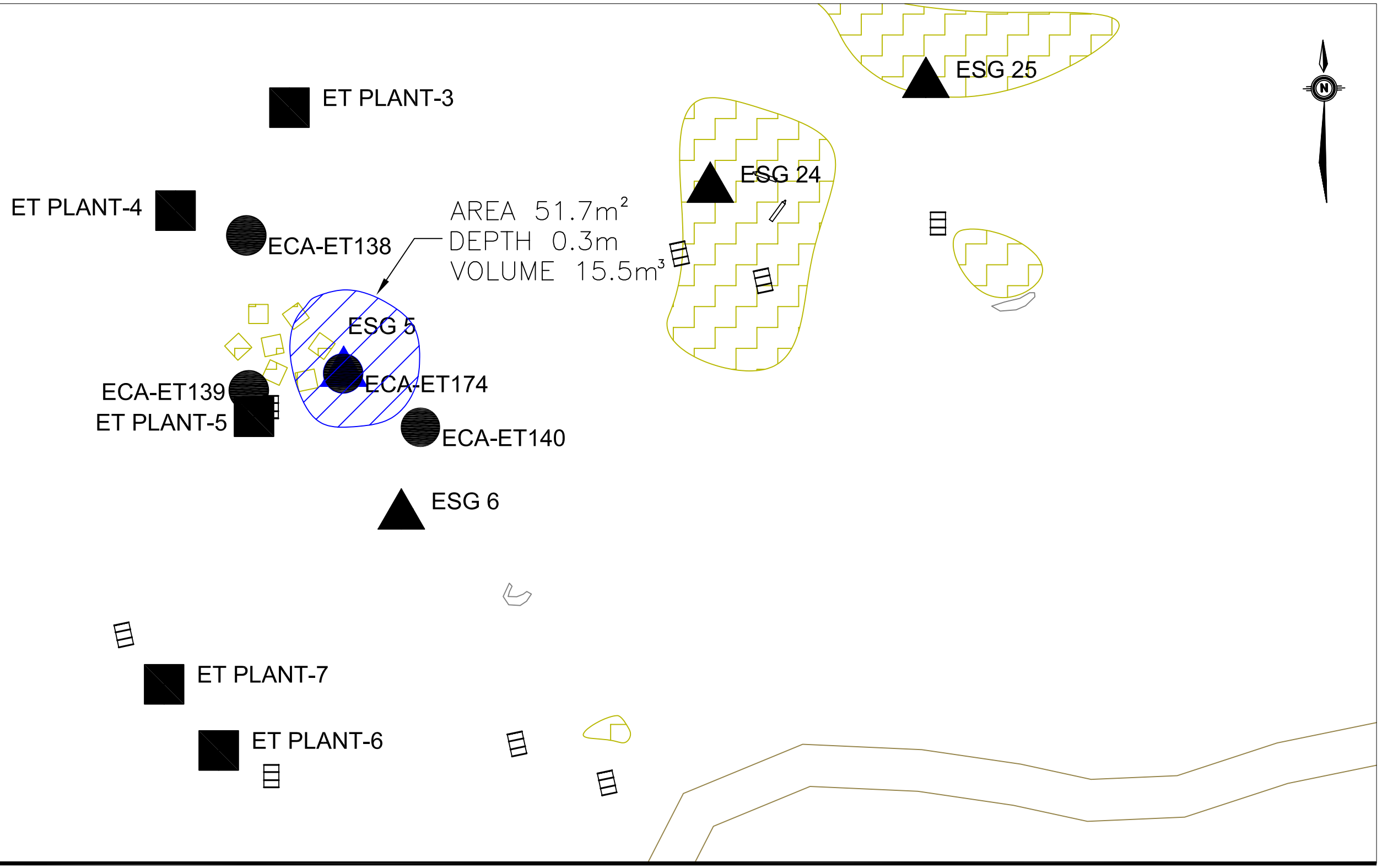
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1:250

EarthTech
A Tyco International Ltd. Company

Legend (Note: ESG Samples were not analyzed for PHC or PAH)

- SOIL SAMPLE
- ESG SAMPLE
- PLANT SAMPLE
- BARREL
- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE

PWGSC
CAM–D DEW LINE
GARAGE AREA (0–110 cm)
Figure 3.1



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Date: FEBRUARY 28, 2006
SCALE:

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EarthTech
A Tyco International Ltd. Company

Legend (Note: ESG Samples were not analyzed for PHC or PAH)

- SOIL SAMPLE
- ESG SAMPLE
- PLANT SAMPLE
- BARREL
- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE

PWGSC
CAM–D DEW LINE
ELECTRICAL CABINET AREA (0–30 cm)
Figure 3.2

POL-ET127

L-ET126

ESG 16

BURRIED DEBRIS AREA

BRN1-ET135

BRN1-ET134

BRN1-ET136

BRN1-ET137

AREA 55.8m^2
DEPTH 0.7m
VOLUME 39.1m^3

WBD-ET161

WBD-ET160

ET159

ET PLANT-3

ET PLANT-4

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Date: FEBRUARY 28, 2006
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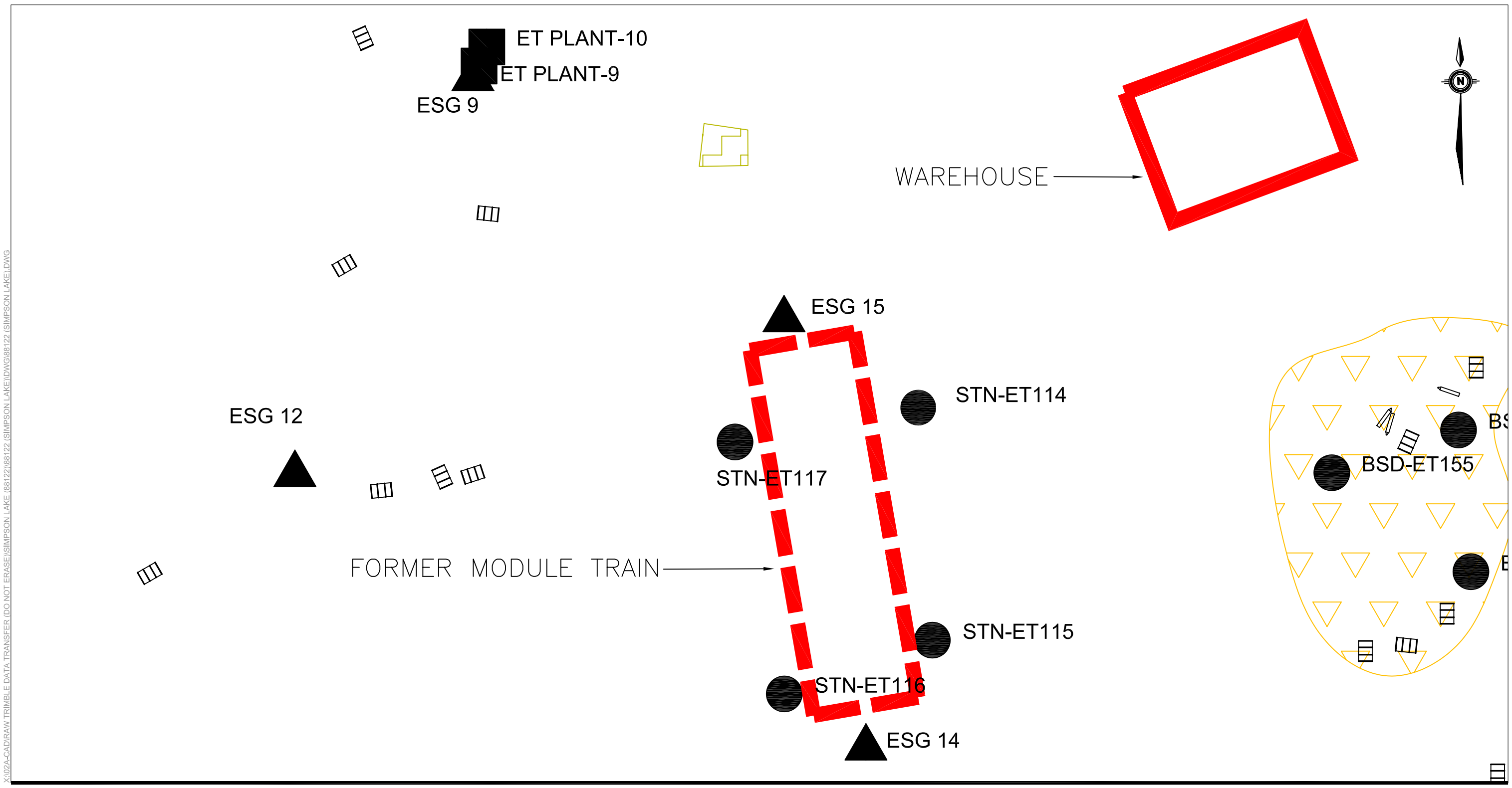
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EarthTech
A Tyco International Ltd. Company

Legend (Note: ESG Samples were not analyzed for PHC or PAH)

- SOIL SAMPLE
- ESG SAMPLE
- PLANT SAMPLE
- BARREL
- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE

PWGSC
CAM–D DEW LINE
BURN PIT AREA (0–70 cm)
Figure 3.3



X:\02A-CAD\RAW TRIMBLE DATA TRANSFER (DO NOT ERASE)\SIMPSON LAKE (88122)\88122 (SIMPSON LAKE)\DWG\88122 (SIMPSON LAKE).DWG

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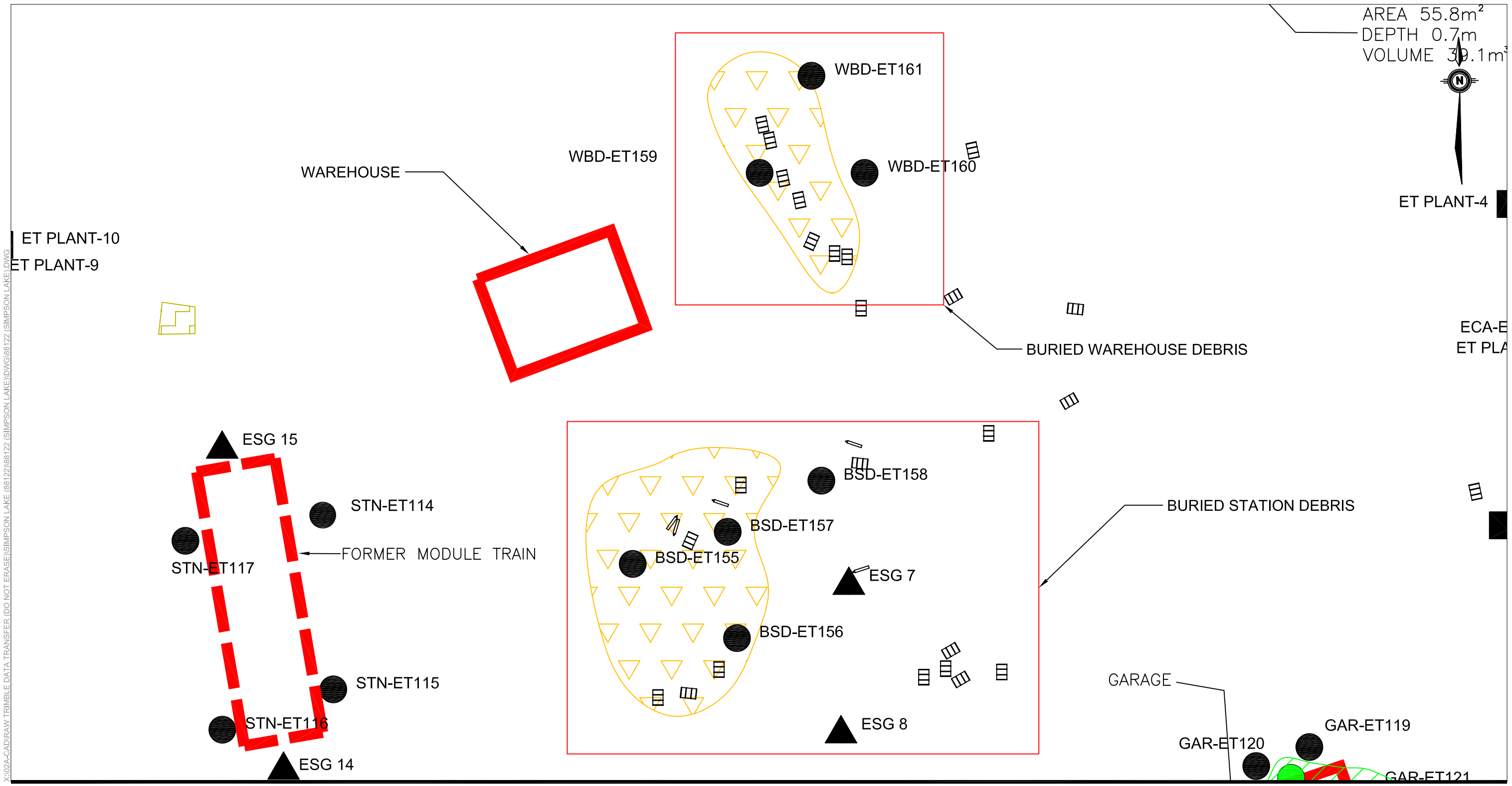
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EarthTech
A Tyco International Ltd. Company

Legend (Note: ESG Samples were not analyzed for PHC or PAH)

- SOIL SAMPLE
- ESG SAMPLE
- PLANT SAMPLE
- BARREL
- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE

PWGSC
CAM–D DEW LINE
FORMER MODULE TRAIN AREA
Figure 3.4



X:\02A-CAD\RAW TRIMBLE DATA TRANSFER (DO NOT ERASE)\SIMPSON LAKE (88122)\88122 (SIMPSON LAKE).DWG

Date: FEBRUARY 28, 2006
SCALE:

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EarthTech
A Tyco International Ltd. Company

Legend (Note: ESG Samples were not analyzed for PHC or PAH)

- SOIL SAMPLE
- ESG SAMPLE
- PLANT SAMPLE
- BARREL
- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE

PWGSC
CAM–D DEW LINE
WAREHOUSE AND BURIED DEBRIS AREAS
Figure 3.5

ESG 19

ESG 22

POLBD-ET164

ESG 23

POL SW

POL-ET132

ET PLANT-8

POL-ET131

POL-ET133

POLBD-ET163

POL-ET128

AREA 74.3m²
DEPTH 1.5m
VOLUME 111.5m³
Hydrocarbon Contaminated

ESG 18

POL-ET129

POL-ET130

POL TANK

ESG 17

PUMP HOUSE

POL-ET125

POL-ET127

AREA 518.8m²
DEPTH 1.5m
VOLUME 778.2m³
PAH and Hydrocarbon Contaminated

POL-ET126

Note: ESG 17 & 18 were not analyzed for PAH or PHC

X:\02A-CAD\RAW TRIMBLE DATA TRANSFER (DO NOT ERASE)\SIMPSON LAKE (88122)\88122 (SIMPSON LAKE)\DWG\88122 (SIMPSON LAKE).DWG

Date: FEBRUARY 28, 2006
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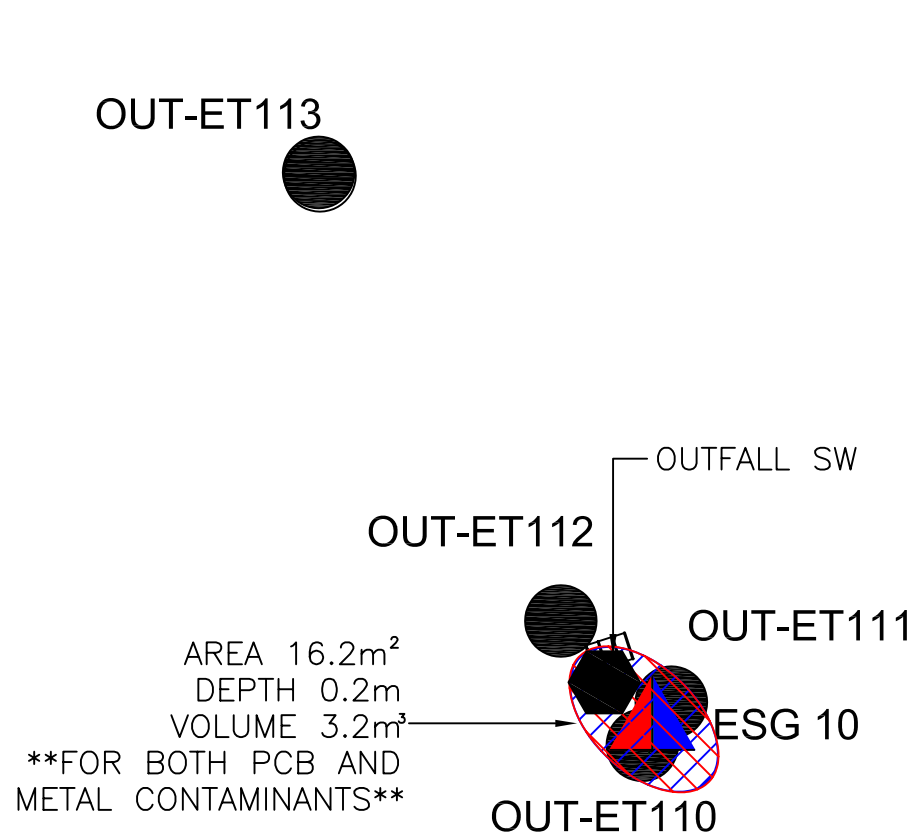
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EarthTech
A Tyco International Ltd. Company

Legend (Note: ESG Samples were not analyzed for PHC or PAH)

- SOIL SAMPLE
- ESG SAMPLE
- PLANT SAMPLE
- BARREL
- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE

PWGSC
CAM–D DEW LINE
POL AREA
Figure 3.6



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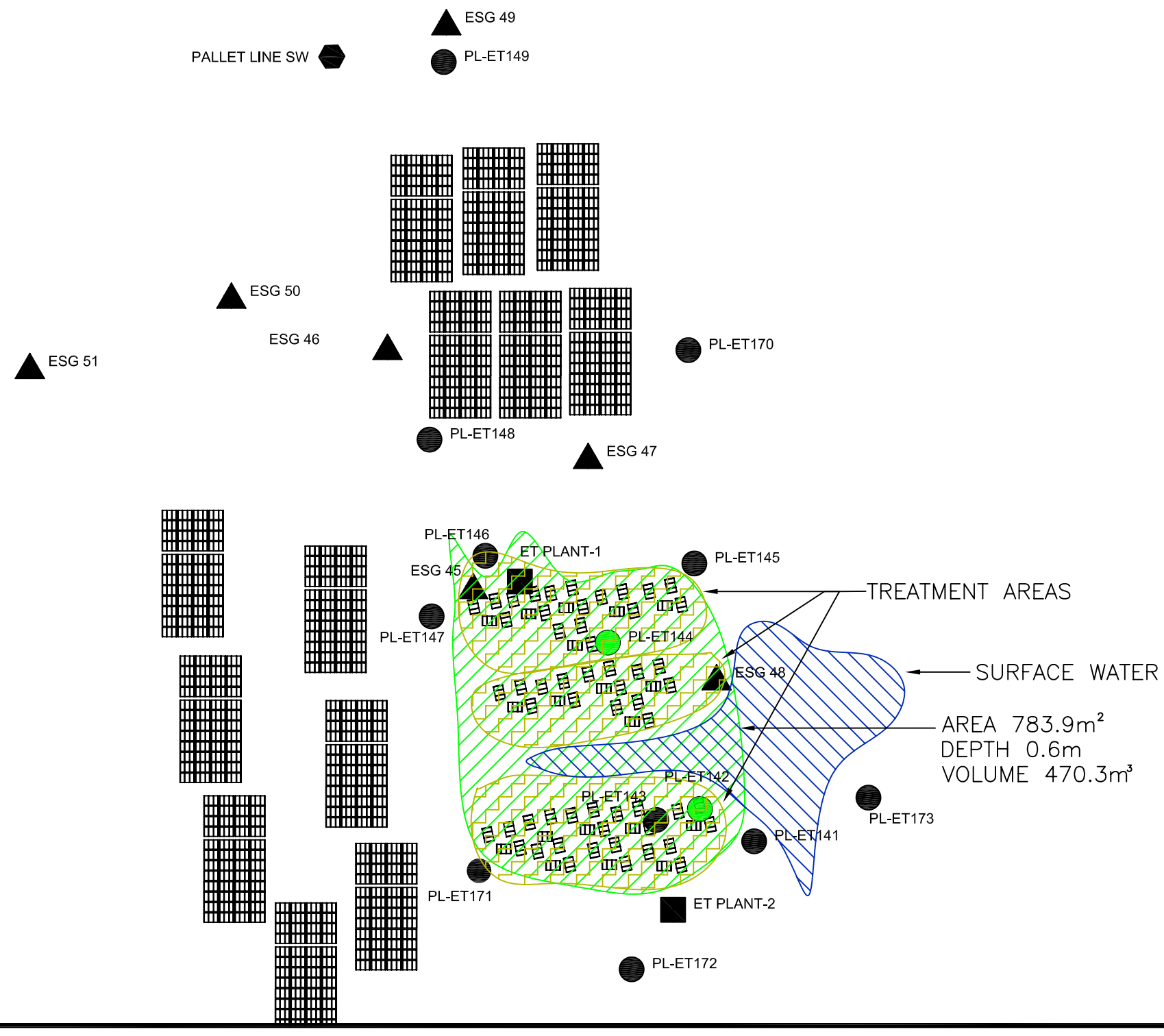
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Earth Tech
A Tyco International Ltd. Company

Legend (Note: ESG Samples were not analyzed for PHC or PAH)

- SOIL SAMPLE
- ESG SAMPLE
- PLANT SAMPLE
- BARREL
- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE

PWGSC
CAM–D DEW LINE
OUTFALL AREA (0–20 cm)
Figure 3.7



X:\02A-CADRAW TRIMBLE DATA TRANSFER (DO NOT ERASE)\SIMPSON LAKE (68122)\68122 (SIMPSON LAKE).DWG

Date: FEBRUARY 28, 2006
SCALE:

0 12.5 25
1:500

EarthTech
A Tyco International Ltd. Company

Legend (Note: ESG Samples were not analyzed for PHC or PAH)

- SOIL SAMPLE
- ESG SAMPLE
- PLANT SAMPLE
- BARREL
- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE

PWGSC
CAM–D DEW LINE
PALET LINE BOREHOLE LOCATIONS (0–60 cm)
Figure 3.8

PORTABLE FUEL TANKS
SW

AREA 265.8m²
DEPTH 1.0m
VOLUME 266m³
PAH and Hydrocarbon Contaminated

AREA 494.7m²
DEPTH 1.0m
VOLUME 495m³
Hydrocarbon Contaminated

ESG 29
FT-ET165
FT-ET168
FT-ET152
ESG 28
FT-ET166
FT-ET153
FT-ET169
FT-ET154

Note: ESG 28 & 29 were not analyzed for PAH or PHC

ESG 33

FT-ET167

ESG 30

X:\02A-CAD\RAW TRIMBLE DATA TRANSFER (DO NOT ERASE)\SIMPSON LAKE (68122)\68122 (SIMPSON LAKE)\DWG\68122 (SIMPSON LAKE).DWG

Date: FEBRUARY 28, 2006
SCALE:

0 5 10
1:250

EarthTech
A Tyco International Ltd. Company

Legend (Note: ESG Samples were not analyzed for PHC or PAH)

- SOIL SAMPLE
- ESG SAMPLE
- PLANT SAMPLE
- BARREL
- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE

PWGSC
CAM–D DEW LINE
PORTABLE FUEL TANKS
Figure 3.9



X:\02A-CAD\RAW TRIMBLE DATA TRANSFER (DO NOT ERASE)\SIMPSON LAKE (88122)\88122 (SIMPSON LAKE).DWG

Date: FEBRUARY 28, 2006
SCALE:

0 25 50

1:750

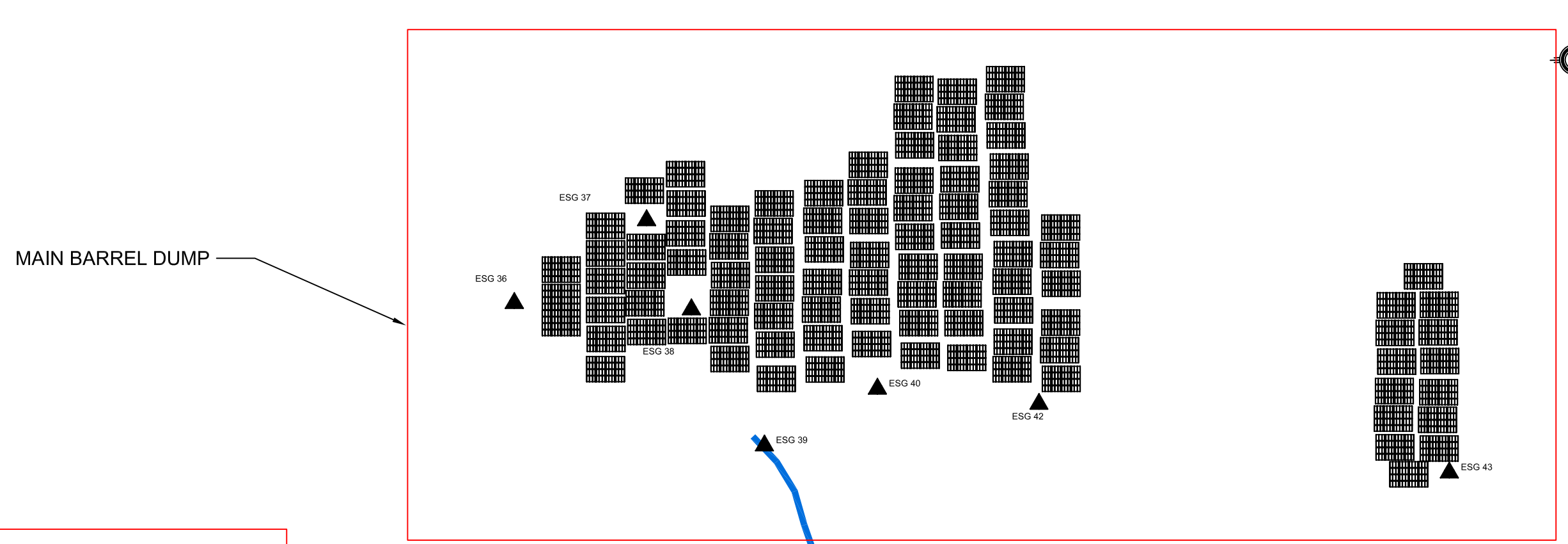
EarthTech
A Tyco International Ltd. Company

Legend (Note: ESG Samples were not analyzed for PHC or PAH)

- SOIL SAMPLE
- ESG SAMPLE
- PLANT SAMPLE
- BARREL
- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE

PWGSC
CAM–D DEW LINE
MAIN DUMP AREA
Figure 3.10

X:\02A-CADRAW TRIMBLE DATA TRANSFER (DO NOT ERASE)\SIMPSON LAKE (88122)\88122 (SIMPSON LAKE).DWG
X:\02A-CADRAW TRIMBLE DATA TRANSFER (DO NOT ERASE)\DWG\88122 (SIMPSON LAKE).DWG



Date: FEBRUARY 28, 2006
SCALE:

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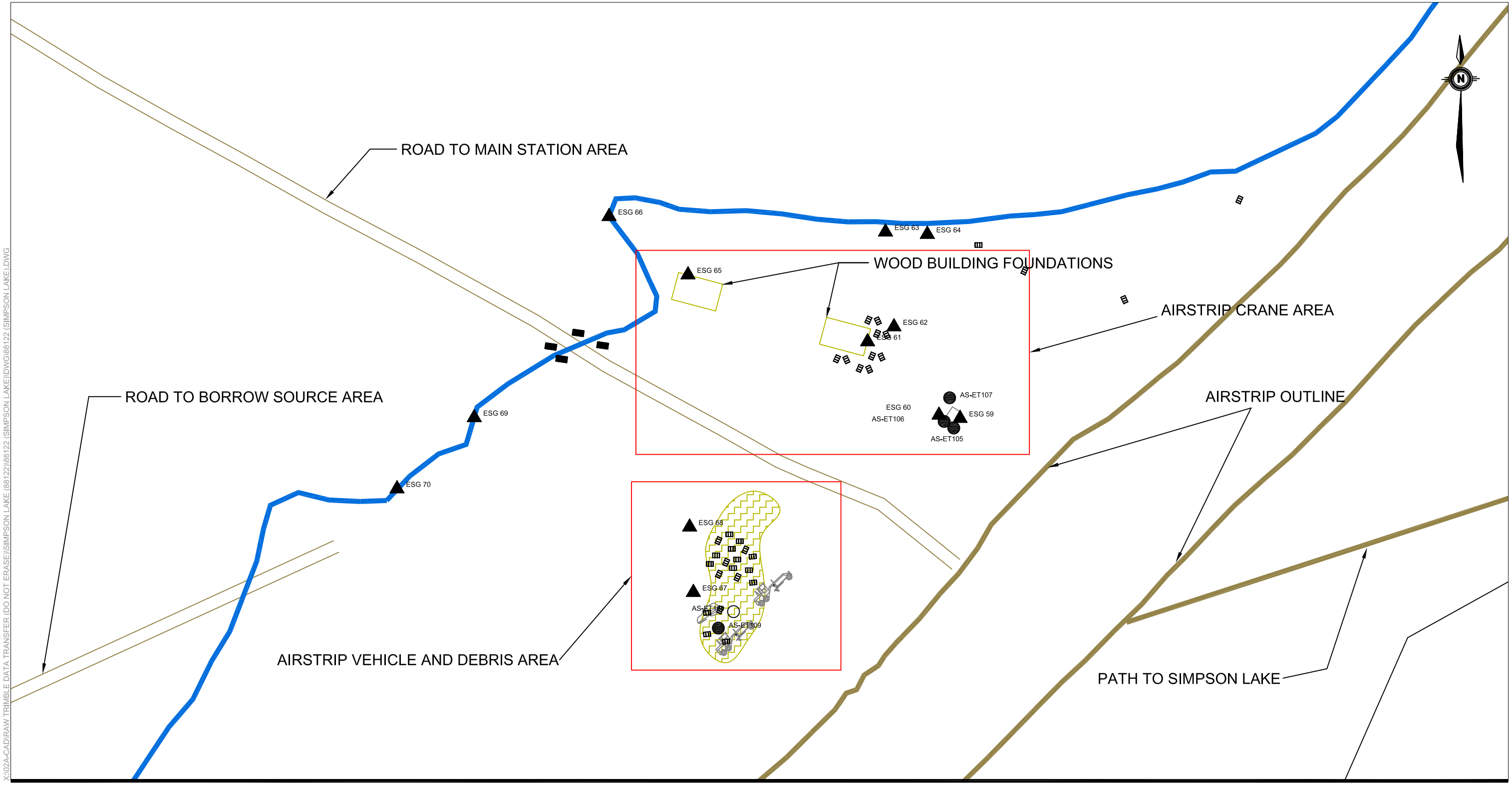
1:750

EarthTech
A Tyco International Ltd. Company

Legend (Note: ESG Samples were not analyzed for PHC or PAH)

- SOIL SAMPLE
- ESG SAMPLE
- PLANT SAMPLE
- BARREL
- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE

PWGSC
CAM–D DEW LINE
VEHICLE AND MAIN BARREL DUMP AREA
Figure 3.11



X:\02A-CAD\RAW TRIMBLE DATA TRANSFER (DO NOT ERASE)\SIMPSON LAKE (68122)\68122 (SIMPSON LAKE)\DWG\68122 (SIMPSON LAKE).DWG

Date: FEBRUARY 28, 2006
SCALE:

0 25 50

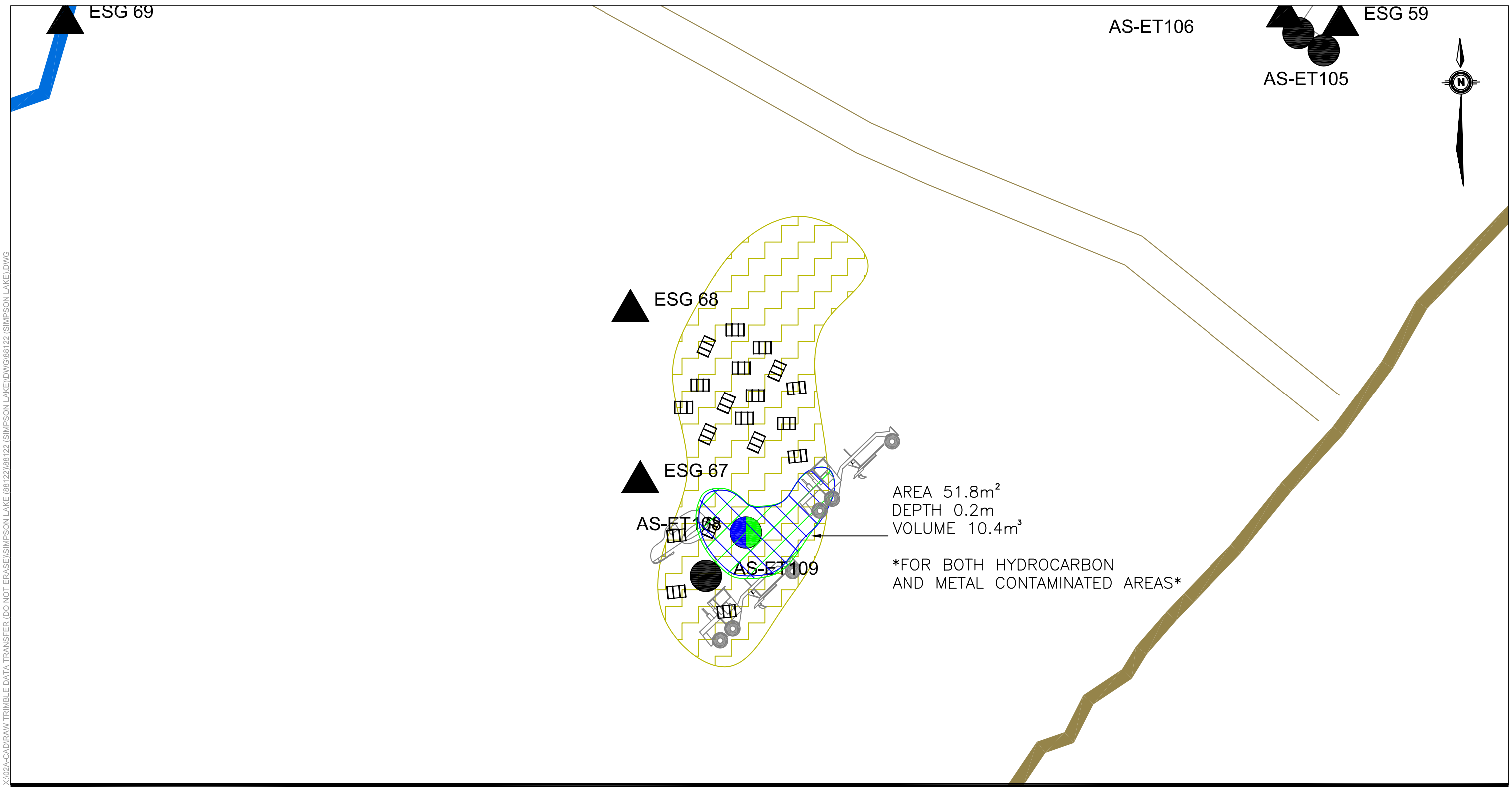
1:750

EarthTech
A Tyco International Ltd. Company

Legend (Note: ESG Samples were not analyzed for PHC or PAH)

- SOIL SAMPLE
- ESG SAMPLE
- PLANT SAMPLE
- BARREL
- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE

PWGSC
CAM–D DEW LINE
AIRSTRIP AREA
Figure 4.0



X:\02A-CAD\RAW TRIMBLE DATA TRANSFER (DO NOT ERASE)\SIMPSON LAKE (68122)\68122 (SIMPSON LAKE).DWG

Date: FEBRUARY 28, 2006
SCALE:

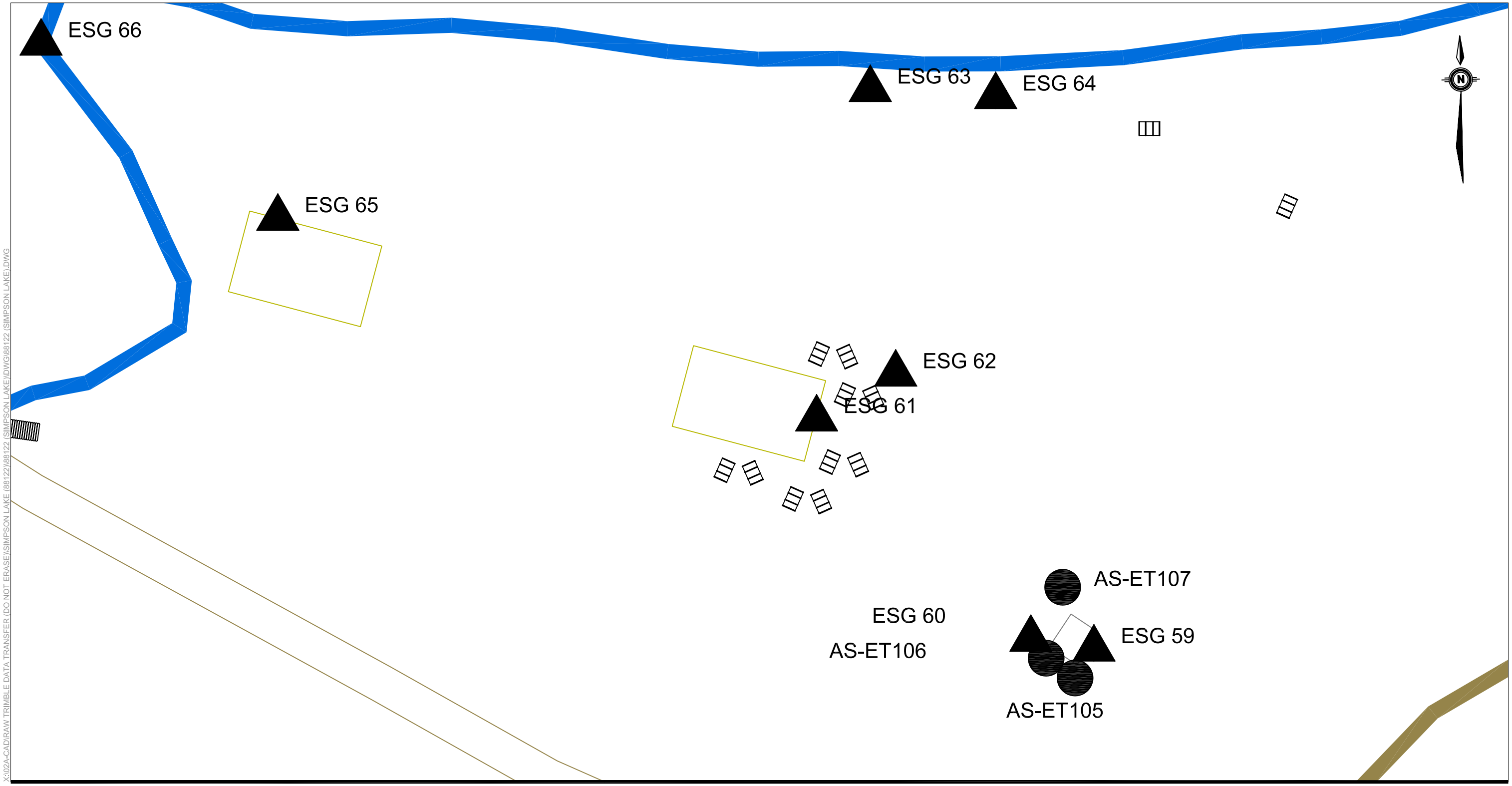
0 5 10
1:250

EarthTech
A Tyco International Ltd. Company

Legend (Note: ESG Samples were not analyzed for PHC or PAH)

- SOIL SAMPLE
- ESG SAMPLE
- PLANT SAMPLE
- BARREL
- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE

PWGSC
CAM–D DEW LINE
AIRSTRIP VEHICLE AND DEBRIS AREA (0–20 cm)
Figure 4.1



Date: FEBRUARY 28, 2006
SCALE:

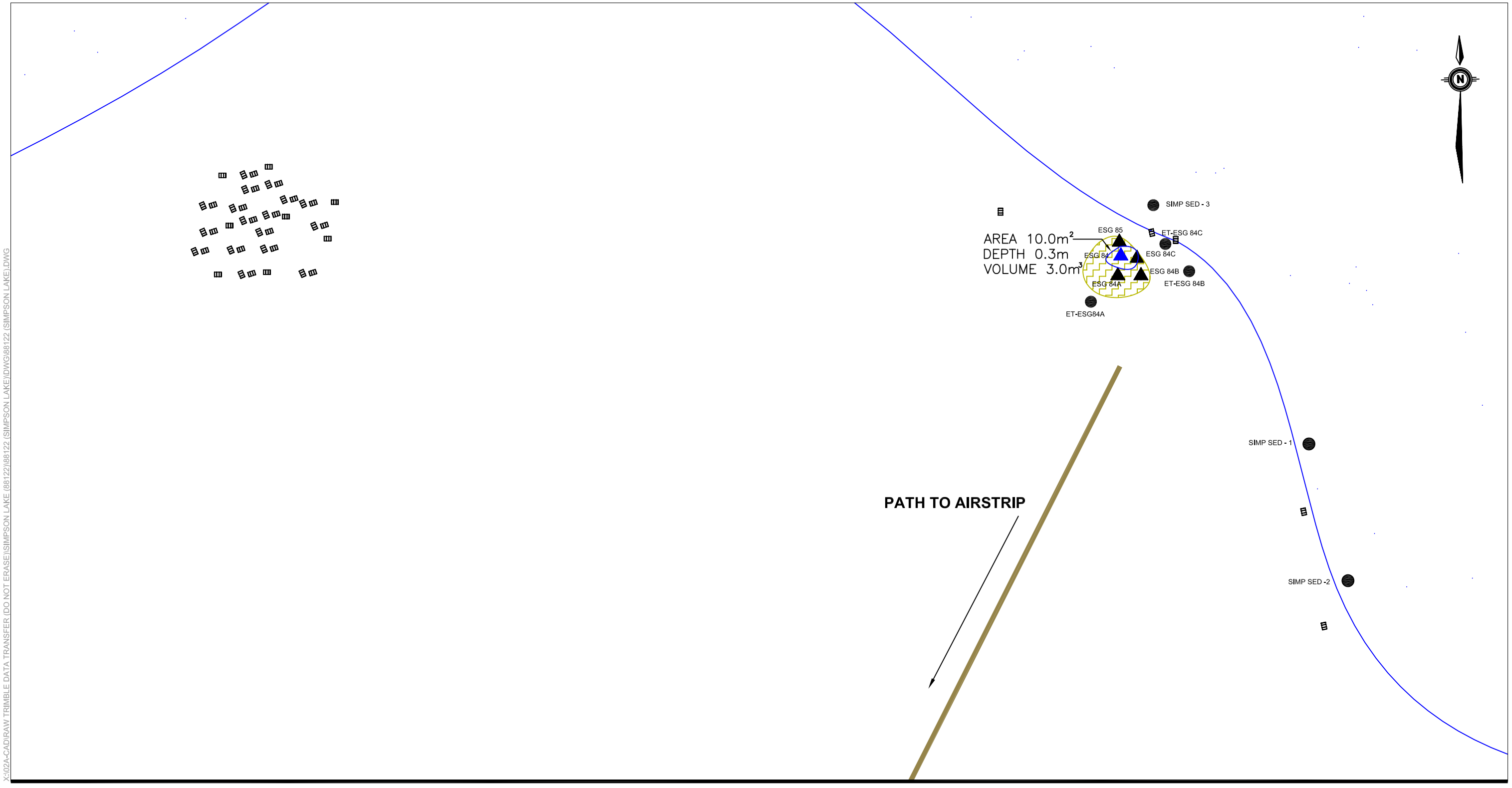
0 5 10
1:250

EarthTech
A Tyco International Ltd. Company

Legend (Note: ESG Samples were not analyzed for PHC or PAH)

- SOIL SAMPLE
- ESG SAMPLE
- PLANT SAMPLE
- BARREL
- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE

PWGSC
CAM–D DEW LINE
CRANE AREA
Figure 4.2



X:\02A-CAD\RAW TRIMBLE DATA TRANSFER (DO NOT ERASE)\SIMPSON LAKE (88122)\88122 (SIMPSON LAKE).DWG

Date: FEBRUARY 28, 2006
SCALE:

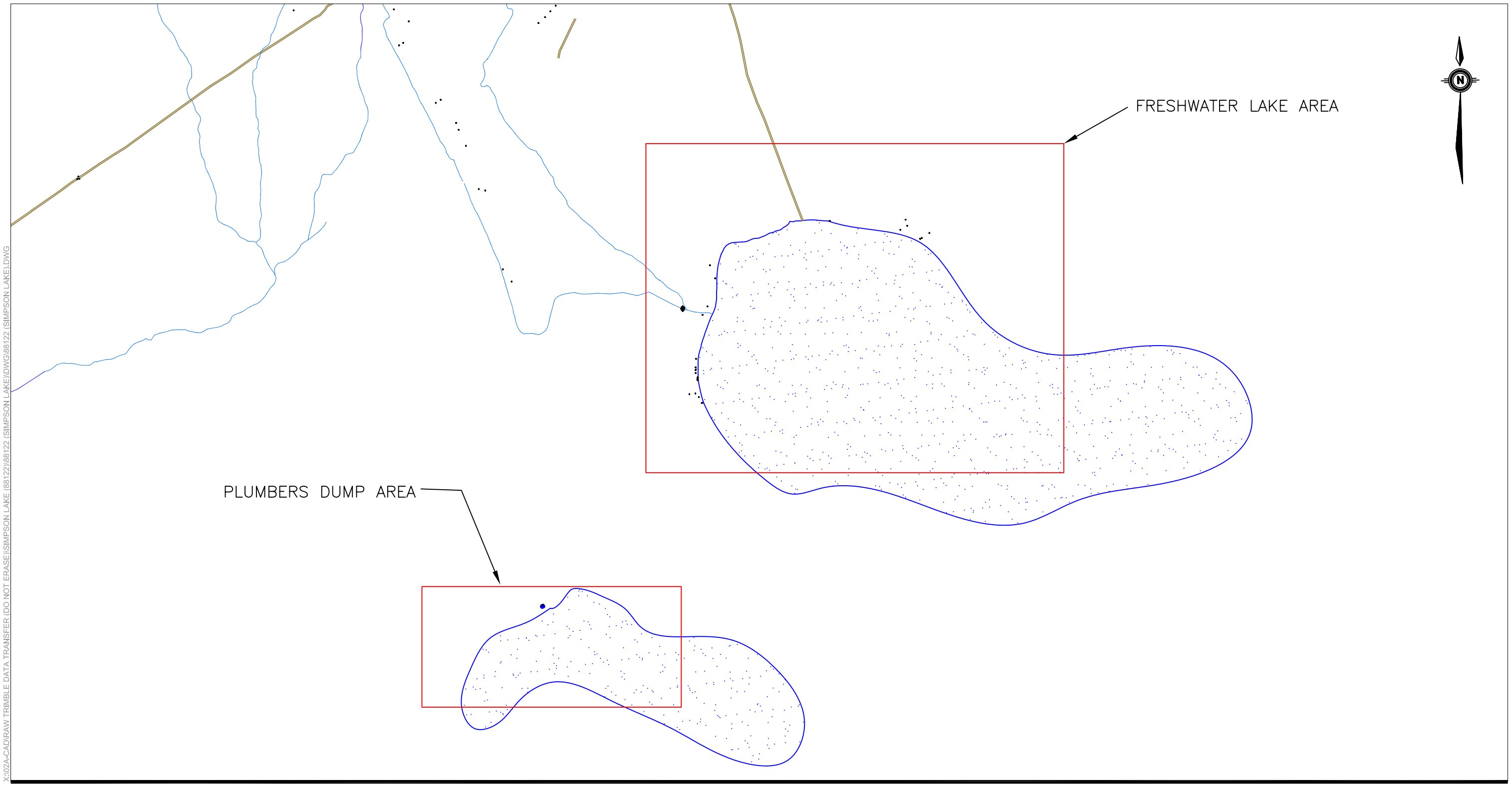
0 20 40 60 80 100m
Scale 1:750

EarthTech
A Tyco International Ltd. Company

Legend (Note: ESG Samples were not analyzed for PHC or PAH)

- SOIL SAMPLE
- ESG SAMPLE
- PLANT SAMPLE
- BARREL
- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE

PWGSC
CAM–D DEW LINE
SIMPSON LAKE AREA
Figure 5.0



X:\02A-CAD\RAW TRIMBLE DATA TRANSFER (DO NOT ERASE)\SIMPSON LAKE (88122)\88122 (SIMPSON LAKE).DWG

Date: FEBRUARY 28, 2006
SCALE:

0 200 400 600 800 1000m
Scale 1:7500

EarthTech
A Tyco International Ltd. Company

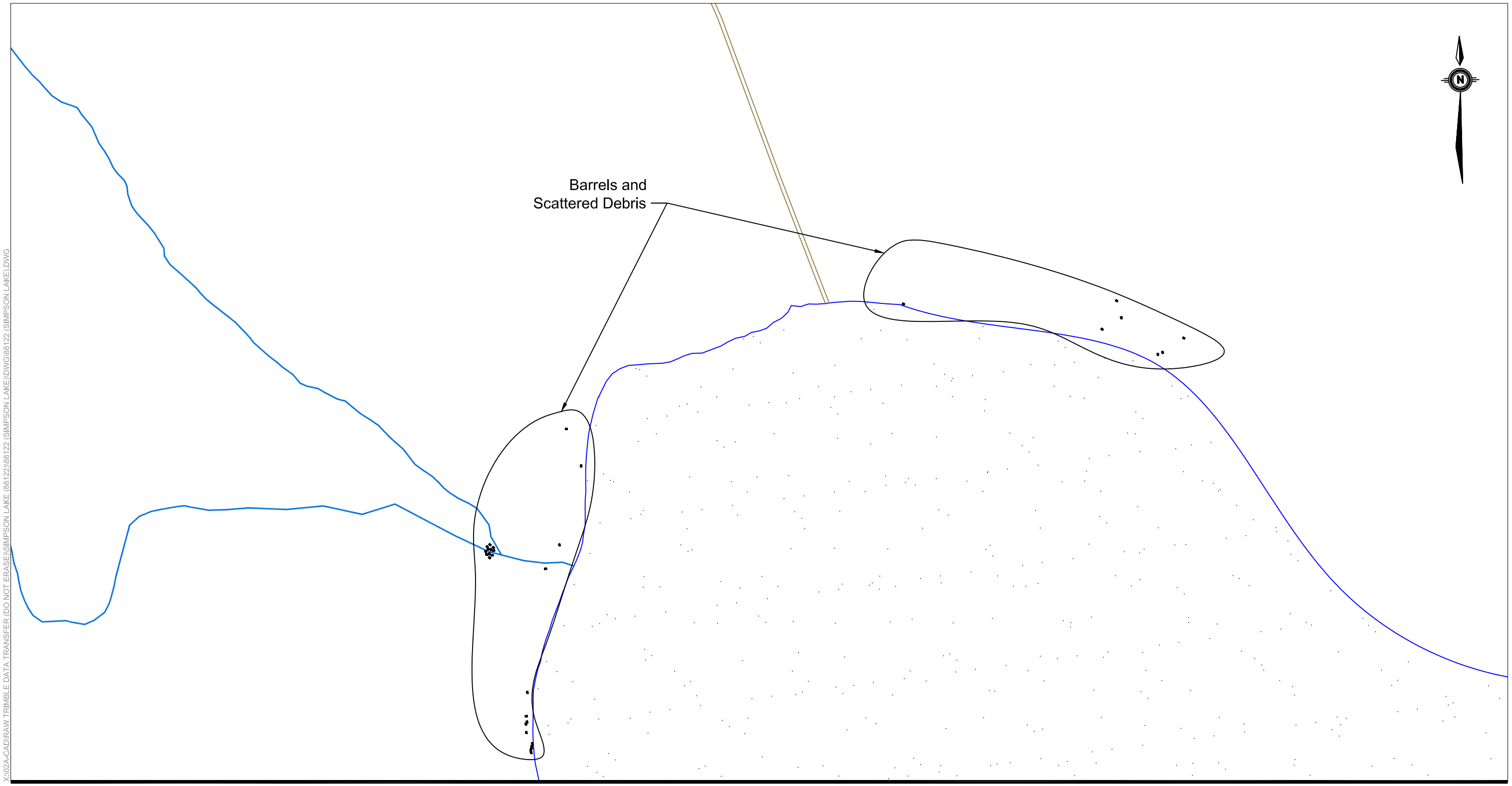
Legend (Note: ESG Samples were not analyzed for PHC or PAH)

- SOIL SAMPLE
- ESG SAMPLE
- PLANT SAMPLE
- BARREL
- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE

PWGSC
CAM–D DEW LINE

FRESHWATER LAKE AND PLUMBERS DUMP AREA

Figure 6.0



X:\02A-CAD\RAW TRIMBLE DATA TRANSFER (DO NOT ERASE)\SIMPSON LAKE (68122)\68122 (SIMPSON LAKE)\DWG\68122 (SIMPSON LAKE).DWG

Date: FEBRUARY 28, 2006
SCALE:

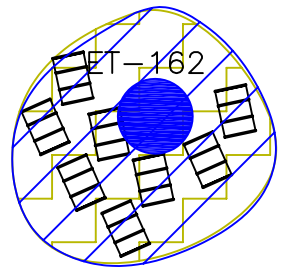
0 50 100
1:2500

EarthTech
A Tyco International Ltd. Company

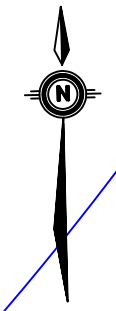
Legend (Note: ESG Samples were not analyzed for PHC or PAH)

- SOIL SAMPLE
- ESG SAMPLE
- PLANT SAMPLE
- BARREL
- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE

PWGSC
CAM–D DEW LINE
FRESHWATER LAKE AREA
Figure 6.1



AREA 41.9m²
DEPTH 0.3m
VOLUME 12.6m³



X:\02A-CADRAW TRIMBLE DATA TRANSFER (DO NOT ERASE)\SIMPSON LAKE (88122)\88122 (SIMPSON LAKE)\DWG\88122 (SIMPSON LAKE).DWG

Date: FEBRUARY 28, 2006
SCALE:

0 5 10
1:250

EarthTech
A Tyco International Ltd. Company

Legend (Note: ESG Samples were not analyzed for PHC or PAH)

- SOIL SAMPLE
- ESG SAMPLE
- PLANT SAMPLE
- BARREL
- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE

PWGSC
CAM-D DEW LINE
PLUMBERS DUMP AREA
Figure 6.2

X:\02A-CAD\RAW TRIMBLE DATA TRANSFER (DO NOT ERASE)\SIMPSON LAKE (88122)\88122 (SIMPSON LAKE)\DWG\88122 (SIMPSON LAKE).DWG

BORROW SOURCE #5
ORIGINAL BORROW SOURCE
4.75km ON NW SHORE
OF SIMPSON LAKE

FORMER
MAIN STATION
AREA

BORROW SOURCE #1
BORROW SOURCE FOR TYPE 5
GENERAL FILL MATERIAL

SRR SITE

AIRSTRIP

AS TP#1

AS TP#2

3.04km

APRON #2

AS TP#4

BORROW SOURCE #1
SAND AND GRAVEL ESKER
SOURCE OF TYPE
2 AND 3 MATERIAL

SIMPSONS
BORROW
#1

Date: FEBRUARY 28, 2006
SCALE:

0 100 200
1:4000

EarthTech
A Tyco International Ltd. Company

Legend (Note: ESG Samples were not analyzed for PHC or PAH)

- SOIL SAMPLE
- ESG SAMPLE
- PLANT SAMPLE
- BARREL
- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE
- CLAY BORROW SOURCE
- GRAVEL/COBBLE BORROW SOURCE
- SAND BORROW SOURCE

PWGSC
CAM–D DEW LINE
GEOTECHNICAL INVESTIGATION OF BORROW SOURCES, CAM–D
MAIN SITE AND ROUTE TO SIMPSON LAKE

Figure 7.0

SOURCE OF TYPE 2,3 AND 4 MATERIAL

SOURCE OF TYPE 1 MATERIAL

GRAVEL #1

SAND #1

GRAVEL #2

SOURCE OF TYPE 3 MATERIAL

BORROW SOURCE #3
MORAINE

CLAY
STOCK
#1

BORROW SOURCE #2
CLAY DRUMLIN
SOURCE OF TYPE 3 MATERIAL

X:\02A-CAD\RAW TRIMBLE DATA TRANSFER (DO NOT ERASE)\SIMPSON LAKE (88122)\88122 (SIMPSON LAKE)\DWG\88122 (SIMPSON LAKE).DWG

Date: FEBRUARY 28, 2006
SCALE:
0 100 200
1:4000

EarthTech
A Tyco International Ltd. Company

Legend (Note: ESG Samples were not analyzed for PHC or PAH)

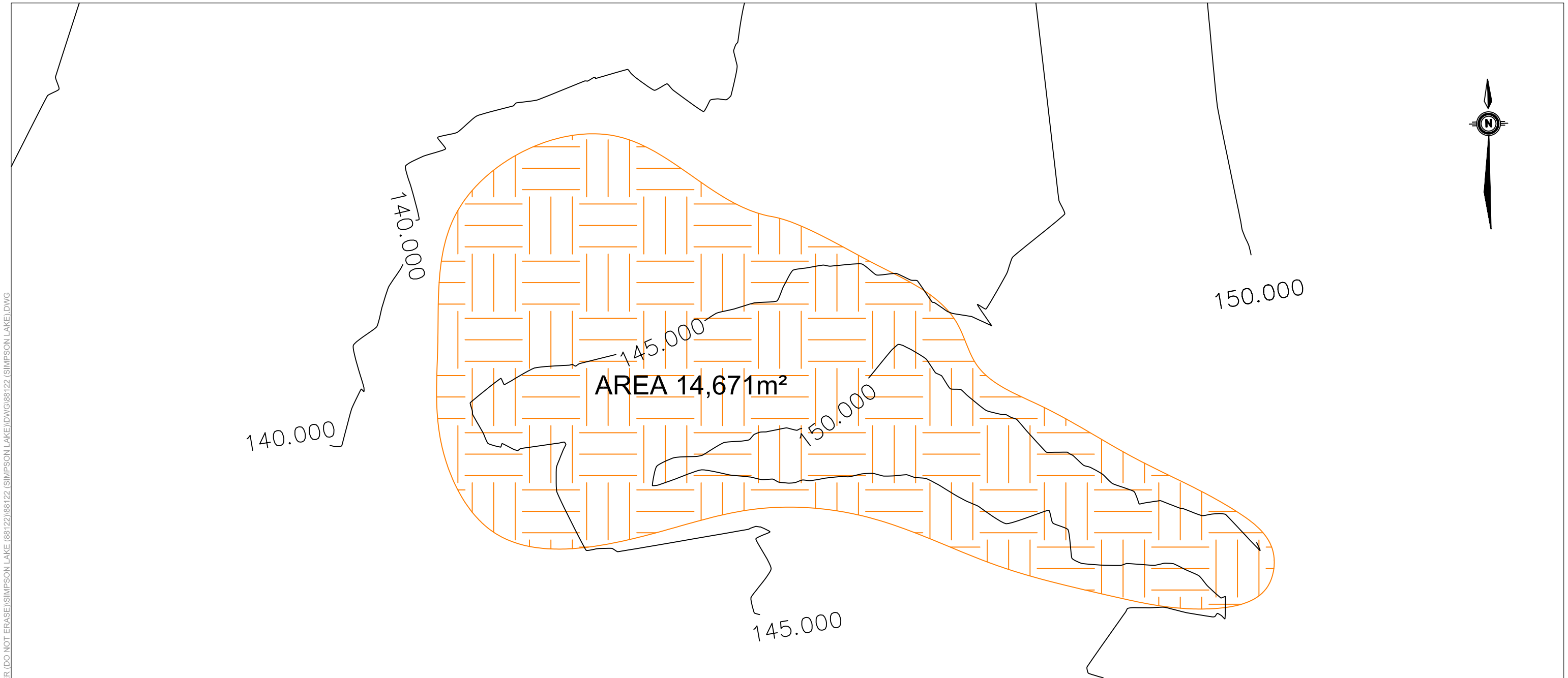
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- ESG SAMPLE
- PLANT SAMPLE
- BARREL
- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE
- CLAY BORROW SOURCE
- GRAVEL/COBBLE BORROW SOURCE
- SAND BORROW SOURCE

PWGSC

CAM–D DEW LINE

GEOTECHNICAL INVESTIGATION OF BORROW SOURCES, CAM–D
MURCHISON RIVER BORROW AREA

Figure 7.1



X:\02A-CAD\RAW TRIMBLE DATA TRANSFER (DO NOT ERASE)\SIMPSON LAKE (68122)\68122 (SIMPSON LAKE).DWG

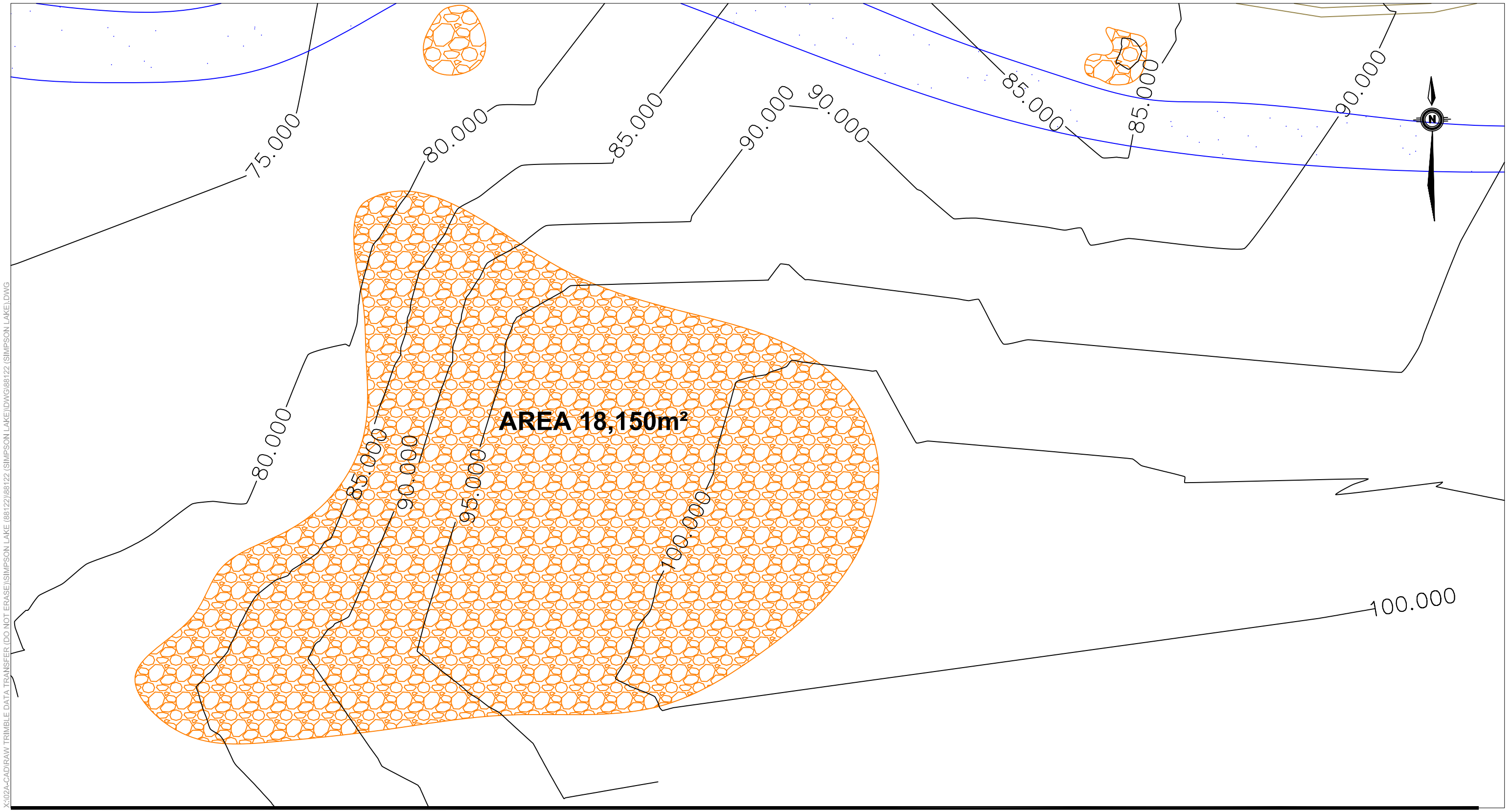
Date: FEBRUARY 28, 2006
SCALE:
0 25 50
1:1000

EarthTech
A Tyco International Ltd. Company

Legend (Note: ESG Samples were not analyzed for PHC or PAH)

- SOIL SAMPLE
- ESG SAMPLE
- PLANT SAMPLE
- BARREL
- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE
- CLAY BORROW SOURCE
- GRAVEL/COBBLE BORROW SOURCE
- SAND BORROW SOURCE

PWGSC
CAM–D DEW LINE
GEOTECHNICAL INVESTIGATION OF BORROW SOURCES, CAM–D
DRUMLIM AT MURCHISON RIVER BORROW AREA(BORROW SOURCE #2
Figure 7.2



X:\02A-CAD\RAW TRIMBLE DATA TRANSFER (DO NOT ERASE)\SIMPSON LAKE (88122)\88122 (SIMPSON LAKE).DWG

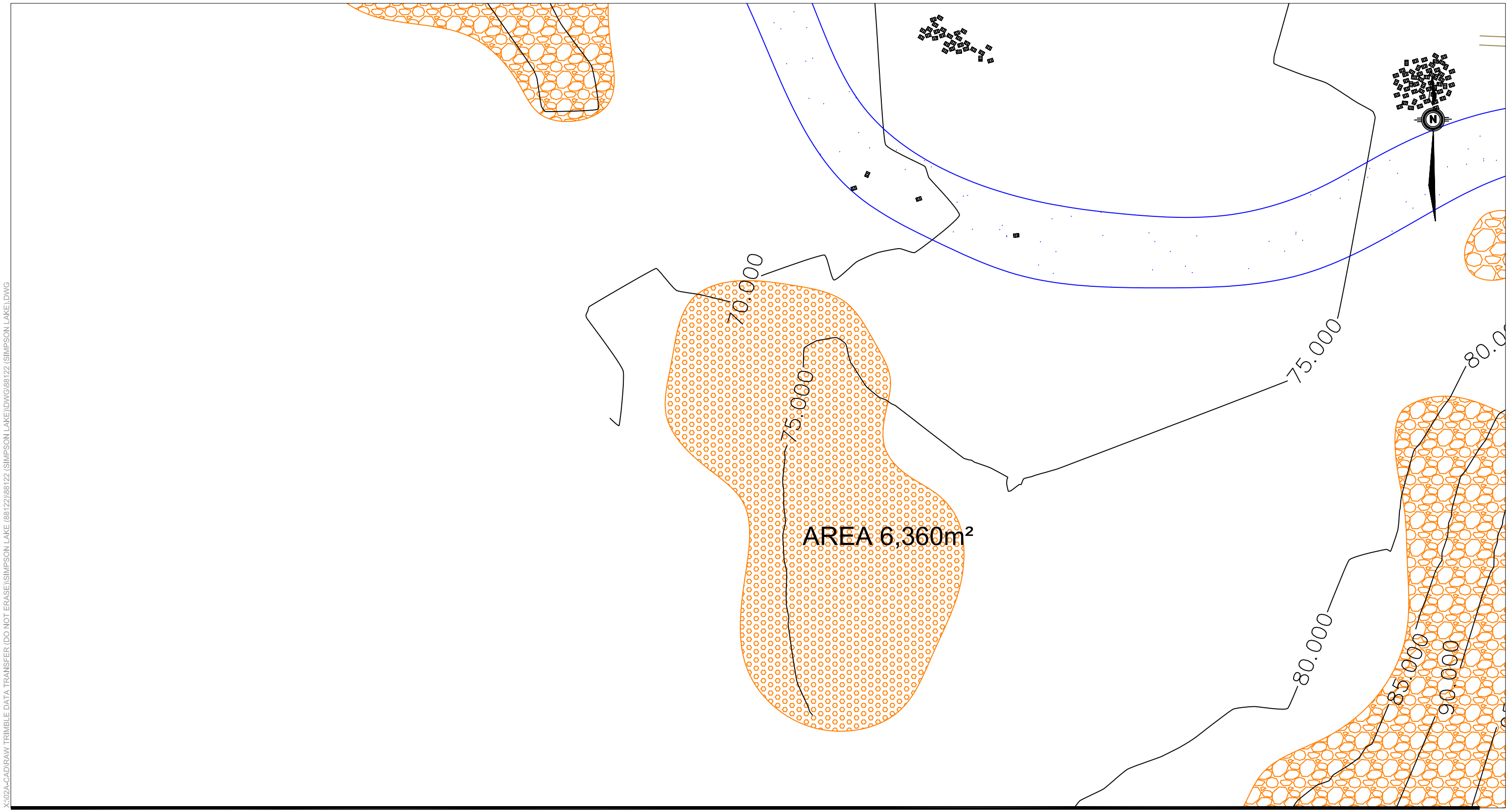
Date: FEBRUARY 28, 2006
SCALE:
0 25 50
1:1000

EarthTech
A Tyco International Ltd. Company

Legend (Note: ESG Samples were not analyzed for PHC or PAH)

- SOIL SAMPLE
- ESG SAMPLE
- PLANT SAMPLE
- BARREL
- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE
- CLAY BORROW SOURCE
- GRAVEL/COBBLE BORROW SOURCE
- SAND BORROW SOURCE

PWGSC
CAM–D DEW LINE
GEOTECHNICAL INVESTIGATION OF BORROW SOURCES, CAM–D
MORAINE DEPOSIT (GRAVEL #2) AT MURCHISON RIVER BORROW AREA
Figure 7.3



X:\02A-CAD\RAW TRIMBLE DATA TRANSFER (DO NOT ERASE)\SIMPSON LAKE (88122)\88122 (SIMPSON LAKE)\DWG\88122 (SIMPSON LAKE).DWG

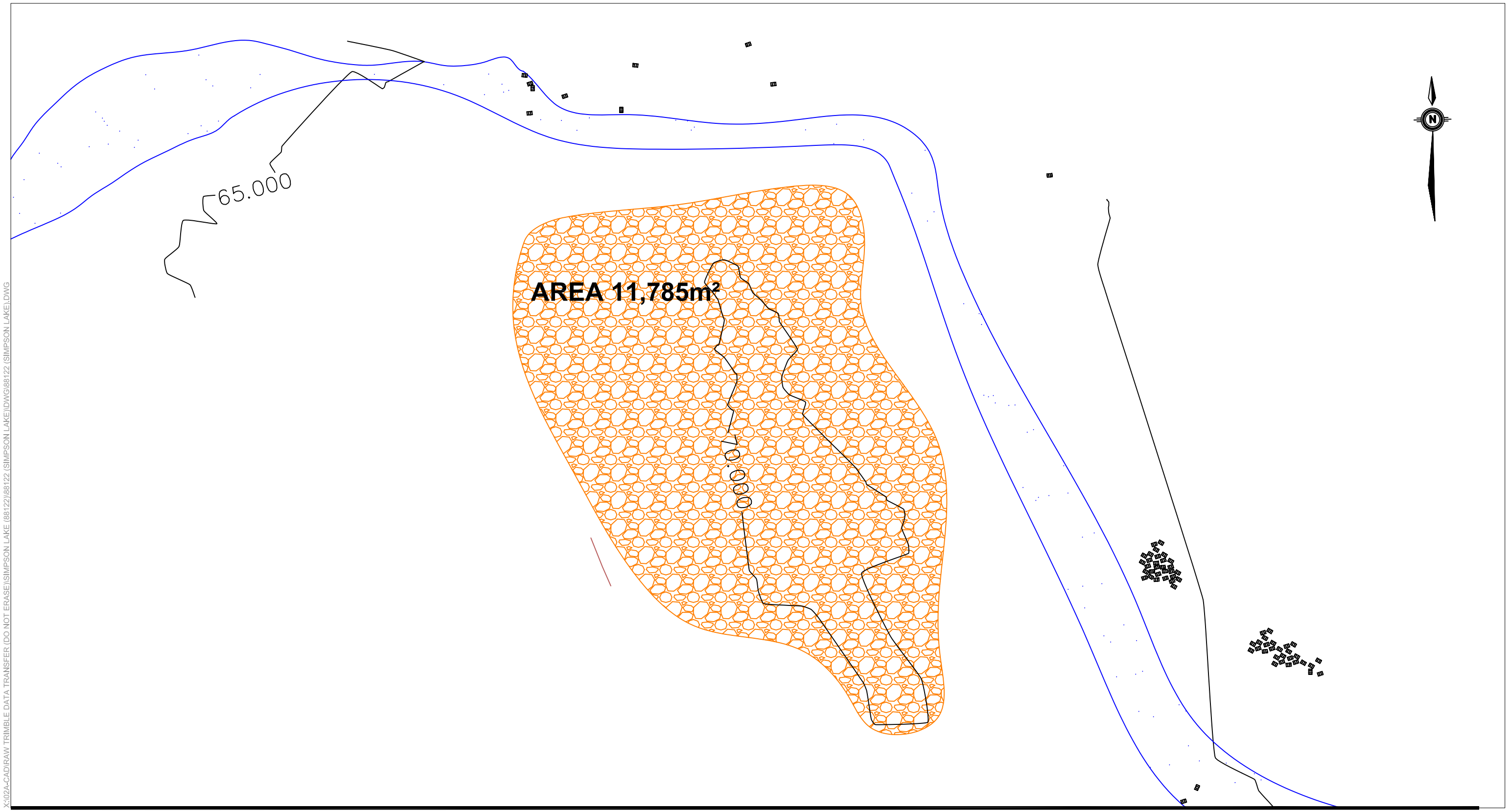
Date: FEBRUARY 28, 2006
SCALE:
0 25 50
1:1000

EarthTech
A Tyco International Ltd. Company

Legend (Note: ESG Samples were not analyzed for PHC or PAH)

- SOIL SAMPLE
- ESG SAMPLE
- PLANT SAMPLE
- BARREL
- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE
- CLAY BORROW SOURCE
- GRAVEL/COBBLE BORROW SOURCE
- SAND BORROW SOURCE

PWGSC
CAM–D DEW LINE
GEOTECHNICAL INVESTIGATION OF BORROW SOURCES, CAM–D
SAND DEPOSIT (SAND #1) AT MURCHISON RIVER BORROW AREA
Figure 7.4



X:\02A-CAD\RAW TRIMBLE DATA TRANSFER (DO NOT ERASE)\SIMPSON LAKE (88122)\88122 (SIMPSON LAKE)\DWG\88122 (SIMPSON LAKE).DWG

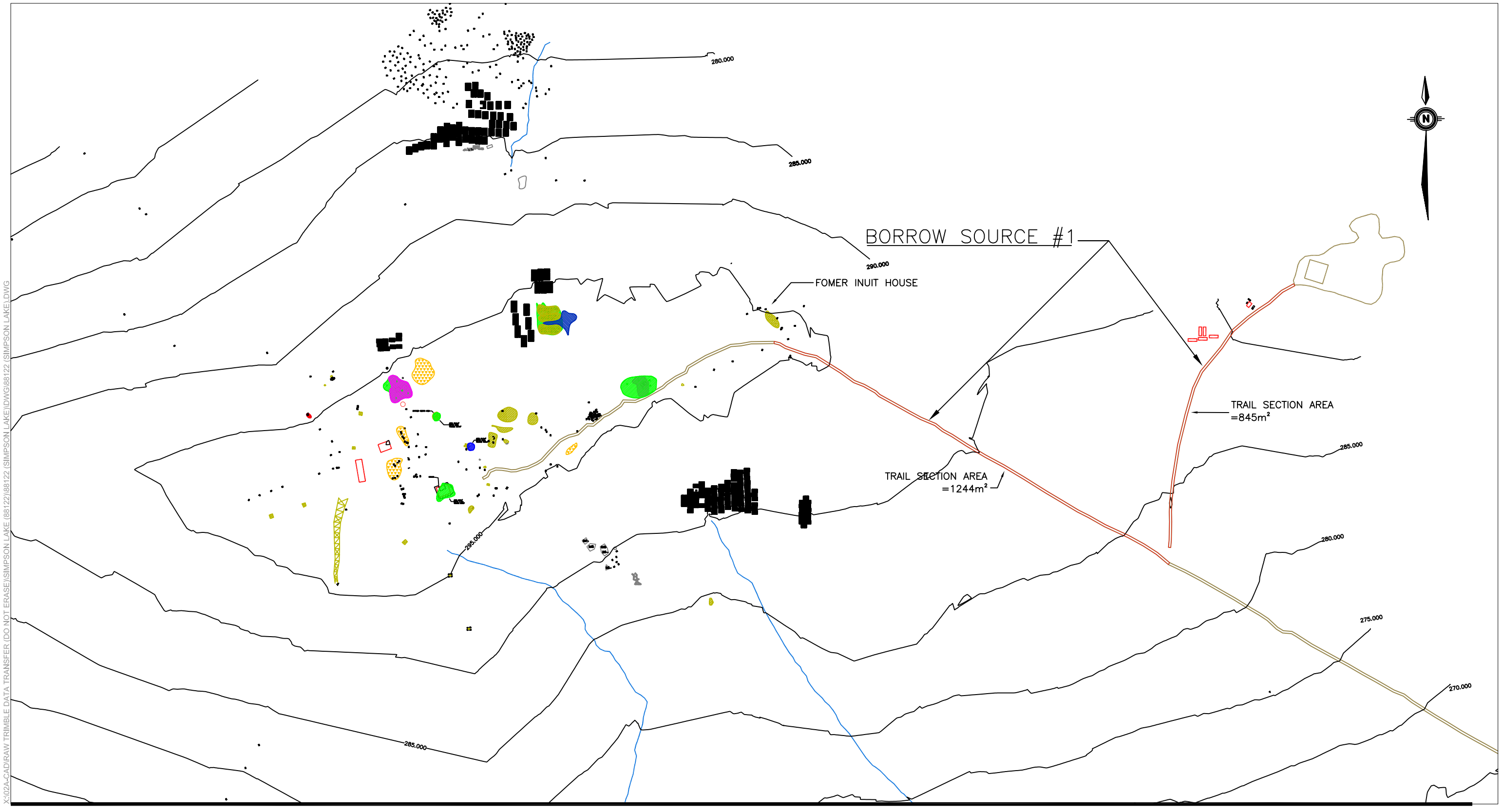
Date: FEBRUARY 28, 2006
SCALE:
0 25 50
1:1000

EarthTech
A Tyco International Ltd. Company

Legend (Note: ESG Samples were not analyzed for PHC or PAH)

- SOIL SAMPLE
- ESG SAMPLE
- PLANT SAMPLE
- BARREL
- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE
- CLAY BORROW SOURCE
- GRAVEL/COBBLE BORROW SOURCE
- SAND BORROW SOURCE

PWGSC
CAM–D DEW LINE
GEOTECHNICAL INVESTIGATION OF BORROW SOURCES, CAM–D
GRAVEL STOCKPILE (GRAVEL #1) AT MURCHISON RIVER BORROW AREA
Figure 7.5



X:\02A-CADRAW TRIMBLE DATA TRANSFER (DO NOT ERASE)\SIMPSON LAKE (88122)\88122 (SIMPSON LAKE).DWG

Date: FEBRUARY 28, 2006
SCALE:
0 100 200
1:4000

EarthTech
A Tyco International Ltd. Company

Legend (Note: ESG Samples were not analyzed for PHC or PAH)

- SOIL SAMPLE
- ESG SAMPLE
- PLANT SAMPLE
- BARREL
- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE
- CLAY BORROW SOURCE
- GRAVEL/COBBLE BORROW SOURCE
- SAND BORROW SOURCE

PWGSC
CAM–D DEW LINE
GEOTECHNICAL INVESTIGATION OF BORROW SOURCES, CAM–D
AREA OF ROADS FROM INUIT HOUSE TO AIRSTRIP

Figure 7.6

X:\02A-CAD\RAW TRIMBLE DATA TRANSFER (DO NOT ERASE)\SIMPSON LAKE (88122)\88122 (SIMPSON LAKE).DWG

GRAVEL AREA
=126,622m²
REMAINING GRAVEL VOLUME, 7,700m³ TO 9,100m³

Date: FEBRUARY 28, 2006
SCALE:
0 100 200
1:5000

EarthTech
A Tyco International Ltd. Company

Legend (Note: ESG Samples were not analyzed for PHC or PAH)

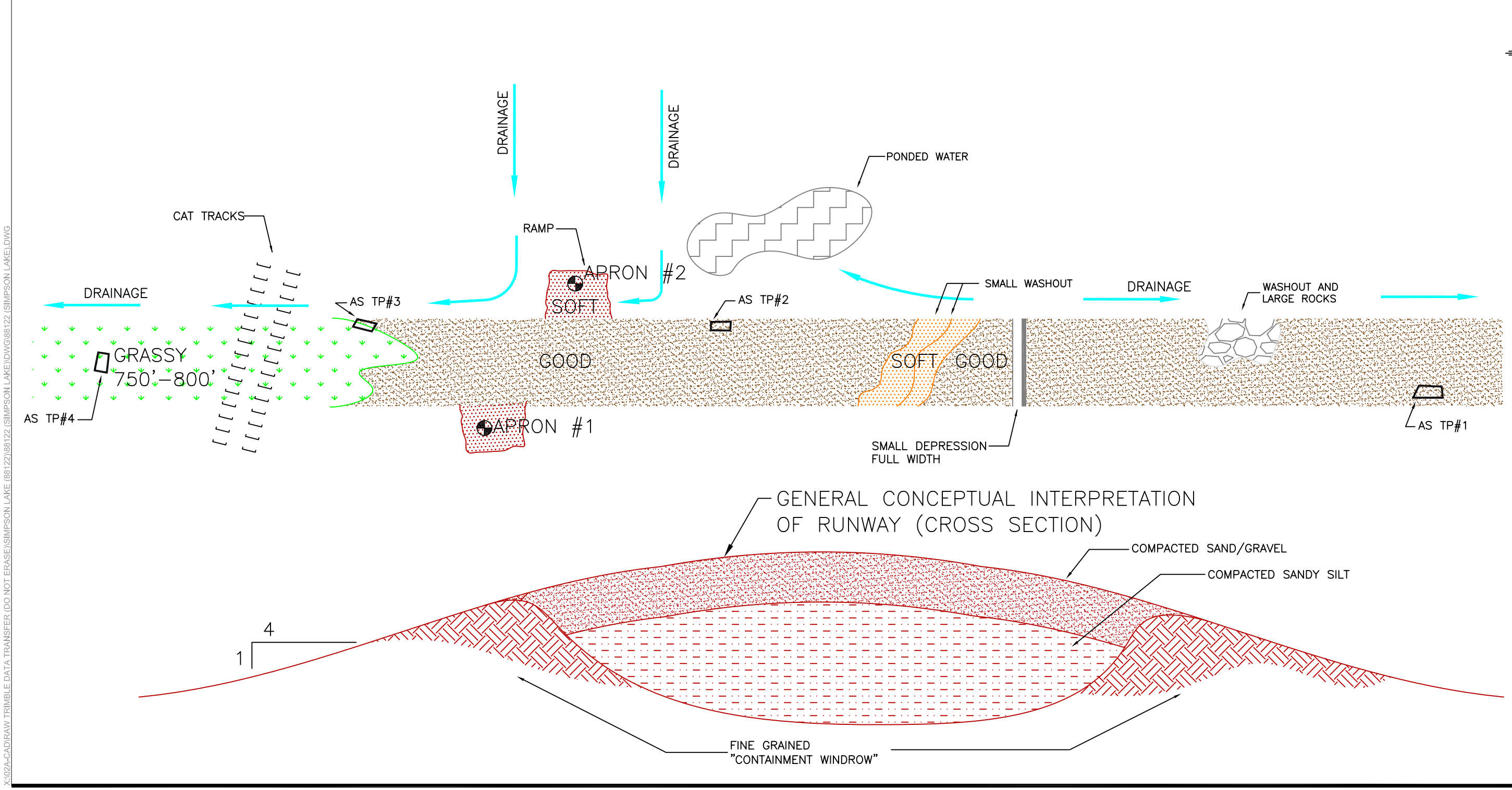
- SOIL SAMPLE
- ESG SAMPLE
- PLANT SAMPLE
- BARREL
- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE
- CLAY BORROW SOURCE
- GRAVEL/COBBLE BORROW SOURCE
- SAND BORROW SOURCE

PWGSC

CAM–D DEW LINE

GEOTECHNICAL INVESTIGATION OF BORROW SOURCES, CAM–D
ORIGINAL GRAVEL AREA, (1964) FROM INUIT HOUSE TO MAIN SITE

Figure 7.7



X:\02A-CAD\RAW TRIMBLE DATA TRANSFER (DO NOT ERASE)\SIMPSON LAKE (88122)\88122 (SIMPSON LAKE)\DWG\88122 (SIMPSON LAKE).DWG

Date: FEBRUARY 28, 2006
SCALE:
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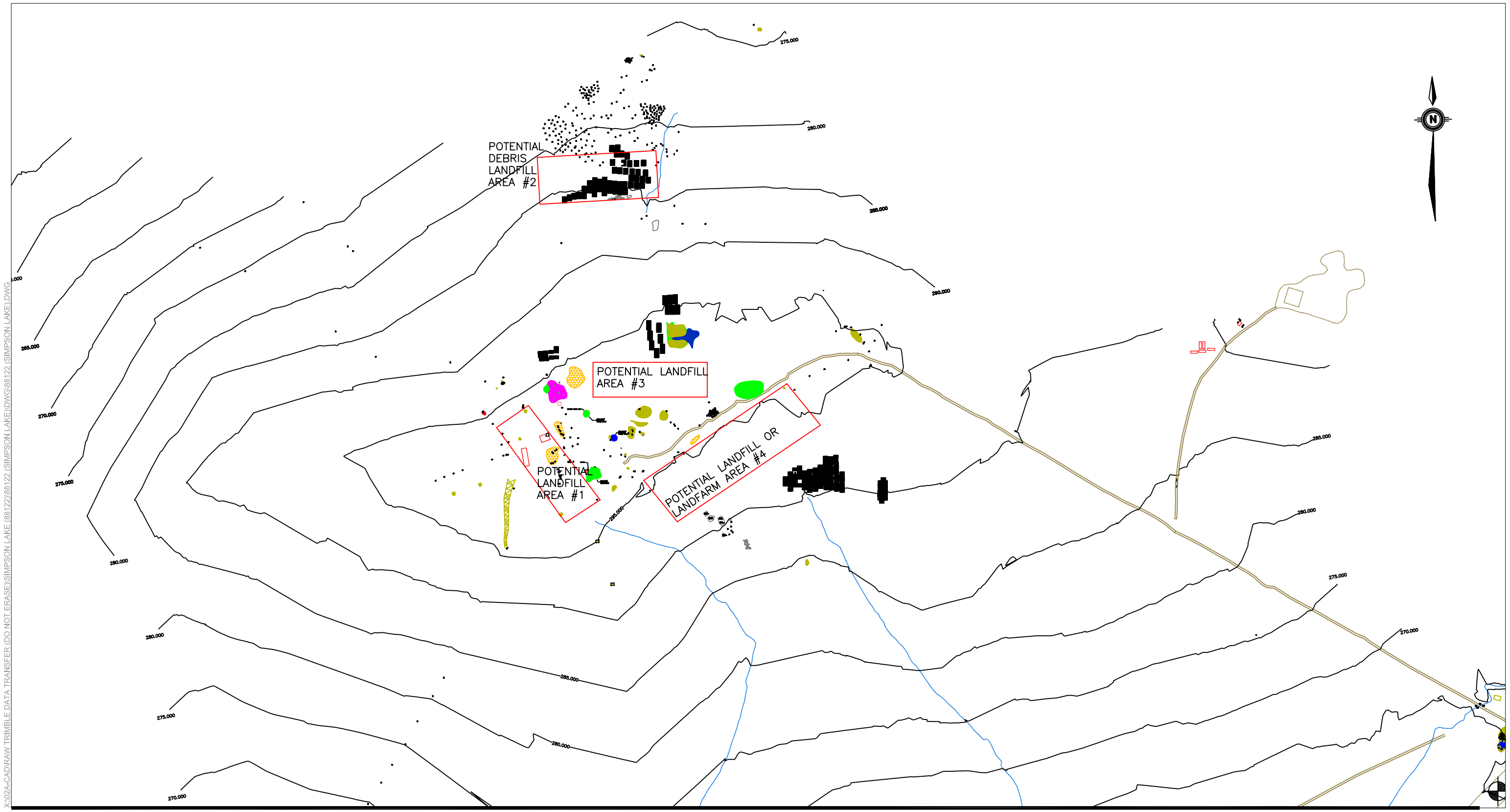
EarthTech
A Tyco International Ltd. Company

Legend (Note: ESG Samples were not analyzed for PHC or PAH)

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- ESG SAMPLE
- PLANT SAMPLE
- BARREL
- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE
- CLAY BORROW SOURCE
- GRAVEL/COBBLE BORROW SOURCE
- SAND BORROW SOURCE

PWGSC
CAM–D DEW LINE
PILOTS OBSERVATIONS OF AIRSTRIP

Figure 7.8



X:\02A-CAD\RAW TRIMBLE DATA TRANSFER (DO NOT ERASE)\SIMPSON LAKE (88122)\88122 (SIMPSON LAKE).DWG

Date: FEBRUARY 28, 2006

SCALE:

0 100 200

1:5000

EarthTech
A Tyco International Ltd. Company

Legend (Note: ESG Samples were not analyzed for PHC or PAH)

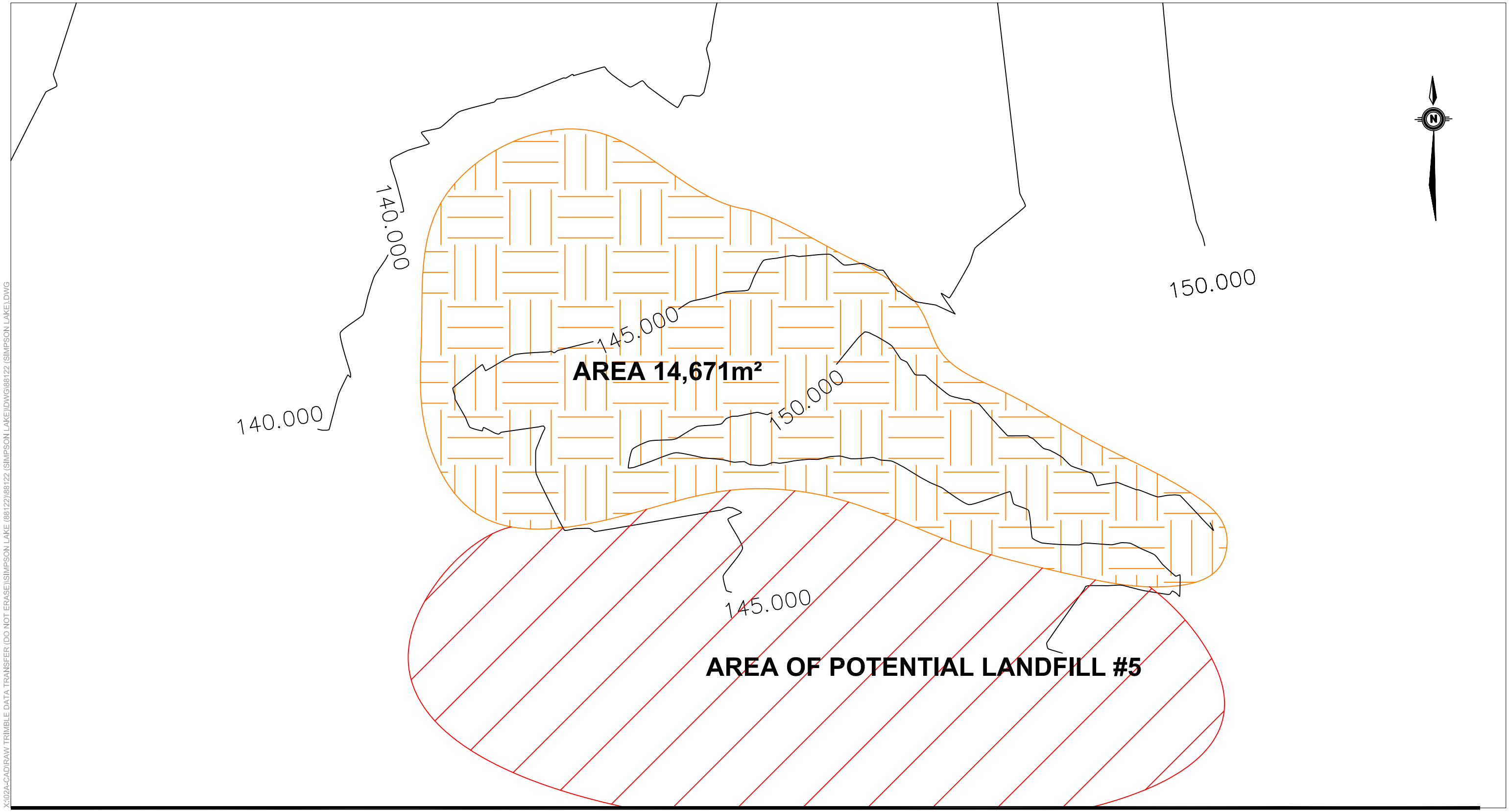
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- PLANT SAMPLE
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- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE
- CLAY BORROW SOURCE
- GRAVEL/COBBLE BORROW SOURCE
- SAND BORROW SOURCE

PWGSC

CAM–D DEW LINE

GEOTECHNICAL INVESTIGATION OF BORROW SOURCES, CAM–D POTENTIAL LANDFILL AND LANDFARM AREAS AT MAIN SITE

Figure 7.9



X:\02A-CAD\RAW TRIMBLE DATA TRANSFER (DO NOT ERASE)\SIMPSON LAKE (68122)\68122 (SIMPSON LAKE).DWG

Date: FEBRUARY 28, 2006
SCALE:
0 25 50
1:1000

EarthTech
A Tyco International Ltd. Company

Legend (Note: ESG Samples were not analyzed for PHC or PAH)

- SOIL SAMPLE
- ESG SAMPLE
- PLANT SAMPLE
- BARREL
- CULVERT
- COMPRESSED GAS CYLINDER
- PCBs EXCEEDANCE
- METALs EXCEEDANCE
- PHCs EXCEEDANCE
- PAHs EXCEEDANCE
- MISCELLANEOUS DEBRIS
- BURRIED DEBRIS
- PCBs CONTAMINATION PLUME
- METALs CONTAMINATION PLUME
- PHCs CONTAMINATION PLUME
- PAHs CONTAMINATION PLUME
- WATERCOURSE
- CLAY BORROW SOURCE
- GRAVEL/COBBLE BORROW SOURCE
- SAND BORROW SOURCE

PWGSC
CAM–D DEW LINE
GEOTECHNICAL INVESTIGATION OF BORROW SOURCES, CAM–D
MURCHISON RIVER BORROW AREA
Figure 7.9a

APPENDIX B



TERMS OF REFERENCE

TERMS OF REFERENCE

PHASE III ENVIRONMENTAL SITE ASSESSMENT, HAZARDOUS AND NONHAZARDOUS MATERIALS AUDIT AND GEOTECHNICAL EVALUATION

FOR

FORMER CAM-D INTERMEDIATE DEW LINE SITE

SIMPSON LAKE, NUNAVUT

Prepared by: Northern Contaminated Site Remediation Group
Public Works and Government Services Canada
July 2005

1.0 INTRODUCTION

As the custodian of most federal lands in the north, Department of Indian Affairs and Northern Development (DIAND) has responsibility, 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 portfolio of contaminated sites in the north originates from private sector mining, oil and gas activities and government military activity dating back over half a century, many years before the environmental impacts of such activities were adequately understood. The former CAM-D Intermediate DEW Line Site at Simpson Lake, Nunavut is one of these sites.

DIAND has retained Public Works and Government Services Canada's Northern Contaminated Sites Group to conduct a Phase III Environmental Site Assessment (ESA), Hazardous and Nonhazardous Materials Audit and Geotechnical Evaluation of the former CAM-D Simpson Lake DEW Line site. The work plan consists of an evaluation of the existing site information available, identification of any information gaps and the implementation of a detailed assessment plan to fill in the information gaps. Based upon all information available and additional studies conducted in 2005 a Remedial Action Plan (RAP) will be developed for implementation at the site in 2007.

All project activities must be carried out in accordance with the *Abandoned Military Site Remediation Protocol* developed by Indian and Northern Affairs Canada (March 2005; attached as Appendix A)

PWGSC – Environmental Services is inviting proposals from consultants to complete the site investigations as identified in the Scope of Work outlined in Section 4.0 of this document.

2.0 PROJECT OBJECTIVES

The objectives of this project are to:

- To obtain traditional knowledge regarding past and present land use of the site from elders of the nearby communities.
- Identify, characterize, and quantify all hazardous and non-hazardous materials at the site and in nearby water bodies.
- Identify and delineate all contaminated overburden at the site.
- Identify borrow sources and potential locations for an engineered landfill(s) on-site.
- Evaluate the condition of site access roads and airstrip as well as possible CAT train routes to access site.
- Complete a detailed site survey, including the documentation of any fauna potentially using the site.
- Increase community and Inuit involvement in the program.
- Document all information in written reports and prepare a detailed work-plan and design for recommended site restoration and closure

3.0 BACKGROUND

The Department of National Defence (DND) constructed CAM-D as an intermediate DEW Line site in 1957. The station was taken out of service in 1963 and in 1965 responsibility for the site was assumed by DIAND. The CAM-D radar facilities consisted of a module train, warehouse, garage, Inuit house, POL tanks, Quonset huts, storage pads, a radar tower and a 750 m airstrip. The main station buildings were located in the Ross Hills at an elevation of 370 m. The terrain is composed of rolling grassy hills cut by rock outcrops.

Environmental assessment of the CAM-D DEW Line site was initiated in 1985 when DND and Environment Canada visited the site to remove contaminants such as PCBs and POLs and identify areas of buried materials that could pose environmental risks in the future. Various pieces of PCB-containing equipment were removed from electrical cabinets at the site. Soil samples collected from beneath the cabinets identified PCB contamination. No other results were reported.

At the time of a 1994 site assessment conducted by the Environmental Sciences Group of Royal Roads Military College, only the garage and the POL pump house were standing with all other buildings removed, demolished or collapsed. One POL tank had also been removed along with the concrete foundation and berm and the Doppler antenna was downed. Several electrical cabinets (most components removed) were identified near the garage area. Along the road to the airstrip there were several collapsed shacks. At the edge of the airstrip there remains a grader, truck, crane and some small shacks. The airstrip was reported to be in good condition in 1994.

Between 1993 and 1995 DND constructed an unmanned Short Range Radar (SRR) facility approximately 1 km east of the former CAM-D site. Facilities associated with the SSR facility include a technical services building with an emergency shelter, diesel tanks, helipad, communication domes, an old shack and the construction camp accommodation module. The gravel pad for the SRR was constructed using material from the old DEW Line site.

Five dump or debris areas were identified at the CAM-D site in 1994 as follows:

1. The Main Dump – this dump is located north of the station within a shallow depression in the bedrock. Debris within this dump consists of heavy equipment, domestic waste and approximately 2000 barrels.
2. The Barrel Dump – this dump is located north of the station and consists of two distinct piles of barrels. Approximately 245 barrels were identified in this area; six were left open and upright and contained some liquid.
3. The Vehicle Dump – this dump is located southeast of the station and includes various pieces of heavy equipment and vehicles as well as empty barrels (10), assorted metal debris, and a battery.
4. The Large Barrel Dump – this dump is located east of the station and consists of approximately 5100 empty barrels. All the barrels inspected in 1994 were either empty or contained a small volume of rusty water.
5. The Pallet Line Area – this dump is located northeast of the station and consists of approximately 1000 barrels and other miscellaneous waste. Fifteen of these barrels were

either full or partially full in 1994. Heavy soil staining associated with this dump was also identified in 1994.

During the 1994 investigations, several collapsed shacks were also noted along the road to the airstrip. At the edge of the airstrip a grader, truck, crane and some small shacks were present. The airstrip was reported to be in good condition.

The surface soil sampling program completed in 1994 identified soil contamination exceeding Tier I and/or Tier II DCC near the module train outfall, the garage, the main dump and at a debris area near Simpson Lake. These investigations did not include assessment of hydrocarbon contamination - a potential source of significant contamination at the site. No PCB containing paint was identified at the site but insulation samples collected from the garage and warehouse contained chrysotile asbestos.

4.0 SCOPE OF WORK

The scope of this project includes the following tasks and associated activities:

TASK 1: Review Previous Information and Data Gap Analysis (Ref. Code 4.1.1)

Prior to planning and executing the site visit, all previous studies must be reviewed in order to determine information gaps. These gaps should be addressed completely when developing schedules and sampling regimes in order to ensure that all required information will be collected during the short field season. The gap analysis will reveal additional work required, therefore this activity should be completed as early as possible.

Relevant reports will be provided to the successful Consultant as follows:

- *Environmental Study of Abandoned DEW Line Sites – One Auxiliary and Eight Intermediate Sites in the Canadian Arctic* - prepared by the Royal Roads Environmental Sciences Group - March 1995.
- *Human Health Screening Level Risk Assessment for CAM-D Simpson Lake Former Military Site* – prepared by SENES Consultants Limited – November 2003.
- *Engineering Design & Cost Estimate Report – prepared by Kitikmeot Corporation – August, 2001*

TASK 2: Fish, Fauna, Sediment and Surface Water Assessment (Ref. Code 4.1.2)

A sampling program will be conducted to confirm that the sediments and surface water in Simpson Lake have not been impacted by the activities at the site and subsequently impacted the resident fish populations. Sediment and surface water samples will be collected for PCB, PHC and metals analysis from the shore in the vicinity of the sediment contamination identified in 1994. Should local communities express a concern regarding the effect of contamination in the nearby lake on the fish, fish will be harvested and analysed for the same parameters. It will also be necessary to obtain background samples from areas of the lake that are perceived as not being affected by previous site activities. The results of all analyses will be shared with the risk assessors to allow for completion of

the site-specific risk assessment.

For the purpose of proposal evaluation, it should be assumed that five (5) sediment samples, five (5) fish tissue samples and two (2) surface water samples will be submitted to the laboratory for PCB, PHC and metals analysis.

A Human Health and Ecological Risk Assessment (HHERA) will be conducted under separate contract for the CAM-D site. It will be necessary for the ESA consultant to obtain all information necessary for the HHERA, focusing on fauna that visit the site and an analysis of the vegetation that these species feed on. The information gathered should consider the risk posed to the fauna by the site, as well as the risk posed by and the potential for wildlife encounters, especially larger animals such as caribou and bears. The Consultant shall be responsible for providing bear encounter education and personal protection to all employees, contractors, and others at the site. Armed wildlife monitors will be provided by INAC, however, the Consultant may provide additional monitors if desired.

TASK 3: Delineation of Contaminated Soil (Ref. Code 4.1.2)

Areas of soil contaminated with heavy metals and PCBs were identified at the CAM-D site during the 1994 ESG site assessment. However, further soil sampling is required to delineate and quantify the volume of metals and PCB contaminated soil on-site. The Consultant must delineate all impacted areas both horizontally and vertically in accordance with the INAC Abandoned Military Site Remediation Protocol. Estimated volumes of impacted soil in exceedance of the applicable criteria must be determined.

As the 1994 assessment did not include analysis of PHCs, the 2005 assessment activities will also investigate areas which may have been contaminated by PHCs. With the exception of very small (less than 2 m^2) surface stains, areas where PHCs are suspected are to be delineated (both horizontally and vertically) to the extent possible using a suitable screening methodology followed by an adequate number of samples to be submitted to a CAEAL accredited laboratory for analysis. The Canadian Council of Ministers of the Environment (CCME) Canada Wide Standards (CWS) for PHCs will be used as the applicable criteria. Estimated volumes of impacted soil in exceedance of the applicable criteria must be determined.

The consultant will maintain a photographic record of all contaminated soil areas and sample locations.

For the purposes of evaluating proposals, it should be assumed that fifty (50) test pits will be advanced; thirty (30) soil samples will be submitted to the laboratory for analysis of PCBs; fifty (50) for target heavy metals; and thirty (30) for PHCs (BTEX & hydrocarbon fractions F1 to F4 in accordance with CCME CWS for PHCs). The results of the laboratory soil analyses will be shared with the risk assessors to allow for completion of the site-specific risk assessment (to be completed outside of this TOR). Suitable field screening techniques that will allow fewer samples to be transported to the laboratory will be considered and evaluated.

Remedial options applicable to the volumes of soil impacted by PCBs, metals or hydrocarbons and

relevant in remote northern sites, including estimated costs must be prepared.

TASK 4: Inventory of Hazardous and Non-Hazardous Materials (Ref. Codes 4.2.1 and 4.2.2)

Non-hazardous materials at the site are predominantly associated with building materials and debris including wood, metal and concrete waste, etc. Estimated volumes of non-hazardous building and scrap materials will be fundamental in the design of landfills on-site and must be exhaustive for all types of material found.

Hazardous materials on-site may include (but are not limited to) batteries, residual petroleum hydrocarbons in barrels (further detailed in Task 6), paint containing lead/PCBs, PCB containing equipment, pressurized gas and asbestos containing materials. In order to determine appropriate handling and disposal options, all hazardous and potentially hazardous materials on-site must be identified and characterized. The volume estimates of different types of hazardous building materials must be calculated and disposal options for hazardous waste off-site or in an on-site hazardous materials landfill must be determined.

The consultant shall inventory all hazardous and non-hazardous materials and debris in order to calculate volumes and weights of materials. All waste types must be identified. The consultant will use this information to prepare a detailed waste summary. For each type of material, the summary must include: percentage of total, volume and weight of waste, method used to estimate the volume and weights and any relevant comments.

Costs associated with each disposal option for these materials should be developed as part of the assessment and presented with remedial options to address all types of hazardous and non-hazardous materials identified. Options will be evaluated to support the recommended option proposed.

For the purpose of proposal evaluation, Consultants should assume that fifteen (15) samples will be submitted for laboratory analysis of asbestos, twenty (20) for PCBs in paint and twenty (20) for lead in paint.

TASK 5: Assessment of Existing Dumps, Barrels, Scattered and Partially Buried Debris (Ref. Code 4.2.3)

Five dumps or debris areas were identified at the CAM-D site in 1994. The dumps were identified as: the Main Dump, Barrel Dump, Vehicle Dump, Large Barrel Dump and Pallet Line Area (as defined in Section 3.0 of this document).

Assessment activities associated with the former dump site and potentially buried debris must include:

- Delineation of the dump boundaries using GPR or EM survey;
- Test pitting at the dump and disturbed areas to confirm or disconfirm the presence of buried debris;
- Identification and quantification, if necessary, of hazardous materials in the dump (including

contaminated soil);
- Determining if the dump is releasing deleterious substances into the surrounding environment; and
- Quantification of all debris discovered on site.

There are approximately 8500 barrels at various locations around the site. Preliminary inspection by ESG identified that most were either empty or contained a small volume of rusty water. A full assessment will be conducted to determine the type of material within full or partially full barrels. A portion of the barrels that contain unknown liquids will be sampled and the sample submitted to an accredited laboratory that can identify the liquid material type. Based upon the findings of the barrel sampling program, estimates of the volume of liquid which can be incinerated on-site, shipped south for disposal, or disposed of on-site will be produced.

For the purpose of proposal evaluation, it should be assumed that wastes from twenty (20) barrels will require characterization through laboratory analysis.

TASK 6: Assessment of Borrow Sources and Landfill Locations (Ref. Codes 4.3.1 and 4.3.2)

It is anticipated that the comprehensive remediation activities to be planned for this site may generate a substantial volume of hazardous and non-hazardous waste. The construction of an engineered landfill(s) at the site for the disposal of the waste is an option that may be implemented. Therefore, investigations are required to confirm if this is a viable option. There is also the potential that the current dump area may be useable.

This activity includes the identification of at least three (3) feasible landfill sites and a determination of the volume of material that could be placed in each.

Potential landfill locations will be based on the area available (using previously disturbed areas to the extent possible), acceptable soil and foundation conditions, limited surface runoff through the area, relatively level topography, no impediment to natural drainage in the area and existing an appropriate distance from natural water bodies or water courses. The anticipated volume and type of debris or impacted soil to be deposited in each facility will also influence locations. An evaluation should be conducted to determine suitable locations for one (1) hazardous materials landfill, one (1) non-hazardous materials landfill and one (1) impacted soil treatment facility at the site.

Borrow material will also be necessary to cap landfills (and potentially repair existing access roads, if required). This task will include the identification and characterization of potential sources of granular borrow materials, the types of material available and an estimate of the quantity of each type available from each location.

Options detailing the development of the gravel sources (borrow pits and/or the development of bedrock outcrops) should include remedial measures to mitigate the environmental effect of the gravel and/or rock removal at the site. Activities recommended for the development of gravel sources during the implementation of the site remediation plan should not adversely affect the environmental condition of the site. The removal of material from the borrow sources, upon

completion of the project, should not result in thermal degradation of the permafrost in the area, significantly alter the site drainage, or drastically change the topography of the area.

At least two (2) testpits will be excavated at each proposed new landfill location and in potential granular borrow areas to establish soil structure, subsurface water and depth to bedrock. Soil samples must be collected during testpitting for laboratory index testing and determination of water content, particle size distributions and moisture density relationship.

For the purposes of evaluating proposals, it should be assumed that ten (10) test pits will be advanced to assess the suitability of the subsurface soil conditions for landfill development, and that ten (10) test pits will be advanced to quantify the volume of borrow material available for use at the site.

TASK 7: Airstrip, Roadway and Site Access Evaluation (Ref. Code 4.3.3)

The previous assessment indicated that roads around the site were subject to varying degrees of degradation. Therefore, the access roads will be assessed to determine what upgrade activities, if any, are required to support future remediation activities at the site. It must be determined if all debris at Simpson Lake will be accessible by heavy machinery during the future clean up efforts. The Consultant will be required to identify improvements necessary to ensure all debris is accessible by the equipment. All roads will also require an assessment of potential remediation options at the completion of site activities (i.e. the removal of roads where required, particularly to facilitate suitable site drainage).

For the purposes of evaluating proposals, it should be assumed that six (6) test pits will be advanced to evaluate the road conditions.

The previous assessment identified that the airstrip was in good condition, however it will be assessed during the 2005 field activities to determine if the condition has changed in the decade since the last inspection. The operation of this runway will be essential to mobilize materials and equipment required for site activities. An inspection of the airstrip must be completed in order to determine its load capacity to support the possibility that future contractors require large aircraft to mobilize remediation equipment and supplies. Future anticipated maintenance requirements and schedules should also be presented.

Test pits should be excavated along the length of the airstrip to assess its surfacing structure, and laboratory testing should be conducted to evaluate the soil types and grain size composition. Drainage or erosion channels and the presence of surface or subsurface occurrences of water and the depth at which it was encountered are also to be indicated. As well, determine the load capacity of the airstrip, taking subgrade material into consideration, which will require soaked and unsoaked California Bearing Ratio (CBR) testing by a certified laboratory. For comparison purposes, indicate loaded and unloaded aircraft load rating (ALR) of aircraft such as DC-3, DC-4, Hercules C130, Otter, Twin Otter DHC6 and the Shorts Skyvan.

For the purposes of evaluating proposals, it should be assumed that three (3) testpits will be advanced for the runway assessment.

As heavy equipment will be required for the site restoration, potential CAT Train and/or other routes should be investigated.

Based on the results of the airstrip, CAT Train, and roadway assessment, remedial options should be developed to effect repairs and/or improvements to the runway for air traffic and to roadways to allow for the movement of heavy equipment at the site to support the future remedial activities.

TASK 8: Detailed Site Survey (Ref. Code 4.3.4)

A full survey of the site will be completed using total station or GPS equipment capable of achieving an accuracy of at least 3 centimeters. Topographical information will also be collected as part of the site survey. The survey should focus on the entire site activity but should also include enough data points to create a base plan connecting all of the developed areas. All geotechnical, geophysical, and assessment sampling locations will be surveyed and tied into the existing site infrastructure using a UTM coordinate system (i.e. including all structures and key existing features, proposed borrow sources, current dump areas, proposed landfill areas, testpit locations, sampling locations, impacted areas, etc.)

Survey information will be input into AutoCAD Land Development Desktop (release 2i) software to generate a base map of the site. The base plan generated from this survey will be included in all reports completed for the 2005 site activities.

TASK 9: Photographic Record

The Consultant will maintain a photographic record of areas investigated under Tasks 2 to 9 above. All photographs must be described in detail and dated.

TASK 10: Reporting

Based upon the findings of the 2005 field investigation, the Consultant will prepare a report containing the results of all investigations completed at the site, including:

- Phase III Environmental Site Assessment and Delineation
- Hazardous and Nonhazardous Materials Audits
- Geotechnical/Geophysical Assessments

The report will be prepared in a standard format utilizing the following sections (as applicable):

Executive Summary
Table of Contents
Introduction
Background
Findings and Discussion
  - Phase III Environmental Site Assessment
  - Hazardous and Non-hazardous Materials Audit
  - Geotechnical Evaluation

Conclusions
Recommendations
Drawings
Appendices including photos, detailed NCS scoring worksheets

The draft assessment report must be submitted to the PWGSC Project Manager by October 15, 2005. The final assessment report are due two (2) weeks after receiving Client comments.

Based on the results and report generated from the 2005 assessment activities a comprehensive site remediation work plan will be developed for the site. For each waste stream identified at the site, remediation options should be developed. Each remediation option should be critically evaluated with its respective potential risks, advantages, and disadvantages discussed. For example, if petroleum hydrocarbon soil is identified the various remedial options which may be explored could include on-site treatment, disposal in an on-site landfill, off-site disposal, or cover in-place. Once the various waste stream remediation options have been detailed, recommendations should be made as to the preferred remediation approach. It is anticipated that the efforts of this field season will result in collection of all the necessary information required to finalize the draft remediation plan by December 15, 2005. A proposed schedule for implementation of the remedial activities should be prepared.

The draft remediation report will be the basis for community meetings in the winter. At the community meetings, the various remedial options will be presented and discussed. The objective of the community meetings will be to arrive at a consensus as to the remedial option selected for each waste stream. The Consultant will attend the community meetings with PWGSC and INAC in Taloyoak (Spence Bay) and Kugaaruk to record notes from the meetings to be summarized and incorporated into the final remediation report. For the purposes of this proposal, the time commitment for community meetings can be estimated at 40 hours over four days. The final report will detail the input from the community meeting and specify the final recommended remedial option for each waste stream. The final Remediation Plan document is due March 15, 2006

Deliverables

1. Draft Assessment Report: Five (5) hard copies & one (1) electronic copy in Adobe Acrobat

2. Final Assessment Report: Ten (10) hard copies & ten (10) electronic copies in Adobe Acrobat

3. Draft Site Restoration Work Plan Report: Ten (10) hard copies & one (1) electronic copy in Adobe Acrobat

4. Final Site Restoration Work Plan Report: Ten (10) hard copies & ten (10) electronic copies in Adobe Acrobat

5. Electronic copies of Final Site Survey and all report figures in AutoCAD format

5.0 PROJECT MANAGEMENT & COMMUNICATION REQUIREMENTS

1. The Project Manager for this project will be:

Brad Thompson, P.Eng.
Senior Environmental Engineer
Public Works and Government Services Canada
Telus Tower North
5th Floor, 10025 Jasper Avenue
Edmonton, Alberta T5J 1S6
Ph: (780) 497-3862
Cell: (780) 918-6277
Fax: (780) 497-3842
email: brad.thompson@pwgsc.gc.ca

2. The Consultant shall maintain contact with the Project Manager throughout the contract.
3. Draft and Final reports shall be submitted to the Project Manager.

6.0 SITE LOGISTICS

The Consultant will be responsible for their own transportation to Yellowknife using regular commercial aircraft. The Consultant should include this cost in their proposal. PWGSC will provide charter aircraft from Yellowknife to and from the site. The charter flights will be scheduled by the PWGSC Project Manager.

The Consultant will provide in their proposal the number of staff proposed for the field work and the estimated weight of equipment and supplies the Consultant will require.

Due to the remoteness of the project location, the Consultant will remain on-site for the duration of the project field activities (an estimated 10 days). Camp services including food, accommodation, transportation, water and wastewater infrastructure, power and emergency telecommunications (satellite phones) will be provided. Excavation equipment will be provided and operated by a general contractor under the direction of the Consultant. However, there may be locations not accessible by the equipment so shovels and/or augers should be provided by the Consultant.

Wildlife monitors will also be provided by a general contractor. If the Consultant plans to have more than one work crew, it should be identified in the proposal so adequate wildlife monitors can be provided for each crew by the general contractor.

PWGSC will provide copies of relevant permits to the Consultant outlining all requirements that must be complied with.

Equipment to be provided by the Consultant includes: all sampling equipment necessary to complete the scope of work as outlined in Section 4.0 (i.e. hand auger, shovel, barrel thiefs and barrel wrenches, sediment sampler, etc.); sampling containers; personal protective equipment (Tyvek suits, respirators equipped with organic gas cartridges, nitrile gloves, etc.); and personal equipment.

7.0 SCHEDULING

The following scheduled milestones must be met in order to coincide with camp operations and aircraft charter dates and to fulfill PWGSC commitments to INAC:

Field Investigation	August 22, 2005 (to be confirmed upon project award)
Completion of Field Investigation	Fourth week in August, 2005
Completion of Draft Assessment Reports	October 15, 2005
Completion of Final Assessment Reports	two weeks after receipt of client comments
Completion of Draft RAP	December 15th, 2006
Completion of Final RAP	March 15, 2006

The consultant must include their intended schedule in the proposal.

8.0 CONSULTANT STAFF AND COST

1. The Consultant shall clearly establish the project team and organizational structure and shall submit the names and responsibilities of each of the members of their staff that will be involved in the project. The Consultant should designate one individual who will be responsible for overseeing the project and who will liaise with the Project Manager throughout the project. The Consultant will not be permitted to make changes in personnel once the team has been agreed to, without the Project Manager's consultation and concurrence one week prior to site activity.

2. Provide qualifications for the staff assigned to this project. Clearly indicate their expertise for the activities they will be working on, i.e. geotechnical assessment, contamination delineation, hazardous materials assessment, etc. and their demonstrated fitness to work at a remote northern site with limited facilities.

3. Given the location of the work, the involvement of aboriginal people in the work to be undertaken should be considered. Clearly identify the number of aboriginal people to be retained to aid in the completion of this work.

4. If additional work is necessary due to a change in requirements, the Consultant will notify the Project Manager in writing immediately. No work shall be undertaken which is additional or supplemental to or in substitution of the work specified unless approved in writing by the Project Manager.

5. The Consultant should include all logistical requirements including transportation to and from Yellowknife, accommodations en route, travel expenses for field staff and other associated costs in their submission. Accommodations on-site will be provided by PWGSC/INAC.

9.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

A proper QA/QC program must be established by the Consultant to ensure that data obtained is accurate and representative of actual conditions. This should involve, among other steps:

-use of trip, field and equipment blanks
-use of duplicate and spiked samples
-proper sample containment, preservation, handling and transportation
-the use of a CAEAL accredited laboratory for sample analysis
-the use of detection limits appropriate for the required evaluation criteria/guidelines outlined
-due regard for necessary health and safety precautions

The consultant should identify in their proposal the number of QA/QC samples included in their sampling program what the estimated cost.

10.0 HEALTH AND SAFETY REQUIREMENTS

The Consultant must establish a Health and Safety program for their staff on the project. This program will outline health and safety requirements specific to the work they will be completing on-site. The Consultant Health and Safety program will be submitted to the General Contractor for inclusion into their overall Health and Safety Program which will identify potential hazard incidents, the Codes/Statutes to be met, rules of behaviour, protective equipment and clothing to be provided, security features to be established, responsible individuals, and all related matters.

The Consultant shall be responsible for making all employees, contractors, and others at the site aware of the site's contamination. Wildlife monitors will be provided, and will not be the responsibility of the Consultant, unless they choose to provide additional personnel, but the Consultant will provide bear encounter education and personal protection to all employees required to visit the site.

11.0 SPECIAL REQUIREMENTS

1. The Consultant will use the metric system of measurement for calculations, drawings, specifications, etc.

2. The information, data, material, etc. gathered as part of this study shall be treated as confidential and shall only be discussed with the Project Manager unless otherwise directed by the Project Manager.

3. All of the drawing information produced by the Consultant shall be compatible with and capable of input to the CAD system in use at the PWGSC offices. Final reports for each project activity shall be provided in paper and electronic format.

4. No acceptance or approval by the Project Manager, expressed or implied, will be deemed to relieve the Consultant of their professional or technical responsibility for the calculations, drawings, analytical results, or other material prepared or assembled by the Consultant, or for things required under this Agreement.

6. The Consultant will refer queries on the project from the public, news media, etc. to the Project Manager.

12.0 TERMS OF PAYMENT

Invoices will be submitted to the Project Manager on a monthly basis. The final invoice should be submitted within 2 weeks of the acceptance of the final report.

13.0 PROPOSAL RESPONSE REQUIREMENTS

Proposals should be returned to the PWGSC by 14:00 MST on August 8th, 2005.

Any deficiencies noted in the Terms of Reference or items that require clarification should be resolved with the PWGSC Project Manager prior to the submission of the proposal.

The proposal shall provide sufficient detail to adequately address the requirements of these Terms of Reference. Ensure the following aspects are included:

(A) Project Team

The proposal must include a brief resume of each of the key persons to be involved in the project, including a description of their experience. The division of work between the various members of the Consultant's team shall be indicated, and the Project Manager shall be notified prior to any change in staff, or staff work assignments.

(B) Methodology

The Consultant shall provide an outline of the proposed steps and methods to be used in meeting the requirements of the Scope of Work. This should include a detailed work plan with milestones.

(C) Schedule

The Consultant shall provide a detailed schedule outlining the timeframes in which the project activities will be undertaken and the submission of deliverables.

(D) Level of Effort

Estimated hours, units, etc including laboratory and mobilization/demobilization costs are to be clearly indicated for each activity associated with the project.

(E) Cost

The estimated cost for the project submitted in the Consultant's proposal shall include all necessary expenditures to undertake all of the required work outlined in these Terms of Reference and in the Consultant's Proposal.

The Consultant shall provide a detailed cost breakdown for the project. The cost table should clearly identify fees and disbursements and be divided and subtotalled for the various tasks and activities outlined in this document, based on the estimated level of effort required.

The table below should be used as a guideline for the submission of costs.

BASIS OF PRICING

Task	Consultant Fees	Consultant Disbursements	Laboratory Costs	Other Contracts	
				Details	Costs
4.1 Environmental Site Assessment and Delineation					
4.1.1 - Gap Analysis					
4.1.2 - Fish, Sediment and Surface Water Assessment					
4.1.3 – Delineation of Contaminated Soil					
4.2 Waste Assessments					
4.2.1 – Hazardous Material Inventory					
4.2.2 – Non-hazardous Building Material Inventory					
4.2.3 – Assessment of Existing Dumps, Barrels, Scattered and Partially Buried Debris					
4.3 Geotechnical/Geophysical Assessment					
4.3.1 – Borrow Material Survey					
4.3.2 – Future Landfill and Landfarm location analysis					
4.3.3 – Airstrip, Roadway and Site Access Evaluation					
4.3.4 – Detailed Site Survey					

Note: - All costs for project management, overhead, photographic records, reporting, etc. should be built into each of the tasks listed above.
- If the consultant recommends additional studies that have not been included in the basis of pricing they should be listed as optional work activities in the proposal for consideration.

14.0 PROPOSAL EVALUATION

Consultant proposals will be evaluated using the following criteria:

Criteria	Points Awarded
Northern Experience on Similar Projects	15
Project Team Experience on Similar Projects	15
Technical Approach to Project	30
Cost	40

Consultant will be selected based on the assessed “best value” to the Crown, as determined by the total score (managerial and technical merit + cost).

APPENDIX C

PHOTOS

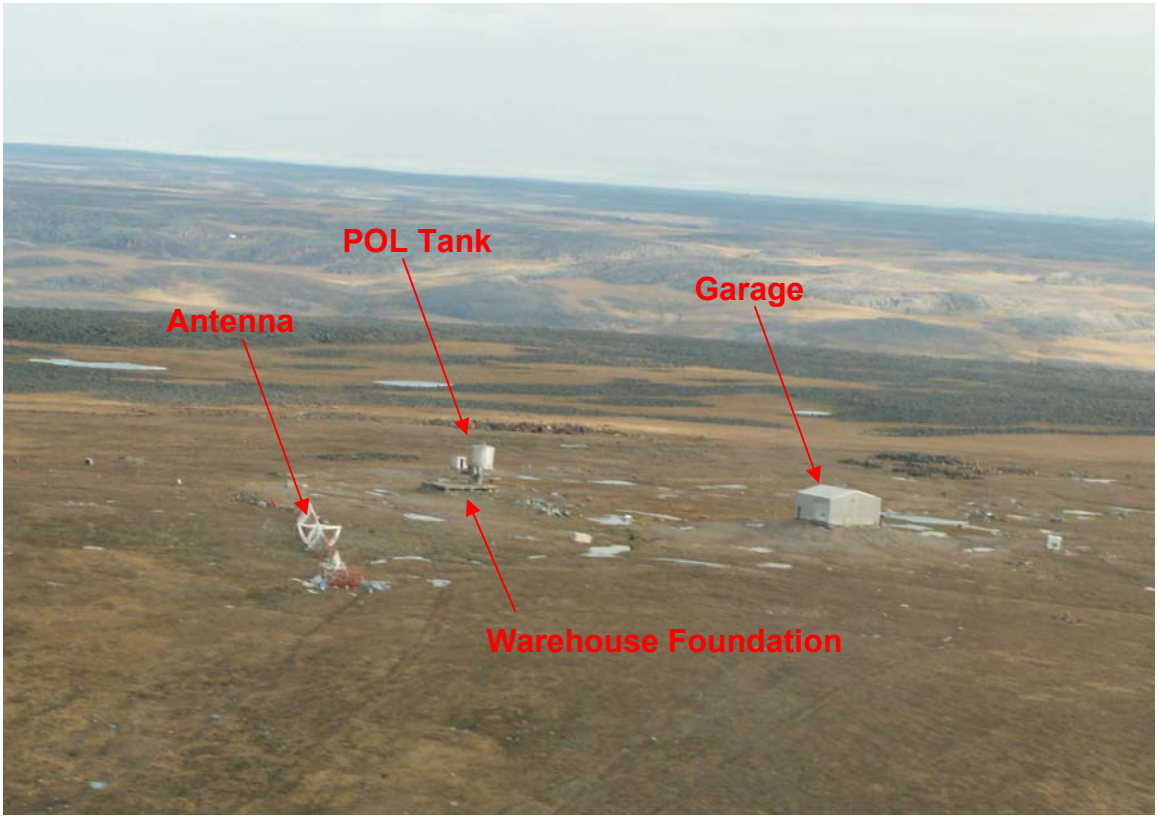


Photo 1: CAM-D Main Station Area (Looking Northeast)



Photo 2: CAM-D Main Station Area (Looking Southwest)

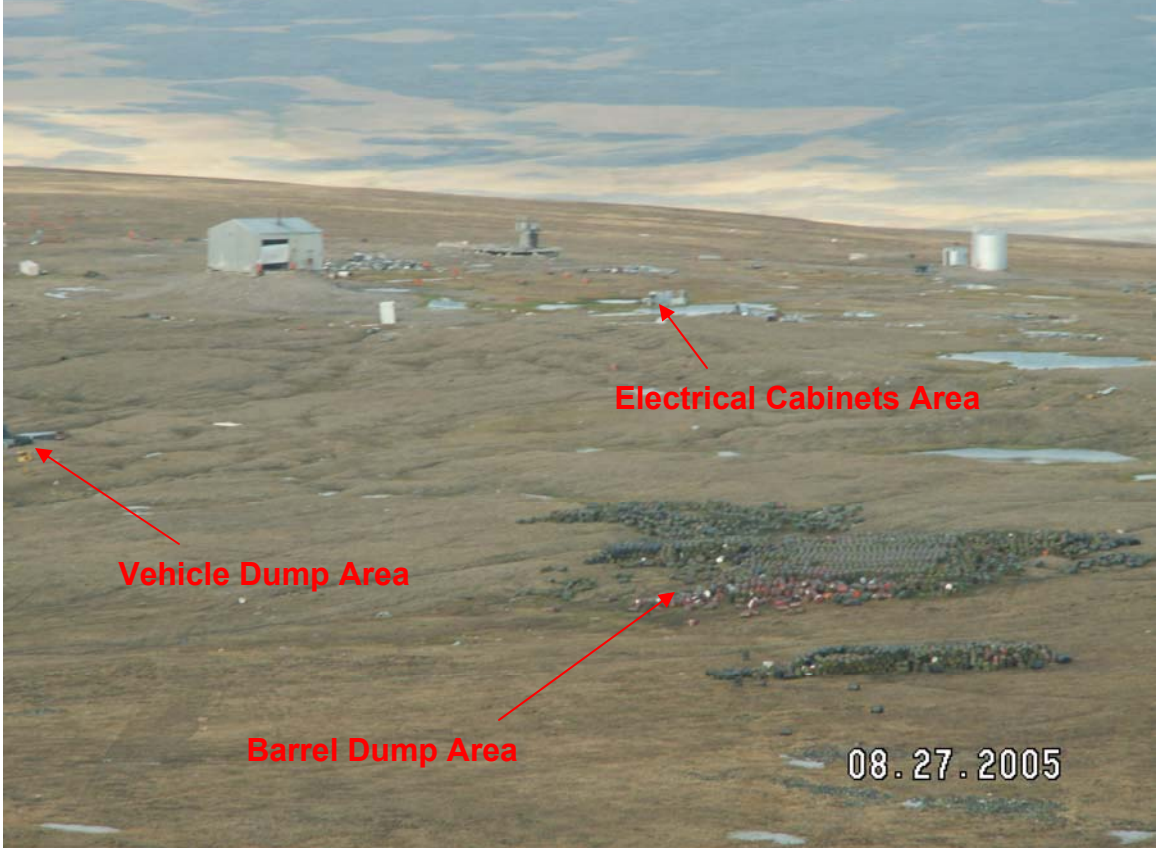


Photo 3: CAM-D Main Station Area (Looking Northwest)



Photo 4: Warehouse Foundation and Survey Control Point Location



Photo 5: Warehouse Foundation and Survey Control Point Location



Photo 6: Garage Looking Southeast



Photo 7: Garage Samples ET118 to ET120



Photo 8: Garage Samples ET121 and ET122, and ESG 1



Photo 9: Garage Samples ET123 to ET124



Photo 10: Electrical Cabinet Area Looking Northwest



Photo 11: Burn Pit Area Looking South



Photo 12: Burn Pit Sample ET134

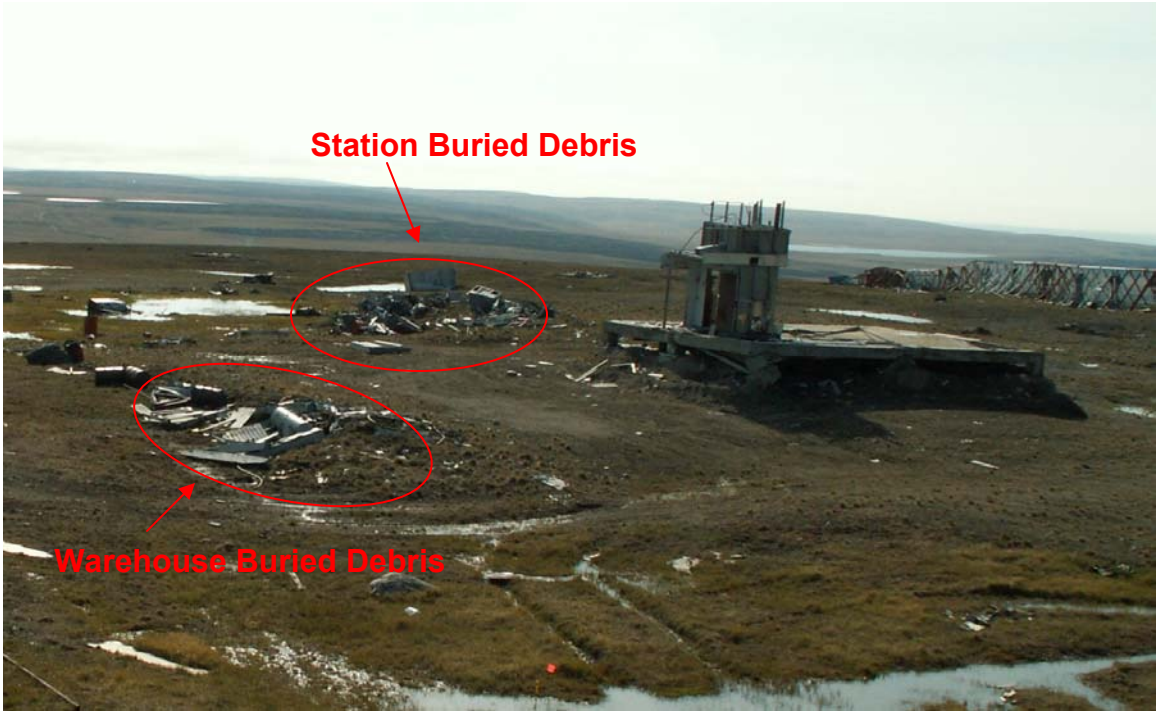


Photo 13: Warehouse Foundation, Buried Station Debris, Buried Warehouse Debris



Photo 14: Buried Station Debris, Sample ET155



Photo 15: Buried Warehouse Debris Looking South



Photo 16: POL Area Looking Northwest

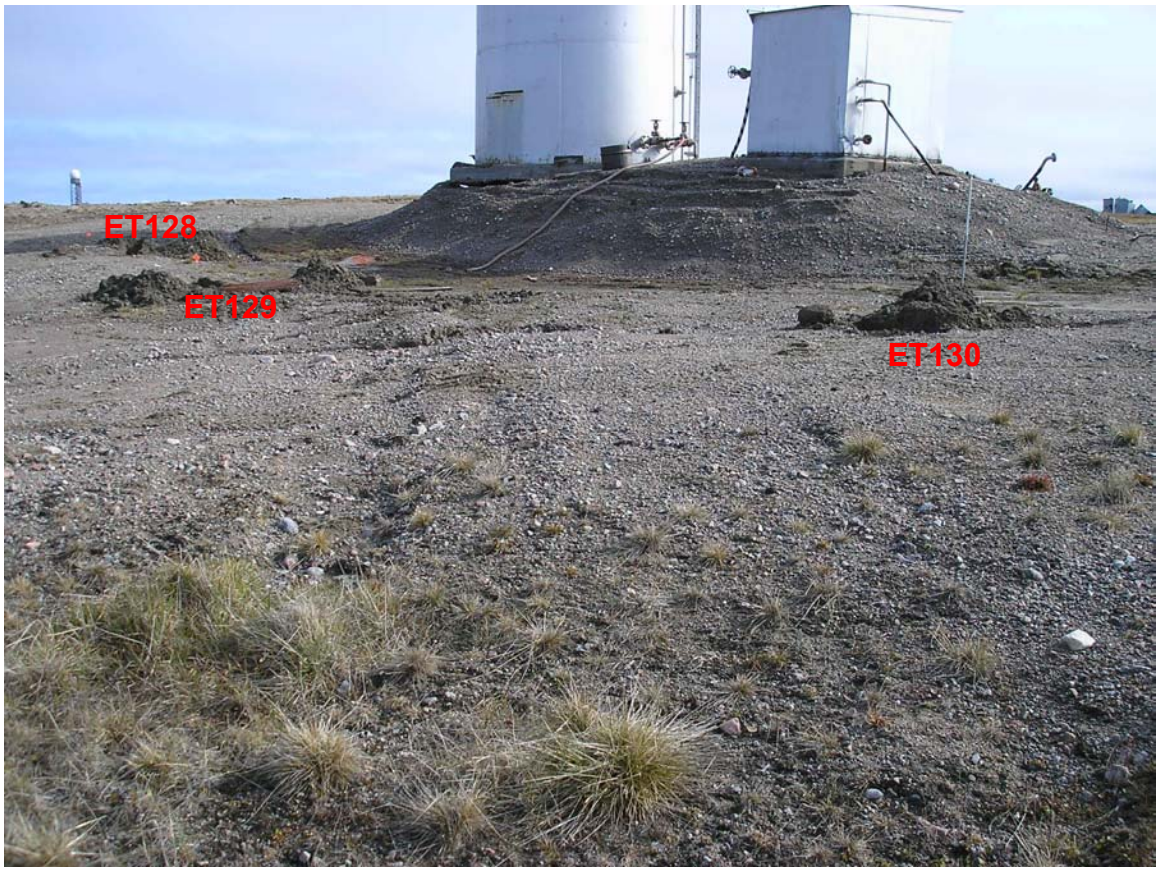


Photo 17: North Side of POL Area Looking East



Photo 18: South Side of POL Area Looking North



Photo 19: POL Area, Potential Hydrocarbon Sheen

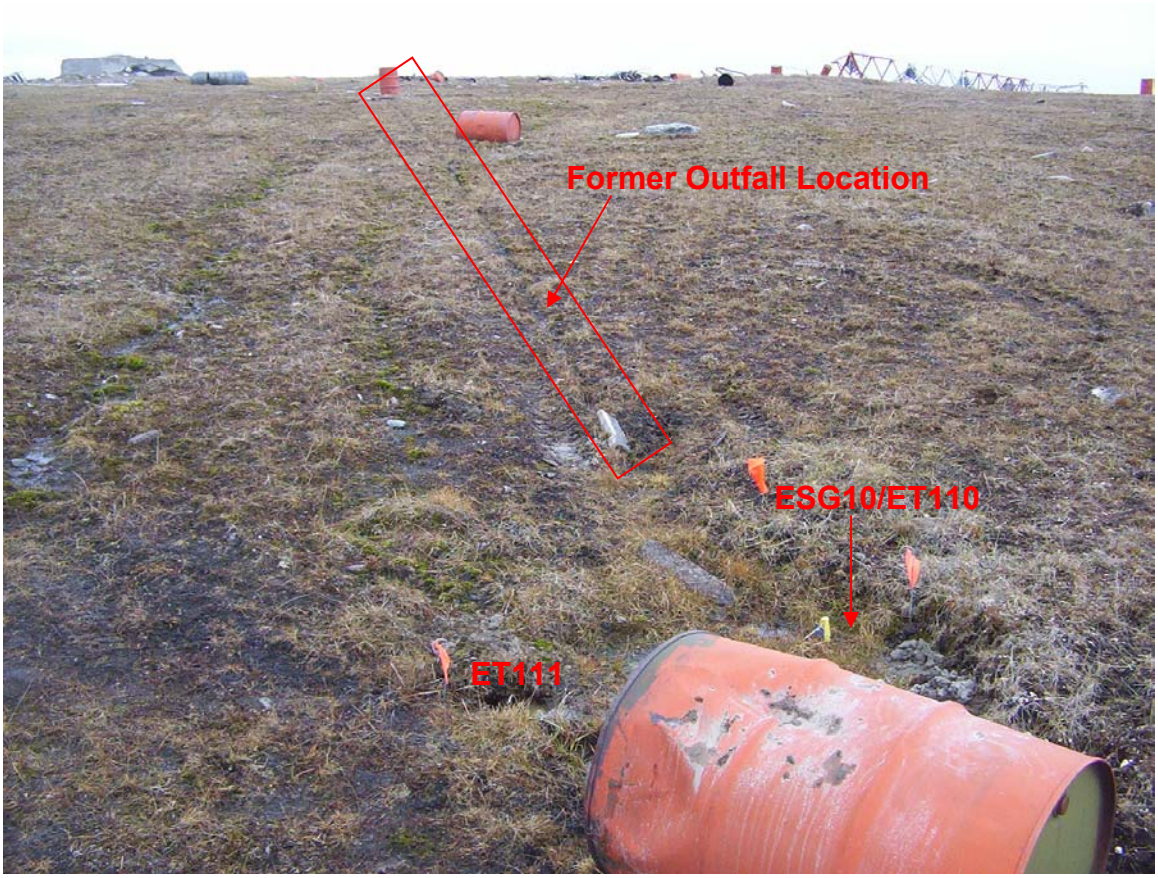


Photo 20: Outfall Area Looking Southeast

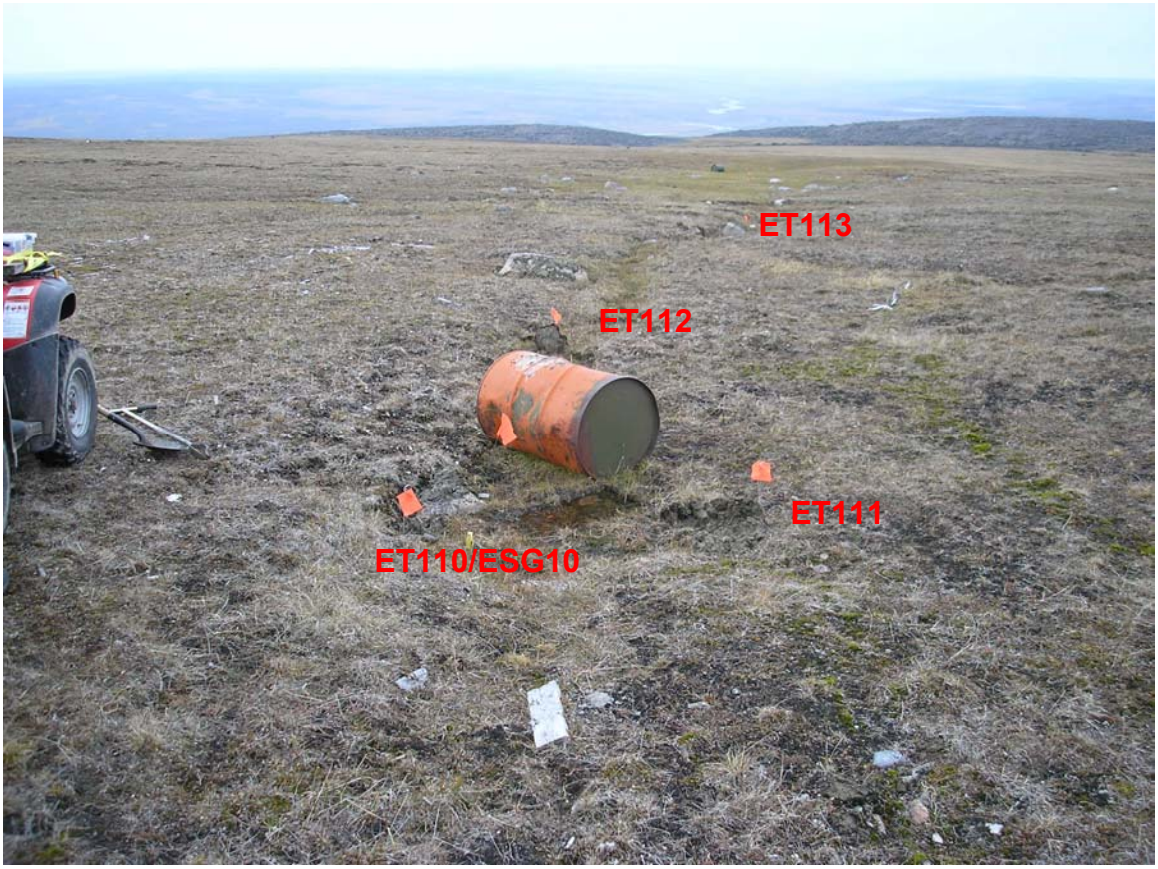


Photo 21: Outfall Area Looking Northwest



Photo 22: Pallet Line Area Looking North



Photo 23: Pallet Line Area Staining



Photo 24: Portable Fuel Tanks Looking West



Photo 25: Main Dump Looking Southwest



Photo 26: Vehicle Dump Looking Northwest

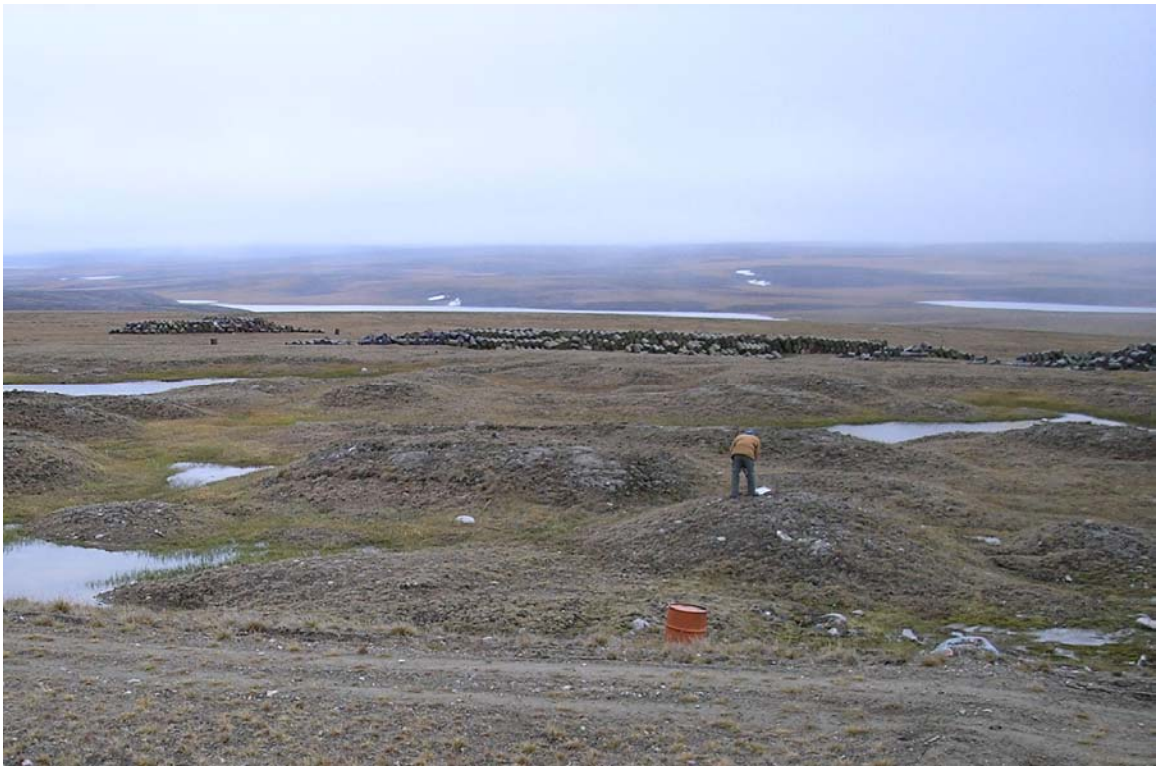


Photo 27: Main Barrel Dump Looking Southeast



Photo 28: Airstrip Vehicle and Debris Area



Photo 29: Airstrip Vehicle and Debris Area Staining



Photo 30: Airstrip Area, Tracked Crane



Photo 31: Plumbers Dump Sample ET162



Photo 32: Simpson Lake Area



Photo 33: Vermiculite in Soil



Photo 34: Floor Tile (Does Not Contain Asbestos)



Photo 35: Floor Tile (Contains Asbestos)



Photo 36: Garage Interior Paint



Photo 37: Fine Grained Soils at STN Et 114 at Former Module Train



Photo 38: Brown Clayey Silt and Grey Clay at ECA ET 138 Near Electrical Cabinets



Photo 39: Drumlin of Boulder Clay Enroute to Murchison River



Photo 40: Silty Clay of Drumlin

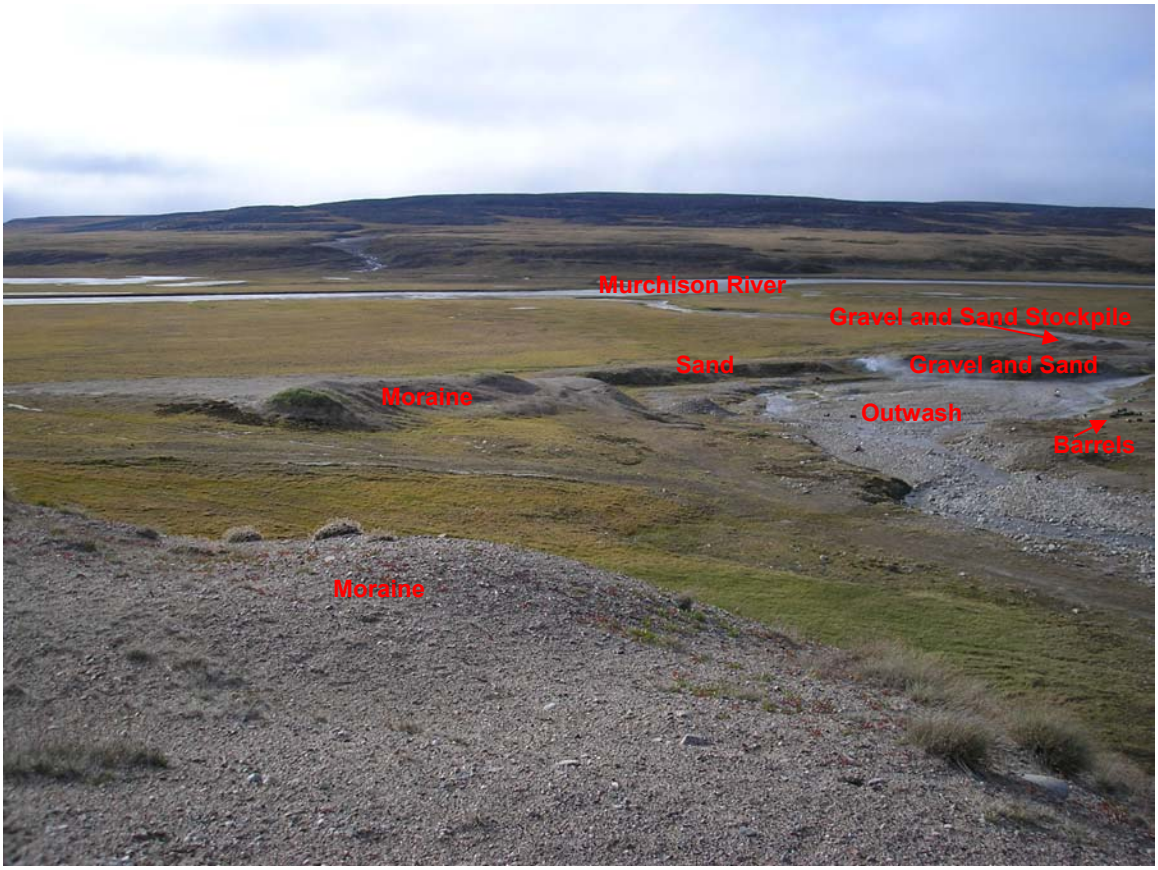


Photo 41: Burrow Area, Murchison River, Looking West



Photo 42: Burrow Area, Murchison River, Looking East



Photo 43: Gravel Stockpile and Stripped Area East of Murchison River



Photo 44: Moderately Sorted Sand and Gravel in Stockpile



Photo 45: Testpit “C” In Sand East of Murchison River

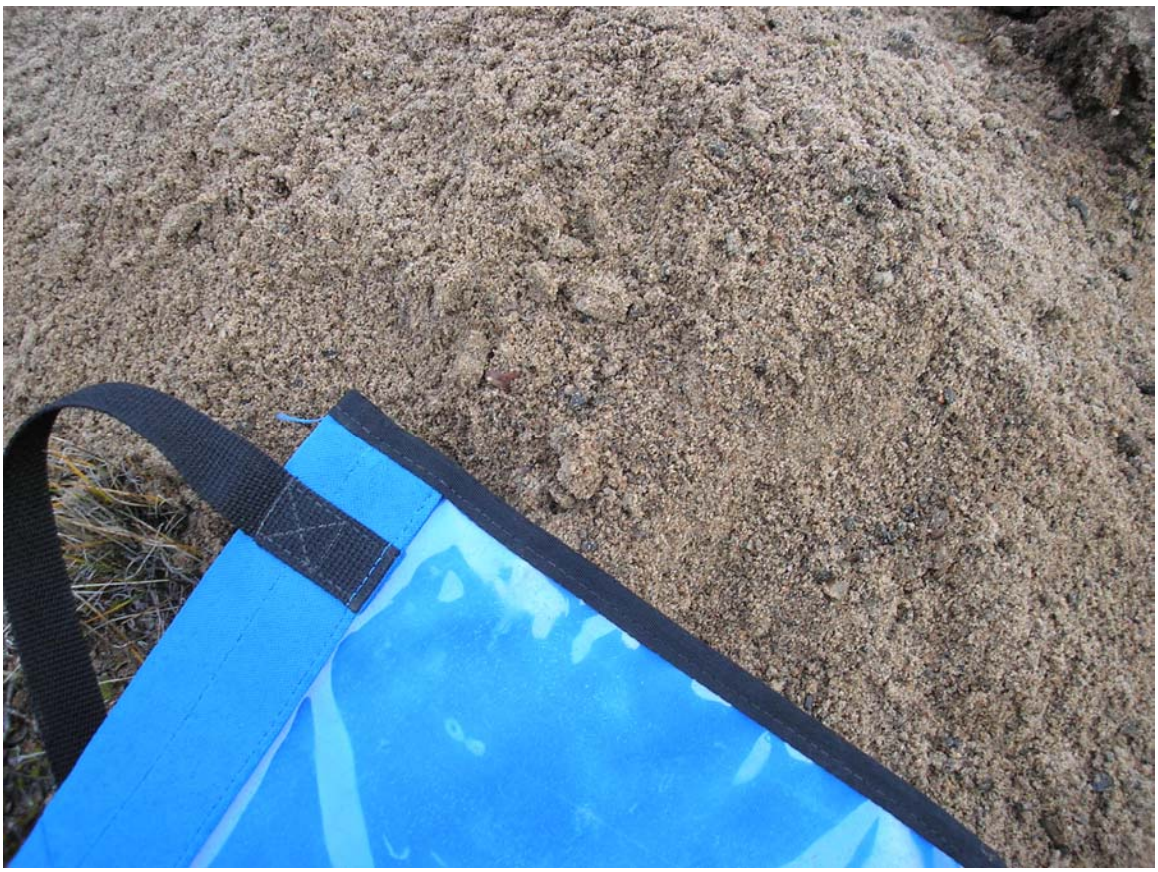


Photo 46: Well Sorted Sand Encountered in Testpit “C” East of Murchison River

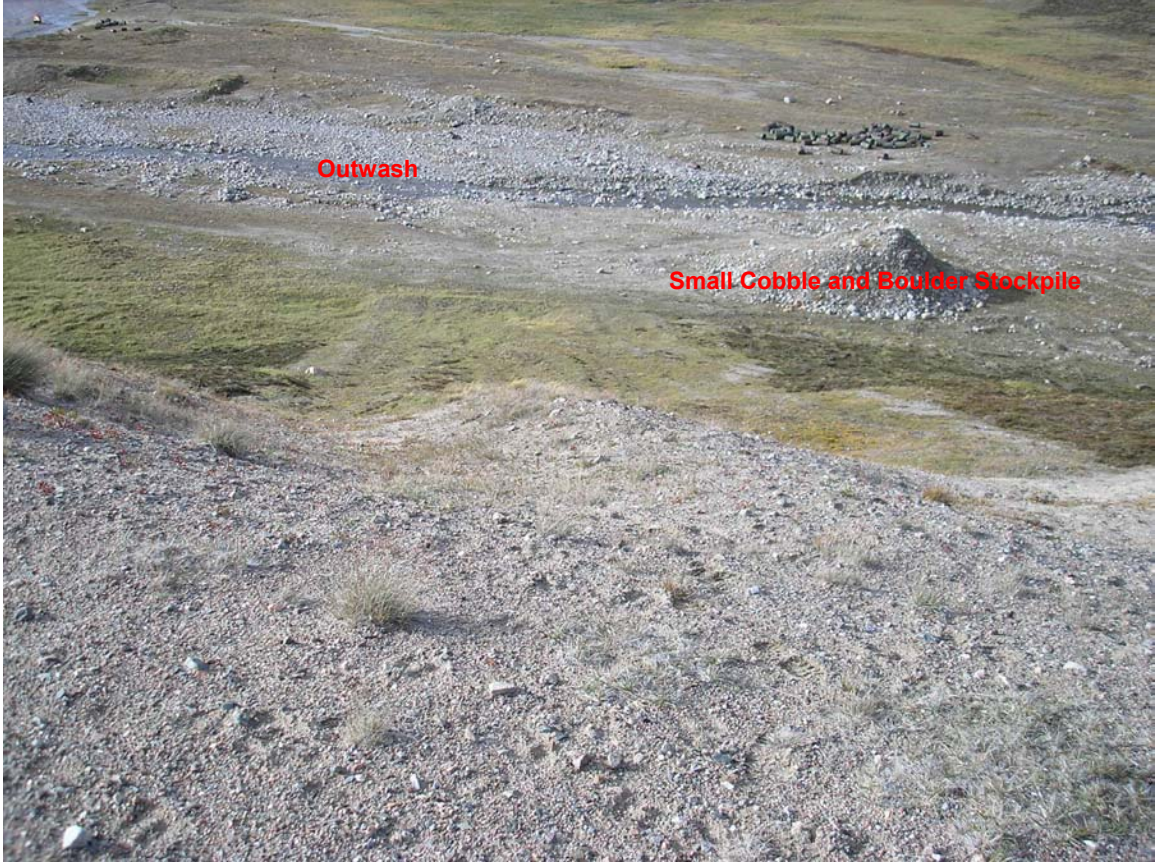


Photo 47: Facing Northwest and Downward From Large Moraine Deposit. Note Scaring at base and small cobble and boulder stockpile.



Photo 48: Facing Southwest Along Summit of Moraine Deposit East East of Murchison River



Photo 49: Facing West at Esker Enroute to Simpson Lake



Photo 50: Facing Northeast Along Summit of Esker

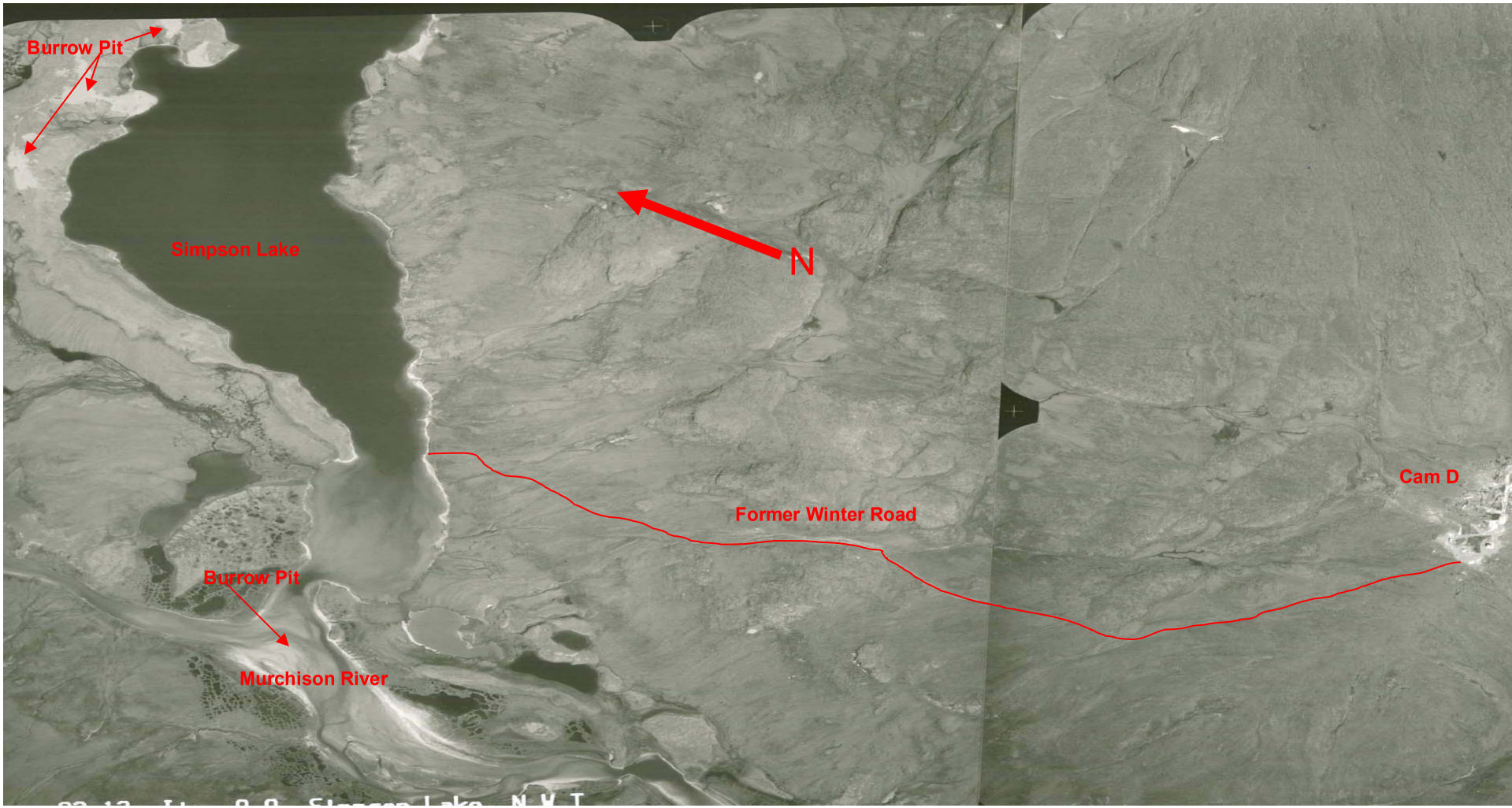


Photo 51: Arial Photo of Simpson Lake Burrow Area



Photo 51A: 1993 Arial Photo of Road to Murchison River Burrow Area

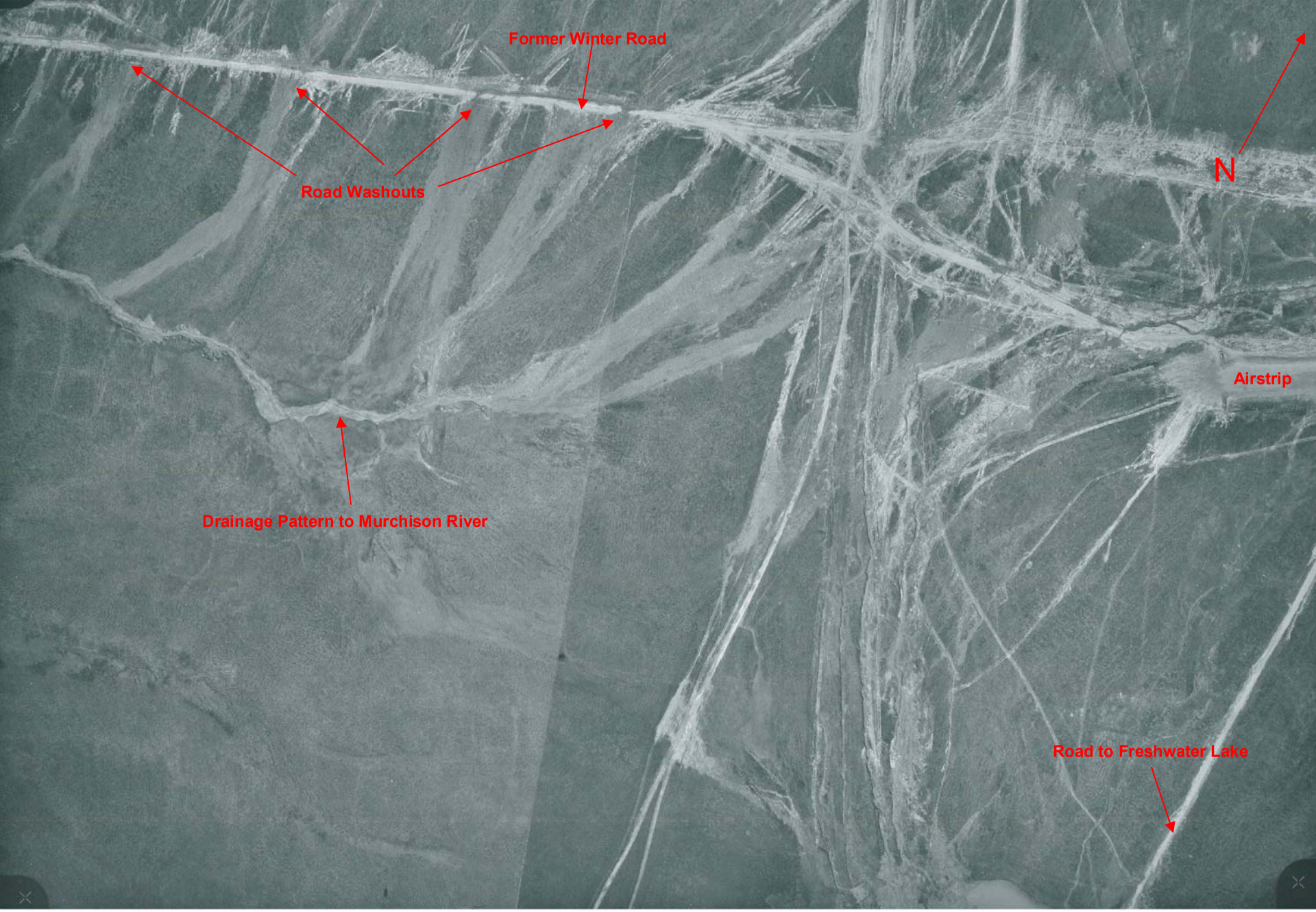


Photo 51B: 1964 Arial Photo of Road to Murchison River. Washout Locations

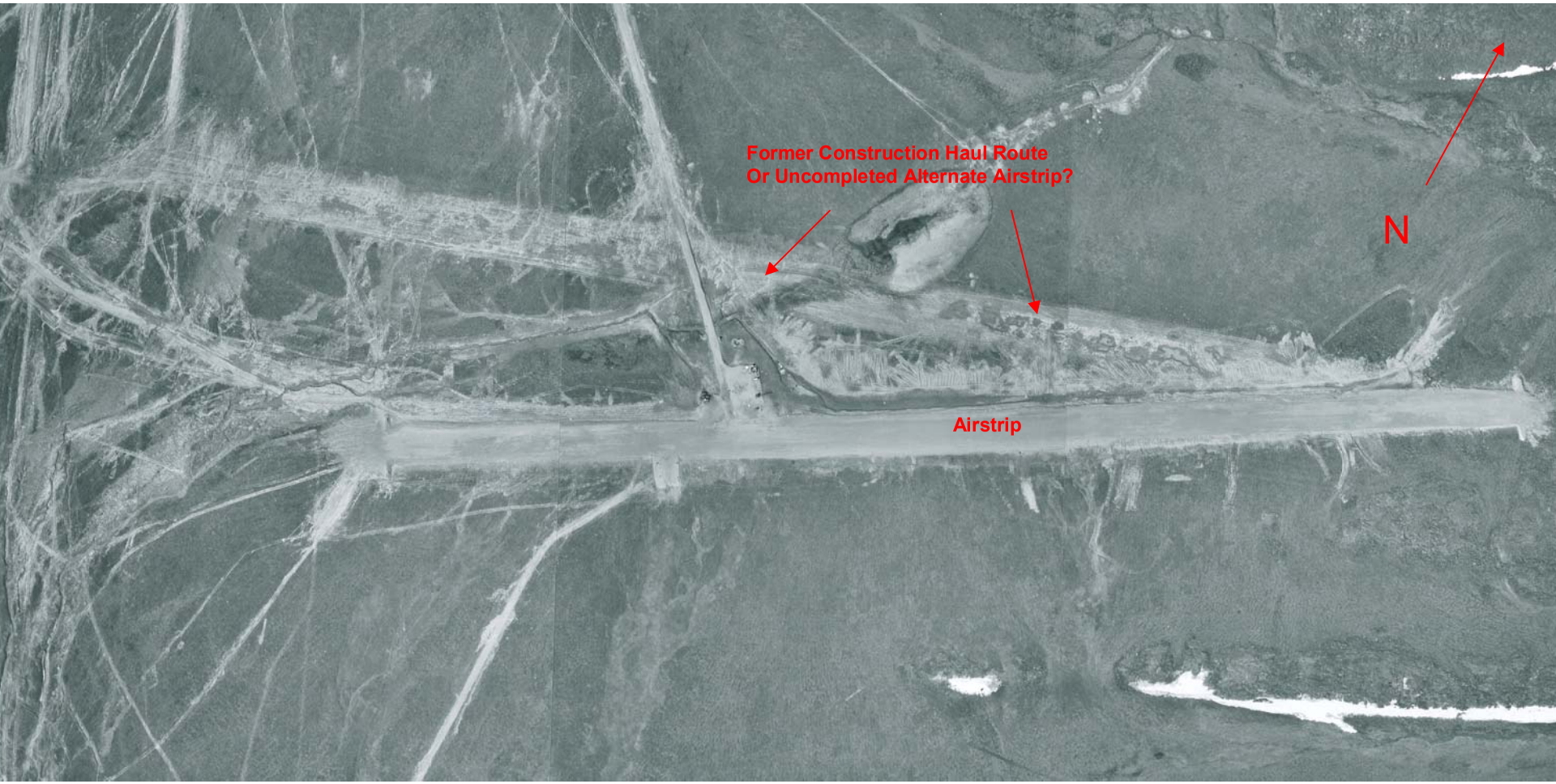


Photo 51C: 1964 Arial Photo of Former Construction Haul Route

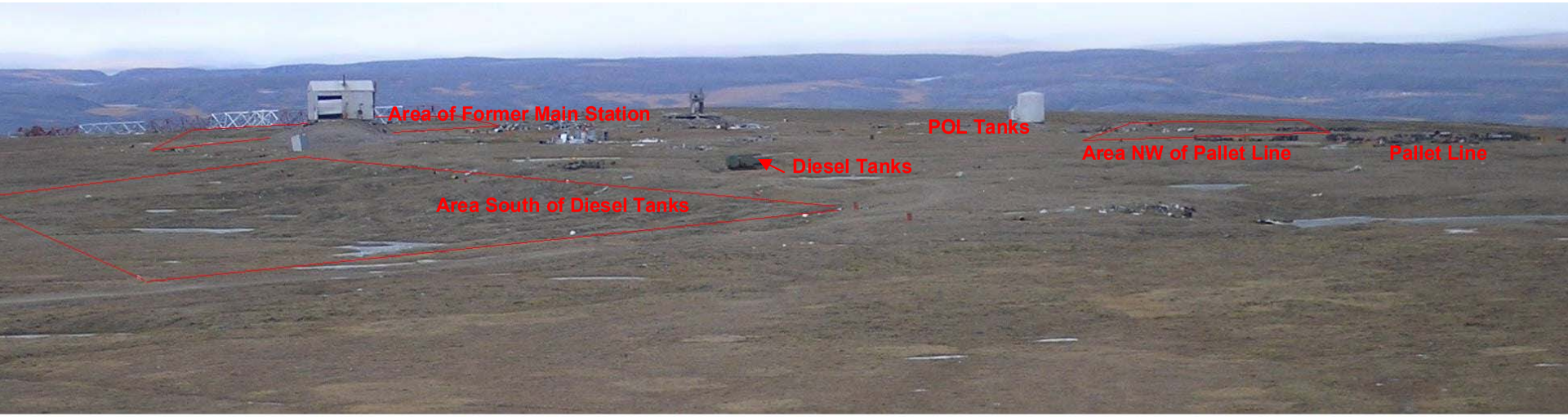


Photo 52: Three of Five Proposed Landfill Locations

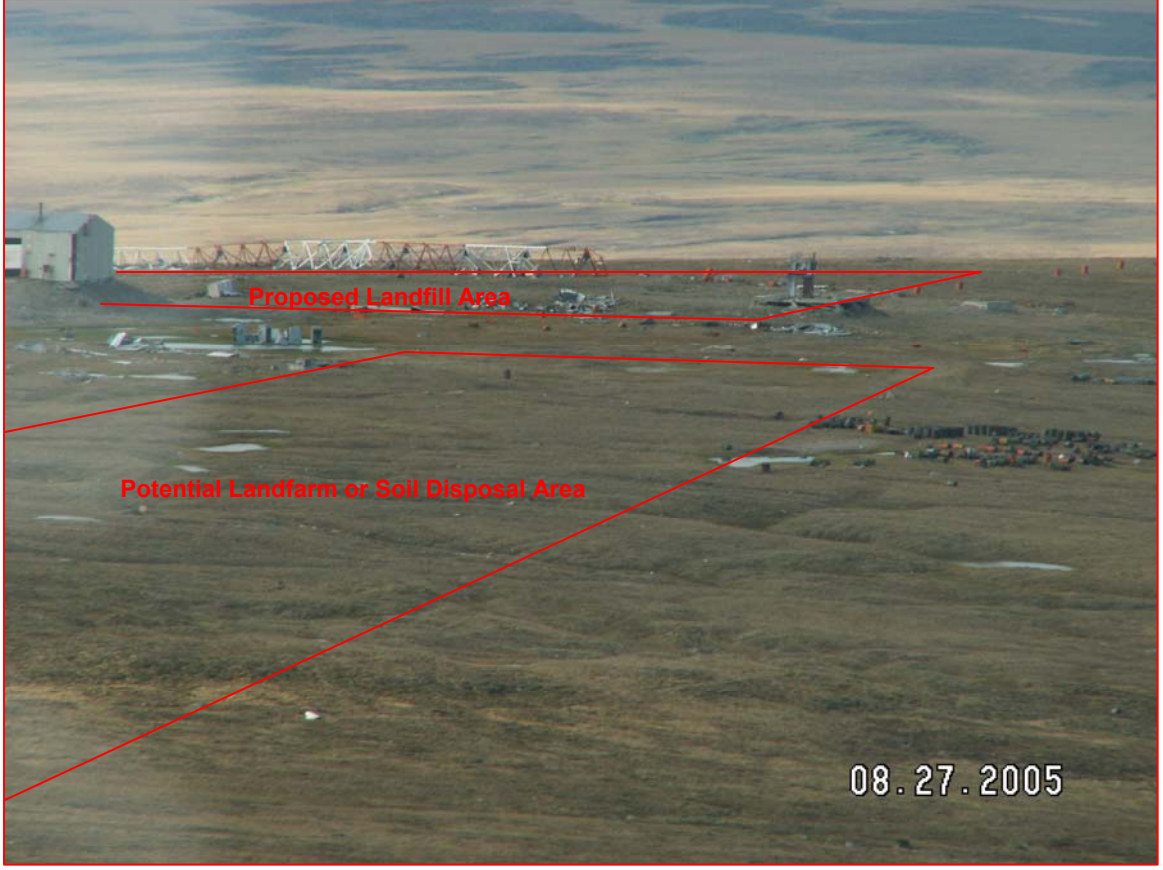


Photo 53: Potential Landfill and Landfarm Locations Near Main Station



Photo 54: Facing Up Slope and South From East Side of Main Dump



Photo 55: Facing South at Toe of Drainage Pattern East of Main Dump



Photo 56: Soft Wet Fine Grain Soils at Main Dump



Photo 57: Facing South at Toe of Drainage Pattern East of Main Dump



Photo 58: Possible Landfill Location West of Pallet Line Area

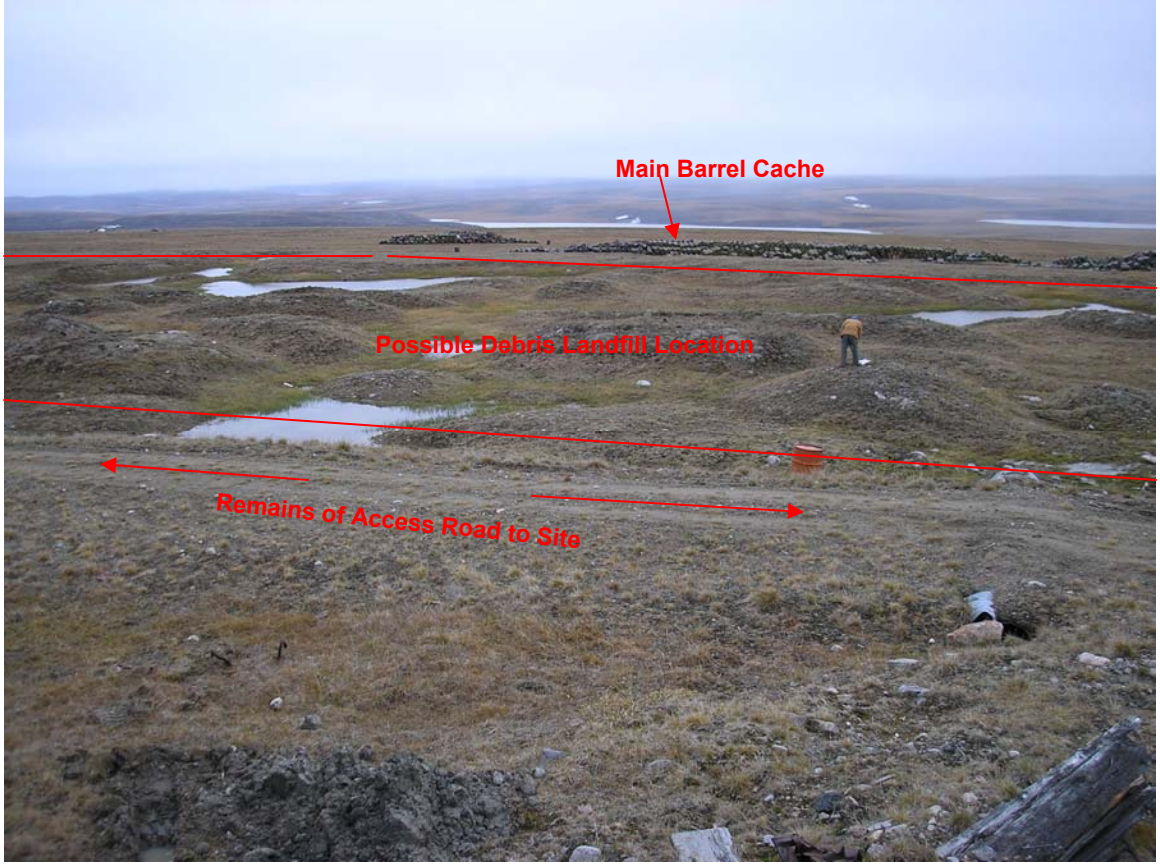


Photo 59: Facing West at Esker Enroute to Simpson Lake

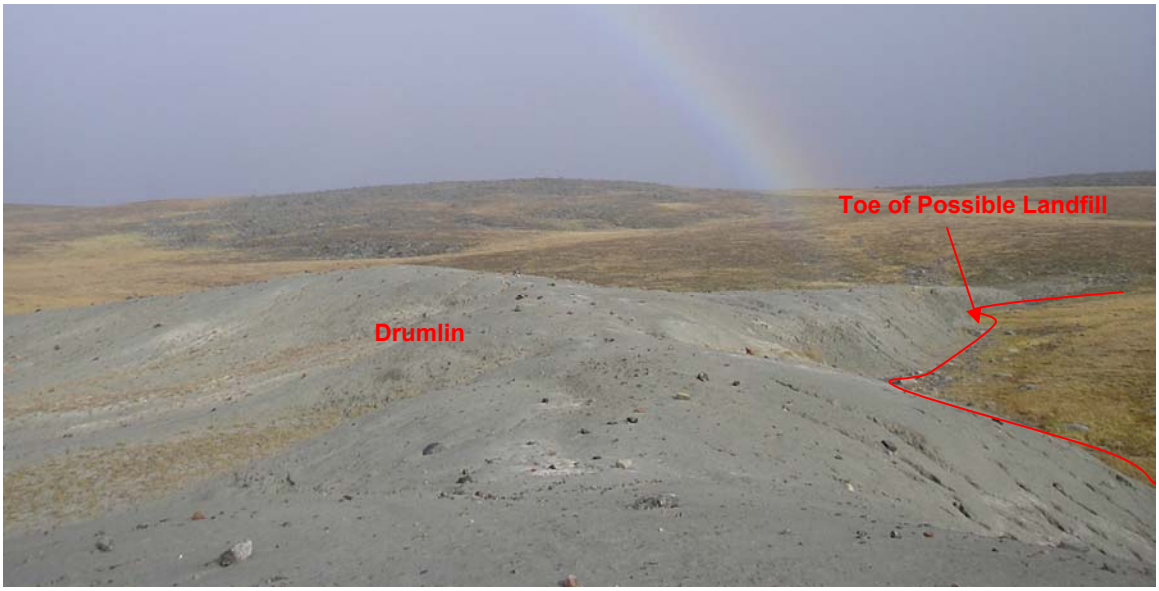


Photo 60: Possible Landfill Location Against South Side of Drumlin

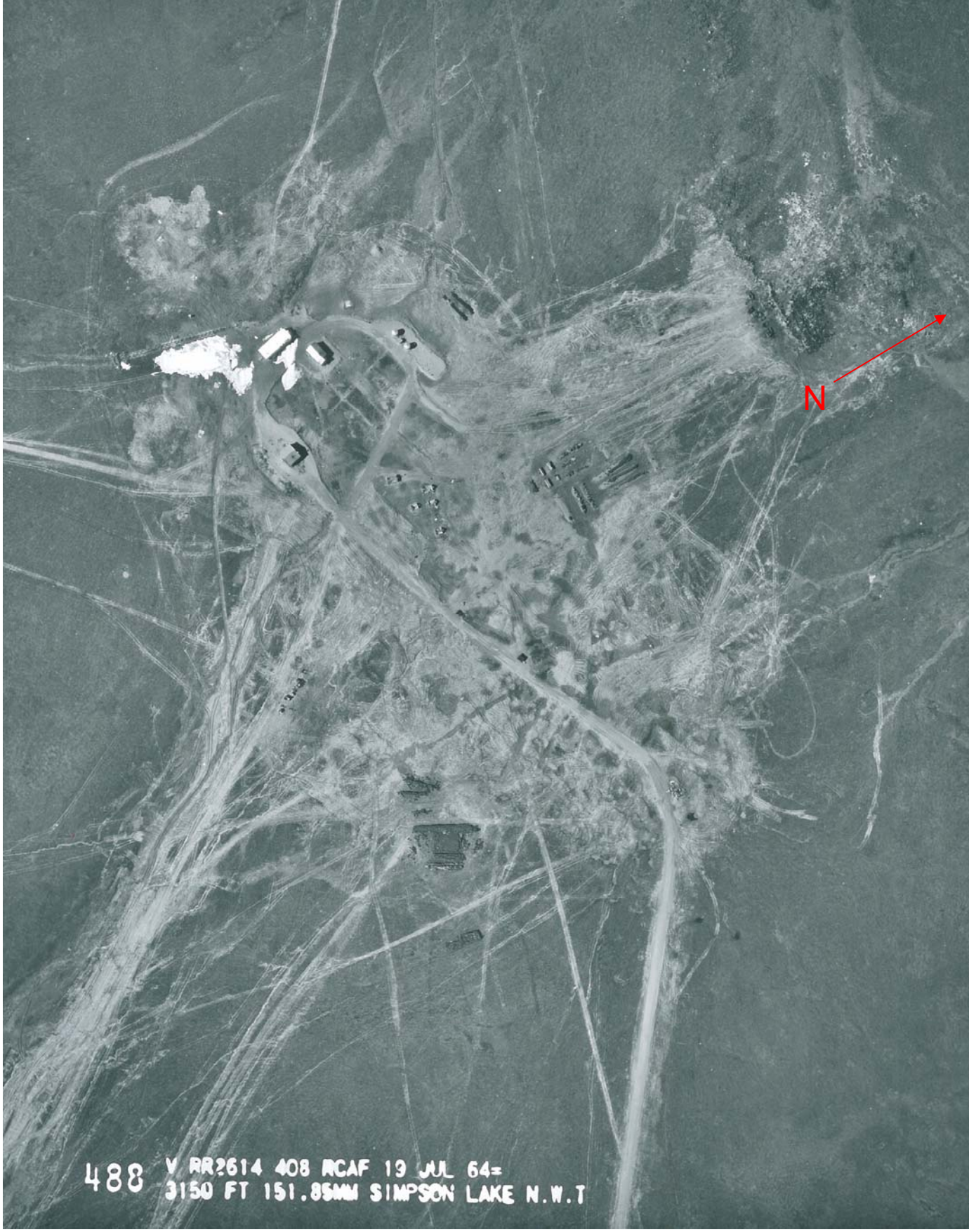


Photo 61: 1964 Air Photo



Photo 62: Facing Southeast Culvert Beneath Airstrip Road.



Photo 63: Facing Northwest at Remains of Culvert Beneath Road to Main Site Near Diesel Tanks

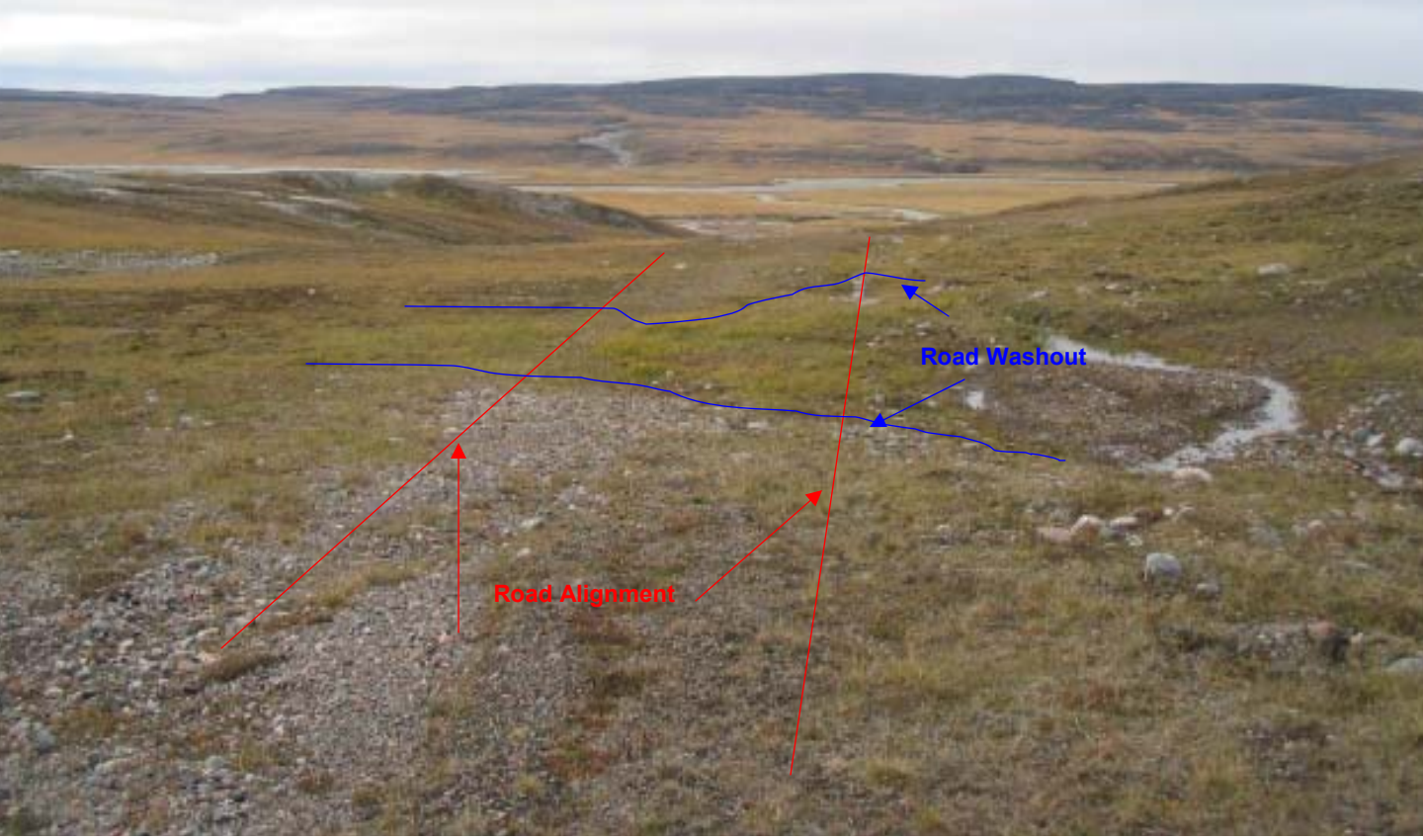


Photo 64: Road to Murchison River - Typical Washout

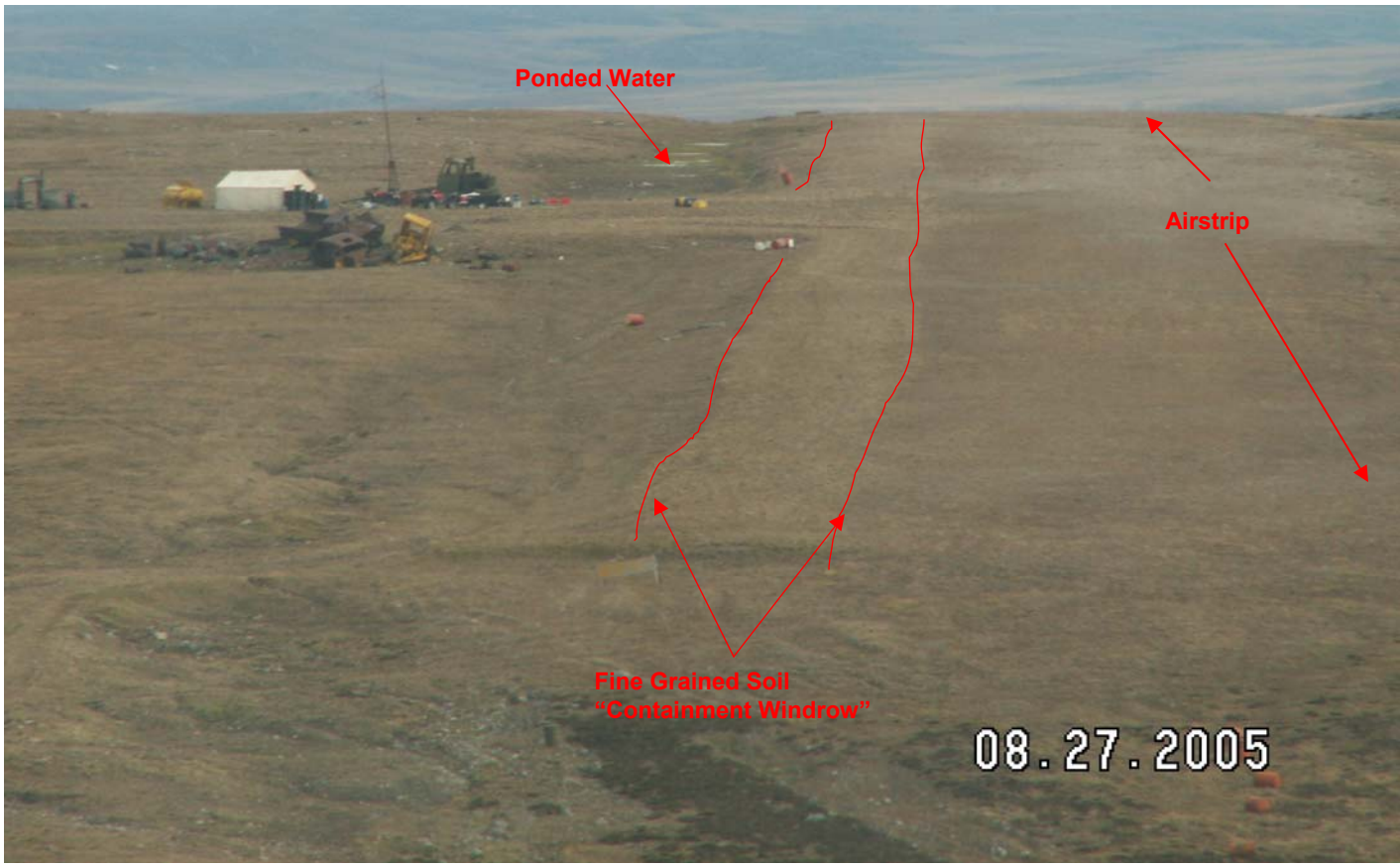


Photo 65: Facing Northeast at Airstrip - Note Arc of Surface



Photo 66: Facing Southwest from Northeast End of Airstrip



Photo 67: Facing Northeast at Northeast End of Airstrip



Photo 68: Example of Minor Rutting Shorts Skyvan Aircraft



Photo 69: Facing South at Ramp on South side of Airstrip



Photo 70: Soils at AS TP #1



Photo 71: Facing Southwest at AS TP #2 on Northern edge of Airstrip

APPENDIX D



TABLES

Table 1: Metals Concentration in Soil in 2005 Background Samples Area

PARAMETER	CRITERIA (ppm)	2005 Background Samples												
		Back 1	Back 2	Back 3	Back 4	Back 5	Back 6	Back 6A	Back 7	Back 8	Back 9	Average	Min	Max
Arsenic	30	1.6	1.6	1.7	1.6	1	0.9	2.3	1.1	0.9	1.4	1.41	0.9	2.3
Cadmium	5	0.06	0.06	0.07	0.05	0.04	0.05	0.07	0.05	0.05	0.06	0.056	0.04	0.07
Chromium	250	19.8	23.3	17.7	20.3	12.6	9.7	32.4	13.7	10	17	17.65	9.7	32.4
Cobalt	50	7.7	8.4	6.6	7.2	4.6	4.3	10.6	5.1	4.3	6.2	6.5	4.3	10.6
Copper	100	9	12	9	8	4	4	16	7	5	8	8.2	4	16
Lead	200/500[2]	6.4	6.9	6.5	6.3	4.8	4.4	9	5	4.5	5.7	5.95	4.4	9
Nickel	100	10.4	12.8	10	10.8	6.4	5.8	18	7.7	5.8	8.8	9.65	5.8	18
Zinc	500	38	47	36	38	24	19	62	26	20	34	34.4	19	62

Table 2: Metals Concentration in Soil in 1994 Background Samples Area

PARAMETER	CRITERIA (ppm)	1994 Background Samples										
		G5348	G5349	G5362A	G5362B	G5367	G5368	G5380	G5381	Average	Min	Max
Arsenic	30	0.5	1.1	1.9	1.9	0.9	2.9	1.9	1.7	1.6	0.5	2.9
Cadmium	5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chromium	250	20	25	32	58	37	30	44	53	37.4	20	58
Cobalt	50	5.1	<5.0	8.2	11.6	7.5	6	21	22	11.6	5.1	22
Copper	100	4.9	6.2	6.5	9.4	4.3	9.7	28	19.2	11.0	4.3	28
Lead	200/500[2]	<10	<10	<10	<10	<10	<10	9.6	10.6	10.1	9.6	10.6
Nickel	100	<5.0	<5.0	8.6	11.4	12	11.7	22	18.7	14.1	8.6	22
Zinc	500	17.9	25	34	34	35	66	92	117	52.6	17.9	117

NOTES:

1) Criteria based on INAC Abandoned Military Site Remediation Protocol Guidelines for Fine Grained Soil
2) Tier I / Tier II Guidelines
3) Exceedance indicated with shading

Table 3: PHC Concentration in Soil in Garage Area

PARAMETER	CRITERIA (mg/kg)	GAR-ET118	GAR-ET118	GAR-ET118	GAR-ET119	GAR-ET120	GAR-ET121	GAR-ET121
	Surface Soil	Sample Depth (cm)						
	(<1.5 m)	0-30	40-80	90-110	0-30	0-30	0-30	40-90
Benzene	0.0068	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Toluene	0.08	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.018	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Total Xylenes (m,p,o)	2.4	<0.02	<0.02	0.08	<0.02	<0.02	<0.02	<0.02
F1 C6-C10	260	3	66	102	<1	<1	<1	6
F2 C10-C16	900	1490	4380	1540	60	50	170	1320
F3 C16-C34	800	550	450	200	200	120	190	150
F4 C34-C50	5600	100	<10	20	30	30	80	40
F4HTGC C34-C50+	5600	110	10	40	30	50	90	50
% C50+	%	0.6	0	1.3	0	7.9	3	1.1

Table 3 cont.: PHC Concentration in Soil in Garage Area

PARAMETER	CRITERIA (mg/kg)	GAR-ET122	GAR-ET122	GAR-ET123	GAR-ET124	AVERAGE	MIN	MAX
	Surface Soil	Sample Depth (cm)						
	(<1.5 m)	0-30	30-60	0-30	0-40			
Benzene	0.0068	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Toluene	0.08	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.018	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Total Xylenes (m,p,o)	2.4	0.08	<0.02	<0.02	<0.02	0.08	<0.02	0.08
F1 C6-C10	260	36	<1	<1	<1	43	<1	102
F2 C10-C16	900	410	<10	70	<10	1054	<10	4380
F3 C16-C34	800	3650	120	900	110	604	110	3650
F4 C34-C50	5600	1440	40	190	20	199	<10	1440
F4HTGC C34-C50+	5600	2030	60	220	20	246	10	2030
% C50+	%	9.6	11.5	1.8	0	-	-	-

NOTES:

1) BTEX criteria based on CCME Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health for Residential/Parkland Land Use for Fine Grained Soil

2) F1-F4 criteria based on CCME Canada Wide Standards for PHC's in Soil for Residential Land Use and Fine Grained Soil

3) Benzene criteria is based on a 10^{-6} incremental risk

4) Exceedance indicated with shading

Table 4: PAH Concentration in Soil in Garage Area

PARAMETER	CRITERIA (mg/kg)	GAR-ET118	GAR-ET118
		Sample Depth (cm)	
		0-30	90-110
Naphthalene	0.6	<0.05	<0.05
Acenaphthylene	-	<0.05	<0.05
Acenaphthene	-	<0.05	<0.05
Fluorene	-	<0.05	0.14
Phenanthrene	5	<0.05	0.23
Anthracene	-	<0.05	<0.05
Fluoranthene	-	<0.05	<0.05
Pyrene	10	<0.05	<0.05
Benzo(a)anthracene	1	<0.05	<0.05
Chrysene	-	<0.05	<0.05
Benzo(b)fluoranthene	1	<0.05	<0.05
Benzo(j)fluoranthene	-	<0.05	<0.05
Benzo(k)fluoranthene	1	<0.05	<0.05
Benzo(a)pyrene	0.7	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	1	<0.05	<0.05
Dibenzo(a,h)anthracene	1	<0.05	<0.05
Benzo(g,h,i)perylene	-	<0.05	<0.05
CB(a)P	-	<0.0002	<0.0002
Nitrobenzene-d5*	-	126	>130
2-Fluorobiphenyl*	-	86	66
p-Terphenyl-d14*	-	85	80

NOTES:

1) Criteria based on CCME Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health for Residential/Parkland Land Use for Fine Grained Soil
2) Exceedance indicated with shading

Table 5: Metals Concentration in Soil in Garage Area

PARAMETER	CRITERIA (ppm)	GAR-ET121	GAR-ET121	GAR-ET122	GAR-ET122	GAR-ET123	GAR-ET124	AVERAGE	MIN	MAX
		Sample Depth (cm)								
		0-30	40-90	0-30	30-60	0-30	0-40			
Arsenic	30	0.7	0.8	1.1	0.6	0.7	0.8	0.8	0.6	1.1
Cadmium	5	0.18	0.04	1.13	0.15	0.51	0.16	0.4	0.04	1.13
Chromium	250	6.6	7	17.8	7.6	9.6	11.1	10.0	6.6	17.8
Cobalt	50	3.5	3.2	6.2	2.7	3.8	4.1	3.9	2.7	6.2
Copper	100	5	6	16	4	8	8	7.8	4	16
Lead	200/500[2]	6	3.8	17.9	7	9.7	6.6	8.5	3.8	17.9
Nickel	100	3.9	4.3	8.9	3.6	5.1	5.8	5.3	3.6	8.9
Zinc	500	35	22	49	19	49	28	33.7	19	49

NOTES:

1) Criteria based on INAC Abandoned Military Site Remediation Protocol Guidelines for Fine Grained Soil
2) Tier I / Tier II Guidelines
3) Exceedance indicated with shading

Table 6: Metals Concentration in Soil in Electrical Cabinet Area

PARAMETER	CRITERIA (ppm)	ECA-ET138	ECA-ET138	ECA-ET138	ECA-ET139	ECA-ET139	ECA-ET140	ECA-ET140A	ECA-ET140	ECA-ET174	ECA-ET174	AVERAGE	MIN	MAX
		Sample Depth (cm)												
		0-30	30-60	100-130	0-30	30-60	0-30	0-30	30-60	30-60	60-90			
Arsenic	30	0.8	1.5	1.4	1.9	1.9	1.2	1.3	1.5	1.6	1.4	1.45	0.8	1.9
Cadmium	5	0.07	0.08	0.07	0.11	0.09	0.07	0.09	0.08	0.15	0.18	0.099	0.07	0.18
Chromium	250	10.3	19.2	16	28.4	29.3	17.1	17.5	21.4	22	20.1	20.13	10.3	29.3
Cobalt	50	4	6.5	6.1	9	8.4	6.1	6.3	7.5	7.3	6.7	6.79	4	9
Copper	100	4	9	7	16	14	8	8	9	9	9	9.3	4	16
Lead	200/500[2]	5.6	6.2	5.7	7.6	7.7	6	6.3	6.8	6.6	6.6	6.51	5.6	7.7
Nickel	100	5.5	10	9	16.1	15.4	9.1	10	11.1	11.7	10.8	10.87	5.5	16.1
Zinc	500	25	38	35	63	59	40	40	46	47	43	43.6	25	63

Table 7: PCB concentrations in Soil in Electrical Cabinet Area

PARAMETER	CRITERIA (ppm)	ECA-ET138	ECA-ET138	ECA-ET138	ECA-ET139	ECA-ET139	ECA-ET140	ECA-ET140A	ECA-ET140	ECA-ET174	ECA-ET174	AVERAGE	MIN	MAX
		Sample Depth (cm)												
		0-30	30-60	100-130	0-30	30-60	0-30	0-30	30-60	30-60	60-90			
Aroclor 1016	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1262	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1268	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total PCBs	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Decachlorobiphenyl	%	115	72	85	82	112	65	107	64	114	74	89	64	115

NOTES:

1) Criteria based on INAC Abandoned Military Site Remediation Protocol Guidelines for Fine Grained Soil
2) Tier I / Tier II Guidelines
3) Exceedance indicated with shading

Table 8: Metals Concentration in Soil in Burn Pit Area

PARAMETER	CRITERIA (ppm)	BRN1-ET134	BRN1-ET134	BRN1-ET135	BRN1-ET136	BRN1-ET137	AVERAGE	MIN	MAX
		Sample Depth (cm)							
		0-30	120-140	0-30	0-30	0-30			
Arsenic	30	1.6	0.7	1	0.7	1.6	1.1	0.7	1.6
Cadmium	5	0.07	0.31	0.1	0.03	0.08	0.1	0.03	0.31
Chromium	250	22.9	9.7	12.6	6	23.2	14.9	6	23.2
Cobalt	50	7.2	3.1	4.3	2.8	7.2	4.9	2.8	7.2
Copper	100	10	4	9	4	11	7.6	4	11
Lead	200/500[2]	6.3	10.6	6.3	4	7.3	6.9	4	10.6
Nickel	100	12.2	4.3	6.5	3.4	12	7.7	3.4	12.2
Zinc	500	47	81	39	23	53	48.6	23	81

Table 9: PCB concentrations in Soil in Burn Pit Area

PARAMETER	CRITERIA (ppm)	BRN1-ET134	BRN1-ET134	BRN1-ET135	BRN1-ET136	BRN1-ET137	AVERAGE	MIN	MAX
		Sample Depth (cm)							
		0-30	120-140	0-30	0-30	0-30			
Aroclor 1016	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1262	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1268	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total PCBs	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Decachlorobiphenyl	%	92	74	73	92	97	85.6	73	97

NOTES:

1) Criteria based on INAC Abandoned Military Site Remediation Protocol Guidelines for Fine Grained Soil

2) Tier I / Tier II Guidelines

3) Exceedance indicated with shading

Table 10: PHC Concentration in Soil in Burn Pit Area

PARAMETER	CRITERIA (	BRN1-ET134	BRN1-ET134A	BRN1-ET134	BRN1-ET135	BRN1-ET136	BRN1-ET137	AVERAGE	MIN	MAX
	Surface Soi	Sample Depth (cm)								
	(<1.5 m)	0-30	0-30	120-140	0-30	0-30	0-30			
Benzene	0.0068	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Toluene	0.08	0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02
Ethylbenzene	0.018	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Total Xylenes (m,p,o)	2.4	<0.02	<0.02	0.06	<0.02	<0.02	<0.02	0.06	<0.02	0.06
F1 C6-C10	260	3	5	6	<1	<1	<1	5	<1	6
F2 C10-C16	900	1840	1640	100	10	60	280	655	10	1840
F3 C16-C34	800	11300	9530	380	230	110	10200	5292	110	11300
F4 C34-C50	5600	13300	10400	320	150	40	9530	5623	40	13300
F4HTGC C34-C50+	5600	14400	10800	340	170	40	10800	6092	40	14400
% C50+	%	4.2	1.5	3.5	5.4	0	6	-	-	-

NOTES:
1) BTEX criteria based on CCME Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health for Residential/Parkland Land Use for Fine Grained Soil
2) F1-F4 criteria based on CCME Canada Wide Standards for PHC's in Soil for Residential Land Use and Fine Grained Soil
3) Benzene criteria is based on a 10^{-6} incremental risk
4) Exceedance indicated with shading

Table 11: PAH Concentration in Soil in Burn Pit Area

PARAMETER	CRITERIA (mg/kg)	BRN1-ET134	BRN1-ET134A	BRN1-ET134	BRN1-ET135	BRN1-ET136	BRN1-ET137	AVERAGE	MIN	MAX
		Sample Depth (cm)								
		0-30	0-30	120-140	0-30	0-30	0-30			
Naphthalene	0.6	<0.05	<0.05	0.15	<0.05	<0.05	<0.05	0.2	0.15	0.15
Acenaphthylene	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Acenaphthene	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Fluorene	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Phenanthrene	5	0.09	0.15	<0.05	<0.05	<0.05	<0.05	0.1	<0.05	0.15
Anthracene	-	0.06	0.07	<0.05	<0.05	<0.05	<0.05	0.1	<0.05	0.07
Fluoranthene	-	0.7	0.78	<0.05	<0.05	<0.05	<0.05	0.7	<0.05	0.78
Pyrene	10	0.96	1.06	0.05	<0.05	<0.05	0.07	0.5	<0.05	1.06
Benzo(a)anthracene	1	0.15	0.15	<0.05	<0.05	<0.05	<0.05	0.2	<0.05	0.15
Chrysene	-	0.25	0.26	<0.05	<0.05	<0.05	0.07	0.2	<0.05	0.26
Benzo(b)fluoranthene	1	0.16	0.19	<0.05	<0.05	<0.05	<0.05	0.2	<0.05	0.19
Benzo(j)fluoranthene	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(k)fluoranthene	1	0.21	0.19	<0.05	<0.05	<0.05	<0.05	0.2	<0.05	0.21
Benzo(a)pyrene	0.7	0.24	0.23	<0.05	<0.05	<0.05	<0.05	0.2	<0.05	0.24
Indeno(1,2,3-c,d)pyrene	1	0.2	0.19	<0.05	<0.05	<0.05	<0.05	0.2	<0.05	0.2
Dibenzo(a,h)anthracene	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(g,h,i)perylene	-	0.26	0.27	<0.05	<0.05	<0.05	<0.05	0.3	<0.05	0.27
CB(a)P	-	0.3331	0.3221	<0.0002	<0.0002	<0.0002	0.0003	0.2	<0.0002	0.3331
Nitrobenzene-d5*	-	61	60	48	95	114	86	77.3	48	114
2-Fluorobiphenyl*	-	32	31	104	96	89	96	74.7	31	104
p-Terphenyl-d14*	-	64	63	119	115	109	109	96.5	63	119

NOTES:
1) PAH criteria based on CCME Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health for Residential/Parkland Land Use for Fine Grained Soil
2) Exceedance indicated with shading

Table 12: PHC Concentration in Soil in Station Area

PARAMETER	CRITERIA (mg/kg)	STN-ET114	STN-ET115	STN-ET116	STN-ET117	AVERAGE	MIN	MAX
	Surface Soil	Sample Depth (cm)						
	(<1.5 m)	0-100	0-80	0-80	0-90			
Benzene	0.0068	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Toluene	0.08	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.018	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Total Xylenes (m,p,o)	2.4	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
F1 C6-C10	260	<1	<1	<1	<1	<1	<1	<1
F2 C10-C16	900	<10	<10	<10	<10	<10	<10	<10
F3 C16-C34	800	<10	10	20	<10	15	<10	20
F4 C34-C50	5600	<10	<10	10	<10	10	<10	10
F4HTGC C34-C50+	5600	<10	<10	10	<10	10	<10	10
% C50+	%	0	0	0	0	-	-	-

NOTES:

1) BTEX criteria based on CCME Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health for Residential/Parkland Land Use for Fine Grained Soil

2) F1-F4 criteria based on CCME Canada Wide Standards for PHC's in Soil for Residential Land Use and Fine Grained Soil

3) Benzene criteria is based on a 10^{-6} incremental risk

4) Exceedance indicated with shading

Table 13: Metals Concentration in Soil in Buried Station Debris Area

PARAMETER	CRITERIA (ppm)	BSD-ET155	BSD-ET156	BSD-ET157	BSD-ET158	AVERAGE	MIN	MAX
		Sample Depth (cm)						
		0-30	0-30	0-30	0-30			
Arsenic	30	1.2	2	1.3	1.5	1.5	1.2	2
Cadmium	5	0.55	0.07	0.06	0.06	0.2	0.06	0.55
Chromium	250	24.2	30.3	19.4	23.9	24.5	19.4	30.3
Cobalt	50	5.9	9.6	6.6	7.8	7.5	5.9	9.6
Copper	100	8	13	8	9	9.5	8	13
Lead	200/500[2]	10.2	8	6.1	6.7	7.8	6.1	10.2
Nickel	100	12.4	15.5	10	11.4	12.3	10	15.5
Zinc	500	78	58	36	44	54.0	36	78

Table 14: PCB concentrations in Soil in Buried Station Debris Area

PARAMETER	CRITERIA (ppm)	BSD-ET155	BSD-ET156	BSD-ET157	BSD-ET158	AVERAGE	MIN	MAX
		Sample Depth (cm)						
		0-30	0-30	0-30	0-30			
Aroclor 1016	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	1/5[2]	0.6	<0.1	<0.1	<0.1	<0.1	<0.1	0.6
Aroclor 1260	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1262	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1268	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total PCBs	1/5[2]	0.6	<0.1	<0.1	<0.1	<0.1	<0.1	0.6
Decachlorobiphenyl	%	78	72	66	66	70.5	66	78

NOTES:

1) Criteria based on INAC Abandoned Military Site Remediation Protocol Guidelines for Fine Grained Soil
2) Tier I / Tier II Guidelines
3) Exceedance indicated with shading

Table 15: Metals Concentration in Soil in Warehouse Buried Debris Area

PARAMETER	CRITERIA (ppm)	WBD-ET159	WBD-ET160	WBD-ET161	AVERAGE	MIN	MAX
		Sample Depth (cm)					
		0-30	0-30	0-30			
Arsenic	30	0.8	1.4	1.4	1.2	0.8	1.4
Cadmium	5	0.51	0.07	0.06	0.2	0.06	0.51
Chromium	250	10.6	19.7	21.2	17.2	10.6	21.2
Cobalt	50	3.4	6.9	6.9	5.7	3.4	6.9
Copper	100	5	8	9	7.3	5	9
Lead	200/500[2]	9.1	6.1	6.5	7.2	6.1	9.1
Nickel	100	5.2	10.3	10.4	8.6	5.2	10.4
Zinc	500	42	39	43	41.3	39	43

Table 16: PCB concentrations in Soil in Warehouse Buried Debris Area

PARAMETER	CRITERIA (ppm)	WBD-ET159	WBD-ET160	WBD-ET161	AVERAGE	MIN	MAX
		Sample Depth (cm)					
		0-30	0-30	0-30			
Aroclor 1016	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	1/5[2]	0.4	<0.1	<0.1	0.4	<0.1	<0.1
Aroclor 1260	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1262	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1268	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total PCBs	1/5[2]	0.4	<0.1	<0.1	0.4	<0.1	<0.1
Decachlorobiphenyl	%	94	89	82	88	82	94

NOTES:

1) Criteria based on INAC Abandoned Military Site Remediation Protocol Guidelines for Fine Grained Soil
2) Tier I / Tier II Guidelines
3) Exceedance indicated with shading

Table 17: PHC Concentration in Soil in Pol Tanks Area

PARAMETER	CRITERIA (mg/kg)	POL-ET125	POL-ET125	POL-ET126	POL-ET126	POL-ET127	POL-ET127	POL-ET128	POL-ET128	POL-ET129	POL-ET129
	Surface Soil	Sample Depth (cm)									
	(<1.5 m)	0-30	140-150	0-30	100-120	0-30	50-90	0-30	90-100	0-30	40-60
Benzene	0.0068	<0.02	<0.02	<0.02	<0.02	<0.02	0.06	<0.02	<0.02	<0.02	0.17
Toluene	0.08	<0.02	0.02	<0.02	0.07	<0.02	0.79	<0.02	<0.02	<0.02	4.77
Ethylbenzene	0.018	<0.02	<0.02	<0.02	0.17	<0.02	1.9	<0.02	<0.02	<0.02	4.29
Total Xylenes (m,p,o)	2.4	<0.02	0.77	<0.02	7.17	<0.02	11.2	<0.02	<0.02	3	39.4
F1 C6-C10	260	100	305	9	195	41	642	9	<1	434	1300
F2 C10-C16	900	3050	1700	590	5070	860	4440	700	<10	16700	6420
F3 C16-C34	800	150	160	150	680	180	210	140	30	1250	380
F4 C34-C50	5600	20	40	20	40	<10	<10	<10	10	160	10
F4HTGC C34-C50+	5600	30	60	20	50	<10	<10	<10	10	260	20
% C50+	%	0	1.5	0	0.2	0	0	0	0	0.6	0

Table 17 cont.: PHC Concentration in Soil in Pol Tanks Area

PARAMETER	CRITERIA (mg/kg)	POL-ET130	POL-ET130	POL-ET131	POL-ET131	POL-ET132	POL-ET133	AVERAGE	MIN	MAX
	Surface Soil	Sample Depth (cm)								
	(<1.5 m)	0-30	80-90	0-30	40-70	0-30	0-30			
Benzene	0.0068	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.12	<0.02	0.17
Toluene	0.08	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	1.41	<0.02	4.77
Ethylbenzene	0.018	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	2.12	<0.02	4.29
Total Xylenes (m,p,o)	2.4	<0.02	0.42	<0.02	<0.02	<0.02	<0.02	10.3	<0.02	39.4
F1 C6-C10	260	<1	64	3	20	<1	<1	260	<1	1300
F2 C10-C16	900	20	1870	140	120	<10	<10	3206	<10	16700
F3 C16-C34	800	30	150	70	20	<10	<10	257	<10	1250
F4 C34-C50	5600	<10	40	20	<10	<10	<10	40	<10	160
F4HTGC C34-C50+	5600	<10	60	30	<10	<10	<10	60	<10	260
% C50+	%	0	1.1	0	0	0	0	-	-	-

NOTES:

1) BTEX criteria based on CCME Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health for Residential/Parkland Land Use for Fine Grained Soil

2) F1-F4 criteria based on CCME Canada Wide Standards for PHC's in Soil for Residential Land Use and Fine Grained Soil

3) Benzene criteria is based on a 10^{-6} incremental risk

4) Exceedance indicated with shading

Table 18: PAH Concentration in Soil in Pol Tanks Area

PARAMETER	CRITERIA (mg/kg)	POL-ET125	POL-ET125	POL-ET126	POL-ET126	POL-ET127	POL-ET127	POL-ET128	POL-ET128	POL-ET129	POL-ET129	POL-ET130	POL-ET130	POL-ET131	POL-ET131	POL-ET132	POL-ET133	AVERAGE	MIN	MAX
		Sample Depth (cm)																		
		0-30	140-150	0-30	100-120	0-30	50-90	0-30	90-100	0-30	40-60	0-30	0-30	0-30	0-30	0-30	0-30			
Naphthalene	0.6	<0.05	<0.05	<0.05	4.91	<0.05	16.1	<0.05	<0.05	20.8	37	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	19.7	4.91	37
Acenaphthylene	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Acenaphthene	-	0.06	0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.1	<0.05	0.2
Fluorene	-	<0.05	0.24	<0.05	0.18	<0.05	0.14	<0.05	<0.05	0.61	0.56	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.3	<0.05	0.61
Phenanthrene	5	<0.05	0.29	<0.05	0.85	<0.05	0.28	<0.05	<0.05	0.72	0.67	<0.05	0.05	<0.05	<0.05	<0.05	<0.05	0.5	<0.05	0.85
Anthracene	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Fluoranthene	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Pyrene	10	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)anthracene	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chrysene	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(b)fluoranthene	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(j)fluoranthene	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(k)fluoranthene	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene	0.7	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dibenzo(a,h)anthracene	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(g,h,i)perylene	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
CB(a)P	-	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Nitrobenzene-d5*	-	>130	>130	>130	>130	>130	>130	>130	84	>130	>130	92	>130	91	60	93	72	82.0	60	93
2-Fluorobiphenyl*	-	120	117	97	119	111	102	123	92	111	114	87	100	100	95	94	98	105.0	87	123
p-Terphenyl-d14*	-	117	135	105	99	111	113	108	108	102	113	99	108	108	130	116	124	112.3	99	135

NOTES:

1) Criteria based on CCME Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health for Residential/Parkland Land Use for Fine Grained Soil

2) Exceedance indicated with shading

Table 19: Metals Concentration in Soil in Pol Buried Debris Area

PARAMETER	CRITERIA (ppm)	POLBD-ET163	POLBD-ET164
		Sample Depth (cm)	
		0-30	0-30
Arsenic	30	0.6	1.3
Cadmium	5	0.04	0.07
Chromium	250	7.9	18
Cobalt	50	3.2	5.6
Copper	100	4	7
Lead	200/500[2]	3.6	6.1
Nickel	100	4.2	9
Zinc	500	22	36

Table 20: PCB concentrations in Soil in Pol Buried Debris Area

PARAMETER	CRITERIA (ppm)	POLBD-ET163	POLBD-ET164
		Sample Depth (cm)	
		0-30	0-30
Aroclor 1016	1/5[2]	<0.1	<0.1
Aroclor 1221	1/5[2]	<0.1	<0.1
Aroclor 1232	1/5[2]	<0.1	<0.1
Aroclor 1242	1/5[2]	<0.1	<0.1
Aroclor 1248	1/5[2]	<0.1	<0.1
Aroclor 1254	1/5[2]	<0.1	<0.1
Aroclor 1260	1/5[2]	<0.1	<0.1
Aroclor 1262	1/5[2]	<0.1	<0.1
Aroclor 1268	1/5[2]	<0.1	<0.1
Total PCBs	1/5[2]	<0.1	<0.1
Decachlorobiphenyl	%	79	94

NOTES:

1) Criteria based on INAC Abandoned Military Site Remediation Protocol Guidelines for Fine Grained Soil
2) Tier I / Tier II Guidelines
3) Exceedance indicated with shading

Table 21: Metals Concentration in Soil in Outfall Area

PARAMETER	CRITERIA (ppm)	OUT-ET110	OUT-ET111	OUT-ET111A	OUT-ET112	OUT-ET113	AVERAGE	MIN	MAX
		Sample Depth (cm)							
		30-40	0-10	0-10	0-10	0-10			
Arsenic	30	1.7	1.4	1.6	1.1	1.6	1.5	1.1	1.7
Cadmium	5	0.07	0.07	0.09	0.33	0.26	0.2	0.07	0.33
Chromium	250	25.7	18.2	23.2	14.7	21.5	20.7	14.7	25.7
Cobalt	50	7.8	6.2	7.5	5	7.1	6.7	5	7.8
Copper	100	14	11	14	15	51	21.0	11	51
Lead	200/500[2]	6.9	6.3	7.6	6.3	11.4	7.7	6.3	11.4
Nickel	100	13.1	9.7	11.7	7.9	12.4	11.0	7.9	13.1
Zinc	500	50	46	52	56	74	55.6	46	74

Table 22: PCB concentrations in Soil in Outfall Area

PARAMETER	CRITERIA (ppm)	OUT-ET110	OUT-ET111	OUT-ET111A	OUT-ET112	OUT-ET113	AVERAGE	MIN	MAX
		Sample Depth (cm)							
		30-40	0-10	0-10	0-10	0-10			
Aroclor 1016	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	1/5[2]	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	0.2
Aroclor 1260	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1262	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1268	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total PCBs	1/5[2]	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	0.2
Decachlorobiphenyl	%	110	70	61	94	77	82.4	61	110

NOTES:

1) Criteria based on INAC Abandoned Military Site Remediation Protocol Guidelines for Fine Grained Soil
2) Tier I / Tier II Guidelines
3) Exceedance indicated with shading

Table 23: PHC Concentration in Soil in Pallet Line Area

PARAMETER	CRITERIA (mg/kg)	PL-ET141	PL-ET142	PL-ET143	PL-ET144	PL-ET144A	PL-ET144	PL-ET145	PL-ET145	PL-ET146	PL-ET147	PL-ET147	PL-ET148	PL-ET148	PL-ET149	PL-ET170	PL-ET170	PL-ET171	PL-ET172	PL-ET173	AVERAGE	MIN	MAX
	Surface Soil	Sample Depth (cm)																					
	(<1.5 m)	0-30	0-30	0-30	0-30	0-30	90-100	0-30	40-70	80-100	0-30	40-70	0-30	40-70	0-30	0-30	40-70	20-50	20-50	20-50			
Benzene	0.0068	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Toluene	0.08	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02
Ethylbenzene	0.018	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Total Xylenes (m,p,o)	2.4	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
F1 C6-C10	260	<1	<1	<1	19	20	6	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	29	<1	<1	29	<1	29
F2 C10-C16	900	20	20	<10	3340	2710	50	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	540	<10	<10	540	540	540
F3 C16-C34	800	<10	8220	50	28300	26100	20	10	<10	10	150	20	10	<10	<10	<10	<10	20	<10	<10	20	20	20
F4 C34-C50	5600	<10	7590	40	6540	6400	<10	<10	<10	<10	100	20	<10	<10	<10	<10	<10	10	10	<10	10	10	10
F4HTGC C34-C50+	5600	<10	10000	50	10100	9930	<10	<10	10	<10	120	20	<10	<10	<10	<10	<10	20	20	<10	20	20	20
% C50+	%	0	13.4	16	8.5	9.1	0	0	0	0	10.3	0	0	0	0	0	0	1.6	0	0	-	-	-

NOTES:
1) BTEX criteria based on CCME Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health for Residential/Parkland Land Use for Fine Grained Soil
2) F1-F4 criteria based on CCME Canada Wide Standards for PHC's in Soil for Residential Land Use and Fine Grained Soil
3) Benzene criteria is based on a 10^{-6} incremental risk
4) Exceedance indicated with shading

Table 24: PAH Concentration in Soil in Pallet Line Area

PARAMETER	CRITERIA (mg/kg)	PL-ET141	PL-ET142	PL-ET143	PL-ET144	PL-ET144A	PL-ET144	PL-ET145	PL-ET145	PL-ET146	PL-ET147	PL-ET147	PL-ET148	PL-ET148	PL-ET149	PL-ET170	PL-ET170	PL-ET171	PL-ET172	PL-ET173	AVERAGE	MIN	MAX
		Sample Depth (cm)																					
		0-30	0-30	0-30	0-30	0-30	90-100	0-30	40-70	80-100	0-30	40-70	0-30	40-70	0-30	0-30	40-70	20-50	20-50	20-50			
Naphthalene	0.6	<0.05	<0.05	<0.05	<0.05	<0.05	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Acenaphthylene	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Acenaphthene	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Fluorene	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Phenanthrene	5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Anthracene	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Fluoranthene	-	<0.05	<0.05	<0.05	0.3	0.25	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Pyrene	10	<0.05	<0.05	<0.05	0.46	0.38	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)anthracene	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chrysene	-	<0.05	<0.05	<0.05	0.45	0.34	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(b)fluoranthene	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(j)fluoranthene	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(k)fluoranthene	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene	0.7	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrer	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dibenzo(a,h)anthracer	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(g,h,i)perylene	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
CB(a)P	-	<0.0002	<0.0002	<0.0002	0.002	0.0015	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Nitrobenzene-d5*	-	61	79	122	130	130	84	96	88	80	91	102	85	105	90	89	92	>130	104	94	95.7	61	130
2-Fluorobiphenyl*	-	72	65	85	56	55	87	93	101	99	95	90	94	91	97	98	100	110	94	106	88.8	55	110
p-Terphenyl-d14*	-	88	80	105	112	81	100	114	116	85	82	100	84	104	86	107	104	112	108	117	99.2	80	117

NOTES:
1) Criteria based on CCME Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health for Residential/Parkland Land Use for Fine Grained Soil
2) Exceedance indicated with shading

Table 25: Metals Concentration in Soil in Pallet Line Area

PARAMETER	CRITERIA (ppm)	PL-ET142	PL-ET144	PL-ET144A	PL-ET144	PL-ET145	PL-ET147	AVERAGE	MIN	MAX
		Sample Depth (cm)								
		0-30	0-30	0-30	90-100	40-70	40-70			
Arsenic	30	0.6	1.2	0.9	1.5	1.4	2	1.3	0.6	2
Cadmium	5	0.03	0.18	0.16	0.06	0.06	0.08	0.1	0.03	0.18
Chromium	250	7.2	18.7	14.3	24.9	17.8	26.8	18.3	7.2	26.8
Cobalt	50	3.6	5.8	5	7.9	6.2	8.4	6.2	3.6	8.4
Copper	100	4	9	8	14	7	14	9.3	4	14
Lead	200/500[2]	3.5	13.6	17.2	6.3	5.8	7.7	9.0	3.5	17.2
Nickel	100	3.9	9.5	7.8	14.3	9.2	15.4	10.0	3.9	15.4
Zinc	500	22	136	124	61	36	57	72.7	22	136

NOTES:

1) Criteria based on INAC Abandoned Military Site Remediation Protocol Guidelines for Fine Grained Soil
2) Tier I / Tier II Guidelines
3) Exceedance indicated with shading

Table 26: PHC Concentration in Soil in Portable Fuel Tank Area

PARAMETER	CRITERIA (mg/kg)	FT-ET152	FT-ET152	FT-ET153	FT-ET153	FT-ET154	FT-ET154	FT-ET165	FT-ET165	FT-ET165A	FT-ET166	FT-ET166	FT-ET167	FT-ET168	FT-ET169	AVERAGE	MIN	MAX
	Surface Soil	Sample Depth (cm)																
	(<1.5 m)	0-30	50-80	0-30	30-50	0-30	50-80	0-30	50-80	50-80	0-30	70-100	0-30	30-60	40-70			
Benzene	0.0068	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Toluene	0.08	<0.02	<0.02	<0.02	<0.02	<0.02	0.04	<0.02	<0.02	<0.02	<0.02	0.07	<0.02	<0.02	<0.02	0.055	<0.02	0.07
Ethylbenzene	0.018	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.44	0.39	<0.02	<0.02	<0.02	0.415	<0.02	0.44
Total Xylenes (m,p,o)	2.4	<0.02	<0.02	<0.02	<0.02	<0.02	5.85	<0.02	0.17	0.1	0.82	4.35	<0.02	<0.02	<0.02	2.258	<0.02	5.85
F1 C6-C10	260	<1	<1	14	<1	<1	276	11	83	32	157	970	<1	<1	6	194	<1	970
F2 C10-C16	900	120	<10	3260	<10	60	2880	420	440	350	1500	2390	<10	10	310	1067	<10	3260
F3 C16-C34	800	2040	<10	4590	10	1080	440	1660	330	280	210	250	250	240	900	945	10	4590
F4 C34-C50	5600	420	<10	810	<10	310	90	520	80	60	40	30	80	70	280	233	<10	810
F4HTGC C34-C50+	5600	670	<10	1030	<10	350	110	710	90	70	50	30	100	90	400	308	<10	1030
% C50+	%	8.8	0	2.5	0	2.6	0.4	6.9	1.2	0	0.9	0	4.4	4.1	7.7	-	-	-

NOTES:
1) BTEX criteria based on CCME Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health for Residential/Parkland Land Use for Fine Grained Soil
2) F1-F4 criteria based on CCME Canada Wide Standards for PHC's in Soil for Residential Land Use and Fine Grained Soil
3) Benzene criteria is based on a 10^{-6} incremental risk
4) Exceedance indicated with shading

Table 27: PAH Concentration in Soil in Portable Fuel Tanks Area

PARAMETER	CRITERIA (mg/kg)	FT-ET152	FT-ET152	FT-ET153	FT-ET153	FT-ET154	FT-ET154	FT-ET165	FT-ET165	FT-ET165A	FT-ET166	FT-ET166	FT-ET167	FT-ET168	FT-ET169	AVERAGE	MIN	MAX
		Sample Depth (cm)																
		0-30	50-80	0-30	30-50	0-30	50-80	0-30	50-80	50-80	0-30	70-100	0-30	30-60	40-70			
Naphthalene	0.6	<0.05	<0.05	<0.05	<0.05	<0.05	1.12	<0.05	1.43	1.03	3.2	3.64	<0.05	<0.05	<0.05	2.1	1.03	3.64
Acenaphthylene	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Acenaphthene	-	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	<0.05	<0.05	<0.05	0.09	0.13	<0.05	<0.05	<0.05	0.1	0.06	0.13
Fluorene	-	<0.05	<0.05	<0.05	<0.05	<0.05	0.13	<0.05	<0.05	<0.05	0.11	0.19	<0.05	<0.05	<0.05	0.1	0.11	0.19
Phenanthrene	5	<0.05	<0.05	<0.05	<0.05	<0.05	0.22	<0.05	<0.05	<0.05	0.12	0.17	<0.05	<0.05	<0.05	0.2	0.12	0.22
Anthracene	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Fluoranthene	-	<0.05	<0.05	0.11	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.1	0.11	0.11
Pyrene	10	<0.05	<0.05	0.15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.2	0.15	0.15
Benzo(a)anthracene	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chrysene	-	0.06	<0.05	0.15	<0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.1	0.05	0.15
Benzo(b)fluoranthene	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(j)fluoranthene	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(k)fluoranthene	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene	0.7	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyren	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dibenzo(a,h)anthracen	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(g,h,i)perylene	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
CB(a)P	-	0.0003	<0.0002	0.0007	<0.0002	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0007
Nitrobenzene-d5*	-	88	79	>130	78	73	>130	88	>130	120	>130	>130	95	92	96	89.9	73	120
2-Fluorobiphenyl*	-	84	98	125	102	87	100	102	96	99	76	106	97	96	88	96.9	76	125
p-Terphenyl-d14*	-	91	90	99	88	72	88	98	105	115	103	108	110	106	107	98.6	72	115

NOTES:
1) Criteria based on CCME Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health for Residential/Parkland Land Use for Fine Grained Soil
2) Exceedance indicated with shading

Table 28: Metals Concentration in Soil in Main Dump Area

PARAMETER	CRITERIA (ppm)	MD-ET150	MD-ET151
		Sample Depth (cm)	
		0-30	0-30
Arsenic	30	1.4	1.7
Cadmium	5	0.11	0.09
Chromium	250	18.8	25.9
Cobalt	50	6.2	8.5
Copper	100	8	14
Lead	200/500[2]	9	9.3
Nickel	100	9.9	14
Zinc	500	50	69

Table 29: PCB concentrations in Soil in Main Dump Area

PARAMETER	CRITERIA (ppm)	MD-ET150	MD-ET151
		Sample Depth (cm)	
		0-30	0-30
Aroclor 1016	1/5[2]	<0.1	<0.1
Aroclor 1221	1/5[2]	<0.1	<0.1
Aroclor 1232	1/5[2]	<0.1	<0.1
Aroclor 1242	1/5[2]	<0.1	<0.1
Aroclor 1248	1/5[2]	<0.1	<0.1
Aroclor 1254	1/5[2]	<0.1	<0.1
Aroclor 1260	1/5[2]	<0.1	<0.1
Aroclor 1262	1/5[2]	<0.1	<0.1
Aroclor 1268	1/5[2]	<0.1	<0.1
Total PCBs	1/5[2]	<0.1	<0.1
Decachlorobiphenyl	%	96	92

NOTES:

1) Criteria based on INAC Abandoned Military Site Remediation Protocol Guidelines for Fine Grained Soil
2) Tier I / Tier II Guidelines
3) Exceedance indicated with shading

Table 30: Metals Concentration in Soil in Airstrip Area

PARAMETER	CRITERIA (ppm)	AS-ET108	AS-ET108	AS-ET109	AVERAGE	MIN	MAX
		Sample Depth (cm)					
		0-10	30-40	0-10			
Arsenic	30	2.8	1.6	1.4	1.9	1.4	2.8
Cadmium	5	3.63	0.19	0.14	1.3	0.14	3.63
Chromium	250	26.8	24.8	21.4	24.3	21.4	26.8
Cobalt	50	7.1	7.7	6.9	7.2	6.9	7.7
Copper	100	107	12	9	42.7	9	107
Lead	200/500[2]	92.3	9.4	7.3	36.3	7.3	92.3
Nickel	100	15.9	13.1	11.1	13.4	11.1	15.9
Zinc	500	1570	144	56	590.0	56	1570

Table 31: PCB concentrations in Soil in Airstrip Area

PARAMETER	CRITERIA (ppm)	AS-ET108	AS-ET108	AS-ET109	AVERAGE	MIN	MAX
		Sample Depth (cm)					
		0-10	30-40	0-10			
Aroclor 1016	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1262	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1268	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total PCBs	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Decachlorobiphenyl	%	121	105	122	116	105	122

NOTES:

1) Criteria based on INAC Abandoned Military Site Remediation Protocol Guidelines for Fine Grained Soil
2) Tier I / Tier II Guidelines
3) Exceedance indicated with shading

Table 32: PHC Concentration in Soil in Airstrip Area

PARAMETER	CRITERIA (mg/kg)	AS-ET105	AS-ET105	AS-ET106	AS-ET107	AS-ET108	AS-ET108	AS-ET109	AVERAGE	MIN	MAX
	Surface Soil	Sample Depth (cm)									
	(<1.5 m)	0-10	60-70	0-10	0-10	0-10	30-40	0-10			
Benzene	0.0068	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Toluene	0.08	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	0.02
Ethylbenzene	0.018	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Total Xylenes (m,p,o)	2.4	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
F1 C6-C10	260	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
F2 C10-C16	900	<10	<10	50	<10	830	20	<10	300	<10	830
F3 C16-C34	800	130	<10	540	10	25500	440	40	4443	<10	25500
F4 C34-C50	5600	20	<10	90	<10	4560	70	<10	1185	<10	4560
F4HTGC C34-C50+	5600	20	10	160	<10	6780	110	<10	1416	<10	6780
% C50+	%	0	0	9.5	0	6.7	6.8	0	-	-	-

NOTES:
1) BTEX criteria based on CCME Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health for Residential/Parkland Land Use for Fine Grained Soil
2) F1-F4 criteria based on CCME Canada Wide Standards for PHC's in Soil for Residential Land Use and Fine Grained Soil
3) Benzene criteria is based on a 10^{-6} incremental risk
4) Exceedance indicated with shading

Table 33: PAH Concentration in Soil in Airstrip Area

PARAMETER	CRITERIA (mg/kg)	AS-ET105	AS-ET105	AS-ET106	AS-ET107	AS-ET108	AS-ET108	AS-ET109	AVERAGE	MIN	MAX
		Sample Depth (cm)									
		0-10	60-70	0-10	0-10	0-10	30-40	0-10			
Naphthalene	0.6	<0.05	<0.05	<0.05	<0.05	0.13	<0.05	<0.05	0.1	<0.05	0.13
Acenaphthylene	-	<0.05	<0.05	<0.05	<0.05	0.05	<0.05	<0.05	0.05	<0.05	0.05
Acenaphthene	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Fluorene	-	<0.05	<0.05	<0.05	<0.05	0.14	<0.05	<0.05	0.14	<0.05	0.14
Phenanthrene	5	<0.05	<0.05	<0.05	<0.05	0.75	<0.05	<0.05	0.75	<0.05	0.75
Anthracene	-	<0.05	<0.05	<0.05	<0.05	0.11	<0.05	<0.05	0.11	<0.05	0.11
Fluoranthene	-	<0.05	<0.05	<0.05	<0.05	0.57	<0.05	<0.05	0.57	<0.05	0.57
Pyrene	10	<0.05	<0.05	<0.05	<0.05	1.4	<0.05	<0.05	1.40	<0.05	1.4
Benzo(a)anthracene	1	<0.05	<0.05	<0.05	<0.05	0.2	<0.05	<0.05	0.20	<0.05	0.2
Chrysene	-	<0.05	<0.05	<0.05	<0.05	1.01	<0.05	<0.05	1.01	<0.05	1.01
Benzo(b)fluoranthene	1	<0.05	<0.05	<0.05	<0.05	0.27	<0.05	<0.05	0.27	<0.05	0.27
Benzo(j)fluoranthene	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(k)fluoranthene	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(a)pyrene	0.7	<0.05	<0.05	<0.05	<0.05	0.06	<0.05	<0.05	0.06	<0.05	0.06
Indeno(1,2,3-c,d)pyrene	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dibenzo(a,h)anthracene	1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(g,h,i)perylene	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
CB(a)P	-	<0.0002	<0.0002	<0.0002	<0.0002	0.1114	<0.0002	<0.0002	0.1114	<0.0002	0.1114
Nitrobenzene-d5*	-	109	100	95	89	84	92	91	94.3	84	109
2-Fluorobiphenyl*	-	98	93	101	98	24	94	101	87.0	24	101
p-Terphenyl-d14*	-	116	105	105	105	85	98	86	100.0	85	116

NOTES:
1) Criteria based on CCME Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health for Residential/Parkland Land Use for Fine Grained Soil
2) Exceedance indicated with shading

Table 34: Metals Concentration in Soil in Simpson Lake Sediment Area

PARAMETER	CRITERIA (ppm)	Simp. Sed 1	Simp. Sed 2	Simp. Sed 3	AVERAGE	MIN	MAX
Arsenic	30	1.5	2	1.6	1.7	1.5	2
Cadmium	5	0.07	0.09	0.09	0.1	0.07	0.09
Chromium	250	23.7	24.2	22.2	23.4	22.2	24.2
Cobalt	50	7.1	6.8	5.8	6.6	5.8	7.1
Copper	100	7	7	6	6.7	6	7
Lead	200/500[2]	6.3	7	5.9	6.4	5.9	7
Nickel	100	11.3	11.3	10.2	10.9	10.2	11.3
Zinc	500	50	44	40	44.7	40	50

Table 35: PCB concentrations in Soil in Simpson Lake Sediment Area

PARAMETER	CRITERIA (ppm)	Simp. Sed 1	Simp. Sed 2	Simp. Sed 3	AVERAGE	MIN	MAX
Aroclor 1016	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1262	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1268	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total PCBs	1/5[2]	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Decachlorobiphenyl	%	65	67	70	67	65	70

NOTES:

1) Criteria based on INAC Abandoned Military Site Remediation Protocol Guidelines for Fine Grained Soil
2) Tier I / Tier II Guidelines
3) Exceedance indicated with shading

Table 36: PHC Concentration in Soil in Simpson Lake Sediment Area

PARAMETER	CRITERIA (mg/kg) Surface Soil (<1.5 m)	Simp. Sed 1	Simp. Sed 2	Simp. Sed 3	AVERAGE	MIN	MAX
Benzene	0.0068	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Toluene	0.08	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Ethylbenzene	0.018	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Total Xylenes (m,p,o)	2.4	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
F1 C6-C10	260	<1	<1	<1	<1	<1	<1
F2 C10-C16	900	<10	<10	<10	<10	<10	<10
F3 C16-C34	800	150	<10	<10	150	<10	150
F4 C34-C50	5600	80	<10	<10	80	<10	80
F4HTGC C34-C50+	5600	170	<10	<10	170	<10	170
% C50+	%	28.9	0	0	-	-	-

NOTES:

1) BTEX criteria based on CCME Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health for Residential/Parkland Land Use for Fine Grained Soil
2) F1-F4 criteria based on CCME Canada Wide Standards for PHC's in Soil for Residential Land Use and Fine Grained Soil
3) Benzene criteria is based on a 10^{-6} incremental risk
4) Exceedance indicated with shading

Table 37: Metals Concentration in Soil in Simpson Lake Shoreline (ESG 84) Area

PARAMETER	CRITERIA (ppm)	ET-ESG 84 A	ET-ESG 84 B	ET-ESG 84 C	AVERAGE	MIN	MAX
		Sample Depth (cm)					
		0-30	0-30	0-30			
Arsenic	30	1	1	1.2	1.1	1	1.2
Cadmium	5	0.06	0.06	0.06	0.1	0.06	0.06
Chromium	250	10.6	9.4	10.9	10.3	9.4	10.9
Cobalt	50	3.8	3.8	4.4	4.0	3.8	4.4
Copper	100	5	5	7	5.7	5	7
Lead	200/500[2]	4.4	4	4.7	4.4	4	4.7
Nickel	100	5.4	5.3	6.7	5.8	5.3	6.7
Zinc	500	26	24	23	24.3	23	26

NOTES:

1) Criteria based on INAC Abandoned Military Site Remediation Protocol Guidelines for Fine Grained Soil
2) Tier I / Tier II Guidelines
3) Exceedance indicated with shading

Table 38: Metals Concentration in Soil in Plumbers Dump Area

PARAMETER	CRITERIA (ppm)	PLUMDUMP-ET162 Sample Depth 0-20
Arsenic	30	1.6
Cadmium	5	5.13
Chromium	250	21.2
Cobalt	50	7
Copper	100	16
Lead	200/500[2]	8.5
Nickel	100	11
Zinc	500	99

Table 39: PCB concentrations in Soil in Plumbers Dump Area

PARAMETER	CRITERIA (ppm)	PLUMDUMP-ET162 Sample Depth 0-20
Aroclor 1016	1/5[2]	<0.1
Aroclor 1221	1/5[2]	<0.1
Aroclor 1232	1/5[2]	<0.1
Aroclor 1242	1/5[2]	<0.1
Aroclor 1248	1/5[2]	<0.1
Aroclor 1254	1/5[2]	<0.1
Aroclor 1260	1/5[2]	<0.1
Aroclor 1262	1/5[2]	<0.1
Aroclor 1268	1/5[2]	<0.1
Total PCBs	1/5[2]	<0.1
Decachlorobiphenyl	%	77

NOTES:

1) Criteria based on INAC Abandoned Military Site Remediation Protocol Guidelines for Fine Grained Soil
2) Tier I / Tier II Guidelines
3) Exceedance indicated with shading

Table 40: Heavy Metals Concentration in Surface Waters

PARAMETER	CRITERIA (mg/L)	POL	OUTFALL	PALLET LINE	MAIN DUMP	MAIN DUMP A	VEHICLE DUMP	FRESHWATER LK	SIMPSON LK
Arsenic	0.005	0.0008	0.0004	0.0012	0.0003	0.0003	0.0005	<0.0002	<0.0002
Cadmium	0.000017	0.00003	0.00028	0.00012	0.00003	0.00003	<0.00001	<0.00001	<0.00001
Chromium	0.0089	0.001	0.0007	0.0118	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt	-	0.0004	0.001	0.0032	0.0001	0.0001	0.0001	<0.0001	<0.0001
Copper	0.002	0.006	0.008	0.01	0.004	0.003	0.001	<0.001	<0.001
Lead	0.002	0.0009	0.0004	0.0072	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	0.065	0.0026	0.0034	0.0082	0.0022	0.0028	0.0007	<0.0005	<0.0005
Zinc	0.03	0.008	0.122	0.045	0.013	0.013	0.004	0.001	0.001

Table 41: PCB Concentrations in Surface Waters

PARAMETER	CRITERIA (mg/L)	OUTFALL	MAIN DUMP	MAIN DUMP A	SIMPSON LAKE
Aroclor 1016	0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1262	0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1268	0.1	<0.1	<0.1	<0.1	<0.1
Total PCBs	0.1	<0.1	<0.1	<0.1	<0.1

NOTES:

1) Criteria based on CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life for Freshwater

2) Exceedance indicated with shading

Table 42: PHC Concentration in Surface Waters

PARAMETER	CRITERIA (mg/L)	POL	PALLET LINE	FUEL TANKS	FUEL TANKS A	SIMPSON LAKE
Benzene	0.37	<0.001	<0.001	<0.001	<0.001	<0.001
Toluene	0.002	<0.001	<0.001	<0.001	<0.001	<0.001
Ethylbenzene	0.09	<0.001	<0.001	<0.001	<0.001	<0.001
Total Xylenes (m,p,o)	-	<0.001	<0.001	<0.001	<0.001	<0.001
F1 C6-C10	-	<0.01	<0.01	<0.01	<0.01	<0.01
F2 C10-C16	-	<0.1	<0.1	<0.1	<0.1	<0.1
F3 C16-C34	-	<0.1	<0.1	<0.1	<0.1	<0.1
F3+ C34+	-	<0.1	<0.1	<0.1	<0.1	<0.1

Table 43: PAH Concentration in Surface Waters

PARAMETER	CRITERIA (µg/L)	POL	PALLET LINE	FUEL TANKS	FUEL TANKS A
Naphthalene	1.1	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	-	<0.01	<0.01	<0.01	<0.01
Acenaphthene	5.8	<0.01	<0.01	<0.01	<0.01
Fluorene	3	<0.01	<0.01	<0.01	<0.01
Phenanthrene	0.4	<0.01	<0.01	<0.01	<0.01
Anthracene	0.012	<0.01	<0.01	<0.01	<0.01
Fluoranthene	0.04	<0.01	<0.01	<0.01	<0.01
Pyrene	0.025	<0.02	<0.02	<0.02	<0.02
Benzo(a)anthracene	0.018	<0.02	<0.02	<0.02	<0.02
Chrysene	-	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	-	<0.01	<0.01	<0.01	<0.01
Benzo(j)fluoranthene	-	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	-	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	-	<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-c,d)pyrer	-	<0.01	<0.01	<0.01	<0.01
Dibenzo(a,h)anthracer	-	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	-	<0.01	<0.01	<0.01	<0.01
CB(a)P	-	<0.01	<0.01	<0.01	<0.01
Nitrobenzene-d5*	-	102	93	103	107
2-Fluorobiphenyl*	-	75	59	65	65
p-Terphenyl-d14*	-	100	85	88	86

NOTES:

1) Criteria based on CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life for Freshwater

2) Exceedance indicated with shading

Table 44: Relative Percent Difference for Duplicate Heavy Metals in Soil Results

	Sample ID		RPD	Sample ID		RPD	Sample ID		RPD	Sample ID		RPD
	ECA-ET140	ECA-ET140A		Back 6	Back 6A		OUT-ET111	OUT-ET111A		PL-ET144	PL-ET144A	
	(0-30cm)			(0cm)			(0-10cm)			(0-30cm)		
Arsenic	1.20	1.30	2	0.90	2.30	22	1	2	3	1.20	0.90	7
Cadmium	0.07	0.09	6	0.05	0.07	8	0	0	6	0.18	0.16	3
Chromium	17.10	17.50	1	9.70	32.40	27	18	23	6	18.70	14.30	7
Cobalt	6.10	6.30	1	4.30	10.60	21	6	8	5	5.80	5.00	4
Copper	8.00	8.00	0	4.00	16.00	30	11	14	6	9.00	8.00	3
Lead	6.00	6.30	1	4.40	9.00	17	6	8	5	13.60	17.20	6
Nickel	9.10	10.00	2	5.80	18.00	26	10	12	5	9.50	7.80	5
Zinc	40.00	40.00	0	19.00	62.00	27	46	52	3	136.00	124.00	2

Table 45: Relative Percent Difference for Duplicate PAHs in Soil Results

	Sample ID		RPD	Sample ID		RPD	Sample ID		RPD
	BRN1-ET134	BRN1-ET134A		FT-ET165	FT-ET165A		PL-ET144	PL-ET144A	
	(0-30cm)			(50-80cm)			(0-30cm)		
Naphthalene	<0.05	<0.05		1.43	1.03		<0.05	<0.05	
Acenaphthylene	<0.05	<0.05		<0.05	<0.05		<0.05	<0.05	
Acenaphthene	<0.05	<0.05		<0.05	<0.05		<0.05	<0.05	
Fluorene	<0.05	<0.05		<0.05	<0.05		<0.05	<0.05	
Phenanthrene	0.09	0.15	13	<0.05	<0.05		<0.05	<0.05	
Anthracene	0.06	0.07	4	<0.05	<0.05		<0.05	<0.05	
Fluoranthene	0.70	0.78	3	<0.05	<0.05		0.30	0.25	5
Pyrene	0.96	1.06	2	<0.05	<0.05		0.46	0.38	5
Benzo(a)anthracene	0.15	0.15	0	<0.05	<0.05		<0.05	<0.05	
Chrysene	0.25	0.26	1	<0.05	<0.05		0.45	0.34	7
Benzo(b)fluoranthene	0.16	0.19	4	<0.05	<0.05		<0.05	<0.05	
Benzo(j)fluoranthene	<0.05	<0.05		<0.05	<0.05		<0.05	<0.05	
Benzo(k)fluoranthene	0.21	0.19	3	<0.05	<0.05		<0.05	<0.05	
Benzo(a)pyrene	0.24	0.23	1	<0.05	<0.05		<0.05	<0.05	
Indeno(1,2,3-c,d)pyrene	0.20	0.19	1	<0.05	<0.05		<0.05	<0.05	
Dibenzo(a,h)anthracene	<0.05	<0.05		<0.05	<0.05		<0.05	<0.05	
Benzo(g,h,i)perylene	0.26	0.27	1	<0.05	<0.05		<0.05	<0.05	
CB(a)P	0.33	0.32	1	<0.0002	<0.0002		0.00	0.00	7
Nitrobenzene-d5*	61.00	60.00	0	>130	120.00		130.00	130.00	0
2-Fluorobiphenyl*	32.00	31.00	1	96.00	99.00	1	56.00	55.00	0
p-Terphenyl-d14*	64.00	63.00	0	105.00	115.00	2	112.00	81.00	8

Note:
1) Exceedance of acceptable RPD is indicated by shading

Table 46: Relative Percent Difference for Duplicate PHCs in Soil Results

	Sample ID		RPD	Sample ID		RPD	Sample ID		RPD
	BRN1-ET134	BRN1-ET134A		FT-ET165	FT-ET165A		PL-ET144	PL-ET144A	
	(0-30cm)			(50-80cm)			(0-30cm)		
Benzene	<0.02	<0.02		<0.02	<0.02		<0.02	<0.02	
Toluene	0.02	0.02		<0.02	<0.02		<0.02	<0.02	
Ethylbenzene	<0.02	<0.02		<0.02	<0.02		<0.02	<0.02	
Total Xylenes (m,p,o)	<0.02	<0.02		0.17	0.10	13	<0.02	<0.02	
F1 -BTEX				83.00	32.00	22			
F1 C6-C10	3.00	5.00	13	83.00	32.00	22	19.00	20.00	1
F2 C10-C16	1840.00	1640.00	3	440.00	350.00	6	3340.00	2710.00	5
F3 C16-C34	11300.00	9530.00	4	330.00	280.00	4	28300.00	26100.00	2
F4 C34-C50	13300.00	10400.00	6	80.00	60.00	7	6540.00	6400.00	1
F4HTGC C34-C50+	14400.00	10800.00	7	90.00	70.00	6	10100.00	9930.00	0
% C50+	4.20	1.50	24	1.20	0.00	50	8.50	9.10	2

Table 47: Relative Percent Difference for Duplicate PHCs in Soil Results

	Sample ID		RPD
	OUT-ET111	OUT-ET111A	
	(0-10cm)		
Aroclor 1016	<0.1	<0.1	
Aroclor 1221	<0.1	<0.1	
Aroclor 1232	<0.1	<0.1	
Aroclor 1242	<0.1	<0.1	
Aroclor 1248	<0.1	<0.1	
Aroclor 1254	<0.1	<0.1	
Aroclor 1260	<0.1	<0.1	
Aroclor 1262	<0.1	<0.1	
Aroclor 1268	<0.1	<0.1	
Total PCBs	<0.1	<0.1	
Decachlorobiphenyl	70.00	61.00	3

Note:
1) Exceedance of acceptable RPD is indicated by shading

Table 48: Detailed Summary of Non-Hazardous Materials CAM D

Location	Items	Material of Concern	Quantity	Comments	In Situ Volume	Crushed or Cut Volume	Landfilled Volume m^3
Main Dump	Tracked Bombardier	Steel/Iron	1		4	2	2.2
	Wobbly Tired Grader Box	Steel/Iron	1		4	4	4.4
	Buggy Earthmover Frame	Steel/Iron	1		4	4	4.4
	Truck	Steel/Iron	1		4	3	3.3
	Barrels	Steel/Iron	2500		400	120	132
	Scrap Metal	Steel/Iron	Lump sum		40	20	22
	Scrap Wood	Wood	Lump sum		40	20	22
	Waste Concrete	Concrete	Lump sum		5	5	5.5
	Random Heavy Equipment	Steel/Iron	Lump sum		20	18	19.8
Pallet Line Area	Barrels	Steel/Iron	688		110.08	33.024	36.3264
	Scrap Metal	Steel/Iron	Lump sum		1	0.5	0.55
POL Area	POL Tank	Steel/Iron	1		75	15	16.5
	Barrels	Steel/Iron	245		39.2	11.76	12.936
	Scrap Metal	Steel/Iron	Lump sum		1	0.5	0.55
	Scrap Wood	Wood	Lump sum		1	0.5	0.55
	POL Shed	Metal/Wood	1		4	2	2.2
	Burried Debris	Steel/Iron	Lump sum		1000	800	880
Warehouse, Burn Pit and Burried Debris Area	Burried Debris Pile NE of Warehouse	Steel/Iron	Lump sum		320	256	281.6
	Burried Debris Pile S of Warehouse	Steel/Iron	Lump sum		600	480	528
	Barrels	Steel/Iron	28		4.48	1.344	1.4784
Electrical Cabinets and Miscellaneous Debris Piles Area	Barrels	Steel/Iron	15		2.4	0.72	0.792
	Scrap Metal	Steel/Iron	Lump sum		2.5	1.25	1.375
	Scrap Wood	Wood	Lump Sum		9	4.5	4.95
	Waste Concrete	Concrete	Lump sum		1	1	1.1
	Electrical Cabinets	Metal	8		8	4	4.4
Portable Fuel Tank Area	Barrels	Steel/Iron	38		6.08	1.824	2.0064
	Portable Fuel Tanks	Steel/Iron	2		20	10	11
	Random Heavy Equipment	Steel/Iron	Lump sum		1.5	1.35	1.485
Inuit House Area	Barrels	Steel/Iron	11		1.76	0.528	0.5808
	Scrap Metal	Steel/Iron	Lump sum		1	0.5	0.55
	Scrap Wood	Wood	Lump sum		1	0.5	0.55
Barrel Dump	Barrels	Steel/Iron	5100		816	244.8	269.28
Vehicle Dump	Barrels	Steel/Iron	8		1.28	0.384	0.4224
	Trucks	Steel/Iron	2		8	7.2	7.92
	Random Heavy Equipment	Steel/Iron	Lump sum		8	7.2	7.92
Garage, Upper Station Area (Includes Antenna)	Barrels	Steel/Iron	25		4	1.2	1.32
	Heat Exchanger	Steel	1		2	1	1.1
	Fuel Tanks	Steel	2		1	0.5	0.55
Airstrip Area	Barrels	Steel/Iron	50		8	2.4	2.64
	Scrap Metal	Steel/Iron	Lump sum		1	0.5	0.55
	Scrap Wood	Wood	Lump sum		3	1.5	1.65
	Tracked Bombardier	Steel/Iron	1		4	3.6	3.96
	Grader	Steel/Iron	1		4	3.6	3.96
	Truck	Steel/Iron	1		4	3.6	3.96
	Tracked Crane	Steel/Iron	1		6	5.4	5.94
Freshwater Lake	Barrels	Steel/Iron	36		5.76	1.728	1.9008
	Scrap Wood	Wood	Lump sum		2	1	1.1
	Scrap Metal	Steel/Iron	Lump sum		2	1	1.1
	Truck Box	Steel/Iron	Lump sum		3	2.7	2.97
	Random Heavy Equipment	Steel/Iron	Lump sum		0.5	0.45	0.495
	Large Steel Cabinet	Steel/Iron	Lump sum		2.5	1.25	1.375
Plumbers Dump Area	Barrels	Steel/Iron	8		1.28	0.384	0.4224
	Plumbing material and Fittings	Steel/Iron	Lump sum		1.5	1.35	1.485
	Scrap Metal	Steel/Iron	Lump sum		0.5	0.25	0.275
	Scrap Wood	Wood	Lump sum		0.5	0.25	0.275
Borrow Source Area	Barrels	Steel/Iron	260		41.6	12.48	13.728
	Scrap Wood	Wood	Lump sum		1	0.5	0.55
	Scrap Metal	Steel/Iron	Lump sum		1	0.5	0.55
	Clay borrow Material	Clay	Lump sum		110090	N/A	N/A
	Sand/Gravel Borrow Source 1	Sand/Gravel	Lump sum		181713	N/A	N/A
	Sand/Gravel Borrow Source 2	Sand/Gravel	Lump sum		9378	N/A	N/A
	Sand/Gravel Borrow Source 3	Sand/Gravel	Lump sum		11748	N/A	N/A
	Cobble Volume	Cobble	Lump sum		846	N/A	N/A
Simpson Lake Area	Barrels	Steel/Iron	50		8	2.4	2.64
	Scrap Wood	Wood	Lump sum		1	0.5	0.55
	Scrap Metal	Steel/Iron	Lump sum		1	0.5	0.55

Totals							
	Main Dump	Main Station Area	Airstrip Area	Freshwater Lakes	Borrow Source Area	Simpson Lake	Totals
Heavy Equipment	34.1	17.325	17.82	3.465	0	0	**72.71**
Barrels	132	325.1424	2.64	2.3232	13.728	2.64	**478.4736**
Scrap Metal	22	38.775	0.55	4.235	0.55	0.55	**66.66**
Scrap Wood	22	6.05	1.65	1.375	0.55	0.55	**32.175**
Concrete	5.5	9.9	0	0	0	0	**15.4**
Burried Debris	0	1689.6	0	0	0	0	**1689.6**
						Total	2355.0186

Table 49: Detailed Summary of Hazardous Materials CAM D

Location	Items	Material of Concern	Quantity	Comments	Surface Area m2	Material Volume m^3
Garage, Upper Station Area (Includes Antenna)	Vermiculite in soil	Asbestos				5
	Floor Tile	Asbestos		Grey Floor Tile (5% Chrysotile) broken and scattered throughout debris piles.		2
	Transite Board	Asbestos		(20% Chrysotile) Broken and edges exposed	30	4
	Pipe Insulation	Asbestos		(60-80% Chrysotile, 2% Amosite) Poor condition, friable		5
	Door Insulation	Asbestos		(60% Chrysotile), 1 door is broken, friable asbestos		1
	Grey Deck Paint	PCBs-Lead		(78.2 ppm-3900 ppm) poor condition, flaking	10	3
	Grey Garage Interior Paint over exterior metal cladding	PCBs-Lead		(157 ppm-4500 ppm) Poor condition, flaking	426	5
	Orange/Grey Garage Interior Paint over garage Structural Steel	Lead		(128000 ug/g)	20	10
	Orange Antenna Paint / White Antenna Paint	Lead		(91500 ug/g) / (2700 ug/g)		35
	Silver POL Pump Shed	Lead		(84800 ug/g)		5
Pallet Line Area	Barrels of POL	POL	15			2.4
POL Area	Large Silver Storage Tank	POL	14			14
Various Locations	Batteries	Lead and Battery Acid	30			1
Various Locations	Compressed Gas Cylinders	Compressed Gas	20			2

Summary of Hazardous Materials	m3
POL Fluid	16.4
Asbestos	17
Batteries	1
PCB Painted Materials	8
Lead Painted Materials	50

Table 50: Asbestos Building Materials

Sample ID	Sample Description	Asbestos Content (%)	Asbestos Type
ETHAZ1	vermicullite in soil	3	chrysotile
ETHAZ3	9x9 brown floor tile	0	
ETHAZ4	9x9 grey floor tile	5	chrysotile
ETHAZ5	transite board	20	chrysotile
ETHAZ6	pipe insulation	80, 2	chrysotile, amosite
ETHAZ10	door insulation	60	chrysotile
ETHAZ11	pipe insulation	60	chrysotile

NOTES:
1) Criteria based on Guideline for the Management of Waste Asbestos
2) Exceedance indicated with shading

Table 51: Building Materials Containing Lead Paint

Sample ID	Sample Description	Lead (µg/g)
ETHAZ7	grey deck paint	3900
ETHAZ8	grey, garage interior	4500
ETHAZ9	orange/grey, garage interior	128000
ETHAZ13	orange, antenna	91500
ETHAZ14	white, antenna	2700
ETHAZ16	silver, POL pump shed	84800

NOTES:
1) Criteria based on Guideline for the Management for Waste Lead and Lead Paint, NWT
2) Exceedance indicated with shading

Table 52: Building Materials Containing PCBs

Sample ID	ETHAZ7	ETHAZ8	ETHAZ9	ETHAZ13	ETHAZ14	ETHAZ16
Sample Description	grey deck paint	grey garage interior	orange/grey garage interior	orange antenna	white antenna	silver POL pump shed
Parameter (mg/kg)						
Aroclor 1016	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Aroclor 1221	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Aroclor 1232	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Aroclor 1242	<0.5	<0.5	<0.5	<0.5	<0.5	<50
Aroclor 1248	<0.5	<0.5	<0.5	<0.5	<0.5	<50
Aroclor 1254	78.2	157	19.5	1	1.5	<0.5
Aroclor 1260	<0.5	9.5	<0.5	<0.5	<0.5	<50
Aroclor 1262	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Aroclor 1268	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total PCBs	78.2	166.5	19.5	1	1.5	<0.5

NOTES:

1) Criteria based on CEPA Guideline
2) Exceedance indicated with shading

APPENDIX E

HEALTH AND SAFETY PLAN

SITE SPECIFIC
HEALTH AND SAFETY PLAN
FOR EARTH TECH OPERATIONS

CAM-D DEW LINE SITE, ENVIRONMENTAL SITE INVESTIGATION
SIMPSON LAKE, NUNAVUT
AUGUST 23rd TO SEPTEMBER 2nd, 2005



Prepared For: Public Works and Government Services Canada
Environmental Services Western Region
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Edmonton, Alberta

Attention: Mr. Brad Thompson, P.Eng.
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Submitted By: Earth Tech Canada Inc.
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August 2005

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1.0 INTRODUCTION AND BACKGROUND

Earth Tech Canada Inc. has been requested by Public Works & Government Services Canada (PWGSC) to provide engineering services for an Environmental Site Assessment, Materials Audit and Geotechnical Evaluation of the CAM-D DEW Line Site, located on the shore of Simpson Lake, Nunavut.

The contaminated sites in Canada's north are a result of mining, oil and gas activity and from former military activities. It is understood that DIAND is responsible for managing contaminated sites on Crown Land in Nunavut. To fulfill this responsibility, a series of environmental investigations and remedial activities will be initiated. In order to develop a remedial plan for the CAM-D site, PWGSC is required to have further assessments completed at the site. The assessments include the following components:

- Geotechnical Assessment – assessment of local available borrow materials and landfill locations. Also, assessment of the airstrip and roadways.
- Geophysical Assessment – geophysical assessment of dump sites and other disturbances.
- Phase III ESA and Materials Audit – completion of an environmental investigation in order to delineate and quantify areas of environmental concern as well as to determine volumes of hazardous and nonhazardous materials.
- Detailed Site Survey – topographical information, location of existing infrastructure, as well as sampling locations from the geotechnical, geophysical, Phase III and materials assessments, will be collected, tied into a UTM coordinate system and used to generate a base map for the CAM-D site.
- Remedial Action Plan – based on the results of all the above programs a remedial design will be developed for implementation at the site in 2007.

Specifically, the objectives of the project include the following:

- To obtain traditional knowledge regarding past and present land use of the site from elders of the nearby communities.
- Identify, characterize and quantify all hazardous and non-hazardous materials at the site and in nearby water bodies.
- Identify and delineate all contaminated overburden at the site.
- Identify borrow sources and potential locations for engineered landfills on-site.
- Evaluate the condition of site access roads and airstrip as well as possible CAT train routes to access site.
- Complete a detailed site survey, including the documentation of any fauna potentially using the site.
- Increase community and Inuit involvement in the program.
- Document all information in written reports and prepare a detailed work-plan and design for recommended site restoration and closure.

1.1 Technical Approach

One of the main goals of the assessment is to complete the delineation of subsurface contamination horizontally, as well as vertically, in all areas of environmental concern. It is understood that previous studies have identified areas with heavy metals and hydrocarbons and that in general the delineation was achieved horizontally but not vertically. Therefore the intent of this investigation is to fill in the data gaps.

Due to the remote nature of the site, the proposed work plan and sampling program is designed to try to accomplish full contaminant delineation during one site visit. In addition to meeting the technical requirements of this assignment, it is recognized that detailed logistical planning and preparation are required to carrying out the work in an efficient and cost effective manner while up keeping the highest level of safety and awareness.

1.2 Site Logistics/Health and Safety

It is understood that the work base will be a based out of Taloyoak and charter aircraft will be used to access the site on a daily basis. Mobilization of staff and equipment to the site will be initially from Yellowknife. An excavator attached to a ATV will also be used to assist in the completion of the assessment work.

Earth Tech employees are fully trained in all operations their field equipment including workplace ergonomics, and awareness of repetitive stress injuries.

Upon arrival at the site, Earth Tech will complete the following items prior to commencing with the investigation items listed in the work plan:

- Meet with the all investigation teams and get site and safety orientations; discuss Health and Safety Plan, work plans, equipment usage schedule.
- During the completion of the field activities, Earth Tech will inspect all study areas of the site to identify all potential risks/hazards to human health (structurally unsafe buildings, open excavations, tripping hazards, broken glass, rebar, chemical hazards, explosive hazards etc).
- Mark, sign and label all hazards upon identification.
- Locate previously investigated areas of environmental concern.

2.0 BACKGROUND DATA

2.1 Location

CAM-D is located in the middle of the Boothia Peninsula, approximately 4.5 km south of Simpson Lake and approximately 120 km southwest of Taloyoak (Spence Bay). The former DEW Line was abandoned in 1963.

2.2 Scope of Work

The scope of work for the project has been separated into individual tasks required at the site. These include an environmental site investigation, hazardous and non-hazardous materials audit, and geotechnical evaluation. Specific Standard Operating Procedures (SOP), for tasks that may undertaken by Earth Tech during the course of site activities, are included in the appendices of this plan.

Task 1: Site Logistics

PWGSC will be providing charter aircraft from Spence Bay to the site at a previously determined set time. All aircraft safety precautions will be adhered to as per the carrier's guidelines and Transport Canada Regulations. Onsite communications will be maintained via two-way radios.

Task 2: Surface Water and Sediment Sampling Program

Surface water and sediment samples will be collected from Simpson Lake. An inflatable boat will be used to assist in the collection of samples. Earth Tech has two PFDs that are required to be worn at all times when inside the boat.

Task 3: Delineation of Contaminated

In general, during the previous programs, impacted areas were delineated laterally but not vertically. Therefore, Earth Tech will be expected to delineate all impacted areas. Earth Tech will sample these locations with the means available (i.e. hand auger, backhoe, etc.) and a specific safety review will be carried with the operator and/or other team members prior to commencing the work.

Task 4: Inventory of Hazardous and Non-Hazardous Materials

Some building materials have been sampled and analyzed for potentially hazardous components. Principle hazardous building materials of concern are PCB's and lead in paint and asbestos containing materials. These hazardous material samples will be retrieved under OSHA, NIOSH, and EPA sampling protocol and guidelines (e.g. Adequately-wet NIOSH guideline for sampling asbestos). Level C PPE will be dawned where and when required. Non-hazardous materials at the site are predominantly associated with building materials and debris including equipment and barrels. Earth Tech will inventory the buildings and site debris in order to calculate volumes and weights of materials. Personnel will be cognizant of sharp objects, slippery and unstable surfaces. At no time will personnel climb, or place themselves beneath waste piles for investigation purposes

Task 5: Assessment of Existing Dumps, Barrels, Scattered and Partially Buried Debris

An unknown number of unopened barrels remain at site, potentially containing some product. Earth Tech will attempt to sample a representative number of barrels and characterize this waste through submission of samples to the laboratory. These barrels may also contain partially burned debris. Earth Tech will utilize drum sampler, syringes, and laceration proof gloves to conduct this task.

Task 6: Assessment of Borrow Sources and Landfill Locations

In order to identify potential borrow sources and future landfill locations, Earth Tech will advance testpits with the means available (i.e. hand auger, backhoe, etc.) and a specific safety review will be carried with the operator and/or other team members prior to commencing the work.

Task 7: Airstrip, Roadway and Site Access Evaluation

In order to evaluate the current state of the airstrip and roadways, Earth Tech will advance testpits with the means available (i.e. hand auger, backhoe, etc.) and a specific safety review will be carried with the operator and/or other team members prior to commencing the work. Investigative activities will only be performed on the airstrip during times of the day when planes/helicopters are not accessing the site. Also, the testpits will be advanced in locations that will not pose a threat to the safety of landing/departing aircrafts.

2.3 Training Requirements

As indicated in the TOR, only personnel having received the OSHA 40 Hour HAZWOPER training course will be allowed to handle any contaminated material.

All personal on site shall be responsible for attending a pre-job safety meeting held on site the morning of each workday. The meeting will be conducted as a daily tailgate safety meeting and an understating of each days scope of work will be established prior to commencing any activities on site. Other mid-day safety awareness and planning meeting will be held at the discretion of the onsite Earth Tech Engineer(s).

2.4 Project Personnel

PWGSC Satellite Phone (Globalstar)	**(403) 997-4821**
Ken Gilmet	(780) 497-3883
Ken Gilmet (Cell)	(780) 916-2138
Brad Thompson	(780) 497-3862
Brad Thompson (Cell)	(780) 918-6277
Earth Tech Satellite Phone (Iridium)	**011 8816 314 67990**
Earth Tech Edmonton Office	780-488-6800
Gordon Woollett	780-458-0710
Elaine Laing	(780) 453-2800
Elaine Laing After Hours	(780) 458-9258
Will Wawrychuk	(780) 453-0721
Will Wawrychuk After Hours	(780) 458-8815 (until August 18)
Police	**867-561-5201**
Medical	**867-561-5111**
Boothia Inn	867-561-5300
Summit Air	867 669-9789

Taloyoak Airport	867-561-6241
Kenn Borek Air	867 983-2415
Canadian Helicopters	416 200-2398
Spence Bay Health Centre	867-561-5111
Paleajook Co-Op	867-561-5221
Spence Bay Northern Store	867-561-5121

2.5 Work Schedule

The proposed work outlined in this health and safety plan is scheduled for August 23, 2005 to September 2nd, 2005 and will be completed during daylight hours.

2.6 Project Roles

Projects of this nature often require the input and participation of several different types of professionals. The paragraph below briefly outlines the roles of each participant for the investigation and closure of each site.

Indian and Northern Affairs Canada (INAC)

Client.

Public Works and Government Services Canada (PWGSC)

Clients project managing body responsible for contracts with consultant and other parties involved with project. Liaison for project staff and client.

Earth Tech Canada Inc.

Project environmental investigation consultant. Responsible for project design, sampling, laboratory analyses, liaison with PWGSC.

3.0 SITE CHARACTERISTICS

3.1 General

(See Section 2.1)

3.2 Access

Plans to access the site with the least amount of damage and disturbance will be implemented. Site access will be via fixed wing aircraft with floats.

3.3 Topography

The sit is situated on the Canadian Shield with sandy gravel deposits throughout. The main site is approximately 200 m above mean sea level and is comprised of gently slopes and drainage valleys.

3.4 Site Plans

A site plan is included with the appendices.

4.0 GENERAL HAZARDS

General site hazards have been identified as:

- Tripping, slipping, or stumbling on uneven or slippery/frozen terrain.

- Cold stress and weather conditions that may cause dehydration or wind burn.
- Loss of traction under wet driving/walking conditions.
- Lifting hazards during any site clearing activities.
- Noise and vibration hazards.
- Eye irritants or projectiles caused by wind.
- Working near wildlife.
- Contact with sharp or jagged objects while soil sampling off augers.
- Destructive sampling hazardous material assessment.

5.0 PROJECT SPECIFIC HAZARDS

5.1 Level of Safety

The investigation of possible subsurface contaminants presents specific safety precautions that must be adhered to.

Potential exposure pathways of chemical exposure these contaminants on site are primarily through dermal exposure and inhalation, and secondly through ingestion exposure.

All personal working are handling potentially hazardous substances shall be required to dawn a minimal of OSHA/NIOSH Level C Personal Protective Equipment (PPE). Level C PPE consists of:

- **Hard Hat**
- **Hearing protection where appropriate (e.g. concrete breaking with hydraulic hammer)**
- **Safety Glasses**
- **Steel Toed Boots**

5.2 Potential Contaminant Identification

The site has been previously used a silver mine site. At no time will on site investigation personnel use olfactory odour or taste identification techniques to identify possible chemical contamination. All identification and quantification shall be done with the use of visual, field instrument, and laboratory techniques.

5.3 Preventing Cross Contamination and Tracking

Cross contamination and tracking of chemicals can pose a safety hazard as well add to project schedule and budget to decontaminate equipment and personnel. All sampling, and excavation equipment shall have precautions taken to minimize exposure to potentially contaminated soil and ground water. Minimization may be in the form of:

- Inspecting PPE to ensure it is in proper condition before each use.
- Closing zippers, buttons, and snaps fully.
- Tucking inner gloves under the sleeves and outer gloves over sleeves.
- Tucking boots under the legs of outer clothing.

- Wearing hoods, if not attached, outside the collar.
- Taping all junctures to help prevent contaminants from running inside gloves, boots, and jackets.
- Follow standard operating procedures (SOP's) regarding decontamination and sampling.
- Minimize the use of porous substances such as wooden tools, leather, foam covered handles, etc. These items are difficult to decontaminate.
- Do not walk through puddles or stockpiled waste material.
- Properly disposing of equipment and solvents used for decontamination.
- Do not directly touch potential hazardous substances.
- Use remote sampling equipment when practical.
- Wear disposable outer garments and use disposable equipment when possible.
- Contain source of hazardous substance.

5.4 Decontamination Procedures

Decontamination of equipment, tools, and personnel will be necessary to prevent cross contaminant of samples, contaminant tracking, and personal hygiene and safety. Decontamination can be accomplished by:

- Physically removing contaminants.
- Chemically removing containments.
- Rinsing off containments.
- Disinfecting and Sterilizing.
- Combining the above methods.

The decontamination at the subject site will utilize a single surfactant/soap wash to clean any necessary sampling equipment. The following generalized decontaminating procedures will be followed during the course of the investigation.

- Personnel shall change gloves regularly during the investigation.
- Heavy equipment shall conduct site work in such a manner that prevents equipment from traveling through, or resting on any drill cuttings. This may include tarping of soils if reentry to investigation area is required.

5.4 Preservation of Site Conditions

The site is situated gravel pad areas built up on the arctic tundra. Travel on the tundra will b on a strictly need to access basis. All site monuments and survey markers will be left in place.

5.5 Working Near Wildlife

A variety of wildlife may be encountered while working within the limits of the site. In particular, polar bears. Since polar bears are extremely unpredictable, all personnel must work within the designated zone where a polar bear monitor (provided by general contractor) is situated. **Under no exceptions are personnel to be out of eye site and**

protection of bear monitor. Wildlife Monitors will be provided by the local Hunters and Trappers Association in Taloyoak**.**

A brief description of polar bear habits is provided within the appendices. At no time are animals encountered on site to be feed.

5.6 Decontamination of Personnel and Equipment

Hands must be washed prior to lunch and nutrition breaks. Equipment used on site shall be decontaminated prior to leaving the premises.

5.7 Record Keeping

The consultant shall keep a record of all health and safety procedures and decontamination practices. All incidents, near misses, and hazard identification shall be recorded. Copies of records will be included in consultants report to the client.

5.8 Insects

All personnel shall take precautions against being bit by flying insects. Bug net jackets and hoods shall be provided as will mosquito repellant with a minimum of 20% DEET. The use of repellent shall be completed under the manufactures instructions.

5.9 Aircraft

All personnel shall conform to Transport Canada rules and regulation for embarking and traveling on aircraft. Detailed guides to both helicopter safety and fixed wing aircraft are included with the appendices of this plan.

5.10 ATV's

All personnel shall conform to the ATV safety manual located in the appendices of this plan.

6.0 EMERGENCY CONTINGENCY PLAN

6.1 Responsibilities

Each member involved in onsite activities shall be responsible for identification of onsite hazards and safety of themselves and others. Each member engaged in onsite work for this project will be responsible for initiating the emergency response plan on an as identified basis.

The General Contractor shall provide emergency plan and mustering point.

6.2 Emergency Response Steps

Should and emergency arise, the following steps are to be taken:

1. Ensure your own safety.
2. Notify other team members of emergency.
3. Call for help.
4. If possible without further endangerment, attempt to assess/address situation and bring under control. Perform First Aid if required.
5. Inform consultant and/or team leader.
6. Inform Client(s).

ENV 201

GENERAL FIELD OPERATIONS REQUIREMENTS

Published:	**January 20, 2003**
Revised:	**N/A**
Page:	**1 of 2**

SUMMARY: The fundamental requirements presented in this procedure are generally applicable to Earth Tech work activities conducted at any job site, unrelated to the type of work activity being performed.

1.0 WORK SITE RULES

1. Each office/project site will have the appropriate labor posters (including state or Federal OSHA Notification) posted prominently. A source for these forms can be found on the EH&S website at http://corp.earthtech.com/healthsafety.
2. Legible and understandable precautionary labels will be prominently affixed to all containers of chemical raw materials, intermediates, products, by-products, mixtures, scrap, waste, debris, and contaminated clothing, per DOT, EPA, OSHA, or other applicable regulations.
3. At least one person qualified in the administration of first aid and cardiopulmonary resuscitation (CPR) will be present at all times at each Earth Tech work site unless exempted by the EH&S Department. Recognized agencies providing training and qualification in First Aid/CPR are the American Red Cross and the American Heart Association. A first aid kit will be provided at each project site. As appropriate, equipment on site will be bonded and grounded, spark proof, and explosion resistant. Ground fault interrupters will be utilized for all electrical equipment.
4. Hazards from protruding objects, careless movements, or placement of materials on paths or foot traffic areas present a problem with regard to slips, trips, falls, and puncture wounds. Personnel will use a reasonable amount of effort to keep slip, trip and fall hazards to a minimum.

2.0 EMPLOYEE PERFORMANCE RULES

1. Each employee, as a condition of employment, is required to comply with the health and safety procedures and the site safety plan governing in each area the employee is required to work. Project managers are to review records of each employee to ensure that all requirements are in compliance.
2. No one will initiate work on a project involving hazardous materials until appropriate training as required by regulation, contract and/or EH&S procedures have been implemented.
3. All employees are directed to immediately bring to the attention of the Site Supervisor or Site Safety Officer any unsafe condition, practice or circumstance.
4. The following practices are expressly forbidden during operations on work sites:
    - Smoking, eating, or drinking while on site except in designated areas;
    - Ignition of flammable or reactive materials;
    - Entry on site without proper safety equipment;
    - Conduct of operations on site without backup personnel;
5. Every accident is to be reported to the Site Supervisor immediately, whether or not anyone is injured.
6. Employees may not alter or attempt to repair any item of safety equipment unless specifically authorized and qualified.
7. An employee must not attempt to move or lift heavy or bulky objects beyond his capacity. No employee will lift more than 49 pounds without aid.
8. Possession or use of intoxicants or drugs on company premises or job sites is prohibited. Employees may not report for work or perform duties while under the influence of intoxicants or drugs. Use of prescription drugs are to be reported to the Site Supervisor and shall not impair the ability of the worker to work safely.
9. Walking under or working under a suspended load is not permitted.
10. Personnel on site will use the "buddy" system (pairs), working alone on any job site is forbidden. Communication or visual contact will be maintained between crew members at all times.

ENV 201 GENERAL FIELD OPERATIONS REQUIREMENTS	Published: January 20, 2003
	Revised: N/A
	Page: 2 of 2

3.0 EMERGENCY PLANNING

1. A sufficient number of fire extinguishers, with a minimum rating of 1A:10B:C, will be strategically located throughout the areas where active work is progressing so that travel distance to an extinguisher from any location is less than 75 linear feet.
2. Where work operations involve the on-site handling or use of corrosive materials (strong acids/bases, etc.) or materials which can cause significant eye irritation/damage, a fixed or portable eye wash unit will be located within 15 feet of the work area. The eyewash unit will meet the latest requirements of American National Standards Institute (ANSI) Standard Z358.1, and be capable of supplying hands-free irrigation of both eyes for at least 15 minutes at a flow rate of at least 0.4-gallon per minute. At the discretion of the EH&S Department, and emergency drench shower, meeting the requirements of ANSI Z358.1, will also be provided.

4.0 STANDARD OPERATING PROCEDURES

The EH&S Department has developed standard operating procedures (SOPs) addressing EH&S requirements for performance of many types of field activities. The requirements are found in the ENV 500-series Procedures, *Activity-Specific Safe Operating Procedures (SOPs)*.

REFERENCES: ENV 208 – *Injury and Illness Prevention Program*



Publications and videos

- Brochures
- Educational Packages
- Newsletters
- Posters
- Take Five
- Videos
- More...

Check It Out

- Canadian Aviation Executives' Safety Network (CAESN) Updated
- Runway Incursions Prevention Tools New
- Educational Packages
- Summer Briefing Kit New
- Weather to Fly Video
- SATOPS Final Report TP 13158
- Safety Management Systems (SMS) New

178 seconds (TP 2228E-1)

To purchase or to view/download alternate formats of this publication, visit Transport Canada's Online Publications Storefront.

If you're ever tempted to take off in marginal weather and have no instrument training, read this article first before you go. If you decide to go anyway and lose visual contact, *start counting down from 178 seconds*.

How long can a pilot who has no instrument training expect to live after he flies into bad weather and loses visual contact? Researchers at the University of Illinois found the answer to this question. Twenty students "guinea pigs" flew into simulated instrument weather, and all went into graveyard spirals or rollercoasters. The outcome differed in only one respect; the time required until control was lost. The interval ranged from 480 seconds to 20 seconds. The average time was 178 seconds, — two seconds short of three minutes.

Here's the fatal scenario...

The sky is overcast and the visibility poor. That reported 5-mile visibility looks more like two, and you can't judge the height of the overcast. Your altimeter says you're at 1500 but your map tells you there's local terrain as high as 1200 feet. There might even be a tower nearby because you're not sure just how far off course you are. But you've flown into worse weather than this, so you press on.

You find yourself unconsciously easing back just a bit on the controls to clear those non-too-imaginary towers. With no warning, you're in the soup. You peer so hard into the milky white mist that your eyes hurt. You fight the feeling in your stomach. You swallow, only to find your mouth dry. Now you realize you should have waited for better weather. The appointment was important — but not that important. Somewhere, a voice is saying "You've had it — it's all over!".

You now have 178 seconds to live. Your aircraft feels in an even keel but your compass turns slowly. You push a little rudder and add a little pressure on the controls to stop the turn but this feels unnatural and you return the controls to their original position. This feels better but your compass in now turning a little faster and your airspeed is increasing slightly. You scan your instrument panel for help but what you see looks somewhat unfamiliar. You're sure this is just a bad spot. You'll break out in a few minutes. (But you don't have several minutes left...)

You now have 100 seconds to live. You glance at your altimeter and are shocked to see it unwinding. You're already down to 1200 feet. Instinctively, you pull back on the controls but the altimeter still unwinds. The engine is into the red — and the airspeed, nearly so.

You have 45 seconds to live. Now you're sweating and shaking. There must be something wrong with the controls; pulling back only moves that airspeed indicator further into the red. You can hear the wind tearing at the aircraft.

You have 10 seconds to live. Suddenly, you see the ground. The trees rush up at you. You can see the horizon if you turn your head far enough but it's at an unusual angle — you're almost inverted. You open your mouth to scream but...

...you have no seconds left

Last updated: 2004-09-14 Important Notices



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Date: October 28, 2005

NORTHERN CONATMINATED SITE REMEDIATION GROUP - PWGSC

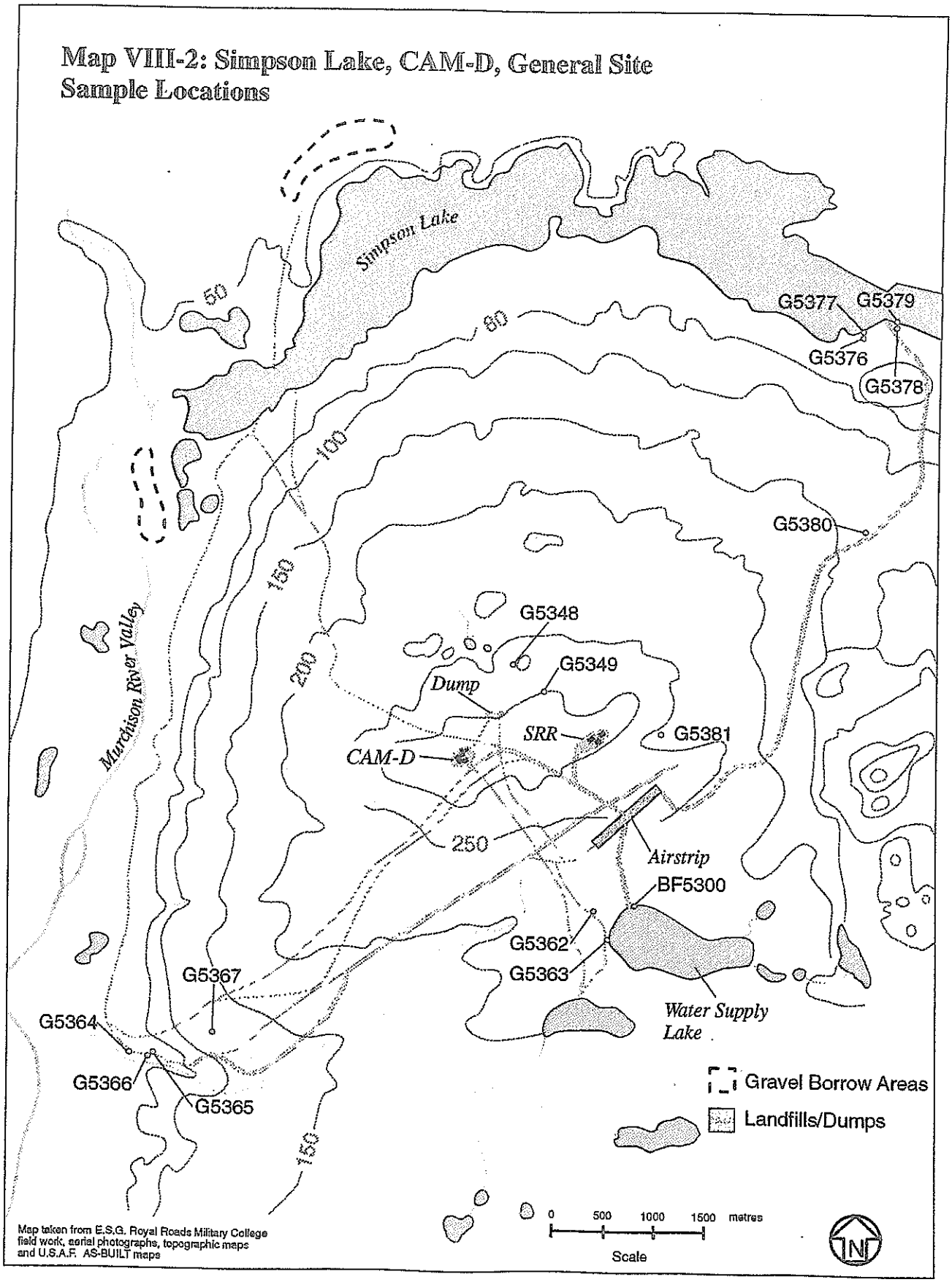
SIMPSON LAKE - DEW LINE SITE

CAM-D LOCATION

Figure 1.0

EarthTech
A Tyco International Ltd. Company

Map VIII-2: Simpson Lake, CAM-D, General Site Sample Locations



Map taken from E.S.G. Royal Roads Military College field work, aerial photographs, topographic maps and U.S.A.F. AS-BUILT maps

Polar Bear Behaviour

Polar bears are great travellers, always following the changing ice. Their normal gait when appears to be a ponderous shuffle but in fact allows the bear to cover long distances efficie legs are outward and then inward as the bear strides along at about 3 - 5 km/hr.

If pressed, a polar bear will break into a trot or a gallop and at top speed can travel about 3(However, most bears, particularly older well-fed ones, seem to tire quickly and take the first opportunity to lie down and rest.



In climbing over hummocks of rough ice and dodging among jumbled ice floes, polar bears remarkable agility for their size and weight and often resort to such places when pursued by dogs. When descending hillsides, the bear assumes a semi-reclining position and uses its forelegs as a brake. If the slope has no obstacles, a bear may lie on its belly and slide dow legs stretched out sideways.

Polar bears are most at home in areas that offer a combination of pack-ice, open water and seem to prefer travelling on solid ground or ice, although their wide feet and webbed toes a move with equal facility through deep soft snow. In water, they can swim at about 10 km/hr dive to depths of several metres and remain submerged for up to 2 minutes, keeping their e and their nostrils closed. In this way, they hunt seabirds in the water by diving and coming them.

Polar bears can pick up the scent of food for many kilometres and travel into the wind towa heads swinging back and forth as they track the scent to its source. They are also able to s

dens covered by ice and snow up to depths of about 1 m. The bear digs through the snow expose the seals within.

Bears use their swimming ability to hunt seals in open leads. They have been observed ca in water by floating motionless and gradually drifting to within striking distance. They also s escape from hunters or to move from floe to floe. When entering water a bear may jump in slide in backwards from the edge of an ice floe. After emerging from a swim, it shakes itsel excess water and decrease chilling.

Up • Distribution • Behaviour • Reproduction • Diet • Harvest Levels • Management • R

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Site last updated Tuesday, September 27, 2005



Polar Bear Diet

Seals are the main food source of polar bears, and are usually found wherever there a catch a seal the bear waits patiently at a breathing hole for the unsuspecting seal to surfac with a rapid blow to the head or lunges and bites. When the ice begins to drift apar progresses, bears stalk seals basking on the ice by silently crawling up to them and the Ringed seals are the most common prey, and other species such as harp, hooded and b and walrus are killed occasionally.

Other polar bear food includes white whales and narwhals, although bears do not oft animals. Usually they are found as carrion washed up on the coast which the bears August and September when much of the ice has melted. If sea birds are nesting nearby, their eggs may be included in the bear's diet. Occasionally they feed upon the carrion muskoxen. Seaweed, lichens, mosses, sorrel, sedges and grasses are also part of the sun

Polar bears have a great curiosity and tolerance for many diverse foods. Since European r in the arctic, the bears have expanded their taste to include such delicacies as bacon, chee engine oil, rope, rubber boats, tents, skidoo seats and nearly everything else associated wi

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ENV 501

MANUAL MATERIALS HANDLING

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SUMMARY: Earth Tech personnel will observe the procedures below when performing manual handling in excess of 10 pounds. No person shall lift more than 49 pounds without the use of mechanical aid or assistance from other personnel.

1.0 INTRODUCTION

Manual materials handling (MMH) means moving or handling things by lifting, lowering, pushing, pulling, carrying, holding, or restraining. Improper MMH can result in cuts, pinches, crushing, and serious back, abdomen, arm, and leg muscle and joint injury. Even "light" objects, lifted improperly, can contribute to injury, causing cuts and muscle injuries.

The level of hazard associated with MMH work depends on what is being handled, what the task is, and what the conditions are at the workplace. Specific considerations include:

- Is the load too heavy for the task that you are doing?
- Is the load located too high or low for a safe lift?
- Is the load too big or may have a shape that makes it difficult to handle?
- Is the load wet, slippery, or have sharp edges that make it difficult to grasp?
- Is the load unstable or can shift its center of gravity because contains items that can move or flow (e.g., a partially filled drum or concrete in a wheelbarrow)?
- Is the load too big to let you see where you are putting your feet?

The task can make MMH hazardous if a worker:

- Uses poor lifting techniques (lifting too fast, too often or too long; lifting with back bent or while twisting or reaching too far; lifting while sitting or kneeling, etc.),
- Has to move material over long distances,
- Doers not take appropriate rest breaks; insufficient recovery time, and
- Performs a combination of different handling tasks together (e.g. lifting, carrying and lowering).

The site conditions can also contribute to hazards of MMH if:

- Walking surfaces are uneven, sloping, wet, icy, slippery, unsteady, etc..
- There are differences in floor levels or walking surfaces.
- There is poor housekeeping that causes slip, trip and fall hazards.
- There is inadequate lighting.
- Work is performed at a fast pace.
- Movement is restricted because of clothing or personal protective equipment, or because the space is small or posture is constrained.

2.0 GENERAL REQUIREMENTS

Mechanical equipment or assistance such as dollies, carts, come-alongs, or rollers are to be used whenever possible. Mechanical assistance must be of proper size, have wheels sized for the terrain, and be designed to prevent pinching or undue stress on wrists. Objects to be moved must be secured to prevent falling and properly balanced to prevent tipping.

The following guidance will be observed:

1. Before performing the lift:
    a. Check to see if mechanical aids such as hoists, lift trucks dollies or wheelbarrows are available.

b. Be sure that you can lift the load without over-exertion, and get help with heavy or awkward loads. All loads in excess of 49 pounds require use of mechanical aids or assistance from other personnel.
c. Be sure that the load is "free" to move.
d. Check that the planned location of the load is free of obstacles and debris.
e. Be sure that the path to the planned location of the load is clear. Grease, oil, water, litter and debris can cause slips and falls.
f. Particular handling and lifting techniques are needed for different kinds of loads or materials being handled (for example, compact loads, small bags, large sacks, drums, barrels, cylinders, sheet materials like metal or glass). See Section 2.0 for additional guidance.
g. Do not lift if you are not sure that you can handle the load safely.

2. General tips for lifting:
   a. Prepare for the lift by warming up the muscles.
   b. Stand close to the load and face the way you intend to move.
   c. Use a wide stance to gain balance.
   d. Be sure you have a good grip on the load.
   e. Keep arms straight.
   f. Tighten abdominal muscles.
   g. Tuck chin into the chest.
   h. Initiate the lift with body weight.
   i. Lift the load as close to the body as possible.
   j. Lift smoothly without jerking.
   k. Avoid twisting and side bending while lifting.
3. Engineering Controls:
   a. Material handling tasks should be designed to minimize the weight, range of motion, and frequency of the activity.
   b. Alter the task to eliminate the hazardous motion and/or change the position of the object in relation to the employee's body -- such as adjusting the height of a pallet or shelf.
   c. Work methods and stations should be designed to minimize the distance between the person and the object being handled.
   d. High-strength push-pull requirements are undesirable, but pushing is better than pulling. Material handling equipment should be easy to move, with handles that can be easily grasped in an upright posture.
   e. Workbench or workstation configurations can force people to bend over. Corrections should emphasize adjustments necessary for the employee to remain in a relaxed upright stance or fully supported, seated posture. Bending the upper body and spine to reach into a bin or container is highly undesirable. The bins should be elevated, tilted or equipped with collapsible sides to improve access.
   f. Repetitive or sustained twisting, stretching, or leaning to one side are undesirable. Corrections could include repositioning bins and moving employees closer to parts and conveyors.
   g. Store heavy objects at waist level.
4. Whenever possible, utilize hand holds or other lifting attachments on objects being handled:
   a. Use the "hook grip" on loads with cut-out handholds.
   b. Curl your fingers around the edge.

c. Do not hold the load with fingertips.
d. Use containers with handles located more than halfway up the side of the container.
e. Use the "ledge grip" to handle regularly shaped objects without handles.
f. Use vacuum lifters to handle sheet materials or plates.
g. Hold the object with hands placed diagonally.
h. Wear gloves where practical.

5. When significant, sustained lifting work is required it is desirable to rotate employees to spread the work load among several people and avoid fatigue. Rotation is not simply performing a different job, but must be a job that utilizes a completely different muscle group from the ones that have been over-exerted.

3.0 SPECIFIC HANDLING TECHNIQUES

The following guidance will be used when performing MMH for various types of materials.

3.1 SQUARE OR RECTANGULAR OBJECTS

To lift square or rectangular objects:

- Place one foot slightly in front of the other.
- Squat as close to the object as possible.
- Grasp one of the top corners away from the body and the opposite bottom corner closest to the body.
- Tilt the object slightly away from the body, tilt forward at the hips, keep the back straight, and tuck in the chin.
- Test to be sure the object is loose from floor and shall lift without snagging.
- Straighten the legs, keeping the backbone straight, pull the object into the body, and stand up slowly and evenly without jerking or twisting.
- If turning or change of direction is required, turn with feet without twisting the torso and step in the direction to travel.
- To set an object down, reverse the sequence, being sure not to trap the bottom hand between the object and the surface on which the object is set.

3.2 CYLINDRICAL OBJECTS

When lifting/moving round or cylindrical objects, the objects should be rolled wherever possible. Rolling must be controlled by chute, tagline, or other means of limiting acceleration. Workers must not be positioned downhill from rolled objects. Use of the legs for pushing and tagline control of rolled objects must be stressed.

Cylindrical objects, such as drums that must remain upright, are to be handled manually by slightly tilting the object, using the legs for control, and balancing the object on the bottom edge. The handler then walks besides the object, with the object tilted toward the body, positioning the hands on the top edge away from the body and moving so they do not cross, thus, maintaining the balance and a steady controlled forward motion. Motion must be controlled so that stopping walking and moving the hands shall stop forward motion.

Use carts or tracks to transport cylinders. Make sure that two people transport a cylinder if carts cannot be used, use lifting straps to improve grip.

Technique for one person lifting a cylinder onto a platform:

1. Roll the cylinder to within 3 feet of the platform.

2. Position the forward foot around the cylinder, the back foot about 1 foot behind the cylinder.
3. Bend knees slightly.
4. Place one hand on the valve protective cap, the other hand underneath the cylinder about 1 foot from the ground.
5. Tilt the cylinder onto the thigh of the back leg.
6. Balance the cylinder on the thigh by pressing down with the back hand while lifting the cylinder with the forward hand.
7. Extend both knees to initiate and forward movement of the cylinder and continue by pushing up and forward with the arms until the cylinder is located on the platform.
8. Climb on the platform.
9. Straddle the cylinder at the valve end.
10. Grasp the valve protective cap of the cylinder with both hands between the thighs.
11. Lean forward and straighten the knees to set the cylinder upright.

3.3 BAGS AND SACKS

The best way to handle a bag depends on its size, weight and how far it is to be carried. When lifting, remember to:

- Straddle the end of the bag.
- Bend the hips and knees.
- Keep the back straight.
- Grasp the bag with both hands under the closer end. Keep elbows inside the thighs.
- Lean forward, straightening the knees to set the bag upright.
- Readjust the straddle position moving feet closer to the bag.
- Readjust the grasp, with one hand clasping the bag against the body and the other under it.
- Stand up by thrusting off with the back leg and continuing in an upward and forward direction.
- Thrust the bag up with the knee while straightening the body.
- Put the bag on the shoulder opposite the knee used to thrust the bag up.
- Stabilize the bag on the shoulder.
- Move off without bending sideways.

Avoid unloading a bag from the shoulder directly to floor level. Use an intermediate platform or get help from a coworker.

1. Stand close to the platform.
2. Place one foot in front of the platform.
3. Bend hips and knees.
4. Keep the back straight.
5. Ease the bag off the shoulder and put it upright on the platform.
6. Pull the bag slightly over the edge of the platform.
7. Stand close to the platform with the bag touching the chest.
8. Clasp the bag against the body with one hand, the other hand holding bottom of the bag.
9. Step back.
10. Bend hips and knees, keeping back straight.
11. Ease the bag on the floor.

Bulkier sacks are easier to carry on your back. Lift the sack onto your back from a platform:

1. Move the sack to the edge of the platform.
2. Put your back against the sack.
3. Grasp with both hands on the upper corners of the sack.
4. Ease the sack onto the back, bending hips and knees before taking the weight.
5. Keep the back straight.
6. Stand up and straighten the hips and knees.
7. Stabilize the sack.
8. Move away without bending sideways.

Two-person handling of a sack:

1. Position one person on either side of the sack.
2. Squat with one foot balancing behind the sack.
3. Keep back straight.
4. Grasp with the outer and on the upper corner, the other holding the bottom of the sack.
5. On one person's command:
    a. Stand up and straighten the hips and knees.
    b. Move towards the stack.
    c. Put the sack on the stack.

3.4 SHEET MATERIALS

When lifting sheet materials:

1. Stand close to the pile of sheets in a walking stance.
2. Grasp sheet firmly at the mid-point of its long side with the closer hand.
3. Pull sheet up and toward the body.
4. Change grip using your other hand and put your fingers on top of the sheet.
5. Pull sheet up to the vertical position and to the side until one half is off the pile.
6. Grasp the lower edge of the sheet with the free hand and support the hand by placing it on your knee.
7. Stand up without bending and twisting body.

To carry sheets:

- Use drywall carts to carry sheet materials.
- Get help from another person where carts are not available.
- Apply carrying handles for manual carrying.
- Always use gloves and carrying handle for glass and other materials with sharp edges.

Team Handling - Team handling occurs when more than one person is involved during the lift. Use team lifting and carrying where other solutions are inappropriate.

- Remember that the combined strength of the team is less than the sum of individual strength.
- Select team members of similar height and strength.
- Assign a leader to the team.
- Determine a set of commands to be used such as "lift", "walk", "stop", "down". Make sure that everyone knows what to do when they hear the command.
- Follow the commands given by the team leader.

- Practice team lifting and carrying together before attempting the task.

4.0 MATERIALS STORAGE

When storing materials on site

- Store materials at a convenient height.
- Leave the lowest shelf unused if necessary.
- Use vertically mobile shelves to avoid bending and overhead reaching.
- Use bin racks for storing small items.
- Store heavy and frequently used materials at waist height.
- Do not store materials at floor level.
- Use hand trucks with elevating devices in storage and loading areas.
- Use trucks with a tilting device to avoid bending.
- Use elevating platforms to avoid overhead reaching.

REFERENCES: ENV 507 - *Handling of Drums and Large Containers*
ENV 522 – *Working Surfaces*

This procedure applies to Earth Tech Environmental Practice operations. Earth Tech's Environmental, Health and Safety (EH&S) Department is solely responsible for its issuance, revision, and maintenance. Any deviation from these requirements requires approval from the GWES EH&S Director or an EH&S Manager.

ENV 509

TANK AND LARGE CONTAINER SAMPLING

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SUMMARY: Sampling conducted on large tanks, trucks, and tank cars will follow procedures established in the project Health and Safety Plan (HASP), subject to the requirements specified below.

1.0 GENERAL REQUIREMENTS

Sampling of storage tanks, tank trucks, and tank cars is potentially dangerous. Therefore, only experienced personnel specializing in sampling techniques should perform tank-sampling operations. Specific sampling procedures and EH&S requirements will be specified in the HASP.

2.0 STORAGE TANKS

2.1 INSPECTION

Although a variety of structural storage facilities may exist at a hazardous waste site, the most common is the aboveground storage tank (AST) similar to those found at oil refineries. Underground storage tanks (USTs) are also commonly encountered. Sampling storage tanks and similar structures presents certain safety hazards not generally encountered in other types of waste sampling. Often these factors are related to the structural integrity of the tank and the location of access points.

When sampling tank structures, it may be necessary to climb on them to obtain access. A thorough inspection of the containment structure must be made to determine the soundness of the tank and any ladders, catwalks, or platforms on which sampling personnel must walk. If there is any uncertainty regarding safety, alternative approaches must be used. Structures in poor physical condition often are rusted, with many openings through which sampling can be performed. Care should be taken to avoid snagging protective clothing or arms and legs on jagged metal edges.

2.2 TANK ENTRY

Entry of any tank must be treated as a permit-required confined space entry, even tanks that are open to the atmosphere and are not likely to contain explosive gas mixtures or high concentrations of other vapors. Prior to sampling, air quality monitoring must be performed using an organic vapor analyzer (OVA), combustible gas meter, or another method as dictated by the entry procedure.

Access to the interior of a closed tank may be obtained through existing hatches or covers. Because of the potential for producing sparks or releasing pressurized gases as the hatch is opened, the procedure must be performed by personnel wearing a self-contained breathing apparatus (SCBA) and full-coverage protection. The individual performing the operation should proceed slowly and position himself to one side of the hatch to avoid being struck if the hatch is blown open by internal pressure. Especially where there is the possibility of explosion, some type of remote opening system, perhaps using ropes and pulleys, is preferred to direct opening of hatches by individuals.

Closed tank structures may be entered only by specially trained personnel equipped with an SCBA and only after extensive air monitoring has been performed. Oxygen-deficient atmospheres may develop in a closed tank even if the entry port is open. An oxygen meter and a carbon monoxide meter should also be used to assess environments of closed structures when warranted. Other toxic contaminants may also be present in the tank atmosphere. Do not enter any tank structure unless approved by the EH&S Department.

3.0 TANK CARS AND TANK TRUCKS

Mobile storage tanks (railroad tank cars and tank trucks) present similar hazards to large stationary tanks. However, because of requirements associated with the mobile nature of these tanks, they may present unique hazards such as:

- Very limited-size access hatches.
- Interior baffles or other structures.
- Small interior volumes.

Since tank configurations can vary widely, specific entry procedures must be coordinated with the EH&S Department prior to implementation, which must take into account the unique conditions associated with the tank. As with stationary tanks, rail car tanks and tank trucks will be considered to be permit-required confined spaces.

REFERENCES: ENV 511 – *Confined Space Entry*

ENV 505 MANUAL HAND TOOLS	Published: January 20, 2003
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SUMMARY: All manually operated hand tools and equipment shall be used, handled, and stored in accordance with the following requirements.

1.0 GENERAL REQUIREMENTS

1. Select the right tool for the job. Substitutes increase the chance of having an accident.
2. Use tools designed to allow the wrist to stay straight. Avoid using hand tools with your wrist bent.
3. Ensure that employees are properly trained in the safe use of hand tools.
4. Use good quality tools.
5. Keep tools in good condition at all times.
6. Inspect tools for defects before use. Replace or repair defective tools.
7. Keep cutting tools sharp and cover sharp edges with suitable covering to protect the tool and to prevent injuries from unintended contact.
8. Replace cracked, splintered, or broken handles on files, hammers, screwdrivers, or sledges.
9. Ensure that the handles of tools like hammers and axes fit tightly into the head of the tool.
10. Replace worn jaws on wrenches, pipe tools and pliers.
11. Redress burred or mushroomed heads of striking tools.
12. Pull on a wrench or pliers. Never push unless you hold the tool with your palm open.
13. Point sharp tools (e.g., saws, chisels, knives) laying on benches away from aisles and handles should not extend over the edge of the bench top.
14. Maintain tools carefully. Keep them clean and dry, and store them properly after each use.
15. Carry tools in a sturdy tool box to and from the worksite.
16. Wear safety glasses or goggles and well-fitting gloves appropriate for the hazards to which you may be exposed when doing various tasks.
17. Keep the work environment clean and tidy to avoid clutter which may cause accidents.
18. Use a heavy belt or apron and hang tools at your sides, not behind your back.
19. Do not use tools for jobs they are not intended to do. For example, do not use a slot screwdriver as a chisel, pry bar, wedge or punch, or a wrench as a hammer.
20. Do not apply excessive force or pressure on tools.
21. Do not cut toward yourself when using cutting tools.
22. Do not hold the stock in the palm of your hand when using a cutting tool or a screwdriver.
23. Do not wear bulky gloves to operate hand tools.
24. Do not throw tools. Hand them, handle first, directly to other workers.
25. Do not carry tools in a way that interferes with using both hands on a ladder, while climbing on a structure, or when doing any hazardous work. If working on a ladder or scaffold, tools should be raised and lowered using a bucket and hand line.
26. Do not carry a sharp tool in your pocket.

2.0 TOOL-SPECIFIC REQUIREMENTS

2.1 CUTTING TOOLS

1. Wear safety glasses and protective gloves when using cutters.
2. Choose the proper cutter for the job. Cutters are designed for a specific type, hardness, and size of material.
3. Cut materials straight across - keep the material being cut at right angles to the cutting edges of jaws.
4. Prevent injury from flying metal by wrapping a burlap bag, cloth or rag around the cutting jaws. Metal can fly when cut. The harder the metal, the farther it will fly.
5. Warn those in the area to take precautionary measures to avoid possible injury from flying metal pieces.
6. Keep cutting tools in good repair.
7. Adjust and lubricate cutter and moving parts daily if heavily used.
8. Sharpen jaws according to manufacturers' instructions.
9. Do not use a cutting tool until you are trained in its proper and safe use.
10. Do not use cushion grip handles for jobs requiring electrically-insulated handles. Cushion grips are for comfort primarily and do not protect against electric shock.
11. Do not use cutters which are cracked, broken or loose.
12. Do not exceed the recommended capacity of a tool.
13. Do not cut diagonally.
14. Do not rock cutters from side to side when cutting wire.
15. Do not pry or twist with tool when cutting.
16. Do not hammer on cutting tools or extend the handle length to achieve greater cutting power.
17. Do not expose cutters to excessive heat.

2.2 HAMMERS

1. Hammers are designed according to the intended purpose. Select a hammer that is comfortable for you and that is the proper size and weight for the job. Misuse can cause the striking face to chip, possibly causing a serious injury.
2. Choose a hammer with a striking face diameter approximately ½ inch larger than the face of the tool being struck (e.g., chisels, punches, wedges, etc.).
3. Ensure that the head of the hammer is firmly attached to the handle.
4. Replace loose, cracked or splintered handles.
5. Discard any hammer with mushroomed or chipped face or with cracks in the claw or eye sections.
6. Strike a hammer blow squarely with the striking face parallel to the surface being struck. Always avoid glancing blows and over and under strikes. (Hammers with bevelled faces are less likely to chip or spall).
7. Look behind and above you before swinging the hammer.
8. Watch the object you are hitting.
9. Hold the hammer with your wrist straight and your hand firmly wrapped around the handle.

10. Do not use a hammer with a loose or damaged handle.
11. Do not use handles that are rough, cracked, broken, splintered, sharp-edged or loosely attached to the head.
12. Do not use any hammer head with dents, cracks, chips, mushrooming, or excessive wear.
13. Do not use a hammer for any purpose for which it was not designed or intended.
14. Do not use one hammer to strike another hammer, other hard metal objects, stones or concrete.
15. Do not redress, grind, weld or reheat-treat a hammer head.
16. Do not strike with the side or cheek of the hammer.

2.3 SAWS

1. Saws are made in various shapes and sizes and for many uses. Use the correct saw for the job.
2. Wear safety glasses.
3. Select a saw of proper shape and size for stock being used.
4. Choose a saw handle that keeps your wrist in a natural position in the horizontal plane.
5. Choose a saw with a handle opening of at least 5 inches long and 2.5 inches wide and slanted at a 15° angle.
6. Check the stock being cut for nails, knots, and other objects that may damage or buckle the saw.
7. Start the cut by placing your hand beside the cut mark with your thumb upright and pressing against blade. Start the cut carefully and slowly to prevent blade from jumping. Pull upward until blade bites. Start with a partial cut, then set the saw at the proper angle.
8. Apply pressure on downstroke only.
9. Hold stock being cut firmly in place.
10. Use a helper, a supporting bench or vise to support long stock if required.
11. Keep teeth and blades properly set.
12. Protect teeth of saw when not in use.
13. Keep saw blades clean.
14. Hacksaws:
    - Select correct blade for material being cut.
    - Secure blade with the teeth pointing forward.
    - Keep blade rigid, and frame properly aligned.
    - Cut using strong, steady strokes, directed away from yourself.
    - Use entire length of blade in each cutting stroke.
    - Use light machine oil on the blade to keep it from overheating and breaking.
    - Cut harder materials more slowly than soft materials.
    - Clamp thin, flat pieces requiring edge cutting.

2.4 PIPE TOOLS (WRENCHES, CUTTERS, REAMERS, AND THREADERS)

1. Pipe tools are made in various shapes and sizes and for many uses. Always use the correct tool for the job.

2. Select a pipe wrench with sufficient capacity and leverage to do the job.
3. Use a pipe wrench to turn or hold a pipe. Never use a pipe wrench to bend, raise or lift a pipe.
4. Adjust the pipe wrench grip to maintain a gap between the back of the hook jaw and the pipe. This concentrates the pressure at the jaw teeth, producing the maximum gripping force. It also aids the ratcheting action.
5. Inspect pipe wrenches periodically for worn or unsafe parts and replace them (e.g., check for worn threads on the adjustment ring and movable jaw).
6. Keep pipe wrench teeth clean and sharp.
7. Face a pipe wrench forward. Turn wrench so pressure is against heel jaw.
8. Pull, rather than push on the pipe wrench handle. Maintain a proper stance with feet firmly placed to hold your balance.
9. Do not use a pipe wrench as a hammer, or strike a pipe wrench with a hammer.
10. Do not use pipe wrenches on nuts and bolts.
11. Do not use a pipe extender for extra leverage. Get a larger pipe wrench.
12. Replace pipe cutter wheels which are nicked or otherwise damaged.
13. Use a 3- or 4-wheeled cutter, if there is not enough space to swing the single wheel pipe cutter completely around the pipe.
14. Choose a cutting wheel suitable for cutting the type of pipe material required:
    - Thin wheel for cutting ordinary steel pipe.
    - Stout wheel for cutting cast iron.
    - Other wheels for cutting stainless steel, plastic and other materials.
15. Select the proper hole diameter and correct tap size to tap a hole. The hole should be sized so that the thread cut by the tap will be about 75% as deep as the thread on the tap.
16. Use a proper tap wrench (with a "T" handle) for turning a tap.
17. Use lubricant or machine cutting fluid with metals other than cast iron.
18. Do not permit chips to clog flutes (groves in the tap that allow metal chips to escape from the hole). The chips may prevent the tap from turning - this may result in the tap breaking if you continue to apply pressure.
19. Do not use a conventional adjustable wrench for turning a tap - it will cause uneven pressure on the tap that may cause it to break.
20. Do not attempt to thread hardened steel. This can chip or damage the die.
21. Do not thread any rod or other cylindrical object that is larger in diameter than the major diameter of the die thread.
22. Do not use a spiral reamer on a rotating pipe. The reamer may snag and cause serious injury.

2.5 PLIERS AND WIRE CUTTERS

1. Pliers are made in various shapes and sizes and for many uses. Use the correct pliers or wire cutters for the job.
2. Choose pliers or wire cutters that have a grip span of 2½ - 3½ inches to prevent your palm or fingers from being pinched when the tools are closed.

3. Use adjustable pliers that allow you to grip the workpiece firmly while maintaining a comfortable handgrip (i.e., hand grasp is not too wide).
4. Use tools only if they are in good condition.
5. Make sure that the cutting edges are sharp. Dull and worn-down cutting edges require many times more force for cutting.
6. Make sure that the toothed jaws are clean and sharp. Greasy or worn-down jaws can result in compromised safety. Such tools also require increased force to hold the workpiece which, in turn, increases the risk of muscular fatigue and repetitive strain injuries.
7. Oil pliers and wire cutters regularly. A drop of oil on the hinge will make the tools easier to use.
8. Pull on the pliers; do not push away from you when applying pressure. If the tool slips unexpectedly, you may lose your balance or injure your hand.
9. Cut at right angles. Never rock the cutting tool from side to side or bend wire back and forth against the cutting edges.
10. Do not cut hardened wire unless the pliers or wire cutters are specifically manufactured for this purpose.
11. Do not expose pliers or wire cutters to excessive heat.
12. Do not bend stiff wire with light pliers. Needle-nose pliers can be damaged by using the tips to bend large wire. Use a sturdier tool.
13. Do not use pliers as a hammer.
14. Do not hammer on pliers or wire cutters to cut wires or bolts.
15. Do not extend the length of handles to gain greater leverage. Use a larger pair of pliers for gripping or a bolt cutter for cutting.
16. Do not use cushion grip handles for jobs requiring tools with electrically insulated handles. Cushion grips are for comfort primarily and do not protect against electric shock.
17. Do not use pliers on nuts and bolts; use a wrench.

2.6 SCREWDRIVERS

1. Screwdrivers are made in various shapes and sizes and for many uses. Use the correct screwdriver for the job.
2. Choose contoured handles that fit the shank tightly, with a flange to keep the hand from slipping off the tool.
3. Use a slot screwdriver with a blade tip width that is the same as the width of the slotted screw head.
4. For cross-head screws, use the correct size and type of screwdriver: a Phillips screwdriver may slip out of a screw head designed for use with the slightly flatter-tipped Pozi-driv screwdriver.
5. Use a vise or clamp to hold the stock if the piece is small or moves easily.
6. Keep the screwdriver handle clean. A greasy handle could cause an injury or damage from unexpected slippage.
7. If work must be carried out on "live" electrical equipment, use screwdrivers that have insulated handles designed for electrical work and a non-conducting shaft. Remember, most plastic handles are designed for grip and comfort.
8. Use non-magnetic tools when working near strong magnets (e.g., in some laboratories).

9. Use a screw-holding screwdriver (with screw-holding clips or magnetic blades) to get screws started in awkward, hard-to-reach areas. Square-tipped screwdrivers (e.g., Robertson) that hold screws with recessed square holes are also useful in such situations.
10. Use an offset screwdriver in close quarters where a conventional screwdriver cannot be used.
11. Use a screwdriver that incorporates the following features when continuous work is needed:
    - A pistol grip to provide for a straighter wrist and better leverage.
    - A "Yankee drill" mechanism (spiral ratchet screwdriver or push screwdriver) which rotates the blade when the tool is pushed forward.
    - A ratchet device to drive hard-to-move screws efficiently, or use a powered screwdriver.
12. File a rounded tip square making sure the edges are straight. A dull or rounded tip can slip out of the slot and cause hand injury or damage to materials.
13. Store screwdrivers in a rack or partitioned pouch so that the proper screwdriver can be selected quickly.
14. Do not lean or push on a screwdriver with any more force than necessary to keep contact with the screw. A screw properly piloted and fitted will draw itself into the right position when turned. Keep the shank directly over the screw being driven.
15. Do not hold the stock in one hand while using the screwdriver with the other. If the screwdriver slips out of the slot you may cut your hand.
16. Do not hammer screws that cannot be turned.
17. Do not grind the tip to fit another size screw head.
18. Do not try to use screwdrivers on screw heads for which they are not designed (e.g., straight blade screwdrivers on Phillips, clutch head, Torx or multi-flutted spline screw heads).
19. Do not use defective screwdrivers (e.g., ones with rounded or damaged edges or tips; split or broken handles; or bent shafts).
20. Do not use a screwdriver for prying, punching, chiseling, scoring, scraping or stirring paint.
21. Do not use pliers on the handle of a screwdriver for extra turning power. A wrench should be used only on the square screwdriver shank designed for that purpose.
22. Do not expose a screwdriver blade to excessive heat. Heat can affect the temper of the metal and weaken the tool.
23. Do not use a screwdriver to check if an electrical circuit is live. Use a suitable meter or other circuit testing device.
24. Do not carry screwdrivers in your pockets.

2.7 SNIPS

1. Wear safety glasses and protective gloves when working with snips. Small pieces of metal may go flying in the air and cut edges of metal are sharp.
2. Snips are made in various shapes and sizes for various tasks. The handle can be like those on scissors with finger and thumb holes or like plier handles. Models are available for cutting in straight lines and in curves to the left or right.
3. Universal snips can cut in both straight and wide curves.
4. Straight snips and duckbill snips (flat blade, "perpendicular" to the handle, with pointed tips) are generally designed to cut in straight lines; some duckbill snips are designed for cutting curved lines.

5. Hawk's bill snips (with crescent-shaped jaws) are used for cutting tight circles.
6. Aviation snips have compound leverage that reduces the effort required for cutting.
7. Offset snips have jaws that are set at an angle from the handle.
8. Select the right size and type of snips for the job; check the manufacturer's specifications about the intended use of the snips (e.g., type of cut - straight, wide curve, tight curve, right or left, and maximum thickness and kind of metal or other material that can be cut).
9. Use only snips that are sharp and in good condition.
10. Use snips for cutting soft metal only. Hard or hardened metal should be cut with tools designed for that purpose.
11. Use ordinary hand pressure for cutting. If extra force is needed, use a larger tool.
12. Cut so that the waste is on the right if you are right-handed or on the left if you are left-handed.
13. Avoid springing the blades. This results from trying to cut metal that is too thick or heavy for the snips you are using.
14. Keep the nut and the pivot bolt properly adjusted at all times.
15. Oil the pivot bolt on the snips occasionally.
16. Do not try to cut sharp curves with straight cut snips.
17. Do not cut sheet metal thicker than the manufacturer's recommended upper limit (e.g., cuts up to 16-gauge cold, rolled steel or 18-gauge stainless steel). Do not extend the length of handles to gain greater leverage.
18. Do not hammer or use your foot to exert extra pressure on the cutting edges.
19. Do not use cushion grip handles for tasks requiring insulated handles. They are for comfort primarily and not for protection against electric shocks.
20. Do not attempt to resharpen snips in a sharpening device designed for scissors, garden tools, or cutlery.

2.8 WOOD CHISELS

1. Wear safety glasses.
2. Wood chisels are made in various shapes and sizes and for many uses. Use the correct chisel for the job.
3. Use the right size of chisel for the job.
4. Choose smooth, rectangular handles that have no sharp edges and are attached firmly to the chisel.
5. Ensure that the cutting edge is sharp. Dull chisels can be difficult to control and require more effort to do the job.
6. Check stock thoroughly for knots, staples, nails, screws, or other foreign objects before chiseling.
7. Clamp stock so it cannot move.
8. Adjust your stance so that you do not lose your balance if the tool slips.
9. Chip or cut away from yourself.
10. Keep your hands and body behind the cutting edge.
11. Use a wooden or plastic mallet with a large striking face on all chisels. Only heavy-duty or framing chisels are made of a solid or molded handle that can be struck with a steel hammer.

12. Make finishing or paring cuts with hand pressure alone.
13. Place chisels safely within the plastic protective caps to cover cutting edges when not in use.
14. Replace any chisel that is bent or shows dents, cracks, chips, or excessive wear.
15. Store chisels in a "storage roll," a cloth or plastic bag with slots for each chisel, and keep them in a drawer or tray.
16. Replace broken or splintered handles.
17. Sharpen cutting edges as often as necessary.
18. Do not use a wood chisel as a pry or a wedge.
19. Do not use a wood chisel on metal.
20. Do not use an all-steel chisel with a mushroomed face or a chipped edge. Redress with a file or whetstone.
21. Do not use a grinder to redress heat-treated tools. Use a whetstone.
22. Do not use a dull chisel.

2.9 WRENCHES

1. Use the correct wrench for the job - pipe wrenches for pipes and plumbing fittings, and general-use wrenches for nuts and bolts.
2. Discard any damaged wrenches (e.g., open-ended wrenches with spread jaws or box wrenches with broken or damaged points).
3. Select the correct jaw size to avoid slippage.
4. Position your body in a way that will prevent you from losing balance and hurting yourself if the wrench slips or something (e.g., a bolt) suddenly breaks.
5. Use a box or socket wrench with a straight handle, rather than an off-set handle, when possible.
6. Ensure that the jaw of an open-ended wrench is in full contact (fully seated, "flat," not tilted) with the nut or bolt before applying pressure.
7. Face an adjustable wrench "forward," adjust tightly, and turn the wrench so pressure is against the permanent or fixed jaw.
8. Ensure that the teeth of a pipe wrench are sharp and free of oil and debris and that the pipe or fitting is clean to prevent unexpected slippage and possible injuries.
9. Apply a small amount of pressure to a ratchet wrench initially to ensure that the ratchet wheel (or gear) is engaged with the pawl (a catch fitting in the gear) for the direction you are applying pressure.
10. Support the head of the ratchet wrench when socket extensions are used.
11. Pull on a wrench using a slow, steady pull; do not use fast, jerky movements.
12. Stand aside when work is done with wrenches overhead.
13. Make sure adjustable wrenches do not "slide" open during use.
14. Keep tools well maintained (cleaned and oiled).
15. Clean and place tools and wrenches in a tool box, rack or tool belt after use.
16. Do not push on a wrench - losing your balance is more likely if the wrench slips.

17. Do not use a wrench that is bent or damaged.
18. Do not use worn adjustable wrenches. Inspect the knurl, jaw and pin for wear.
19. Do not pull on an adjustable wrench that is loosely adjusted.
20. Do not use pipe wrenches on nuts or bolts.
21. Do not use pipe wrenches for lifting or bending pipes.
22. Do not use a wrench on moving machinery.
23. Do not use the wrong tools for the job. For example, never use pliers instead of a wrench or a wrench as a hammer.
24. Do not use a makeshift wrench.
25. Do not insert a shim in a wrench for better fit.
26. Do not strike a wrench (except a "strike face" wrench) with a hammer or similar object to gain more force.
27. Do not increase the leverage by adding sleeved additions (e.g., a pipe) to increase tool handle length.
28. Do not expose a wrench to excessive heat (like from a blow torch) that could affect the temper of the metal and ruin the tool.

2.10 FILES/RASPS

1. Personnel will not use a file as a pry bar, hammer, screwdriver, or chisel.
2. When using a file or a rasp, grasp the handle in one hand and the toe of the file in the other.
3. Personnel will not hammer on a file.

2.11 CHISELS

1. Personnel will not use a chisel that has a dull cutting edge.
2. Personnel will not use chisels that have "mushroomed" striking heads.
3. Hold a chisel by using a tool holder if possible.
4. Clamp small workpieces in the vise and chip towards the stationary jaw when working with a chisel.

2.12 VISES

1. When clamping a long workpiece in a vise, support the far end of the workpiece by using an adjustable pipe stand, saw horse or box.
2. Position the workpiece in the vise so that the entire face of the jaw supports the workpiece.
3. Personnel will not use a vise that has worn or broken jaw inserts, or has cracks or fractures in the body of the vise.
4. Personnel will not slip a pipe over the handle of a vise to gain extra leverage.

2.13 CLAMPS

1. Personnel will not use the C-clamp for hoisting materials.
2. Personnel will not use the C-clamp as a permanent fastening device.

2.14 JACKS

1. Personnel will not exceed the jack's rated lifting capacity as noted on the label of the jack.
2. Clear all tools, equipment and any other obstructions from under the vehicle before lowering the jack.

2.15 TOOL BOXES/CHESTS/CABINETS

1. Use the handle when opening and closing a drawer or door of a tool box, chest, or cabinet.
2. Tape over or file off sharp edges on toolboxes, chests or cabinets.
3. Personnel will not stand on toolboxes, chests or cabinets to gain extra height.
4. Lock the wheels on large toolboxes, chests or cabinets to prevent them from rolling.
5. Push large chests, cabinets and toolboxes rather that pulling them.
6. Personnel will not open more than one drawer of a toolbox at a time.
7. Close and lock all drawers and doors before moving the tool chest to a new location.
8. Personnel will not move a toolbox, chest or cabinet if it has loose tools or parts on the top.

REFERENCES: None

ENV 507

HANDLING OF DRUMS AND LARGE CONTAINERS

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Revised:	N/A
Page:	1 of 3

SUMMARY: This procedure provides guidance to employees and managers to minimize injuries, exposures, environmental contamination, and work disruptions resulting from accidents or injuries that could be caused by improper handling of drums and other containers.

1.0 GENERAL REQUIREMENTS

These requirements apply to drums of 10-gallon capacity and larger, and to other portable atmospheric containers of 10-gallon capacity or larger. The requirements of this procedure are not applicable to the handling of containers used to store pressurized gases or to hazardous waste drum handling.

1.1 DEFINITIONS

The following definitions apply to these procedures and are slightly modified for specific operations.

Drums - Hollow, cylindrical containers (capacity between 10 and 55 gallons) used for the storage or containerization of bulk quantities of work materials or wastes.

Other Large Containers - Containers other than drums that are used to hold bulk quantities of work materials or wastes. These include tanks and roll-off bins, and are generally much larger than drums.

Tanks - Hollow containers of capacity greater than 55 gallons used for the storage or containerization of bulk liquids.

Roll-off Bins - Rectangular-shaped containers capable of being transported using a specially designed vehicle on which the roll-off bin can be mounted/dismounted. Roll-off bins can be placed at a site, used to containerize bulk materials, and re-mounted on the vehicle for off-site transportation. Some roll-off bins are equipped with wheels, and can be moved manually.

2.0 PROCEDURES

2.1 GENERAL

All storage and handling of drums and other containers will conform to the following handling requirements.

- No drum or container will be filled beyond its rated capacity (expressed as either weight or volume). For liquid-containing drums/containers, a void space must be left to allow for liquid expansion in extreme heat.
- Storage locations for drums/containers shall be segregated so that differing types of materials are not stored together or co-mingled. Chemical products and waste materials shall not be stored together. Incompatible materials (e.g., fuels and oxidizers) shall not be stored together.
- Any drum/container storage structure must have the capability to fully contain a spill consisting of the contents of the largest container permitted for use in the structure plus the volume of water expected to be generated by a 25-year storm. The storage area shall be fenced and locked, and access will be limited to designated personnel.
- In accordance with the requirements of 29 CFR 1910.1200 (Hazard Communication), all drums and other containers will be labeled as to their contents. Hazardous properties such as flammability, etc., shall also be clearly indicated. For containers of hazardous wastes, the date on which waste was first accumulated in the drum/container shall be noted.

2.2 DRUMS

In addition to the above requirements, handling of all drums will be accomplished in accordance with the following:

- Only drums meeting U.S. Department of Transportation (DOT) specifications shall be used. Drums shall be inspected for rust, corrosion, warping, and other damage. Damaged drums shall not be used.
- Drums containing any materials will be covered with a tight-fitting lid when not in use.
- At the conclusion of each working shift, all drums will be placed in the designated storage area appropriate to their contents. Each such area will be properly marked and secured.
- Drums containing hazardous or flammable materials will be electrically grounded to prevent the buildup of static charge. As required, containers will be bonded to ensure that no potential charge difference exists between containers that might come into contact and cause sparking.
- Manual lifting, carrying, or moving of drums will not be permitted. A drum-handling cart or similar apparatus will be used for moving drums from collection points to the designated storage area.

2.3 OTHER CONTAINERS

- Each container shall be inspected for rust, corrosion, warping, and other damage prior to use. Damaged containers shall not be used.
- Containers larger than 55 gallons and/or 800 pounds will not be moved using any type of manual method, including non-powered mechanical devices. All handling will be accomplished using powered mechanical equipment designed specifically for that purpose.
- As applicable, any container holding material shall be covered with a tight-fitting lid when not in use.
- Containers of hazardous or flammable materials will be electrically grounded to prevent the buildup of static charge. As required, containers will be bonded to ensure that no potential charge difference exists between containers that might come into contact and cause sparking.

3.0 DRUM HANDLING PROCEDURE

Use mechanical aids whenever possible. Do not attempt to raise a full drum alone.

Moving an upright drum:

1. Stand close to the drum with feet apart. One foot at the front and the other behind.
2. Keep knees slightly flexed.
3. Put your hands firmly against upper rim of the drum.
4. Keep arms straight with the elbows "locked".
5. Rock the drum gently to get the feel of its contents before you move it.
6. Push the top of the drum away by extending the back leg and shifting your body weight onto your front leg.
7. Stop tilting the drum at the balance point. Use back leg as a counter balance.

Raising a drum laid on its side:

1. Make sure that the drum is empty before raising it.
2. Stand at the end of the drum.
3. Place one foot forward at the side of the drum, the other behind.
4. Bend your hips and knees.
5. Keep the back straight.
6. Grasp the rim about 15 cm from the ground with the elbows inside thighs.

7. Stand up by thrusting off with the back leg and continuing in an upward and forward direction.
8. Bring the back leg forward as if you are walking. Keep close to the drum.
9. Stop at the balance point to change hand grip.
10. Set the drum on its base by moving back leg forward. Use the body weight as a counter balance.

REFERENCES: ENV 501 – *Manual Materials Handling*
ENV 508 – *Drum Sampling*

This procedure applies to Earth Tech Environmental Practice operations. Earth Tech's Environmental, Health and Safety (EH&S) Department is solely responsible for its issuance, revision, and maintenance. Any deviation from these requirements requires approval from the GWES EH&S Director or an EH&S Manager.

ENV 301

HAZARDOUS WASTE OPERATIONS

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Page:	1 of 7

SUMMARY: All hazardous waste operations (HAZWOPER) work performed or managed by Earth Tech will be performed in accordance with the following requirements, which are intended to ensure compliance with 29 CFR 1910.120 (and equivalent state regulations).

1.0 PERSONNEL QUALIFICATIONS

All personnel working at HAZWOPER sites must meet the training and medical monitoring requirements specified in 29 CFR 1910.120 (e) and (f). Also, additional training will be required based on site activities (e.g., confined space, lead in construction, OSHA 10-hour construction). These additional training requirements will be outlined in the project- or site-specific health and safety plan.

1.1 EARTH TECH PERSONNEL

Earth Tech's HAZWOPER-qualified employees will participate in the following training and medical monitoring procedures.

1.1.1 Medical Monitoring

Specific HAZWOPER medical examination protocols have been developed by Earth Tech's Corporate Medical Provider (CMP) to meet the requirements of 29 CFR 1910.120 (f). To be medically qualified to perform HAZWOPER work personnel receive the following medical examinations:

- Initial (Baseline) Examination - The initial examination is a part of pre-employment requirements, and must be completed (with results received) prior to the employee's start of work date.
- Annual Examination - HAZWOPER-qualified employees will complete a medical examination once each year[1].
- Termination Examination - At the conclusion of employment at Earth Tech, or when re-assigned to non-HAZWOPER duties, personnel will be provided with the opportunity to receive a termination medical examination.
- Special Examinations - The EH&S Department and the CMP will jointly determine the need for special examinations due to:
    - Unusual exposure conditions.
    - In response to possible overexposures.

The CMP will determine the medical protocol elements for each of these examinations based on exposure information provided by the EH&S Department. The CMP will evaluate the results of each employee's examination, and will provide a medical clearance clearly stating medical compliance with the HAZWOPER regulatory standard (29 CFR 1910.120 (f)), and approval of the employee to perform unrestricted HAZWOPER activities. For Initial and Annual examinations the CMP will also evaluate the employee for the use of air purifying and supplied air respiratory protection, and the written evaluation from these examinations will indicate the physician's approval/limitations on the employee's sue of respiratory protection.

1.1.2 Training

All personnel assigned to work at a hazardous waste site must participate in training meeting the requirements of 29 CFR 1910.120 (e).

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[1] Medical qualification expires on the anniversary date of the last examination completed, and there will be no "grace period" exemptions beyond this date without the express approval of an EH&S Manager. At the recommendation of the EH&S Department, the CMP may approve an alternate examination frequency, at periods of up to two years, in cases where the worker's exposures to environmental contaminants are infrequent and typically well below any occupational exposure limits (e.g., senior management personnel).

This procedure applies to Earth Tech Environmental Practice operations. Earth Tech's Environmental, Health and Safety (EH&S) Department is solely responsible for its issuance, revision, and maintenance. Any deviation from these requirements requires approval from the GWES EH&S Director or an EH&S Manager.

1. Initial 40-Hour Training - Before being assigned to a HAZWOPER site all Earth Tech personnel must complete 40 hours of training meeting the requirements of 29 CFR 1910.120 (e)(3)(i). At the conclusion of training personnel will receive a written certification of course completion, signed by the instructor, which indicates the course of instruction (40-hour HAZWOPER) and training dates. A copy of this certification must be provided to the employee's HSA. The employee is responsible for maintaining their own copy of this certificate, and bringing it when working on any HAZWOPER site.

   Available Training Sources:
   - On-site training provided by the EH&S Department
   - Outsourced training providers approved by the EH&S Department

2. Refresher 8-Hour Training - To remain qualified to perform on-site work activities each Earth Tech employee will complete 8-hours of HAZWOPER refresher training meeting the requirements of 29 CFR 1910.120 (e)(8) at yearly intervals[2] following completion of Initial 40-hour training. At the conclusion of training personnel will receive a written certification of course completion, signed by the instructor, which indicates the course of instruction (8-hour HAZWOPER Refresher) and the training date. A copy of this certification must be provided to the employee's Health and Safety Administrator (HSA). The employee is responsible for maintaining their own copy of this certificate, and bringing it when working on any HAZWOPER site.

   Available Training Sources:
   - Internet-based training approved by the EH&S Department
   - On-site training provided by the EH&S Department
   - Outsourced training providers approved by the EH&S Department
   - Earth Tech's Take-home Refresher Training course (with EH&S Manager approval only)

3. Supervisor Training - Any Earth Tech employee acting in a management capacity for HAZWOPER activities (e.g., project management personnel, field managers, site safety officers, etc.) must complete 8 hours of HAZWOPER Supervisor training meeting the requirements of 29 CFR 1910.120 (e)(4). This training is required only once, no supervisor refresher training is specified (however supervisors must still maintain their overall HAZWOPER-qualification through annual completion of Refresher training). At the conclusion of training personnel will receive a written certification of course completion, signed by the instructor, which indicates the course of instruction (HAZWOPER Supervisor) and the training date. A copy of this certification must be provided to the employee's HSA. The employee is responsible for maintaining their own copy of this certificate, and bringing it when working on any HAZWOPER site.

   Available Training Sources:
   - On-site training provided by the EH&S Department
   - Outsourced training providers approved by the EH&S Department

4. 24-Hour HAZWOPER Training - Some site support contractors and site visitors may qualify to substitute 24-hour HAZWOPER training in place of 40-hour training, as specified in 29 CFR 1910.120 (e)(3)(ii). Personnel potentially qualifying for this alternative training include:
   - Site support personnel who will not work in any Exclusion Zone areas.
   - Subcontractors and site visitors who's duties will not entail significant exposure to site contaminants[3].

[2] Training expires on the anniversary date of the last class completed. The worker's HAZWOPER-qualification expires at this time, and there will be no "grace period" exemptions beyond this date without the express approval of an EH&S Manager.

[3] Defined as not working in any areas where airborne contaminant concentrations exceed one-half of any applicable occupational exposure limit, and no contact or exposure to materials with site contaminant concentrations exceeding natural background levels.

An EH&S Manager must approve of the substitution of 24-hour training for Initial 40-hour training. Persons qualifying for 24-hour training must provide written certification of course completion prior to beginning work on site. Persons completing 24-hour training must complete 8 hours of annual refresher training at the required interval to maintain eligibility for on-site work, and must provide proof of this training (as necessary to demonstrate re-training) prior to beginning work on site.

1.2 SUBCONTRACTOR PERSONNEL

Any subcontractor organization whose employees will support Earth Tech operations at a HAZWOPER site will:

- Provide the Earth Tech Project Manager with a copy of their written HAZWOPER medical monitoring and training program requirements. The elements of the program must be similar to those for Earth Tech's own program, as detailed above.
- Provide the Project Manager with written certification of a physician's approved medical clearance for each employee who will work on the site. Certification can be demonstrated by:
  - A copy of the physician's signed medical clearance for each employee (preferred), or
  - A letter identifying the medical status and clearance expiration date of every employee, signed by the company's safety director or an officer of the company.
- A copy of the each employee's training certifications, which must include:
  - The Initial 40-hour training certificate (24-hour training may be substituted with EH&S Department approval).
  - The most current Refresher training certificate (must be current within the previous 1-year period).
  - A copy of the Supervisor training certificate for each person serving in a management capacity (e.g., foreman personnel).

2.0 PROJECT EH&S DOCUMENTATION – HEALTH AND SAFETY PLANS

The project EH&S documentation prepared for HAZWOPER activities is referred to as a Health and Safety Plan (HASP), and must meet the requirements presented in 29 CFR 1910.120 (b)(4). The required plan elements include:

1. A description of the work location, the site history, and a summary of any information available concerning site hazards (including both physical hazards and contamination conditions).
2. A summary of the work activities to be performed under Earth Tech's scope of activities.
3. A safety and health risk or hazard analysis for each on-site task which will be performed. Identified risks must include both chemical and physical hazards to which personnel may be exposed during the conduct of the work task.
4. Protective measures for each work task to prevent or mitigate the potential hazards identified in the hazard analyses.
5. Personal protective equipment (PPE) requirements for each work task.
6. Frequency and types of air monitoring, personal monitoring, and environmental sampling techniques and instrumentation to be used.
7. Site control measures.
8. Decontamination procedures.
9. An emergency response plan addressing actions to be taken in the event of each type of credible incident which might result during the performance of planned work activities, including minor and major injuries,

and chemical release and fire. Response plans must address the means for coordinating the evacuation of all on-site personnel in the event of a catastrophic incident.

Responsibility for development of each HASP will be coordinated between the Project Manager and the EH&S Department as part of project initiation. Regardless of where the HASP is developed, it will be reviewed and approved by the EH&S Department prior to submission to any agency outside of Earth Tech.

3.0 HAZWOPER PROTECTIVE EQUIPMENT ENSEMBLES

Defined HAZWOPER PPE ensembles are specified for general use on all HAZWOPER operations. The project HASP may specify modifications to these requirements to meet specific on-site conditions.

3.1 LEVEL D ENSEMBLE

The Level D ensemble provides a minimal level of skin protection (primarily against physical rather than chemical hazards) and no respiratory protection. Level D PPE is the minimum work uniform which will be used on HAZWOPER sites. Its use is appropriate when there is no significant potential for encountering chemical materials while working in controlled work areas.

Level D Equipment List

- Hard hat
- Eye protection
- Safety-toe work boots
- Hearing protection (as required).

3.2 MODIFIED LEVEL D ENSEMBLE

The Modified Level D ensemble provides moderate skin protection against chemical contact, but no respiratory protection. It's use is appropriate where there is a moderate to low potential for skin contact with chemical materials, but no significant inhalation hazard is expected. The Modified Level D ensemble will consist of the Level D ensemble, supplemented by the addition of one or more of the following items:

- Chemical-resistant disposable outer coveralls
- Chemical-resistant outer gloves (taped to outer coveralls)[4]
- Chemical-resistant inner gloves[4]
- Chemical-resistant safety-toe boots (taped to outer coveralls)

3.3 LEVEL C ENSEMBLE

The Level C ensemble provides moderate skin protection against chemical contact and moderate respiratory protection. It's use is appropriate where there is the potential for skin contact with chemical materials, together with a limited and well defined potential for exposure via inhalation.

[4] Selection of specific glove types/materials will be provided in the project HASP based consideration of the contaminants and the physical conditions of the work.

Level C Equipment List

- Full-face air-purifying respirator equipped with HASP-designated cartridges[5]
- Chemical-resistant disposable outer coveralls
- Chemical-resistant outer glove (taped to outer coveralls)[4]
- Chemical-resistant inner gloves[4]
- Hard hat
- Safety-toe boots (taped to coveralls) the use of boot covers or chemical-resistant boot may be specified
- Hearing protection (as required).

3.4 LEVEL B ENSEMBLE

The Level B ensemble provides both the highest level of inhalation exposure protection, and considerable skin contact protection. It's use is appropriate where there are significant chemical hazards involving both skin and inhalation exposure (up to and including IDLH conditions), or where adverse atmospheric conditions cannot be mitigated by use of air purifying respirators (e.g., oxygen deficient atmospheres, chemicals with poor warning properties).

Level B Equipment List

- Supplied air respirator (either SCBA or air line system w/Grade D or better breathing air)
- Chemical-resistant disposable outer coveralls
- Chemical-resistant outer glove (taped to outer coveralls)[4]
- Chemical-resistant inner gloves[4]
- Hard hat
- Chemical resistant safety-toe boots (taped to coveralls)
- Hearing protection (as required).

3.5 LEVEL A ENSEMBLE

The Level A ensemble provides the highest level of both respiratory and skin protection, up to and including protection against skin contact with vapor-phase contaminants. The use of Level A PPE requires approval from the GWES EH&S Director.

Specific Level A ensemble components will be determined on a case-by-case basis by the EH&S Department.

4.0 EXPOSURE MONITORING

Air monitoring at HAZWOPER sites will be conducted to monitor and control employee exposures to chemical contaminants, and to regulate controlled work area boundaries for the protection of non-HAZWOPER workers and the general public.

[5] Selection of specific cartridges will be made by the EH&S Department based on contaminants present. A cartridge change-out frequency will also be specified in the HASP based on manufacturer's cartridge performance data.

4.1 DIRECT READING AIR MONITORING REQUIREMENTS

Airborne contaminants present potential hazards to HAZWOPER personnel working within controlled work areas, and to non-HAZWOPER workers and the general public present outside the controlled areas. On site monitoring will be utilized to asses the magnitude of these hazards, and provide indications of any necessary control procedures to mitigate unacceptable hazards.

Specific air monitoring requirements will be established in individual Health and Safety Plans (HASPs) subject to the following requirements:

- Direct reading instrumentation will be used when available. Instruments include:
    - Flame Ionization Detectors (FIDs – e.g., OVA) – select organic vapors
    - Photoionization detectors (PID – e.g., miniRAE or Micro-TIP) – select organic vapors
    - Explosimeters – explosivity (as a percent of the Lower Explosive Limit)
    - Oxygen monitors – oxygen concentration (in percent)
    - Single gas meters (mono-tox) – selected contaminants (in parts per million)
        - Hydrogen sulfide
        - Carbon monoxide
        - Oxides of Nitrogen
        - Cyanide
    - Colorimeteric Detector Tubes (e.g., Draegar) – selected contaminants (in parts per million)
    - Aerosol monitors (e.g., mini-RAM) – airborne particulate concentration (in milligrams per cubic meter)
    - Portable gas chromatographs (e.g., OVA) – selected organic vapors

Selected instruments will be capable of discriminating contaminant concentrations to concentrations of at least one-half of the HASP-specified exposure limit. All direct reading instrumentation will be calibrated daily as directed by the manufacturer.

4.1.1 Work Area Monitoring

1. Work area monitoring will include breathing zone readings for the maximally exposed worker(s).
2. Results will be used to determine adequacy of PPE (especially respiratory protection). Specific criteria for upgrade/downgrade will be established in the HASP.

4.1.2 Perimeter Air Monitoring

1. Perimeter air samples will be collected when the potential exists for airborne contaminants to migrate off-site.
2. Perimeter monitoring will be conducted at locations downwind from the project activities at a minimum.
3. Results will be used to determine if the existing controlled work area boundaries are adequate, and/or if work operations present unwarranted hazards to off-site personnel.

4.2 PERSONAL EXPOSURE MONITORING

Personal exposure monitoring will be conducted to determine individual exposures, as specified in the HASP or directed by the EH&S Department.

- Sample results will be recorded in a log book or on the sample log form provided in Attachment 2.
- Records will indicate individual name, SSN, and job/operation at the time of sample collection.

- Samples sent out for independent laboratory analysis will follow chain of custody requirements.
- Exposure results will be posted on site and explained in a safety briefing.
- Employees will receive a written statement of results within 5 days of receipt from the laboratory.

Results of all personal exposure monitoring will be provided to the EH&S Department for inclusion in the employee medical records.

REFERENCES: ENV 003 – *EH&S Administrative Support*
ENV 203 – *Medical Monitoring Program*

ATTACHMENT: Attachment 1 – *Direct Reading Instrument Monitoring Log*
Attachment 2 - *Personal Sampling Data Sheet*
Attachment 3 - *Instrument Calibration Log*

DIRECT READING INSTRUMENT MONITORING LOG

Project: _____ Job No.: _____

Date: _____ Operator: _____

Instrument: _____ Calibration: _____
(Amt, Component, Date)

Sampling Technique: _____

_____

Sample Interval: _____

Background Reading: _____

Action Level/Response: _____

Time	Location	Reading (units)	Detection Limits (Scale)

PERSONAL SAMPLING DATA SHEET

Client: _____ Material: _____

Site Location: _____ Job No.: _____ Sampling Media: _____

Item No.	Name of Earth Tech Personnel	SS Number	Sample Number	Date	Start Time	Stop Time	Total Time	Air Flow Vm		Total Air Flow (l)	Sampler's Initials	Amount (mg)	Conc. ppm, mg/m^3	Remarks
								Pre	Post					

EARTH TECH
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Earth Tech
Instrument Calibration Log

Instrument Information	
Instrument Name:	Manufacturer:
Serial Number:	Last Service Date:
Parameter(s):	Calibration Gas:
Calibration Procedure:	

Daily Calibration Results

Date: _____ Calibration Result: _____
Name: _____ Signature: _____
Notes:

Date: _____ Calibration Result: _____
Name: _____ Signature: _____
Notes:

Date: _____ Calibration Result: _____
Name: _____ Signature: _____
Notes:

Date: _____ Calibration Result: _____
Name: _____ Signature: _____
Notes:

Date: _____ Calibration Result: _____
Name: _____ Signature: _____
Notes:

Date: _____ Calibration Result: _____
Name: _____ Signature: _____
Notes:

Date: _____ Calibration Result: _____
Name: _____ Signature: _____
Notes:

ENV 507

HANDLING OF DRUMS AND LARGE CONTAINERS

Published:	January 20, 2003
Revised:	N/A
Page:	1 of 3

SUMMARY: This procedure provides guidance to employees and managers to minimize injuries, exposures, environmental contamination, and work disruptions resulting from accidents or injuries that could be caused by improper handling of drums and other containers.

1.0 GENERAL REQUIREMENTS

These requirements apply to drums of 10-gallon capacity and larger, and to other portable atmospheric containers of 10-gallon capacity or larger. The requirements of this procedure are not applicable to the handling of containers used to store pressurized gases or to hazardous waste drum handling.

1.1 DEFINITIONS

The following definitions apply to these procedures and are slightly modified for specific operations.

Drums - Hollow, cylindrical containers (capacity between 10 and 55 gallons) used for the storage or containerization of bulk quantities of work materials or wastes.

Other Large Containers - Containers other than drums that are used to hold bulk quantities of work materials or wastes. These include tanks and roll-off bins, and are generally much larger than drums.

Tanks - Hollow containers of capacity greater than 55 gallons used for the storage or containerization of bulk liquids.

Roll-off Bins - Rectangular-shaped containers capable of being transported using a specially designed vehicle on which the roll-off bin can be mounted/dismounted. Roll-off bins can be placed at a site, used to containerize bulk materials, and re-mounted on the vehicle for off-site transportation. Some roll-off bins are equipped with wheels, and can be moved manually.

2.0 PROCEDURES

2.1 GENERAL

All storage and handling of drums and other containers will conform to the following handling requirements.

- No drum or container will be filled beyond its rated capacity (expressed as either weight or volume). For liquid-containing drums/containers, a void space must be left to allow for liquid expansion in extreme heat.
- Storage locations for drums/containers shall be segregated so that differing types of materials are not stored together or co-mingled. Chemical products and waste materials shall not be stored together. Incompatible materials (e.g., fuels and oxidizers) shall not be stored together.
- Any drum/container storage structure must have the capability to fully contain a spill consisting of the contents of the largest container permitted for use in the structure plus the volume of water expected to be generated by a 25-year storm. The storage area shall be fenced and locked, and access will be limited to designated personnel.
- In accordance with the requirements of 29 CFR 1910.1200 (Hazard Communication), all drums and other containers will be labeled as to their contents. Hazardous properties such as flammability, etc., shall also be clearly indicated. For containers of hazardous wastes, the date on which waste was first accumulated in the drum/container shall be noted.

2.2 DRUMS

In addition to the above requirements, handling of all drums will be accomplished in accordance with the following:

- Only drums meeting U.S. Department of Transportation (DOT) specifications shall be used. Drums shall be inspected for rust, corrosion, warping, and other damage. Damaged drums shall not be used.
- Drums containing any materials will be covered with a tight-fitting lid when not in use.
- At the conclusion of each working shift, all drums will be placed in the designated storage area appropriate to their contents. Each such area will be properly marked and secured.
- Drums containing hazardous or flammable materials will be electrically grounded to prevent the buildup of static charge. As required, containers will be bonded to ensure that no potential charge difference exists between containers that might come into contact and cause sparking.
- Manual lifting, carrying, or moving of drums will not be permitted. A drum-handling cart or similar apparatus will be used for moving drums from collection points to the designated storage area.

2.3 OTHER CONTAINERS

- Each container shall be inspected for rust, corrosion, warping, and other damage prior to use. Damaged containers shall not be used.
- Containers larger than 55 gallons and/or 800 pounds will not be moved using any type of manual method, including non-powered mechanical devices. All handling will be accomplished using powered mechanical equipment designed specifically for that purpose.
- As applicable, any container holding material shall be covered with a tight-fitting lid when not in use.
- Containers of hazardous or flammable materials will be electrically grounded to prevent the buildup of static charge. As required, containers will be bonded to ensure that no potential charge difference exists between containers that might come into contact and cause sparking.

3.0 DRUM HANDLING PROCEDURE

Use mechanical aids whenever possible. Do not attempt to raise a full drum alone.

Moving an upright drum:

1. Stand close to the drum with feet apart. One foot at the front and the other behind.
2. Keep knees slightly flexed.
3. Put your hands firmly against upper rim of the drum.
4. Keep arms straight with the elbows "locked".
5. Rock the drum gently to get the feel of its contents before you move it.
6. Push the top of the drum away by extending the back leg and shifting your body weight onto your front leg.
7. Stop tilting the drum at the balance point. Use back leg as a counter balance.

Raising a drum laid on its side:

1. Make sure that the drum is empty before raising it.
2. Stand at the end of the drum.
3. Place one foot forward at the side of the drum, the other behind.
4. Bend your hips and knees.
5. Keep the back straight.
6. Grasp the rim about 15 cm from the ground with the elbows inside thighs.

7. Stand up by thrusting off with the back leg and continuing in an upward and forward direction.
8. Bring the back leg forward as if you are walking. Keep close to the drum.
9. Stop at the balance point to change hand grip.
10. Set the drum on its base by moving back leg forward. Use the body weight as a counter balance.

REFERENCES: ENV 501 – *Manual Materials Handling*
ENV 508 – *Drum Sampling*

This procedure applies to Earth Tech Environmental Practice operations. Earth Tech's Environmental, Health and Safety (EH&S) Department is solely responsible for its issuance, revision, and maintenance. Any deviation from these requirements requires approval from the GWES EH&S Director or an EH&S Manager.

ENV 301

HAZARDOUS WASTE OPERATIONS

Published:	January 20, 2003
Revised:	N/A
Page:	1 of 7

SUMMARY: All hazardous waste operations (HAZWOPER) work performed or managed by Earth Tech will be performed in accordance with the following requirements, which are intended to ensure compliance with 29 CFR 1910.120 (and equivalent state regulations).

1.0 PERSONNEL QUALIFICATIONS

All personnel working at HAZWOPER sites must meet the training and medical monitoring requirements specified in 29 CFR 1910.120 (e) and (f). Also, additional training will be required based on site activities (e.g., confined space, lead in construction, OSHA 10-hour construction). These additional training requirements will be outlined in the project- or site-specific health and safety plan.

1.1 EARTH TECH PERSONNEL

Earth Tech's HAZWOPER-qualified employees will participate in the following training and medical monitoring procedures.

1.1.1 Medical Monitoring

Specific HAZWOPER medical examination protocols have been developed by Earth Tech's Corporate Medical Provider (CMP) to meet the requirements of 29 CFR 1910.120 (f). To be medically qualified to perform HAZWOPER work personnel receive the following medical examinations:

- Initial (Baseline) Examination - The initial examination is a part of pre-employment requirements, and must be completed (with results received) prior to the employee's start of work date.
- Annual Examination - HAZWOPER-qualified employees will complete a medical examination once each year[1].
- Termination Examination - At the conclusion of employment at Earth Tech, or when re-assigned to non-HAZWOPER duties, personnel will be provided with the opportunity to receive a termination medical examination.
- Special Examinations - The EH&S Department and the CMP will jointly determine the need for special examinations due to:
    - Unusual exposure conditions.
    - In response to possible overexposures.

The CMP will determine the medical protocol elements for each of these examinations based on exposure information provided by the EH&S Department. The CMP will evaluate the results of each employee's examination, and will provide a medical clearance clearly stating medical compliance with the HAZWOPER regulatory standard (29 CFR 1910.120 (f)), and approval of the employee to perform unrestricted HAZWOPER activities. For Initial and Annual examinations the CMP will also evaluate the employee for the use of air purifying and supplied air respiratory protection, and the written evaluation from these examinations will indicate the physician's approval/limitations on the employee's sue of respiratory protection.

1.1.2 Training

All personnel assigned to work at a hazardous waste site must participate in training meeting the requirements of 29 CFR 1910.120 (e).

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[1] Medical qualification expires on the anniversary date of the last examination completed, and there will be no "grace period" exemptions beyond this date without the express approval of an EH&S Manager. At the recommendation of the EH&S Department, the CMP may approve an alternate examination frequency, at periods of up to two years, in cases where the worker's exposures to environmental contaminants are infrequent and typically well below any occupational exposure limits (e.g., senior management personnel).

This procedure applies to Earth Tech Environmental Practice operations. Earth Tech's Environmental, Health and Safety (EH&S) Department is solely responsible for its issuance, revision, and maintenance. Any deviation from these requirements requires approval from the GWES EH&S Director or an EH&S Manager.

1. Initial 40-Hour Training - Before being assigned to a HAZWOPER site all Earth Tech personnel must complete 40 hours of training meeting the requirements of 29 CFR 1910.120 (e)(3)(i). At the conclusion of training personnel will receive a written certification of course completion, signed by the instructor, which indicates the course of instruction (40-hour HAZWOPER) and training dates. A copy of this certification must be provided to the employee's HSA. The employee is responsible for maintaining their own copy of this certificate, and bringing it when working on any HAZWOPER site.

   Available Training Sources:
   - On-site training provided by the EH&S Department
   - Outsourced training providers approved by the EH&S Department

2. Refresher 8-Hour Training - To remain qualified to perform on-site work activities each Earth Tech employee will complete 8-hours of HAZWOPER refresher training meeting the requirements of 29 CFR 1910.120 (e)(8) at yearly intervals[2] following completion of Initial 40-hour training. At the conclusion of training personnel will receive a written certification of course completion, signed by the instructor, which indicates the course of instruction (8-hour HAZWOPER Refresher) and the training date. A copy of this certification must be provided to the employee's Health and Safety Administrator (HSA). The employee is responsible for maintaining their own copy of this certificate, and bringing it when working on any HAZWOPER site.

   Available Training Sources:
   - Internet-based training approved by the EH&S Department
   - On-site training provided by the EH&S Department
   - Outsourced training providers approved by the EH&S Department
   - Earth Tech's Take-home Refresher Training course (with EH&S Manager approval only)

3. Supervisor Training - Any Earth Tech employee acting in a management capacity for HAZWOPER activities (e.g., project management personnel, field managers, site safety officers, etc.) must complete 8 hours of HAZWOPER Supervisor training meeting the requirements of 29 CFR 1910.120 (e)(4). This training is required only once, no supervisor refresher training is specified (however supervisors must still maintain their overall HAZWOPER-qualification through annual completion of Refresher training). At the conclusion of training personnel will receive a written certification of course completion, signed by the instructor, which indicates the course of instruction (HAZWOPER Supervisor) and the training date. A copy of this certification must be provided to the employee's HSA. The employee is responsible for maintaining their own copy of this certificate, and bringing it when working on any HAZWOPER site.

   Available Training Sources:
   - On-site training provided by the EH&S Department
   - Outsourced training providers approved by the EH&S Department

4. 24-Hour HAZWOPER Training - Some site support contractors and site visitors may qualify to substitute 24-hour HAZWOPER training in place of 40-hour training, as specified in 29 CFR 1910.120 (e)(3)(ii). Personnel potentially qualifying for this alternative training include:
   - Site support personnel who will not work in any Exclusion Zone areas.
   - Subcontractors and site visitors who's duties will not entail significant exposure to site contaminants[3].

[2] Training expires on the anniversary date of the last class completed. The worker's HAZWOPER-qualification expires at this time, and there will be no "grace period" exemptions beyond this date without the express approval of an EH&S Manager.

[3] Defined as not working in any areas where airborne contaminant concentrations exceed one-half of any applicable occupational exposure limit, and no contact or exposure to materials with site contaminant concentrations exceeding natural background levels.

An EH&S Manager must approve of the substitution of 24-hour training for Initial 40-hour training. Persons qualifying for 24-hour training must provide written certification of course completion prior to beginning work on site. Persons completing 24-hour training must complete 8 hours of annual refresher training at the required interval to maintain eligibility for on-site work, and must provide proof of this training (as necessary to demonstrate re-training) prior to beginning work on site.

1.2 SUBCONTRACTOR PERSONNEL

Any subcontractor organization whose employees will support Earth Tech operations at a HAZWOPER site will:

- Provide the Earth Tech Project Manager with a copy of their written HAZWOPER medical monitoring and training program requirements. The elements of the program must be similar to those for Earth Tech's own program, as detailed above.
- Provide the Project Manager with written certification of a physician's approved medical clearance for each employee who will work on the site. Certification can be demonstrated by:
  - A copy of the physician's signed medical clearance for each employee (preferred), or
  - A letter identifying the medical status and clearance expiration date of every employee, signed by the company's safety director or an officer of the company.
- A copy of the each employee's training certifications, which must include:
  - The Initial 40-hour training certificate (24-hour training may be substituted with EH&S Department approval).
  - The most current Refresher training certificate (must be current within the previous 1-year period).
  - A copy of the Supervisor training certificate for each person serving in a management capacity (e.g., foreman personnel).

2.0 PROJECT EH&S DOCUMENTATION – HEALTH AND SAFETY PLANS

The project EH&S documentation prepared for HAZWOPER activities is referred to as a Health and Safety Plan (HASP), and must meet the requirements presented in 29 CFR 1910.120 (b)(4). The required plan elements include:

1. A description of the work location, the site history, and a summary of any information available concerning site hazards (including both physical hazards and contamination conditions).
2. A summary of the work activities to be performed under Earth Tech's scope of activities.
3. A safety and health risk or hazard analysis for each on-site task which will be performed. Identified risks must include both chemical and physical hazards to which personnel may be exposed during the conduct of the work task.
4. Protective measures for each work task to prevent or mitigate the potential hazards identified in the hazard analyses.
5. Personal protective equipment (PPE) requirements for each work task.
6. Frequency and types of air monitoring, personal monitoring, and environmental sampling techniques and instrumentation to be used.
7. Site control measures.
8. Decontamination procedures.
9. An emergency response plan addressing actions to be taken in the event of each type of credible incident which might result during the performance of planned work activities, including minor and major injuries,

and chemical release and fire. Response plans must address the means for coordinating the evacuation of all on-site personnel in the event of a catastrophic incident.

Responsibility for development of each HASP will be coordinated between the Project Manager and the EH&S Department as part of project initiation. Regardless of where the HASP is developed, it will be reviewed and approved by the EH&S Department prior to submission to any agency outside of Earth Tech.

3.0 HAZWOPER PROTECTIVE EQUIPMENT ENSEMBLES

Defined HAZWOPER PPE ensembles are specified for general use on all HAZWOPER operations. The project HASP may specify modifications to these requirements to meet specific on-site conditions.

3.1 LEVEL D ENSEMBLE

The Level D ensemble provides a minimal level of skin protection (primarily against physical rather than chemical hazards) and no respiratory protection. Level D PPE is the minimum work uniform which will be used on HAZWOPER sites. Its use is appropriate when there is no significant potential for encountering chemical materials while working in controlled work areas.

Level D Equipment List

- Hard hat
- Eye protection
- Safety-toe work boots
- Hearing protection (as required).

3.2 MODIFIED LEVEL D ENSEMBLE

The Modified Level D ensemble provides moderate skin protection against chemical contact, but no respiratory protection. It's use is appropriate where there is a moderate to low potential for skin contact with chemical materials, but no significant inhalation hazard is expected. The Modified Level D ensemble will consist of the Level D ensemble, supplemented by the addition of one or more of the following items:

- Chemical-resistant disposable outer coveralls
- Chemical-resistant outer gloves (taped to outer coveralls)[4]
- Chemical-resistant inner gloves[4]
- Chemical-resistant safety-toe boots (taped to outer coveralls)

3.3 LEVEL C ENSEMBLE

The Level C ensemble provides moderate skin protection against chemical contact and moderate respiratory protection. It's use is appropriate where there is the potential for skin contact with chemical materials, together with a limited and well defined potential for exposure via inhalation.

[4] Selection of specific glove types/materials will be provided in the project HASP based consideration of the contaminants and the physical conditions of the work.

Level C Equipment List

- Full-face air-purifying respirator equipped with HASP-designated cartridges[5]
- Chemical-resistant disposable outer coveralls
- Chemical-resistant outer glove (taped to outer coveralls)[4]
- Chemical-resistant inner gloves[4]
- Hard hat
- Safety-toe boots (taped to coveralls) the use of boot covers or chemical-resistant boot may be specified
- Hearing protection (as required).

3.4 LEVEL B ENSEMBLE

The Level B ensemble provides both the highest level of inhalation exposure protection, and considerable skin contact protection. It's use is appropriate where there are significant chemical hazards involving both skin and inhalation exposure (up to and including IDLH conditions), or where adverse atmospheric conditions cannot be mitigated by use of air purifying respirators (e.g., oxygen deficient atmospheres, chemicals with poor warning properties).

Level B Equipment List

- Supplied air respirator (either SCBA or air line system w/Grade D or better breathing air)
- Chemical-resistant disposable outer coveralls
- Chemical-resistant outer glove (taped to outer coveralls)[4]
- Chemical-resistant inner gloves[4]
- Hard hat
- Chemical resistant safety-toe boots (taped to coveralls)
- Hearing protection (as required).

3.5 LEVEL A ENSEMBLE

The Level A ensemble provides the highest level of both respiratory and skin protection, up to and including protection against skin contact with vapor-phase contaminants. The use of Level A PPE requires approval from the GWES EH&S Director.

Specific Level A ensemble components will be determined on a case-by-case basis by the EH&S Department.

4.0 EXPOSURE MONITORING

Air monitoring at HAZWOPER sites will be conducted to monitor and control employee exposures to chemical contaminants, and to regulate controlled work area boundaries for the protection of non-HAZWOPER workers and the general public.

[5] Selection of specific cartridges will be made by the EH&S Department based on contaminants present. A cartridge change-out frequency will also be specified in the HASP based on manufacturer's cartridge performance data.

4.1 DIRECT READING AIR MONITORING REQUIREMENTS

Airborne contaminants present potential hazards to HAZWOPER personnel working within controlled work areas, and to non-HAZWOPER workers and the general public present outside the controlled areas. On site monitoring will be utilized to asses the magnitude of these hazards, and provide indications of any necessary control procedures to mitigate unacceptable hazards.

Specific air monitoring requirements will be established in individual Health and Safety Plans (HASPs) subject to the following requirements:

- Direct reading instrumentation will be used when available. Instruments include:
    - Flame Ionization Detectors (FIDs – e.g., OVA) – select organic vapors
    - Photoionization detectors (PID – e.g., miniRAE or Micro-TIP) – select organic vapors
    - Explosimeters – explosivity (as a percent of the Lower Explosive Limit)
    - Oxygen monitors – oxygen concentration (in percent)
    - Single gas meters (mono-tox) – selected contaminants (in parts per million)
        - Hydrogen sulfide
        - Carbon monoxide
        - Oxides of Nitrogen
        - Cyanide
    - Colorimeteric Detector Tubes (e.g., Draegar) – selected contaminants (in parts per million)
    - Aerosol monitors (e.g., mini-RAM) – airborne particulate concentration (in milligrams per cubic meter)
    - Portable gas chromatographs (e.g., OVA) – selected organic vapors

Selected instruments will be capable of discriminating contaminant concentrations to concentrations of at least one-half of the HASP-specified exposure limit. All direct reading instrumentation will be calibrated daily as directed by the manufacturer.

4.1.1 Work Area Monitoring

1. Work area monitoring will include breathing zone readings for the maximally exposed worker(s).
2. Results will be used to determine adequacy of PPE (especially respiratory protection). Specific criteria for upgrade/downgrade will be established in the HASP.

4.1.2 Perimeter Air Monitoring

1. Perimeter air samples will be collected when the potential exists for airborne contaminants to migrate off-site.
2. Perimeter monitoring will be conducted at locations downwind from the project activities at a minimum.
3. Results will be used to determine if the existing controlled work area boundaries are adequate, and/or if work operations present unwarranted hazards to off-site personnel.

4.2 PERSONAL EXPOSURE MONITORING

Personal exposure monitoring will be conducted to determine individual exposures, as specified in the HASP or directed by the EH&S Department.

- Sample results will be recorded in a log book or on the sample log form provided in Attachment 2.
- Records will indicate individual name, SSN, and job/operation at the time of sample collection.

- Samples sent out for independent laboratory analysis will follow chain of custody requirements.
- Exposure results will be posted on site and explained in a safety briefing.
- Employees will receive a written statement of results within 5 days of receipt from the laboratory.

Results of all personal exposure monitoring will be provided to the EH&S Department for inclusion in the employee medical records.

REFERENCES: ENV 003 – *EH&S Administrative Support*
ENV 203 – *Medical Monitoring Program*

ATTACHMENT: Attachment 1 – *Direct Reading Instrument Monitoring Log*
Attachment 2 - *Personal Sampling Data Sheet*
Attachment 3 - *Instrument Calibration Log*

DIRECT READING INSTRUMENT MONITORING LOG

Project: _____ Job No.: _____

Date: _____ Operator: _____

Instrument: _____ Calibration: _____
(Amt, Component, Date)

Sampling Technique: _____

_____

Sample Interval: _____

Background Reading: _____

Action Level/Response: _____

Time	Location	Reading (units)	Detection Limits (Scale)

PERSONAL SAMPLING DATA SHEET

Client: _____ Material: _____

Site Location: _____ Job No.: _____ Sampling Media: _____

Item No.	Name of Earth Tech Personnel	SS Number	Sample Number	Date	Start Time	Stop Time	Total Time	Air Flow Vm		Total Air Flow (l)	Sampler's Initials	Amount (mg)	Conc. ppm, mg/m^3	Remarks
								Pre	Post					

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Earth Tech
Instrument Calibration Log

Instrument Information	
Instrument Name:	Manufacturer:
Serial Number:	Last Service Date:
Parameter(s):	Calibration Gas:
Calibration Procedure:	

Daily Calibration Results

Date: _____ Calibration Result: _____
Name: _____ Signature: _____
Notes:

Date: _____ Calibration Result: _____
Name: _____ Signature: _____
Notes:

Date: _____ Calibration Result: _____
Name: _____ Signature: _____
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Date: _____ Calibration Result: _____
Name: _____ Signature: _____
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Date: _____ Calibration Result: _____
Name: _____ Signature: _____
Notes:

ENV 508

DRUM SAMPLING

Published: January 20, 2003
Revised: N/A
Page: 1 of 4

SUMMARY: Drum sampling activities will be performed using the specific procedures and equipment specified in this procedure.

1.0 REQUIREMENTS

Prior to sampling, drums must be inventoried, staged, and opened. Inventory entails recording visual qualities of each drum and any characteristic pertinent to the contents' classification. Staging involves the organization, and sometimes consolidation, of drums that have similar wastes or characteristics. Closed drums can be opened manually or remotely. Remote drum opening is recommended for worker safety. Air monitoring is mandatory during drum-handling operations.

2.0 EQUIPMENT/APPARATUS

2.1 PREREQUISITE EQUIPMENT/MATERIALS

The following are standard programs, plans, materials and equipment required for sampling:

- Health and Safety Plan
- Personal protective equipment (PPE)
- Wide-mouth glass jars with Teflon® cap liner and approximately 500-ml volume
- Uniquely numbered sample identification labels with corresponding data sheets
- One-gallon covered cans half-filled with absorbent
- Chain-of-custody sheets
- Decontamination plan and materials
- Glass thieving tubes and materials

2.2 DRUM-OPENING DEVICES

Bung Wrench

A universal bung wrench is commonly used to manually open drums. These wrenches have fittings to remove nearly all bung types. Wrenches are usually constructed of cast iron, brass, or a bronze-beryllium, nonsparking alloy formulated to reduce the likelihood of sparks.

The use of a wrench designated as “non-sparking” does not eliminate the possibility of a spark being produced, however.

Drum Deheader

If a drum cannot be opened manually using a bung wrench, another alternative is a drum deheader. Constructed of forged steel with an alloy steel blade, this tool is designed to completely or partially cut the lid of a drum with scissor-like cutting action. A limitation of this device is that it can be attached only to closed-head drums. Drums with removable heads must be opened by other means.

Hand Pick, Pickaxe, and Hand Spike

These tools are usually constructed of brass or a nonsparking alloy, with a sharpened point that can penetrate a drum lid or head when the tool is swung. Hand picks or pickaxes are commonly used and commercially available; spikes are generally fabricated 4-foot poles with a pointed end.

Backhoe Spike

The most common tool for remotely opening drums for sampling is a metal spike attached or welded to a backhoe bucket. This is an efficient opening method that greatly reduces the likelihood of personnel exposure.

Hydraulic Drum Opener

A fabricated hydraulic device can effectively open drums remotely to minimize exposure. This device uses hydraulic pressure to pierce through the wall of a drum. It consists of a manually operated pump that pressurizes through a length of hydraulic line.

Pneumatic Devices

A pneumatic bung remover consists of a compressed air supply that is controlled by a heavy-duty, two-stage regulator. A high-pressure air line of desired length delivers compressed air to a pneumatic drill, which turns a sized fitting to remove the bung. An adjustable bracketing system has been designed to position and align the pneumatic drill over the bung. This bracketing system must be attached to the drum before the drill can be operated. Once the bung has been loosened, the bracketing system must be removed before the drum can be sampled. Because this remote bung opener does not permit slow venting of the container, appropriate precautions must be taken. It also requires the container to be upright and relatively level. Bungs that are rusted shut cannot be removed using this device.

3.0 DRUM SAMPLING PROCEDURES

After the drum has been opened, preliminary monitoring of headspace gases should be performed using an explosimeter and organic vapor analyzer (OVA). In most cases, it is impossible to observe the contents of these sealed or partially sealed vessels. Since some layering or stratification is likely in any solution left undisturbed over time, a sample must be taken that represents the entire depth of the vessel.

When sampling a previously sealed vessel, check for the presence of a bottom sludge. This is easily accomplished by measuring the depth to apparent bottom, then comparing it to the known interior depth of the drum.

3.1 GLASS THIEF SAMPLER

The most widely used instrument for sampling is a glass tube (glass thief, 6 mm to 16 mm inner diameter [ID], and 48 inches in length). This tool is simple, cost-effective, quick, and collects a sample without having to be decontaminated.

Specific Sampling Procedure Using a Glass Thief

1. Remove cover from sample container.
2. Insert glass tubing almost to the bottom of the drum or until a solid layer is encountered. About 1 foot of tubing should extend above the drum.
3. Allow the waste in the drum to reach its natural level in the tube.
4. Cap the top of the sampling tube with a tapered stopper or thumb, ensuring the liquid remains within the stopper.
5. Carefully remove the capped tube from the drum and insert the uncapped end in the sample container. Do not spill liquid on the outside of the sample container.
6. Release stopper and allow the glass thief to drain completely into the sample container. Fill the container to about two-thirds of capacity.
7. Remove tube from the sample container, break it into pieces, and place the pieces in the drum.

8. Cap the sample container tightly and place the pre-labeled sample container in a carrier.
9. Replace the bung or place the pieces in the drum.
10. Transport sample to decontamination zone for preparation for transport to analytical laboratory.

In many instances, a drum containing waste material will have a sludge layer on the bottom. Slow insertion of the sample tube down into this layer and then a gradual withdrawal will allow the sludge to act as a bottom plug to maintain the fluid in the tube. The plug can be gently removed and placed into the sample container by using a stainless-steel lab spoon.

It should be noted that in some instances disposal of the tube by breaking it into the drum may interfere with eventual plans for the removal of its contents. The use of this technique should be cleared with the project manager or other disposal techniques evaluated.

3.2 COLIWASA SAMPLER

There is equipment that will collect a sample from the full depth of a drum and maintain it in the transfer tube until delivery to the sample bottle. These equipment designs include primarily the Composite Liquid Waste Sampler (COLIWASA) and modifications thereof. The COLIWASA is a sampler designed to permit representative sampling of multiphase wastes from drums and other containerized wastes. One configuration is a 152-cm-by-4-cm ID section of tubing with a neoprene stopper at one end, attached by a rod running the length of the tube to a locking mechanism which opens and closes the sampler by raising and lowering the neoprene stopper.

The major drawbacks associated with using a COLIWASA are decontamination and costs. The sampler is difficult if not impossible to decontaminate in the field and its high cost in relative to alternative procedures (glass tubes) makes it an impractical throwaway item. It still has applications, however, especially in instances where a true representation of a multiphase waste is absolutely necessary.

Procedures for Use

1. Put the sampler in the open position by placing the stopper rod handle in the T-position and pushing the rod down until the handle sits against the sampler's locking block.
2. Slowly lower the sampler into the liquid waste. (Lower the sampler at a rate that permits the levels of the liquid inside and outside the sampler tube to be about the same. If the level of the liquid in the sample tube is lower than that outside the sampler, the sampling rate is too fast and will result in a nonrepresentative sample.)
3. When the sampler stopper hits the bottom of the waste container, push the sampler tube downward against the stopper to close the sampler. Lock the sampler in the closed position by turning the T-handle until it is upright and one end rests tightly on the locking block.
4. Slowly withdraw the sample from the waste container with one hand, while wiping the sampler tube with a disposable cloth or rag with the other hand.
5. Carefully discharge the sample into a suitable sample container by slowly pulling the lower end of the T-handle away from the locking block while the lower end of the sampler is positioned in a sample container.
6. Cap the sample container with a Teflon®-lined cap, attach label and seal, and record on sample data sheet.
7. Unscrew the T-handle of the sampler and disengage the locking block. Clean sampler.

4.0 SAMPLE HANDLING AND STORAGE

- Place sample container in two Ziplock® plastic bags.
- Place each bagged container in a one-gallon, covered can containing absorbent packaging material.
- Place lid on can.
- Mark the sample identification number on the outside of the can.
- Place marked cans in a cooler, and fill remaining space with absorbent packing material.
- Fill out chain-of-custody record for each cooler, place in plastic, and affix to the inside of the cooler lid.
- Secure and custody-seal the cooler lid.
- Arrange for the appropriate transportation mode consistent with the type of hazardous waste involved.

REFERENCES: ENV 507 - *Handling of Drums and Large Containers*

This procedure applies to Earth Tech Environmental Practice operations. Earth Tech's Environmental, Health and Safety (EH&S) Department is solely responsible for its issuance, revision, and maintenance. Any deviation from these requirements requires approval from the GWES EH&S Director or an EH&S Manager.

ENV 302

ASBESTOS OPERATIONS

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Page:	1 of 4

SUMMARY: The requirements below apply for all Earth Tech activities where asbestos-containing materials (ACM) may be encountered as an ancillary part of environmental practice activities. These procedures meet the requirements of 29 CFR 1910.1001 and 29 CFR 1926.1101.

1.0 APPLICABLE DEFINITIONS

Asbestos – means any member of a group of fibrous mineral types found naturally occurring in many parts of the world. Most common in the United States is chrysotile, a white-colored mineral widely used in fire-retardant product and thermal insulation. Other asbestos forms include amosite (a brownish mineral), cricidolite (a bluish mineral), tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that have been chemically treated and/or altered.

Asbestos Containing Material (ACM) – means bulk materials containing, or presumed to contain, asbestos in excess of 1.0% by mass.

Class I Asbestos Work – removal of thermal system insulation (TSI) and surfacing ACM and PACM.

Class II Asbestos Work – removal of ACM which is not TSI or surfacing material; this includes floor tile, roofing products, construction mastics, etc.

HAZWOPER – means any on-site contamination investigation or clean-up activities subject to the operational requirements of 29 CFR 1910.120.

Acceptable Exposure Limit (AEL) – Means the maximum exposure concentration to which a Earth Tech employee can be subjected, normalized to an 8 (eight) hour time weighted average (TWA) and with consideration of the mitigation provided by any respiratory protection which may be used. For normal work shifts (8-hours or less) Earth Tech's asbestos AEL is 0.1 fibers per cubic centimeter of air (0.1 f/cc).

2.0 RESPONSIBILITIES

2.1 EH&S DEPARTMENT

1. Provide technical assistance in the identification of ACM and the evaluation of asbestos exposure hazards as requested by management personnel.
2. Review and approve all asbestos exposure hazard assessments prior to the start of work activities.
3. Review and approve all asbestos abatement plans and exposure monitoring activities to ensure compliance with federal, state and local regulations.

2.2 PROJECT MANAGERS

1. Assure that the presence of ACM at Earth Tech work sites is identified (where reasonably possible) prior to commencing field activities, that prior to initiating any task involving disturbance of or contact with ACM (or immediately upon identification of previously unknown ACM) a task asbestos exposure hazard assessment is developed and approved by the EH&S Department, and that the applicable requirements of Section 3.0 are observed for each task where the asbestos exposure assessment indicates that the airborne asbestos fiber concentrations can exceed the AEL.
2. Assure that employees developing work procedures and/or conducting work activities involving ACM possess any required state specific registrations or certifications.
3. Assure that employee's assigned to perform any work activities involving ACM have been trained in the job-specific hazards of asbestos exposure, have received proper medical surveillance, and are trained and properly fit tested in the use of any designated respiratory protection devices.

2.3 ALL EARTH TECH EMPLOYEES

1. Do not disturb or handle any ACM or suspected ACM without appropriate personal protective equipment (PPE), training in the job-specific hazards of asbestos exposure, medical monitoring, and respirator fit test.
2. Immediately notify the Project Manager of the presence or suspected presence of previously unidentified ACM in the workplace, and cease all work activities involving disturbance or contact with the materials until further direction is received.

3.0 OPERATIONAL REQUIREMENTS

The following operation-specific requirements pertain to activities where the presence of ACM is identified, suspected or is recognized as a significant operational occurrence.

3.1 HAZWOPER ACTIVITIES

Asbestos may be present at HAZWOPER sites as a soil contaminant or building material. If such contamination is noted the following requirements must be observed:

1. The site-specific health and safety plan (HASP) must provide a specific analysis of the asbestos exposure hazard for each task involving the disturbance or handling of ACM.
2. If any potential is identified for worker inhalation exposures to exceed the AEL then specific asbestos exposure control and monitoring procedures must be developed for the work activity and included in the HASP.
3. If workers may be exposed in excess of the AEL, they must complete baseline medical monitoring and asbestos training as detailed below.

3.2 CLASS I OR CLASS II ASBESTOS WORK ACTIVITIES

The past widespread use of ACM in buildings is widely recognized as the source of a significant exposure hazard for personnel performing building demolition/renovation activities. Accordingly, the following requirements will be observed:

1. Prior to commencement of possible Class I or Class II activities a thorough inspection and sampling program will be completed throughout the demolition area to identify the presence of ACM.
2. Where feasible, ACM will be removed prior to commencement of general work activities.
3. The hazards of the removal work will be addressed in an Asbestos Abatement Plan, which will provide exposure controls and monitoring procedures to prevent worker exposures in excess of the AEL. The Asbestos Abatement Plan must be approved by the EH&S Department prior to implementation.
4. A demolition or renovation notification must be filed with and approved by the EPA and any local construction regulatory agencies prior to commencing demolition activities.
5. Workers will meet the training and medical monitoring requirements detailed below.

4.0 MEDICAL MONITORINGAND TRAINING REQUIREMENTS

The following requirements pertain to all workers performing Class I of Class II asbestos work, or tasks where the associated asbestos exposure assessment indicates the potential to exceed the AEL.

4.1 MEDICAL MONITORING REQUIREMENTS

Personnel will complete an asbestos-protocol medical monitoring procedure meeting the requirements of ENV 203. Workers must have a medical clearance from Earth Tech's Corporate Medical Provider to perform work involving potential asbestos exposures.

Medical exams shall be conducted:

- Prior to assignment to an area requiring negative pressure respirators.
- Prior to assignment to an area where the action level may be exceeded.
- On an annual basis for personnel performing on-going asbestos work, or more frequently if the examining physician deems it advisable for medical reasons.
- Within 30 days before or after the date of termination of employment for any employee who has been exposed at or above the AL.

The medical exam shall include:

- A medical and work history;
- A complete physical exam with emphasis on the respiratory system, cardiovascular system and respiratory tract;
- Completion of the standardized medical history questionnaire found in Appendix D of 29 CFR 1910.1001.
- Pulmonary function test;
- Chest X-ray for the initial exam, and periodically thereafter as deemed necessary by the physician or according to the following chart:

Years Since Employee First Exposed	Age of Employee		
	15 - 35	35 - 45	45 plus
0 - 10	every 5 years	every 5 years	every 5 years
10 plus	every 5 years	every 2 years	every year

4.2 TRAINING

Training will be provided prior to or at the time of initial assignment, and at least annually thereafter. Training will be provided at no cost to the employee.

For Class I activities workers must be accredited as asbestos abatement workers under the EPA Model Accreditation Plan.

For Class II activities which involve asbestos-containing roofing materials, flooring materials, siding materials, ceiling tiles, or transite panels workers must be trained in the topics outlined by OSHA, including hands-on, for a minimum of 8 hours. For Other Class II activities workers must be trained in the OSHA-required topics, including hands-on training, and cover the OSHA work practices and engineering control requirements detailed for Class II work.

HAZWOPER work activities involving asbestos must be performed by HAZWOPER-qualified personnel who receive an additional 2-hours of asbestos awareness training which addresses:

1. Hazards of asbestos.

2. Asbestos exposure limits and other regulatory requirements.
3. Asbestos exposure prevention measures.

This training will be provided by the EH&S Department on an as-needed basis.

4.3 RESPIRATORY PROTECTION

Where respiratory protection is specified for use in controlling worker exposures to asbestos, each employee must:

1. Be medically qualified for use of the specified respiratory protection.
2. Complete respirator training and fit testing.
3. Be assigned an appropriate respirator for use during field operations.

Full-face air purifying respirators equipped with P100 particulate matter cartridges are appropriate for most work activities involving asbestos. The use if supplied air respiratory protection requires the prior approval of the EH&S Department.

REFERENCES: EHS 701 – *Asbestos*
ENV 203 – *Medical Monitoring Program*

ENV 529

COLD STRESS AND WINTER OPERATIONS

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Page:	1 of 4

SUMMARY: This procedure is intended to protect workers from the severest effects of cold stress (hypothermia) and cold injury, and to describe exposures to cold working conditions under which it is believed nearly all workers can be repeatedly exposed without adverse health effects. The objective is to prevent the deep body temperature from falling below 96.8°F and to prevent cold injury to body extremities.

1.0 INTRODUCTION

Fatal exposures to cold among workers have almost always resulted from accidental exposures involving failure to escape from low environmental air temperatures or from immersion in low temperature water. The single most important aspect of life-threatening hypothermia is the fall in the deep core temperature of the body. Workers should be protected from exposure to cold so that the deep core temperature does not fall below 96.8°F; lower body temperatures will very likely result in reduced mental alertness, reduction in rational decision making, or loss of consciousness with the threat of fatal consequences.

Pain in the extremities may be the first early warning of danger from cold stress. During exposure to cold, maximum severe shivering develops when the body temperature has fallen to 95°F. This must be taken as a sign of danger to the workers and exposure to cold should be immediately terminated for any workers when severe shivering becomes evident. Useful physical or mental work is limited when severe shivering occurs.

2.0 GENERAL REQUIREMENTS

Since prolonged exposure to cold air, or to immersion in cold water, at temperatures even well above freezing can lead to dangerous hypothermia, whole-body protection must be provided.

1. Adequate insulating dry clothing to maintain core temperatures above 96.8°F must be provided to workers if work is performed in air temperatures below 40°F. Wind chill cooling rate and the cooling power of air are critical factors. The higher the wind speed and the lower the temperature in the work area, the greater the insulation value of the protective clothing required. An equivalent chill temperature (ECT) chart relating the actual dry bulb air temperature and the wind velocity is presented in Attachment 1.
2. Unless there are unusual or extenuating circumstances, cold injury to other than hands, feet, and head is not likely to occur without the development of the initial signs of hypothermia. Superficial or deep local tissue freezing will occur only at temperatures below 32°F regardless of wind speed. However, older workers or workers with circulatory problems require special precautionary protection against cold injury. The use of extra insulating clothing and/or a reduction in the duration of the exposure period are among the special precautions which should be considered.
3. For exposed skin, continuous exposure should not be permitted when the air speed and temperature results in an equivalent chill temperature of –25°F or below.
4. At air temperatures of 40°F or less, it is imperative that workers who become immersed in water or whose clothing becomes wet be immediately provided a change of clothing and be treated for hypothermia.
5. If the air velocity at the job site is increased by wind, draft, or artificial ventilating equipment, the cooling effect of the wind should be reduced by shielding the work area or by wearing an easily removable windbreak garment.
6. If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work should be modified or suspended until adequate clothing is made available or until weather conditions improve.

A recommended work/warm-up schedule is discussed in Section 4.0.

This procedure applies to Earth Tech Environmental Practice operations. Earth Tech's Environmental, Health and Safety (EH&S) Department is solely responsible for its issuance, revision, and maintenance. Any deviation from these requirements requires approval from the GWES EH&S Director or an EH&S Manager.

3.0 HANDS

Special protection of the hands is required to maintain manual dexterity for the prevention of accidents:

1. If fine work is to be performed with bare hands for more than 10 to 20 minutes in an environment below 60°F, special provisions should be established for keeping the workers' hands warm. For this purpose, warm air jets, radiant heaters (fuel burner or electric radiator), or contact warm plates may be utilized. Metal handles of tools and control bars should be covered by thermal insulating material at temperatures below 30°F.
2. If the air temperature falls below 60°F for sedentary work, 40°F for light work, or 20°F for moderate work, and fine manual dexterity is not required, then gloves should be used by the workers.
3. To prevent contact frostbite, the workers should wear anticontact gloves:
    a. When cold surfaces below 20°F are within reach, a warning should be given to each worker to prevent inadvertent contact by bare skin.
    b. If the air temperature is 0°F or less, the hands should be protected by mittens. Machine controls and tools for use in cold conditions should be designed so that they can be handled without removing the mittens.
4. Provisions for additional total body protection are required if work is performed in an environment at or below 40°F. The workers should wear cold protective clothing appropriate for the level of cold and physical activity:

4.0 WORK-WARMING REGIMEN

If work is performed continuously in the cold at an equivalent chill temperature (ECT) at or below –15°F, heated warming shelters (tents, cabins, rest rooms, etc.) should be made available nearby. The workers should be encouraged to use these shelters at regular intervals, the frequency depending on the severity of the environmental exposure. The onset of heavy shivering, minor frostbite (frostnip), the feeling of excessive fatigue, drowsiness, irritability, or euphoria are indications for immediate return to the shelter. When entering the heated shelter, the outer layer of clothing should be removed and the remainder of the clothing loosened to permit sweat evaporation or a change of dry work clothing provided. A change of dry work clothing should be provided as necessary to prevent workers from returning to work with wet clothing.

Attachment 2 provides guidelines for a work/warm-up schedule.

5.0 OTHER WORK PRACTICES

For work practices at or below 10°F ECT (see Attachment 1), the following should apply:

1. The worker should be under constant protective observation (buddy system or supervision).
2. The work rate should not be so high as to cause heavy sweating that will result in wet clothing; if heavy work must be done, rest periods should be taken in heated shelters and opportunity for changing into dry clothing should be provided.
3. New employees should not be required to work fulltime in the cold during the first days of employment until they become accustomed to the working conditions and required protective clothing.
4. The weight and bulkiness of clothing should be included in estimating the required work performance and weights to be lifted by the worker.
5. The work should be arranged in such a way that sitting still or standing still for long periods is minimized. Unprotected metal chair seats should not be used. The worker should be protected from drafts to the greatest extent possible.
6. The workers should be instructed in safety and health procedures, which should address:

a. Proper rewarming procedures and appropriate first aid treatment.
b. Proper clothing practices.
c. Proper eating and drinking habits.
d. Recognition of impending frostbite.
e. Recognition of signs and symptoms of impending hypothermia or excessive cooling of the body even when shivering does not occur.
f. Safe work practices.

7. Eye protection for workers employed outdoors in a snow and/or ice-covered terrain should be supplied. Special safety goggles to protect against ultraviolet light and glare (which can produce temporary conjunctivitis and/or temporary loss of vision) and blowing ice crystals should be required when there is an expanse of snow coverage causing a potential eye exposure hazard.
8. Workers handling evaporative liquid (gasoline, alcohol or cleaning fluids) at air temperatures below 40°F should take special precautions to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling. Special note should be taken of the particularly acute effects of splashes of “cryogenic fluids” or those liquids with a boiling point that is just above ambient temperature.
9. Trauma sustained in freezing or subzero conditions requires special attention because an injured worker is predisposed to cold injury. Special provisions should be made to prevent hypothermia and freezing of damaged tissue in addition to providing for first aid treatment.

6.0 COLD-RELATED ILLNESS AND TREATMENT

6.1 FROSTBITE

If exposure occurs in temperatures that are below freezing (30 degrees F or below), frostbite or trench foot (immersion foot) may accompany or complicate the symptoms of hypothermia. Frostbite is the freezing of living tissues with a resultant breakdown of cell structure. Injury due to frostbite may range from superficial redness of the skin, slight numbness, and blisters, to the obstruction of blood flow (ischemia), blood clots (thrombosis), or skin discoloration due to insufficient oxygen in the blood (cyanosis). Frostbite may occur if the skin comes into contact with objects with a surface temperature below freezing, such as metal tool handles. Trench foot is caused by continuous exposure to cold combined with persistent dampness or immersion in water. Injuries in this case include permanent tissue damage due to oxygen deficiency, damage to capillary walls, severe pain, blistering, tissue death, and ulceration. Additionally, cold exposures may either induce or intensify vascular abnormalities. These include chilblain (a swelling or sore), Raynaud's disease, acrocyanosis (blueness of hands and feet) and thromboangiitis (inflammation of the innermost walls of blood vessels with accompanying clot formation). Workers suffering from these ailments should take particular precautions to avoid chilling.

Treatment

1. Wrap the victim in woolen cloth and keep dry until he or she can be brought inside.
2. Do not rub, chafe, or manipulate frozen parts.
3. Bring the victim indoors.
4. Place the victim in warm water (102 degrees to 105 degrees F) and make sure the water remains warm. Test the water by pouring it on the inner surface of your forearm. Never thaw affected body parts if the victim has to go back out into the cold. The affected area may be refrozen.
5. Do not use hot water bottles or a heat lamp, and do not place the victim near a hot stove.
6. Do not allow the victim to walk if his or her feet are affected.
7. Have the victim gently exercise the affected parts once they are thawed.
8. Seek medical aid for thawing of serious frostbite.

6.2 HYPOTHERMIA

Hypothermia damages both the body's internal temperature mechanisms (hypothalamus) and the peripheral mechanisms to prevent heat loss (vasoconstriction and perspiration.) These effects may last up to three years.

Treatment

1. Give artificial respiration and stop any bleeding, if necessary.
2. Bring the victim into a warm room or shelter as quickly as possible.
3. If the victim cannot be moved (spinal injury, etc.), carefully place newspapers, blankets or some other insulation between the victim and the ground.
4. Remove all wet clothing.
5. Provide an external heat source since the body cannot generate its own heat. Wrap the victim in prewarmed blankets, place him or her in the liner of a portable hypothermia treatment unit, put the torso (not the extremities) into a tub of warm water or use body-to-body contact to rewarm the body core. These measures will slowly reopen the peripheral circulation, minimizing the possibility of after-shock or after-drop (the flowing of cooled, stagnated blood from the limbs to the heart), which may cause ventricular fibrillation, cardiac arrest, or death.
6. Do not allow the victim to sleep.
7. Give warm, sweet drinks, no alcohol or pain relievers.
8. Keep the victim still. Do not try to walk.
9. Do not rub numb skin.
10. Get medical help as soon as possible.

REFERENCES: None

ATTACHMENTS: Attachment 1 – *Estimation of Equivalent Chill Temperature*
Attachment 2 – *Work/Warm-up Schedule Guidelines*

Estimation of Equivalent Chill Temperature

Estimated Wind Speed (mph)	Actual Temperature Reading (°F)									
	50	**40**	**30**	**20**	**10**	**0**	**-10**	**-20**	**-30**	**-40**
	Equivalent Chill Temperature (°F)									
Calm	50	40	30	20	10	0	-10	-20	-30	-20
5	48	37	27	16	6	-5	-15	-26	-36	-47
10	40	28	16	4	-9	-24	-33	-46	-58	-70
15	36	22	9	-5	18	-32	-45	-58	-72	-85
20	32	18	4	-10	-25	-39	-53	-67	-82	-96
25	30	16	0	-15	-29	-44	-59	-75	-88	-104
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109
35	27	11	-4	-20	35	-51	-67	-82	-98	-113
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116
Wind speeds above 40 mph have little additional effect	**LITTLE DANGER**				**INCREASING DANGER**			**GREAT DANGER**		
	Trenchfoot and immersion foot may occur at any point on this chart.									

Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA.

Work/Warm-up Schedule Guidelines

Air Temp. (Sunny Sky) °F	No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind		25 mph Wind	
	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks	Max. Work Period	Breaks
above 5°	Normal Work Sched.		Normal Work Sched.		Normal Work Sched.		Normal Work Sched.		Normal Work Sched.		Normal Work Sched.	
5° to –1°											100 min	2
0° to –4°									100 min	2	75 min	2
-5° to –9°							100 min	2	75 min	2	55 min	3
-10° to –14°					100 min	2	75 min	2	55 min	3	40 min	4
-15° to –19°			100 min	2	75 min	2	55 min	3	40 min	4	30 min	5
-20° to –24°	100 min	2	75 min	2	55 min	3	40 min	4	30 min	5	Cease Work	
-25° to –29°	75 min	2	55 min	3	40 min	4	30 min	5	Cease Work			
-30° to –34°	55 min	3	40 min	4	30 min	5	Cease Work					
-35° to –39°	40 min	4	30 min	5	Cease Work							
-40° to –44°	30 min	5	Cease Work									
-44° & below	Cease Work											

Modified from ACGIH's 2002 Threshold Limit Values for Chemical Substances and Physical Agents.

Note 1: Schedule describes the maximum continuous duration of work and number of 10-15 minute breaks to be observed during any 4-hour work period, and assumes that period will be followed by an extended warm-up period (e.g., lunch). Allowed breaks should be taken in a warm environment.

Note 2: Schedule applies to moderate to heavy work performed by acclimated workers wearing appropriate layered clothing. For light to moderate work apply the schedule for conditions 1 step lower. For unacclimated workers apply the schedule for conditions 2 steps lower. These modifications are additive.

Note 3: For work under 25% - 50% overcast/clouds apply the schedule for conditions 1 step lower. For work at night or under greater then 50% overcast/clouds apply the schedule for conditions 2 steps lower. These modifications are additive with any applicable modifications from Note 2.

Note 4: For wind speeds in excess of 25 mph cease all non-emergency work when temperatures fall below 5°F.

ENV 522

WORKING SURFACES

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Page:	1 of 2

SUMMARY: Employees are required to maintain a workplace free of hazards (e.g., hazards associated with tripping, falling, or overhead objects as a result of uneven walking surfaces, holes, or debris). This procedure addresses requirements for flooring, work platforms, and stairway safety.

1.0 GENERAL REQUIREMENTS

- A means of access (e.g., ladder, stairway, ramp) shall be provided for all personnel points of access where a break of elevation of 16 inches or more exists.
- Means of access shall be kept clear to allow free passage for employees.
- Unprotected sides of stairway landings shall be provided with guardrail systems.
- Floor or deck holes shall be guarded using a secure cover to prevent accidental passage of materials or tools.
- Floor openings that are 4 feet or more above adjacent floor or ground level shall be guarded either by:
    - A secure cover.
    - A guardrail and toeboards installed on all exposed sides.
    - Perimeter cable installed on all exposed sides. (Note: if the perimeter cable is not 18 inches or more away from the opening, then a mid-height cable shall also be installed.)
- Openings in decks through which personnel or materials may fall shall be guarded as follows:
    - Openings greater than or equal to 18 square feet must be protected using standard railing and toeboards. The railing shall be constructed so rail supports do not exceed 10 feet off center spacing, and rails (both top and midrail) shall be constructed of 2” by 4” lumber, or taut wire rope. Toeboards shall be a minimum of 4 inches in height.
    - Openings less than 18 square feet shall be protected as above, with the exception of tank tops or inner bottoms. Tank tops or inner bottoms shall be protected using a rail system, constructed of iron or steel, where the rail is between 30 to 31 inches in height, with a top rail only. These guards shall be constructed such that they do not require removal for entry.
- When a cover has been removed, the opening shall be protected by barricades installed a minimum of 6 feet from the opening.
- A wall opening or floor opening being used to lower equipment (a chute used for equipment/debris) shall have a barricade or barrier, or a worker assigned to prevent personnel from entering the area where the equipment is descending.
- All platforms in buildings that are 6 feet or more above an adjacent floor or ground level shall be protected with a guardrail or perimeter cable, unless it is not feasible. In such circumstances the use of fall protection is mandatory.
- Where gratings, platforms, or floor plates have been removed, standard railings shall be installed, unless it will interfere with the work.
- On open decks, where the fall from the exposed edge is 5 or more feet, standard guard rails shall be installed.
- All platforms above or adjacent to dangerous equipment, tanks of hazardous substances, or other hazards shall be guarded with perimeter rails or cables.
- When the top of an open tank or vat that contains a hazardous substance is less than 36 inches above the floor or platform, then a barrier (e.g., guard rails) shall be erected to at least 36 inches in height.

- Runways or ramps shall be guarded as follows:
  - Guarded by guardrails on both open sides if the height is 4 or more feet above the floor or ground level.
  - Guarded by guardrails on both sides, regardless of height, if above or adjacent to dangerous equipment, tanks of hazardous substances or other hazards.
- A wall opening that has a bottom that is less than 3 feet above the working surface shall be guarded by a guardrail or wall screen.
- Stairways shall be equipped with a stair railing or handrail as follows:
  - A stairway not more than 44 inches wide and enclosed on both sides, shall have a handrail on the right descending side.
  - A stairway not more than 44 inches wide and open on one side, shall have a stair railing on the open side.
  - A stairway not more than 44 inches wide, which has two open sides, shall have a stair railing on each side.
  - A stairway that is more than 44 inches wide but less than 88 inches shall have 1 handrail on each enclosed side and 1 stair rail on each open side.
  - A stairway that is 88 inches or more in width shall have 1 handrail on each enclosed side, 1 stair rail on each open side, and 1 intermediate stair rail located in the middle of the stairway.
- A guardrail (except for tank tops or inner bottoms) shall consist of a top rail, an intermediate rail, and supporting posts. The top rail shall be not less than 42 inches above the floor, ramp, platform or runway. The intermediate rail shall be halfway between the floor and the top rail. If the intermediate rail will allow for an opening of more than 24 inches, then more than one intermediate rail is required to keep openings less than 24 inches. The guardrail shall be constructed to be able to withstand a 200-pound force in any direction. Supporting posts shall not be more than 8 feet apart (on ships, not more than 10 feet apart off center).
- A toeboard shall be not less than 4 inches in height, and secured in place not more than ¼ inch above the floor, platform, or runway.
- Temporary stairways shall have a minimum width of 22 inches.
- A stairway shall have a minimum vertical clearance of 7 feet, unless the overhead object is padded and caution signs or paint is used to visibly demarcate the hazard.
- A skylight guard shall be constructed to withstand a 200-pound load applied perpendicularly to any one portion of the screen. The guard shall be of grillwork with openings not more than 4 inches long or slatwork with an opening not more than 2 inches wide.

2.0 MAINTENANCE

Floors, platform stair treads and landings shall be maintained free of broken, worn, splintered or loose pieces that would create a tripping or falling hazard. Material used to repair these components shall meet the design strength of the original components.

REFERENCES: ENV 502 - *Ladders*
ENV 503 - *Scaffolding*

ENV 536

ALL-TERRAIN VEHICLES (ATV)

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Page:	**1 of 2**

SUMMARY: Procurement and use of all-terrain vehicles (ATVs) shall conform to the requirements below.

1.0 GENERAL REQUIREMENTS

Due to the increased demand for ATVs on Earth Tech project sites, the EH&S Department has developed this procedure to raise employee awareness and to inform field personnel of the basic requirements for operating ATVs safely and responsibly during non-recreational applications.

Many employees have practical experience riding ATVs for recreation; however, using them for construction and site maintenance tasks presents unique hazards workers may not be familiar with. ATV operations can be very dangerous if basic safety equipment is not used and/or the operator fails to maintain a "Safety First" attitude at all times.

Company policy states that at a minimum; workers must follow the guidelines specified in the equipment-specific ATV user/operator manual in the following areas:

- Vehicle training requirements
- Wearing the proper safety equipment
- Checking the mechanics of the vehicle before operating
- Starting the vehicle properly
- Safe operating guidelines.

The following briefly describes each of these elements.

2.0 TRAINING

- All site personnel must be aware of and follow applicable local and state laws regarding ATV use, especially near active roadways. According to OSHA, the majority of citations issued are related to unauthorized equipment modifications, reckless driving, and not adhering to applicable state regulations, primarily associated with ATV safety features (lights, horns, etc.).
- Site-specific training is required to discuss safe operating guidelines, a formal review of the manufacturer's operating guidelines/requirements (for each ATV used), and the limitations and restrictions for use at the site (e.g., performing field task the ATV is not designed for, no operations within 50 feet of open vaults, etc.).
- All training must be documented and maintained in the project files for the duration of site activities. Tailgate or toolbox briefings can be used to refresh ATV operators. File all sign-in pages/forms.
- Site-specific control maps are recommended to illustrate where operators can and cannot operate ATVs.
- Because of the startling fatality/accident statistics, many states have implemented ATV programs to promote safe behaviors and attitudes among operators. Enrollment in a free ATV safety course is available by calling 800-887-2887. This nationwide service promotes safe vehicle use to minimize ATV accidents and dangerous behavior.

3.0 SAFETY EQUIPMENT

- *Head Protection*--includes a helmet with face protection approved by the American National Standards Institute (ANSI), DOT, or the Snell Memorial Foundation

- *Eye Protection*--an ANSI-approved face shield in the helmet or ANSI-approved goggles or glasses
- *Body Protection*--gloves and ANSI-approved work boots, long-sleeved shirts and long pants
- *Hearing Protection*--use ear plugs if elevated noise is produced by ATV.

4.0 PRE-RIDE CHECK

- Check air pressure in tires, tighten axle nuts and secure axle by cotter pin
- Check throttle and breaks
- Check ignition, headlights and tail lights
- Check oil and fuel levels
- Inspect and adjust drive-shaft chassis, look for loose nuts and bolts
- Do not operate if faulty equipment is discovered during the pre-ride check
- Service all fluid levels and equipment needing repairs prior to operating the ATV.

5.0 PROPER START

- Have parking break in place
- "On" position for fuel cap vent/valve and ignition key (if applicable)
- Transmission in neutral
- Engine stop switch should be in "run" or "start" position
- If engine is cold put the choke "on," then start the ATV.

6.0 SAFE OPERATIONS

- Always follow manufacture specifications and user/operator manual
- Investigate and locate visible hazards in the environment prior to performing ATV site activities
- Be aware of other vehicle traffic
- Regulate speed of ATV while on site. If a governor is installed, do not tamper with or adjust without authorization from the EH&S Department
- Do not allow a passenger on an ATV who is not trained in its operation
- Never make after-market modifications to the equipment that may compromise the safety of the operator (e.g., welding additional brackets for material transport, altering hitch assembly, etc.)
- Operators must know the limitations of the ATV, especially when performing unique tasks (e.g., landscaping/clearing, snow plowing, pulling cable or hose, hauling on uneven terrain).

Following the above guidelines during ATV use will greatly decrease the operator's risk of injury or accident. As with any equipment, the operation of ATVs must be taken seriously.

REFERENCES: ENV 205 – Personal Protective Equipment

ENV 530

WORKING ON/NEAR/OVER WATER OR ICE

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Page:	1 of 2

SUMMARY: The following guidelines shall be implemented during all work activities that require personnel to work on, near or over water and/or ice (e.g., rivers, lakes, ponds, retention basins, unguarded clarifiers, containment systems, etc.). These guidelines must be communicated to all employees performing operations where the potential for drowning exists.

1.0 DEFINITIONS

Personal Floatation Device (PDF) – U.S. Coast Guard-approved life jacket or buoyant work vest. Only types which are designed to keep the user upright when in use will be acceptable.

On/Over Water – Any work location that positions the employee on (in watercraft) or over a body of water where the potential for drowning exists.

Near Water – Adjacent to any body of water where the potential for drowning exists (i.e., top of river bank, unguarded edge of basin, etc.).

2.0 REQUIREMENTS

If work must be performed on, near or over water, the following requirements must be followed:

- Work must be performed in accordance with the "Buddy System."
- Employees working over or near water, where the danger of drowning exists, shall be provided with U.S. Coast Guard-approved life jacket or buoyant work vests (PFD). Type of PFD should be selected by the water conditions present. Prior to and after each use, the PFDs shall be inspected for defects, which would alter their strength or buoyancy. Defective units shall not be used and replaced.
- Ring buoys with at least 90 feet of line shall be provided and readily available for emergency rescue operations. Distance between ring buoys shall not exceed 200 feet.
- At least one lifesaving skiff/boat shall be immediately available at locations where employees are working over or adjacent to water.
- Whenever possible, minimize the risk to employees avoiding the use of watercraft and instead performing work from the shore/bank. For situations where ice exists reschedule work to periods of warmer temperatures, when ice is not an issue.
- Avoid wearing waders or hip boots, they are cumbersome and may encourage workers to go deeper into water than is safe. Only use this apparel in shallow waters (i.e., creek beds).
- If workers have the potential to get stuck in mud or sediment, air injection equipment designed to free workers feet/legs may need to be available onsite. If a worker does get stuck, do not struggle as this causes deeper sinking. Workers should not be permitted to access areas where this hazard exists, especially in locations containing tidal water flow.
- Use a pole to probe ahead to assess water depths and/or stability of shoreline terrain.
- Take special care on slippery rocks around lakeshores, riverbanks and creeks. Always look ahead at the ground when walking around the water's edge.
- If sampling near or in flowing water environments, be aware of slippery or steep banks and fast currents. If the current is fast or the water looks deeper than knee height, do not enter the water. If you must enter the water, a restraining system must be worn and secured to the bank for retrieval.

This procedure applies to Earth Tech Environmental Practice operations. Earth Tech's Environmental, Health and Safety (EH&S) Department is solely responsible for its issuance, revision, and maintenance. Any deviation from these requirements requires approval from the GWES EH&S Director or an EH&S Manager.

If work must be performed on ice, the following requirements must be followed:

- Work must be performed in accordance with the "Buddy System" with rescue communications available.
- Do not walk or work on ice unless there is no other way of performing work.
- Whenever possible, use alternate methods. Have personnel use flat-bottomed boat with ropes (or equivalent) tied to each end and handled by workers on the berm, bank, or shore.
- Only walk on ice that is fully frozen, not cracked or brittle, that will support the necessary weight of workers and associated equipment.
- PFDs shall be inspected and worn in accordance with the requirements listed above.
- Workers must wear a restraining system (a lifeline attached to the front of a full-body harness) and stay close enough to the edge to make it possible for the attendant to pull the individual back on the ice.
- Workers must have available (on their person) equipment that can be used to partially penetrate the ice to help pull them out of the water and back up on the ice (equipment is available with capped ends that can be worn safely until needed).

3.0 WATER AND ICE SAFETY EQUIPMENT

The safety equipment required to support work on, over or near water and/or ice includes:

- Cell phones (or equivalent) capable of contacting emergency services.
- U.S. Coast Guard-approved life jacket or buoyant work vests (PFD).
- Ring buoys with at least 90 feet of line.
- Full-body harness with restraining line.
- Lifesaving skiff/boat (as needed) - contact the EH&S Department for guidance.
- Air injection equipment designed to free workers feet/legs (if necessary).
- Poles to probe for assessment purposes.
- Capped ice picks, spikes, etc.

REFERENCES: None

ENV 531

MACHINE GUARDING

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SUMMARY: Machine guarding practices will meet the following requirements. This pertains to all equipment located 7 feet or less from the floor.

1.0 GENERAL REQUIREMENTS

Typically, moving parts (e.g., rotating parts) require machine guards to prevent employee injury. Guards will be firmly fixed or secured, with no more than ½-inch-diameter openings. If work equipment does not have the proper machine guards installed, it shall be removed from service, and locked out/tagged out until the proper guard is installed. Guards will conform to the following requirements:

1. Under no circumstances shall employees remove manufacturer-installed guards (except during maintenance procedures), or use in a manner not consistent with the manufacturer's directions.
2. When guarding is provided by two hand-control devices, the devices shall be constructed to prevent tie-down of either of the two, or to prevent bridging (i.e., using something else such as a pipe to hold down both control devices simultaneously with one hand).
3. Employees shall not place any part of their body under any vehicle or equipment that is solely supported by a jack, overhead hoist, chain fall or other temporary supporting means. Safety stands, blocks or other support system capable of holding the total imposed weight shall be used.
4. Under no circumstances shall deadman switches be bypassed (e.g., taped down as in the case of abrasive blast guns).

2.0 AUTO-STARTING EQUIPMENT

Some process equipment starts automatically in response to control system inputs of system sensors. Since inadvertent startup can present special worker hazards, all auto-starting equipment will be identified, and a label affixed to each reading:

CAUTION

EQUIPMENT MAY START WITHOUT WARNING

DE-ENERGIZE BEFORE SERVICING

REFERENCES: None

This procedure applies to Earth Tech Environmental Practice operations. Earth Tech's Environmental, Health and Safety (EH&S) Department is solely responsible for its issuance, revision, and maintenance. Any deviation from these requirements requires approval from the GWES EH&S Director or an EH&S Manager.

ENV 537

CYLINDER DISPOSITION & DECOMMISSIONING

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Page:	1 of 5

SUMMARY: Cylinder disposition & decommissioning (D&D) activities will be performed by qualified personnel using the methods and equipment specified in this procedure.

1.0 APPLICABLE DEFINITIONS

Competent Person – One who has demonstrated knowledge of cylinders, including hands-on experience working with cylinders on at least three projects that entailed inspection, identification, sampling of cylinders, and the on-site treatment of the contents of liquid and compressed gas cylinders (or who can demonstrate to Earth Tech's EH&S Department that they are competent to perform such tasks through their past experience and actions).

2.0 PROCESS DESCRIPTION

As part of the D&D of compressed gas cylinders, the cylinders must be inventoried, staged, and inspected. Prior to the commencement of cylinder D&D activities, local emergency response agencies (i.e., Fire Department, Medical, and Emergency Response, if separate) must be contacted and D&D activities coordinated with the local agencies. Air monitoring is mandatory during cylinder D&D operations. An EH&S Manager must be contacted during the planning stages of a cylinder D&D effort in order to determine whether a site-specific cylinder D&D plan is required. A copy of the 2000 Emergency Response Guidebook and applicable Compressed Gas Association, Inc. (CGA) guidelines must be on site during D&D activities.

3.0 CYLINDER INVENTORY

Inventory entails recording visual qualities of each cylinder (e.g., color) and any characteristics pertinent to the contents' classification.

3.1 COLOR CODING SCHEME

The color coding of compressed gas cylinders is governed by the CGA, which has assigned specific colors to categories or classes of chemicals/substances. While recently manufactured cylinders reflect the color coding guidance established by the CGA, older cylinders may not reflect this nomenclature. It is also possible for cylinders to have been repainted a different color from their original. Cylinder contents should never be determined by the color of the cylinder alone. The following table provides general guidance on the standard color coding scheme and potential contents associated with those colors.

Standard Color (Color of Cylinder)	Class of Material
Yellow	*Flammable Materials*. All materials known ordinarily as flammables or combustibles.
Brown	*Toxic and Poisonous Materials*. All materials extremely hazardous to life or health under normal conditions, such as toxics or poisons.
Blue	*Anesthetics and Harmful Materials*. All materials productive of anesthetic vapors and all liquid chemicals and compounds hazardous to life and property but not normally productive of dangerous quantities of fumes or vapors.
Green	*Oxidizing Materials*. All materials, which readily furnish oxygen for combustion and fire producers that react explosively or with the evolution of heat in contact with many other materials.
Gray	*Physically Dangerous Materials*. All materials, not dangerous in themselves, which are asphyxiating in confined areas or which are generally handled in a dangerous physical state of pressure or temperature.
Red	*Fire Protection Materials*. All materials provided in piping systems or in compressed gas cylinders exclusively for use in fire protection.

Note: Old cylinders that predate the CGA standard color scheme may not adhere to the color schemes shown above; therefore, additional characteristics such as color bands or identifying decals should also be evaluated. Also, the CGA *Handbook of Compressed Gases*, 3rd Ed. should be consulted for further information.

4.0 CYLINDER STAGING

Staging involves the organization, and sometimes consolidation, of cylinders that have similar contents or characteristics. The staging of cylinders should occur in a remote location at the site in order to minimize the potential injury or property damage from an accidental release or emergency decompression. Safe distances should be based on the evacuation distances provided in the Department of Transportation's 2000 Emergency Response Guidebook. When multiple cylinders containing different substances are present, the distance should be based on the greatest evacuation distance required by the substances present.

Cylinders should be stored upright and secured with a chain (or equivalent) to prevent the cylinder from falling. Empty cylinders and cylinders that still contain a substance should be segregated and staged. Overall, cylinders should be transported and staged/secured in accordance with the procedures in ENV 403, *Compressed Gases*. Also, the handling or moving of cylinders, which weigh more than 49 pounds, must involve two person lifting techniques or a mechanical lifting device.

5.0 CYLINDER INSPECTION

Inspection entails the evaluation of the integrity of the cylinder as well as the serviceability of the attached manifold and valve fittings. Remote cylinder inspection and opening/purging is recommended for worker and public safety.

5.1 PERSONAL PROTECTIVE EQUIPMENT (PPE)

The inspection of cylinders containing unknown substances will be performed in a Level B ensemble as a minimum (See Section 3.4 of ENV 301, *Hazardous Waste Operations*), while cylinders containing known substances, and in good condition, will be inspected in an appropriate ensemble designated within the site-specific health and safety plan. Where the use of a Level A ensemble is anticipated, the EH&S Department must be contacted during the pre-task planning to determine the appropriate Level A ensemble components, and personnel involved in the activity. The use of Level A must be approved by the EH&S Director.

5.2 AIR MONITORING REQUIREMENTS

Air monitoring requirements are dependent upon the specific substances contained within the cylinders and will be specified within the individual HASP prepared prior to commencement of field activities. Air monitoring parameters may include, but are not limited to:

- Explosivity (i.e., lower explosive limit or LEL)
- Chemical-specific substance (e.g., chlorine, ammonia, arsine, etc.)
- Perimeter monitoring

Action levels will be identified in the site-specific HASP.

5.3 INSPECTION PROCEDURES

All cylinder inspection procedures will adhere to the procedures identified in CGA P-22, *The Responsible Management & Disposition of Compressed Gases & Their Containers*, 1st Ed., 1995 For valve or fitting identification, the information contained in CGA V-1, *Compressed Gas Association Standard for Compressed Gas Cylinder Valve Outlet and Inlet Connections*, 10th Ed., 2002.

At a minimum, the inspection process should include the following procedures:

- Observe the cylinder from a safe distance to identify any visual markings or other information
- Inspect the cylinder size, shape, and general condition (if visible, include the valve system/stem in the inspection process)

- If the cylinder or valve system appears to be in poor condition or has lost structural integrity, do not approach the cylinder. Observations indicating a cylinder is in poor condition may include:
    - Leaking
    - Hissing sound
    - Odor in vicinity of the cylinder
    - Rusty components
    - Bulging side wall or end
    - Corroded valve system
- If the cylinder is determined to be in poor condition, cordon the area off and limit access to necessary personnel only
    - Don applicable PPE and approach the cylinder with the appropriate direct reading air monitoring instrument (do not approach from the ends of the cylinder), then determine the airborne contaminant concentrations in the immediate area
    - Document cylinder information (visible markings, labels, placards, etc.)

6.0 DISPOSITION OF CYLINDERS

Disposition refers to the recycling, treatment, or disposal of a compressed gas cylinder and/or its contents. Recovery and recycling of materials are preferred over any other method of disposition. Cylinder disposition activities must be approved by an EH&S Professional. An effort should be made to recover and recycle the contents of a cylinder; however, if recovering or recycling the contents is not possible, then other options include:

- Venting to the Atmosphere
- Flaring
- Neutralization
- Detonation

Under no circumstances should poisonous, toxic, or ozone-depleting substances be vented to the atmosphere. Only cylinders containing flammable gases should be detonated, as the flammable contents will be consumed in the subsequent explosion. If the cylinder valve has been determined to be inoperable, then the available options for disposition are limited to having an outside vendor perform the remote opening and sampling of the cylinder, or detonation of the cylinder where the cylinder contents are consumed in the subsequent explosion (flammable gases only).

6.1 VENTING TO THE ATMOSPHERE

Cylinders that contain certain products can be vented to the atmosphere. All venting activities will be performed in accordance with the following procedures:

1. Atmospheric venting will be accomplished at a remote location.
2. Atmospheric venting activities will be completed in a Level B Ensemble.
3. Venting activities will be dependent upon a wind direction that does not carry the outgas plume in the direction of an adjacent public structure.
4. The cylinder will be properly grounded to ensure a static charge is not generated, potentially resulting in ignition of a flammable gas.
5. All tools used on the cylinder will be non-sparking.

6. Low-pressure discharging will not exceed 15 pounds per square inch gauge (psig).
7. Once discharging has started, all workers will retreat to the exclusion zone (100 feet) around the remote location until the discharging process is complete.

6.2 FLARING

Flaring activities involve the combustion of the cylinder contents through the discharge of a low-intensity flame. Flaring activities will be performed in accordance with the following procedures:

1. Flaring will be accomplished at a remote location.
2. Flaring activities will be completed in a Level B Ensemble (in addition, the flaring team members will don Nomex fire-retardant forearm-length gloves).
3. Flaring activities will be dependent upon a wind direction that does not carry the combustion plume in the direction of an adjacent public structure.
4. The cylinder will be properly grounded to ensure a static charge is not generated, potentially resulting in ignition of a flammable gas.
5. All tools used on the cylinder will be non-sparking.
6. Low-pressure discharging will not exceed 15 pounds per square inch gauge (psig).
7. A hot work permit must be completed prior to the start of flaring activities (See ENV 517, *Welding, Torch Cutting, and Other Hot Work*).
8. No other cylinders will be within 35 feet of the cylinder being flared.
9. Flaring activities will use a low-pressure discharge and maintain a small, low-intensity flame.
10. The worker outside the exclusion zone will standby with a fire extinguisher (20A:100B:C) during flaring activities (i.e., fire watch).
11. The flare will be positioned so that it is not pointing toward any flammable materials, personnel, or equipment in the immediate area.

6.3 NEUTRALIZATION

Neutralization refers to the on-site neutralization of the cylinder contents through a controlled chemical reaction process. Specialized equipment may be necessary based on the chemical involved, as well as reaction byproducts, catalysts, or physical conditions (i.e., temperature, acidic, basic, etc.). Neutralization activities will be performed in accordance with the following procedures:

1. Neutralization is the required disposition method for cylinders containing acid gases, as well as many alkaline gases.
2. The neutralization process must be approved by a professional engineer (e.g., chemical) or based on a published chemical-specific neutralization methodology.
3. Water (or other liquid) levels in the reaction vessels will be maintained at least 12 inches below the top of the vessel.
4. Based on the specific chemical reaction, the temperature of the reaction vessel and its contents will be monitored continuously and controlled accordingly.
5. Pressure levels will be maintained within acceptable limits to prevent the reaction from accelerating, unwanted by-product formation, or the break-through of the chemical intended to be neutralized.
6. Personnel will don the PPE identified within the HASP.

6.4 DETONATION

Detonation refers to the use of explosives to open and subsequently consume the contents of the cylinder by the heat generated during the explosion. Detonation activities will be performed in accordance with the following procedures:

1. A detonation plan must be submitted to and approved by the EH&S Department prior to the commencement of cylinder detonation activities.
2. The detonation of compressed gas cylinders will be completed under the guidance of an experienced ordnance and explosives (OE) professional who is licensed in the use of explosives (See ENV 306 para. 4.1).
3. A sufficient amount of explosives will be used to consume the contents of the cylinder (flammable gases only).
4. A blast pit will be excavated where all detonations will take place.
5. The OE professional will determine the blast hazard zone/potential debris impact zone, and this area will be evacuated prior to the detonation.
6. The OE professional will sound a warning signal (e.g., horn or equivalent) three times to indicate that a detonation is imminent and ensure all personnel have evacuated the blast hazard zone prior to detonation.
7. Personnel will be on standby outside the blast hazard zone with fire extinguishers (minimum rating of 20A:100B:C).

7.0 DECOMMISSIONING

Decommissioning refers to the removal of a compressed gas cylinder from service by rendering it permanently unusable. Prior to decommissioning, cylinder contents will be verified, removed from the cylinder, and the cylinder purged with an inert gas (e.g., nitrogen, carbon dioxide, etc.). All identifying marks or decals will be removed from the cylinder. The EH&S Manager must be contacted prior to the decommissioning of compressed gas cylinders that contain or contained ethylene oxide, arsine, diborane, hydrogen selenide, cyanogen chloride, amines, hydrogen sulfide, acetylene, or methyl mercaptan, as additional safety precautions may be necessary due to highly reactive residues left behind by these substances. The recommended methods of decommissioning include:

- Burning/torch-cutting an elongated hole into the side of the cylinder (See ENV 517)
- Torch-cutting the cylinder in half (See ENV 517)
- Crushing the cylinder

REFERENCES: ENV 301 – *Hazardous Waste Operations*
ENV 306 – *Ordnance and Explosives/Unexploded Ordnance Operations*
ENV 403 – *Compressed Gases*
ENV 501 – *Manual Materials Handling*
ENV 517 – *Welding, Torch Cutting, and Other Hot Work*

ENV 520

HEAVY EARTH-WORKING EQUIPMENT

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Page:	1 of 6

SUMMARY: The following procedures outline safe working requirements during heavy earth-working equipment operations.

1.0 DEFINITIONS

Heavy equipment – for this procedure, all excavating equipment and any heavy earthmoving machinery defined in 29 CFR 1926.602(a)(1). These include scrapers, loaders, crawler or wheel tractors, excavators, backhoes, bulldozers, off-highway trucks, graders, agricultural and industrial tractors, and similar equipment.

Operator – any person who operates heavy equipment.

Ground personnel/workers – personnel required to perform work on foot (note: operators are considered ground personnel when outside of the equipment cab).

2.0 GENERAL REQUIREMENTS

Field operations that involve heavy equipment represent a significant hazard to ground workers as well as heavy equipment operators. Heavy equipment may cause serious injury or death as a result of rollover, contact with ground personnel, and pinch points. All personnel working at or visiting a site where heavy equipment operations occur shall read and abide by the requirements of this procedure.

2.1 COMMUNICATIONS

Communication between site supervisors/managers, heavy equipment operators, and other site personnel is a key method of preventing serious injury or death during heavy equipment operations. The following outline the communication requirements during heavy equipment operations:

- Site supervisors/managers shall ensure that all operators are notified/informed of when, where, and how many ground personnel will be working on site.
- Site supervisors/managers shall inform all ground personnel before changes are made in the locations of designated areas.
- If required to work near heavy equipment, ground personnel shall use industry standard hand signals to communicate with operators.
- Always maintain eye contact with operators to the greatest extent possible (always face equipment). Never approach equipment from a blind spot or angle.
- All heavy equipment shall be equipped with reverse warning devices (i.e., backup alarms) that can be significantly heard over equipment and other background noise. Reverse signaling lights shall be in working order.
- When feasible, two-way radios shall be used to verify the location of nearby ground personnel.
- When an operator cannot adequately survey the working or traveling zone, a guide shall use a standard set of hand signals to provide directions. Flags or other high visibility devices may be used to highlight these signals.

This procedure applies to Earth Tech Environmental Practice operations. Earth Tech's Environmental, Health and Safety (EH&S) Department is solely responsible for its issuance, revision, and maintenance. Any deviation from these requirements requires approval from the Global Environmental Services EH&S Director or an EH&S Manager.

2.2 CLEARANCE

Ground clearance around heavy equipment may significantly reduce hazards posed during heavy equipment operations. The following outline the clearance requirements during heavy equipment operations:

- Ground personnel shall always yield to heavy equipment.
- Ground personnel shall maintain approximately 100 feet of clearance from all active heavy equipment, unless an approved, job-specific hazard analysis that identifies any special precautions is completed and communicated to the appropriate operators and ground personnel.
- Site supervisors/managers shall designate areas of heavy equipment operation and ensure that all ground personnel are aware of designated areas. Designated areas shall include boundaries and travel routes for heavy equipment. Travel routes shall be set up to reduce crossing of heavy equipment paths and to keep heavy equipment away from ground personnel.
- When feasible, site supervisors/managers shall set up physical barriers (e.g., caution tape, orange cones, concrete jersey barriers) around designated areas and ensure that unauthorized ground personnel do not enter such areas.
- Operators shall stop work whenever unauthorized personnel or equipment enter the designated area and only resume when the area has been cleared.
- Operators shall only move equipment when aware of the location of all workers and when the travel path is clear.
- Ground personnel shall never stand between two pieces of heavy equipment or other objects (i.e., steel support beams, trees, buildings, etc.).
- Ground personnel shall never stand directly below heavy equipment located on higher ground.
- If working near heavy equipment, ground personnel shall stay out of the travel and swing areas (excavators, all-terrain forklifts, hoists, etc.) of all heavy equipment.
- Ground personnel shall never work near heavy equipment during times of inadequate lighting.
- Personnel shall keep all extremities, hair, tools, and loose clothing away from pinch points and other moving parts on heavy equipment.

2.3 PERSONAL PROTECTIVE EQUIPMENT

At a minimum, all ground personnel and operators outside of heavy equipment shall wear the following:

- **High visibility, reflective safety vest** that is visible from all angles and made of fluorescent material and orange, white, or yellow reflective material (ensure that vest is not faded or covered with outer garments, dirt, etc.)
- ANSI-approved hard hat
- ANSI-approved safety glasses with sideshields
- ANSI-approved steel toe safety boots
- Hearing protection as needed
- Appropriate work uniform (i.e., full length jeans/trousers and a sleeved shirt; no tank, crew tops or other loose clothing permitted).

2.4 UTILITIES

When contacted by heavy equipment, aboveground and underground utilities may cause severe injuries or death as a result of electrocution, explosion, etc. The following outline the requirements while performing heavy equipment operations that may lead to contact with aboveground or underground utilities:

- Always be aware of surrounding utilities.
- Ensure all equipment (i.e., dump trailers, loaders, excavators, etc.) is lowered prior to moving underneath of aboveground utilities.
- Ensure utilities are cleared and identified prior to beginning any earthmoving operation. Contact the local utility service providers for clearance prior to performing work.
- Follow the applicable requirements outlined in ENV 515 – *Excavation*, ENV 516 – *Cranes & Lifting Devices*, and ENV 524 – *Overhead Electrical Lines*.

3.0 HEAVY EQUIPMENT REQUIREMENTS

3.1 TRAINING

- Only designated, qualified personnel shall operate heavy equipment.
- Operators shall have all appropriate local, state, or federal licenses or training to operate a designated piece of heavy equipment.
- Operators shall be evaluated through documented experience (resume) and a practical evaluation of skills (field tests). Operators shall be knowledgeable and competent in the operation of a designated piece of heavy equipment.

3.2 INSPECTIONS AND MAINTENANCE

- All heavy equipment shall be inspected and if necessary, repaired prior to use. Operators shall not operate heavy equipment that has not been cleared for use. All machinery and mechanized equipment will be certified to be in safe operating condition (certification form attached) by a competent individual seven days prior to on-site operation, and is valid for one year.
- All heavy equipment shall be inspected at a minimum to the manufacturer's recommendations prior to each work shift. All defects shall be reported to the site supervisor/manager immediately. Inspection records shall be maintained at the site. If a manufacturer's or company-specific inspection checklist is not provided, use the Heavy Equipment Pre-Operation Inspection Checklist (attached).
- Defective heavy equipment shall be immediately taken out of service until repaired.
- All heavy equipment shall be maintained and operated in accordance with the manufacturer's specifications and recommendations (i.e., speed restrictions, load limits, inspections, etc.).
- Never service heavy equipment in an unsafe or hazardous situation (e.g., do not crawl under the raised dump body during an inspection/service of a dump truck).
- All windows and windshields shall be kept free from obstructions and dirt. Windows shall not be cracked or visibly broken. All cab glass shall be safety glass or equivalent that introduces no visible distortion.
- Operators shall keep the cab, deck, rails, steps, and rungs free of grease, oil, mud, ice, and other debris.
- All heavy equipment shall be equipped with overhead protection to guard the operator from falling objects.

- All heavy equipment shall be equipped with a rollover protective structure meeting all OSHA requirements.
- All heavy equipment shall be equipped with seats belts that meet the requirements of the Society of Automotive Engineers Guidelines. Seat belts must be worn while operating heavy equipment.
- All heavy equipment shall be equipped with a tagged, fully charged fire extinguisher.
- All scissor points on front end loaders and other heavy equipment shall be guarded appropriately.

3.3 OPERATION

- All heavy equipment shall be operated in a safe manner that will not endanger persons or property.
- All heavy equipment shall be operated at safe speeds.
- Always move heavy equipment up and down the face of a slope. Never move equipment across the face of a slope.
- Slow down and stay as far away as possible while operating near steep slopes, shoulders, ditches, cuts, or excavations.
- When feasible, operators shall travel with the “load trailing”, if the load obstructs the forward view of the operator.
- Slow down and sound horn when approaching a blind curve or intersection. Flagmen equipped with 2-way radio communications may be required to adequately control traffic.
- Operators shall remain in cab while heavy equipment is being loaded.
- Always keep heavy equipment in gear while in operation. Do not place in neutral.
- All heavy equipment shall be shut down prior to and during fueling. Do not smoke or use electrical devices while fueling. Fuel shall not be carried in or on heavy equipment, except in permanent fuel tanks or approved safety cans.
- Turn off heavy equipment, place gear in neutral, and set parking brake prior to leaving vehicle unattended. Also, place all buckets and blades on the ground and place hydraulic gear in neutral. Heavy equipment parked on slopes shall have the wheels chocked.
- Never jump on to or off of a piece of heavy equipment.
- Never exit heavy equipment while it is in motion.
- Passengers shall only ride in heavy equipment designed for occupancy of passengers.
- Never ride on the outside of a piece of heavy equipment (e.g., tailgates, buckets, steps, etc.).
- Site vehicles must be parked in a safe place away from heavy equipment.
- Operators shall never push/pull “stuck” or “broken-down” equipment unless a spotter determines that the area is cleared of all personnel around and underneath the equipment.
- Operators shall wear seatbelts at all times while operating heavy equipment.
- If designated for work in contaminated areas/zones, equipment shall be kept in the exclusion zone until work or the shift has been completed. Equipment will be decontaminated within designated decontamination areas.
- Equipment left unattended at night adjacent to traveled roadways shall have appropriate lights or reflectors, or barricades equipped with appropriate lights or reflectors, to identify the location of that

equipment, and shall not be closer than 6 feet (or the regulatory requirement for the work location) to the active roadway.

- Pneumatic-tired earthmoving haulage equipment, with a maximum speed exceeding 15 miles per hour, shall be equipped with fenders on all wheels.
- Lift trucks shall have the rated capacity clearly posted on the vehicle, and the ratings are not exceeded.
- Steering or spinner knobs shall not be attached to steering wheels.
- High lift rider industrial trucks shall be equipped with overhead guards.
- When ascending or descending grades in excess of 5%, loaded trucks shall be driven with the load upgrade.
- All belts, gears, shafts, pulleys, sprockets, spindles, drums, flywheels, chains, or other reciprocating, rotating or moving parts of equipment shall be guarded when exposed to contact by persons or when they otherwise create a hazard.
- All hot surfaces of equipment, including exhaust pipes or other lines, shall be guarded or insulated to prevent injury and fire.
- All equipment having a charging skip shall be provided with guards on both sides and open end of the skip area to prevent persons from walking under the skip while it is elevated.
- Platforms, footwalks, steps, handholds, guardrails, and toeboards shall be designed, constructed, and installed on machinery and equipment to provide safe footing and access ways.
- Equipment shall be provided with suitable working surfaces of platforms, guard rails, and hand grabs when attendants or other employees are required to ride for operating purposes outside the operator's cab or compartment. Platforms and steps shall be of nonskid material.
- Substantial overhead protection shall be provided for the operators of fork lifts and similar equipment.

3.4 FUELING AND BATTERIES

- Only the type and quality of fuel recommended by the engine manufacturer shall be used.
- A well-ventilated area shall be used for refueling.
- Fuel tanks shall not be filled while the engine is running. All electrical switches shall be turned off.
- No one shall spill fuel on hot surfaces. Any spillage should be cleaned before starting an engine.
- Spilled fuel shall be cleaned with cotton rags or cloths; do not use wool or metallic cloth.
- Open lights, lighted smoking materials, and flames or sparking equipment shall remain well away from the fueling area.
- Heaters in carrier cabs shall be turned off when refueling the carrier or the drill rig.
- Portable fuel containers shall not be filled completely to allow expansion of the fuel during temperature changes.
- The fuel nozzle shall be kept in contact with the tank being filled to prevent static sparks from igniting the fuel.
- Portable fuel containers shall not travel in the vehicle or carrier cab with personnel.
- Fuel containers and transfer hoses shall be kept in contact with a metal surface during travel to prevent buildup of a static charge.

- Batteries shall be serviced in a ventilated area while wearing appropriate PPE.
- When a battery is removed from a vehicle or service unit, the battery shall be disconnected ground post first.
- When installing a battery, the battery shall be connected ground post last.
- When charging a battery, cell caps shall be loosened prior to charging to permit gas to escape.
- When charging a battery, the power source shall be turned off to the battery before either connecting or disconnecting charger loads to the battery posts.
- Spilled battery acid shall be immediately flushed off the skin with a continuous supply of water.
- Should battery acid get into the eyes, the eyes shall be flushed immediately with copious amounts of water and medical attention sought immediately.
- To avoid battery explosions, the cells shall be filled with electrolytes. A flashlight (not an open flame) shall be used to check water electrolyte levels. Avoid creating sparks around battery by shorting across a battery terminal. Lighted smoking materials and flames shall be kept at least 25 feet away from battery-charging stations.

REFERENCES: ENV 515 – *Excavation*
ENV 516 – *Cranes & Lifting Devices*
ENV 524 – *Overhead Electrical Lines*
ENV 532 – *Traffic Safety*

ATTACHMENTS: Certification Form for Machinery and Mechanized Equipment
Heavy Equipment Pre-Operation Inspection Checklist

This procedure applies to Earth Tech Environmental Practice operations. Earth Tech's Environmental, Health and Safety (EH&S) Department is solely responsible for its issuance, revision, and maintenance. Any deviation from these requirements requires approval from the Global Environmental Services EH&S Director or an EH&S Manager.

Certification Form for Machinery and Mechanized Equipment

Project Managers are responsible for ensuring all equipment is certified and that this Machinery and Mechanized Equipment certification form has been submitted by equipment owners.

GENERAL GUIDELINES

Subcontractor equipment shall comply with all applicable requirements for motor vehicles and material handling heavy equipment contained in 29 CFR 1926 Subpart O. Heavy equipment includes, but is not limited to, drill rigs, front end loaders, backhoes, trackhoes, bulldozers, forklifts, and similar equipment used for the implementation of the project Statement of Work.

EQUIPMENT SAFETY INSPECTIONS

The following presents general guidelines for certifying equipment is in safe operating condition before activities commence at the site and during site operations. The following guidelines are not meant to be all-inclusive.

- All machinery and mechanized equipment will be certified to be in safe operating condition (using the attached form) by a competent individual seven days prior to onsite operation, and is valid for one year.
- Equipment will be inspected on a daily basis by the owner/operator and daily logs will be maintained. All discrepancies shall be corrected prior to placing the equipment in service.
- Inspections shall include, but are not limited to: all hydraulic lines and fittings for wear and damage, all cable systems and pull ropes for damage and proper installation, exhaust systems, brake systems, and drill controls, etc.
- Drill rigs and related support equipment and vehicles shall be inspected by the driller in charge on a daily basis. These inspections shall be recorded on the Daily Drill Rig Checklist; or on equivalent subcontractor forms.
- Exhaustive preventive maintenance shall be conducted for all equipment according to manufacturer recommendations and/or the Subcontractor's internal policies, schedules, and equipment SOPs.
- Machinery and mechanized equipment shall be operated only by designated qualified persons.
- Records of tests and inspections shall be maintained at the site by the contractor, and shall be made available upon request of the designated authority, and shall become part of the official project file.
- Equipment not found to be in safe operating condition, or when a deficiency which affects the safe operation of the equipment, shall immediately be taken out of service and its use prohibited until safe conditions have been corrected.
- All equipment shall be kept in the exclusion zone until work or the shift has been completed. Equipment will be decontaminated within designated decontamination areas.
- Equipment with an obstructed rear view must have an audible alarm that sounds when equipment is moving in reverse.

Certification Form for Machinery and Mechanized Equipment

TO: Earth Tech DATE:

FROM:

Project Name::

Project Location:

1. This form provides certification of machinery and mechanized equipment to be used on the referenced project for the following work:

Description of equipment work:	
Project Site:	
Subcontractor providing equipment: Address:	
Dates (duration) of equipment work:	

2. Inspection and certification of machinery and mechanized equipment, as required by Earth Tech, has been made prior to, but within seven calendar days advance of, use on the project site. Re-certification will be required for equipment that is used on the project site for more than one year.

Identification of equipment (make, model, serial no.)		Date of Certification
1		
2		
3		

3. The above listed equipment has been inspected and tested as indicated above, and is CERTIFIED TO BE IN SAFE OPERATING CONDITION BY THE FOLLOWING COMPETENT INDIVIDUAL:

Name		Title	
Company			
Signature		Date	

4. If there are any questions regarding this certification, please contact the following Earth Tech representative:

_____.

HEAVY EQUIPMENT PRE-OPERATION INSPECTION CHECKLIST

Project Name/Location

Number/Name:	**Make/Model:**

Checklist Items - Operator must initial each item (UNSAT Items require corrective action prior to equipment use)

Hour meter reading:															
Check the following as appropriate	**Operator Name/Date:**			**Operator Name/Date**			**Operator Name/Date**			**Operator Name/Date**			**Operator Name/Date**		
	SAT	**UNSAT**	**N/A**	**SAT**	**UNSAT**	**N/A**	**SAT**	**UNSAT**	**N/A**	**SAT**	**UNSAT**	**N/A**	**SAT**	**UNSAT**	**N/A**
1. Operator Qualified to Operate Designated Piece of Heavy Equipment															
2. Overhead guard															
3. Horn															
4. Lights (including reverse signaling lights)															
5. Parking brake															
6. Service brakes															
7. Steering															
8. Oil Level															
9. Hydraulic oil level															
10. Radiator fluid level															
11. Major fluid leaks															
12. Windows															
13. Backup alarm															
14. Tires (visual)															
15. Seat belts															
16. Fuel leaks															
17. Fire extinguisher full and secure															
18. Fuel lines secure															
19. Electrical lines															
20. Exhaust components															

Comments/Remarks

ENV 510

UNKNOWN HAZARDOUS WASTE DRUM HANDLING

Published:	January 20, 2003
Revised:	N/A
Page:	1 of 5

SUMMARY: Drums containing unknown materials, or damaged drums containing hazardous materials, must be handled in accordance with the following procedures.

1.0 PLANNING

Because drum handling introduces the potential for danger, every step of the operation should be carefully planned, based on all available information. The results of the preliminary inspection can be used to determine: (1) if any hazards are present and the appropriate response, and (2) which drums need to be moved in order to be opened and sampled. A preliminary plan should be developed that specifies the procedures based on the hazards associated with the probable drum contents as determined by visual inspection. This plan should be revised as new information is obtained during drum handling.

2.0 AIR MONITORING

Continuous air monitoring is required during the initial evaluation and handling of unknown/hazardous waste drums. Readings will be collected in the breathing zone and general work area. Readings will be collected for organic vapors, combustible gas (% LEL), oxygen (% oxygen), and radiation. The following levels will be utilized as action levels unless otherwise specified in the Health and Safety Plan (HASP). During initial monitoring, when materials are not adequately characterized, or if drums/containers are leaking and/or ruptured, Level B personal protective equipment (PPE) will be worn by site personnel.

Organic Vapors

Readings	Action/Level of Protection
0 – 1 ppm	Continue monitoring, Level D personal protective equipment (PPE)
>1 – 10 ppm	Continue monitoring, Level C PPE; Institute engineering controls
>10 ppm	Cease work and withdraw from the area. Contact the EH&S Professional for guidance. Level B PPE may be required.

Combustible Gases

Readings	Action/Level of Protection
<10% LEL	Continue monitoring.
≥10% LEL	Cease work activities immediately. Evacuate area and ventilate, then re-monitor. Re-entry allowed only after level falls below 10% LEL. Continue to ventilate and monitor area.

Oxygen

Readings	Action/Level of Protection
19.5 to 23.5% O_2	Continue work activities
<19.5 or >23.5% O_2	Cease work, exit area, and contact the EH&S Professional.

3.0 HANDLING

The purpose of handling is to: (1) respond to any obvious problems that might impair worker safety, such as radioactivity, leakage, or the presence of explosive substances; (2) unstack and orient drums for sampling; and

(3) if necessary, to organize drums into different areas on site to facilitate characterization and remedial action. Handling may or may not be necessary, depending on how the drums are positioned at a site.

Since accidents occur frequently during handling, particularly initial handling, drums should be handled only if necessary. Prior to handling, all personnel should be warned about the hazards of handling and instructed to minimize handling by using remote methods. In all phases of handling, personnel should be alert for new information about potential hazards. Personnel should respond to new hazard information before continuing with routine handling operations.

Overpack drums, which are larger drums that contain leaking or damaged drums for storage or shipment (see 49 CFR Part 173.3(c)), and an adequate volume of absorbent should be kept near areas where minor spills may occur. In these areas, a containment berm adequate to contain the entire volume of liquid in the drums should be constructed prior to any drum handling. If drum contents spill, personnel trained in spill-response procedures should isolate and contain the spill.

Several types of equipment can be used to move drums: (1) A drum grappler attached to a hydraulic excavator; (2) a small front-end loader, which can be either loaded manually or equipped with a bucket sling; (3) a rough-terrain forklift; (4) a roller conveyor equipped with solid rollers; and (5) drum carts designed specifically for drum handling. Sometimes drums are moved manually. The drum grappler is the preferred piece of equipment for drum handling. The grappler distances the operator from the drums so there is less likelihood of injury if the drums detonate or rupture. If the drum is leaking, the operator can stop the leak by rotating the drum and immediately placing it into an overpack. In case of an explosion, grappler claws help protect the operator by partially deflecting the force of the explosion.

The following procedures are to be used to maximize worker safety during drum handling and movement:

- Train personnel in proper lifting and moving techniques to prevent back injuries.
- Make sure the vehicle selected has sufficient rated load capacity to handle the anticipated loads and can operate smoothly on the available road surface.
- Air condition vehicle cabs to increase operator efficiency; protect the operator with heavy splash and/or blast shields.
- Supply operators with appropriate respiratory protective equipment when needed. Normally, either a combination self-contained breathing apparatus (SCBA)/supplied-air respirator (SAR) with the air tank fastened to the vehicle or an airline respirator and an escape SCBA are used because of the high hazard potential of drum handling. Respiratory equipment improves operator efficiency and provides protection in case the operator must abandon the equipment.
- Have overpacks ready before attempting to move drums.
- Determine the most appropriate sequence for moving the various drums and other containers. For example, it may be necessary to move small containers first in order to move larger drums or to permit heavy equipment to enter the area.
- Exercise extreme caution in handling drums that are not intact and tightly sealed.
- Ensure that operators have a clear view of the roadway when carrying drums. If necessary, station ground workers to guide the operator's motion.

3.1 BURIED DRUMS

- Prior to initiating subsurface excavation, use ground-penetrating systems to estimate the location and depth of the drums.
- Remove soil with great caution to minimize the potential for drum rupture.

- Keep a dry chemical fire extinguisher on hand to control small fires.

3.2 DRUMS CONTAINING RADIOACTIVE WASTE

If the drum exhibits radiation levels above background, immediately contact a health physicist. Do *not* handle any drums that are determined to be radioactive before consulting individuals with expertise in this area.

3.3 DRUMS THAT MAY CONTAIN EXPLOSIVE OR SHOCK-SENSITIVE WASTE

- If a drum is suspected to contain explosive or shock-sensitive waste as determined by visual inspection, seek specialized assistance before handling.
- If handling is necessary, handle these drums with *extreme caution*.
- Prior to handling these drums, move all nonessential personnel a safe distance away.
- Use a grappler unit constructed for explosive containment for initial handling of such drums.
- Place drums on pallets prior to transport. Secure drums to pallets.
- Use an audible siren signal system, similar to the type used in conventional blasting operations, to signal the commencement and completion of explosive waste-handling activities.
- Maintain continuous communications with the Site Safety Officer and/or the command post until drum-handling operations are complete.

3.4 BULGING DRUMS

- Pressurized drums are extremely hazardous. Wherever possible, do not move drums that are internally pressurized, as evidenced by bulging or swelling.
- If a pressurized drum must be moved, whenever possible, handle the drum with a grappler unit constructed for explosive containment. Either move the bulged drum only as far as necessary to allow seating on firm ground or carefully overpack the drum. Exercise extreme caution when working with or near potentially pressurized drums.
- Pressure may be released using remote methods. Contact the Corporate Certified Industrial Hygienist (CIH) to outline specific steps to accomplish this task. The following methods may be used:
    - Tube and spear device. A light aluminum tube (3 meters long) is positioned at the vapor space of the drum. A rigid, hooking device attached to the tube goes over the chime and holds the tube securely in place. The spear is inserted in the tube and positioned against the drum wall. A sharp blow on the end of the spear drives the sharpened tip through the drum and the gas vents along the grooves. Venting should be done from behind a wall or barricade. This device can be cheaply and easily designed and constructed. Once the pressure has been relieved, the bung can be removed and the drum sampled.
    - Hydraulic device. A piercing device with a metal point is attached to the end of a hydraulic line and is pushed into the drum by hydraulic pressure. The piercing device can be attached so that a hole for sampling can be made in either the side or the head of the drum. Some metal piercers are hollow or tube-like so that they can be left in place and serve as a permanent tap or sampling port. The piercer is designed to establish a tight seal after penetrating the container.
- Protect personnel by keeping them at a safe distance from the drums being opened. If personnel must be near the drums, place explosion-resistant plastic shields between them and the drums as protection in case of detonation. Locate controls for drum-opening equipment, monitoring equipment, and fire-suppression equipment behind the explosion-resistant plastic shield.
- Use the following remote-controlled devices for opening drums:

- Pneumatically operated impact wrench to remove drum's bungs.
- Hydraulically or pneumatically operated drum piercers.
- Backhoes equipped with bronze spikes for penetrating drum tops in large-scale operations.

- Do *not* use picks, chisels, or firearms to open drums.
- Perform all steps slowly. Relieve excess pressure prior to opening and, if possible, from a remote location using devices such as a pneumatic impact wrench or hydraulic penetration device. If pressure must be relieved manually, place a barrier, such as explosion-resistant plastic sheeting, between the worker and bung to deflect any gas, liquid, or solids that may be expelled as the bung is loosened.

3.5 LEAKING, OPEN, AND DETERIORATED DRUMS

- If a drum containing a liquid cannot be moved without rupture, immediately transfer its contents to a sound drum using a pump designed for liquid transfer.
- Using a drum grappler, immediately place the following damaged drums in overpack containers:
  - Leaking drums that contain sludges or semi-solids.
  - Open drums that contain liquid or solid waste.
  - Deteriorated drums that can be moved without rupture.

4.0 OPENING

Drums are usually opened and sampled in place during site investigations. However, remedial and emergency operations may require a separate drum-opening area. Procedures for opening drums are the same regardless of location. To enhance the efficiency of drum-opening operations and the safety of personnel, the following procedures should be instituted.

- If a supplied-air respiratory protection system is used, place a bank of air cylinders outside the work area and supply air to the operators via airlines and escape SCBAs. This practice enables workers to operate in relative comfort for extended periods of time.
- If possible, monitor continuously while drums are being opened. Place monitoring equipment sensors, such as colormetric tubes, dosimeters, radiation survey instruments, explosion meters, organic vapor analyzers, and oxygen meters as close as possible to the source of contaminants (i.e., at the drum opening).
- Hang or balance the drum-opening equipment to minimize worker exertion.
- Open exotic metal drums and polyethylene or polyvinyl chloride-lined (PVC-lined) drums through the bung by removal or drilling. Exercise extreme caution when manipulating these containers.
- Do *not* open or sample individual containers within laboratory packs.
- Reseal open bungs and drill openings as soon as possible with new bungs or plugs to avoid explosions and/or vapor generation. If an open drum cannot be resealed, place the drum into an overpack. Plug any openings in pressurized drums with pressure-venting caps set to a 5-psi (pounds per square inch) release to allow venting of vapor pressure.
- Decontaminate equipment after each use to avoid mixing incompatible wastes.

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5.0 DRUM SEGREGATION AND STAGING

Drums and containers used during the cleanup will meet the appropriate U.S. Department of Transportation (DOT), Occupational Safety and Health Administration (OSHA), and U.S. Environmental Protection Agency (USEPA) regulations for their respective wastes.

Unlabeled drums and containers will be considered to contain hazardous substances and will be handled accordingly until the contents are positively identified and noted on the label.

Before moving drums or containers, employees with the transfer operation should be warned of the potential hazards associated with the contents of the drums or containers and should review the latest site information and risk analysis forms. In congested areas where drums are staged, Earth Tech personnel will use forklifts to move drums to minimize abrasions, pinch hazards, etc.

Prior to handling or moving any containers, the condition of each drum will be noted and appropriate handling procedures discussed with the Project Manager. Drums will be marked to indicate acceptability for handling. Specific locations for drum staging will be constructed during site mobilization. These areas will be equipped with all proper safety and emergency equipment necessary to contain spills and releases. Exact staging locations will be noted on the site plan and incorporated into this HASP using the task risk (job safety) analysis form.

The DOT-specified salvage drums or containers and sizable quantities of proper absorbent and neutralizers (diatomaceous earth, citric acid powder, soda ash, activated carbon, sorbent pads, and boom) will be available and used in areas where spills, leaks, or ruptures may occur.

For major spills or leaks, a customized spill pallet with all necessary tools and equipment will be moved into position. The pallet will contain sorbent media, neutralizing media, tools and equipment, and fire extinguishers. The pallet will be accessible and fully stocked at all times to respond to spills, leaks, or releases during the project.

Drums and containers that cannot be moved without rupture, leakage, or spillage will be emptied into a sound container using a device classified for the material being transferred. Typically, this would be done with an explosion-proof transfer pump or a peristaltic pump. Soil or covering material will be removed with caution to prevent drum or container rupture. Fire extinguishers will be available to control small fires. Personnel will don level B PPE to include Saran® suits and chemical-resistant gloves/booties.

Chemical spills, splashes, and reactions between incompatible chemicals present the greatest risks for exposure in these operations. *The principal routes of exposure are skin contact and inhalation. An emergency eyewash station will be present in the work area.*

REFERENCES: ENV 507 – *Handling of Drums and Large Containers*
ENV 508 – *Drum Sampling*

ENV 303

LEAD OPERATIONS

Published:	January 20, 2003
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SUMMARY: The requirements below apply for all activities where lead and lead-containing materials may be encountered as an ancillary part of environmental practice activities. These procedures meet the requirements of 29 CFR 1910.1025 and 29 CFR 1926.62.

1.0 APPLICABLE DEFINITIONS

Action Level (AL) – Means an *airborne lead concentration* of 30 micrograms per cubic meter of air (30 $\mu g/m^3$), calculated as an 8 (eight) hour time weighted average (TWA), irrespective of mitigation provided by any respiratory protection which might be used.

Demolition – Means the wrecking or taking out of any load-supporting structural members and any related razing, removing, or stripping of lead products.

HAZWOPER – means any on-site contamination investigation or clean-up activities subject to the operational requirements of 29 CFR 1910.120.

Lead Containing Material – means:

1. Structural or decorative components containing lead in excess of 1% by weight.
2. Paint or other surface coatings that contain lead equal to or in excess of 1.0 milligram per centimeter squared (1.0 mg/cm^2) or 0.5% by weight.
3. Bulk materials containing lead in excess of 0.1%, or for soils any lead-in-soil concentration in excess of 1000 mg/kg.

Allowable Exposure Limit (AEL) – Means the maximum exposure concentration to which a Earth Tech employee can be subjected, normalized to an 8 (eight) hour time weighted average (TWA) and with consideration of the mitigation provided by any respiratory protection which may be used. For normal work shifts (8-hours or less) Earth Tech's lead AEL is 50 micrograms per cubic meter of air (50 $\mu g/m^3$).

Renovation – Means the modifying of any building component that does not impact structural supports.

2.0 RESPONSIBILITIES

2.1 EH&S DEPARTMENT

1. Provide technical assistance in the identification of lead containing materials and the evaluation of lead exposure hazards as requested by management personnel.
2. Review and approve all lead exposure hazard assessments prior to the start of work activities.
3. Review and approve all lead exposure mitigation plans and exposure monitoring activities to ensure compliance with federal, state and local regulations.

2.2 PROJECT MANAGERS

1. Assure that the presence of lead-containing materials at Earth Tech work sites is identified (where reasonably possible) prior to commencing field activities, that prior to initiating any task involving disturbance of or contact with lead-containing materials (or immediately upon identification of previously unknown lead-containing materials) a task lead exposure hazard assessment is developed and approved by the EH&S Department, and that the applicable requirements of Section 3.0 are observed for each task where the lead exposure assessment indicates that the airborne lead concentrations can exceed the Action Level or other significant lead exposure hazards are present.
2. Assure that employees developing work procedures and/or conducting work activities involving lead containing materials possess any required state specific registrations or certifications.

3. Assure that employee's assigned to perform any work activities involving lead containing materials have been trained in the job-specific hazards of lead exposure, have received proper medical surveillance, and are trained and properly fit tested in the use of any designated respiratory protection devices.

2.3 ALL EARTH TECH EMPLOYEES

1. Do not disturb or handle any lead containing materials without appropriate personal protective equipment (PPE), training in the job-specific hazards of lead exposure, medical monitoring, and respirator fit test.
2. Immediately notify the Project Manager of the presence or suspected presence of previously unidentified lead containing materials in the workplace, and cease all work activities involving disturbance or contact with the materials until further direction is received.

3.0 OPERATIONAL REQUIREMENTS

The following operation-specific requirements pertain to activities where the presence of lead-containing materials is identified, suspected or is recognized as a significant operational occurrence.

3.1 HAZWOPER ACTIVITIES

Lead may be present at HAZWOPER sites as a soil or groundwater contaminant, or as a building material. If such contamination is noted the following requirements must be observed:

1. The site-specific health and safety plan (HASP) must provide a specific analysis of the lead exposure hazard for each task involving the disturbance or handling of lead-contaminated materials.
2. If any potential is identified for worker lead exposures to exceed the AL then specific lead exposure control and monitoring procedures must be developed for the work activity and included in the HASP.
3. If workers may be exposed in excess of the AL, they must complete baseline medical monitoring and lead awareness training.

3.2 DEMOLITION OR RENOVATION ACTIVITIES

The past wide-spread use of lead-containing materials in buildings is widely recognized as the source of a significant exposure hazard for personnel performing demolition and renovation activities. Accordingly, the following requirements will be observed:

1. Prior to commencement of demolition or activities a thorough inspection and sampling program will be completed throughout the demolition area to identify the presence of lead containing materials.
2. Where feasible, lead-containing materials will be removed prior to commencement of general work activities.
3. The hazards of any remaining lead will be analyzed and an exposure control and monitoring plan developed to prevent worker lead exposures in excess of the AEL (required) and the AL (where feasible). The exposure control plan must be approved by the EH&S Department prior to implementation.
4. A demolition or renovation notification must be filed with and approved by the EPA and any local construction regulatory agencies prior to commencing demolition activities.
5. If workers may be exposed in excess of the AL, they must complete baseline medical monitoring and lead awareness training.

3.3 OTHER ACTIVITIES

If the presence of lead-containing material is identified or suspected at any work location, and there is the potential for this material to become disturbed during planned work activities, then the following requirements must be observed:

1. A lead exposure hazard assessment will be completed for each task in which lead-containing material may be disturbed.
2. If any exposure assessment indicates the potential for worker exposures to exceed the AL then appropriate exposure mitigation procedures must be identified to keep exposures to less than the AEL (required) and the AL (where feasible). Mitigation procedures must be reviewed and approved by the EH&S Manager prior to implementation.
3. If workers may be exposed in excess of the AL, they must complete baseline medical monitoring and lead awareness training.
4. The EH&S Department will determine if any exposure monitoring procedures must be implemented during work activities.

4.0 WORKER EXPOSURE CONTROL PROGRAM

The following requirements pertain to all workers performing tasks where the associated lead exposure assessment indicates the potential for lead exposures to exceed the AL.

4.1 MEDICAL MONITORING REQUIREMENTS

Prior to commencing work where lead exposure may exceed the AL, each employee will have completed a biological monitoring procedure for consisting for blood lead and ZPP (Zinc Protoporphyrin) concentrations. Workers must have a medical clearance from Earth Tech's Corporate Medical Provider to perform work involving potential lead exposures.

4.2 TRAINING

Each worker must have completed training consisting of the following elements:

1. Hazards of lead
2. Lead exposure limits and other regulatory requirements
3. Job-specific lead hazards and exposure prevention measures

4.3 RESPIRATORY PROTECTION

Where respiratory protection is specified for use in controlling worker exposures to lead each employee must:

1. Be medically qualified for use of the specified respiratory protection.
2. Complete respirator training and fit testing.
3. Be assigned an appropriate respirator for use during field operations.

REFERENCES: EHS 702 – *Lead-Containing Materials*
ENV 203 – *Medical Monitoring Program*

This procedure applies to Earth Tech Environmental Practice operations. Earth Tech's Environmental, Health and Safety (EH&S) Department is solely responsible for its issuance, revision, and maintenance. Any deviation from these requirements requires approval from the GWES EH&S Director or an EH&S Manager.

ENV 305

CONSTRUCTION OPERATIONS

Published:	January 20, 2003
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SUMMARY: Environmental actions often involve limited construction, demolition, or renovation activities. The requirements below specify whether planned construction activities being conducted as part of an environmental action can be safely performed using the Environmental Practices EH&S procedures, or if the scope of activities warrants implementation of the more rigorous construction safety requirements found in Earth Tech's *Environmental, Health and Safety for Construction Procedures*.

1.0 APPLICABLE DEFINITIONS

Construction – Means the erection or expansion of a building or structure where structural support members are involved, performing grading or landscaping activities intended to substantially alter the finished quality of the site surface, and activities associated with the creation or expansion of a landfill, soil treatment unit or similar structure.

Demolition – Means the wrecking or taking out of any load-supporting structural members and any related razing, removing, or stripping of lead products.

Renovation – Means the modifying of any building component that does not impact structural supports.

2.0 ACTIVITIES COVERED UNDER ENVIRONMENTAL PRACTICE STANDARDS

Activities associated with jobs meeting the specifications below can be performed in accordance with the EH&S procedures found in the ENV 500-series of Earth Tech's *Environmental, Health and Safety Program Manual for Environmental Practices*.

1. All landscaping activities.
2. All landfill construction and earthworking activities where less than 100,000 total cubic yards of material will be handled.
3. All facility construction activities associated with environmental activities (e.g., facilities housing treatment system components) where structures are no more than 2 stories (25 feet) in height, and no structural steel framework or reinforced concrete supports are required.
4. All facility renovation activities (including interior "gutting"), associated with asbestos/lead remediation, radiological contamination remediation, or other environmental restoration activities.
5. Any demolition activities involving:
    - Non-reinforced concrete or wooden frame structures less than 25 feet high.
    - Any underground structures, including underground storage tanks.
    - Above ground storage tanks of less than 100,000 gallons capacity.
6. Other activities as approved by the GWES EH&S Director or an EH&S Manager.

3.0 ACTIVITIES REQUIRING IMPLEMENTATION OF EARTH TECH'S CONSTRUCTION SAFETY STANDARDS

The following activities require implementation of the construction safety requirements found in Earth Tech's *Environmental, Health and Safety for Construction Procedures*.

1. Landfill construction and earthworking activities where more than 100,000 total cubic yards of material will be handled.
2. Facility construction activities associated with environmental actions where structures:
    - Are greater than 25 feet in height, or

- Require the installation of a structural steel frame or reinforced concrete supports.

3. Facility renovation activities not associated with environmental restoration activities.
4. Demolition activities involving:
   - Facilities greater than 2 stories (25 feet) in height.
   - Facilities constructed using structural steel or reinforced concrete.
   - Aboveground storage tanks greater than 100,000 gallons in capacity.
5. Other activities as determined by the GWES EH&S Director or an EH&S Manager.

For these activities, EH&S support of construction-related activities will be provided by a construction EH&S Professional in the Earth Tech Construction and Project Delivery Group. EH&S support of non-construction hazards (e.g., hazards associated with on-site contamination) will continue to be provided by GWES EH&S personnel.

REFERENCES: Earth Tech's *Environmental, Health and Safety for Construction Procedures*
ENV 101 – *EH&S Project Support*
ENV 102 – *General EH&S Plan Requirements*
ENV 103 – *Purchasing Activities*
ENV 104 – *Subcontractor Selection*

ENV 401

PROTECTION FROM SOLVENTS

Published: January 20, 2003
Revised: N/A
Page: 1 of 1

SUMMARY: The guidelines presented below provide for worker protection from the adverse effects associated with the use of solvent-containing products and the handling of solvent-contaminated materials.

1.0 GENERAL SOLVENT PROPERTIES

1. All solvents remove protective oils from the skin on contact, increasing the possibility of dermatitis and infection. Some solvents may be absorbed through the skin and produce systemic effects.
2. Repeated skin contact can cause a person to become sensitized to a given solvent.
3. All solvents have varying adverse effects if ingested. Hydrocarbon liquids produce respiratory complications if allowed to enter the lungs.
4. Airborne vapor concentrations for a given solvent are highly difficult to predict in any task because they depend on the method of dispensing, agitation, temperature, air movement, and confinement. In any case, the concentration will be directly proportional to the area of the surface wetted under a given set of conditions.
5. Some solvent vapors may be detected by odor before the occupational exposure limit (OEL) is reached. However, smell is not a reliable method for protection against overexposure since some solvents paralyze the sense of smell while other solvents present no noticeable odor until the OEL has been exceeded.

2.0 GENERAL SAFETY PROCEDURES

1. The amount of solvent stored in work areas must be limited to the amount necessary for daily operation.
2. Solvent containers for bench use shall be of the smallest size practical and shall provide a method of dispensing without pouring (e.g., by wetting cloth, squeeze bottle, or plunger-type safety container).
3. All wiping cloths used for solvents shall be placed in a closed container immediately after use.
4. Disposition of all solvent wastes must be by an environmentally approved method.
5. Spills shall be cleaned up immediately. Clear the area of other persons as necessary.
6. No solvent shall be used in a way that permits skin contact with the liquid. In most instances this means that gloves must be worn.
7. Solvent-contaminated clothing must be removed at once.
8. Any use of a solvent in a poorly ventilated room or enclosed space requires the use of respiratory protection.
9. When using solvents inside a pit or confined area, regardless of quantity, personnel must wear supplied air respiratory protection and treat the activity as a permit-required confined space entry until air monitoring can be used to verify that no hazardous atmosphere exists.
10. Containers of solvents shall be labeled with an appropriate warning label.
11. The following precautions must be observed when opening full drums of solvents or chemicals:
    - When opening full drums, all personnel in the immediate area must wear chemical goggles or a face shield.
    - When removing the bung, the barrel must be in an upright position and a proper bung wrench used. The bung will first be loosened one turn, internal drum pressure allowed to reach atmospheric pressure, and then removed. Never place head or face above a bung when opening.

REFERENCES: ENV 511 – Permit-Required Confined Space Entry

This procedure applies to Earth Tech Environmental Practice operations. Earth Tech's Environmental, Health and Safety (EH&S) Department is solely responsible for its issuance, revision, and maintenance. Any deviation from these requirements requires approval from the GWES EH&S Director or an EH&S Manager.

ENV 402

FLAMMABLE AND COMBUSTIBLE LIQUIDS

Published:	January 20, 2003
Revised:	N/A
Page:	1 of 2

SUMMARY: The requirements below provide general requirements for the safe storage, use and handling of flammable and combustible liquids.

1.0 DEFINITIONS

Class I Flammable - Those having a "flash point" below 100ºF.

Class II Combustible Liquids - Those having a "flash point" at or above 100ºF, but below 140ºF.

Class III Combustible Liquids - Those having a "flash point" above 140ºF, but below 200ºF.

2.0 GENERAL INFORMATION

It is fundamentally important to handle and store flammable liquids in closed or approved safety containers and avoid exposing the liquid surface to air. Placards required for flammable or combustible liquids are as follows:

- "Flash point" of 20ºF or below: "DANGER! EXTREMELY FLAMMABLE."
- "Flash point" from 20ºF to 100ºF: "WARNING! FLAMMABLE."
- "Flash point" from 100ºF to 200ºF: "CAUTION! COMBUSTIBLE."

3.0 HANDLING AND DISPENSING

- Storage containers in storage racks are to be stored a minimum of 50 feet from the nearest structure. All containers are to be electrically grounded. Drip trays are to be provided under container spigots.
- When transferring a flammable/combustible liquid an electrical bond (metal-to-metal) is to be established between the two transfer containers prior to transfer. Storage containers are to be equipped with an approved safety faucet and flexible metal hose. A pressure-vacuum relief vent is required for containers of flammable liquids. Metal-to-metal contact may also be established by using a grounding strap.
- Spill containment is required for all solvent dispensing areas. The secondary containment dike will be designed for 110 percent of the maximum stored solvent volume, with the capacity for 24-hour holding time.
- The maximum amount of flammable solvent (used for cleaning purposes) at any workstation is limited to one quart. Variance from this requirement requires the prior approval of an EH&S Manager.
- Maximum use must be made of fireproof metal cabinets to store flammable liquids inside any structure.
- Rags, kimwipes, etc., that are contaminated with flammable liquids are to be placed in a safety container equipped with a fusible link lid.
- All containers of flammable liquids must be properly identified as to contents.
- All manually handled flammable liquids shall be handled in approved safety containers. The exception is pint-sized squirt bottles.
- Where flammable solvents must be used in wash containers, such as for paint sprayer cleaning, the container must be provided with a self-closing or fusible lid.
- Flammable liquid in portable containers in excess of the amount required for one day of use must be stored in approved flammable liquid storage cabinets.

This procedure applies to Earth Tech Environmental Practice operations. Earth Tech's Environmental, Health and Safety (EH&S) Department is solely responsible for its issuance, revision, and maintenance. Any deviation from these requirements requires approval from the GWES EH&S Director or an EH&S Manager.

- Flammable storage cabinets will be kept closed, and will be latched each time after use.
- "NO SMOKING" signs are to be posted in areas where flammable liquids are stored, dispensed, or used.
- An adequate supply of fire extinguishers will be located to support each area where flammable or combustible liquids are handled or stored.

Additional information and requirements for handling and storage of specific flammable liquids are detailed in Material Safety Data Sheets, which must be obtained and maintained on site for each solvent material in use.

REFERENCES: None

ENV 403

COMPRESSED GASES

Published: January 20, 2003
Revised: N/A

SUMMARY: The following requirements pertain to all uses of compressed gases.

1.0 GENERAL USE OF COMPRESSED AIR OR GASES

1. Compressed air or other compressed gases in operating pressures exceeding 10 pounds per square inch gauge (psig) are not to be used to blow dirt, chips, or dust from clothing while it is being worn. Compressed air used for other types of cleaning (other than clothing/personnel) is to be limited to 30 psig.
2. The use of blown compressed air is to be controlled, and proper personal protective equipment or safeguards utilized, to protect against the possibility of eye injury to the operator or other persons.
3. Compressed air or gases are not to be used to empty containers of liquids in cases where the operating pressure can exceed the safe working pressure of the container.
4. Compressed gases are not to be used to elevate or otherwise transfer any hazardous substance from one container to another unless the containers are designed to withstand the operating gas pressure with a safety factor of at least four.

2.0 COMPRESSED GASES (CYLINDERS)

1. Cylinders are not to be used unless they bear Department of Transportation (DOT) markings showing that they have been tested as required by DOT regulations.
2. Cylinders must never be dropped, struck, or permitted to strike each other violently. Cylinders may be moved by tilting and rolling them on their bottom edges.
3. Valve protection caps must always be kept on cylinders when they are being moved or stored, and until ready for use.
4. Cylinder valves are to be kept closed except when gas is being used or when connected to a permanent manifold. Valves of empty cylinders must be closed.
5. Cylinders must never be used as rollers or supports, or for any purpose other than carrying gas.
6. Cylinders of compressed gas shall be stored in areas where they are protected from external heat sources such as flame impingement, intense radiant heat, electric arc, or high-temperature steam lines.
7. Cylinders are to be stored in an assigned area, with full and empty cylinders stored separately. Stored fuel gases and oxygen cylinders are to be separated by at least 20 feet, or by a fire wall at least 5 feet high that has a fire-resistance rating of at least ½ hour.
8. Oxygen, nitrogen, helium, or freon cylinders may be stored or transported either in an upright or horizontal position. Acetylene cylinders must always be kept in an upright position. All horizontally placed cylinders are to be secured by chocks or ties to prevent rolling.
9. Cylinders are to be secured to a fixed object by chain or equivalent fastening device whenever they are placed in an upright position. The protective cap is not to be removed or the cylinder valve opened until the cylinder is secured.
10. Repair of leaks must never be attempted on a pressurized system. System pressure should be reduced to atmospheric pressure as rapidly as possible, and the supervisor notified immediately.
11. Compressed gas cylinders must be legibly marked for the purpose of identifying the gas content with either the chemical or the trade name of the gas. Such marking is to be by means of stenciling, stamping or labeling, and must not be readily removable. Whenever practical, the marking is to be located on the shoulder of the cylinder. Positive identification of the gas in any cylinder is required before connecting cylinders for use.

This procedure applies to Earth Tech Environmental Practice operations. Earth Tech's Environmental, Health and Safety (EH&S) Department is solely responsible for its issuance, revision, and maintenance. Any deviation from these requirements requires approval from the GWES EH&S Director or an EH&S Manager.

12. Compressed gas cylinders in portable service are to be conveyed by suitable trucks, to which they are securely fastened. All gas cylinders in service must be securely held in substantial racks or secured to other rigid structures so that they will not fall or be knocked over.
13. Gas cylinders moved by hoist must be handled in suitable cradles or skip boxes. Any slings used for this purpose must be specifically designed for that cylinder handling.
14. Cylinders must not be placed where they might form part of an electrical circuit.
15. Transfer of acetylene from one cylinder to another, or mixing of gases in a cylinder, is prohibited.
16. Oxygen cylinders are never to be stored near:
    - highly combustible materials, especially oil and grease;
    - reserve stocks of acetylene or other fuel gas cylinders; or
    - any other substance likely to cause or accelerate fire.
17. Compressed oxygen is never to be used:
    - as breathing air;
    - to purge pipelines, tanks, or any confined area;
    - to supply a head-pressure tank;
    - in pneumatic tools;
    - in oil preheating burners;
    - to start internal combustion engines;
    - for ventilation;
    - for cleaning clothing; or
    - in any other way as a substitute for compressed air.
18. Use of a cylinder's contents for purposes other than those intended by the supplier is prohibited.

REFERENCES: None

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

EARTH TECH, INC.
ENVIRONMENTAL, HEALTH & SAFETY MANAGEMENT
TASK HAZARD ANALYSIS FORM

ADMINISTRATIVE INFORMATION:

JOB/TASK NAME:

PROJECT NAME:	**PROJECT LOCATION:**
PROJECT MANAGER:	**ANALYSIS PERFORMED BY:**
DATE JOB/TASK TO BE PERFORMED:	**TYPE OF JOB/TASK:** ☐ One time ☐ Routine job/task
RESPONSIBLE ORGANIZATION:	**JOB SUPERVISOR:**

JOB EVENT SEQUENCE
(LIST ONE STEP OF THE JOB FOR EACH LINE. ATTACH ADDITIONAL JOB SEQUENCE FORM(S) AS NECESSARY) PAGE ____ OF ____

1.	2.
3.	4.
5.	6.
7.	8.
9.	10.

PHYSICAL HAZARDS:

- ☐ Bees, snakes, or spiders
- ☐ Cold stress
- ☐ Compressed gas
- ☐ Electrical equipment
- ☐ Elevated work areas
- ☐ Eye hazards (impact, light, etc.)
- ☐ Explosions
- ☐ Fire
- ☐ Hand tool use
- ☐ Hazardous noise exposure
- ☐ Heat stress
- ☐ Heavy equipment operations
- ☐ Holes, pits, trenches
- ☐ Impalement
- ☐ Laser radiation
- ☐ Leading edge work
- ☐ Overhead hazards
- ☐ Portable power tool use
- ☐ Powder-actuated tools
- ☐ Self-starting equipment
- ☐ Slippery surfaces
- ☐ Uneven terrain
- ☐ Unguarded moving parts/equip.
- ☐ Vehicle traffic

CHEMICAL HAZARDS:

- ☐ Adhesives
- ☐ Asbestos
- ☐ Cleaning solvents
- ☐ Concrete or concrete dust
- ☐ Form oils
- ☐ Gasoline or diesel Fuel
- ☐ Lead
- ☐ Lubricating oils & greases
- ☐ PCBs
- ☐ Sand blasting products
- ☐ Smokes & dusts
- ☐ Solvents
- ☐ Surfacing materials
- ☐ Welding fume
- ☐ **None**

Other Physical/Chemical Hazards: _____

PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIRED:

Boots:
- ☐ Leather
- ☐ Rubber
- ☐ Safety-toe

Gloves
- ☐ Chemical-resistant
- ☐ Cut-resistant
- ☐ Leather
- ☐ Welder's

Eye Protection:
- ☐ Faceshield
- ☐ Safety glasses
- ☐ Welder's helmet

General:
- ☐ Coveralls
- ☐ Hearing protection
- ☐ Respirator
- ☐ Safety harness & lanyard

Other: _____

OTHER SAFETY EQUIPMENT/CONSIDERATIONS:

- ☐ Fire extinguisher
- ☐ First-aid kit
- ☐ Dust control measures
- ☐ Portable eyewash
- ☐ Fire watch

Other: _____

APPLICABLE SAFETY PROCEDURES (SEE PHSP OR SHSP):

EXPOSURE CONTROL REQUIREMENTS:

☐ Not applicable ☐ Requirements: _____

APPROVAL SIGNATURES:

SITE SUPERINTENDENT:	**SSC/EH&S:**

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

EARTH TECH, INC.
ENVIRONMENTAL, HEALTH & SAFETY MANAGEMENT
JOB SEQUENCE FORM

ADMINISTRATIVE INFORMATION:	
JOB/TASK NAME:	
PROJECT NAME:	**PROJECT LOCATION:**
PROJECT MANAGER:	**ANALYSIS PERFORMED BY:**
DATE JOB/TASK TO BE PERFORMED:	**TYPE OF JOB/TASK:** ☐ One time ☐ Routine job/task
RESPONSIBLE ORGANIZATION:	**JOB SUPERVISOR**

JOB EVENT SEQUENCE **(CONTINUED FROM PREVIOUS THA PAGE) PAGE ____ OF ____**
11.
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27.
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29.
30.
31.

APPROVAL SIGNATURES	
SITE SUPERINTENDENT:	**SSC/EH&S:**

EARTH TECH

A tyco INTERNATIONAL LTD. COMPANY

EARTH TECH, INC.
ENVIRONMENTAL, SAFETY & HEALTH MANAGEMENT
TASK HAZARD ANALYSIS SIGN-OFF FORM

ADMINISTRATIVE INFORMATION:	
JOB/TASK NAME:	
PROJECT NAME:	**PROJECT LOCATION:**
PROJECT MANAGER:	**ANALYSIS PERFORMED BY:**
DATE JOB/TASK TO BE PERFORMED:	**TYPE OF JOB/TASK:** ☐ One time ☐ Routine job/task
RESPONSIBLE ORGANIZATION:	**JOB SUPERVISOR**

I HAVE READ OR BEEN BRIEFED ON THE HAZARDS AND PROTECTIVE MEASURES IDENTIFIED FOR THE ABOVE-LISTED JOB/TASK AND FULLY UNDERSTAND THE JOB/TASK-SPECIFIC REQUIREMENTS THAT HAVE BEEN ESTABLISHED FOR IT.

DATE	EMPLOYEE NAME	EMPLOYEE SIGNATURE	EMPLOYER NAME

E

EARTH TECH, INC
ENVIRONMENTAL, HEALTH & SAFETY MANAGEMENT
TAILGATE SAFETY BRIEFING FORM

CHECK THE TOPICS/INFORMATION REVIEWED:

- ❑ Safety Glasses, Hard Hat, Safety Boots
- ❑ Site Safety Plan Review And Location
- ❑ Equipment And Machinery Familiarization
- ❑ Employee Right-To-Know / MSDS Location
- ❑ Open Pits, Excavations, And Site Hazards
- ❑ Vehicle Safety And Driving/Road Conditions
- ❑ Portable Tool Safety And Awareness
- ❑ Overhead Utility Locations And Clearance
- ❑ First Aid, Safety, And PPE Location
- ❑ Sharp Object, Rebar, And Scrap Metal Hazards
- ❑ Safety Is Everyone's Responsibility
- ❑ Hand Protection
- ❑ Excavation/Trenching In
- ❑ Full Face Respirators With Proper Cartridges
- ❑ Slips, Trips, And Falls
- ❑ Directions To Hospital
- ❑ Anticipated Visitors
- ❑ Electrical Ground Fault
- ❑ Public Safety And Fences
- ❑ Excavator Swing And Loading
- ❑ Orderly Site And Housekeeping
- ❑ Smoking In Designated Areas
- ❑ Leather Gloves For Protection
- ❑ Effects Of The Night Before
- ❑ Vibration Related Injuries
- ❑ Fire Extinguisher Locations
- ❑ Eye Wash Station Locations
- ❑ Decontamination Procedures
- ❑ Daily Work Scope
- ❑ Emergency Protocol
- ❑ Parking And Laydown
- ❑ Hot Work Permits
- ❑ Strains And Sprains
- ❑ Noise Hazards
- ❑ No Horseplay
- ❑ Heat And Cold Stress
- ❑ Backing Up Hazards
- ❑ Accidents Are Costly
- ❑ Dust And Vapor Control
- ❑ Refueling Procedures
- ❑ Confined Space Entry
- ❑ Flying Debris Hazards

DISCUSSION/COMMENTS/CORRECTIVE AND FOLLOW-UP ACTIONS:

NAME	SIGNATURE	COMPANY

Instructions:

- Conduct Tailgate Safety Briefing according to Project Health and Safety Plan (PHSP) interval requirements.
- Complete form, obtain signatures, and file with Daily Summary, provide copy to Earth Tech SSC upon Completion.
- Follow-up on any noted items and document resolution of any action items.

APPENDIX F

SOIL LOGS

Test Pit	Depth of Major Change (m)	Description of Soils for Possible Burrow and Landfill Sourcing in Vicinity of Main Station Area	Geotechnical S Analyses.
Out ET 112	0 0.1	Sewer Outfall Area Grass/Moss, Rootmat Clay, brown, silty, some gravel and sand, occasional cobbles, wet, soft low plasticity, small rootlets decreasing with depth. Gravel and sand content increasing slightly with depth. Permafrost refusal at 1.3 m. Water in hole upon completion	
Stn ET 114	0	Main Station (Former Module Train) Area Clay, brown with light olive brown mottling, some silt, gravel, and sand with, occasional cobbles, trace rootlets near surface, wet, soft low plasticity. Permafrost refusal at 1.4 m. Water in hole upon completion	
Stn ET 115		Main Station (Former Module Train) Area Same as Stn ET 114	
Stn ET 116	0 0.6 0.7	Main Station (Former Module Train) Area Sand, brown to light brown, poorly sorted, silty, clayey, some gravel with occasional cobbles, wet, very loose, sloughing. Silt, light olive brown, clayey, sandy, traces of gravel and cobble, wet, soft, Clay, grey, silty, some sand with occasional gravel, wet soft low plasticity. Permafrost refusal at 1.3 m. Water in hole upon completion.	
Stn ET 117		Main Station (Former Module Train) Area Same as Stn ET 114	
Gar ET 118-124		Main Station, Garage Area Sand/Gravel, (imported fill for base of garage) brown, sub rounded, fine to course grained, trace cobbles and trace silt. Moist to wet, dense, frozen and refusal from 0.8 to 1.5 m below grade.	
POL ET 125	0	Main Station, POL Tank Farm Area Sand/Gravel, (imported fill for base of POL tank farm and shed) brown, poorly sorted, sub rounded, fine to course grained, trace cobbles and trace silt. Weathered petroleum odour throughout to depth. Moist to wet, dense, frozen and refusal at 1.5 m below original pad location.	

Abbreviations:
Out. Sewer Outfall Area
Gar. Garage Area
Stn. Main Station (Former Module Train) Area
POL Petroleum-Oil-Lubricant

POL ET 125	0	Main Station, POL Tank Farm Area Sand/Gravel, (imported fill for base of POL tank farm and shed) brown, poorly sorted, sub rounded, fine to course grained, trace cobbles and trace silt. Weathered petroleum odour throughout to depth. Moist to wet, dense, frozen and refusal at 1.5 m below original pad location. Water in hole upon completion.	
POL ET 126	0 0.3	Main Station, POL Tank Farm Area Sand/Gravel, (imported fill for base of POL tank farm and shed) brown, poorly sorted, sub rounded, fine to course grained, trace cobbles and trace silt, wet, dense. Clay, grey, silty, trace sand and gravel with occasional cobbles, wet, soft, non-plastic, trace hydrocarbon odour? Frozen and refusal at 0.8 m below grade. Water in hole upon completion.	
POL ET 127	0 0.5	Main Station, POL Tank Farm Area Sand/Gravel, (imported fill for base of POL tank farm and shed) brown, sub rounded, fine to course grained, trace cobbles and trace silt, wet, dense. Clay, grey, silty, trace sand and gravel with occasional cobbles, trace organics, wet, soft, non-plastic, hydrocarbon odour. Frozen and refusal at 0.8 m below grade. Water in hole upon completion.	
POL ET 128-130	0 0.2	Main Station, POL Tank Farm Area Sand/Gravel, (imported fill for base of POL tank farm and shed) brown, poorly sorted, sub rounded, fine to course grained, trace cobbles and trace silt, wet, dense. Clay, grey, silty, trace sand and gravel with occasional cobbles, wet, soft, non-plastic, trace hydrocarbon odour? Frozen and refusal at 1.0 m below grade. Water in hole upon completion.	
POL ET 131	0	Main Station, POL Tank Farm Area Clay, brown, trace organic near surface, silty, trace sand and gravel with occasional cobbles, wet, soft, non-plastic, trace hydrocarbon odour decreasing with depth. Frozen and refusal at 0.9 m below grade. Water in hole upon completion.	

Abbreviations:
Out. Sewer Outfall Area
Stn. Main Station (Former Module Train) Area
Gar. Garage Area
POL. Petroleum-Oil-Lubricant
Brn1. Burn Area #1 Located halfway between POL and Garage Sites

Brn1 ET 134	0 0.3	Main Station, In between POL and Garage Area Sand, (fill), brown with heavy black staining, poorly sorted, sub rounded, fine to course grained, trace cobbles and trace silt, wet, dense. Contains debris including wood and wire, weathered hydrocarbon odour. Clay, brown, silty and sandy, trace gravel with occasional cobbles, wet, soft, non-plastic, trace hydrocarbon odour? At 0.6 m grades to grey in colour. Frozen and refusal at 1.4 m below grade. Water in hole upon completion.	
ECA ET 138-140	0 0.1 0.35	Main Station, Electrical Instrumentation Cabinets NE of Garage Area Organics-Rootmat Sand, (fill from former access road), brown, poorly sorted, sub rounded, fine to course grained, trace cobbles and trace silt, wet, dense. Silt, brown, sandy, trace clay gravel with occasional cobbles, wet, soft, non-plastic, trace, wet soft, Frozen and refusal at 1.2 m below grade. Water in hole upon completion.	
PL ET 142 and 143 (typical of pallet pads)	0 0.3	Barrel Cache Area located NE of Main Station Sand, (fill), brown with heavy black staining, poorly sorted, sub rounded, fine to course grained, trace cobbles and trace silt, wet, dense. Strong hydrocarbon odour. Clay, brown, silty and sandy, trace gravel with occasional cobbles, wet, soft, non-plastic, trace hydrocarbon odour? Water in hole upon completion.	
PL ET 141, 144-149 (typical of area surrounding pallet pads)	0	Barrel Cache Area located NE of Main Station Clay, brown, silty and sandy, trace gravel with occasional cobbles, wet, soft, non-plastic. Water in hole upon completion.	
MD ET 150 and 151		Main Dump Site NE of Main Station Clay, brown grading to grey with depth, silty and sandy, trace gravel with occasional cobbles, wet, soft, non-plastic. Water in hole upon completion.	
FT ET 152-154	0 0.3	Fuel Tank Area east of Main Station Sand, (fill), brown, poorly sorted, sub rounded, fine to course grained, trace cobbles and trace silt, wet, dense. Clay, brown, silty and sandy, trace gravel with occasional cobbles, wet, soft, non-plastic, trace hydrocarbon odour increasing with depth. Water in hole upon completion.	

Abbreviations:
Out. Sewer Outfall Area
Train) Area
POL. Petroleum-Oil-Lubricant

ECA Electrical Cabinet Area

Stn. Main Station (Former Module
Gar. Garage Area
Brn1. Burn Area #1 Located halfway between POL and Garage Sites
PL. Pallet Line Area

MD Main Dump Area

FT. Fuel Tank Area (diesel tanks on large skid)

Test Pit	Depth of Major Change (m)	Description of Soils At Possible Burrow Sources Near Murchison River Located West of Cam D Site Main	Geotechnical S Analyses.
Gravel Stock	0	Gravel Stockpile Created During Site Construction Adjacent Drainage Course East of Murchison River Gravel and Sand, brown, poorly sorted, fine to course grained sand with trace cobbles and occasional boulders, moist, dense. Frozen and refusal at 1.8 m below grade.	
TP A	0	Sand Source Adjacent Drainage Course East of Murchison River Sand, brown, medium to well sorted, medium grained, sub angular to sub rounded. Some silt, traces of gravel, trace rootlets near surface, damp, dense. At 0.3 m becoming well sorted, no silt or rootlets, moist, dense. Frozen and refusal at 1.8 m below grade.	
TP B	0	Sand Source Adjacent Drainage Course East of Murchison River Sand, brown, medium to well sorted, medium grained, sub angular to sub rounded. Some silt, traces of gravel, trace rootlets near surface, damp, dense. At 0.3 m becoming well sorted, no silt or rootlets, moist, dense, increasing gravel content with depth. Frozen and refusal at 1.6 m below grade.	
TP C	0	Sand Source Adjacent Drainage Course East of Murchison River Same as TP B above.	
Sand 2	0	Sand Source Adjacent Drainage Course East of Murchison River Sand, brown, medium to poorly sorted, medium to course grained, sub angular to sub rounded. Some gravel, trace silt, trace cobbles, damp, dense. Decreasing silt content with depth, becoming more moist. Frozen and refusal at 1.6 m below grade.	

Abbreviations:
Out. Sewer Outfall Area
Train) Area
POL. Petroleum-Oil-Lubricant

ECA Electrical Cabinet Area
MD Main Dump Area FT. Fuel Tank Area (diesel tanks on

Stn. Main Station (Former Module
Gar. Garage Area
Brn1. Burn Area #1 Located halfway between POL and Garage Sites
PL. Pallet Line Area

Gravel 2	0	<u>Gravel/Sand Source Adjacent Drainage Course East of Murchison River</u> Gravel/Sand, brown, fine to course grained, poorly sorted, angular to rounded. Some cobbles, trace boulders, damp at surface increasing moisture with depth, very dense. Frozen and refusal at 1.8 m below grade.	
Clay Stock	0	<u>Source of Nearly Pure Clay east of Main Station towards Murchison River</u> Clay, olive grey, trace amounts of silt, damp, desiccated and friable. When moisture introduced, high plasticity. Frozen and refusal at 0.8 m below grade.	

Abbreviations:
Out. Sewer Outfall Area
Train) Area
POL. Petroleum-Oil-Lubricant

ECA Electrical Cabinet Area
MD Main Dump Area

Stn. Main Station (Former Module
Gar. Garage Area
Brn1. Burn Area #1 Located halfway between POL and Garage Sites
PL. Pallet Line Area
FT. Fuel Tank Area (diesel tanks on large skid)

Test Pit	Depth of Major Change (m)	Description of Soils in Vicinity of Airstrip Located SE of Cam D Site Main	Geotechnical S Analyses.
AS TP #1	0	Test Pit on NE end of Airstrip Near Edge Sand, brown, poorly sorted, fine to course grain, some gravel, trace silt, occasional cobbles, moist, dense, water infiltration near 1.2 m depth. Frozen and refusal at 1.3 m.	0-30 cm 30-60 cm 60-90 cm
AS TP #2	0	Test Pit on NE end of Airstrip Near Edge Sand, brown, poorly sorted, fine to course grain, clayey, some silt, trace gravel and occasional cobbles, wet, compact, water infiltration near 0.2 m depth. Clay, brown, silty, sandy, trace gravel with occasional cobbles, wet, soft, low plasticity. Frozen and refusal at 0.8 m.	0-30 cm 30-60 cm 60-90 cm
AS TP #3	0	Test Pit on SW end of Airstrip Near Edge Same as AS TP #2.	0-30 cm 30-60 cm 60-90 cm
AS TP #4	0	Test Pit on SW end of Airstrip In Centre of Airstrip Sand/Gravel, brown, poorly sorted, fine to course grain, trace silt, occasional cobbles, moist to wet, dense. Clay, grey, silty, sandy, trace gravel with occasional cobbles, moist, firm, low to medium plasticity. Frozen and refusal at 0.9 m. Water infiltration near 0.7m depth. Frozen and refusal at 1.1 m.	0-30 cm 30-60 cm 60-90 cm

Abbreviations:
Out. Sewer Outfall Area
Train) Area
POL. Petroleum-Oil-Lubricant

ECA Electrical Cabinet Area
MD Main Dump Area FT. Fuel Tank Area (diesel tanks on

Stn. Main Station (Former Module
Gar. Garage Area
Brn1. Burn Area #1 Located halfway between POL and Garage Sites
PL. Pallet Line Area
AS Air Strip

Test Pit	Depth of Major Change (m)	Description of Soils at Esker located East Airstrip Enroute to Simpson Lake	Geotechnical S Analyses.
Simp #1	0	Test Pit on Esker Located Enroute to Simpson Lake along Former Winter Road Sand, grey, silty, poorly sorted, fine to course grain, some gravel, trace cobbles with occasional boulders, moist, dense. Frozen and refusal at 0.8 m.	0-30 cm

Abbreviations:
Out. Sewer Outfall Area
Train) Area

Stn. Main Station (Former Module
Gar. Garage Area

POL. Petroleum-Oil-Lubricant

ECA Electrical Cabinet Area
MD Main Dump Area
FT. Fuel Tank Area (diesel tanks on
Simp. Simpson Lake
Brn1. Burn Area #1 Located halfway between POL and Garage Sites
PL. Pallet Line Area
AS Air Strip

APPENDIX G

LABORATORY DATA

NORWEST LABS

407/23 Control Number E 241011

Environmental Sample Information Sheet

NOTE: Proper completion of this form is required in order to proceed with analysis
See reverse for your nearest Norwest location and proper sampling protocol

Billing Address: x	**Copy of Report To:**	**Copy of invoice:** ☐
Company: Earth Tech Canada Inc.	Company: Earth Tech Canada Inc.	Mail invoice to this address for approval x
Address: 17203-103 Ave, Edmonton, AB T5S 1J4	Address: 17203-103 Ave, Edmonton, AB T5S 1J4	
QA/QC Report ☑		
Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-Service ☑	Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-service ☐	
Attention: Greg Wright	Attention: Greg Wright	
Phone: (780) 488-6800	Phone: (780) 488-6800	
Fax: (780) 488-2121	Fax: (780) 488-2121	
Cell:	Cell:	
e-mail: greg.wright@earthtech.ca	e-mail: greg.wright@earthtech.ca	

Information to be included on Report and Invoice

Project ID: 88122
Project Name: Phase III Arctic ESA
Project Location: Simpson Lake
Legal Location:
PO#:
Proj. Acct. Code:
Agreement ID: 62449

RUSH Please contact the laboratory to confirm rush dates and times before submitting samples.

Upon filling out this section, client accepts that surcharges will be attached to this analysis

Required on: all analyses **or** as indicated ☐ or ☐

Date Required: _____
Signature: _____
Norwest Authorization: _____

Sample Custody (Please Print)

Relinquished by: Greg Wright
Company ETC Signature GW

I authorize Norwest Labs to proceed with the work indicated on this form:
Date: Sept 1, 2005
Initial: GW.

Received by: ☐ Coolers
Waybill # Date ☐ Boxes
Company Time ☐ Samples

Received By: Date:
Company: Time:

Special Instructions / Comments ☐ Check here if Norwest is required to report results directly to a regulatory body (Please include contact information)

	Sample Identification	Location	Depth IN CM M	Date / Time Sampled	Matrix	Sampling Method	Number of Containers	CCMEW	PCB	METALS	CCMES	PCB	METALS	Fuel ID (list type)	Clorine					
							↓	Enter tests above (✓ relevant samples below)												
1	Simpson Lake (LK)		—	Aug 30	water	grab	6	✓	✓	✓										
2	Simp. Sed 1		—	Aug 30	sediment	grab	3				✓	✓	✓							
3	Simp Sed 2		—	"	"	"	3				✓	✓	✓							
4	Simp Sed 3		—	"	"	"	3				✓	✓	✓							
5	ESG 84 A		—	"	Soil	"	1						✓							
6	ESG 84 B		—	"	"	"	1						✓							
7	ESG 84 C		—	"	"	"	1						✓							
8	POL TANK		—	Aug 31	fuel	grab	1							✓	✓					
9	PALLET AREA		—	"	oil	"	1							✓	✓					
10	AIRSTRIP BARREL		—	"	fuel	"	1							✓	✓					
11			—																	
12			—																	
13			—																	
14			—																	
15			—																	

NOTE: All hazardous samples must be labelled according to WHMIS guidelines.
Accredited by the Standards Council of Canada for specific tests

(03/08) NWL008

NORWEST LABS

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407123**
Control Number: E 241011
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744400

NWL Number	407123-1
Sample Date	Aug 30, 2005
Sample Description	Simpson Lake (LK)
Matrix	Water - General

Analyte		Units	Results	Results	Results	Detection Limit
Metals Total						
Iron	Total	mg/L	<0.1			0.1
Manganese	Total	mg/L	<0.005			0.005
Silicon	Total	mg/L	0.41			0.05
Sulfur	Total	mg/L	0.4			0.3
Mercury	Total	mg/L	<0.0001			0.0001
Aluminum	Total	mg/L	0.112			0.005
Antimony	Total	mg/L	<0.0002			0.0002
Arsenic	Total	mg/L	<0.0002			0.0002
Barium	Total	mg/L	0.002			0.001
Beryllium	Total	mg/L	<0.0001			0.0001
Bismuth	Total	mg/L	<0.0005			0.0005
Boron	Total	mg/L	0.004			0.002
Cadmium	Total	mg/L	<0.00001			0.00001
Chromium	Total	mg/L	<0.0005			0.0005
Cobalt	Total	mg/L	<0.0001			0.0001
Copper	Total	mg/L	<0.001			0.001
Lead	Total	mg/L	<0.0001			0.0001
Lithium	Total	mg/L	<0.001			0.001
Molybdenum	Total	mg/L	<0.001			0.001
Nickel	Total	mg/L	<0.0005			0.0005
Selenium	Total	mg/L	<0.0002			0.0002
Silver	Total	mg/L	<0.0001			0.0001
Strontium	Total	mg/L	0.006			0.001
Thallium	Total	mg/L	<0.00005			0.00005
Tin	Total	mg/L	<0.001			0.001
Titanium	Total	mg/L	0.0039			0.0005
Uranium	Total	mg/L	<0.0005			0.0005
Vanadium	Total	mg/L	0.0003			0.0001
Zinc	Total	mg/L	0.001			0.001
Physical and Aggregate Properties						
Temperature of observed pH		°C	22.0			
Routine Water						
pH			6.78			
Electrical Conductivity		µS/cm at 25 C	25			1
Calcium	Dissolved	mg/L	1.4			0.2

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Edmonton, AB. T6B 3J4
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Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407123**
Control Number: E 241011
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744400

NWL Number	407123-1
Sample Date	Aug 30, 2005
Sample Description	Simpson Lake (LK)
Matrix	Water - General

Analyte		Units	Results	Results	Results	Detection Limit
Routine Water - Continued						
Magnesium	Dissolved	mg/L	0.7			0.1
Sodium	Dissolved	mg/L	2.0			0.4
Potassium	Dissolved	mg/L	0.6			0.4
Iron	Dissolved	mg/L	0.01			0.01
Manganese	Dissolved	mg/L	<0.005			0.005
Chloride	Dissolved	mg/L	2.6			0.4
Nitrate - N		mg/L	0.01			0.01
Nitrite - N		mg/L	<0.005			0.005
Nitrate and Nitrite - N		mg/L	<0.02			0.02
Sulfate (SO4)	Dissolved	mg/L	1			0.9
Hydroxide		mg/L	<5			5
Carbonate		mg/L	7			6
Bicarbonate		mg/L	<5			5
P-Alkalinity	as CaCO3	mg/L	<5			5
T-Alkalinity	as CaCO3	mg/L	6			5
Total Dissolved Solids	Calculated	mg/L	10			1
Hardness	Dissolved as CaCO3	mg/L	6			
Ionic Balance	Dissolved	%	70			
Mono-Aromatic Hydrocarbons - Water						
Benzene		mg/L	<0.001			0.001
Toluene		mg/L	<0.001			0.001
Ethylbenzene		mg/L	<0.001			0.001
Total Xylenes (m,p,o)		mg/L	<0.001			0.001
F1 -BTEX		mg/L	<0.01			0.01
F1 C6-C10		mg/L	<0.01			0.01
Volatile Petroleum Hydrocarbons - Water						
F1 C6-C10		mg/L	<0.01			0.01
F1 -BTEX		mg/L	<0.01			0.01
Extractable Petroleum Hydrocarbons - Water						
F2 C10-C16		mg/L	<0.1			0.1
F3 C16-C34		mg/L	<0.1			0.1
F3+ C34+		mg/L	<0.1			0.1
Polychlorinated Biphenyls - Water						
Aroclor 1016		ug/L	<0.1			0.1
Aroclor 1221		ug/L	<0.1			0.1

Norwest Labs
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Analytical Report

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Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407123**
Control Number: E 241011
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744400

NWL Number 407123-1
Sample Date Aug 30, 2005
Sample Description Simpson Lake (LK)
Matrix Water - General

Analyte		Units	Results	Results	Results	Detection Limit
Polychlorinated Biphenyls - Water - Continued						
Aroclor 1232		ug/L	<0.1			0.1
Aroclor 1242		ug/L	<0.1			0.1
Aroclor 1248		ug/L	<0.1			0.1
Aroclor 1254		ug/L	<0.1			0.1
Aroclor 1260		ug/L	<0.1			0.1
Aroclor 1262		ug/L	<0.1			0.1
Aroclor 1268		ug/L	<0.1			0.1
Total PCBs		ug/L	<0.1			<0.1
Polychlorinated Biphenyls - Water - Surrogate						
Decachlorobiphenyl	Surrogate	%	115			50-150

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Edmonton, AB, Canada
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Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407123**
Control Number: E 241011
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744400

			NWL Number	407123-2	407123-3	407123-4	
			Sample Date	Aug 30, 2005	Aug 30, 2005	Aug 30, 2005	
			Sample Description	Simp. Sed 1	Simp. Sed 2	Simp. Sed 3	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble							
Boron	Water Soluble	mg/kg		0.2	0.2	0.1	0.1
Metals Strong Acid Digestion							
Mercury	Strong Acid Extractable	ug/g		<0.01	<0.01	<0.01	0.01
Antimony	Strong Acid Extractable	ug/g		<0.2	<0.2	<0.2	0.2
Arsenic	Strong Acid Extractable	ug/g		1.5	2.0	1.6	0.2
Barium	Strong Acid Extractable	ug/g		54	53	47	1
Beryllium	Strong Acid Extractable	ug/g		0.4	0.4	0.4	0.1
Cadmium	Strong Acid Extractable	ug/g		0.07	0.09	0.09	0.01
Chromium	Strong Acid Extractable	ug/g		23.7	24.2	22.2	0.5
Cobalt	Strong Acid Extractable	ug/g		7.1	6.8	5.8	0.1
Copper	Strong Acid Extractable	ug/g		7	7	6	1
Lead	Strong Acid Extractable	ug/g		6.3	7.0	5.9	0.1
Molybdenum	Strong Acid Extractable	ug/g		<1	<1	<1	1
Nickel	Strong Acid Extractable	ug/g		11.3	11.3	10.2	0.5
Selenium	Strong Acid Extractable	ug/g		<0.3	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	ug/g		<0.1	0.1	0.1	0.1
Thallium	Strong Acid Extractable	ug/g		0.25	0.26	0.23	0.05
Tin	Strong Acid Extractable	ug/g		2	2	2	1
Vanadium	Strong Acid Extractable	ug/g		35.7	34.6	31.9	0.1
Zinc	Strong Acid Extractable	ug/g		50	44	40	1
Mono-Aromatic Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
Benzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Toluene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Total Xylenes (m,p,o)	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
F1 -BTEX	Dry Weight	mg/kg		<1	<1	<1	1
F1 C6-C10	Dry Weight	mg/kg		<1	<1	<1	1
Volatile Petroleum Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F1 C6-C10	Dry Weight	mg/kg		<1	<1	<1	1
F1 -BTEX	Dry Weight	mg/kg		<1	<1	<1	1
Extractable Petroleum Hydrocarbons - Soxhlet							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F2 C10-C16	Dry Weight	mg/kg		<10	<10	<10	10

Norwest Labs
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Analytical Report

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Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407123**
Control Number: E 241011
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744400

	NWL Number	407123-2	407123-3	407123-4	
	Sample Date	Aug 30, 2005	Aug 30, 2005	Aug 30, 2005	
	Sample Description	Simp. Sed 1	Simp. Sed 2	Simp. Sed 3	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Extractable Petroleum Hydrocarbons - Soxhlet - C						
F3 C16-C34	Dry Weight	mg/kg	150	<10	<10	10
F4 C34-C50	Dry Weight	mg/kg	80	<10	<10	10
F4HTGC C34-C50+	Dry Weight	mg/kg	170	<10	<10	10
% C50+		%	28.9	0.0	0.0	
Silica Gel Cleanup						
Silica Gel Cleanup			Done	Done	Done	
Soil % Moisture						
Moisture	Soil % Moisture	%	38.40	20.60	12.20	
Polychlorinated Biphenyls - Soil						
Aroclor 1016	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1221	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1232	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1242	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1248	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1254	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1260	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1262	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1268	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Total PCBs	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Polychlorinated Biphenyls - Soil - Surrogate						
Decachlorobiphenyl	Surrogate	%	65	67	70	50-150

NORWEST LABS

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Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407123**
Control Number: E 241011
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744400

			NWL Number	407123-5	407123-6	407123-7	
			Sample Date	Aug 30, 2005	Aug 30, 2005	Aug 30, 2005	
			Sample Description	ESG 84 A	ESG 84 B	ESG 84 C	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble							
Boron	Water Soluble	mg/kg		<0.1	<0.1	0.3	0.1
Metals Strong Acid Digestion							
Mercury	Strong Acid Extractable	ug/g		<0.01	<0.01	<0.01	0.01
Antimony	Strong Acid Extractable	ug/g		<0.2	<0.2	<0.2	0.2
Arsenic	Strong Acid Extractable	ug/g		1.0	1	1.2	0.2
Barium	Strong Acid Extractable	ug/g		28	26	28	1
Beryllium	Strong Acid Extractable	ug/g		0.2	0.2	0.2	0.1
Cadmium	Strong Acid Extractable	ug/g		0.06	0.06	0.06	0.01
Chromium	Strong Acid Extractable	ug/g		10.6	9.4	10.9	0.5
Cobalt	Strong Acid Extractable	ug/g		3.8	3.8	4.4	0.1
Copper	Strong Acid Extractable	ug/g		5	5	7	1
Lead	Strong Acid Extractable	ug/g		4.4	4.0	4.7	0.1
Molybdenum	Strong Acid Extractable	ug/g		<1	<1	<1	1
Nickel	Strong Acid Extractable	ug/g		5.4	5.3	6.7	0.5
Selenium	Strong Acid Extractable	ug/g		<0.3	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	ug/g		<0.1	<0.1	0.1	0.1
Thallium	Strong Acid Extractable	ug/g		0.16	0.15	0.17	0.05
Tin	Strong Acid Extractable	ug/g		2	2	1	1
Vanadium	Strong Acid Extractable	ug/g		17.6	17.3	18.4	0.1
Zinc	Strong Acid Extractable	ug/g		26	24	23	1

			NWL Number	407123-8	407123-9	407123-10	
			Sample Date	Aug 31, 2005	Aug 31, 2005	Aug 31, 2005	
			Sample Description	Pol Tank	Pallet Area	Air Strip Barrel	
			Matrix	Petroleum Oil	Petroleum Oil	Petroleum Oil	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Oil Properties							
Organic Chloride	As Received	mg/kg		16	54	36	1

Approved by:



Darren Crichton, BSc, PChem
Operations Chemist

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407123**
Control Number: E 241011
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744400

Hot Water Soluble

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Boron	mg/kg	<0.0	0.0	0.0	0.0	✓
Material Used:	Edmonton Method Blank					
Date Acquired:	Sep 12, 2005					
Acquired By:	Fernando Maglalang					

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Boron	mg/kg	0.6	0.6	10.0	0.1	✓
Material Used:	Edmonton Duplicate					
Date Acquired:	Sep 12, 2005					
Acquired By:	Fernando Maglalang					

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Boron	mg/kg	1.4	1.4	1.0	1.8	✓
Material Used:	2001 Farm Soil Standard					
Date Acquired:	Sep 12, 2005					
Acquired By:	Fernando Maglalang					

Metals Dissolved

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Sulfur	mg/L	<0.3	0.0	-0.3	0.3	✓
Material Used:	Edmonton Method Blank					
Date Acquired:	Sep 09, 2005					
Acquired By:	Bvul Sim					

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Sulfur	mg/L	47.8	50.0	45.0	55.0	✓
Material Used:	Metals High					
Date Acquired:	Sep 09, 2005					
Acquired By:	Bvul Sim					
Sulfur	mg/L	1	1.0	0.9	1.2	✓
Material Used:	Metals Low					
Date Acquired:	Sep 09, 2005					
Acquired By:	Bvul Sim					

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Fax: (780) 438-0396

Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407123**
Control Number: E 241011
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744400

Metals Strong Acid Digestion

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Mercury	ug/g	<0.00	0.00	0.00	0.00	✓
Antimony	ug/g	<0.0	0.0	0.0	0.0	✓
Arsenic	ug/g	<0.0	0.0	-0.1	0.2	✓
Barium	ug/g	<0	1	-2	3	✓
Beryllium	ug/g	<0.0	0.0	0.0	0.0	✓
Cadmium	ug/g	0.00	0.00	-0.03	0.03	✓
Chromium	ug/g	<0.0	-0.3	-1.5	0.9	✓
Cobalt	ug/g	<0.0	0.0	-0.1	0.1	✓
Copper	ug/g	<0	0	-1	1	✓
Lead	ug/g	<0.0	0.1	-0.2	0.4	✓
Molybdenum	ug/g	<0	0	0	0	✓
Nickel	ug/g	<0.0	-0.2	-1.7	1.2	✓
Selenium	ug/g	<0.0	0.0	-0.3	0.2	✓
Silver	ug/g	<0.0	0.0	0.0	0.0	✓
Thallium	ug/g	<0.00	0.00	-0.01	0.01	✓
Tin	ug/g	0	2	2	3	✓
Vanadium	ug/g	<0.0	0.0	-0.2	0.3	✓
Zinc	ug/g	0	0	-3	3	✓

Material Used: Edmonton Method Blank
Date Acquired: Sep 12, 2005
Acquired By: Linda Li

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Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407123**
Control Number: E 241011
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744400

Metals Strong Acid Digestion (Continued...)

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	ug/g	0.03	0.04	9.99	0.03	✓
Antimony	ug/g	<0.2	<0.2	20.0	0.4	✓
Arsenic	ug/g	1.4	1.6	20.0	0.4	✓
Barium	ug/g	76	72	20	2	✓
Beryllium	ug/g	0.4	0.4	20.0	0.2	✓
Cadmium	ug/g	0.18	0.15	20.01	0.02	✓
Chromium	ug/g	20.1	20.5	20.0	1.1	✓
Cobalt	ug/g	6.7	6.6	20.0	0.2	✓
Copper	ug/g	9	9	20	2	✓
Lead	ug/g	6.6	6.3	20.0	0.2	✓
Molybdenum	ug/g	<1	<1	20	2	✓
Nickel	ug/g	10.8	10.5	20.0	1.1	✓
Selenium	ug/g	<0.3	<0.3	20.0	0.7	✓
Silver	ug/g	0.1	<0.1	20.0	0.2	✓
Thallium	ug/g	0.26	0.25	20.01	0.11	✓
Tin	ug/g	2	2	20	2	✓
Vanadium	ug/g	34.0	34.2	20.0	0.2	✓
Zinc	ug/g	43	44	20	2	✓

Material Used: Edmonton Duplicate
Date Acquired: Sep 12, 2005
Acquired By: Linda Li

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Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407123**
Control Number: E 241011
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744400

Metals Strong Acid Digestion (Continued...)

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Mercury	ug/g	1.53	1.45	1.18	1.72	✓
Antimony	ug/g	<0.2	0.2	0.1	0.3	✓
Arsenic	ug/g	17.4	16.8	14.1	19.5	✓
Barium	ug/g	440	406	330	482	✓
Beryllium	ug/g	1	0.9	0.7	1.1	✓
Cadmium	ug/g	0.43	0.38	0.30	0.45	✓
Chromium	ug/g	83.4	84.7	69.4	100.0	✓
Cobalt	ug/g	14.1	13.4	11.1	15.7	✓
Copper	ug/g	32	33	27	39	✓
Lead	ug/g	14.4	13.4	11.0	15.8	✓
Molybdenum	ug/g	<1	1	1	1	✓
Nickel	ug/g	81.9	81.8	68.5	95.1	✓
Selenium	ug/g	1.6	1.2	0.5	1.9	✓
Silver	ug/g	0.4	0.4	0.2	0.5	✓
Thallium	ug/g	0.36	0.35	0.28	0.41	✓
Tin	ug/g	<1	1	1	1	✓
Vanadium	ug/g	84.3	83.3	63.7	103.0	✓
Zinc	ug/g	110	103	85	121	✓

Material Used: Metals Soils
Date Acquired: Sep 12, 2005
Acquired By: Linda Li

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Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407123**
Control Number: E 241011
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744400

Metals Total

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Iron	mg/L	<0.1	0.0	0.0	0.0	✓
Manganese	mg/L	<0.005	0.000	-0.001	0.001	✓
Silicon	mg/L	<0.05	0.02	-0.04	0.09	✓
Sulfur	mg/L	<0.3	0.0	-0.3	0.3	✓
Mercury	mg/L	<0.0001	0.0000	0.0000	0.0000	✓
Aluminum	ug/L	<5	0	-5	5	✓
Antimony	ug/L	<0.2	0.0	-0.2	0.2	✓
Arsenic	ug/L	<0.2	0.0	-0.2	0.2	✓
Barium	ug/L	<1	0	-1	1	✓
Beryllium	ug/L	<0.1	0.0	-0.1	0.1	✓
Bismuth	ug/L	<0.5	0.0	-0.5	0.5	✓
Boron	ug/L	<2	0	-2	2	✓
Cadmium	ug/L	<0.01	0.00	-0.01	0.01	✓
Chromium	ug/L	<0.5	0.0	-0.5	0.5	✓
Cobalt	ug/L	<0.1	0.0	-0.1	0.1	✓
Copper	ug/L	<1	0	-1	1	✓
Lead	ug/L	<0.1	0.0	-0.1	0.1	✓
Lithium	ug/L	<1	0	-1	1	✓
Molybdenum	ug/L	<1	0	-1	1	✓
Nickel	ug/L	<0.5	0.0	-0.5	0.5	✓
Selenium	ug/L	<0.2	0.0	-0.2	0.2	✓
Silver	ug/L	<0.1	0.0	-0.1	0.1	✓
Strontium	ug/L	<1	0	-1	1	✓
Thallium	ug/L	<0.05	0.00	-0.05	0.05	✓
Tin	ug/L	<1	0	-1	1	✓
Titanium	ug/L	<0.5	0.0	-0.5	0.5	✓
Uranium	ug/L	<0.5	0.0	-0.5	0.5	✓
Vanadium	ug/L	<0.1	0.0	-0.1	0.1	✓
Zinc	ug/L	<1	0	-1	1	✓

Material Used: Edmonton Method Blank
Date Acquired: Sep 09, 2005
Acquired By: Linda Li

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Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407123**
Control Number: E 241011
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744400

Metals Total (Continued...)

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Iron	mg/L	0.2	0.2	15.0	0.2	✓
Manganese	mg/L	0.013	0.013	15.000	0.010	✓
Silicon	mg/L	10.2	10.0	15.00	0.10	✓
Sulfur	mg/L	4.9	4.8	15.0	0.1	✓
Aluminum	ug/L	73	75	15	11	✓
Antimony	ug/L	0.2	0.2	15.0	0.4	✓
Arsenic	ug/L	1.6	1.7	15.0	0.4	✓
Barium	ug/L	42	41	15	2	✓
Beryllium	ug/L	<0.1	<0.1	15.0	0.2	✓
Bismuth	ug/L	<0.5	<0.5	15.0	1.1	✓
Boron	ug/L	99	100	15	4	✓
Cadmium	ug/L	0.03	0.03	15.00	0.02	✓
Chromium	ug/L	0.6	0.6	15.0	1.1	✓
Cobalt	ug/L	1.4	1.4	15.0	0.2	✓
Copper	ug/L	14	15	15	2	✓
Lead	ug/L	1.4	1.4	15.0	0.2	✓
Lithium	ug/L	<1	<1	15	2	✓
Molybdenum	ug/L	<1	<1	15	2	✓
Nickel	ug/L	1.8	1.8	15.0	1.1	✓
Selenium	ug/L	0.2	<0.2	15.0	0.4	✓
Silver	ug/L	<0.1	<0.1	15.0	0.2	✓
Strontium	ug/L	1060	1080	15	2	✓
Thallium	ug/L	<0.05	<0.05	15.00	0.11	✓
Tin	ug/L	<1	<1	15	2	✓
Titanium	ug/L	14.9	16.6	15.0	1.1	✓
Uranium	ug/L	1.7	1.7	15.0	1.1	✓
Vanadium	ug/L	4.2	4.4	15.0	0.2	✓
Zinc	ug/L	135	137	15	2	✓

Material Used: Edmonton Duplicate
Date Acquired: Sep 09, 2005
Acquired By: Linda Li

Norwest Labs
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Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407123**
Control Number: E 241011
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744400

Metals Total (Continued...)

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Iron	mg/L	1.9	2.0	1.8	2.2	✓
Manganese	mg/L	0.470	0.500	0.450	0.550	✓
Silicon	mg/L	5.1	5.00	4.50	5.50	✓
Sulfur	mg/L	11	10.0	9.0	11.0	✓
Mercury	mg/L	0.0007	0.0008	0.0007	0.0010	✓
Aluminum	ug/L	299	322	273	371	✓
Antimony	ug/L	10.7	11.5	10.2	12.8	✓
Arsenic	ug/L	10.8	11.5	10.3	12.7	✓
Barium	ug/L	59	61	52	69	✓
Beryllium	ug/L	5.3	5.9	4.9	7.0	✓
Bismuth	ug/L	28.4	30.2	26.0	34.4	✓
Boron	ug/L	112	125	102	148	✓
Cadmium	ug/L	0.65	0.63	0.47	0.78	✓
Chromium	ug/L	30.2	31.8	27.5	36.2	✓
Cobalt	ug/L	6.0	6.4	5.4	7.5	✓
Copper	ug/L	58	63	55	70	✓
Lead	ug/L	5.9	6.2	5.4	7.0	✓
Lithium	ug/L	55	65	53	76	✓
Molybdenum	ug/L	59	61	53	69	✓
Nickel	ug/L	29.6	31.4	27.0	35.8	✓
Selenium	ug/L	10.2	11.0	9.7	12.3	✓
Silver	ug/L	6.0	6.2	5.5	7.0	✓
Strontium	ug/L	59	64	55	72	✓
Thallium	ug/L	2.87	3.14	2.56	3.72	✓
Tin	ug/L	55	59	52	66	✓
Titanium	ug/L	31.3	31.5	27.0	36.0	✓
Uranium	ug/L	29.2	30.8	26.9	34.7	✓
Vanadium	ug/L	5.7	6.5	5.4	7.6	✓
Zinc	ug/L	60	59	49	69	✓
Material Used:	Edmonton Digestion Check					
Date Acquired:	Sep 09, 2005					
Acquired By:	Linda Li					
Iron	mg/L	9.9	10.0	9.0	11.0	✓
Manganese	mg/L	2.43	2.500	2.250	2.750	✓
Silicon	mg/L	24.0	25.00	22.50	27.50	✓
Sulfur	mg/L	47.5	50.0	45.0	55.0	✓
Mercury	mg/L	0.0030	0.0031	0.0027	0.0035	✓
Material Used:	Metals High					
Date Acquired:	Sep 12, 2005					
Acquired By:	Byul Sim					

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Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407123**
Control Number: E 241011
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744400

Metals Total (Continued...)

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Iron	mg/L	0.2	0.2	0.2	0.2	✓
Manganese	mg/L	0.051	0.050	0.045	0.055	✓
Silicon	mg/L	0.49	0.50	0.45	0.55	✓
Sulfur	mg/L	0.9	1.0	0.9	1.2	✓
Mercury	mg/L	0.0008	0.0008	-0.0016	0.0032	✓
Aluminum	ug/L	1040	1000	850	1150	✓
Antimony	ug/L	40.6	40.0	34.0	46.0	✓
Arsenic	ug/L	41.0	40.0	34.0	46.0	✓
Barium	ug/L	208	200	170	230	✓
Beryllium	ug/L	19.6	20.0	17.0	23.0	✓
Bismuth	ug/L	98.5	100.0	85.0	115.0	✓
Boron	ug/L	405	400	340	460	✓
Cadmium	ug/L	2.06	2.00	1.70	2.30	✓
Chromium	ug/L	103	100.0	85.0	115.0	✓
Cobalt	ug/L	20.7	20.0	17.0	23.0	✓
Copper	ug/L	205	200	170	230	✓
Lead	ug/L	20.5	20.0	17.0	23.0	✓
Lithium	ug/L	187	200	170	230	✓
Molybdenum	ug/L	205	200	170	230	✓
Nickel	ug/L	101	100.0	85.0	115.0	✓
Selenium	ug/L	38.5	40.0	34.0	46.0	✓
Silver	ug/L	20.7	20.0	17.0	23.0	✓
Strontium	ug/L	200	200	170	230	✓
Thallium	ug/L	9.80	10.00	8.50	11.50	✓
Tin	ug/L	194	200	170	230	✓
Titanium	ug/L	106	100.0	85.0	115.0	✓
Uranium	ug/L	101	100.0	85.0	115.0	✓
Vanadium	ug/L	20.9	20.0	17.0	23.0	✓
Zinc	ug/L	203	200	170	230	✓

Material Used: Metals Low
Date Acquired: Sep 09, 2005
Acquired By: Linda Li

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Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407123**
Control Number: E 241011
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744400

Metals Total (Continued...)

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Aluminum	ug/L	54	50	43	58	✓
Antimony	ug/L	2.0	2.0	1.7	2.3	✓
Arsenic	ug/L	2.0	2.0	1.7	2.3	✓
Barium	ug/L	10	10	9	12	✓
Beryllium	ug/L	1.0	1.0	0.9	1.2	✓
Bismuth	ug/L	5.1	5.0	4.3	5.8	✓
Boron	ug/L	20	20	17	23	✓
Cadmium	ug/L	0.11	0.10	0.09	0.12	✓
Chromium	ug/L	5.4	5.0	4.3	5.8	✓
Cobalt	ug/L	1.1	1.0	0.9	1.2	✓
Copper	ug/L	11	10	9	12	✓
Lead	ug/L	1	1.0	0.9	1.2	✓
Lithium	ug/L	10	10	9	12	✓
Molybdenum	ug/L	11	10	9	12	✓
Nickel	ug/L	5.3	5.0	4.3	5.8	✓
Selenium	ug/L	2.0	2.0	1.7	2.3	✓
Silver	ug/L	1	1.0	0.9	1.2	✓
Strontium	ug/L	10	10	9	12	✓
Thallium	ug/L	0.55	0.50	0.43	0.58	✓
Tin	ug/L	10	10	9	12	✓
Titanium	ug/L	5.3	5.0	4.3	5.8	✓
Uranium	ug/L	5.1	5.0	4.3	5.8	✓
Vanadium	ug/L	1.0	1.0	0.9	1.2	✓
Zinc	ug/L	10	10	9	12	✓

Material Used: Metals Trace
Date Acquired: Sep 09, 2005
Acquired By: Linda Li

NORWEST LABS

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Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407123**
Control Number: E 241011
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744400

Routine Water

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	<0.2	0.0	-0.2	0.2	✓
Magnesium	mg/L	<0.1	0.0	-0.1	0.1	✓
Sodium	mg/L	<0.4	0.0	-0.4	0.4	✓
Potassium	mg/L	<0.4	0.0	-0.4	0.4	✓
Iron	mg/L	<0.01	0.00	-0.01	0.01	✓
Manganese	mg/L	<0.005	0.000	-0.005	0.005	✓
Chloride	mg/L	<0.4	0.0	-0.5	0.5	✓
Nitrate - N	mg/L	<0.01	0.00	-0.01	0.01	✓
Nitrite - N	mg/L	<0.005	0.000	-0.005	0.005	✓

Material Used: Edmonton Method Blank
Date Acquired: Sep 09, 2005
Acquired By: Marc Dzura

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
pH		7.24	7.24	9.99	0.10	✓
Electrical Conductivity	dS/m at 25 C	1.14	1.14	9.990	0.002	✓
Chloride	mg/L	4.9	5.1	10.0	0.5	✓
Nitrate - N	mg/L	0.09	0.09	9.99	0.01	✓
Nitrite - N	mg/L	<0.005	<0.005	9.990	0.010	✓
Hydroxide	mg/L	<5	<5	10		✓
Carbonate	mg/L	<6	<6	10		✓
Bicarbonate	mg/L	675	672	10		✓
P-Alkalinity	mg/L	<5	<5	10	5	✓
T-Alkalinity	mg/L	554	551	10	5	✓

Material Used: Edmonton Duplicate
Date Acquired: Sep 09, 2005
Acquired By: Wilailuk Somjit

Norwest Labs
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Edmonton, AB. T6B 3J4
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Fax: (780) 438-0396

Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407123**
Control Number: E 241011
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744400

Routine Water (Continued...)

Control Sample		Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Chloride		mg/L	2060	2087.0	1875.2	2298.8	✓
Material Used:	Chloride High						
Date Acquired:	Sep 12, 2005						
Acquired By:	To Thong						
Calcium		mg/L	235	250.0	225.0	275.0	✓
Magnesium		mg/L	93.5	100.0	90.0	110.0	✓
Sodium		mg/L	241	250.0	225.0	275.0	✓
Potassium		mg/L	238	250.0	225.0	275.0	✓
Iron		mg/L	9.45	10.00	9.01	10.99	✓
Manganese		mg/L	2.34	2.500	2.260	2.740	✓
Material Used:	Metals High						
Date Acquired:	Sep 09, 2005						
Acquired By:	Byul Sim						
Calcium		mg/L	4.9	5.0	4.5	5.5	✓
Magnesium		mg/L	1.9	2.0	1.8	2.2	✓
Sodium		mg/L	5.0	5.0	4.5	5.5	✓
Potassium		mg/L	4.8	5.0	4.5	5.5	✓
Iron		mg/L	0.20	0.20	0.18	0.22	✓
Manganese		mg/L	0.048	0.050	0.045	0.055	✓
Material Used:	Metals Low						
Date Acquired:	Sep 09, 2005						
Acquired By:	Byul Sim						
pH			9.16	9.23	9.11	9.35	✓
Electrical Conductivity		dS/m at 25 C	2.71	2.730	2.611	2.849	✓
Chloride		mg/L	81.5	81.0	76.4	85.6	✓
Nitrate - N		mg/L	10.2	10.00	9.61	10.39	✓
Nitrite - N		mg/L	9.94	10.000	9.562	10.438	✓
P-Alkalinity		mg/L	519	507	415	599	✓
T-Alkalinity		mg/L	1010	1009	969	1049	✓
Material Used:	Water High						
Date Acquired:	Sep 09, 2005						
Acquired By:	Wilailuk Somiit						

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Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
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P.O.:
Acct. Code:

NWL Lot ID: **407123**
Control Number: E 241011
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744400

Routine Water (Continued...)

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
pH		6.87	6.90	6.83	6.97	✓
Electrical Conductivity	dS/m at 25 C	0.075	0.076	0.070	0.081	✓
Chloride	mg/L	15.1	14.9	13.2	16.6	✓
Nitrate - N	mg/L	0.52	0.50	0.44	0.56	✓
Nitrite - N	mg/L	0.495	0.495	0.437	0.553	✓
P-Alkalinity	mg/L	63	54	20	88	✓
T-Alkalinity	mg/L	128	127	118	136	✓
Material Used:	Water Low					
Date Acquired:	Sep 09, 2005					
Acquired By:	Wilailuk Somiit					

Mono-Aromatic Hydrocarbons - Soil

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Benzene	ng	49.1	50.00	98.20	77.50-122.50	✓
Toluene	ng	48.3	50.00	96.60	77.50-122.50	✓
Ethylbenzene	ng	47.0	50.00	94.00	77.50-122.50	✓
Total Xylenes (m,p,o)	ng	141.0	150.00	94.00	77.50-122.50	✓
Material Used:	Calibration Check - BTEX					
Date Acquired:	Sep 12, 2005					
Acquired By:	Paul Cushing					

Matrix Spike	Units	Measured	Actual	% Recovery	Criteria (%)	Passed QC
F1 C6-C10	mg/kg	54	49	110	40-160	✓
Material Used:	Matrix Spike - F1					
Date Acquired:	Sep 12, 2005					
Acquired By:	Paul Cushing					

Mono-Aromatic Hydrocarbons - Water

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Benzene	mg/L	<0.001	0.000	-0.002	0.002	✓
Toluene	mg/L	<0.001	0.000	-0.002	0.002	✓
Ethylbenzene	mg/L	<0.001	0.000	-0.002	0.002	✓
Total Xylenes (m,p,o)	mg/L	<0.001	0.000	-0.002	0.002	✓
Material Used:	Method Blank - VHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	Neil Wood					

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Benzene	ng	48.5	50.000	97.000	77.500-122.500	✓
Toluene	ng	50.9	50.000	101.800	77.500-122.500	✓
Ethylbenzene	ng	51.5	50.000	103.000	77.500-122.500	✓
Total Xylenes (m,p,o)	ng	156.0	150.000	104.000	77.500-122.500	✓
Material Used:	Calibration Check - BTEX					
Date Acquired:	Sep 12, 2005					
Acquired By:	Neil Wood					

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Quality Control

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17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407123**
Control Number: E 241011
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Date Reported: Sep 19, 2005
Report Number: 744400

Volatile Petroleum Hydrocarbons - Soil

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
F1 C6-C10	mg/kg	54	55	45		✓
Material Used:	Duplicate - Run 2 - F1					
Date Acquired:	Sep 12, 2005					
Acquired By:	Paul Cushing					

Volatile Petroleum Hydrocarbons - Water

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
F1 C6-C10	mg/L	<0.01	0.00	-0.02	0.02	✓
F1 -BTEX	mg/L	<0.01	0.00	-0.02	0.02	✓
Material Used:	Method Blank - VHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	Neil Wood					

Extractable Petroleum Hydrocarbons - Soxhlet

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
F2 C10-C16	mg/kg	<10	0	-15	15	✓
F3 C16-C34	mg/kg	<10	0	-15	15	✓
F4HTGC C34-C50+	mg/kg	<10	0	-15	15	✓
Material Used:	Method Blank - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	My Linh Nguyen					

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
F2 C10-C16	ug/mL	83.7	90	93	78-123	✓
F3 C16-C34	ug/mL	660.2	710	93	78-123	✓
F4HTGC C34-C50+	ug/mL	186.0	200	93	78-123	✓
Material Used:	Calibration Check - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	My Linh Nguyen					

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
F2 C10-C16	mg/kg	390	420	30	0	✓
F3 C16-C34	mg/kg	670	710	30	0	✓
F4HTGC C34-C50+	mg/kg	200	200	30	0	✓
Material Used:	Duplicate - Run 2 - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	My Linh Nguyen					

Matrix Spike	Units	Measured	Actual	% Recovery	Criteria (%)	Passed QC
F2 C10-C16	mg/kg	390	407	97	40-160	✓
F3 C16-C34	mg/kg	670	644	104	40-160	✓
F4HTGC C34-C50+	mg/kg	200	164	119	40-160	✓
Material Used:	Matrix Spike - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	My Linh Nguyen					

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Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407123**
Control Number: E 241011
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744400

Extractable Petroleum Hydrocarbons - Water

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
F2 C10-C16	mg/L	<0.1	0.0	-0.2	0.2	✓
F3 C16-C34	mg/L	<0.1	0.0	-0.2	0.2	✓
Material Used:	Method Blank - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	My Linh Nguyen					

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
F2 C10-C16	ug/mL	88.2	90.0	98.0	77.5-122.5	✓
F3 C16-C34	ug/mL	695.5	710.0	98.0	77.5-122.5	✓
Material Used:	Calibration Check - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	My Linh Nguyen					

Polychlorinated Biphenyls - Soil

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Aroclor 1016	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1221	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1232	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1242	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1248	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1254	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1260	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1262	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1268	mg/kg	<0.1	0.0	-0.3	0.3	✓
Material Used:	Method Blank - SV					
Date Acquired:	Sep 12, 2005					
Acquired By:						

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Aroclor 1254	ug/mL	0.9	1.0	90.0	70.0-130.0	✓
Material Used:	Calibration Check - PCBs					
Date Acquired:	Sep 12, 2005					
Acquired By:						

Polychlorinated Biphenyls - Soil - Surrogate

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Decachlorobiphenyl	%	84	100	10	190	✓
Material Used:	Method Blank - SV					
Date Acquired:	Sep 12, 2005					
Acquired By:						

Norwest Labs
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Quality Control

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Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407123**
Control Number: E 241011
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744400

Polychlorinated Biphenyls - Water

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Aroclor 1016	ug/L	<0.1	0.0	-0.3	0.3	✓
Aroclor 1221	ug/L	<0.1	0.0	-0.3	0.3	✓
Aroclor 1232	ug/L	<0.1	0.0	-0.3	0.3	✓
Aroclor 1242	ug/L	<0.1	0.0	-0.3	0.3	✓
Aroclor 1248	ug/L	<0.1	0.0	-0.3	0.3	✓
Aroclor 1254	ug/L	<0.1	0.0	-0.3	0.3	✓
Aroclor 1260	ug/L	<0.1	0.0	-0.3	0.3	✓
Aroclor 1262	ug/L	<0.1	0.0	-0.3	0.3	✓
Aroclor 1268	ug/L	<0.1	0.0	-0.3	0.3	✓
Material Used:	Method Blank - SV					
Date Acquired:	Sep 12, 2005					
Acquired By:	Inna Kazakov					

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Aroclor 1260	ug/mL	1.1	1.0	110.0	70.0-130.0	✓
Material Used:	Calibration Check - PCBs					
Date Acquired:	Sep 12, 2005					
Acquired By:	Inna Kazakov					

Polychlorinated Biphenyls - Water - Surrogate

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Decachlorobiphenyl	%	94	100	10	190	✓
Material Used:	Method Blank - SV					
Date Acquired:	Sep 12, 2005					
Acquired By:	Inna Kazakov					

Oil Properties

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Relative Density @ 15/15°C		0.8265	0.8265		0.0002	✓
Material Used:	Edmonton Duplicate					
Date Acquired:	Sep 09, 2005					
Acquired By:	Erna Estigoy					

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Relative Density @ 15/15°C		0.8461	0.8461	0.8458	0.8464	✓
Material Used:	Edmonton Calibration Check					
Date Acquired:	Sep 09, 2005					
Acquired By:	Erna Estigoy					

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Edmonton, AB. T6B 3J4
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Methodology and Notes

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17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
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LSD:
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NWL Lot ID: **407123**
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Method of Analysis:

MethodName	Reference		Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	*	Conductivity - Laboratory Method, 2510 B	9-Sep-05	Norwest Labs Edmonton
Alkalinity, pH, and EC in water	APHA	*	Electrometric Method, 4500-H+ B	9-Sep-05	Norwest Labs Edmonton
Alkalinity, pH, and EC in water	APHA	*	Titration Method, 2320 B	9-Sep-05	Norwest Labs Edmonton
Anions (Routine) by Ion Chromatography	APHA	*	Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	12-Sep-05	Norwest Labs Edmonton
Boron in general soil	McKeague	*	Hot Water Soluble Boron - Azomethine-H Method, 4.61	12-Sep-05	Norwest Labs Edmonton
Boron in general soil	McKeague	*	Hot Water Soluble Boron - Azomethine-H Method, 4.61	13-Sep-05	Norwest Labs Edmonton
BTEX-CCME - Soil	CCME		Reference Method - Canada-Wide Standard for PHC in Soil, CWS PHC	13-Sep-05	Norwest Labs Calgary
BTEX-CCME - Water	US EPA	*	US EPA method, 8021B/5035B	13-Sep-05	Norwest Labs Calgary
Chloride in Water	APHA	*	Automated Ferricyanide Method, 4500-Cl- E	12-Sep-05	Norwest Labs Edmonton
Mercury (Hot Block) in Soil	US EPA	*	Determination of Hg in Sediment by Cold Vapor Atomic Absorption Spec, 245.5	12-Sep-05	Norwest Labs Edmonton
Mercury (Total) in water	US EPA	*	Determination of Hg in Sediment by Cold Vapor Atomic Absorption Spec, 245.5	12-Sep-05	Norwest Labs Edmonton
Metals ICP-MS (Hot Block) in soil	SW-846	*	Acid Digestion of Sediments, Sludges, and Soils, EPA 3050B	12-Sep-05	Norwest Labs Edmonton
Metals ICP-MS (Total) in water	US EPA	*	Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	9-Sep-05	Norwest Labs Edmonton
Metals Trace (Dissolved) in water	APHA	*	Inductively Coupled Plasma (ICP) Method, 3120 B	9-Sep-05	Norwest Labs Edmonton
Metals Trace (Total) in water	APHA	*	Inductively Coupled Plasma (ICP) Method, 3120 B	9-Sep-05	Norwest Labs Edmonton
PCB - Soil	US EPA	*	US EPA method, 8082	19-Sep-05	Norwest Labs Calgary
PCB - Water	US EPA	*	US EPA method, 8082	15-Sep-05	Norwest Labs Calgary
TEH-CCME - Water	Alta. Env. Method		Hydrocarbon Soil and Water Quality Guidelines, C51260500	13-Sep-05	Norwest Labs Calgary
TEH-CCME-Soil (Soxhlet)	CCME		Reference Method - Canada-Wide Standard for PHC in Soil, CWS PHC	15-Sep-05	Norwest Labs Calgary
Total organic chloride D4929 modified	ASTM		Standard test method for determination of organic chloride content in crude oil, D 4929-99	12-Sep-05	Norwest Labs Edmonton

Please direct any inquiries regarding this report to our Client Services group.
Results relate only to samples as submitted

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Methodology and Notes

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P.O.:
Acct. Code:

NWL Lot ID: **407123**
Control Number: E 241011
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Date Reported: Sep 19, 2005
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* Norwest method(s) is based on reference method

References:

Alta. Env. Method	Alberta Environment Method
APHA	Standard Methods for the Examination of Water and Wastewater
ASTM	Annual Book of ASTM Standards
CCME	Canadian Council of Ministers of the Environment
McKeague	Manual on Soil Sampling and Methods of Analysis
SW-846	Test Methods for Evaluating Solid Waste
US EPA	US Environmental Protection Agency Test Methods

Comments:

Sample	1	The ion balance was outside the acceptable range for sample 407123-1. The ion balance can be variable in samples with TDS less than 100 mg/L.
	8	See enclosed 3 page report 744426 for hydrocarbon characterization analysis.
	9	See enclosed 3 page report 744426 for hydrocarbon characterization analysis.
	10	See enclosed 3 page report 744426 for hydrocarbon characterization analysis.

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Energy Resouce Group

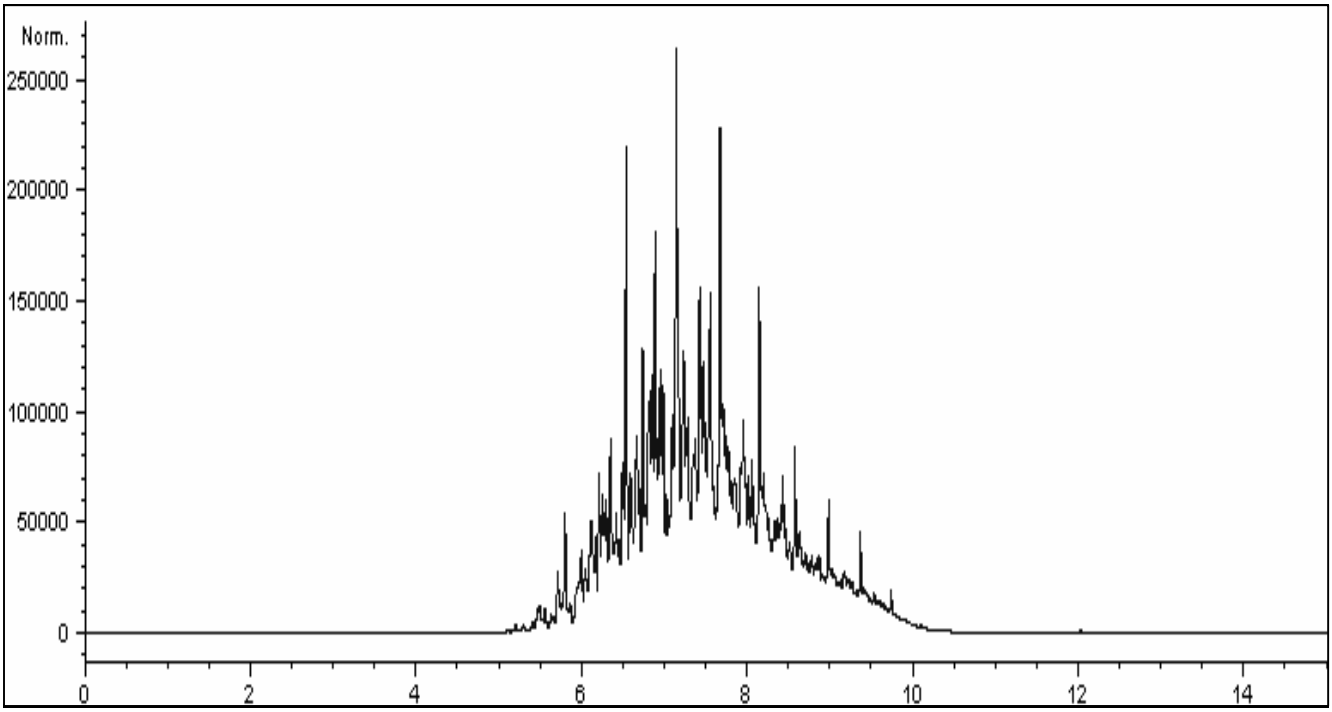
7217 Roper Road Edmonton, Alberta T6B 3J4
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744426
Laboratory Report Number

Hydrocarbon Characterization

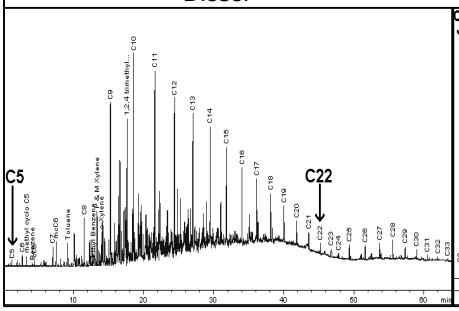
Container	Operator		Container Identity
Simpson Lake	Phase III Artic ESA		
Location	Well Name		K.B. Elev, m GR Elev, m
	Pol Tank	Greg Wright	ETC
Field/Area	Sample Point	Sampler	Company

Date Sampled	Date Received	Date Reported	Other Information
2005-08-30	2005-09-09	2005-09-13	

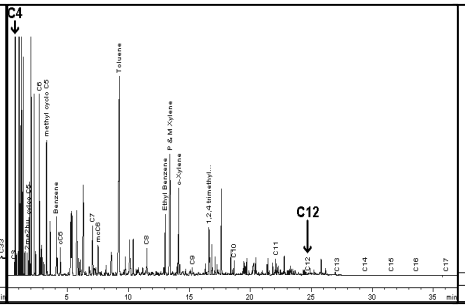


Typical Hydrocarbon Component Distribution

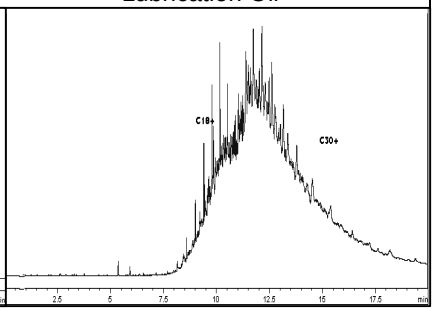
Diesel



Gasoline



Lubrication Oil



Carbon Number Distribution Ranges			
Gasoline	C4-C12	Diesel Fuel	C5-C22
Varsol	C8-C12	Lubricating Oils	C18-C40
Kerosene	C7-C16	Crude Oils	C3-C30+

Sample Distribution Assesment

Based on the component distribution, the sample appears to be a refined product.

Supervisor D. Aebig

Approved S. Montgomery

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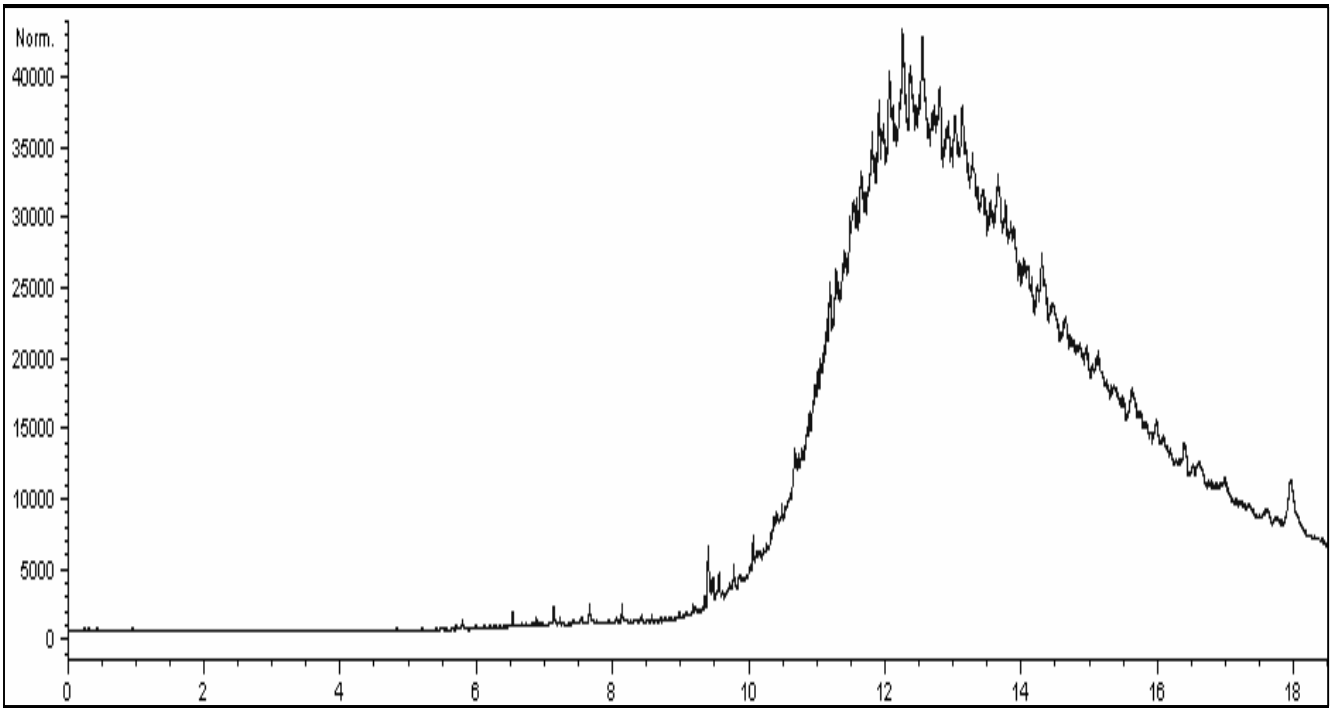
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744426
Laboratory Report Number

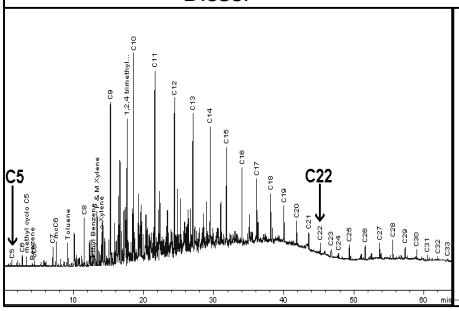
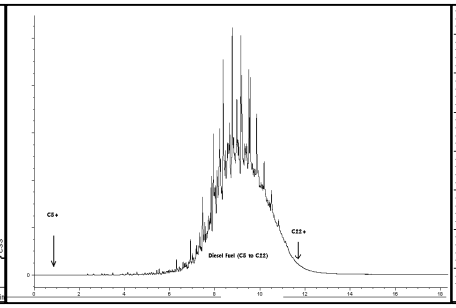
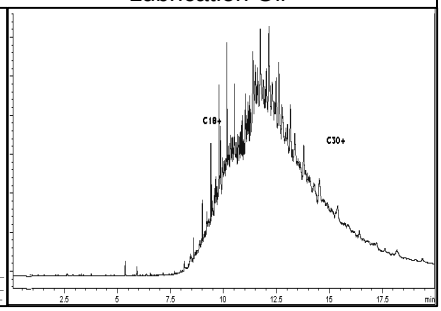
Hydrocarbon Characterization

Container	Operator		Container Identity
Simpson Lake	Phase III Artic ESA		
Location	Well Name		K.B. Elev, m GR Elev, m
	Pallet Area	Greg Wright	ETC
Field/Area	Sample Point	Sampler	Company

Date Sampled	Date Received	Date Reported	Other Information
2005-08-30	2005-09-09	2005-09-13	



Typical Hydrocarbon Component Distribution

Diesel	Invert Mud	Lubrication Oil
		

Carbon Number Distribution Ranges			
Gasoline	C4-C12	Diesel Fuel	C5-C22
Varsol	C8-C12	Lubricating Oils	C18-C40
Kerosene	C7-C16	Crude Oils	C3-C30+

Sample Distribution Assesment

Based on the component distribution, the sample appears to be a Lurication Oil.

Supervisor D. Aebig

Approved S. Montgomery

NORWEST LABS
Energy Resouce Group

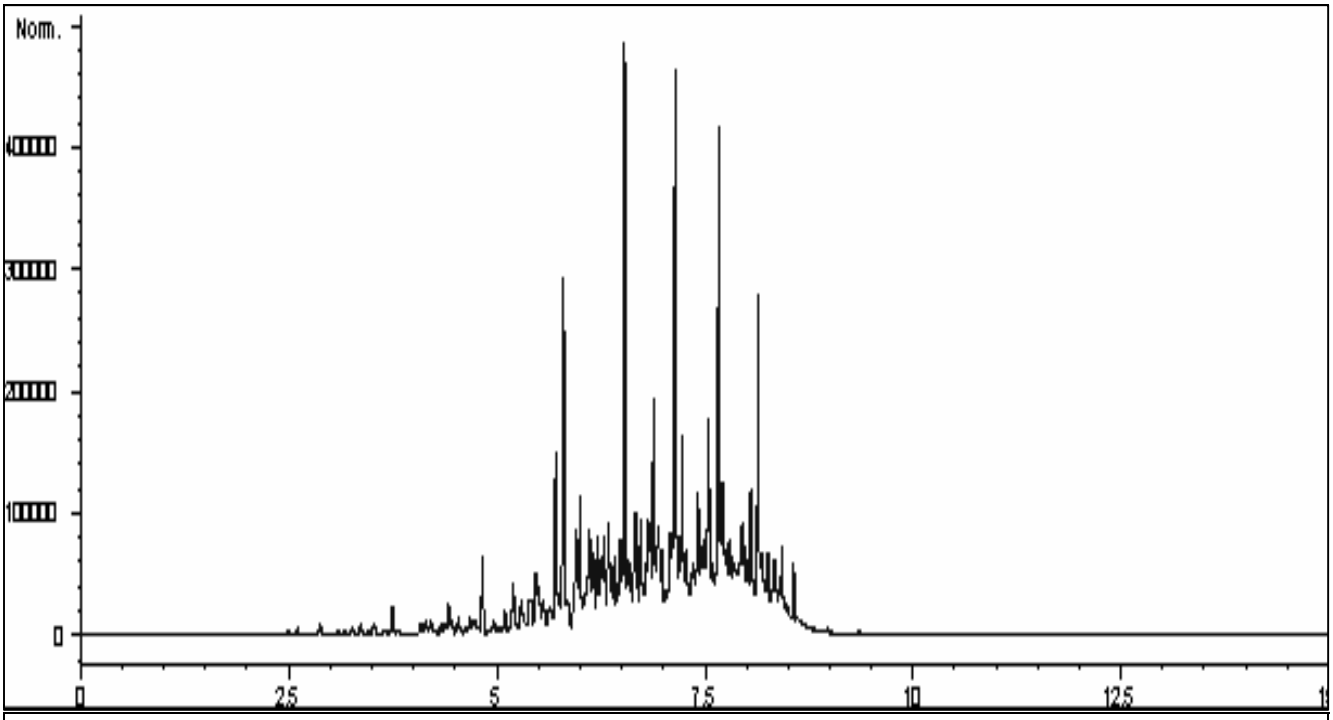
7217 Roper Road Edmonton, Alberta T6B 3J4
Phone (780) 438-5522

744426
Laboratory Report Number

Hydrocarbon Characterization

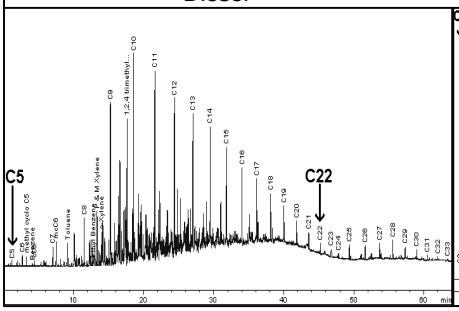
Container	Operator		Container Identity
Simpson Lake	Phase III Artic ESA		
Location	Well Name		K.B. Elev, m GR Elev, m
	Air Strip Barrel	Greg Wright	ETC
Field/Area	Sample Point	Sampler	Company

Date Sampled	Date Received	Date Reported	Other Information
2005-08-30	2005-09-09	2005-09-13	

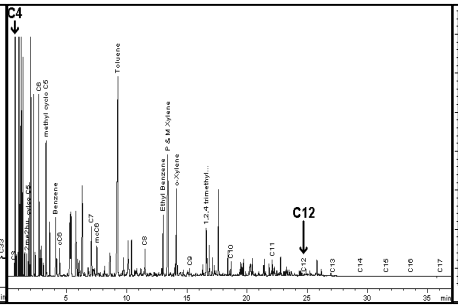


Typical Hydrocarbon Component Distribution

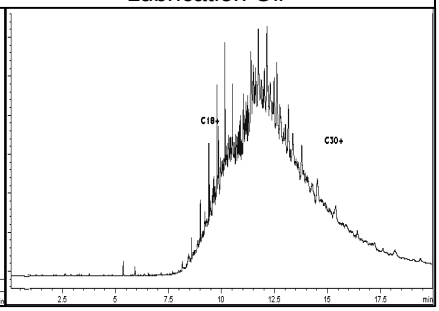
Diesel



Gasoline



Lubrication Oil



Carbon Number Distribution Ranges			
Gasoline	C4-C12	Diesel Fuel	C5-C22
Varsol	C8-C12	Lubricating Oils	C18-C40
Kerosene	C7-C16	Crude Oils	C3-C30+

Sample Distribution Assesment

Based on the component distribution, the sample appears to be a refined product.

Supervisor D. Aebig

Approved S. Montgomery

NORWEST LABS

407159

Control Number E 241007

Environmental Sample Information Sheet

NOTE: Proper completion of this form is required in order to proceed with analysis

See reverse for your nearest Norwest location and proper sampling protocol

Billing Address: x	**Copy of Report To:**	**Copy of invoice:** ☐
Company: Earth Tech Canada Inc.	Company: Earth Tech Canada Inc.	Mail invoice to this address for approval x ☐
Address: 17203-103 Ave, Edmonton, AB T5S 1J4	Address: 17203-103 Ave, Edmonton, AB T5S 1J4	
QA/QC Report ☑		
Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-Service ☑		Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-service ☐
Attention: Greg Wright	Attention: Greg Wright	
Phone: (780) 488-6800	Phone: (780) 488-6800	
Fax: (780) 488-2121	Fax: (780) 488-2121	
Cell:	Cell:	
e-mail: ~~greg.wright@earthtech.ca~~	e-mail: greg.wright@earthtech.ca	

Information to be included on Report and Invoice

Project ID: 88122
Project Name: Phase III Arctic ESA
Project Location: Simpson Lake
Legal Location:
PO#:
Proj. Acct. Code:
Agreement ID: 62449

RUSH Please contact the laboratory to confirm rush dates and times before submitting samples.

Upon filling out this section, client accepts that surcharges will be attached to this analysis

Required on: all analyses **or** as indicated ☐ or ☐

Date Required: _____

Signature: _____

Norwest Authorization: _____

Sample Custody (Please Print)

Relinquished by: Greg Wright

Company ETC Signature _____

I authorize Norwest Labs to ~~proceed~~ with the work indicated on this form:

Date: Aug 31, 2005

Initial: _____

Received by: ☐ Coolers

Waybill # Date ☐ Boxes

Company Time ☐ Samples

Received By: Date:

Company: Time:

Special Instructions / Comments ☐ Check here if Norwest is required to report results directly to a regulatory body (Please include contact information)

	Sample Identification	Location	Depth IN (CM) M	Date / Time Sampled	Matrix	Sampling Method	Number of Containers	CCMES	PAH										
							↓	Enter tests above (✔ relevant samples below)											
1	FT-ET153		0 – 30	Aug 30	soil	grab	2	✓	✓										
2	FT-ET165		0 – 30	"	"	"	2	✓	✓										
3	FT-ET165		50 – 80	"	"	"	2	✓	✓										
4	FT-ET165A		50 – 80	"	"	"	2	✓	✓										
5	FT-ET152		0 – 30	"	"	"	2	✓	✓										
6	FT-ET167		0 – 30	"	"	"	2	✓	✓										
7	FT-ET168		30 – 60	"	"	"	2	✓	✓										
8	FT-ET169		40 – 70	"	"	"	2	✓	✓										
9	FT-ET166		0 – 30	"	"	"	2	✓	✓										
10	FT-ET166		70 – 100	"	"	"	2	✓	✓										
11	PL-ET171		20 – 50	"	"	"	2	✓	✓										
12	PL-ET172		20 – 50	"	"	"	2	✓	✓										
13	PL-ET173		20 – 50	"	"	"	2	✓	✓										
14	PL-ET170		40 – 70	"	"	"	2	✓	✓										
15	PL-ET170		0 – 30	"	"	"	2	✓	✓										

NOTE: All hazardous samples must be labelled according to WHMIS guidelines.

Accredited by the Standards Council of Canada for specific tests

NWL1008 (08/03)

NORWEST LABS

407159

Control Number E 241008

Environmental Sample Information Sheet

NOTE: Proper completion of this form is required in order to proceed with analysis

See reverse for your nearest Norwest location and proper sampling protocol

Billing Address: x	**Copy of Report To:**	**Copy of invoice:** ☐
Company: Earth Tech Canada Inc.	Company: Earth Tech Canada Inc.	Mail invoice to this address for approval x ☐
Address: 17203-103 Ave, Edmonton, AB T5S 1J4	Address: 17203-103 Ave, Edmonton, AB T5S 1J4	
QA/QC Report ☐		
Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-Service ☐	Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-service ☐	
Attention: Greg Wright	Attention: Greg Wright	
Phone: (780) 488-6800	Phone: (780) 488-6800	
Fax: (780) 488-2121	Fax: (780) 488-2121	
Cell:	Cell:	
e-mail: greg.wright@earthtech.ca	e-mail: greg.wright@earthtech.ca	

Information to be included on Report and Invoice

Project ID: 88122
Project Name: Phase III Arctic ESA
Project Location: Simpson Lake
Legal Location:
PO#:
Proj. Acct. Code:
Agreement ID: 62449

RUSH Please contact the laboratory to confirm rush dates and times before submitting samples.

Upon filling out this section, client accepts that surcharges will be attached to this analysis

Required on: all analyses **or** as indicated ☐ or ☐

Date Required: _____

Signature: _____

Norwest Authorization: _____

Sample Custody (Please Print)

Relinquished by: Greg Wright

Company: ETC Signature: GW

I authorize Norwest Labs to proceed with the work indicated on this form:

Date: Aug 31, 2005

Initial: GW

Received by: ☐ Coolers

Waybill # Date ☐ Boxes

Company Time ☐ Samples

Received By: Date:

Company: Time:

Special Instructions / Comments ☐ Check here if Norwest is required to report results directly to a regulatory body (Please include contact information)

	Sample Identification	Location	Depth IN (CM) M	Date / Time Sampled	Matrix	Sampling Method	Number of Containers	CCMES	PAH	METALS	PCB								
							↓	Enter tests above (✓ relevant samples below)											
1	PL-ET145	16	40-70	Aug30	soil	grab	3	✓	✓	✓									
2	PL-ET147	17	40-70	"	"	"	3	✓	✓	✓									
3	PL-ET148	18	40-70	"	"	"	2	✓	✓										
4	ECA-ET138	19	30-60	"	"	"	2			✓	✓								
5	ECA-ET139	20	30-60	"	"	"	2			✓	✓								
6	ECA-ET140	21	30-60	"	"	"	2			✓	✓								
7	ECA-ET174	22	30-60	"	"	"	2			✓	✓								
8	ECA-ET174	23	60-90	"	"	"	2			✓	✓								
9			—																
10			—																
11			—																
12			—																
13			—																
14			—																
15			—																

NOTE: All hazardous samples must be labelled according to WHMIS guidelines.

Accredited by the Standards Council of Canada for specific tests

NWL0008 (08/03)

NORWEST LABS

407159.

Control Number E 241009

Environmental Sample Information Sheet

NOTE: Proper completion of this form is required in order to proceed with analysis

See reverse for your nearest Norwest location and proper sampling protocol

Billing Address: x	**Copy of Report To:**	**Copy of invoice:** ☐
Company: Earth Tech Canada Inc.	Company: Earth Tech Canada Inc.	Mail invoice to this address for approval x
Address: 17203-103 Ave, Edmonton, AB T5S 1J4	Address: 17203-103 Ave, Edmonton, AB T5S 1J4	
QA/QC Report ☐		
Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-Service ☐		Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-service ☐
Attention: Greg Wright	Attention: Greg Wright	
Phone: (780) 488-6800	Phone: (780) 488-6800	
Fax: (780) 488-2121	Fax: (780) 488-2121	
Cell:	Cell:	
e-mail: ~~greg.wright@earthtech.ca~~	e-mail: greg.wright@earthtech.ca	

Information to be included on Report and Invoice

Project ID: 88122
Project Name: Phase III Arctic ESA
Project Location: Simpson Lake
Legal Location:
PO#:
Proj. Acct. Code:
Agreement ID: 62449

RUSH Please contact the laboratory to confirm rush dates and times before submitting samples.

Upon filling out this section, client accepts that surcharges will be attached to this analysis

Required on: all analyses **or** as indicated ☐ or ☐

Date Required: _____

Signature: _____

Norwest Authorization: _____

Sample Custody (Please Print)

Relinquished by: Greg Wright

Company ETC Signature GW.

I authorize Norwest Labs to proceed with the work indicated on this form:

Date: Aug 31, 2005

Initial: GW.

Received by: ☐ Coolers

Waybill # Date ☐ Boxes

Company Time ☐ Samples

Special Instructions / Comments ☐ Check here if Norwest is required to report results directly to a regulatory body (Please include contact information)

Received By: Date:

Company: Time:

	Sample Identification	Location	Depth IN CM M	Date / Time Sampled	Matrix	Sampling Method	Number of Containers	PCB	PBDT	Enter tests above (✓ relevant samples below)
1	ETHAZ2	24	—	Aug28	concrete	grab	1	✓		
2	ETHAZ 7	25	—		paint	"	2	✓	✓	
3	ETHAZ8	26	—		"	"	2	✓	✓	
4	ETHAZ 9	27	—		"	"	2	✓	✓	
5	ETHAZ 12	28	—		concrete	"	1	✓		
6	ETHAZ 13	29	—		paint	"	2	✓	✓	
7	ETHAZ 14	30	—		"	"	2	✓	✓	
8	ETHAZ 15	31	—		concrete	"	1	✓		
9	ETHAZ 16	32	—		paint	"	2	✓	✓	
10			—							
11			—							
12			—							
13			—							
14			—							
15			—							

NOTE: All hazardous samples must be labelled according to WHMIS guidelines.

Accredited by the Standards Council of Canada for specific tests

NWL008 (08/03)

Analytical Report

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407159**
Control Number: E 241007
Date Received: Sep 09, 2005
Date Reported: Sep 20, 2005
Report Number: 744448

			NWL Number	407159-1	407159-2	407159-3	
			Sample Date	Aug 30, 2005	Aug 30, 2005	Aug 30, 2005	
			Sample Description	FT-ET153 / 0-30 / cm	FT-ET165 / 0-30 / cm	FT-ET165 / 50-80 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Mono-Aromatic Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
Benzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Toluene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Total Xylenes (m,p,o)	Dry Weight	mg/kg		<0.02	<0.02	0.17	0.02
F1 -BTEX	Dry Weight	mg/kg		14	11	83	1
F1 C6-C10	Dry Weight	mg/kg		14	11	83	1
Volatile Petroleum Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F1 C6-C10	Dry Weight	mg/kg		14	11	83	1
F1 -BTEX	Dry Weight	mg/kg		14	11	83	1
Extractable Petroleum Hydrocarbons - Soxhlet							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F2 C10-C16	Dry Weight	mg/kg		3260	420	440	10
F3 C16-C34	Dry Weight	mg/kg		4590	1660	330	10
F4 C34-C50	Dry Weight	mg/kg		810	520	80	10
F4HTGC C34-C50+	Dry Weight	mg/kg		1030	710	90	10
% C50+		%		2.5	6.9	1.2	
Silica Gel Cleanup							
Silica Gel Cleanup				Done	Done	Done	
Soil % Moisture							
Moisture	Soil % Moisture	%		13.10	1.59	10.10	
Polynuclear Aromatic Hydrocarbons - Soil							
Naphthalene	Dry Weight	mg/kg		<0.05	<0.05	1.43	0.05
Acenaphthylene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Acenaphthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluorene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Phenanthrene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluoranthene	Dry Weight	mg/kg		0.11	<0.05	<0.05	0.05
Pyrene	Dry Weight	mg/kg		0.15	<0.05	<0.05	0.05
Benzo(a)anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Chrysene	Dry Weight	mg/kg		0.15	<0.05	<0.05	0.05
Benzo(b)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(j)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(k)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407159**
Control Number: E 241007
Date Received: Sep 09, 2005
Date Reported: Sep 20, 2005
Report Number: 744448

			NWL Number	407159-1	407159-2	407159-3	
			Sample Date	Aug 30, 2005	Aug 30, 2005	Aug 30, 2005	
			Sample Description	FT-ET153 / 0-30 / cm	FT-ET165 / 0-30 / cm	FT-ET165 / 50-80 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Polynuclear Aromatic Hydrocarbons - Soil - Conti							
Benzo(a)pyrene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Indeno(1,2,3-c,d)pyrene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Dibenzo(a,h)anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(g,h,i)perylene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
CB(a)P	Carcinogenic Potency Equivalent	mg/kg		0.0007	<0.0002	<0.0002	0.0002
PAH - Soil - Surrogate Recovery							
Nitrobenzene-d5	PAH - Surrogate	%		>130	88	>130	23-130
2-Fluorobiphenyl	PAH - Surrogate	%		125	102	96	30-130
p-Terphenyl-d14	PAH - Surrogate	%		99	98	105	18-137

NORWEST LABS

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407159**
Control Number: E 241007
Date Received: Sep 09, 2005
Date Reported: Sep 20, 2005
Report Number: 744448

			NWL Number	407159-4	407159-5	407159-6	
			Sample Date	Aug 30, 2005	Aug 30, 2005	Aug 30, 2005	
			Sample Description	FT-ET165A / 50-80 / cm	FT-ET152 / 0-30 / cm	FT-ET167 / 0-30 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Mono-Aromatic Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
Benzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Toluene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Total Xylenes (m,p,o)	Dry Weight	mg/kg		0.10	<0.02	<0.02	0.02
F1 -BTEX	Dry Weight	mg/kg		32	<1	<1	1
F1 C6-C10	Dry Weight	mg/kg		32	<1	<1	1
Volatile Petroleum Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F1 C6-C10	Dry Weight	mg/kg		32	<1	<1	1
F1 -BTEX	Dry Weight	mg/kg		32	<1	<1	1
Extractable Petroleum Hydrocarbons - Soxhlet							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F2 C10-C16	Dry Weight	mg/kg		350	120	<10	10
F3 C16-C34	Dry Weight	mg/kg		280	2040	250	10
F4 C34-C50	Dry Weight	mg/kg		60	420	80	10
F4HTGC C34-C50+	Dry Weight	mg/kg		70	670	100	10
% C50+		%		0.0	8.8	4.4	
Silica Gel Cleanup							
Silica Gel Cleanup				Done	Done	Done	
Soil % Moisture							
Moisture	Soil % Moisture	%		11.40	12.70	12.90	
Polynuclear Aromatic Hydrocarbons - Soil							
Naphthalene	Dry Weight	mg/kg		1.03	<0.05	<0.05	0.05
Acenaphthylene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Acenaphthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluorene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Phenanthrene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Pyrene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(a)anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Chrysene	Dry Weight	mg/kg		<0.05	0.06	<0.05	0.05
Benzo(b)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(j)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407159**
Control Number: E 241007
Date Received: Sep 09, 2005
Date Reported: Sep 20, 2005
Report Number: 744448

	NWL Number	407159-4	407159-5	407159-6	
	Sample Date	Aug 30, 2005	Aug 30, 2005	Aug 30, 2005	
	Sample Description	FT-ET165A / 50-80 / cm	FT-ET152 / 0-30 / cm	FT-ET167 / 0-30 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Polynuclear Aromatic Hydrocarbons - Soil - Conti						
Benzo(k)fluoranthene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(a)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Indeno(1,2,3-c,d)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Dibenzo(a,h)anthracene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(g,h,i)perylene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
CB(a)P	Carcinogenic Potency Equivalent	mg/kg	<0.0002	0.0003	<0.0002	0.0002
PAH - Soil - Surrogate Recovery						
Nitrobenzene-d5	PAH - Surrogate	%	120	88	95	23-130
2-Fluorobiphenyl	PAH - Surrogate	%	99	84	97	30-130
p-Terphenyl-d14	PAH - Surrogate	%	115	91	110	18-137

NORWEST LABS

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407159**
Control Number: E 241007
Date Received: Sep 09, 2005
Date Reported: Sep 20, 2005
Report Number: 744448

			NWL Number	407159-7	407159-8	407159-9	
			Sample Date	Aug 30, 2005	Aug 30, 2005	Aug 30, 2005	
			Sample Description	FT-ET168 / 30-60 / cm	FT-ET169 / 40-70 / cm	FT-ET166 / 0-30 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Mono-Aromatic Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
Benzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Toluene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg		<0.02	<0.02	0.44	0.02
Total Xylenes (m,p,o)	Dry Weight	mg/kg		<0.02	<0.02	0.82	0.02
F1 -BTEX	Dry Weight	mg/kg		<1	6	156	1
F1 C6-C10	Dry Weight	mg/kg		<1	6	157	1
Volatile Petroleum Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F1 C6-C10	Dry Weight	mg/kg		<1	6	157	1
F1 -BTEX	Dry Weight	mg/kg		<1	6	156	1
Extractable Petroleum Hydrocarbons - Soxhlet							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F2 C10-C16	Dry Weight	mg/kg		10	310	1500	10
F3 C16-C34	Dry Weight	mg/kg		240	900	210	10
F4 C34-C50	Dry Weight	mg/kg		70	280	40	10
F4HTGC C34-C50+	Dry Weight	mg/kg		90	400	50	10
% C50+		%		4.1	7.7	0.9	
Silica Gel Cleanup							
Silica Gel Cleanup				Done	Done	Done	
Soil % Moisture							
Moisture	Soil % Moisture	%		10.50	15.40	12.70	
Polynuclear Aromatic Hydrocarbons - Soil							
Naphthalene	Dry Weight	mg/kg		<0.05	<0.05	3.20	0.05
Acenaphthylene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Acenaphthene	Dry Weight	mg/kg		<0.05	<0.05	0.09	0.05
Fluorene	Dry Weight	mg/kg		<0.05	<0.05	0.11	0.05
Phenanthrene	Dry Weight	mg/kg		<0.05	<0.05	0.12	0.05
Anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Pyrene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(a)anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Chrysene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(b)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(j)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(k)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05

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Analytical Report

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Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407159**
Control Number: E 241007
Date Received: Sep 09, 2005
Date Reported: Sep 20, 2005
Report Number: 744448

	NWL Number	407159-7	407159-8	407159-9	
	Sample Date	Aug 30, 2005	Aug 30, 2005	Aug 30, 2005	
	Sample Description	FT-ET168 / 30-60 / cm	FT-ET169 / 40-70 / cm	FT-ET166 / 0-30 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Polynuclear Aromatic Hydrocarbons - Soil - Conti						
Benzo(a)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Indeno(1,2,3-c,d)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Dibenzo(a,h)anthracene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(g,h,i)perylene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
CB(a)P	Carcinogenic Potency Equivalent	mg/kg	<0.0002	<0.0002	<0.0002	0.0002
PAH - Soil - Surrogate Recovery						
Nitrobenzene-d5	PAH - Surrogate	%	92	96	>130	23-130
2-Fluorobiphenyl	PAH - Surrogate	%	96	88	76	30-130
p-Terphenyl-d14	PAH - Surrogate	%	106	107	103	18-137

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Company: ETC

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NWL Lot ID: **407159**
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			NWL Number	407159-10	407159-11	407159-12	
			Sample Date	Aug 30, 2005	Aug 30, 2005	Aug 30, 2005	
			Sample Description	FT-ET166 / 70-100 / cm	PL-ET171 / 20-50 / cm	PL-ET172 / 20-50 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Mono-Aromatic Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
Benzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Toluene	Dry Weight	mg/kg		0.07	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg		0.39	<0.02	<0.02	0.02
Total Xylenes (m,p,o)	Dry Weight	mg/kg		4.35	<0.02	<0.02	0.02
F1 -BTEX	Dry Weight	mg/kg		965	29	<1	1
F1 C6-C10	Dry Weight	mg/kg		970	29	<1	1
Volatile Petroleum Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F1 C6-C10	Dry Weight	mg/kg		970	29	<1	1
F1 -BTEX	Dry Weight	mg/kg		965	29	<1	1
Extractable Petroleum Hydrocarbons - Soxhlet							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F2 C10-C16	Dry Weight	mg/kg		2390	540	<10	10
F3 C16-C34	Dry Weight	mg/kg		250	20	<10	10
F4 C34-C50	Dry Weight	mg/kg		30	10	10	10
F4HTGC C34-C50+	Dry Weight	mg/kg		30	20	20	10
% C50+		%		0.0	1.6	0.0	
Silica Gel Cleanup							
Silica Gel Cleanup				Done	Done	Done	
Soil % Moisture							
Moisture	Soil % Moisture	%		10.80	9.99	15.60	
Polynuclear Aromatic Hydrocarbons - Soil							
Naphthalene	Dry Weight	mg/kg		3.64	<0.05	<0.05	0.05
Acenaphthylene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Acenaphthene	Dry Weight	mg/kg		0.13	<0.05	<0.05	0.05
Fluorene	Dry Weight	mg/kg		0.19	<0.05	<0.05	0.05
Phenanthrene	Dry Weight	mg/kg		0.17	<0.05	<0.05	0.05
Anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Pyrene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(a)anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Chrysene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(b)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(j)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05

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Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407159**
Control Number: E 241007
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	NWL Number	407159-10	407159-11	407159-12	
	Sample Date	Aug 30, 2005	Aug 30, 2005	Aug 30, 2005	
	Sample Description	FT-ET166 / 70-100 / cm	PL-ET171 / 20-50 / cm	PL-ET172 / 20-50 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Polynuclear Aromatic Hydrocarbons - Soil - Conti						
Benzo(k)fluoranthene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(a)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Indeno(1,2,3-c,d)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Dibenzo(a,h)anthracene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(g,h,i)perylene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
CB(a)P	Carcinogenic Potency Equivalent	mg/kg	<0.0002	<0.0002	<0.0002	0.0002
PAH - Soil - Surrogate Recovery						
Nitrobenzene-d5	PAH - Surrogate	%	>130	>130	104	23-130
2-Fluorobiphenyl	PAH - Surrogate	%	106	110	94	30-130
p-Terphenyl-d14	PAH - Surrogate	%	108	112	108	18-137

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Sampled By: Greg Wright
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NWL Lot ID: **407159**
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Date Reported: Sep 20, 2005
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			NWL Number	407159-13	407159-14	407159-15	
			Sample Date	Aug 30, 2005	Aug 30, 2005	Aug 30, 2005	
			Sample Description	PL-ET173 / 20-50 / cm	PL-ET170 / 40-70 / cm	PL-ET170 / 0-30 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Mono-Aromatic Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
Benzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Toluene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Total Xylenes (m,p,o)	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
F1 -BTEX	Dry Weight	mg/kg		<1	<1	<1	1
F1 C6-C10	Dry Weight	mg/kg		<1	<1	<1	1
Volatile Petroleum Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F1 C6-C10	Dry Weight	mg/kg		<1	<1	<1	1
F1 -BTEX	Dry Weight	mg/kg		<1	<1	<1	1
Extractable Petroleum Hydrocarbons - Soxhlet							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F2 C10-C16	Dry Weight	mg/kg		<10	<10	<10	10
F3 C16-C34	Dry Weight	mg/kg		<10	<10	<10	10
F4 C34-C50	Dry Weight	mg/kg		<10	<10	<10	10
F4HTGC C34-C50+	Dry Weight	mg/kg		<10	<10	<10	10
% C50+		%		0.0	0.0	0.0	
Silica Gel Cleanup							
Silica Gel Cleanup				Done	Done	Done	
Soil % Moisture							
Moisture	Soil % Moisture	%		8.47	11.10	10.40	
Polynuclear Aromatic Hydrocarbons - Soil							
Naphthalene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Acenaphthylene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Acenaphthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluorene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Phenanthrene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Pyrene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(a)anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Chrysene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(b)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(j)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(k)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05

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Attn: Greg Wright
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Project ID: 88122
Name: Phase III Arctic ESA
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NWL Lot ID: **407159**
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	NWL Number	407159-13	407159-14	407159-15	
	Sample Date	Aug 30, 2005	Aug 30, 2005	Aug 30, 2005	
	Sample Description	PL-ET173 / 20-50 / cm	PL-ET170 / 40-70 / cm	PL-ET170 / 0-30 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Polynuclear Aromatic Hydrocarbons - Soil - Conti						
Benzo(a)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Indeno(1,2,3-c,d)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Dibenzo(a,h)anthracene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(g,h,i)perylene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
CB(a)P	Carcinogenic Potency Equivalent	mg/kg	<0.0002	<0.0002	<0.0002	0.0002
PAH - Soil - Surrogate Recovery						
Nitrobenzene-d5	PAH - Surrogate	%	94	92	89	23-130
2-Fluorobiphenyl	PAH - Surrogate	%	106	100	98	30-130
p-Terphenyl-d14	PAH - Surrogate	%	117	104	107	18-137

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NWL Lot ID: **407159**
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			NWL Number	407159-16	407159-17	407159-18	
			Sample Date	Aug 30, 2005	Aug 30, 2005	Aug 30, 2005	
			Sample Description	PL-ET145 / 40-70 / cm	PL-ET147 / 40-70 / cm	PL-ET148 / 40-70 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Mono-Aromatic Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
Benzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Toluene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Total Xylenes (m,p,o)	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
F1 -BTEX	Dry Weight	mg/kg		<1	<1	<1	1
F1 C6-C10	Dry Weight	mg/kg		<1	<1	<1	1
Volatile Petroleum Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F1 C6-C10	Dry Weight	mg/kg		<1	<1	<1	1
F1 -BTEX	Dry Weight	mg/kg		<1	<1	<1	1
Extractable Petroleum Hydrocarbons - Soxhlet							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F2 C10-C16	Dry Weight	mg/kg		<10	<10	<10	10
F3 C16-C34	Dry Weight	mg/kg		<10	20	<10	10
F4 C34-C50	Dry Weight	mg/kg		<10	20	<10	10
F4HTGC C34-C50+	Dry Weight	mg/kg		10	20	<10	10
% C50+		%		0.0	0.0	0.0	
Silica Gel Cleanup							
Silica Gel Cleanup				Done	Done	Done	
Soil % Moisture							
Moisture	Soil % Moisture	%		10.80	11.90	10.20	
Polynuclear Aromatic Hydrocarbons - Soil							
Naphthalene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Acenaphthylene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Acenaphthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluorene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Phenanthrene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Pyrene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(a)anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Chrysene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(b)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(j)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(k)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05

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Date Reported: Sep 20, 2005
Report Number: 744448

	NWL Number	407159-16	407159-17	407159-18	
	Sample Date	Aug 30, 2005	Aug 30, 2005	Aug 30, 2005	
	Sample Description	PL-ET145 / 40-70 / cm	PL-ET147 / 40-70 / cm	PL-ET148 / 40-70 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Polynuclear Aromatic Hydrocarbons - Soil - Conti						
Benzo(a)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Indeno(1,2,3-c,d)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Dibenzo(a,h)anthracene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(g,h,i)perylene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
CB(a)P	Carcinogenic Potency Equivalent	mg/kg	<0.0002	<0.0002	<0.0002	0.0002
PAH - Soil - Surrogate Recovery						
Nitrobenzene-d5	PAH - Surrogate	%	88	102	105	23-130
2-Fluorobiphenyl	PAH - Surrogate	%	101	90	91	30-130
p-Terphenyl-d14	PAH - Surrogate	%	116	100	104	18-137

NORWEST LABS

Norwest Labs
7217 Roper Road NW
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Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407159**
Control Number: E 241007
Date Received: Sep 09, 2005
Date Reported: Sep 20, 2005
Report Number: 744448

	NWL Number	407159-16	407159-17	407159-19	
	Sample Date	Aug 30, 2005	Aug 30, 2005	Aug 30, 2005	
	Sample Description	PL-ET145 / 40-70 / cm	PL-ET147 / 40-70 / cm	ECA-ET138 / 30-60 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble						
Boron	Water Soluble	mg/kg	1.5	0.3	0.1	0.1
Metals Strong Acid Digestion						
Mercury	Strong Acid Extractable	ug/g	<0.01	<0.01	<0.01	0.01
Antimony	Strong Acid Extractable	ug/g	<0.2	<0.2	<0.2	0.2
Arsenic	Strong Acid Extractable	ug/g	1.4	2.0	1.5	0.2
Barium	Strong Acid Extractable	ug/g	63	97	66	1
Beryllium	Strong Acid Extractable	ug/g	0.4	0.5	0.4	0.1
Cadmium	Strong Acid Extractable	ug/g	0.06	0.08	0.08	0.01
Chromium	Strong Acid Extractable	ug/g	17.8	26.8	19.2	0.5
Cobalt	Strong Acid Extractable	ug/g	6.2	8.4	6.5	0.1
Copper	Strong Acid Extractable	ug/g	7	14	9	1
Lead	Strong Acid Extractable	ug/g	5.8	7.7	6.2	0.1
Molybdenum	Strong Acid Extractable	ug/g	<1	<1	<1	1
Nickel	Strong Acid Extractable	ug/g	9.2	15.4	10.0	0.5
Selenium	Strong Acid Extractable	ug/g	<0.3	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	ug/g	<0.1	0.1	<0.1	0.1
Thallium	Strong Acid Extractable	ug/g	0.22	0.33	0.23	0.05
Tin	Strong Acid Extractable	ug/g	2	3	2	1
Vanadium	Strong Acid Extractable	ug/g	28.7	39.1	30.1	0.1
Zinc	Strong Acid Extractable	ug/g	36	57	38	1

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NWL Lot ID: **407159**
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		NWL Number	407159-19	407159-20	407159-21	
		Sample Date	Aug 30, 2005	Aug 30, 2005	Aug 30, 2005	
		Sample Description	ECA-ET138 / 30-60 / cm	ECA-ET139 / 30-60 / cm	ECA-ET140 / 30-60 / cm	
		Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Polychlorinated Biphenyls - Soil						
Aroclor 1016	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1221	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1232	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1242	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1248	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1254	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1260	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1262	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1268	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Total PCBs	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Polychlorinated Biphenyls - Soil - Surrogate						
Decachlorobiphenyl	Surrogate	%	72	112	64	50-150

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Sampled By: Greg Wright
Company: ETC

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Name: Phase III Arctic ESA
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NWL Lot ID: **407159**
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	NWL Number	407159-20	407159-21	407159-22	
	Sample Date	Aug 30, 2005	Aug 30, 2005	Aug 30, 2005	
	Sample Description	ECA-ET139 / 30-60 / cm	ECA-ET140 / 30-60 / cm	ECA-ET174 / 30-60 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble						
Boron	Water Soluble	mg/kg	0.2	0.1	<0.1	0.1
Metals Strong Acid Digestion						
Mercury	Strong Acid Extractable	ug/g	<0.01	<0.01	<0.01	0.01
Antimony	Strong Acid Extractable	ug/g	<0.2	<0.2	<0.2	0.2
Arsenic	Strong Acid Extractable	ug/g	1.9	1.5	1.6	0.2
Barium	Strong Acid Extractable	ug/g	111	82	79	1
Beryllium	Strong Acid Extractable	ug/g	0.6	0.4	0.5	0.1
Cadmium	Strong Acid Extractable	ug/g	0.09	0.08	0.15	0.01
Chromium	Strong Acid Extractable	ug/g	29.3	21.4	22.0	0.5
Cobalt	Strong Acid Extractable	ug/g	8.4	7.5	7.3	0.1
Copper	Strong Acid Extractable	ug/g	14	9	9	1
Lead	Strong Acid Extractable	ug/g	7.7	6.8	6.6	0.1
Molybdenum	Strong Acid Extractable	ug/g	<1	<1	<1	1
Nickel	Strong Acid Extractable	ug/g	15.4	11.1	11.7	0.5
Selenium	Strong Acid Extractable	ug/g	<0.3	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	ug/g	0.1	0.1	0.1	0.1
Thallium	Strong Acid Extractable	ug/g	0.36	0.27	0.27	0.05
Tin	Strong Acid Extractable	ug/g	2	2	2	1
Vanadium	Strong Acid Extractable	ug/g	43.5	36.5	37.0	0.1
Zinc	Strong Acid Extractable	ug/g	59	46	47	1

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NWL Lot ID: **407159**
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	NWL Number	407159-22	407159-23	407159-24	
	Sample Date	Aug 30, 2005	Aug 30, 2005	Aug 28, 2005	
	Sample Description	ECA-ET174 / 30-60 / cm	ECA-ET174 / 60-90 / cm	ETHAZ2 / Concrete	
	Matrix	Soil - general	Soil - general	Miscellaneous	
Analyte	**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Polychlorinated Biphenyls - Soil					
Aroclor 1016 Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1221 Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1232 Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1242 Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1248 Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1254 Dry Weight	mg/kg	<0.1	<0.1	40.3	0.1
Aroclor 1260 Dry Weight	mg/kg	<0.1	<0.1	2.7	0.1
Aroclor 1262 Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1268 Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Total PCBs Dry Weight	mg/kg	<0.1	<0.1	43.0	0.1
Polychlorinated Biphenyls - Soil - Surrogate					
Decachlorobiphenyl Surrogate	%	114	74	108	50-150

	NWL Number	407159-23			
	Sample Date	Aug 30, 2005			
	Sample Description	ECA-ET174 / 60-90 / cm			
	Matrix	Soil - general			
Analyte	**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble					
Boron Water Soluble	mg/kg	<0.1			0.1

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NWL Lot ID: **407159**
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	NWL Number	407159-23	407159-25	407159-26	
	Sample Date	Aug 30, 2005	Aug 28, 2005	Aug 28, 2005	
	Sample Description	ECA-ET174 / 60-90 / cm	ETHAZ7 / Paint	ETHAZ8 / Paint	
	Matrix	Soil - general	Miscellaneous	Miscellaneous	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Metals Strong Acid Digestion						
Mercury	Strong Acid Extractable	ug/g	<0.01	-	-	0.01
Antimony	Strong Acid Extractable	ug/g	<0.2	-	-	0.2
Arsenic	Strong Acid Extractable	ug/g	1.4	-	-	0.2
Barium	Strong Acid Extractable	ug/g	76	-	-	1
Beryllium	Strong Acid Extractable	ug/g	0.4	-	-	0.1
Cadmium	Strong Acid Extractable	ug/g	0.18	-	-	0.01
Chromium	Strong Acid Extractable	ug/g	20.1	-	-	0.5
Cobalt	Strong Acid Extractable	ug/g	6.7	-	-	0.1
Copper	Strong Acid Extractable	ug/g	9	-	-	1
Lead	Strong Acid Extractable	ug/g	6.6	3900	4500	0.1
Molybdenum	Strong Acid Extractable	ug/g	<1	-	-	1
Nickel	Strong Acid Extractable	ug/g	10.8	-	-	0.5
Selenium	Strong Acid Extractable	ug/g	<0.3	-	-	0.3
Silver	Strong Acid Extractable	ug/g	0.1	-	-	0.1
Thallium	Strong Acid Extractable	ug/g	0.26	-	-	0.05
Tin	Strong Acid Extractable	ug/g	2	-	-	1
Vanadium	Strong Acid Extractable	ug/g	34.0	-	-	0.1
Zinc	Strong Acid Extractable	ug/g	43	-	-	1

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		NWL Number	407159-25	407159-26	407159-27	
		Sample Date	Aug 28, 2005	Aug 28, 2005	Aug 28, 2005	
		Sample Description	ETHAZ7 / Paint	ETHAZ8 / Paint	ETHAZ9 / Paint	
		Matrix	Miscellaneous	Miscellaneous	Miscellaneous	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Polychlorinated Biphenyls - Oil						
Aroclor 1016		mg/kg	<0.5	<0.5	<0.5	0.5
Aroclor 1221		mg/kg	<0.5	<0.5	<0.5	0.5
Aroclor 1232		mg/kg	<0.5	<0.5	<0.5	0.5
Aroclor 1242		mg/kg	<0.5	<0.5	<0.5	0.5
Aroclor 1248		mg/kg	<0.5	<0.5	<0.5	0.5
Aroclor 1254		mg/kg	78.2	157	19.5	0.5
Aroclor 1260		mg/kg	<0.5	9.5	<0.5	0.5
Aroclor 1262		mg/kg	<0.5	<0.5	<0.5	0.5
Aroclor 1268		mg/kg	<0.5	<0.5	<0.5	0.5
Total PCBs		mg/kg	78.2	166.5	19.5	0.5
Polychlorinated Biphenyls - Oil - Surrogate						
Decachlorobiphenyl	Surrogate	%	120	107	112	50-150

		NWL Number	407159-27	407159-29	407159-30	
		Sample Date	Aug 28, 2005	Aug 28, 2005	Aug 28, 2005	
		Sample Description	ETHAZ9 / Paint	ETHAZ13 / Paint	ETHAZ14 / Paint	
		Matrix	Miscellaneous	Miscellaneous	Miscellaneous	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Metals Strong Acid Digestion						
Lead	Strong Acid Extractable	ug/g	128000	91500	2700	0.1

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			NWL Number	407159-28	407159-31		
			Sample Date	Aug 28, 2005	Aug 28, 2005		
			Sample Description	ETHAZ12 / Concrete	ETHAZ15 / Concrete		
			Matrix	Miscellaneous	Miscellaneous		
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Polychlorinated Biphenyls - Soil							
Aroclor 1016	Dry Weight	mg/kg		<0.1	<0.1		0.1
Aroclor 1221	Dry Weight	mg/kg		<0.1	<0.1		0.1
Aroclor 1232	Dry Weight	mg/kg		<0.1	<0.1		0.1
Aroclor 1242	Dry Weight	mg/kg		<0.1	<0.1		0.1
Aroclor 1248	Dry Weight	mg/kg		<0.1	<0.1		0.1
Aroclor 1254	Dry Weight	mg/kg		3.8	<0.1		0.1
Aroclor 1260	Dry Weight	mg/kg		0.5	<0.1		0.1
Aroclor 1262	Dry Weight	mg/kg		<0.1	<0.1		0.1
Aroclor 1268	Dry Weight	mg/kg		<0.1	<0.1		0.1
Total PCBs	Dry Weight	mg/kg		4.3	<0.1		0.1
Polychlorinated Biphenyls - Soil - Surrogate							
Decachlorobiphenyl	Surrogate	%		69	96		50-150

			NWL Number	407159-29	407159-30	407159-32	
			Sample Date	Aug 28, 2005	Aug 28, 2005	Aug 28, 2005	
			Sample Description	ETHAZ13 / Paint	ETHAZ14 / Paint	ETHAZ16 / Paint	
			Matrix	Miscellaneous	Miscellaneous	Miscellaneous	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Polychlorinated Biphenyls - Oil							
Aroclor 1016		mg/kg		<0.5	<0.5	<0.5	0.5
Aroclor 1221		mg/kg		<0.5	<0.5	<0.5	0.5
Aroclor 1232		mg/kg		<0.5	<0.5	<0.5	0.5
Aroclor 1242		mg/kg		<0.5	<0.5	<50	0.5
Aroclor 1248		mg/kg		<0.5	<0.5	<50	0.5
Aroclor 1254		mg/kg		1.0	1.5	<0.5	0.5
Aroclor 1260		mg/kg		<0.5	<0.5	<50	0.5
Aroclor 1262		mg/kg		<0.5	<0.5	<0.5	0.5
Aroclor 1268		mg/kg		<0.5	<0.5	<0.5	0.5
Total PCBs		mg/kg		1.0	1.5	<0.5	0.5
Polychlorinated Biphenyls - Oil - Surrogate							
Decachlorobiphenyl	Surrogate	%		110	119	>150	50-150

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NWL Number	407159-32
Sample Date	Aug 28, 2005
Sample Description	ETHAZ16 / Paint
Matrix	Miscellaneous

Analyte		Units	Results	Results	Results	Detection Limit
Metals Strong Acid Digestion						
Lead	Strong Acid Extractable	ug/g	84800			0.1

Approved by:

Randy Neumann, BSc
Vice President, Environmental

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Quality Control

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Hot Water Soluble

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Boron	mg/kg	<0.1	0.0	0.0	0.0	✓
Material Used:	Edmonton Method Blank					
Date Acquired:	Sep 14, 2005					
Acquired By:	Bvul Sim					

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Boron	mg/kg	0.6	0.6	10.0	0.1	✓
Material Used:	Edmonton Duplicate					
Date Acquired:	Sep 12, 2005					
Acquired By:	Fernando Maglalang					

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Boron	mg/kg	1.4	1.4	1.0	1.8	✓
Material Used:	2001 Farm Soil Standard					
Date Acquired:	Sep 12, 2005					
Acquired By:	Fernando Maglalang					

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Metals Strong Acid Digestion

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Mercury	ug/g	<0.00	0.00	0.00	0.00	✓
Antimony	ug/g	<0.0	0.0	0.0	0.0	✓
Arsenic	ug/g	<0.0	0.0	-0.1	0.2	✓
Barium	ug/g	<0	1	-2	3	✓
Beryllium	ug/g	<0.0	0.0	0.0	0.0	✓
Cadmium	ug/g	0.00	0.00	-0.03	0.03	✓
Chromium	ug/g	<0.0	-0.3	-1.5	0.9	✓
Cobalt	ug/g	<0.0	0.0	-0.1	0.1	✓
Copper	ug/g	<0	0	-1	1	✓
Lead	ug/g	<0.0	0.1	-0.2	0.4	✓
Molybdenum	ug/g	<0	0	0	0	✓
Nickel	ug/g	<0.0	-0.2	-1.7	1.2	✓
Selenium	ug/g	<0.0	0.0	-0.3	0.2	✓
Silver	ug/g	<0.0	0.0	0.0	0.0	✓
Thallium	ug/g	<0.00	0.00	-0.01	0.01	✓
Tin	ug/g	0	2	2	3	✓
Vanadium	ug/g	<0.0	0.0	-0.2	0.3	✓
Zinc	ug/g	0	0	-3	3	✓

Material Used: Edmonton Method Blank
Date Acquired: Sep 12, 2005
Acquired By: Linda Li

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Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407159**
Control Number: E 241007
Date Received: Sep 09, 2005
Date Reported: Sep 20, 2005
Report Number: 744448

Metals Strong Acid Digestion (Continued...)

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	ug/g	0.03	0.04	9.99	0.03	✓
Antimony	ug/g	<0.2	<0.2	20.0	0.4	✓
Arsenic	ug/g	1.4	1.6	20.0	0.4	✓
Barium	ug/g	76	72	20	2	✓
Beryllium	ug/g	0.4	0.4	20.0	0.2	✓
Cadmium	ug/g	0.18	0.15	20.01	0.02	✓
Chromium	ug/g	20.1	20.5	20.0	1.1	✓
Cobalt	ug/g	6.7	6.6	20.0	0.2	✓
Copper	ug/g	9	9	20	2	✓
Lead	ug/g	6.6	6.3	20.0	0.2	✓
Molybdenum	ug/g	<1	<1	20	2	✓
Nickel	ug/g	10.8	10.5	20.0	1.1	✓
Selenium	ug/g	<0.3	<0.3	20.0	0.7	✓
Silver	ug/g	0.1	<0.1	20.0	0.2	✓
Thallium	ug/g	0.26	0.25	20.01	0.11	✓
Tin	ug/g	2	2	20	2	✓
Vanadium	ug/g	34.0	34.2	20.0	0.2	✓
Zinc	ug/g	43	44	20	2	✓

Material Used: Edmonton Duplicate
Date Acquired: Sep 12, 2005
Acquired By: Linda Li

NORWEST LABS

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

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Metals Strong Acid Digestion (Continued...)

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Mercury	ug/g	1.53	1.45	1.18	1.72	✓
Antimony	ug/g	<0.2	0.2	0.1	0.3	✓
Arsenic	ug/g	17.4	16.8	14.1	19.5	✓
Barium	ug/g	440	406	330	482	✓
Beryllium	ug/g	1	0.9	0.7	1.1	✓
Cadmium	ug/g	0.43	0.38	0.30	0.45	✓
Chromium	ug/g	83.4	84.7	69.4	100.0	✓
Cobalt	ug/g	14.1	13.4	11.1	15.7	✓
Copper	ug/g	32	33	27	39	✓
Lead	ug/g	14.4	13.4	11.0	15.8	✓
Molybdenum	ug/g	<1	1	1	1	✓
Nickel	ug/g	81.9	81.8	68.5	95.1	✓
Selenium	ug/g	1.6	1.2	0.5	1.9	✓
Silver	ug/g	0.4	0.4	0.2	0.5	✓
Thallium	ug/g	0.36	0.35	0.28	0.41	✓
Tin	ug/g	<1	1	1	1	✓
Vanadium	ug/g	84.3	83.3	63.7	103.0	✓
Zinc	ug/g	110	103	85	121	✓

Material Used: Metals Soils
Date Acquired: Sep 12, 2005
Acquired By: Linda Li

Mono-Aromatic Hydrocarbons - Soil

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Benzene	ng	49.3	50.00	98.60	77.50-122.50	✓
Toluene	ng	52.0	50.00	104.00	77.50-122.50	✓
Ethylbenzene	ng	51.8	50.00	103.60	77.50-122.50	✓
Total Xylenes (m,p,o)	ng	154.0	150.00	102.67	77.50-122.50	✓

Material Used: Calibration Check - BTEX
Date Acquired: Sep 12, 2005
Acquired By: Neil Wood

Matrix Spike	Units	Measured	Actual	% Recovery	Criteria (%)	Passed QC
F1 C6-C10	mg/kg	57	49	113	40-160	✓

Material Used: Matrix Spike - F1
Date Acquired: Sep 12, 2005
Acquired By: Neil Wood

Volatile Petroleum Hydrocarbons - Soil

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
F1 C6-C10	mg/kg	57	58	45		✓

Material Used: Duplicate - Run 2 - F1
Date Acquired: Sep 12, 2005
Acquired By: Neil Wood

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Extractable Petroleum Hydrocarbons - Soxhlet

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
F2 C10-C16	mg/kg	<10	0	-15	15	✓
F3 C16-C34	mg/kg	<10	0	-15	15	✓
F4HTGC C34-C50+	mg/kg	<10	0	-15	15	✓
Material Used:	Method Blank - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	My Linh Nguyen					

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
F2 C10-C16	ug/mL	85.3	90	95	78-123	✓
F3 C16-C34	ug/mL	672.8	710	95	78-123	✓
F4HTGC C34-C50+	ug/mL	189.5	200	95	78-123	✓
Material Used:	Calibration Check - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	My Linh Nguyen					

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
F2 C10-C16	mg/kg	390	420	30	0	✓
F3 C16-C34	mg/kg	670	710	30	0	✓
F4HTGC C34-C50+	mg/kg	200	200	30	0	✓
Material Used:	Duplicate - Run 2 - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	My Linh Nguyen					

Matrix Spike	Units	Measured	Actual	% Recovery	Criteria (%)	Passed QC
F2 C10-C16	mg/kg	390	407	97	40-160	✓
F3 C16-C34	mg/kg	670	644	104	40-160	✓
F4HTGC C34-C50+	mg/kg	200	164	119	40-160	✓
Material Used:	Matrix Spike - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	My Linh Nguyen					

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Polynuclear Aromatic Hydrocarbons - Soil

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Naphthalene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Acenaphthylene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Acenaphthene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Fluorene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Phenanthrene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Anthracene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Fluoranthene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Pyrene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Benzo(a)anthracene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Chrysene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Benzo(b)fluoranthene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Benzo(k)fluoranthene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Benzo(a)pyrene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Dibenzo(a,h)anthracene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Benzo(g,h,i)perylene	mg/kg	<0.05	0.00	-0.08	0.08	✓

Material Used: Method Blank - SV
Date Acquired: Sep 13, 2005
Acquired By: Inna Kazakov

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Naphthalene	ug/mL	480.0	500.00	96.00	70.00-130.00	✓
Acenaphthylene	ng/mL	513.0	500.00	102.60	70.00-130.00	✓
Acenaphthene	ng/mL	498.0	500.00	99.60	70.00-130.00	✓
Fluorene	ng/mL	465.0	500.00	93.00	70.00-130.00	✓
Phenanthrene	ng/mL	431.0	500.00	86.20	70.00-130.00	✓
Anthracene	ng/mL	486.0	500.00	97.20	70.00-130.00	✓
Fluoranthene	ng/mL	493.0	500.00	98.60	70.00-130.00	✓
Pyrene	ng/mL	481.0	500.00	96.20	70.00-130.00	✓
Benzo(a)anthracene	ng/mL	517.0	500.00	103.40	70.00-130.00	✓
Chrysene	ng/mL	458.0	500.00	91.60	70.00-130.00	✓
Benzo(b)fluoranthene	ng/mL	463.0	500.00	92.60	70.00-130.00	✓
Benzo(k)fluoranthene	ng/mL	445.0	500.00	89.00	70.00-130.00	✓
Benzo(a)pyrene	ng/mL	457.0	500.00	91.40	70.00-130.00	✓
Indeno(1,2,3-c,d)pyrene	ng/mL	535.0	500.00	107.00	70.00-130.00	✓
Dibenzo(a,h)anthracene	ng/mL	458.0	500.00	91.60	70.00-130.00	✓
Benzo(g,h,i)perylene	ng/mL	445.0	500.00	89.00	70.00-130.00	✓

Material Used: Standard - PAHs
Date Acquired: Sep 13, 2005
Acquired By: Inna Kazakov

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PAH - Soil - Surrogate Recovery

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Nitrobenzene-d5	%	89	77	-4	157	✓
2-Fluorobiphenyl	%	88	80	5	155	✓
p-Terphenyl-d14	%	98	78	-12	167	✓

Material Used: Method Blank - SV
Date Acquired: Sep 13, 2005
Acquired By: Inna Kazakov

Polychlorinated Biphenyls - Soil

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Aroclor 1016	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1221	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1232	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1242	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1248	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1254	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1260	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1262	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1268	mg/kg	<0.1	0.0	-0.3	0.3	✓

Material Used: Method Blank - SV
Date Acquired: Sep 12, 2005
Acquired By: Inna Kazakov

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Aroclor 1254	ug/mL	0.9	1.0	90.0	70.0-130.0	✓
Aroclor 1260	ug/mL	1.0	1.0	100.0	70.0-130.0	✓

Material Used: Calibration Check - PCBs
Date Acquired: Sep 12, 2005
Acquired By: Inna Kazakov

Polychlorinated Biphenyls - Soil - Surrogate

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Decachlorobiphenyl	%	84	100	10	190	✓

Material Used: Method Blank - SV
Date Acquired: Sep 12, 2005
Acquired By: Inna Kazakov

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Polychlorinated Biphenyls - Oil

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Aroclor 1016	mg/kg	<0.5	0.0	-1.5	1.5	✓
Aroclor 1221	mg/kg	<0.5	0.0	-1.5	1.5	✓
Aroclor 1232	mg/kg	<0.5	0.0	-1.5	1.5	✓
Aroclor 1242	mg/kg	<0.5	0.0	-1.5	1.5	✓
Aroclor 1248	mg/kg	<0.5	0.0	-1.5	1.5	✓
Aroclor 1254	mg/kg	<0.5	0.0	-1.5	1.5	✓
Aroclor 1260	mg/kg	<0.5	0.0	-1.5	1.5	✓
Aroclor 1262	mg/kg	<0.5	0.0	-1.5	1.5	✓
Aroclor 1268	mg/kg	<0.5	0.0	-1.5	1.5	✓
Material Used:	Method Blank - SV					
Date Acquired:	Sep 15, 2005					
Acquired By:	Inna Kazakov					

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Aroclor 1254	ug/mL	1.0	1.0	100.0	70.0-130.0	✓
Aroclor 1260	ug/mL	1.0	1.0	100.0	70.0-130.0	✓
Material Used:	Calibration Check - PCBs					
Date Acquired:	Sep 15, 2005					
Acquired By:	Inna Kazakov					

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Aroclor 1016	mg/kg	<0.5	<0.5	15.0	1.0	✓
Aroclor 1221	mg/kg	<0.5	<0.5	15.0	1.0	✓
Aroclor 1232	mg/kg	<0.5	<0.5	15.0	1.0	✓
Aroclor 1242	mg/kg	<0.5	<0.5	15.0	1.0	✓
Aroclor 1248	mg/kg	<0.5	<0.5	15.0	1.0	✓
Aroclor 1254	mg/kg	0.9	0.7	15.0	1.0	✓
Aroclor 1260	mg/kg	<0.5	<0.5	15.0	1.0	✓
Aroclor 1262	mg/kg	<0.5	<0.5	15.0	1.0	✓
Aroclor 1268	mg/kg	<0.5	<0.5	15.0	1.0	✓
Material Used:	Duplicate - Run 2 - SV					
Date Acquired:	Sep 15, 2005					
Acquired By:	Inna Kazakov					

Polychlorinated Biphenyls - Oil - Surrogate

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Decachlorobiphenyl	%	100	100	10	190	✓
Material Used:	Method Blank - SV					
Date Acquired:	Sep 15, 2005					
Acquired By:	Inna Kazakov					

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Method of Analysis:

MethodName	Reference		Method	Date Analysis Started	Location
Boron in general soil	McKeague	*	Hot Water Soluble Boron - Azomethine-H Method, 4.61	14-Sep-05	Norwest Labs Edmonton
Boron in general soil	McKeague	*	Hot Water Soluble Boron - Azomethine-H Method, 4.61	13-Sep-05	Norwest Labs Edmonton
BTEX-CCME - Soil	CCME		Reference Method - Canada-Wide Standard for PHC in Soil, CWS PHC	14-Sep-05	Norwest Labs Calgary
Mercury (Hot Block) in Soil	US EPA	*	Determination of Hg in Sediment by Cold Vapor Atomic Absorption Spec, 245.5	12-Sep-05	Norwest Labs Edmonton
Metals ICP-MS (Hot Block) in soil	SW-846	*	Acid Digestion of Sediments, Sludges, and Soils, EPA 3050B	12-Sep-05	Norwest Labs Edmonton
Metals ICP-MS (Hot Block) in soil	SW-846	*	Acid Digestion of Sediments, Sludges, and Soils, EPA 3050B	16-Sep-05	Norwest Labs Edmonton
PAH - Soil	US EPA	*	Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry, 8270	16-Sep-05	Norwest Labs Calgary
PCB - Oil	US EPA	*	US EPA method, 8082	19-Sep-05	Norwest Labs Calgary
PCB - Oil	US EPA	*	US EPA method, 8082	20-Sep-05	Norwest Labs Calgary
PCB - Soil	US EPA	*	US EPA method, 8082	19-Sep-05	Norwest Labs Calgary
TEH-CCME-Soil (Soxhlet)	CCME		Reference Method - Canada-Wide Standard for PHC in Soil, CWS PHC	15-Sep-05	Norwest Labs Calgary

Please direct any inquiries regarding this report to our Client Services group.
Results relate only to samples as submitted

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* Norwest method(s) is based on reference method

References:

CCME	Canadian Council of Ministers of the Environment
McKeague	Manual on Soil Sampling and Methods of Analysis
SW-846	Test Methods for Evaluating Solid Waste
US EPA	US Environmental Protection Agency Test Methods

Comments:

>130 - The surrogate recovery is higher then the range (23-130)% due to interference of Nitrobenzene-d5 with other hydrocarbons contained in the sample.IK 05/09/16
>150 - The surrogate recovery is higher then the range (50-150)% possibly due to matrix interference . IK 05/09/20
Talked with Leigh P. In regards to the holding time, Samples are compromised due to the holding time being over the 7 day recommendation. Leigh P will get in touch with client in regards to the holding time.
The detection limit for pcb analysis of the sample #32 was increased due to matrix interference. The sample has chromatographic interference in the retention time range of arochlor 1254 , which could mask this arochlor in the sample. Therefore the detection limit was increased. Ik 05/09/20

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Petroleum Hydrocarbons in Soil

Batch Notes

1. The method used complies with the Reference Method for the Canada Wide Standards for Petroleum Hydrocarbons in Soil - Tier 1, April 2001 and is accredited for use in Norwest laboratories.
2. Modifications of the method: See Notes and Methodology for Non-conformances (if Applicable).
3. Qualifications on results: See Notes and Methodology for Non-conformances (if applicable).
4. Silica gel treatment is done for fractions F2, F3, F4.
5. F1-BTEX: BTEX has been subtracted from the F1 fraction.
6. F2-naphth and F3-PAH: selected PAHs have been subtracted from the appropriate fractions.
7. F4HTGC is reported when more than 5% of the total carbon envelope elutes past C50.
8. Gravimetric Heavy Hydrocarbons are not reported anymore in Alberta, F4 high temperature is reported instead.
9. When both F4(C34-C50) and FHTGC are reported, F4HTGC is the F4 that is to be used for interpreting the CWS.
10. Quality criteria met for the batch: Data is reported in Quality Control Section of report (if requested).
    -nC6 and nC10 response factors (RF) are within 30% of RF for toluene
    -nC10,nC16 and nC34 RFs are within 10% of each other
    -nC50 RF is within 70% of the average RF for NC10+nC16+nC16+nC34
    -linearity is within 15%
11. Batch data for QC samples is available on request.
12. Extraction and analysis holding times were met: See Notes and Methodology for Non-conformances (if applicable).

Approved by: 

Randy Neumann, BSc
Vice President, Environmental

NORWEST LABS

4/07209

Control Number E 241005

Environmental Sample Information Sheet

NOTE: Proper completion of this form is required in order to proceed with analysis

See reverse for your nearest Norwest location and proper sampling protocol

Billing Address: x	**Copy of Report To:**	**Copy of invoice:** ☐
Company: Earth Tech Canada Inc.	Company: Earth Tech Canada Inc.	Mail invoice to this address for approval x
Address: 17203-103 Ave, Edmonton, AB T5S 1J4	Address: 17203-103 Ave, Edmonton, AB T5S 1J4	
QA/QC Report ☑		
Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-Service ☑	Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-service ☐	
Attention: Greg Wright	Attention: Greg Wright	
Phone: (780) 488-6800	Phone: (780) 488-6800	
Fax: (780) 488-2121	Fax: (780) 488-2121	
Cell:	Cell:	
e-mail: greg.wright@earthtech.ca	e-mail: greg.wright@earthtech.ca	

Information to be included on Report and Invoice

Project ID: 88122
Project Name: Phase III Arctic ESA
Project Location: Simpson Lake
Legal Location:
PO#:
Proj. Acct. Code:
Agreement ID: 62449

RUSH Please contact the laboratory to confirm rush dates and times before submitting samples.

Upon filling out this section, client accepts that surcharges will be attached to this analysis

Required on: all analyses **or** as indicated ☐ or ☐

Date Required: _____

Signature: _____

Norwest Authorization: _____

Sample Custody (Please Print)

Relinquished by: Greg Wright

Company ETC Signature

I authorize Norwest Labs to proceed with the work indicated on this form:

Date: Aug 29, 2005

Initial: GW.

Received by: ☐ Coolers

Waybill # Date ☐ Boxes

Company Time ☐ Samples

Received By: Date:

Company: Time:

Special Instructions / Comments ☐ Check here if Norwest is required to report results directly to a regulatory body (Please include contact information)

	Sample Identification	Location	Depth IN CM M	Date / Time Sampled	Matrix	Sampling Method	Number of Containers ↓	CCMES	PAH	
							Enter tests above (✓ relevant samples below)			
1	POL-ET125		0 – 30	Aug 27	soil	grab	2	✓	✓	
2	POL-ET125		140 – 150	"	"	"	2	✓	✓	
3	POL-ET126		0 – 30	"	"	"	2	✓	✓	
4	POL-ET126		100 – 120	"	"	"	2	✓	✓	
5	POL-ET127		0 – 30	"	"	"	2	✓	✓	
6	POL-ET127		50 – 90	"	"	"	2	✓	✓	
7	POL-ET128		0 – 30	"	"	"	2	✓	✓	
8	POL-ET128		90 – 100	"	"	"	2	✓	✓	
9	POL-ET129		0 – 30	"	"	"	2	✓	✓	
10	POL-ET129		40 – 60	"	"	"	2	✓	✓	
11	POL-ET130		0 – 30	"	"	"	2	✓	✓	
12	POL-ET130		80 – 90	"	"	"	2	✓	✓	
13	POL-ET131		0 – 30	"	"	"	2	✓	✓	
14	POL-ET131		40 – 70	"	"	"	2	✓	✓	
15	POL-ET132		0 – 30	"	"	"	2	✓	✓	

NOTE: All hazardous samples must be labelled according to WHMIS guidelines.

Accredited by the Standards Council of Canada for specific tests

NWL008 (08/03)

NORWEST LABS

407209

Control Number E 241006

Environmental Sample Information Sheet

NOTE: Proper completion of this form is required in order to proceed with analysis

See reverse for your nearest Norwest location and proper sampling protocol

Billing Address: x	**Copy of Report To:**	**Copy of invoice:** ☐
Company: Earth Tech Canada Inc.	Company: Earth Tech Canada Inc.	Mail invoice to this address for approval x ☐
Address: 17203-103 Ave, Edmonton, AB T5S 1J4	Address: 17203-103 Ave, Edmonton, AB T5S 1J4	
QA/QC Report ☑		
Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-Service ☑		Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-service ☐
Attention: Greg Wright	Attention: Greg Wright	
Phone: (780) 488-6800	Phone: (780) 488-6800	
Fax: (780) 488-2121	Fax: (780) 488-2121	
Cell:	Cell:	
e-mail: greg.wright@earthtech.ca	e-mail: greg.wright@earthtech.ca	

Information to be included on Report and Invoice

Project ID: 88122
Project Name: Phase III Arctic ESA
Project Location: Simpson Lake
Legal Location:
PO#:
Proj. Acct. Code:
Agreement ID: 62449

RUSH Please contact the laboratory to confirm rush dates and times before submitting samples.

Upon filling out this section, client accepts that surcharges will be attached to this analysis

Required on: all analyses or as indicated ☐ or ☐

Date Required: _____

Signature: _____

Norwest Authorization: _____

Sample Custody (Please Print)

Relinquished by: Greg Wright

Company ETC Signature: [signature]

I authorize Norwest Labs to proceed with the work indicated on this form:

Date: Aug 29, 2005

Initial: [initials]

Received by: ☐ Coolers

Waybill # Date ☐ Boxes

Company Time ☐ Samples

Special Instructions / Comments ☐ Check here if Norwest is required to report results directly to a regulatory body (Please include contact information)

Received By: Date:

Company: Time:

	Sample Identification	Location	Depth IN (CM) M	Date / Time Sampled	Matrix	Sampling Method	Number of Containers	CCMES	PAH	PCB	METALS
							↓	Enter tests above (✓ relevant samples below)			
1	POL-ET133	16	0 – 30	Aug 27	soil	grab	2	✓	✓		
2	BRN1-ET134	17	0 – 30	"	"	"	4	✓	✓	✓	✓
3	BRN1-ET134A	18	0 – 30	"	"	"	2	✓	✓		
4	BRN1-ET134	19	120 – 140	"	"	"	4	✓	✓	✓	✓
5	BRN1-ET135	20	0 – 30	"	"	"	4	✓	✓	✓	✓
6	BRN1-ET136	21	0 – 30	"	"	"	4	✓	✓	✓	✓
7	BRN1-ET137	22	0 – 30	"	"	"	4	✓	✓	✓	✓
8			–								
9			–								
10			–								
11			–								
12			–								
13			–								
14			–								
15			–								

NOTE: All hazardous samples must be labelled according to WHMIS guidelines.

Accredited by the Standards Council of Canada for specific tests

NWL008 (08/03)

Analytical Report

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407209**
Control Number: E 241005
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744605

			NWL Number	407209-1	407209-2	407209-3	
			Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
			Sample Description	POL-ET125 / 0-30 / cm	POL-ET125 / 140-150 / cm	POL-ET126 / 0-30 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Mono-Aromatic Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
Benzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Toluene	Dry Weight	mg/kg		<0.02	0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Total Xylenes (m,p,o)	Dry Weight	mg/kg		<0.02	0.77	<0.02	0.02
F1 -BTEX	Dry Weight	mg/kg		100	304	9	1
F1 C6-C10	Dry Weight	mg/kg		100	305	9	1
Volatile Petroleum Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F1 C6-C10	Dry Weight	mg/kg		100	305	9	1
F1 -BTEX	Dry Weight	mg/kg		100	304	9	1
Extractable Petroleum Hydrocarbons - Soxhlet							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F2 C10-C16	Dry Weight	mg/kg		3050	1700	590	10
F3 C16-C34	Dry Weight	mg/kg		150	160	150	10
F4 C34-C50	Dry Weight	mg/kg		20	40	20	10
F4HTGC C34-C50+	Dry Weight	mg/kg		30	60	20	10
% C50+		%		0.0	1.5	0.0	
Silica Gel Cleanup							
Silica Gel Cleanup				Done	Done	Done	
Soil % Moisture							
Moisture	Soil % Moisture	%		8.37	11.40	11.70	
Polynuclear Aromatic Hydrocarbons - Soil							
Naphthalene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Acenaphthylene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Acenaphthene	Dry Weight	mg/kg		0.06	0.20	<0.05	0.05
Fluorene	Dry Weight	mg/kg		<0.05	0.24	<0.05	0.05
Phenanthrene	Dry Weight	mg/kg		<0.05	0.29	<0.05	0.05
Anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Pyrene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(a)anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Chrysene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(b)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(j)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407209**
Control Number: E 241005
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744605

	NWL Number	407209-1	407209-2	407209-3	
	Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
	Sample Description	POL-ET125 / 0-30 / cm	POL-ET125 / 140-150 / cm	POL-ET126 / 0-30 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Polynuclear Aromatic Hydrocarbons - Soil - Conti						
Benzo(k)fluoranthene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(a)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Indeno(1,2,3-c,d)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Dibenzo(a,h)anthracene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(g,h,i)perylene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
CB(a)P	Carcinogenic Potency Equivalent	mg/kg	<0.0002	<0.0002	<0.0002	0.0002
PAH - Soil - Surrogate Recovery						
Nitrobenzene-d5	PAH - Surrogate	%	>130	>130	>130	23-130
2-Fluorobiphenyl	PAH - Surrogate	%	120	117	97	30-130
p-Terphenyl-d14	PAH - Surrogate	%	117	135	105	18-137

NORWEST LABS

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407209**
Control Number: E 241005
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744605

			NWL Number	407209-4	407209-5	407209-6	
			Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
			Sample Description	POL-ET126 / 100-120 / cm	POL-ET127 / 0-30 / cm	POL-ET127 / 50-90 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Mono-Aromatic Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
Benzene	Dry Weight	mg/kg		<0.02	<0.02	0.06	0.02
Toluene	Dry Weight	mg/kg		0.07	<0.02	0.79	0.02
Ethylbenzene	Dry Weight	mg/kg		0.17	<0.02	1.90	0.02
Total Xylenes (m,p,o)	Dry Weight	mg/kg		7.17	<0.02	11.2	0.02
F1 -BTEX	Dry Weight	mg/kg		188	41	628	1
F1 C6-C10	Dry Weight	mg/kg		195	41	642	1
Volatile Petroleum Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F1 C6-C10	Dry Weight	mg/kg		195	41	642	1
F1 -BTEX	Dry Weight	mg/kg		188	41	628	1
Extractable Petroleum Hydrocarbons - Soxhlet							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F2 C10-C16	Dry Weight	mg/kg		5070	860	4440	10
F3 C16-C34	Dry Weight	mg/kg		680	180	210	10
F4 C34-C50	Dry Weight	mg/kg		40	<10	<10	10
F4HTGC C34-C50+	Dry Weight	mg/kg		50	<10	<10	10
% C50+		%		0.2	0.0	0.0	
Silica Gel Cleanup							
Silica Gel Cleanup				Done	Done	Done	
Soil % Moisture							
Moisture	Soil % Moisture	%		12.70	11.10	13.90	
Polynuclear Aromatic Hydrocarbons - Soil							
Naphthalene	Dry Weight	mg/kg		4.91	<0.05	16.1	0.05
Acenaphthylene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Acenaphthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluorene	Dry Weight	mg/kg		0.18	<0.05	0.14	0.05
Phenanthrene	Dry Weight	mg/kg		0.85	<0.05	0.28	0.05
Anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Pyrene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(a)anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Chrysene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(b)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(j)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407209**
Control Number: E 241005
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744605

	NWL Number	407209-4	407209-5	407209-6	
	Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
	Sample Description	POL-ET126 / 100-120 / cm	POL-ET127 / 0-30 / cm	POL-ET127 / 50-90 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Polynuclear Aromatic Hydrocarbons - Soil - Conti						
Benzo(k)fluoranthene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(a)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Indeno(1,2,3-c,d)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Dibenzo(a,h)anthracene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(g,h,i)perylene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
CB(a)P	Carcinogenic Potency Equivalent	mg/kg	<0.0002	<0.0002	<0.0002	0.0002
PAH - Soil - Surrogate Recovery						
Nitrobenzene-d5	PAH - Surrogate	%	>130	>130	>130	23-130
2-Fluorobiphenyl	PAH - Surrogate	%	119	111	102	30-130
p-Terphenyl-d14	PAH - Surrogate	%	99	111	113	18-137

NORWEST LABS

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407209**
Control Number: E 241005
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744605

			NWL Number	407209-7	407209-8	407209-9	
			Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
			Sample Description	POL-ET128 / 0-30 / cm	POL-ET128 / 90-100 / cm	POL-ET129 / 0-30 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Mono-Aromatic Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
Benzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Toluene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Total Xylenes (m,p,o)	Dry Weight	mg/kg		<0.02	<0.02	3.00	0.02
F1 -BTEX	Dry Weight	mg/kg		9	<1	431	1
F1 C6-C10	Dry Weight	mg/kg		9	<1	434	1
Volatile Petroleum Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F1 C6-C10	Dry Weight	mg/kg		9	<1	434	1
F1 -BTEX	Dry Weight	mg/kg		9	<1	431	1
Extractable Petroleum Hydrocarbons - Soxhlet							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F2 C10-C16	Dry Weight	mg/kg		700	<10	16700	10
F3 C16-C34	Dry Weight	mg/kg		140	30	1250	10
F4 C34-C50	Dry Weight	mg/kg		<10	10	160	10
F4HTGC C34-C50+	Dry Weight	mg/kg		<10	10	260	10
% C50+		%		0.0	0.0	0.6	
Silica Gel Cleanup							
Silica Gel Cleanup				Done	Done	Done	
Soil % Moisture							
Moisture	Soil % Moisture	%		10.30	7.43	21.70	
Polynuclear Aromatic Hydrocarbons - Soil							
Naphthalene	Dry Weight	mg/kg		<0.05	<0.05	20.8	0.05
Acenaphthylene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Acenaphthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluorene	Dry Weight	mg/kg		<0.05	<0.05	0.61	0.05
Phenanthrene	Dry Weight	mg/kg		<0.05	<0.05	0.72	0.05
Anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Pyrene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(a)anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Chrysene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(b)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(j)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
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Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407209**
Control Number: E 241005
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744605

		NWL Number	407209-7	407209-8	407209-9	
		Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
		Sample Description	POL-ET128 / 0-30 / cm	POL-ET128 / 90-100 / cm	POL-ET129 / 0-30 / cm	
		Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Polynuclear Aromatic Hydrocarbons - Soil - Conti						
Benzo(k)fluoranthene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(a)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Indeno(1,2,3-c,d)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Dibenzo(a,h)anthracene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(g,h,i)perylene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
CB(a)P	Carcinogenic Potency Equivalent	mg/kg	<0.0002	<0.0002	<0.0002	0.0002
PAH - Soil - Surrogate Recovery						
Nitrobenzene-d5	PAH - Surrogate	%	>130	84	>130	23-130
2-Fluorobiphenyl	PAH - Surrogate	%	123	92	111	30-130
p-Terphenyl-d14	PAH - Surrogate	%	108	108	102	18-137

NORWEST LABS

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Phone: (780) 438-5522
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Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407209**
Control Number: E 241005
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744605

	NWL Number	407209-10	407209-11	407209-12	
	Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
	Sample Description	POL-ET129 / 40-60 / cm	POL-ET130 / 0-30 / cm	POL-ET130 / 80-90 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte	**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Mono-Aromatic Hydrocarbons - Soil					
Extraction Date		12-Sep-05	12-Sep-05	12-Sep-05	
Benzene Dry Weight	mg/kg	0.17	<0.02	<0.02	0.02
Toluene Dry Weight	mg/kg	4.77	<0.02	<0.02	0.02
Ethylbenzene Dry Weight	mg/kg	4.29	<0.02	<0.02	0.02
Total Xylenes (m,p,o) Dry Weight	mg/kg	39.4	<0.02	0.42	0.02
F1 -BTEX Dry Weight	mg/kg	1250	<1	64	1
F1 C6-C10 Dry Weight	mg/kg	1300	<1	64	1
Volatile Petroleum Hydrocarbons - Soil					
Extraction Date		12-Sep-05	12-Sep-05	12-Sep-05	
F1 C6-C10 Dry Weight	mg/kg	1300	<1	64	1
F1 -BTEX Dry Weight	mg/kg	1250	<1	64	1
Extractable Petroleum Hydrocarbons - Soxhlet					
Extraction Date		12-Sep-05	12-Sep-05	12-Sep-05	
F2 C10-C16 Dry Weight	mg/kg	6420	20	1870	10
F3 C16-C34 Dry Weight	mg/kg	380	30	150	10
F4 C34-C50 Dry Weight	mg/kg	10	<10	40	10
F4HTGC C34-C50+ Dry Weight	mg/kg	20	<10	60	10
% C50+	%	0.0	0.0	1.1	
Silica Gel Cleanup					
Silica Gel Cleanup		Done	Done	Done	
Soil % Moisture					
Moisture Soil % Moisture	%	9.74	8.31	10.10	
Polynuclear Aromatic Hydrocarbons - Soil					
Naphthalene Dry Weight	mg/kg	37.0	<0.05	<0.05	0.05
Acenaphthylene Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Acenaphthene Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Fluorene Dry Weight	mg/kg	0.56	<0.05	<0.05	0.05
Phenanthrene Dry Weight	mg/kg	0.67	<0.05	0.05	0.05
Anthracene Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Fluoranthene Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Pyrene Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(a)anthracene Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Chrysene Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(b)fluoranthene Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(j)fluoranthene Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05

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Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407209**
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	NWL Number	407209-10	407209-11	407209-12	
	Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
	Sample Description	POL-ET129 / 40-60 / cm	POL-ET130 / 0-30 / cm	POL-ET130 / 80-90 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Polynuclear Aromatic Hydrocarbons - Soil - Conti						
Benzo(k)fluoranthene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(a)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Indeno(1,2,3-c,d)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Dibenzo(a,h)anthracene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(g,h,i)perylene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
CB(a)P	Carcinogenic Potency Equivalent	mg/kg	<0.0002	<0.0002	<0.0002	0.0002
PAH - Soil - Surrogate Recovery						
Nitrobenzene-d5	PAH - Surrogate	%	>130	92	>130	23-130
2-Fluorobiphenyl	PAH - Surrogate	%	114	87	100	30-130
p-Terphenyl-d14	PAH - Surrogate	%	113	99	108	18-137

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Sampled By: Greg Wright
Company: ETC

Project ID: 88122
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NWL Lot ID: **407209**
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Date Reported: Sep 19, 2005
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			NWL Number	407209-13	407209-14	407209-15	
			Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
			Sample Description	POL-ET131 / 0-30 / cm	POL-ET131 / 40-70 / cm	POL-ET132 / 0-30 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Mono-Aromatic Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
Benzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Toluene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Total Xylenes (m,p,o)	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
F1 -BTEX	Dry Weight	mg/kg		3	20	<1	1
F1 C6-C10	Dry Weight	mg/kg		3	20	<1	1
Volatile Petroleum Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F1 C6-C10	Dry Weight	mg/kg		3	20	<1	1
F1 -BTEX	Dry Weight	mg/kg		3	20	<1	1
Extractable Petroleum Hydrocarbons - Soxhlet							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F2 C10-C16	Dry Weight	mg/kg		140	120	<10	10
F3 C16-C34	Dry Weight	mg/kg		70	20	<10	10
F4 C34-C50	Dry Weight	mg/kg		20	<10	<10	10
F4HTGC C34-C50+	Dry Weight	mg/kg		30	<10	<10	10
% C50+		%		0.0	0.0	0.0	
Silica Gel Cleanup							
Silica Gel Cleanup				Done	Done	Done	
Soil % Moisture							
Moisture	Soil % Moisture	%		12.30	9.78	10.90	
Polynuclear Aromatic Hydrocarbons - Soil							
Naphthalene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Acenaphthylene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Acenaphthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluorene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Phenanthrene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Pyrene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(a)anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Chrysene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(b)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(j)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05

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Analytical Report

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Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407209**
Control Number: E 241005
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	NWL Number		407209-13	407209-14	407209-15	
	Sample Date		Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
	Sample Description		POL-ET131 / 0-30 / cm	POL-ET131 / 40-70 / cm	POL-ET132 / 0-30 / cm	
	Matrix		Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Polynuclear Aromatic Hydrocarbons - Soil - Conti						
Benzo(k)fluoranthene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(a)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Indeno(1,2,3-c,d)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Dibenzo(a,h)anthracene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(g,h,i)perylene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
CB(a)P	Carcinogenic Potency Equivalent	mg/kg	<0.0002	<0.0002	<0.0002	0.0002
PAH - Soil - Surrogate Recovery						
Nitrobenzene-d5	PAH - Surrogate	%	91	60	93	23-130
2-Fluorobiphenyl	PAH - Surrogate	%	100	95	94	30-130
p-Terphenyl-d14	PAH - Surrogate	%	108	130	116	18-137

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Sampled By: Greg Wright
Company: ETC

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NWL Lot ID: **407209**
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			NWL Number	407209-16	407209-17	407209-18	
			Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
			Sample Description	POL-ET133 / 0-30 / cm	BRN1-ET134 / 0-30 / cm	BRN1-ET134A / 0-30 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Mono-Aromatic Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
Benzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Toluene	Dry Weight	mg/kg		<0.02	0.02	0.02	0.02
Ethylbenzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Total Xylenes (m,p,o)	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
F1 -BTEX	Dry Weight	mg/kg		<1	3	5	1
F1 C6-C10	Dry Weight	mg/kg		<1	3	5	1
Volatile Petroleum Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F1 C6-C10	Dry Weight	mg/kg		<1	3	5	1
F1 -BTEX	Dry Weight	mg/kg		<1	3	5	1
Extractable Petroleum Hydrocarbons - Soxhlet							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F2 C10-C16	Dry Weight	mg/kg		<10	1840	1640	10
F3 C16-C34	Dry Weight	mg/kg		<10	11300	9530	10
F4 C34-C50	Dry Weight	mg/kg		<10	13300	10400	10
F4HTGC C34-C50+	Dry Weight	mg/kg		<10	14400	10800	10
% C50+		%		0.0	4.2	1.5	
Silica Gel Cleanup							
Silica Gel Cleanup				Done	Done	Done	
Soil % Moisture							
Moisture	Soil % Moisture	%		12.30	9.48	4.50	
Polynuclear Aromatic Hydrocarbons - Soil							
Naphthalene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Acenaphthylene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Acenaphthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluorene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Phenanthrene	Dry Weight	mg/kg		<0.05	0.09	0.15	0.05
Anthracene	Dry Weight	mg/kg		<0.05	0.06	0.07	0.05
Fluoranthene	Dry Weight	mg/kg		<0.05	0.70	0.78	0.05
Pyrene	Dry Weight	mg/kg		<0.05	0.96	1.06	0.05
Benzo(a)anthracene	Dry Weight	mg/kg		<0.05	0.15	0.15	0.05
Chrysene	Dry Weight	mg/kg		<0.05	0.25	0.26	0.05
Benzo(b)fluoranthene	Dry Weight	mg/kg		<0.05	0.16	0.19	0.05
Benzo(j)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05

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17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
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	NWL Number	407209-16	407209-17	407209-18	
	Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
	Sample Description	POL-ET133 / 0-30 / cm	BRN1-ET134 / 0-30 / cm	BRN1-ET134A / 0-30 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Polynuclear Aromatic Hydrocarbons - Soil - Conti						
Benzo(k)fluoranthene	Dry Weight	mg/kg	<0.05	0.21	0.19	0.05
Benzo(a)pyrene	Dry Weight	mg/kg	<0.05	0.24	0.23	0.05
Indeno(1,2,3-c,d)pyrene	Dry Weight	mg/kg	<0.05	0.20	0.19	0.05
Dibenzo(a,h)anthracene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(g,h,i)perylene	Dry Weight	mg/kg	<0.05	0.26	0.27	0.05
CB(a)P	Carcinogenic Potency Equivalent	mg/kg	<0.0002	0.3331	0.3221	0.0002
PAH - Soil - Surrogate Recovery						
Nitrobenzene-d5	PAH - Surrogate	%	72	61	60	23-130
2-Fluorobiphenyl	PAH - Surrogate	%	98	32	31	30-130
p-Terphenyl-d14	PAH - Surrogate	%	124	64	63	18-137

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Sampled By: Greg Wright
Company: ETC

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	NWL Number	407209-17	407209-19	407209-20	
	Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
	Sample Description	BRN1-ET134 / 0-30 / cm	BRN1-ET134 / 120-140 / cm	BRN1-ET135 / 0-30 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble						
Boron	Water Soluble	mg/kg	0.6	<0.1	0.2	0.1
Metals Strong Acid Digestion						
Mercury	Strong Acid Extractable	ug/g	<0.01	0.02	<0.01	0.01
Antimony	Strong Acid Extractable	ug/g	<0.2	<0.2	<0.2	0.2
Arsenic	Strong Acid Extractable	ug/g	1.6	0.7	1	0.2
Barium	Strong Acid Extractable	ug/g	112	1720	327	1
Beryllium	Strong Acid Extractable	ug/g	0.5	0.2	0.3	0.1
Cadmium	Strong Acid Extractable	ug/g	0.07	0.31	0.10	0.01
Chromium	Strong Acid Extractable	ug/g	22.9	9.7	12.6	0.5
Cobalt	Strong Acid Extractable	ug/g	7.2	3.1	4.3	0.1
Copper	Strong Acid Extractable	ug/g	10	4	9	1
Lead	Strong Acid Extractable	ug/g	6.3	10.6	6.3	0.1
Molybdenum	Strong Acid Extractable	ug/g	<1	<1	<1	1
Nickel	Strong Acid Extractable	ug/g	12.2	4.3	6.5	0.5
Selenium	Strong Acid Extractable	ug/g	<0.3	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	ug/g	0.1	<0.1	<0.1	0.1
Thallium	Strong Acid Extractable	ug/g	0.26	0.12	0.15	0.05
Tin	Strong Acid Extractable	ug/g	2	2	2	1
Vanadium	Strong Acid Extractable	ug/g	35.2	16.0	21.9	0.1
Zinc	Strong Acid Extractable	ug/g	47	81	39	1
Polychlorinated Biphenyls - Soil						
Aroclor 1016	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1221	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1232	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1242	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1248	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1254	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1260	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1262	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1268	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Total PCBs	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Polychlorinated Biphenyls - Soil - Surrogate						
Decachlorobiphenyl	Surrogate	%	92	74	73	50-150

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			NWL Number	407209-19	407209-20	407209-21	
			Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
			Sample Description	BRN1-ET134 / 120-140 / cm	BRN1-ET135 / 0-30 / cm	BRN1-ET136 / 0-30 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Mono-Aromatic Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
Benzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Toluene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Total Xylenes (m,p,o)	Dry Weight	mg/kg		0.06	<0.02	<0.02	0.02
F1 -BTEX	Dry Weight	mg/kg		6	<1	<1	1
F1 C6-C10	Dry Weight	mg/kg		6	<1	<1	1
Volatile Petroleum Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F1 C6-C10	Dry Weight	mg/kg		6	<1	<1	1
F1 -BTEX	Dry Weight	mg/kg		6	<1	<1	1
Extractable Petroleum Hydrocarbons - Soxhlet							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F2 C10-C16	Dry Weight	mg/kg		100	10	60	10
F3 C16-C34	Dry Weight	mg/kg		380	230	110	10
F4 C34-C50	Dry Weight	mg/kg		320	150	40	10
F4HTGC C34-C50+	Dry Weight	mg/kg		340	170	40	10
% C50+		%		3.5	5.4	0.0	
Silica Gel Cleanup							
Silica Gel Cleanup				Done	Done	Done	
Soil % Moisture							
Moisture	Soil % Moisture	%		11.60	16.60	11.50	
Polynuclear Aromatic Hydrocarbons - Soil							
Naphthalene	Dry Weight	mg/kg		0.15	<0.05	<0.05	0.05
Acenaphthylene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Acenaphthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluorene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Phenanthrene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Pyrene	Dry Weight	mg/kg		0.05	<0.05	<0.05	0.05
Benzo(a)anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Chrysene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(b)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(j)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05

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Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407209**
Control Number: E 241005
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744605

	NWL Number	407209-19	407209-20	407209-21	
	Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
	Sample Description	BRN1-ET134 / 120-140 / cm	BRN1-ET135 / 0-30 / cm	BRN1-ET136 / 0-30 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Polynuclear Aromatic Hydrocarbons - Soil - Conti						
Benzo(k)fluoranthene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(a)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Indeno(1,2,3-c,d)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Dibenzo(a,h)anthracene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(g,h,i)perylene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
CB(a)P	Carcinogenic Potency Equivalent	mg/kg	<0.0002	<0.0002	<0.0002	0.0002
PAH - Soil - Surrogate Recovery						
Nitrobenzene-d5	PAH - Surrogate	%	48	95	114	23-130
2-Fluorobiphenyl	PAH - Surrogate	%	104	96	89	30-130
p-Terphenyl-d14	PAH - Surrogate	%	119	115	109	18-137

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NWL Lot ID: **407209**
Control Number: E 241005
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Date Reported: Sep 19, 2005
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	NWL Number	407209-21	407209-22		
	Sample Date	Aug 27, 2005	Aug 27, 2005		
	Sample Description	BRN1-ET136 / 0-30 / cm	BRN1-ET137 / 0-30 / cm		
	Matrix	Soil - general	Soil - general		
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble						
Boron	Water Soluble	mg/kg	<0.1	0.6		0.1
Metals Strong Acid Digestion						
Mercury	Strong Acid Extractable	ug/g	<0.01	<0.01		0.01
Antimony	Strong Acid Extractable	ug/g	<0.2	<0.2		0.2
Arsenic	Strong Acid Extractable	ug/g	0.7	1.6		0.2
Barium	Strong Acid Extractable	ug/g	32	80		1
Beryllium	Strong Acid Extractable	ug/g	0.2	0.5		0.1
Cadmium	Strong Acid Extractable	ug/g	0.03	0.08		0.01
Chromium	Strong Acid Extractable	ug/g	6.0	23.2		0.5
Cobalt	Strong Acid Extractable	ug/g	2.8	7.2		0.1
Copper	Strong Acid Extractable	ug/g	4	11		1
Lead	Strong Acid Extractable	ug/g	4.0	7.3		0.1
Molybdenum	Strong Acid Extractable	ug/g	<1	<1		1
Nickel	Strong Acid Extractable	ug/g	3.4	12.0		0.5
Selenium	Strong Acid Extractable	ug/g	<0.3	<0.3		0.3
Silver	Strong Acid Extractable	ug/g	<0.1	<0.1		0.1
Thallium	Strong Acid Extractable	ug/g	0.09	0.27		0.05
Tin	Strong Acid Extractable	ug/g	2	2		1
Vanadium	Strong Acid Extractable	ug/g	14.5	37.3		0.1
Zinc	Strong Acid Extractable	ug/g	23	53		1
Polychlorinated Biphenyls - Soil						
Aroclor 1016	Dry Weight	mg/kg	<0.1	<0.1		0.1
Aroclor 1221	Dry Weight	mg/kg	<0.1	<0.1		0.1
Aroclor 1232	Dry Weight	mg/kg	<0.1	<0.1		0.1
Aroclor 1242	Dry Weight	mg/kg	<0.1	<0.1		0.1
Aroclor 1248	Dry Weight	mg/kg	<0.1	<0.1		0.1
Aroclor 1254	Dry Weight	mg/kg	<0.1	<0.1		0.1
Aroclor 1260	Dry Weight	mg/kg	<0.1	<0.1		0.1
Aroclor 1262	Dry Weight	mg/kg	<0.1	<0.1		0.1
Aroclor 1268	Dry Weight	mg/kg	<0.1	<0.1		0.1
Total PCBs	Dry Weight	mg/kg	<0.1	<0.1		0.1
Polychlorinated Biphenyls - Soil - Surrogate						
Decachlorobiphenyl	Surrogate	%	92	97		50-150

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Name: Phase III Arctic ESA
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NWL Lot ID: **407209**
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Report Number: 744605

NWL Number	407209-22
Sample Date	Aug 27, 2005
Sample Description	BRN1-ET137 / 0-30 / cm
Matrix	Soil - general

Analyte		Units	Results	Results	Results	Detection Limit
Mono-Aromatic Hydrocarbons - Soil						
Extraction Date			12-Sep-05			
Benzene	Dry Weight	mg/kg	<0.02			0.02
Toluene	Dry Weight	mg/kg	<0.02			0.02
Ethylbenzene	Dry Weight	mg/kg	<0.02			0.02
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.02			0.02
F1 -BTEX	Dry Weight	mg/kg	<1			1
F1 C6-C10	Dry Weight	mg/kg	<1			1
Volatile Petroleum Hydrocarbons - Soil						
Extraction Date			12-Sep-05			
F1 C6-C10	Dry Weight	mg/kg	<1			1
F1 -BTEX	Dry Weight	mg/kg	<1			1
Extractable Petroleum Hydrocarbons - Soxhlet						
Extraction Date			12-Sep-05			
F2 C10-C16	Dry Weight	mg/kg	280			10
F3 C16-C34	Dry Weight	mg/kg	10200			10
F4 C34-C50	Dry Weight	mg/kg	9530			10
F4HTGC C34-C50+	Dry Weight	mg/kg	10800			10
% C50+		%	6.0			
Silica Gel Cleanup						
Silica Gel Cleanup			Done			
Soil % Moisture						
Moisture	Soil % Moisture	%	11.80			
Polynuclear Aromatic Hydrocarbons - Soil						
Naphthalene	Dry Weight	mg/kg	<0.05			0.05
Acenaphthylene	Dry Weight	mg/kg	<0.05			0.05
Acenaphthene	Dry Weight	mg/kg	<0.05			0.05
Fluorene	Dry Weight	mg/kg	<0.05			0.05
Phenanthrene	Dry Weight	mg/kg	<0.05			0.05
Anthracene	Dry Weight	mg/kg	<0.05			0.05
Fluoranthene	Dry Weight	mg/kg	<0.05			0.05
Pyrene	Dry Weight	mg/kg	0.07			0.05
Benzo(a)anthracene	Dry Weight	mg/kg	<0.05			0.05
Chrysene	Dry Weight	mg/kg	0.07			0.05
Benzo(b)fluoranthene	Dry Weight	mg/kg	<0.05			0.05
Benzo(j)fluoranthene	Dry Weight	mg/kg	<0.05			0.05

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17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
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NWL Lot ID: **407209**
Control Number: E 241005
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NWL Number	407209-22
Sample Date	Aug 27, 2005
Sample Description	BRN1-ET137 / 0-30 / cm
Matrix	Soil - general

Analyte		Units	Results	Results	Results	Detection Limit
Polynuclear Aromatic Hydrocarbons - Soil - Conti						
Benzo(k)fluoranthene	Dry Weight	mg/kg	<0.05			0.05
Benzo(a)pyrene	Dry Weight	mg/kg	<0.05			0.05
Indeno(1,2,3-c,d)pyrene	Dry Weight	mg/kg	<0.05			0.05
Dibenzo(a,h)anthracene	Dry Weight	mg/kg	<0.05			0.05
Benzo(g,h,i)perylene	Dry Weight	mg/kg	<0.05			0.05
CB(a)P	Carcinogenic Potency Equivalent	mg/kg	0.0003			0.0002
PAH - Soil - Surrogate Recovery						
Nitrobenzene-d5	PAH - Surrogate	%	86			23-130
2-Fluorobiphenyl	PAH - Surrogate	%	96			30-130
p-Terphenyl-d14	PAH - Surrogate	%	109			18-137

Approved by:

Darren Crichton, BSc, PChem
Operations Chemist

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Quality Control

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ID: 88122
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Hot Water Soluble

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Boron	mg/kg	<0.0	0.0	0.0	0.0	✓
Material Used:	Edmonton Method Blank					
Date Acquired:	Sep 12, 2005					
Acquired By:	Fernando Maglalang					

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Boron	mg/kg	0.6	0.6	10.0	0.1	✓
Material Used:	Edmonton Duplicate					
Date Acquired:	Sep 12, 2005					
Acquired By:	Fernando Maglalang					

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Boron	mg/kg	1.4	1.4	1.0	1.8	✓
Material Used:	2001 Farm Soil Standard					
Date Acquired:	Sep 12, 2005					
Acquired By:	Fernando Maglalang					

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Project
ID: 88122
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NWL Lot ID: **407209**
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Date Received: Sep 09, 2005
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Metals Strong Acid Digestion

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Mercury	ug/g	<0.00	0.00	0.00	0.00	✓
Antimony	ug/g	<0.0	0.0	0.0	0.0	✓
Arsenic	ug/g	<0.0	0.0	-0.1	0.2	✓
Barium	ug/g	<0	1	-2	3	✓
Beryllium	ug/g	<0.0	0.0	0.0	0.0	✓
Cadmium	ug/g	0.00	0.00	-0.03	0.03	✓
Chromium	ug/g	<0.0	-0.3	-1.5	0.9	✓
Cobalt	ug/g	<0.0	0.0	-0.1	0.1	✓
Copper	ug/g	<0	0	-1	1	✓
Lead	ug/g	<0.0	0.1	-0.2	0.4	✓
Molybdenum	ug/g	<0	0	0	0	✓
Nickel	ug/g	<0.0	-0.2	-1.7	1.2	✓
Selenium	ug/g	<0.0	0.0	-0.3	0.2	✓
Silver	ug/g	<0.0	0.0	0.0	0.0	✓
Thallium	ug/g	<0.00	0.00	-0.01	0.01	✓
Tin	ug/g	0	2	2	3	✓
Vanadium	ug/g	<0.0	0.0	-0.2	0.3	✓
Zinc	ug/g	0	0	-3	3	✓

Material Used: Edmonton Method Blank
Date Acquired: Sep 12, 2005
Acquired By: Linda Li

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NWL Lot ID: **407209**
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Metals Strong Acid Digestion (Continued...)

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	ug/g	0.03	0.04	9.99	0.03	✓
Antimony	ug/g	<0.2	<0.2	20.0	0.4	✓
Arsenic	ug/g	1.4	1.6	20.0	0.4	✓
Barium	ug/g	76	72	20	2	✓
Beryllium	ug/g	0.4	0.4	20.0	0.2	✓
Cadmium	ug/g	0.18	0.15	20.01	0.02	✓
Chromium	ug/g	20.1	20.5	20.0	1.1	✓
Cobalt	ug/g	6.7	6.6	20.0	0.2	✓
Copper	ug/g	9	9	20	2	✓
Lead	ug/g	6.6	6.3	20.0	0.2	✓
Molybdenum	ug/g	<1	<1	20	2	✓
Nickel	ug/g	10.8	10.5	20.0	1.1	✓
Selenium	ug/g	<0.3	<0.3	20.0	0.7	✓
Silver	ug/g	0.1	<0.1	20.0	0.2	✓
Thallium	ug/g	0.26	0.25	20.01	0.11	✓
Tin	ug/g	2	2	20	2	✓
Vanadium	ug/g	34.0	34.2	20.0	0.2	✓
Zinc	ug/g	43	44	20	2	✓

Material Used: Edmonton Duplicate
Date Acquired: Sep 12, 2005
Acquired By: Linda Li

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Metals Strong Acid Digestion (Continued...)

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Mercury	ug/g	1.53	1.45	1.18	1.72	✓
Antimony	ug/g	<0.2	0.2	0.1	0.3	✓
Arsenic	ug/g	17.4	16.8	14.1	19.5	✓
Barium	ug/g	440	406	330	482	✓
Beryllium	ug/g	1	0.9	0.7	1.1	✓
Cadmium	ug/g	0.43	0.38	0.30	0.45	✓
Chromium	ug/g	83.4	84.7	69.4	100.0	✓
Cobalt	ug/g	14.1	13.4	11.1	15.7	✓
Copper	ug/g	32	33	27	39	✓
Lead	ug/g	14.4	13.4	11.0	15.8	✓
Molybdenum	ug/g	<1	1	1	1	✓
Nickel	ug/g	81.9	81.8	68.5	95.1	✓
Selenium	ug/g	1.6	1.2	0.5	1.9	✓
Silver	ug/g	0.4	0.4	0.2	0.5	✓
Thallium	ug/g	0.36	0.35	0.28	0.41	✓
Tin	ug/g	<1	1	1	1	✓
Vanadium	ug/g	84.3	83.3	63.7	103.0	✓
Zinc	ug/g	110	103	85	121	✓

Material Used: Metals Soils
Date Acquired: Sep 12, 2005
Acquired By: Linda Li

NORWEST LABS

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Mono-Aromatic Hydrocarbons - Soil

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Benzene	ng	49.1	50.00	98.20	77.50-122.50	✓
Toluene	ng	48.3	50.00	96.60	77.50-122.50	✓
Ethylbenzene	ng	47.0	50.00	94.00	77.50-122.50	✓
Total Xylenes (m,p,o)	ng	141.0	150.00	94.00	77.50-122.50	✓
Material Used:	Calibration Check - BTEX					
Date Acquired:	Sep 12, 2005					
Acquired By:	Paul Cushing					

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Benzene	mg/kg	0.92	0.92	45.00		✓
Toluene	mg/kg	0.91	0.91	45.00		✓
Ethylbenzene	mg/kg	0.98	0.98	45.00		✓
Total Xylenes (m,p,o)	mg/kg	2.89	2.91	45.00		✓
Material Used:	Duplicate - Run 2 - BTEX					
Date Acquired:	Sep 12, 2005					
Acquired By:	Paul Cushing					

Matrix Spike	Units	Measured	Actual	% Recovery	Criteria (%)	Passed QC
Benzene	mg/kg	0.92	0.99	92.93	40.00-160.00	✓
Toluene	mg/kg	0.91	0.99	91.92	40.00-160.00	✓
Ethylbenzene	mg/kg	0.98	0.99	98.99	40.00-160.00	✓
Total Xylenes (m,p,o)	mg/kg	2.89	2.96	97.64	40.00-160.00	✓
Material Used:	Matrix Spike - BTEX					
Date Acquired:	Sep 12, 2005					
Acquired By:	Paul Cushing					
F1 C6-C10	mg/kg	58	46		40-160	✓
Material Used:	Matrix Spike - F1					
Date Acquired:	Sep 12, 2005					
Acquired By:	Paul Cushing					

Volatile Petroleum Hydrocarbons - Soil

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
F1 C6-C10	mg/kg	58	58	45		✓
Material Used:	Duplicate - Run 2 - F1					
Date Acquired:	Sep 12, 2005					
Acquired By:	Paul Cushing					

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Quality Control

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Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
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Acct. Code:

NWL Lot ID: **407209**
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Extractable Petroleum Hydrocarbons - Soxhlet

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
F2 C10-C16	mg/kg	<10	0	-15	15	✓
F3 C16-C34	mg/kg	<10	0	-15	15	✓
F4HTGC C34-C50+	mg/kg	<10	0	-15	15	✓
Material Used:	Method Blank - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	Nancy Yeung					

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
F2 C10-C16	ug/mL	86.5	90	96	78-123	✓
F3 C16-C34	ug/mL	682.0	710	96	78-123	✓
F4HTGC C34-C50+	ug/mL	192.1	200	96	78-123	✓
Material Used:	Calibration Check - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	Nancy Yeung					

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
F2 C10-C16	mg/kg	390	420	30	0	✓
F3 C16-C34	mg/kg	670	710	30	0	✓
F4HTGC C34-C50+	mg/kg	200	200	30	0	✓
Material Used:	Duplicate - Run 2 - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	My Linh Nguyen					

Matrix Spike	Units	Measured	Actual	% Recovery	Criteria (%)	Passed QC
F2 C10-C16	mg/kg	390	407	97	40-160	✓
F3 C16-C34	mg/kg	670	644	104	40-160	✓
F4HTGC C34-C50+	mg/kg	200	164	119	40-160	✓
Material Used:	Matrix Spike - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	My Linh Nguyen					

NORWEST LABS

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407209**
Control Number: E 241005
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744605

Polynuclear Aromatic Hydrocarbons - Soil

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Naphthalene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Acenaphthylene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Acenaphthene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Fluorene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Phenanthrene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Anthracene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Fluoranthene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Pyrene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Benzo(a)anthracene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Chrysene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Benzo(b)fluoranthene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Benzo(k)fluoranthene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Benzo(a)pyrene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Dibenzo(a,h)anthracene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Benzo(g,h,i)perylene	mg/kg	<0.05	0.00	-0.08	0.08	✓

Material Used: Method Blank - SV
Date Acquired: Sep 12, 2005
Acquired By:

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Naphthalene	ug/mL	492.0	500.00	98.40	70.00-130.00	✓
Acenaphthylene	ng/mL	509.0	500.00	101.80	70.00-130.00	✓
Acenaphthene	ng/mL	498.0	500.00	99.60	70.00-130.00	✓
Fluorene	ng/mL	461.0	500.00	92.20	70.00-130.00	✓
Phenanthrene	ng/mL	434.0	500.00	86.80	70.00-130.00	✓
Anthracene	ng/mL	478.0	500.00	95.60	70.00-130.00	✓
Fluoranthene	ng/mL	500.0	500.00	100.00	70.00-130.00	✓
Pyrene	ng/mL	495.0	500.00	99.00	70.00-130.00	✓
Benzo(a)anthracene	ng/mL	472.0	500.00	94.40	70.00-130.00	✓
Chrysene	ng/mL	456.0	500.00	91.20	70.00-130.00	✓
Benzo(b)fluoranthene	ng/mL	439.0	500.00	87.80	70.00-130.00	✓
Benzo(k)fluoranthene	ng/mL	486.0	500.00	97.20	70.00-130.00	✓
Benzo(a)pyrene	ng/mL	468.0	500.00	93.60	70.00-130.00	✓
Indeno(1,2,3-c,d)pyrene	ng/mL	504.0	500.00	100.80	70.00-130.00	✓
Dibenzo(a,h)anthracene	ng/mL	490.0	500.00	98.00	70.00-130.00	✓
Benzo(g,h,i)perylene	ng/mL	499.0	500.00	99.80	70.00-130.00	✓

Material Used: Standard - PAHs
Date Acquired: Sep 12, 2005
Acquired By:

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407209**
Control Number: E 241005
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744605

PAH - Soil - Surrogate Recovery

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Nitrobenzene-d5	%	60	77	-4	157	✓
2-Fluorobiphenyl	%	95	80	5	155	✓
p-Terphenyl-d14	%	130	78	-12	167	✓

Material Used: Method Blank - SV
Date Acquired: Sep 12, 2005
Acquired By:

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407209**
Control Number: E 241005
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744605

Polychlorinated Biphenyls - Soil

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Aroclor 1016	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1221	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1232	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1242	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1248	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1254	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1260	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1262	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1268	mg/kg	<0.1	0.0	-0.3	0.3	✓
Material Used:	Method Blank - SV					
Date Acquired:	Sep 12, 2005					
Acquired By:	Inna Kazakov					

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Aroclor 1254	ug/mL	0.9	1.0	90.0	70.0-130.0	✓
Material Used:	Calibration Check - PCBs					
Date Acquired:	Sep 12, 2005					
Acquired By:	Inna Kazakov					

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Aroclor 1016	mg/kg	<0.1	<0.1	15.0	0.2	✓
Aroclor 1221	mg/kg	<0.1	<0.1	15.0	0.2	✓
Aroclor 1232	mg/kg	<0.1	<0.1	15.0	0.2	✓
Aroclor 1242	mg/kg	<0.1	<0.1	15.0	0.2	✓
Aroclor 1248	mg/kg	<0.1	<0.1	15.0	0.2	✓
Aroclor 1254	mg/kg	<0.1	<0.1	15.0	0.2	✓
Aroclor 1260	mg/kg	<0.1	<0.1	15.0	0.2	✓
Aroclor 1262	mg/kg	<0.1	<0.1	15.0	0.2	✓
Aroclor 1268	mg/kg	<0.1	<0.1	15.0	0.2	✓
Material Used:	Duplicate - Run 2 - SV					
Date Acquired:	Sep 12, 2005					
Acquired By:	Inna Kazakov					

Matrix Spike	Units	Measured	Actual	% Recovery	Criteria (%)	Passed QC
Aroclor 1260	mg/kg	0.9	1	90.0	10.0-190.0	✓
Material Used:	Matrix Spike - SV					
Date Acquired:	Sep 12, 2005					
Acquired By:	Inna Kazakov					

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407209**
Control Number: E 241005
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744605

Polychlorinated Biphenyls - Soil - Surrogate

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Decachlorobiphenyl	%	50	100	10	190	✓

Material Used: Method Blank - SV
Date Acquired: Sep 12, 2005
Acquired By: Inna Kazakov

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Methodology and Notes

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407209**
Control Number: E 241005
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744605

Method of Analysis:

MethodName	Reference		Method	Date Analysis Started	Location
Boron in general soil	McKeague	*	Hot Water Soluble Boron - Azomethine-H Method, 4.61	13-Sep-05	Norwest Labs Edmonton
BTEX-CCME - Soil	CCME		Reference Method - Canada-Wide Standard for PHC in Soil, CWS PHC	13-Sep-05	Norwest Labs Calgary
Mercury (Hot Block) in Soil	US EPA	*	Determination of Hg in Sediment by Cold Vapor Atomic Absorption Spec, 245.5	12-Sep-05	Norwest Labs Edmonton
Metals ICP-MS (Hot Block) in soil	SW-846	*	Acid Digestion of Sediments, Sludges, and Soils, EPA 3050B	12-Sep-05	Norwest Labs Edmonton
PAH - Soil	US EPA	*	Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry, 8270	14-Sep-05	Norwest Labs Calgary
PCB - Soil	US EPA	*	US EPA method, 8082	19-Sep-05	Norwest Labs Calgary
TEH-CCME-Soil (Soxhlet)	CCME		Reference Method - Canada-Wide Standard for PHC in Soil, CWS PHC	15-Sep-05	Norwest Labs Calgary
TEH-CCME-Soil (Soxhlet)	CCME		Reference Method - Canada-Wide Standard for PHC in Soil, CWS PHC	14-Sep-05	Norwest Labs Calgary

* Norwest method(s) is based on reference method

References:

CCME	Canadian Council of Ministers of the Environment
McKeague	Manual on Soil Sampling and Methods of Analysis
SW-846	Test Methods for Evaluating Solid Waste
US EPA	US Environmental Protection Agency Test Methods

Comments:

>130 - The surrogate recovery is higher then the range (23-130)% due to interference of Nitrobenzene-d5 with other hydrocarbons contained in the sample.IK 05/09/14
Talked with Leigh P. In regards to the holding time, Samples are compromised due to the holding time being over the 7 day recommendation. Leigh P will get in touch with client in regards to the holding time.

Please direct any inquiries regarding this report to our Client Services group.
Results relate only to samples as submitted
The test report shall not be reproduced except in full, without the written approval of the laboratory

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407209**
Control Number: E 241005
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744605

Petroleum Hydrocarbons in Soil

Batch Notes

1. The method used complies with the Reference Method for the Canada Wide Standards for Petroleum Hydrocarbons in Soil - Tier 1, April 2001 and is accredited for use in Norwest laboratories.
2. Modifications of the method: See Notes and Methodology for Non-conformances (if Applicable).
3. Qualifications on results: See Notes and Methodology for Non-conformances (if applicable).
4. Silica gel treatment is done for fractions F2, F3, F4.
5. F1-BTEX: BTEX has been subtracted from the F1 fraction.
6. F2-naphth and F3-PAH: selected PAHs have been subtracted from the appropriate fractions.
7. F4HTGC is reported when more than 5% of the total carbon envelope elutes past C50.
8. Gravimetric Heavy Hydrocarbons are not reported anymore in Alberta, F4 high temperature is reported instead.
9. When both F4(C34-C50) and FHTGC are reported, F4HTGC is the F4 that is to be used for interpreting the CWS.
10. Quality criteria met for the batch: Data is reported in Quality Control Section of report (if requested).
    -nC6 and nC10 response factors (RF) are within 30% of RF for toluene
    -nC10,nC16 and nC34 RFs are within 10% of each other
    -nC50 RF is within 70% of the average RF for NC10+nC16+nC16+nC34
    -linearity is within 15%
11. Batch data for QC samples is available on request.
12. Extraction and analysis holding times were met: See Notes and Methodology for Non-conformances (if applicable).

Approved by:



Darren Crichton, BSc, PChem
Operations Chemist

NORWEST LABS

407240

Control Number E 241022

Environmental Sample Information Sheet

NOTE: Proper completion of this form is required in order to proceed with analysis
See reverse for your nearest Norwest location and proper sampling protocol

Billing Address: x

Company: Earth Tech Canada Inc.
Address: 17203-103 Ave
Edmonton, AB T5S 1J4
Attention: Greg Wright
Phone: (780) 488-6800
Fax: (780) 488-2121
Cell:
e-mail: ~~greg.wright@earthtech.ca~~

QA/QC Report ☑

Report Result:
Fax ☐
Mail ☐
Courier ☐
e-mail ☐
e-Service ☑

Copy of Report To: **Copy of invoice:** ☐

Company: Earth Tech Canada Inc.
Address: 17203-103 Ave
Edmonton, AB T5S 1J4
Attention: Greg Wright
Phone: (780) 488-6800
Fax: (780) 488-2121
Cell:
e-mail: greg.wright@earthtech.ca

Mail invoice to this address for approval x

Report Result:
Fax ☐
Mail ☐
Courier ☐
e-mail ☐
e-service ☐

Information to be included on Report and Invoice

Project ID: 88122
Project Name: Phase III Arctic ESA
Project Location: Simpson Lake
Legal Location:
PO#:
Proj. Acct. Code:
Agreement ID: 62449

RUSH Please contact the laboratory to confirm rush dates and times before submitting samples.

Upon filling out this section, client accepts that surcharges will be attached to this analysis

Required on: all analyses **or** as indicated
☐ or ☐

Date Required: _____
Signature: _____
Norwest Authorization: _____

Sample Custody (Please Print)

Relinquished by: Greg Wright
Company ETC Signature

I authorize Norwest Labs to proceed with the work indicated on this form:
Date: Aug 29, 2005
Initial:

Received by: ☐ Coolers
Waybill # Date ☐ Boxes
Company Time ☐ Samples

Received By: Date:
Company: Time:

Special Instructions / Comments ☐ Check here if Norwest is required to report results directly to a regulatory body (Please include contact information)

	Sample Identification	Location	Depth IN / (CM) / M	Date / Time Sampled	Matrix	Sampling Method	Number of Containers	PCB	METALS	COMES	PAH
							↓	Enter tests above (✓ relevant samples below)			
1	ECA-ET138		0 – 30	Aug 27	soil	grab	2	✓	✓		
2	ECA-ET138		100 – 130	"	"	"	2	✓	✓		
3	ECA-ET139		0 – 30	"	"	"	2	✓	✓		
4	ECA-ET140		0 – 30	"	"	"	2	✓	✓		
5	ECA-ET140A		0 – 30	"	"	"	2	✓	✓		
6	PL-ET141		10 – 30	"	"	"	2			✓	✓
7	PL-ET142		0 – 30	"	"	"	3		✓	✓	✓
8	PL-ET143		0 – 30	"	"	"	2			✓	✓
9	PL-ET144		0 – 30	"	"	"	3		✓	✓	✓
10	PL-ET144A		0 – 30	"	"	"	3		✓	✓	✓
11	PL-ET144		90 – 100	"	"	"	3		✓	✓	✓
12	PL-ET145		0 – 30	"	"	"	2			✓	✓
13	PL-ET146		80 – 100	"	"	"	2			✓	✓
14	POLBD-ET163		0 – 30	Aug 28	"	"	2	✓	✓		
15	POLBD-ET164		0 – 30	"	"	"	2	✓	✓		

NOTE: All hazardous samples must be labelled according to WHMIS guidelines.
Accredited by the Standards Council of Canada for specific tests

NWL008 (08/03)

NORWEST LABS

407240

Control Number E 241023

Environmental Sample Information Sheet

NOTE: Proper completion of this form is required in order to proceed with analysis

See reverse for your nearest Norwest location and proper sampling protocol

Billing Address: x	**Copy of Report To:**	**Copy of invoice:**
Company: Earth Tech Canada Inc.	Company: Earth Tech Canada Inc.	Mail invoice to this address for approval x
Address: 17203-103 Ave, Edmonton, AB T5S 1J4	Address: 17203-103 Ave, Edmonton, AB T5S 1J4	
Attention: Greg Wright	Attention: Greg Wright	
Phone: (780) 488-6800	Phone: (780) 488-6800	
Fax: (780) 488-2121	Fax: (780) 488-2121	
Cell:	Cell:	
e-mail: greg.wright@earthtech.ca	e-mail: greg.wright@earthtech.ca	
QA/QC Report ☑		
Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-Service ☑	Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-service ☐	

Information to be included on Report and Invoice

Project ID: 88122
Project Name: Phase III Arctic ESA
Project Location: Simpson Lake
Legal Location:
PO#:
Proj. Acct. Code:
Agreement ID: 62449

RUSH Please contact the laboratory to confirm rush dates and times before submitting samples.

Upon filling out this section, client accepts that surcharges will be attached to this analysis

Required on: all analyses or as indicated ☐ or ☐

Date Required: _____

Signature: _____

Norwest Authorization: _____

Sample Custody (Please Print)

Relinquished by: Greg Wright

Company ETC Signature GW.

I authorize Norwest Labs to proceed with the work indicated on this form:

Date: Aug 29, 2005

Initial: GW

Received by: ☐ Coolers

Waybill # Date ☐ Boxes

Company Time ☐ Samples

Received By: Date:

Company: Time:

Special Instructions / Comments ☐ Check here if Norwest is required to report results directly to a regulatory body (Please include contact information)

	Sample Identification		Location	Depth IN (CM) M	Date / Time Sampled	Matrix	Sampling Method	Number of Containers	COMES	PAH	METALS	PCB								
								↓	Enter tests above (✓ relevant samples below)											
1	PL-ET147	16		0 – 30	Aug 27	soil	grab	2	✓	✓										
2	PL-ET148	17		0 – 30	"	"	"	2	✓	✓										
3	PL-ET149	18		0 – 30	"	"	"	2	✓	✓										
4	MD-ET150	19		0 – 30	"	"	"	2			✓	✓								
5	MD-ET151	20		0 – 30	"	"	"	2			✓	✓								
6	FT-ET152	21		50 – 80	"	"	"	2	✓	✓										
7	FT-ET153	22		30 – 50	"	"	"	2	✓	✓										
8	FT-ET154	23		0 – 30	"	"	"	2	✓	✓										
9	FT-ET154	24		50 – 80	"	"	"	2	✓	✓										
10	BSD-ET155	25		0 – 30	Aug 28	"	"	2			✓	✓								
11	BSD-ET156	26		0 – 30	"	"	"	2			✓	✓								
12	BSD-ET157	27		0 – 30	"	"	"	2			✓	✓								
13	BSD-ET158	28		0 – 30	"	"	"	2			✓	✓								
14				–																
15				–																

NOTE: All hazardous samples must be labelled according to WHMIS guidelines.

Accredited by the Standards Council of Canada for specific tests

NWL008 (08/03)

NORWEST LABS

407240

Control Number E 241021

Environmental Sample Information Sheet

NOTE: Proper completion of this form is required in order to proceed with analysis

See reverse for your nearest Norwest location and proper sampling protocol

Billing Address: x	**Copy of Report To:**	**Copy of invoice:** ☐
Company: Earth Tech Canada Inc.	Company: Earth Tech Canada Inc.	Mail invoice to this address for approval x ☐
Address: 17203-103 Ave, Edmonton, AB T5S 1J4	Address: 17203-103 Ave, Edmonton, AB T5S 1J4	
QA/QC Report ☑		
Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-Service ☑	Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-service ☐	
Attention: Greg Wright	Attention: Greg Wright	
Phone: (780) 488-6800	Phone: (780) 488-6800	
Fax: (780) 488-2121	Fax: (780) 488-2121	
Cell:	Cell:	
e-mail: greg.wright@earthtech.ca	e-mail: greg.wright@earthtech.ca	

Information to be included on Report and Invoice

Project ID: 88122
Project Name: Phase III Arctic ESA
Project Location: Simpson Lake
Legal Location:
PO#:
Proj. Acct. Code:
Agreement ID: 62449

RUSH Please contact the laboratory to confirm rush dates and times before submitting samples.

Upon filling out this section, client accepts that surcharges will be attached to this analysis

Required on: all analyses **or** as indicated ☐ or ☐

Date Required: _____
Signature: _____
Norwest Authorization: _____

Sample Custody (Please Print)

Relinquished by: Greg Wright
Company ETC Signature [signature]

I authorize Norwest Labs to proceed with the work indicated on this form:
Date: Aug 29, 2005
Initial: [initials]

Received by: ☐ Coolers
Waybill # Date ☐ Boxes
Company Time ☐ Samples

Received By: Date:
Company: Time:

Special Instructions / Comments ☐ Check here if Norwest is required to report results directly to a regulatory body (Please include contact information)

	Sample Identification	Location	Depth IN (CM) M	Date / Time Sampled	Matrix	Sampling Method	Number of Containers	METALS	PCB										
							↓	Enter tests above (✓ relevant samples below)											
1	WBD-~~ED159~~ ET159	29	0 – 30	Aug28	soil	grab	2	✓	✓		8								
2	WBD- ET160	30	0 – 30	"	"	"	2	✓	✓										
3	WBD-ET161	31	0 – 30	"	"	"	2	✓	✓										
4	PLUMDUMP-ET162	32	0 – 20	"	"	"	2	✓	✓										
5			–																
6			–																
7			–																
8			–																
9			–																
10			–																
11			–																
12			–																
13			–																
14			–																
15			–																

NOTE: All hazardous samples must be labelled according to WHMIS guidelines.

Accredited by the Standards Council of Canada for specific tests

NWL008 (08/03)

Analytical Report

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407240**
Control Number: E 241022
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744617

	NWL Number	407240-1	407240-2	407240-3	
	Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
	Sample Description	ECA-ET138 / 0-30 / cm	ECA-ET138 / 100-130 / cm	ECA-ET139 / 0-30 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble						
Boron	Water Soluble	mg/kg	<0.1	<0.1	0.1	0.1
Metals Strong Acid Digestion						
Mercury	Strong Acid Extractable	ug/g	<0.01	<0.01	<0.01	0.01
Antimony	Strong Acid Extractable	ug/g	<0.2	<0.2	<0.2	0.2
Arsenic	Strong Acid Extractable	ug/g	0.8	1.4	1.9	0.2
Barium	Strong Acid Extractable	ug/g	31	56	110	1
Beryllium	Strong Acid Extractable	ug/g	0.3	0.4	0.5	0.1
Cadmium	Strong Acid Extractable	ug/g	0.07	0.07	0.11	0.01
Chromium	Strong Acid Extractable	ug/g	10.3	16.0	28.4	0.5
Cobalt	Strong Acid Extractable	ug/g	4.0	6.1	9.0	0.1
Copper	Strong Acid Extractable	ug/g	4	7	16	1
Lead	Strong Acid Extractable	ug/g	5.6	5.7	7.6	0.1
Molybdenum	Strong Acid Extractable	ug/g	<1	<1	<1	1
Nickel	Strong Acid Extractable	ug/g	5.5	9.0	16.1	0.5
Selenium	Strong Acid Extractable	ug/g	<0.3	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	ug/g	<0.1	0.1	0.1	0.1
Thallium	Strong Acid Extractable	ug/g	0.12	0.19	0.36	0.05
Tin	Strong Acid Extractable	ug/g	2	2	2	1
Vanadium	Strong Acid Extractable	ug/g	18.3	26.9	43.0	0.1
Zinc	Strong Acid Extractable	ug/g	25	35	63	1
Polychlorinated Biphenyls - Soil						
Aroclor 1016	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1221	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1232	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1242	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1248	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1254	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1260	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1262	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1268	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Total PCBs	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Polychlorinated Biphenyls - Soil - Surrogate						
Decachlorobiphenyl	Surrogate	%	115	85	82	50-150

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Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407240**
Control Number: E 241022
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744617

			NWL Number	407240-4	407240-5	407240-14	
			Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
			Sample Description	ECA-ET140 / 0-30 / cm	ECA-ET140A / 0-30 / cm	POLBD-ET163 / 0-30 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Polychlorinated Biphenyls - Soil							
Aroclor 1016	Dry Weight	mg/kg		<0.1	<0.1	<0.1	0.1
Aroclor 1221	Dry Weight	mg/kg		<0.1	<0.1	<0.1	0.1
Aroclor 1232	Dry Weight	mg/kg		<0.1	<0.1	<0.1	0.1
Aroclor 1242	Dry Weight	mg/kg		<0.1	<0.1	<0.1	0.1
Aroclor 1248	Dry Weight	mg/kg		<0.1	<0.1	<0.1	0.1
Aroclor 1254	Dry Weight	mg/kg		<0.1	<0.1	<0.1	0.1
Aroclor 1260	Dry Weight	mg/kg		<0.1	<0.1	<0.1	0.1
Aroclor 1262	Dry Weight	mg/kg		<0.1	<0.1	<0.1	0.1
Aroclor 1268	Dry Weight	mg/kg		<0.1	<0.1	<0.1	0.1
Total PCBs	Dry Weight	mg/kg		<0.1	<0.1	<0.1	0.1
Polychlorinated Biphenyls - Soil - Surrogate							
Decachlorobiphenyl	Surrogate	%		65	107	79	50-150

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NWL Lot ID: **407240**
Control Number: E 241022
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	NWL Number	407240-4	407240-5	407240-7	
	Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
	Sample Description	ECA-ET140 / 0-30 / cm	ECA-ET140A / 0-30 / cm	PL-ET142 / 0-30 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble						
Boron	Water Soluble	mg/kg	0.6	0.5	<0.1	0.1
Metals Strong Acid Digestion						
Mercury	Strong Acid Extractable	ug/g	<0.01	0.01	<0.01	0.01
Antimony	Strong Acid Extractable	ug/g	<0.2	<0.2	<0.2	0.2
Arsenic	Strong Acid Extractable	ug/g	1.2	1.3	0.6	0.2
Barium	Strong Acid Extractable	ug/g	63	71	94	1
Beryllium	Strong Acid Extractable	ug/g	0.4	0.4	0.2	0.1
Cadmium	Strong Acid Extractable	ug/g	0.07	0.09	0.03	0.01
Chromium	Strong Acid Extractable	ug/g	17.1	17.5	7.2	0.5
Cobalt	Strong Acid Extractable	ug/g	6.1	6.3	3.6	0.1
Copper	Strong Acid Extractable	ug/g	8	8	4	1
Lead	Strong Acid Extractable	ug/g	6.0	6.3	3.5	0.1
Molybdenum	Strong Acid Extractable	ug/g	<1	<1	<1	1
Nickel	Strong Acid Extractable	ug/g	9.1	10.0	3.9	0.5
Selenium	Strong Acid Extractable	ug/g	<0.3	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	ug/g	<0.1	<0.1	<0.1	0.1
Thallium	Strong Acid Extractable	ug/g	0.21	0.22	0.10	0.05
Tin	Strong Acid Extractable	ug/g	2	2	2	1
Vanadium	Strong Acid Extractable	ug/g	27.6	29.8	14.0	0.1
Zinc	Strong Acid Extractable	ug/g	40	40	22	1

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Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
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NWL Lot ID: **407240**
Control Number: E 241022
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			NWL Number	407240-6	407240-7	407240-8	
			Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
			Sample Description	PL-ET141 / 10-30 / cm	PL-ET142 / 0-30 / cm	PL-ET143 / 0-30 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Mono-Aromatic Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
Benzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Toluene	Dry Weight	mg/kg		<0.02	0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Total Xylenes (m,p,o)	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
F1 -BTEX	Dry Weight	mg/kg		<1	<1	<1	1
F1 C6-C10	Dry Weight	mg/kg		<1	<1	<1	1
Volatile Petroleum Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F1 C6-C10	Dry Weight	mg/kg		<1	<1	<1	1
F1 -BTEX	Dry Weight	mg/kg		<1	<1	<1	1
Extractable Petroleum Hydrocarbons - Soxhlet							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F2 C10-C16	Dry Weight	mg/kg		20	20	<10	10
F3 C16-C34	Dry Weight	mg/kg		<10	8220	50	10
F4 C34-C50	Dry Weight	mg/kg		<10	7590	40	10
F4HTGC C34-C50+	Dry Weight	mg/kg		<10	10000	50	10
% C50+		%		0.0	13.4	16.0	
Silica Gel Cleanup							
Silica Gel Cleanup				Done	Done	Done	
Soil % Moisture							
Moisture	Soil % Moisture	%		9.48	3.11	7.95	
Polynuclear Aromatic Hydrocarbons - Soil							
Naphthalene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Acenaphthylene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Acenaphthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluorene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Phenanthrene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Pyrene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(a)anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Chrysene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(b)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(j)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(k)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05

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Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407240**
Control Number: E 241022
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744617

	NWL Number	407240-6	407240-7	407240-8	
	Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
	Sample Description	PL-ET141 / 10-30 / cm	PL-ET142 / 0-30 / cm	PL-ET143 / 0-30 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Polynuclear Aromatic Hydrocarbons - Soil - Conti						
Benzo(a)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Indeno(1,2,3-c,d)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Dibenzo(a,h)anthracene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(g,h,i)perylene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
CB(a)P	Carcinogenic Potency Equivalent	mg/kg	<0.0002	<0.0002	<0.0002	0.0002
PAH - Soil - Surrogate Recovery						
Nitrobenzene-d5	PAH - Surrogate	%	61	79	122	23-130
2-Fluorobiphenyl	PAH - Surrogate	%	72	65	85	30-130
p-Terphenyl-d14	PAH - Surrogate	%	88	80	105	18-137

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NWL Lot ID: **407240**
Control Number: E 241022
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Date Reported: Sep 19, 2005
Report Number: 744617

			NWL Number	407240-9	407240-10	407240-11	
			Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
			Sample Description	PL-ET144 / 0-30 / cm	PL-ET144A / 0-30 / cm	PL-ET144 / 90-100 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble							
Boron	Water Soluble	mg/kg		0.8	0.8	<0.1	0.1
Metals Strong Acid Digestion							
Mercury	Strong Acid Extractable	ug/g		0.01	<0.01	<0.01	0.01
Antimony	Strong Acid Extractable	ug/g		<0.2	<0.2	<0.2	0.2
Arsenic	Strong Acid Extractable	ug/g		1.2	0.9	1.5	0.2
Barium	Strong Acid Extractable	ug/g		81	67	98	1
Beryllium	Strong Acid Extractable	ug/g		0.4	0.3	0.5	0.1
Cadmium	Strong Acid Extractable	ug/g		0.18	0.16	0.06	0.01
Chromium	Strong Acid Extractable	ug/g		18.7	14.3	24.9	0.5
Cobalt	Strong Acid Extractable	ug/g		5.8	5.0	7.9	0.1
Copper	Strong Acid Extractable	ug/g		9	8	14	1
Lead	Strong Acid Extractable	ug/g		13.6	17.2	6.3	0.1
Molybdenum	Strong Acid Extractable	ug/g		<1	<1	<1	1
Nickel	Strong Acid Extractable	ug/g		9.5	7.8	14.3	0.5
Selenium	Strong Acid Extractable	ug/g		<0.3	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	ug/g		<0.1	<0.1	0.1	0.1
Thallium	Strong Acid Extractable	ug/g		0.22	0.18	0.30	0.05
Tin	Strong Acid Extractable	ug/g		2	2	2	1
Vanadium	Strong Acid Extractable	ug/g		27.6	23.5	37.4	0.1
Zinc	Strong Acid Extractable	ug/g		136	124	61	1
Mono-Aromatic Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
Benzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Toluene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Total Xylenes (m,p,o)	Dry Weight	mg/kg		<0.02	<0.02	0.02	0.02
F1 -BTEX	Dry Weight	mg/kg		19	20	6	1
F1 C6-C10	Dry Weight	mg/kg		19	20	6	1
Volatile Petroleum Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F1 C6-C10	Dry Weight	mg/kg		19	20	6	1
F1 -BTEX	Dry Weight	mg/kg		19	20	6	1
Extractable Petroleum Hydrocarbons - Soxhlet							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F2 C10-C16	Dry Weight	mg/kg		3340	2710	50	10

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Sampled By: Greg Wright
Company: ETC

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Location: Simpson Lake
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P.O.:
Acct. Code:

NWL Lot ID: **407240**
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	NWL Number	407240-9	407240-10	407240-11	
	Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
	Sample Description	PL-ET144 / 0-30 / cm	PL-ET144A / 0-30 / cm	PL-ET144 / 90-100 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Extractable Petroleum Hydrocarbons - Soxhlet - C						
F3 C16-C34	Dry Weight	mg/kg	28300	26100	20	10
F4 C34-C50	Dry Weight	mg/kg	6540	6400	<10	10
F4HTGC C34-C50+	Dry Weight	mg/kg	10100	9930	<10	10
% C50+		%	8.5	9.1	0.0	
Silica Gel Cleanup						
Silica Gel Cleanup			Done	Done	Done	
Soil % Moisture						
Moisture	Soil % Moisture	%	13.30	14.90	10.60	
Polynuclear Aromatic Hydrocarbons - Soil						
Naphthalene	Dry Weight	mg/kg	<0.05	<0.05	0.10	0.05
Acenaphthylene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Acenaphthene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Fluorene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Phenanthrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Anthracene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Fluoranthene	Dry Weight	mg/kg	0.30	0.25	<0.05	0.05
Pyrene	Dry Weight	mg/kg	0.46	0.38	<0.05	0.05
Benzo(a)anthracene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Chrysene	Dry Weight	mg/kg	0.45	0.34	<0.05	0.05
Benzo(b)fluoranthene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(j)fluoranthene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(k)fluoranthene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(a)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Indeno(1,2,3-c,d)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Dibenzo(a,h)anthracene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(g,h,i)perylene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
CB(a)P	Carcinogenic Potency Equivalent	mg/kg	0.0020	0.0015	<0.0002	0.0002
PAH - Soil - Surrogate Recovery						
Nitrobenzene-d5	PAH - Surrogate	%	130	130	84	23-130
2-Fluorobiphenyl	PAH - Surrogate	%	56	55	87	30-130
p-Terphenyl-d14	PAH - Surrogate	%	112	81	100	18-137

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			NWL Number	407240-12	407240-13	407240-16	
			Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
			Sample Description	PL-ET145 / 0-30 / cm	PL-ET146 / 80-100 / cm	PL-ET147 / 0-30 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Mono-Aromatic Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
Benzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Toluene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Total Xylenes (m,p,o)	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
F1 -BTEX	Dry Weight	mg/kg		<1	<1	<1	1
F1 C6-C10	Dry Weight	mg/kg		<1	<1	<1	1
Volatile Petroleum Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F1 C6-C10	Dry Weight	mg/kg		<1	<1	<1	1
F1 -BTEX	Dry Weight	mg/kg		<1	<1	<1	1
Extractable Petroleum Hydrocarbons - Soxhlet							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F2 C10-C16	Dry Weight	mg/kg		10	<10	<10	10
F3 C16-C34	Dry Weight	mg/kg		10	10	150	10
F4 C34-C50	Dry Weight	mg/kg		<10	<10	100	10
F4HTGC C34-C50+	Dry Weight	mg/kg		<10	<10	120	10
% C50+		%		0.0	0.0	10.3	
Silica Gel Cleanup							
Silica Gel Cleanup				Done	Done	Done	
Soil % Moisture							
Moisture	Soil % Moisture	%		17.60	9.20	14.60	
Polynuclear Aromatic Hydrocarbons - Soil							
Naphthalene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Acenaphthylene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Acenaphthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluorene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Phenanthrene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Pyrene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(a)anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Chrysene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(b)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(j)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05

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Analytical Report

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Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
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Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407240**
Control Number: E 241022
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744617

		NWL Number	407240-12	407240-13	407240-16	
		Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
		Sample Description	PL-ET145 / 0-30 / cm	PL-ET146 / 80-100 / cm	PL-ET147 / 0-30 / cm	
		Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Polynuclear Aromatic Hydrocarbons - Soil - Conti						
Benzo(k)fluoranthene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(a)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Indeno(1,2,3-c,d)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Dibenzo(a,h)anthracene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(g,h,i)perylene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
CB(a)P	Carcinogenic Potency Equivalent	mg/kg	<0.0002	<0.0002	<0.0002	0.0002
PAH - Soil - Surrogate Recovery						
Nitrobenzene-d5	PAH - Surrogate	%	96	80	91	23-130
2-Fluorobiphenyl	PAH - Surrogate	%	93	99	95	30-130
p-Terphenyl-d14	PAH - Surrogate	%	114	85	82	18-137

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NWL Lot ID: **407240**
Control Number: E 241022
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Date Reported: Sep 19, 2005
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	NWL Number	407240-14	407240-15	407240-19	
	Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
	Sample Description	POLBD-ET163 / 0-30 / cm	POLBD-ET164 / 0-30 / cm	MD-ET150 / 0-30 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble						
Boron	Water Soluble	mg/kg	<0.1	0.8	0.5	0.1
Metals Strong Acid Digestion						
Mercury	Strong Acid Extractable	ug/g	<0.01	<0.01	0.01	0.01
Antimony	Strong Acid Extractable	ug/g	<0.2	<0.2	<0.2	0.2
Arsenic	Strong Acid Extractable	ug/g	0.6	1.3	1.4	0.2
Barium	Strong Acid Extractable	ug/g	24	57	70	1
Beryllium	Strong Acid Extractable	ug/g	0.2	0.3	0.3	0.1
Cadmium	Strong Acid Extractable	ug/g	0.04	0.07	0.11	0.01
Chromium	Strong Acid Extractable	ug/g	7.9	18.0	18.8	0.5
Cobalt	Strong Acid Extractable	ug/g	3.2	5.6	6.2	0.1
Copper	Strong Acid Extractable	ug/g	4	7	8	1
Lead	Strong Acid Extractable	ug/g	3.6	6.1	9.0	0.1
Molybdenum	Strong Acid Extractable	ug/g	<1	<1	<1	1
Nickel	Strong Acid Extractable	ug/g	4.2	9.0	9.9	0.5
Selenium	Strong Acid Extractable	ug/g	<0.3	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	ug/g	<0.1	<0.1	<0.1	0.1
Thallium	Strong Acid Extractable	ug/g	0.11	0.20	0.22	0.05
Tin	Strong Acid Extractable	ug/g	2	2	2	1
Vanadium	Strong Acid Extractable	ug/g	15.0	26.5	30.9	0.1
Zinc	Strong Acid Extractable	ug/g	22	36	50	1

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Name: Phase III Arctic ESA
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NWL Lot ID: **407240**
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		NWL Number	407240-15	407240-19	407240-20	
		Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
		Sample Description	POLBD-ET164 / 0-30 / cm	MD-ET150 / 0-30 / cm	MD-ET151 / 0-30 / cm	
		Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Polychlorinated Biphenyls - Soil						
Aroclor 1016	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1221	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1232	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1242	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1248	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1254	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1260	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1262	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1268	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Total PCBs	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Polychlorinated Biphenyls - Soil - Surrogate						
Decachlorobiphenyl	Surrogate	%	94	96	92	50-150

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Project
ID: 88122
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NWL Lot ID: **407240**
Control Number: E 241022
Date Received: Sep 09, 2005
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Report Number: 744617

			NWL Number	407240-17	407240-18	407240-21	
			Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
			Sample Description	PL-ET148 / 0-30 / cm	PL-ET149 / 0-30 / cm	FT-ET152 / 50-80 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Mono-Aromatic Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
Benzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Toluene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Total Xylenes (m,p,o)	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
F1 -BTEX	Dry Weight	mg/kg		<1	<1	<1	1
F1 C6-C10	Dry Weight	mg/kg		<1	<1	<1	1
Volatile Petroleum Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F1 C6-C10	Dry Weight	mg/kg		<1	<1	<1	1
F1 -BTEX	Dry Weight	mg/kg		<1	<1	<1	1
Extractable Petroleum Hydrocarbons - Soxhlet							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F2 C10-C16	Dry Weight	mg/kg		<10	<10	<10	10
F3 C16-C34	Dry Weight	mg/kg		10	<10	<10	10
F4 C34-C50	Dry Weight	mg/kg		<10	<10	<10	10
F4HTGC C34-C50+	Dry Weight	mg/kg		<10	<10	<10	10
% C50+		%		0.0	0.0	0.0	
Silica Gel Cleanup							
Silica Gel Cleanup				Done	Done	Done	
Soil % Moisture							
Moisture	Soil % Moisture	%		11.70	10.90	10.20	
Polynuclear Aromatic Hydrocarbons - Soil							
Naphthalene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Acenaphthylene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Acenaphthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluorene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Phenanthrene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Pyrene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(a)anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Chrysene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(b)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(j)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(k)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05

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Analytical Report

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Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
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Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407240**
Control Number: E 241022
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744617

	NWL Number	407240-17	407240-18	407240-21	
	Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
	Sample Description	PL-ET148 / 0-30 / cm	PL-ET149 / 0-30 / cm	FT-ET152 / 50-80 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Polynuclear Aromatic Hydrocarbons - Soil - Conti						
Benzo(a)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Indeno(1,2,3-c,d)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Dibenzo(a,h)anthracene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(g,h,i)perylene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
CB(a)P	Carcinogenic Potency Equivalent	mg/kg	<0.0002	<0.0002	<0.0002	0.0002
PAH - Soil - Surrogate Recovery						
Nitrobenzene-d5	PAH - Surrogate	%	85	90	79	23-130
2-Fluorobiphenyl	PAH - Surrogate	%	94	97	98	30-130
p-Terphenyl-d14	PAH - Surrogate	%	84	86	90	18-137

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Project ID: 88122
Name: Phase III Arctic ESA
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NWL Lot ID: **407240**
Control Number: E 241022
Date Received: Sep 09, 2005
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Report Number: 744617

			NWL Number	407240-20	407240-25	407240-26	
			Sample Date	Aug 27, 2005	Aug 28, 2005	Aug 28, 2005	
			Sample Description	MD-ET151 / 0-30 / cm	BSD-ET155 / 0-30 / cm	BSD-ET156 / 0-30 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble							
Boron	Water Soluble	mg/kg		0.5	1.9	0.9	0.1
Metals Strong Acid Digestion							
Mercury	Strong Acid Extractable	ug/g		0.04	0.09	<0.01	0.01
Antimony	Strong Acid Extractable	ug/g		<0.2	0.7	<0.2	0.2
Arsenic	Strong Acid Extractable	ug/g		1.7	1.2	2.0	0.2
Barium	Strong Acid Extractable	ug/g		92	64	108	1
Beryllium	Strong Acid Extractable	ug/g		0.6	0.3	0.6	0.1
Cadmium	Strong Acid Extractable	ug/g		0.09	0.55	0.07	0.01
Chromium	Strong Acid Extractable	ug/g		25.9	24.2	30.3	0.5
Cobalt	Strong Acid Extractable	ug/g		8.5	5.9	9.6	0.1
Copper	Strong Acid Extractable	ug/g		14	8	13	1
Lead	Strong Acid Extractable	ug/g		9.3	10.2	8.0	0.1
Molybdenum	Strong Acid Extractable	ug/g		<1	<1	<1	1
Nickel	Strong Acid Extractable	ug/g		14.0	12.4	15.5	0.5
Selenium	Strong Acid Extractable	ug/g		<0.3	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	ug/g		0.1	0.1	0.1	0.1
Thallium	Strong Acid Extractable	ug/g		0.32	0.20	0.35	0.05
Tin	Strong Acid Extractable	ug/g		2	2	2	1
Vanadium	Strong Acid Extractable	ug/g		39.6	26.8	46.6	0.1
Zinc	Strong Acid Extractable	ug/g		69	78	58	1

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			NWL Number	407240-22	407240-23	407240-24	
			Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
			Sample Description	FT-ET153 / 30-50 / cm	FT-ET154 / 0-30 / cm	FT-ET154 / 50-80 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Mono-Aromatic Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
Benzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Toluene	Dry Weight	mg/kg		<0.02	<0.02	0.04	0.02
Ethylbenzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Total Xylenes (m,p,o)	Dry Weight	mg/kg		<0.02	<0.02	5.85	0.02
F1 -BTEX	Dry Weight	mg/kg		<1	<1	270	1
F1 C6-C10	Dry Weight	mg/kg		<1	<1	276	1
Volatile Petroleum Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F1 C6-C10	Dry Weight	mg/kg		<1	<1	276	1
F1 -BTEX	Dry Weight	mg/kg		<1	<1	270	1
Extractable Petroleum Hydrocarbons - Soxhlet							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F2 C10-C16	Dry Weight	mg/kg		<10	60	2880	10
F3 C16-C34	Dry Weight	mg/kg		10	1080	440	10
F4 C34-C50	Dry Weight	mg/kg		<10	310	90	10
F4HTGC C34-C50+	Dry Weight	mg/kg		<10	350	110	10
% C50+		%		0.0	2.6	0.4	
Silica Gel Cleanup							
Silica Gel Cleanup				Done	Done	Done	
Soil % Moisture							
Moisture	Soil % Moisture	%		9.59	7.58	9.93	
Polynuclear Aromatic Hydrocarbons - Soil							
Naphthalene	Dry Weight	mg/kg		<0.05	<0.05	1.12	0.05
Acenaphthylene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Acenaphthene	Dry Weight	mg/kg		<0.05	<0.05	0.06	0.05
Fluorene	Dry Weight	mg/kg		<0.05	<0.05	0.13	0.05
Phenanthrene	Dry Weight	mg/kg		<0.05	<0.05	0.22	0.05
Anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Pyrene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(a)anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Chrysene	Dry Weight	mg/kg		<0.05	0.05	<0.05	0.05
Benzo(b)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(j)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(k)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05

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NWL Lot ID: **407240**
Control Number: E 241022
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744617

			NWL Number	407240-22	407240-23	407240-24	
			Sample Date	Aug 27, 2005	Aug 27, 2005	Aug 27, 2005	
			Sample Description	FT-ET153 / 30-50 / cm	FT-ET154 / 0-30 / cm	FT-ET154 / 50-80 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Polynuclear Aromatic Hydrocarbons - Soil - Conti							
Benzo(a)pyrene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Indeno(1,2,3-c,d)pyrene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Dibenzo(a,h)anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(g,h,i)perylene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
CB(a)P	Carcinogenic Potency Equivalent	mg/kg		<0.0002	0.0002	<0.0002	0.0002
PAH - Soil - Surrogate Recovery							
Nitrobenzene-d5	PAH - Surrogate	%		78	73	>130	23-130
2-Fluorobiphenyl	PAH - Surrogate	%		102	87	100	30-130
p-Terphenyl-d14	PAH - Surrogate	%		88	72	88	18-137

			NWL Number	407240-25	407240-26	407240-27	
			Sample Date	Aug 28, 2005	Aug 28, 2005	Aug 28, 2005	
			Sample Description	BSD-ET155 / 0-30 / cm	BSD-ET156 / 0-30 / cm	BSD-ET157 / 0-30 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Polychlorinated Biphenyls - Soil							
Aroclor 1016	Dry Weight	mg/kg		<0.1	<0.1	<0.1	0.1
Aroclor 1221	Dry Weight	mg/kg		<0.1	<0.1	<0.1	0.1
Aroclor 1232	Dry Weight	mg/kg		<0.1	<0.1	<0.1	0.1
Aroclor 1242	Dry Weight	mg/kg		<0.1	<0.1	<0.1	0.1
Aroclor 1248	Dry Weight	mg/kg		<0.1	<0.1	<0.1	0.1
Aroclor 1254	Dry Weight	mg/kg		0.6	<0.1	<0.1	0.1
Aroclor 1260	Dry Weight	mg/kg		<0.1	<0.1	<0.1	0.1
Aroclor 1262	Dry Weight	mg/kg		<0.1	<0.1	<0.1	0.1
Aroclor 1268	Dry Weight	mg/kg		<0.1	<0.1	<0.1	0.1
Total PCBs	Dry Weight	mg/kg		0.6	<0.1	<0.1	0.1
Polychlorinated Biphenyls - Soil - Surrogate							
Decachlorobiphenyl	Surrogate	%		78	72	66	50-150

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Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407240**
Control Number: E 241022
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744617

	NWL Number	407240-27	407240-28	407240-29	
	Sample Date	Aug 28, 2005	Aug 28, 2005	Aug 28, 2005	
	Sample Description	BSD-ET157 / 0-30 / cm	BSD-ET158 / 0-30 / cm	WBD-ET159 / 0-30 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble						
Boron	Water Soluble	mg/kg	0.5	0.2	0.5	0.1
Metals Strong Acid Digestion						
Mercury	Strong Acid Extractable	ug/g	<0.01	<0.01	0.01	0.01
Antimony	Strong Acid Extractable	ug/g	<0.2	<0.2	1.7	0.2
Arsenic	Strong Acid Extractable	ug/g	1.3	1.5	0.8	0.2
Barium	Strong Acid Extractable	ug/g	70	83	29	1
Beryllium	Strong Acid Extractable	ug/g	0.4	0.5	0.2	0.1
Cadmium	Strong Acid Extractable	ug/g	0.06	0.06	0.51	0.01
Chromium	Strong Acid Extractable	ug/g	19.4	23.9	10.6	0.5
Cobalt	Strong Acid Extractable	ug/g	6.6	7.8	3.4	0.1
Copper	Strong Acid Extractable	ug/g	8	9	5	1
Lead	Strong Acid Extractable	ug/g	6.1	6.7	9.1	0.1
Molybdenum	Strong Acid Extractable	ug/g	<1	<1	<1	1
Nickel	Strong Acid Extractable	ug/g	10.0	11.4	5.2	0.5
Selenium	Strong Acid Extractable	ug/g	<0.3	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	ug/g	<0.1	0.1	<0.1	0.1
Thallium	Strong Acid Extractable	ug/g	0.24	0.28	0.14	0.05
Tin	Strong Acid Extractable	ug/g	2	2	2	1
Vanadium	Strong Acid Extractable	ug/g	34.4	37.5	18.0	0.1
Zinc	Strong Acid Extractable	ug/g	36	44	42	1

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Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407240**
Control Number: E 241022
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744617

	NWL Number	407240-28	407240-29	407240-30	
	Sample Date	Aug 28, 2005	Aug 28, 2005	Aug 28, 2005	
	Sample Description	BSD-ET158 / 0-30 / cm	WBD-ET159 / 0-30 / cm	WBD-ET160 / 0-30 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Polychlorinated Biphenyls - Soil						
Aroclor 1016	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1221	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1232	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1242	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1248	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1254	Dry Weight	mg/kg	<0.1	0.4	<0.1	0.1
Aroclor 1260	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1262	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1268	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Total PCBs	Dry Weight	mg/kg	<0.1	0.4	<0.1	0.1
Polychlorinated Biphenyls - Soil - Surrogate						
Decachlorobiphenyl	Surrogate	%	66	94	89	50-150

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T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
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NWL Lot ID: **407240**
Control Number: E 241022
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744617

	NWL Number	407240-30	407240-31	407240-32	
	Sample Date	Aug 28, 2005	Aug 28, 2005	Aug 28, 2005	
	Sample Description	WBD-ET160 / 0-30 / cm	WBD-ET161 / 0-30 / cm	PLUMDUMP-ET162 / 0-20 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble						
Boron	Water Soluble	mg/kg	0.2	0.2	0.2	0.1
Metals Strong Acid Digestion						
Mercury	Strong Acid Extractable	ug/g	<0.01	<0.01	<0.01	0.01
Antimony	Strong Acid Extractable	ug/g	<0.2	<0.2	<0.2	0.2
Arsenic	Strong Acid Extractable	ug/g	1.4	1.4	1.6	0.2
Barium	Strong Acid Extractable	ug/g	69	76	65	1
Beryllium	Strong Acid Extractable	ug/g	0.4	0.4	0.4	0.1
Cadmium	Strong Acid Extractable	ug/g	0.07	0.06	5.13	0.01
Chromium	Strong Acid Extractable	ug/g	19.7	21.2	21.2	0.5
Cobalt	Strong Acid Extractable	ug/g	6.9	6.9	7.0	0.1
Copper	Strong Acid Extractable	ug/g	8	9	16	1
Lead	Strong Acid Extractable	ug/g	6.1	6.5	8.5	0.1
Molybdenum	Strong Acid Extractable	ug/g	<1	<1	<1	1
Nickel	Strong Acid Extractable	ug/g	10.3	10.4	11.0	0.5
Selenium	Strong Acid Extractable	ug/g	<0.3	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	ug/g	<0.1	<0.1	<0.1	0.1
Thallium	Strong Acid Extractable	ug/g	0.24	0.26	0.23	0.05
Tin	Strong Acid Extractable	ug/g	2	2	2	1
Vanadium	Strong Acid Extractable	ug/g	32.7	35.0	31.1	0.1
Zinc	Strong Acid Extractable	ug/g	39	43	99	1

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T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407240**
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Report Number: 744617

			NWL Number	407240-31	407240-32		
			Sample Date	Aug 28, 2005	Aug 28, 2005		
			Sample Description	WBD-ET161 / 0-30 / cm	PLUMDUMP-ET162 / 0-20 / cm		
			Matrix	Soil - general	Soil - general		
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Polychlorinated Biphenyls - Soil							
Aroclor 1016	Dry Weight	mg/kg		<0.1	<0.1		0.1
Aroclor 1221	Dry Weight	mg/kg		<0.1	<0.1		0.1
Aroclor 1232	Dry Weight	mg/kg		<0.1	<0.1		0.1
Aroclor 1242	Dry Weight	mg/kg		<0.1	<0.1		0.1
Aroclor 1248	Dry Weight	mg/kg		<0.1	<0.1		0.1
Aroclor 1254	Dry Weight	mg/kg		<0.1	<0.1		0.1
Aroclor 1260	Dry Weight	mg/kg		<0.1	<0.1		0.1
Aroclor 1262	Dry Weight	mg/kg		<0.1	<0.1		0.1
Aroclor 1268	Dry Weight	mg/kg		<0.1	<0.1		0.1
Total PCBs	Dry Weight	mg/kg		<0.1	<0.1		0.1
Polychlorinated Biphenyls - Soil - Surrogate							
Decachlorobiphenyl	Surrogate	%		82	77		50-150

Approved by:

Darren Crichton, BSc, PChem
Operations Chemist

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Quality Control

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17203-103 Ave
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Attn: Greg Wright
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Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
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Acct. Code:

NWL Lot ID: **407240**
Control Number: E 241022
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Hot Water Soluble

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Boron	mg/kg	<0.0	0.0	0.0	0.0	✓
Material Used:	Edmonton Method Blank					
Date Acquired:	Sep 12, 2005					
Acquired By:	To Thong					

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Boron	mg/kg	0.6	0.6	10.0	0.1	✓
Material Used:	Edmonton Duplicate					
Date Acquired:	Sep 12, 2005					
Acquired By:	Fernando Maglalang					

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Boron	mg/kg	1.4	1.4	1.0	1.8	✓
Material Used:	2001 Farm Soil Standard					
Date Acquired:	Sep 12, 2005					
Acquired By:	Fernando Maglalang					

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T5S 1J4
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Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407240**
Control Number: E 241022
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744617

Metals Strong Acid Digestion

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Mercury	ug/g	<0.00	0.00	0.00	0.00	✓
Antimony	ug/g	<0.0	0.0	0.0	0.0	✓
Arsenic	ug/g	<0.0	0.0	-0.1	0.2	✓
Barium	ug/g	<0	1	-2	3	✓
Beryllium	ug/g	<0.0	0.0	0.0	0.0	✓
Cadmium	ug/g	0.00	0.00	-0.03	0.03	✓
Chromium	ug/g	<0.0	-0.3	-1.5	0.9	✓
Cobalt	ug/g	<0.0	0.0	-0.1	0.1	✓
Copper	ug/g	<0	0	-1	1	✓
Lead	ug/g	<0.0	0.1	-0.2	0.4	✓
Molybdenum	ug/g	<0	0	0	0	✓
Nickel	ug/g	<0.0	-0.2	-1.7	1.2	✓
Selenium	ug/g	<0.0	0.0	-0.3	0.2	✓
Silver	ug/g	<0.0	0.0	0.0	0.0	✓
Thallium	ug/g	<0.00	0.00	-0.01	0.01	✓
Tin	ug/g	0	2	2	3	✓
Vanadium	ug/g	<0.0	0.0	-0.2	0.3	✓
Zinc	ug/g	0	0	-3	3	✓

Material Used: Edmonton Method Blank
Date Acquired: Sep 12, 2005
Acquired By: Linda Li

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Quality Control

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17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407240**
Control Number: E 241022
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744617

Metals Strong Acid Digestion (Continued...)

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	ug/g	0.01	0.03	9.99	0.03	✓
Antimony	ug/g	<0.2	<0.2	20.0	0.4	✓
Arsenic	ug/g	1.6	1.7	20.0	0.4	✓
Barium	ug/g	76	72	20	2	✓
Beryllium	ug/g	0.4	0.4	20.0	0.2	✓
Cadmium	ug/g	5.13	5.21	20.01	0.02	✓
Chromium	ug/g	21.2	21.3	20.0	1.1	✓
Cobalt	ug/g	7.0	7.1	20.0	0.2	✓
Copper	ug/g	9	9	20	2	✓
Lead	ug/g	8.5	8.9	20.0	0.2	✓
Molybdenum	ug/g	<1	<1	20	2	✓
Nickel	ug/g	11.0	10.6	20.0	1.1	✓
Selenium	ug/g	<0.3	<0.3	20.0	0.7	✓
Silver	ug/g	0.1	<0.1	20.0	0.2	✓
Thallium	ug/g	0.26	0.25	20.01	0.11	✓
Tin	ug/g	2	2	20	2	✓
Vanadium	ug/g	34.0	34.2	20.0	0.2	✓
Zinc	ug/g	99	102	20	2	✓

Material Used: Edmonton Duplicate
Date Acquired: Sep 12, 2005
Acquired By: Linda Li

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Quality Control

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T5S 1J4
Attn: Greg Wright
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Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
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Acct. Code:

NWL Lot ID: **407240**
Control Number: E 241022
Date Received: Sep 09, 2005
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Metals Strong Acid Digestion (Continued...)

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Mercury	ug/g	1.53	1.45	1.18	1.72	✓
Antimony	ug/g	<0.2	0.2	0.1	0.3	✓
Arsenic	ug/g	17.4	16.8	14.1	19.5	✓
Barium	ug/g	440	406	330	482	✓
Beryllium	ug/g	1	0.9	0.7	1.1	✓
Cadmium	ug/g	0.43	0.38	0.30	0.45	✓
Chromium	ug/g	83.4	84.7	69.4	100.0	✓
Cobalt	ug/g	14.1	13.4	11.1	15.7	✓
Copper	ug/g	32	33	27	39	✓
Lead	ug/g	14.4	13.4	11.0	15.8	✓
Molybdenum	ug/g	<1	1	1	1	✓
Nickel	ug/g	81.9	81.8	68.5	95.1	✓
Selenium	ug/g	1.6	1.2	0.5	1.9	✓
Silver	ug/g	0.4	0.4	0.2	0.5	✓
Thallium	ug/g	0.36	0.35	0.28	0.41	✓
Tin	ug/g	<1	1	1	1	✓
Vanadium	ug/g	84.3	83.3	63.7	103.0	✓
Zinc	ug/g	110	103	85	121	✓

Material Used: Metals Soils
Date Acquired: Sep 12, 2005
Acquired By: Linda Li

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T5S 1J4
Attn: Greg Wright
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Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
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Acct. Code:

NWL Lot ID: **407240**
Control Number: E 241022
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
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Mono-Aromatic Hydrocarbons - Soil

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Benzene	ng	49.1	50.00	98.20	77.50-122.50	✓
Toluene	ng	48.3	50.00	96.60	77.50-122.50	✓
Ethylbenzene	ng	47.0	50.00	94.00	77.50-122.50	✓
Total Xylenes (m,p,o)	ng	141.0	150.00	94.00	77.50-122.50	✓
Material Used:	Calibration Check - BTEX					
Date Acquired:	Sep 12, 2005					
Acquired By:	Paul Cushing					

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Benzene	mg/kg	0.92	0.92	45.00		✓
Toluene	mg/kg	0.91	0.91	45.00		✓
Ethylbenzene	mg/kg	0.98	0.98	45.00		✓
Total Xylenes (m,p,o)	mg/kg	2.89	2.91	45.00		✓
Material Used:	Duplicate - Run 2 - BTEX					
Date Acquired:	Sep 12, 2005					
Acquired By:	Paul Cushing					
F1 C6-C10	mg/kg	58	58	45		✓
Material Used:	Duplicate - Run 2 - F1					
Date Acquired:	Sep 12, 2005					
Acquired By:	Paul Cushing					

Matrix Spike	Units	Measured	Actual	% Recovery	Criteria (%)	Passed QC
Benzene	mg/kg	0.92	0.99	92.93	40.00-160.00	✓
Toluene	mg/kg	0.91	0.99	91.92	40.00-160.00	✓
Ethylbenzene	mg/kg	0.98	0.99	98.99	40.00-160.00	✓
Total Xylenes (m,p,o)	mg/kg	2.89	2.96	97.64	40.00-160.00	✓
Material Used:	Matrix Spike - BTEX					
Date Acquired:	Sep 12, 2005					
Acquired By:	Paul Cushing					
F1 C6-C10	mg/kg	58	46		40-160	✓
Material Used:	Matrix Spike - F1					
Date Acquired:	Sep 12, 2005					
Acquired By:	Paul Cushing					

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Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
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Acct. Code:

NWL Lot ID: **407240**
Control Number: E 241022
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
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Extractable Petroleum Hydrocarbons - Soxhlet

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
F2 C10-C16	mg/kg	<10	0	-15	15	✓
F3 C16-C34	mg/kg	<10	0	-15	15	✓
F4HTGC C34-C50+	mg/kg	<10	0	-15	15	✓
Material Used:	Method Blank - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	Nancy Yeung					

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
F2 C10-C16	ug/mL	86.5	90	96	78-123	✓
F3 C16-C34	ug/mL	682.0	710	96	78-123	✓
F4HTGC C34-C50+	ug/mL	192.1	200	96	78-123	✓
Material Used:	Calibration Check - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	Nancy Yeung					

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
F2 C10-C16	mg/kg	360	350	30	0	✓
F3 C16-C34	mg/kg	550	560	30	0	✓
F4HTGC C34-C50+	mg/kg	130	130	30	0	✓
Material Used:	Duplicate - Run 2 - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	Nancy Yeung					

Matrix Spike	Units	Measured	Actual	% Recovery	Criteria (%)	Passed QC
F2 C10-C16	mg/kg	360	415	86	40-160	✓
F3 C16-C34	mg/kg	550	641	87	40-160	✓
F4HTGC C34-C50+	mg/kg	130	165	79	40-160	✓
Material Used:	Matrix Spike - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	Nancy Yeung					

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Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407240**
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Polynuclear Aromatic Hydrocarbons - Soil

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Naphthalene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Acenaphthylene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Acenaphthene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Fluorene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Phenanthrene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Anthracene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Fluoranthene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Pyrene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Benzo(a)anthracene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Chrysene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Benzo(b)fluoranthene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Benzo(k)fluoranthene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Benzo(a)pyrene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Dibenzo(a,h)anthracene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Benzo(g,h,i)perylene	mg/kg	<0.05	0.00	-0.08	0.08	✓

Material Used: Method Blank - SV
Date Acquired: Sep 12, 2005
Acquired By: Inna Kazakov

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Naphthalene	ug/mL	490.0	500.00	98.00	70.00-130.00	✓
Acenaphthylene	ng/mL	516.0	500.00	103.20	70.00-130.00	✓
Acenaphthene	ng/mL	523.0	500.00	104.60	70.00-130.00	✓
Fluorene	ng/mL	520.0	500.00	104.00	70.00-130.00	✓
Phenanthrene	ng/mL	519.0	500.00	103.80	70.00-130.00	✓
Anthracene	ng/mL	504.0	500.00	100.80	70.00-130.00	✓
Fluoranthene	ng/mL	554.0	500.00	110.80	70.00-130.00	✓
Pyrene	ng/mL	562.0	500.00	112.40	70.00-130.00	✓
Benzo(a)anthracene	ng/mL	521.0	500.00	104.20	70.00-130.00	✓
Chrysene	ng/mL	465.0	500.00	93.00	70.00-130.00	✓
Benzo(b)fluoranthene	ng/mL	438.0	500.00	87.60	70.00-130.00	✓
Benzo(k)fluoranthene	ng/mL	596.0	500.00	119.20	70.00-130.00	✓
Benzo(a)pyrene	ng/mL	533.0	500.00	106.60	70.00-130.00	✓
Indeno(1,2,3-c,d)pyrene	ng/mL	510.0	500.00	102.00	70.00-130.00	✓
Dibenzo(a,h)anthracene	ng/mL	573.0	500.00	114.60	70.00-130.00	✓
Benzo(g,h,i)perylene	ng/mL	511.0	500.00	102.20	70.00-130.00	✓

Material Used: Standard - PAHs
Date Acquired: Sep 12, 2005
Acquired By: Inna Kazakov

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407240**
Control Number: E 241022
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744617

Polynuclear Aromatic Hydrocarbons - Soil (Continued...)

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Naphthalene	mg/kg	0.35	0.34	30.00	0.10	✓
Acenaphthylene	mg/kg	0.33	0.32	30.00	0.10	✓
Acenaphthene	mg/kg	0.33	0.31	30.00	0.10	✓
Fluorene	mg/kg	0.30	0.29	30.00	0.10	✓
Phenanthrene	mg/kg	0.30	0.30	30.00	0.10	✓
Anthracene	mg/kg	0.31	0.31	30.00	0.10	✓
Fluoranthene	mg/kg	0.34	0.33	30.00	0.10	✓
Pyrene	mg/kg	0.34	0.33	30.00	0.10	✓
Benzo(a)anthracene	mg/kg	0.34	0.31	30.00	0.10	✓
Chrysene	mg/kg	0.31	0.29	30.00	0.10	✓
Benzo(b)fluoranthene	mg/kg	0.31	0.26	30.00	0.10	✓
Benzo(k)fluoranthene	mg/kg	0.30	0.27	30.00	0.10	✓
Benzo(a)pyrene	mg/kg	0.29	0.25	30.00	0.10	✓
Indeno(1,2,3-c,d)pyrene	mg/kg	0.30	0.25	30.00	0.10	✓
Dibenzo(a,h)anthracene	mg/kg	0.27	0.21	30.00	0.10	✓
Benzo(g,h,i)perylene	mg/kg	0.26	0.23	30.00	0.10	✓

Material Used: Duplicate - Run 2 - SV
Date Acquired: Sep 12, 2005
Acquired By: Inna Kazakov

Matrix Spike	Units	Measured	Actual	% Recovery	Criteria (%)	Passed QC
Naphthalene	mg/kg	540	500	108.00	10.00-190.00	✓
Acenaphthylene	mg/kg	519	500	103.80	10.00-190.00	✓
Acenaphthene	mg/kg	511	500	102.20	10.00-190.00	✓
Fluorene	mg/kg	471	500	94.20	10.00-190.00	✓
Phenanthrene	mg/kg	473	500	94.60	10.00-190.00	✓
Anthracene	mg/kg	485	500	97.00	10.00-190.00	✓
Fluoranthene	mg/kg	526	500	105.20	10.00-190.00	✓
Pyrene	mg/kg	531	500	106.20	10.00-190.00	✓
Benzo(a)anthracene	mg/kg	522	500	104.40	10.00-190.00	✓
Chrysene	mg/kg	473	500	94.60	10.00-190.00	✓
Benzo(b)fluoranthene	mg/kg	476	500	95.20	10.00-190.00	✓
Benzo(k)fluoranthene	mg/kg	468	500	93.60	10.00-190.00	✓
Benzo(a)pyrene	mg/kg	448	500	89.60	10.00-190.00	✓
Indeno(1,2,3-c,d)pyrene	mg/kg	463	500	92.60	10.00-190.00	✓
Dibenzo(a,h)anthracene	mg/kg	416	500	83.20	10.00-190.00	✓
Benzo(g,h,i)perylene	mg/kg	408	500	81.60	10.00-190.00	✓

Material Used: Matrix Spike - SV
Date Acquired: Sep 12, 2005
Acquired By: Inna Kazakov

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
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Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407240**
Control Number: E 241022
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744617

PAH - Soil - Surrogate Recovery

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Nitrobenzene-d5	%	95	77	-4	157	✓
2-Fluorobiphenyl	%	100	80	5	155	✓
p-Terphenyl-d14	%	89	78	-12	167	✓

Material Used: Method Blank - SV
Date Acquired: Sep 12, 2005
Acquired By: Inna Kazakov

Polychlorinated Biphenyls - Soil

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Aroclor 1016	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1221	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1232	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1242	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1248	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1254	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1260	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1262	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1268	mg/kg	<0.1	0.0	-0.3	0.3	✓

Material Used: Method Blank - SV
Date Acquired: Sep 12, 2005
Acquired By: Inna Kazakov

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Aroclor 1254	ug/mL	0.9	1.0	90.0	70.0-130.0	✓

Material Used: Calibration Check - PCBs
Date Acquired: Sep 12, 2005
Acquired By: Inna Kazakov

Polychlorinated Biphenyls - Soil - Surrogate

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Decachlorobiphenyl	%	100	100	10	190	✓

Material Used: Method Blank - SV
Date Acquired: Sep 12, 2005
Acquired By: Inna Kazakov

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Methodology and Notes

Bill to: Earth Tech Canada Inc.
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17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407240**
Control Number: E 241022
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744617

Method of Analysis:

MethodName	Reference		Method	Date Analysis Started	Location
Boron in general soil	McKeague	*	Hot Water Soluble Boron - Azomethine-H Method, 4.61	13-Sep-05	Norwest Labs Edmonton
BTEX-CCME - Soil	CCME		Reference Method - Canada-Wide Standard for PHC in Soil, CWS PHC	13-Sep-05	Norwest Labs Calgary
Mercury (Hot Block) in Soil	US EPA	*	Determination of Hg in Sediment by Cold Vapor Atomic Absorption Spec, 245.5	12-Sep-05	Norwest Labs Edmonton
Metals ICP-MS (Hot Block) in soil	SW-846	*	Acid Digestion of Sediments, Sludges, and Soils, EPA 3050B	12-Sep-05	Norwest Labs Edmonton
PAH - Soil	US EPA	*	Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry, 8270	16-Sep-05	Norwest Labs Calgary
PCB - Soil	US EPA	*	US EPA method, 8082	19-Sep-05	Norwest Labs Calgary
TEH-CCME-Soil (Soxhlet)	CCME		Reference Method - Canada-Wide Standard for PHC in Soil, CWS PHC	14-Sep-05	Norwest Labs Calgary

* Norwest method(s) is based on reference method

References:

CCME	Canadian Council of Ministers of the Environment
McKeague	Manual on Soil Sampling and Methods of Analysis
SW-846	Test Methods for Evaluating Solid Waste
US EPA	US Environmental Protection Agency Test Methods

Comments:

>130 - The surrogate recovery is higher then the range (23-130)% due to interference of Nitrobenzene-d5 with other hydrocarbons contained in the sample.IK 05/09/16

Please direct any inquiries regarding this report to our Client Services group.
Results relate only to samples as submitted

The test report shall not be reproduced except in full, without the written approval of the laboratory

Norwest Labs
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Edmonton, AB. T6B 3J4
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Fax: (780) 438-0396

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407240**
Control Number: E 241022
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744617

Petroleum Hydrocarbons in Soil

Batch Notes

1. The method used complies with the Reference Method for the Canada Wide Standards for Petroleum Hydrocarbons in Soil - Tier 1, April 2001 and is accredited for use in Norwest laboratories.
2. Modifications of the method: See Notes and Methodology for Non-conformances (if Applicable).
3. Qualifications on results: See Notes and Methodology for Non-conformances (if applicable).
4. Silica gel treatment is done for fractions F2, F3, F4.
5. F1-BTEX: BTEX has been subtracted from the F1 fraction.
6. F2-naphth and F3-PAH: selected PAHs have been subtracted from the appropriate fractions.
7. F4HTGC is reported when more than 5% of the total carbon envelope elutes past C50.
8. Gravimetric Heavy Hydrocarbons are not reported anymore in Alberta, F4 high temperature is reported instead.
9. When both F4(C34-C50) and FHTGC are reported, F4HTGC is the F4 that is to be used for interpreting the CWS.
10. Quality criteria met for the batch: Data is reported in Quality Control Section of report (if requested).
    -nC6 and nC10 response factors (RF) are within 30% of RF for toluene
    -nC10,nC16 and nC34 RFs are within 10% of each other
    -nC50 RF is within 70% of the average RF for NC10+nC16+nC16+nC34
    -linearity is within 15%
11. Batch data for QC samples is available on request.
12. Extraction and analysis holding times were met: See Notes and Methodology for Non-conformances (if applicable).

Approved by:



Darren Crichton, BSc, PChem
Operations Chemist

NORWEST LABS

407307

Control Number E 241012

Environmental Sample Information Sheet

NOTE: Proper completion of this form is required in order to proceed with analysis

See reverse for your nearest Norwest location and proper sampling protocol

Billing Address: x	**Copy of Report To:**	**Copy of invoice:** ☐
Company: Earth Tech Canada Inc.	Company: Earth Tech Canada Inc.	Mail invoice to this address for approval x ☐
Address: 17203-103 Ave, Edmonton, AB T5S 1J4	Address: 17203-103 Ave, Edmonton, AB T5S 1J4	
QA/QC Report ☑		
Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-Service ☑		Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-service ☐
Attention: Greg Wright	Attention: Greg Wright	
Phone: (780) 488-6800	Phone: (780) 488-6800	
Fax: (780) 488-2121	Fax: (780) 488-2121	
Cell:	Cell:	
e-mail: greg.wright@earthtech.ca	e-mail: greg.wright@earthtech.ca	

Information to be included on Report and Invoice

Project ID: 88122
Project Name: Phase III Arctic ESA
Project Location: Simpson Lake
Legal Location:
PO#:
Proj. Acct. Code:
Agreement ID: 62449

RUSH

Please contact the laboratory to confirm rush dates and times before submitting samples.

Upon filling out this section, client accepts that surcharges will be attached to this analysis

Required on: all analyses **or** as indicated ☐ or ☐

Date Required: _____

Signature: _____

Norwest Authorization: _____

Sample Custody (Please Print)

Relinquished by: Greg Wright

Company ETC Signature GW

I authorize Norwest Labs to proceed with the work indicated on this form:

Date: Sept 1, 2005

Initial: GW.

Received by: ☐ Coolers

Waybill # Date ☐ Boxes

Company Time ☐ Samples

Special Instructions / Comments ☐ Check here if Norwest is required to report results directly to a regulatory body (Please include contact information)

Received By: Date:

Company: Time:

	Sample Identification	Location	Depth IN CM M	Date / Time Sampled	Matrix	Sampling Method	Number of Containers	Barrel Proto	CCMEW	METALS	PAH	PCB	POTABILITY	TSS	CCMES	METALS	PAH	PCB
							↓	Enter tests above (✓ relevant samples below)										
1	Barrel Proto		—	Aug 31	water	grab	6	✓										
2	BARREL DUMP		—	"	"	"	6		✓	✓	✓							
3	FRESHWATER LAKE		—	"	"	"	3			✓			✓	✓				
4	GAR FLOOR		—	"	Soil	"	4								✓	✓	✓	✓
5			—															
6			—															
7			—															
8			—															
9			—															
10			—															
11			—															
12			—															
13			—															
14			—															
15			—															

NOTE: All hazardous samples must be labelled according to WHMIS guidelines.

Accredited by the Standards Council of Canada for specific tests

NWL008 (08/03)

Analytical Report

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407307**
Control Number: E 241012
Date Received: Sep 09, 2005
Date Reported: Sep 16, 2005
Report Number: 744784

NWL Number	407307-3
Sample Date	Aug 31, 2005
Sample Description	Freshwater Lake
Sample Matrix	Water - General

Analyte		Units	Result	Detection Limit	Guideline Limit	Guideline Comments
Metals Total						
Iron	Total	mg/L	<0.1	0.1	0.3	Acceptable
Manganese	Total	mg/L	<0.005	0.005	0.05	Acceptable
Silicon	Total	mg/L	0.65	0.05		n/a
Sulfur	Total	mg/L	4.7	0.3		n/a
Mercury	Total	mg/L	<0.0001	0.0001	0.001	Pass
Aluminum	Total	mg/L	0.099	0.005		n/a
Antimony	Total	mg/L	<0.0002	0.0002		n/a
Arsenic	Total	mg/L	<0.0002	0.0002		n/a
Barium	Total	mg/L	0.004	0.001		n/a
Beryllium	Total	mg/L	<0.0001	0.0001		n/a
Bismuth	Total	mg/L	<0.0005	0.0005		n/a
Boron	Total	mg/L	0.004	0.002		n/a
Cadmium	Total	mg/L	<0.00001	0.00001		n/a
Chromium	Total	mg/L	<0.0005	0.0005		n/a
Cobalt	Total	mg/L	<0.0001	0.0001		n/a
Copper	Total	mg/L	<0.001	0.001		n/a
Lead	Total	mg/L	<0.0001	0.0001		n/a
Lithium	Total	mg/L	<0.001	0.001		n/a
Molybdenum	Total	mg/L	<0.001	0.001		n/a
Nickel	Total	mg/L	<0.0005	0.0005		n/a
Selenium	Total	mg/L	<0.0002	0.0002		n/a
Silver	Total	mg/L	0.0001	0.0001		n/a
Strontium	Total	mg/L	0.012	0.001		n/a
Thallium	Total	mg/L	<0.00005	0.00005		n/a
Tin	Total	mg/L	<0.001	0.001		n/a
Titanium	Total	mg/L	0.0071	0.0005		n/a
Uranium	Total	mg/L	<0.0005	0.0005		n/a
Vanadium	Total	mg/L	0.0002	0.0001		n/a
Zinc	Total	mg/L	0.001	0.001		n/a
Physical and Aggregate Properties						
Colour	Apparent, Potable	Colour units	16	5	15	Above Aesthetic
Turbidity		NTU	2.7	0.1	5	Acceptable

Please Note: Related regulatory criteria are provided as a service to clients. Norwest Labs' responsibility is limited to analytical data. We are not responsible for ensuring that listed criteria are current, scientifically valid, appropriate and sufficient for the user of the data.

NORWEST LABS

Norwest Labs
7217 Roper Road NW
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Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407307**
Control Number: E 241012
Date Received: Sep 09, 2005
Date Reported: Sep 16, 2005
Report Number: 744784

NWL Number	407307-3
Sample Date	Aug 31, 2005
Sample Description	Freshwater Lake
Sample Matrix	Water - General

Analyte		Units	Result	Detection Limit	Guideline Limit	Guideline Comments
Physical and Aggregate Properties - Continued						
Temperature of observed pH		°C	19.8	-		n/a
Solids	Total Suspended	mg/L	8	1		n/a
Routine Water						
pH			7.06	-	6.5 - 8.5	Acceptable
Electrical Conductivity		µS/cm at 25 C	57	1		n/a
Calcium	Dissolved	mg/L	4.1	0.2		n/a
Calcium	Extractable	mg/L	4.1	0.2		n/a
Magnesium	Dissolved	mg/L	2.2	0.1		n/a
Magnesium	Extractable	mg/L	2.1	0.1		n/a
Sodium	Dissolved	mg/L	2.5	0.4	200	Acceptable
Sodium	Extractable	mg/L	2.2	0.4	200	Acceptable
Potassium	Dissolved	mg/L	1.0	0.4		n/a
Potassium	Extractable	mg/L	0.9	0.4		n/a
Iron	Dissolved	mg/L	0.02	0.01	0.3	Acceptable
Iron	Extractable	mg/L	0.03	0.03	0.3	Acceptable
Manganese	Dissolved	mg/L	<0.005	0.005	0.05	Acceptable
Manganese	Extractable	mg/L	<0.005	0.005	0.05	Acceptable
Chloride	Dissolved	mg/L	1.7	0.4	250	Acceptable
Fluoride		mg/L	<0.05	0.05	1.5	Pass
Nitrate - N		mg/L	0.02	0.01	10	Pass
Nitrite - N		mg/L	<0.005	0.005	1	Pass
Nitrate and Nitrite - N		mg/L	<0.02	0.02	10	Pass
Sulfate (SO4)		mg/L	12	0.9	500	Acceptable
Sulfate (SO4)	Dissolved	mg/L	13	0.9	500	Acceptable
Hydroxide		mg/L	<5	5		n/a
Carbonate		mg/L	11	6		n/a
Bicarbonate		mg/L	<5	5		n/a
P-Alkalinity	as CaCO3	mg/L	<5	5		n/a
T-Alkalinity	as CaCO3	mg/L	9	5	250-650	Low
Total Dissolved Solids		mg/L	29	1	500	Acceptable

Please Note: Related regulatory criteria are provided as a service to clients. Norwest Labs' responsibility is limited to analytical data. We are not responsible for ensuring that listed criteria are current, scientifically valid, appropriate and sufficient for the user of the data.

Analytical Report

Norwest Labs
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T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407307**
Control Number: E 241012
Date Received: Sep 09, 2005
Date Reported: Sep 16, 2005
Report Number: 744784

NWL Number	407307-3
Sample Date	Aug 31, 2005
Sample Description	Freshwater Lake
Sample Matrix	Water - General

Analyte		Units	Result	Detection Limit	Guideline Limit	Guideline Comments
Routine Water - Continued						
Total Dissolved Solids	Calculated	mg/L	30	1		n/a
Hardness	Dissolved as CaCO3	mg/L	19	-		n/a
Hardness	as CaCO3	mg/L	19	-		Soft
Ionic Balance	Dissolved	%	77	-		n/a
Ionic Balance		%	74	-		n/a

Approved by:

Anthony Neumann, MSc
Laboratory Operations Manager

Please Note: Related regulatory criteria are provided as a service to clients. Norwest Labs' responsibility is limited to analytical data. We are not responsible for ensuring that listed criteria are current, scientifically valid, appropriate and sufficient for the user of the data.

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Methodology and Notes

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407307**
Control Number: E 241012
Date Received: Sep 09, 2005
Date Reported: Sep 16, 2005
Report Number: 744784

Method of Analysis:

MethodName	Reference		Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	*	Conductivity - Laboratory Method, 2510 B	12-Sep-05	Norwest Labs Edmonton
Alkalinity, pH, and EC in water	APHA	*	Electrometric Method, 4500-H+ B	12-Sep-05	Norwest Labs Edmonton
Alkalinity, pH, and EC in water	APHA	*	Titration Method, 2320 B	12-Sep-05	Norwest Labs Edmonton
Anions (Routine) by Ion Chromatography	APHA	*	Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	13-Sep-05	Norwest Labs Edmonton
Chloride in Water	APHA	*	Automated Ferricyanide Method, 4500-Cl- E	12-Sep-05	Norwest Labs Edmonton
Colour (Apparent) in water	APHA	*	Visual Comparison Method, 2120 B	12-Sep-05	Norwest Labs Edmonton
Mercury (Total) in water	US EPA	*	Determination of Hg in Sediment by Cold Vapor Atomic Absorption Spec, 245.5	12-Sep-05	Norwest Labs Edmonton
Metals ICP-MS (Total) in water	US EPA	*	Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	12-Sep-05	Norwest Labs Edmonton
Metals Trace (Dissolved) in water	APHA	*	Inductively Coupled Plasma (ICP) Method, 3120 B	12-Sep-05	Norwest Labs Edmonton
Metals Trace (Extractable) in water	APHA	*	Inductively Coupled Plasma (ICP) Method, 3120 B	12-Sep-05	Norwest Labs Edmonton
Metals Trace (Total) in water	APHA	*	Inductively Coupled Plasma (ICP) Method, 3120 B	12-Sep-05	Norwest Labs Edmonton
Solids Suspended (Total, Fixed and Volatile)	APHA	*	Total Suspended Solids Dried at 103-105'C, 2540 D	13-Sep-05	Norwest Labs Edmonton
Turbidity in Water	APHA	*	Nephelometric Method, 2130 B	12-Sep-05	Norwest Labs Edmonton

* Norwest method(s) is based on reference method

References:

APHA	Standard Methods for the Examination of Water and Wastewater
US EPA	US Environmental Protection Agency Test Methods

Comments:

Talked with Leigh P. In regards to the holding time, Samples are compromised due to the holding time being over the 7 day recommendation. Leigh P will get in touch with client in regards to the holding time.

Please direct any inquiries regarding this report to our Client Services group.
Results relate only to samples as submitted
The test report shall not be reproduced except in full, without the written approval of the laboratory

NORWEST LABS

407307

Control Number E 241012

Environmental Sample Information Sheet

NOTE: Proper completion of this form is required in order to proceed with analysis

See reverse for your nearest Norwest location and proper sampling protocol

Billing Address: x	**Copy of Report To:**	**Copy of invoice:** ☐
Company: Earth Tech Canada Inc.	Company: Earth Tech Canada Inc.	Mail invoice to this address for approval x ☐
Address: 17203-103 Ave, Edmonton, AB T5S 1J4	Address: 17203-103 Ave, Edmonton, AB T5S 1J4	
QA/QC Report ☑		
Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-Service ☑		Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-service ☐
Attention: Greg Wright	Attention: Greg Wright	
Phone: (780) 488-6800	Phone: (780) 488-6800	
Fax: (780) 488-2121	Fax: (780) 488-2121	
Cell:	Cell:	
e-mail: greg.wright@earthtech.ca	e-mail: greg.wright@earthtech.ca	

Information to be included on Report and Invoice

Project ID: 88122
Project Name: Phase III Arctic ESA
Project Location: Simpson Lake
Legal Location:
PO#:
Proj. Acct. Code:
Agreement ID: 62449

RUSH

Please contact the laboratory to confirm rush dates and times before submitting samples.

Upon filling out this section, client accepts that surcharges will be attached to this analysis

Required on: all analyses **or** as indicated ☐ or ☐

Date Required: _____

Signature: _____

Norwest Authorization: _____

Sample Custody (Please Print)

Relinquished by: Greg Wright

Company ETC Signature GW

I authorize Norwest Labs to proceed with the work indicated on this form:

Date: Sept 1, 2005

Initial: GW.

Received by: ☐ Coolers

Waybill # Date ☐ Boxes

Company Time ☐ Samples

Special Instructions / Comments ☐ Check here if Norwest is required to report results directly to a regulatory body (Please include contact information)

Received By: Date:

Company: Time:

	Sample Identification	Location	Depth IN CM M	Date / Time Sampled	Matrix	Sampling Method	Number of Containers	Barrel Proto	CCMEW	METALS	PAH	PCB	POTABILITY	TSS	CCMES	METALS	PAH	PCB
							↓	Enter tests above (✓ relevant samples below)										
1	Barrel Proto		—	Aug 31	water	grab	6	✓										
2	BARREL DUMP		—	"	"	"	6		✓	✓	✓							
3	FRESHWATER LAKE		—	"	"	"	3			✓			✓	✓				
4	GAR FLOOR		—	"	Soil	"	4								✓	✓	✓	✓
5			—															
6			—															
7			—															
8			—															
9			—															
10			—															
11			—															
12			—															
13			—															
14			—															
15			—															

NOTE: All hazardous samples must be labelled according to WHMIS guidelines.

Accredited by the Standards Council of Canada for specific tests

NWL008 (08/03)

Analytical Report

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407307**
Control Number: E 241012
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744765

NWL Number	407307-1
Sample Date	Aug 31, 2005
Sample Description	Barrel Proto
Sample Matrix	Water - General

Analyte		Units	Result	Detection Limit
Alcohol Screen - Water				
Methanol		mg/L	<5	5
Ethanol		mg/L	<5	5
2-Propanol		mg/L	<5	5
1-Propanol		mg/L	<5	5
1-Butanol		mg/L	<5	5
1-Pentanol		mg/L	<5	5
Glycol Screen - Water				
Ethylene Glycol		mg/L	<10	10
Propylene Glycol		mg/L	<10	10
Diethylene Glycol		mg/L	<10	10
Triethylene Glycol		mg/L	<10	10
Tetraethylene Glycol		mg/L	<10	10
Inorganic Nonmetallic Parameters				
Chlorine	Total	mg/L	<0.1	0.1
Metals Total				
Cadmium	Total	mg/L	<0.00005	0.00001
Chromium	Total	mg/L	0.021	0.0005
Lead	Total	mg/L	0.0005	0.0001
Polychlorinated Biphenyls - Water				
Aroclor 1016		ug/L	<0.1	0.1
Aroclor 1221		ug/L	<0.1	0.1
Aroclor 1232		ug/L	<0.1	0.1
Aroclor 1242		ug/L	<0.1	0.1
Aroclor 1248		ug/L	<0.1	0.1
Aroclor 1254		ug/L	<0.1	0.1
Aroclor 1260		ug/L	<0.1	0.1
Aroclor 1262		ug/L	<0.1	0.1
Aroclor 1268		ug/L	<0.1	0.1
Total PCBs		ug/L	<0.1	<0.1
Polychlorinated Biphenyls - Water - Surrogate				
Decachlorobiphenyl	Surrogate	%	107	50-150
Extractable Hydrocarbons (C40) - Water				
Total C11-C40+		mg/L	87.7	0.1

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Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407307**
Control Number: E 241012
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744765

NWL Number	407307-2
Sample Date	Aug 31, 2005
Sample Description	Barrel Dump
Sample Matrix	Water - General

Analyte		Units	Result	Detection Limit
Polychlorinated Biphenyls - Water				
Aroclor 1016		ug/L	<0.1	0.1
Aroclor 1221		ug/L	<0.1	0.1
Aroclor 1232		ug/L	<0.1	0.1
Aroclor 1242		ug/L	<0.1	0.1
Aroclor 1248		ug/L	<0.1	0.1
Aroclor 1254		ug/L	<0.1	0.1
Aroclor 1260		ug/L	<0.1	0.1
Aroclor 1262		ug/L	<0.1	0.1
Aroclor 1268		ug/L	<0.1	0.1
Total PCBs		ug/L	<0.1	<0.1
Polychlorinated Biphenyls - Water - Surrogate				
Decachlorobiphenyl	Surrogate	%	98	50-150
Polynuclear Aromatic Hydrocarbons - Water				
Naphthalene		ug/L	<0.01	0.01
Acenaphthylene		ug/L	<0.01	0.01
Acenaphthene		ug/L	<0.01	0.01
Fluorene		ug/L	<0.01	0.01
Phenanthrene		ug/L	<0.01	0.01
Anthracene		ug/L	<0.01	0.01
Acridine		ug/L	<0.01	0.01
Fluoranthene		ug/L	<0.02	0.02
Pyrene		ug/L	<0.02	0.02
Benzo(a)anthracene		ug/L	<0.01	0.01
Chrysene		ug/L	<0.01	0.01
Benzo(b)fluoranthene		ug/L	<0.01	0.01
Benzo(k)fluoranthene		ug/L	<0.01	0.01
Benzo(a)pyrene		ug/L	<0.01	0.01
Indeno(1,2,3-c,d)pyrene		ug/L	<0.01	0.01
Dibenzo(a,h)anthracene		ug/L	<0.01	0.01
Benzo(g,h,i)perylene		ug/L	<0.01	0.01
CB(a)P	Carcinogenic Potency Equivalent	ug/L	<0.01	.01
PAH - Water - Surrogate Recovery				

NORWEST LABS

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Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407307**
Control Number: E 241012
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744765

NWL Number	407307-2
Sample Date	Aug 31, 2005
Sample Description	Barrel Dump
Sample Matrix	Water - General

Analyte		Units	Result	Detection Limit
Nitrobenzene-d5	PAH - Surrogate	%	74	23-130
2-Fluorobiphenyl	PAH - Surrogate	%	38	30-130
p-Terphenyl-d14	PAH - Surrogate	%	87	18-137
Mono-Aromatic Hydrocarbons - Water				
Benzene		mg/L	<0.001	0.001
Toluene		mg/L	<0.001	0.001
Ethylbenzene		mg/L	<0.001	0.001
Total Xylenes (m,p,o)		mg/L	<0.001	0.001
F1 -BTEX		mg/L	<0.01	0.01
F1 C6-C10		mg/L	<0.01	0.01
Volatile Petroleum Hydrocarbons - Water				
F1 C6-C10		mg/L	<0.01	0.01
F1 -BTEX		mg/L	<0.01	0.01
Extractable Petroleum Hydrocarbons - Water				
F2 C10-C16		mg/L	<0.1	0.1
F3 C16-C34		mg/L	<0.1	0.1
F3+ C34+		mg/L	<0.1	0.1

Analytical Report

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Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407307**
Control Number: E 241012
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744765

NWL Number	407307-3
Sample Date	Aug 31, 2005
Sample Description	Freshwater Lake
Sample Matrix	Water - General

Analyte		Units	Result	Detection Limit
Metals Total				
Iron	Total	mg/L	<0.1	0.1
Manganese	Total	mg/L	<0.005	0.005
Silicon	Total	mg/L	0.65	0.05
Sulfur	Total	mg/L	4.7	0.3
Mercury	Total	mg/L	<0.0001	0.0001
Aluminum	Total	mg/L	0.099	0.005
Antimony	Total	mg/L	<0.0002	0.0002
Arsenic	Total	mg/L	<0.0002	0.0002
Barium	Total	mg/L	0.004	0.001
Beryllium	Total	mg/L	<0.0001	0.0001
Bismuth	Total	mg/L	<0.0005	0.0005
Boron	Total	mg/L	0.004	0.002
Cadmium	Total	mg/L	<0.00001	0.00001
Chromium	Total	mg/L	<0.0005	0.0005
Cobalt	Total	mg/L	<0.0001	0.0001
Copper	Total	mg/L	<0.001	0.001
Lead	Total	mg/L	<0.0001	0.0001
Lithium	Total	mg/L	<0.001	0.001
Molybdenum	Total	mg/L	<0.001	0.001
Nickel	Total	mg/L	<0.0005	0.0005
Selenium	Total	mg/L	<0.0002	0.0002
Silver	Total	mg/L	0.0001	0.0001
Strontium	Total	mg/L	0.012	0.001
Thallium	Total	mg/L	<0.00005	0.00005
Tin	Total	mg/L	<0.001	0.001
Titanium	Total	mg/L	0.0071	0.0005
Uranium	Total	mg/L	<0.0005	0.0005
Vanadium	Total	mg/L	0.0002	0.0001
Zinc	Total	mg/L	0.001	0.001
Physical and Aggregate Properties				
Colour	Apparent, Potable	Colour units	16	5
Turbidity		NTU	2.7	0.1
Temperature of observed pH		°C	19.8	-

NORWEST LABS

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17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407307**
Control Number: E 241012
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744765

NWL Number	407307-3
Sample Date	Aug 31, 2005
Sample Description	Freshwater Lake
Sample Matrix	Water - General

Analyte		Units	Result	Detection Limit
Solids	Total Suspended	mg/L	8	1
Routine Water				
pH			7.06	-
Electrical Conductivity		µS/cm at 25 C	57	1
Calcium	Dissolved	mg/L	4.1	0.2
Calcium	Extractable	mg/L	4.1	0.2
Magnesium	Dissolved	mg/L	2.2	0.1
Magnesium	Extractable	mg/L	2.1	0.1
Sodium	Dissolved	mg/L	2.5	0.4
Sodium	Extractable	mg/L	2.2	0.4
Potassium	Dissolved	mg/L	1.0	0.4
Potassium	Extractable	mg/L	0.9	0.4
Iron	Dissolved	mg/L	0.02	0.01
Iron	Extractable	mg/L	0.03	0.03
Manganese	Dissolved	mg/L	<0.005	0.005
Manganese	Extractable	mg/L	<0.005	0.005
Chloride	Dissolved	mg/L	1.7	0.4
Fluoride		mg/L	<0.05	0.05
Nitrate - N		mg/L	0.02	0.01
Nitrite - N		mg/L	<0.005	0.005
Nitrate and Nitrite - N		mg/L	<0.02	0.02
Sulfate (SO4)		mg/L	12	0.9
Sulfate (SO4)	Dissolved	mg/L	13	0.9
Hydroxide		mg/L	<5	5
Carbonate		mg/L	11	6
Bicarbonate		mg/L	<5	5
P-Alkalinity	as CaCO3	mg/L	<5	5
T-Alkalinity	as CaCO3	mg/L	9	5
Total Dissolved Solids		mg/L	29	1
Total Dissolved Solids	Calculated	mg/L	30	1
Hardness	Dissolved as CaCO3	mg/L	19	-
Hardness	as CaCO3	mg/L	19	-
Ionic Balance	Dissolved	%	77	-

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Attn: Greg Wright
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Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407307**
Control Number: E 241012
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744765

NWL Number	407307-4
Sample Date	Aug 31, 2005
Sample Description	Gar Floor
Sample Matrix	Soil - general

Analyte		Units	Result	Detection Limit
Hot Water Soluble				
Boron	Water Soluble	mg/kg	3.6	0.1
Metals Strong Acid Digestion				
Mercury	Strong Acid Extractable	ug/g	0.12	0.01
Antimony	Strong Acid Extractable	ug/g	6.0	0.2
Arsenic	Strong Acid Extractable	ug/g	11.6	0.2
Barium	Strong Acid Extractable	ug/g	270	1
Beryllium	Strong Acid Extractable	ug/g	1.8	0.1
Cadmium	Strong Acid Extractable	ug/g	9.31	0.01
Chromium	Strong Acid Extractable	ug/g	134	0.5
Cobalt	Strong Acid Extractable	ug/g	16.4	0.1
Copper	Strong Acid Extractable	ug/g	1500	1
Lead	Strong Acid Extractable	ug/g	972	0.1
Molybdenum	Strong Acid Extractable	ug/g	8	1
Nickel	Strong Acid Extractable	ug/g	24.4	0.5
Selenium	Strong Acid Extractable	ug/g	0.5	0.3
Silver	Strong Acid Extractable	ug/g	0.2	0.1
Thallium	Strong Acid Extractable	ug/g	0.22	0.05
Tin	Strong Acid Extractable	ug/g	5	1
Vanadium	Strong Acid Extractable	ug/g	17.1	0.1
Zinc	Strong Acid Extractable	ug/g	1000	1
Polychlorinated Biphenyls - Soil				
Aroclor 1016	Dry Weight	mg/kg	<0.1	0.1
Aroclor 1221	Dry Weight	mg/kg	<0.1	0.1
Aroclor 1232	Dry Weight	mg/kg	<0.1	0.1
Aroclor 1242	Dry Weight	mg/kg	<0.1	0.1
Aroclor 1248	Dry Weight	mg/kg	<0.1	0.1
Aroclor 1254	Dry Weight	mg/kg	25.3	0.1
Aroclor 1260	Dry Weight	mg/kg	<0.1	0.1
Aroclor 1262	Dry Weight	mg/kg	<0.1	0.1
Aroclor 1268	Dry Weight	mg/kg	<0.1	0.1
Total PCBs	Dry Weight	mg/kg	25.3	0.1
Polychlorinated Biphenyls - Soil - Surrogate				
Decachlorobiphenyl	Surrogate	%	122	50-150

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Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407307**
Control Number: E 241012
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744765

NWL Number	407307-4
Sample Date	Aug 31, 2005
Sample Description	Gar Floor
Sample Matrix	Soil - general

Analyte		Units	Result	Detection Limit
Polynuclear Aromatic Hydrocarbons - Soil				
Naphthalene	Dry Weight	mg/kg	<0.05	0.05
Acenaphthylene	Dry Weight	mg/kg	<0.05	0.05
Acenaphthene	Dry Weight	mg/kg	<0.05	0.05
Fluorene	Dry Weight	mg/kg	<0.05	0.05
Phenanthrene	Dry Weight	mg/kg	0.78	0.05
Anthracene	Dry Weight	mg/kg	<0.05	0.05
Fluoranthene	Dry Weight	mg/kg	1.43	0.05
Pyrene	Dry Weight	mg/kg	1.72	0.05
Benzo(a)anthracene	Dry Weight	mg/kg	0.40	0.05
Chrysene	Dry Weight	mg/kg	4.47	0.05
Benzo(b)fluoranthene	Dry Weight	mg/kg	1.07	0.05
Benzo(j)fluoranthene	Dry Weight	mg/kg	<0.05	0.05
Benzo(k)fluoranthene	Dry Weight	mg/kg	<0.05	0.05
Benzo(a)pyrene	Dry Weight	mg/kg	<0.05	0.05
Indeno(1,2,3-c,d)pyrene	Dry Weight	mg/kg	0.06	0.05
Dibenzo(a,h)anthracene	Dry Weight	mg/kg	0.05	0.05
Benzo(g,h,i)perylene	Dry Weight	mg/kg	0.09	0.05
CB(a)P	Carcinogenic Potency Equivalent	mg/kg	0.2337	0.0002
PAH - Soil - Surrogate Recovery				
Nitrobenzene-d5	PAH - Surrogate	%	36	23-130
2-Fluorobiphenyl	PAH - Surrogate	%	36	30-130
p-Terphenyl-d14	PAH - Surrogate	%	129	18-137
Soil % Moisture				
Moisture	Soil % Moisture	%	12.80	-
Mono-Aromatic Hydrocarbons - Soil				
Extraction Date			12-Sep-05	-
Benzene	Dry Weight	mg/kg	<0.02	0.02
Toluene	Dry Weight	mg/kg	0.03	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.02	0.02
Total Xylenes (m,p,o)	Dry Weight	mg/kg	0.03	0.02
F1 -BTEX	Dry Weight	mg/kg	<1	1
F1 C6-C10	Dry Weight	mg/kg	<1	1

Analytical Report

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Edmonton, AB. T6B 3J4
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Fax: (780) 438-0396

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407307**
Control Number: E 241012
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744765

NWL Number	407307-4
Sample Date	Aug 31, 2005
Sample Description	Gar Floor
Sample Matrix	Soil - general

Analyte		Units	Result	Detection Limit
Volatile Petroleum Hydrocarbons - Soil				
Extraction Date			12-Sep-05	-
F1 C6-C10	Dry Weight	mg/kg	<1	1
F1 -BTEX	Dry Weight	mg/kg	<1	1
Extractable Petroleum Hydrocarbons - Soxhlet				
Extraction Date			12-Sep-05	-
F2 C10-C16	Dry Weight	mg/kg	250	10
F3 C16-C34	Dry Weight	mg/kg	119000	10
F4 C34-C50	Dry Weight	mg/kg	41600	10
F4HTGC C34-C50+	Dry Weight	mg/kg	63600	10
% C50+		%	12.0	-
Silica Gel Cleanup				
Silica Gel Cleanup			Done	-

Approved by:

Darren Crichton, BSc, PChem
Operations Chemist

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Alcohol Screen - Water

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Methanol	mg/L	<5	0	-8	8	✓
Ethanol	mg/L	<5	0	-8	8	✓
2-Propanol	mg/L	<5	0	-8	8	✓
1-Propanol	mg/L	<5	0	-8	8	✓
2-Methyl-1-Propanol	mg/L	<5	0	-8	8	✓
2-Methyl-2-Propanol	mg/L	<5	0	-8	8	✓
2-Butanol	mg/L	<5	0	-8	8	✓
1-Butanol	mg/L	<5	0	-8	8	✓
1-Pentanol	mg/L	<5	0	-8	8	✓

Material Used: Method Blank - OX
Date Acquired: Sep 12, 2005
Acquired By: Inna Kazakov

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Methanol	ng/uL	89.1	101	88	70-130	✓
Ethanol	ng/uL	97.5	100	98	70-130	✓
2-Propanol	ng/uL	105.4	100	105	70-130	✓
1-Propanol	ng/uL	99.7	97	103	70-130	✓
2-Methyl-1-Propanol	ng/uL	99.9	98	102	70-130	✓
2-Methyl-2-Propanol	ng/uL	102.5	99	104	70-130	✓
2-Butanol	ng/uL	100.4	98	103	70-130	✓
1-Butanol	ng/uL	92.3	99	93	70-130	✓
1-Pentanol	ng/uL	92.8	98	95	70-130	✓

Material Used: Standard - Alcohols
Date Acquired: Sep 12, 2005
Acquired By: Inna Kazakov

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Glycol Screen - Water

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Ethylene Glycol	mg/L	<10	0	-15	15	✓
Propylene Glycol	mg/L	<10	0	-15	15	✓
Diethylene Glycol	mg/L	<10	0	-15	15	✓
Triethylene Glycol	mg/L	<10	0	-15	15	✓
Tetraethylene Glycol	mg/L	<10	0	-15	15	✓
Material Used:	Method Blank - OX					
Date Acquired:	Sep 14, 2005					
Acquired By:	Inna Kazakov					

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Ethylene Glycol	ug/mL	99.0	101	98	70-130	✓
Propylene Glycol	ug/mL	101.0	101	100	70-130	✓
Diethylene Glycol	ug/mL	94.0	101	93	70-130	✓
Triethylene Glycol	ug/mL	94.0	100	94	70-130	✓
Tetraethylene Glycol	ug/mL	87.0	101	87	70-130	✓
Material Used:	Standard - Glycols					
Date Acquired:	Sep 14, 2005					
Acquired By:	Inna Kazakov					

Hot Water Soluble

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Boron	mg/kg	<0.0	0.0	0.0	0.0	✓
Material Used:	Edmonton Method Blank					
Date Acquired:	Sep 12, 2005					
Acquired By:	To Thong					

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Boron	mg/kg	0.4	0.4	10.0	0.1	✓
Material Used:	Edmonton Duplicate					
Date Acquired:	Sep 12, 2005					
Acquired By:	To Thong					

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Boron	mg/kg	1.3	1.4	1.0	1.8	✓
Material Used:	2001 Farm Soil Standard					
Date Acquired:	Sep 12, 2005					
Acquired By:	To Thong					

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Inorganic Nonmetallic Parameters

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Chlorine	mg/L	<0.1	0.0	0.0	0.0	✓
Material Used:	Edmonton Method Blank					
Date Acquired:	Sep 09, 2005					
Acquired By:	Marc Dzura					

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Chlorine	mg/L	<0.1	<0.1	10.0	0.3	✓
Material Used:	Edmonton Duplicate					
Date Acquired:	Sep 09, 2005					
Acquired By:	Marc Dzura					

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Chlorine	mg/L	1.9	2.0	1.7	2.3	✓
Material Used:	Water High					
Date Acquired:	Sep 09, 2005					
Acquired By:	Marc Dzura					

Metals Dissolved

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Sulfur	mg/L	<0.3	0.0	-0.3	0.3	✓
Material Used:	Edmonton Method Blank					
Date Acquired:	Sep 12, 2005					
Acquired By:	Fernando Maglalang					

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Sulfur	mg/L	50.7	50.0	45.0	55.0	✓
Material Used:	Metals High					
Date Acquired:	Sep 12, 2005					
Acquired By:	Fernando Maglalang					
Sulfur	mg/L	1.0	1.0	0.9	1.2	✓
Material Used:	Metals Low					
Date Acquired:	Sep 12, 2005					
Acquired By:	Fernando Maglalang					

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ID: 88122
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Metals Extractable

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Sulfur	mg/L	<0.3	0.0	-0.3	0.3	✓
Material Used:	Edmonton Method Blank					
Date Acquired:	Sep 12, 2005					
Acquired By:	Fernando Maglalang					

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Sulfur	mg/L	52.0	49.8	44.8	54.8	✓
Material Used:	Metals High					
Date Acquired:	Sep 12, 2005					
Acquired By:	Fernando Maglalang					
Sulfur	mg/L	1.0	1.0	0.9	1.2	✓
Material Used:	Metals Low					
Date Acquired:	Sep 12, 2005					
Acquired By:	Fernando Maglalang					

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Metals Strong Acid Digestion

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Mercury	ug/g	<0.00	0.00	0.00	0.00	✓
Antimony	ug/g	<0.0	0.0	0.0	0.0	✓
Arsenic	ug/g	<0.0	0.0	-0.1	0.2	✓
Barium	ug/g	<0	1	-2	3	✓
Beryllium	ug/g	<0.0	0.0	0.0	0.0	✓
Cadmium	ug/g	0.00	0.00	-0.03	0.03	✓
Chromium	ug/g	<0.0	-0.3	-1.5	0.9	✓
Cobalt	ug/g	<0.0	0.0	-0.1	0.1	✓
Copper	ug/g	<0	0	-1	1	✓
Lead	ug/g	<0.0	0.1	-0.2	0.4	✓
Molybdenum	ug/g	<0	0	0	0	✓
Nickel	ug/g	<0.0	-0.2	-1.7	1.2	✓
Selenium	ug/g	<0.0	0.0	-0.3	0.2	✓
Silver	ug/g	<0.0	0.0	0.0	0.0	✓
Thallium	ug/g	<0.00	0.00	-0.01	0.01	✓
Tin	ug/g	0	2	2	3	✓
Vanadium	ug/g	<0.0	0.0	-0.2	0.3	✓
Zinc	ug/g	<0	0	-3	3	✓

Material Used: Edmonton Method Blank
Date Acquired: Sep 12, 2005
Acquired By: Linda Li

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Metals Strong Acid Digestion (Continued...)

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	ug/g	0.12	0.14	9.99	0.03	✓
Antimony	ug/g	<0.2	<0.2	20.0	0.4	✓
Arsenic	ug/g	1.6	1.7	20.0	0.4	✓
Barium	ug/g	65	65	20	2	✓
Beryllium	ug/g	0.4	0.4	20.0	0.2	✓
Cadmium	ug/g	5.13	5.21	20.01	0.02	✓
Chromium	ug/g	21.2	21.3	20.0	1.1	✓
Cobalt	ug/g	7.0	7.1	20.0	0.2	✓
Copper	ug/g	16	16	20	2	✓
Lead	ug/g	8.5	8.9	20.0	0.2	✓
Molybdenum	ug/g	<1	<1	20	2	✓
Nickel	ug/g	11.0	10.6	20.0	1.1	✓
Selenium	ug/g	<0.3	<0.3	20.0	0.7	✓
Silver	ug/g	<0.1	0.1	20.0	0.2	✓
Thallium	ug/g	0.23	0.22	20.01	0.11	✓
Tin	ug/g	2	2	20	2	✓
Vanadium	ug/g	31.1	31.2	20.0	0.2	✓
Zinc	ug/g	99	102	20	2	✓

Material Used: Edmonton Duplicate
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Metals Strong Acid Digestion (Continued...)

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Mercury	ug/g	1.36	1.45	1.18	1.72	✓
Antimony	ug/g	<0.2	0.2	0.1	0.3	✓
Arsenic	ug/g	17.4	16.8	14.1	19.5	✓
Barium	ug/g	419	406	330	482	✓
Beryllium	ug/g	1	0.9	0.7	1.1	✓
Cadmium	ug/g	0.38	0.38	0.30	0.45	✓
Chromium	ug/g	81.7	84.7	69.4	100.0	✓
Cobalt	ug/g	14.1	13.4	11.1	15.7	✓
Copper	ug/g	32	33	27	39	✓
Lead	ug/g	13.1	13.4	11.0	15.8	✓
Molybdenum	ug/g	<1	1	1	1	✓
Nickel	ug/g	79.5	81.8	68.5	95.1	✓
Selenium	ug/g	1.6	1.2	0.5	1.9	✓
Silver	ug/g	0.4	0.4	0.2	0.5	✓
Thallium	ug/g	0.33	0.35	0.28	0.41	✓
Tin	ug/g	<1	1	1	1	✓
Vanadium	ug/g	84.3	83.3	63.7	103.0	✓
Zinc	ug/g	110	103	85	121	✓

Material Used: Metals Soils
Date Acquired: Sep 12, 2005
Acquired By: Linda Li

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Metals Total

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Iron	mg/L	<0.1	0.0	0.0	0.0	✓
Manganese	mg/L	<0.005	0.000	-0.001	0.001	✓
Silicon	mg/L	<0.05	0.02	-0.04	0.09	✓
Sulfur	mg/L	<0.3	0.0	-0.3	0.3	✓
Mercury	mg/L	<0.0001	0.0000	0.0000	0.0000	✓
Aluminum	ug/L	<5	0	-5	5	✓
Antimony	ug/L	<0.2	0.0	-0.2	0.2	✓
Arsenic	ug/L	<0.2	0.0	-0.2	0.2	✓
Barium	ug/L	<1	0	-1	1	✓
Beryllium	ug/L	<0.1	0.0	-0.1	0.1	✓
Bismuth	ug/L	<0.5	0.0	-0.5	0.5	✓
Boron	ug/L	<2	0	-2	2	✓
Cadmium	ug/L	<0.01	0.00	-0.01	0.01	✓
Chromium	ug/L	<0.5	0.0	-0.5	0.5	✓
Cobalt	ug/L	<0.1	0.0	-0.1	0.1	✓
Copper	ug/L	<1	0	-1	1	✓
Lead	ug/L	<0.1	0.0	-0.1	0.1	✓
Lithium	ug/L	<1	0	-1	1	✓
Molybdenum	ug/L	<1	0	-1	1	✓
Nickel	ug/L	<0.5	0.0	-0.5	0.5	✓
Selenium	ug/L	<0.2	0.0	-0.2	0.2	✓
Silver	ug/L	<0.1	0.0	-0.1	0.1	✓
Strontium	ug/L	<1	0	-1	1	✓
Thallium	ug/L	<0.05	0.00	-0.05	0.05	✓
Tin	ug/L	<1	0	-1	1	✓
Titanium	ug/L	<0.5	0.0	-0.5	0.5	✓
Uranium	ug/L	<0.5	0.0	-0.5	0.5	✓
Vanadium	ug/L	<0.1	0.0	-0.1	0.1	✓
Zinc	ug/L	<1	0	-1	1	✓

Material Used: Edmonton Method Blank
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Metals Total (Continued...)

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Iron	mg/L	1.5	1.5	15.0	0.2	✓
Manganese	mg/L	1.20	1.20	15.000	0.010	✓
Silicon	mg/L	4.16	4.23	15.00	0.10	✓
Sulfur	mg/L	44.2	44.3	15.0	0.1	✓
Aluminum	ug/L	11	10	15	11	✓
Antimony	ug/L	<0.2	<0.2	15.0	0.4	✓
Arsenic	ug/L	0.2	0.2	15.0	0.4	✓
Barium	ug/L	385	381	15	2	✓
Beryllium	ug/L	<0.1	<0.1	15.0	0.2	✓
Bismuth	ug/L	<0.5	<0.5	15.0	1.1	✓
Boron	ug/L	872	859	15	4	✓
Cadmium	ug/L	<0.01	<0.01	15.00	0.02	✓
Chromium	ug/L	0.5	0.6	15.0	1.1	✓
Cobalt	ug/L	<0.1	<0.1	15.0	0.2	✓
Copper	ug/L	<1	<1	15	2	✓
Lead	ug/L	<0.1	<0.1	15.0	0.2	✓
Lithium	ug/L	36	36	15	2	✓
Molybdenum	ug/L	<1	<1	15	2	✓
Nickel	ug/L	<0.5	<0.5	15.0	1.1	✓
Selenium	ug/L	<0.2	<0.2	15.0	0.4	✓
Silver	ug/L	<0.1	<0.1	15.0	0.2	✓
Strontium	ug/L	498	493	15	2	✓
Thallium	ug/L	<0.05	<0.05	15.00	0.11	✓
Tin	ug/L	<1	<1	15	2	✓
Titanium	ug/L	1.7	1.6	15.0	1.1	✓
Uranium	ug/L	<0.5	<0.5	15.0	1.1	✓
Vanadium	ug/L	0.2	<0.1	15.0	0.2	✓
Zinc	ug/L	4	3	15	2	✓

Material Used: Edmonton Duplicate
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Metals Total (Continued...)

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Iron	mg/L	2.0	2.0	1.8	2.2	✓
Manganese	mg/L	0.489	0.500	0.450	0.550	✓
Silicon	mg/L	4.68	5.00	4.50	5.50	✓
Sulfur	mg/L	9.9	10.0	9.0	11.0	✓
Mercury	mg/L	0.0007	0.0008	0.0007	0.0010	✓
Aluminum	ug/L	318	322	273	371	✓
Antimony	ug/L	11.3	11.5	10.2	12.8	✓
Arsenic	ug/L	11.8	11.5	10.3	12.7	✓
Barium	ug/L	60	61	52	69	✓
Beryllium	ug/L	5.8	5.9	4.9	7.0	✓
Bismuth	ug/L	29.3	30.2	26.0	34.4	✓
Boron	ug/L	119	125	102	148	✓
Cadmium	ug/L	0.71	0.63	0.47	0.78	✓
Chromium	ug/L	30.0	31.8	27.5	36.2	✓
Cobalt	ug/L	6.4	6.4	5.4	7.5	✓
Copper	ug/L	64	63	55	70	✓
Lead	ug/L	6.1	6.2	5.4	7.0	✓
Lithium	ug/L	62	65	53	76	✓
Molybdenum	ug/L	60	61	53	69	✓
Nickel	ug/L	30.8	31.4	27.0	35.8	✓
Selenium	ug/L	11.4	11.0	9.7	12.3	✓
Silver	ug/L	6.0	6.2	5.5	7.0	✓
Strontium	ug/L	63	64	55	72	✓
Thallium	ug/L	3.04	3.14	2.56	3.72	✓
Tin	ug/L	56	59	52	66	✓
Titanium	ug/L	33.5	31.5	27.0	36.0	✓
Uranium	ug/L	30.1	30.8	26.9	34.7	✓
Vanadium	ug/L	6.0	6.5	5.4	7.6	✓
Zinc	ug/L	57	59	49	69	✓
Material Used:	Edmonton Digestion Check					
Date Acquired:	Sep 12, 2005					
Acquired By:	Linda Li					
Iron	mg/L	9.8	10.0	9.0	11.0	✓
Manganese	mg/L	2.41	2.500	2.250	2.750	✓
Silicon	mg/L	23.8	25.00	22.50	27.50	✓
Sulfur	mg/L	50.6	50.0	45.0	55.0	✓
Mercury	mg/L	0.0030	0.0031	0.0027	0.0035	✓
Material Used:	Metals High					
Date Acquired:	Sep 12, 2005					
Acquired By:	Byul Sim					

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Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407307**
Control Number: E 241012
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744765

Metals Total (Continued...)

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Iron	mg/L	0.2	0.2	0.2	0.2	✓
Manganese	mg/L	0.051	0.050	0.045	0.055	✓
Silicon	mg/L	0.50	0.50	0.45	0.55	✓
Sulfur	mg/L	1	1.0	0.9	1.2	✓
Mercury	mg/L	0.0008	0.0008	-0.0016	0.0032	✓
Aluminum	ug/L	1030	1000	850	1150	✓
Antimony	ug/L	38.5	40.0	34.0	46.0	✓
Arsenic	ug/L	42.9	40.0	34.0	46.0	✓
Barium	ug/L	185	200	170	230	✓
Beryllium	ug/L	21.9	20.0	17.0	23.0	✓
Bismuth	ug/L	94.8	100.0	85.0	115.0	✓
Boron	ug/L	393	400	340	460	✓
Cadmium	ug/L	2.12	2.00	1.70	2.30	✓
Chromium	ug/L	95.7	100.0	85.0	115.0	✓
Cobalt	ug/L	20.7	20.0	17.0	23.0	✓
Copper	ug/L	206	200	170	230	✓
Lead	ug/L	21.3	20.0	17.0	23.0	✓
Lithium	ug/L	212	200	170	230	✓
Molybdenum	ug/L	194	200	170	230	✓
Nickel	ug/L	97.2	100.0	85.0	115.0	✓
Selenium	ug/L	43.3	40.0	34.0	46.0	✓
Silver	ug/L	19.3	20.0	17.0	23.0	✓
Strontium	ug/L	207	200	170	230	✓
Thallium	ug/L	9.95	10.00	8.50	11.50	✓
Tin	ug/L	174	200	170	230	✓
Titanium	ug/L	106	100.0	85.0	115.0	✓
Uranium	ug/L	96.5	100.0	85.0	115.0	✓
Vanadium	ug/L	18.4	20.0	17.0	23.0	✓
Zinc	ug/L	204	200	170	230	✓

Material Used: Metals Low
Date Acquired: Sep 12, 2005
Acquired By: Linda Li

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Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407307**
Control Number: E 241012
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744765

Metals Total (Continued...)

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Aluminum	ug/L	54	50	43	58	✓
Antimony	ug/L	2.0	2.0	1.7	2.3	✓
Arsenic	ug/L	2.2	2.0	1.7	2.3	✓
Barium	ug/L	10	10	9	12	✓
Beryllium	ug/L	1.1	1.0	0.9	1.2	✓
Bismuth	ug/L	5.0	5.0	4.3	5.8	✓
Boron	ug/L	22	20	17	23	✓
Cadmium	ug/L	0.10	0.10	0.09	0.12	✓
Chromium	ug/L	5.5	5.0	4.3	5.8	✓
Cobalt	ug/L	1	1.0	0.9	1.2	✓
Copper	ug/L	11	10	9	12	✓
Lead	ug/L	0.9	1.0	0.9	1.2	✓
Lithium	ug/L	11	10	9	12	✓
Molybdenum	ug/L	11	10	9	12	✓
Nickel	ug/L	5.3	5.0	4.3	5.8	✓
Selenium	ug/L	2.1	2.0	1.7	2.3	✓
Silver	ug/L	1	1.0	0.9	1.2	✓
Strontium	ug/L	11	10	9	12	✓
Thallium	ug/L	0.54	0.50	0.43	0.58	✓
Tin	ug/L	10	10	9	12	✓
Titanium	ug/L	4.8	5.0	4.3	5.8	✓
Uranium	ug/L	4.9	5.0	4.3	5.8	✓
Vanadium	ug/L	1.1	1.0	0.9	1.2	✓
Zinc	ug/L	11	10	9	12	✓

Material Used: Metals Trace
Date Acquired: Sep 12, 2005
Acquired By: Linda Li

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Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407307**
Control Number: E 241012
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
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Physical and Aggregate Properties

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	<0.1	0.0	-0.1	0.1	✓
Material Used:	Edmonton Method Blank					
Date Acquired:	Sep 12, 2005					
Acquired By:	Barry Herchuk					

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Turbidity	NTU	0.7	0.5	10.0	0.2	✓
Solids	mg/L	6	8	10	15	✓
Material Used:	Edmonton Duplicate					
Date Acquired:	Sep 13, 2005					
Acquired By:	Amanda Heidler					

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Turbidity	NTU	2270	2283.0	2056.8	2509.2	✓
Material Used:	Turbidity High					
Date Acquired:	Sep 12, 2005					
Acquired By:	Barry Herchuk					
Turbidity	NTU	7810	7856.0	7022.0	8690.0	✓
Material Used:	Turbidity Ultra High					
Date Acquired:	Sep 12, 2005					
Acquired By:	Barry Herchuk					
Turbidity	NTU	167	167.0	150.1	183.9	✓
Solids	mg/L	196	200	180	220	✓
Material Used:	Water High					
Date Acquired:	Sep 13, 2005					
Acquired By:	Amanda Heidler					
Turbidity	NTU	15.1	15.2	13.7	16.7	✓
Solids	mg/L	19	20	18	22	✓
Material Used:	Water Low					
Date Acquired:	Sep 13, 2005					
Acquired By:	Amanda Heidler					
Turbidity	NTU	1.5	1.5	1.3	1.6	✓
Material Used:	Water Trace					
Date Acquired:	Sep 12, 2005					
Acquired By:	Barry Herchuk					

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Quality Control

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17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407307**
Control Number: E 241012
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744765

Polychlorinated Biphenyls - Water

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Aroclor 1016	ug/L	<0.1	0.0	-0.3	0.3	✓
Aroclor 1221	ug/L	<0.1	0.0	-0.3	0.3	✓
Aroclor 1232	ug/L	<0.1	0.0	-0.3	0.3	✓
Aroclor 1242	ug/L	<0.1	0.0	-0.3	0.3	✓
Aroclor 1248	ug/L	<0.1	0.0	-0.3	0.3	✓
Aroclor 1254	ug/L	<0.1	0.0	-0.3	0.3	✓
Aroclor 1260	ug/L	<0.1	0.0	-0.3	0.3	✓
Aroclor 1262	ug/L	<0.1	0.0	-0.3	0.3	✓
Aroclor 1268	ug/L	<0.1	0.0	-0.3	0.3	✓
Material Used:	Method Blank - SV					
Date Acquired:	Sep 12, 2005					
Acquired By:	Inna Kazakov					

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Aroclor 1260	ug/mL	1.1	1.0	110.0	70.0-130.0	✓
Material Used:	Calibration Check - PCBs					
Date Acquired:	Sep 12, 2005					
Acquired By:	Inna Kazakov					

Polychlorinated Biphenyls - Water - Surrogate

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Decachlorobiphenyl	%	94	100	10	190	✓
Material Used:	Method Blank - SV					
Date Acquired:	Sep 12, 2005					
Acquired By:	Inna Kazakov					

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Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
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Edmonton, AB, Canada
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Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407307**
Control Number: E 241012
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744765

Polychlorinated Biphenyls - Soil

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Aroclor 1016	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1221	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1232	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1242	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1248	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1254	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1260	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1262	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1268	mg/kg	<0.1	0.0	-0.3	0.3	✓
Material Used:	Method Blank - SV					
Date Acquired:	Sep 12, 2005					
Acquired By:	Inna Kazakov					

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Aroclor 1254	ug/mL	0.9	1.0	90.0	70.0-130.0	✓
Material Used:	Calibration Check - PCBs					
Date Acquired:	Sep 12, 2005					
Acquired By:	Inna Kazakov					

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Aroclor 1016	mg/kg	<0.1	<0.1	15.0	0.2	✓
Aroclor 1221	mg/kg	<0.1	<0.1	15.0	0.2	✓
Aroclor 1232	mg/kg	<0.1	<0.1	15.0	0.2	✓
Aroclor 1242	mg/kg	<0.1	<0.1	15.0	0.2	✓
Aroclor 1248	mg/kg	<0.1	<0.1	15.0	0.2	✓
Aroclor 1254	mg/kg	<0.1	<0.1	15.0	0.2	✓
Aroclor 1260	mg/kg	<0.1	<0.1	15.0	0.2	✓
Aroclor 1262	mg/kg	<0.1	<0.1	15.0	0.2	✓
Aroclor 1268	mg/kg	<0.1	<0.1	15.0	0.2	✓
Material Used:	Duplicate - Run 2 - SV					
Date Acquired:	Sep 12, 2005					
Acquired By:	Inna Kazakov					

Matrix Spike	Units	Measured	Actual	% Recovery	Criteria (%)	Passed QC
Aroclor 1260	mg/kg	0.9	1	90.0	10.0-190.0	✓
Material Used:	Matrix Spike - SV					
Date Acquired:	Sep 12, 2005					
Acquired By:	Inna Kazakov					

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Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407307**
Control Number: E 241012
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744765

Polychlorinated Biphenyls - Soil - Surrogate

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Decachlorobiphenyl	%	50	100	10	190	✓

Material Used: Method Blank - SV
Date Acquired: Sep 12, 2005
Acquired By: Inna Kazakov

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Quality Control

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Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
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Acct. Code:

NWL Lot ID: **407307**
Control Number: E 241012
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
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Polynuclear Aromatic Hydrocarbons - Soil

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Naphthalene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Acenaphthylene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Acenaphthene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Fluorene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Phenanthrene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Anthracene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Fluoranthene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Pyrene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Benzo(a)anthracene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Chrysene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Benzo(b)fluoranthene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Benzo(k)fluoranthene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Benzo(a)pyrene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Dibenzo(a,h)anthracene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Benzo(g,h,i)perylene	mg/kg	<0.05	0.00	-0.08	0.08	✓

Material Used: Method Blank - SV
Date Acquired: Sep 13, 2005
Acquired By: Inna Kazakov

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Naphthalene	ug/mL	500.0	500.00	100.00	70.00-130.00	✓
Acenaphthylene	ng/mL	517.0	500.00	103.40	70.00-130.00	✓
Acenaphthene	ng/mL	527.0	500.00	105.40	70.00-130.00	✓
Fluorene	ng/mL	510.0	500.00	102.00	70.00-130.00	✓
Phenanthrene	ng/mL	505.0	500.00	101.00	70.00-130.00	✓
Anthracene	ng/mL	509.0	500.00	101.80	70.00-130.00	✓
Fluoranthene	ng/mL	601.0	500.00	120.20	70.00-130.00	✓
Pyrene	ng/mL	567.0	500.00	113.40	70.00-130.00	✓
Benzo(a)anthracene	ng/mL	532.0	500.00	106.40	70.00-130.00	✓
Chrysene	ng/mL	488.0	500.00	97.60	70.00-130.00	✓
Benzo(b)fluoranthene	ng/mL	443.0	500.00	88.60	70.00-130.00	✓
Benzo(k)fluoranthene	ng/mL	516.0	500.00	103.20	70.00-130.00	✓
Benzo(a)pyrene	ng/mL	512.0	500.00	102.40	70.00-130.00	✓
Indeno(1,2,3-c,d)pyrene	ng/mL	591.0	500.00	118.20	70.00-130.00	✓
Dibenzo(a,h)anthracene	ng/mL	549.0	500.00	109.80	70.00-130.00	✓
Benzo(g,h,i)perylene	ng/mL	483.0	500.00	96.60	70.00-130.00	✓

Material Used: Standard - PAHs
Date Acquired: Sep 13, 2005
Acquired By: Inna Kazakov

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Quality Control

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Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407307**
Control Number: E 241012
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744765

PAH - Soil - Surrogate Recovery

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Nitrobenzene-d5	%	75	77	-4	157	✓
2-Fluorobiphenyl	%	94	80	5	155	✓
p-Terphenyl-d14	%	91	78	-12	167	✓

Material Used: Method Blank - SV
Date Acquired: Sep 13, 2005
Acquired By: Inna Kazakov

NORWEST LABS

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ID: 88122
Name: Phase III Arctic ESA
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NWL Lot ID: **407307**
Control Number: E 241012
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744765

Polynuclear Aromatic Hydrocarbons - Water

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Naphthalene	ug/L	<0.01	0.00	-0.15	0.15	✓
Acenaphthylene	ug/L	<0.01	0.00	-0.15	0.15	✓
Acenaphthene	ug/L	<0.01	0.00	-0.15	0.15	✓
Fluorene	ug/L	<0.01	0.00	-0.15	0.15	✓
Phenanthrene	ug/L	<0.01	0.00	-0.15	0.15	✓
Anthracene	ug/L	<0.01	0.00	-0.15	0.15	✓
Acridine	ug/L	<0.01	0.00	-0.08	0.08	✓
Fluoranthene	ug/L	<0.02	0.00	-0.15	0.15	✓
Pyrene	ug/L	<0.02	0.00	-0.03	0.03	✓
Benzo(a)anthracene	ug/L	<0.01	0.00	-0.02	0.02	✓
Chrysene	ug/L	<0.01	0.00	-0.15	0.15	✓
Benzo(b)fluoranthene	ug/L	<0.01	0.00	-0.02	0.02	✓
Benzo(k)fluoranthene	ug/L	<0.01	0.00	-0.02	0.02	✓
Benzo(a)pyrene	ug/L	<0.01	0.00	-0.02	0.02	✓
Indeno(1,2,3-c,d)pyrene	ug/L	<0.01	0.00	-0.15	0.15	✓
Dibenzo(a,h)anthracene	ug/L	<0.01	0.00	-0.02	0.02	✓
Benzo(g,h,i)perylene	ug/L	<0.01	0.00	-0.15	0.15	✓

Material Used: Method Blank - SV
Date Acquired: Sep 15, 2005
Acquired By: Inna Kazakov

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Naphthalene	ng/mL	460.0	500.00	92.00	70.00-130.00	✓
Acenaphthylene	ng/mL	496.0	500.00	99.20	70.00-130.00	✓
Acenaphthene	ng/mL	474.0	500.00	94.80	70.00-130.00	✓
Fluorene	ng/mL	437.0	500.00	87.40	70.00-130.00	✓
Phenanthrene	ng/mL	436.0	500.00	87.20	70.00-130.00	✓
Anthracene	ng/mL	492.0	500.00	98.40	70.00-130.00	✓
Acridine	ng/mL	353.0	390.00	90.51	70.00-130.00	✓
Fluoranthene	ng/mL	520.0	500.00	104.00	70.00-130.00	✓
Pyrene	ng/mL	515.0	500.00	103.00	70.00-130.00	✓
Benzo(a)anthracene	ng/mL	495.0	500.00	99.00	70.00-130.00	✓
Chrysene	ng/mL	466.0	500.00	93.20	70.00-130.00	✓
Benzo(b)fluoranthene	ng/mL	512.0	500.00	102.40	70.00-130.00	✓
Benzo(k)fluoranthene	ng/mL	451.0	500.00	90.20	70.00-130.00	✓
Benzo(a)pyrene	ng/mL	483.0	500.00	96.60	70.00-130.00	✓
Indeno(1,2,3-c,d)pyrene	ng/mL	558.0	500.00	111.60	70.00-130.00	✓
Dibenzo(a,h)anthracene	ng/mL	470.0	500.00	94.00	70.00-130.00	✓
Benzo(g,h,i)perylene	ng/mL	419.0	500.00	83.80	70.00-130.00	✓

Material Used: Standard - PAHs
Date Acquired: Sep 15, 2005
Acquired By: Inna Kazakov

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Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407307**
Control Number: E 241012
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744765

Polynuclear Aromatic Hydrocarbons - Water (Continued...)

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Naphthalene	ug/L	0.17	0.16	15.00	0.20	✓
Acenaphthylene	ug/L	0.32	0.32	15.00	0.20	✓
Acenaphthene	ug/L	0.31	0.30	15.00	0.20	✓
Fluorene	ug/L	0.34	0.31	15.00	0.20	✓
Phenanthrene	ug/L	0.33	0.32	15.00	0.20	✓
Anthracene	ug/L	0.34	0.34	15.00	0.20	✓
Acridine	ug/L	0.30	0.29	15.00	0.10	✓
Fluoranthene	ug/L	0.41	0.42	15.00	0.20	✓
Pyrene	ug/L	0.38	0.39	15.00	0.04	✓
Benzo(a)anthracene	ug/L	0.38	0.39	15.00	0.02	✓
Chrysene	ug/L	0.35	0.34	15.00	0.20	✓
Benzo(b)fluoranthene	ug/L	0.38	0.37	15.00	0.02	✓
Benzo(k)fluoranthene	ug/L	0.31	0.32	15.00	0.02	✓
Benzo(a)pyrene	ug/L	0.36	0.34	15.00	0.02	✓
Indeno(1,2,3-c,d)pyrene	ug/L	0.40	0.37	15.00	0.20	✓
Dibenzo(a,h)anthracene	ug/L	0.35	0.33	15.00	0.02	✓
Benzo(g,h,i)perylene	ug/L	0.30	0.27	15.00	0.20	✓

Material Used: Duplicate - Run 2 - SV
Date Acquired: Sep 15, 2005
Acquired By: Inna Kazakov

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Polynuclear Aromatic Hydrocarbons - Water (Continued...)

Matrix Spike	Units	Measured	Actual	% Recovery	Criteria (%)	Passed QC
Naphthalene	ug/L	172	500	34.40	10.00-190.00	✓
Acenaphthylene	ug/L	315	500	63.00	10.00-190.00	✓
Acenaphthene	ug/L	306	500	61.20	10.00-190.00	✓
Fluorene	ug/L	336	500	67.20	10.00-190.00	✓
Phenanthrene	ug/L	325	500	65.00	10.00-190.00	✓
Anthracene	ug/L	344	500	68.80	10.00-190.00	✓
Acridine	ug/L	302	500	60.40	10.00-190.00	✓
Fluoranthene	ug/L	411	500	82.20	10.00-190.00	✓
Pyrene	ug/L	378	500	75.60	10.00-190.00	✓
Benzo(a)anthracene	ug/L	382	500	76.40	10.00-190.00	✓
Chrysene	ug/L	353	500	70.60	10.00-190.00	✓
Benzo(b)fluoranthene	ug/L	378	500	75.60	10.00-190.00	✓
Benzo(k)fluoranthene	ug/L	312	500	62.40	10.00-190.00	✓
Benzo(a)pyrene	ug/L	355	500	71.00	10.00-190.00	✓
Indeno(1,2,3-c,d)pyrene	ug/L	397	500	79.40	10.00-190.00	✓
Dibenzo(a,h)anthracene	ug/L	347	500	69.40	10.00-190.00	✓
Benzo(g,h,i)perylene	ug/L	295	500	59.00	10.00-190.00	✓

Material Used: Matrix Spike - SV
Date Acquired: Sep 15, 2005
Acquired By: Inna Kazakov

PAH - Water - Surrogate Recovery

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Nitrobenzene-d5	%	108	77	-4	157	✓
2-Fluorobiphenyl	%	57	80	5	155	✓
p-Terphenyl-d14	%	93	78	-12	167	✓

Material Used: Method Blank - SV
Date Acquired: Sep 15, 2005
Acquired By: Inna Kazakov

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Quality Control

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17203-103 Ave
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T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
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Acct. Code:

NWL Lot ID: **407307**
Control Number: E 241012
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Routine Water

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	<0.2	0.0	-0.2	0.2	✓
Magnesium	mg/L	<0.1	0.0	-0.1	0.1	✓
Sodium	mg/L	<0.4	0.0	-0.4	0.4	✓
Potassium	mg/L	<0.4	0.0	-0.4	0.4	✓
Iron	mg/L	<0.03	0.00	-0.03	0.03	✓
Manganese	mg/L	<0.005	0.000	-0.005	0.005	✓
Chloride	mg/L	<0.4	0.0	-0.5	0.5	✓
Fluoride	mg/L	<0.05	0.00	-0.05	0.05	✓
Nitrate - N	mg/L	<0.01	0.00	-0.01	0.01	✓
Nitrite - N	mg/L	<0.005	0.000	-0.005	0.005	✓

Material Used: Edmonton Method Blank
Date Acquired: Sep 12, 2005
Acquired By: Marc Dzura

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
pH		8.43	8.41	9.99	0.10	✓
Electrical Conductivity	dS/m at 25 C	1.01	1.01	9.990	0.002	✓
Calcium	mg/L	4300	4350	10.0	0.6	✓
Magnesium	mg/L	1190	1200	10.0	0.7	✓
Sodium	mg/L	34700	34700	10.0	1.2	✓
Potassium	mg/L	890	910	10.0	1.2	✓
Iron	mg/L	2.8	2.8	9.99	0.05	✓
Chloride	mg/L	4.9	5.1	10.0	0.5	✓
Fluoride	mg/L	1.68	1.67	9.99	0.05	✓
Nitrate - N	mg/L	<0.01	<0.01	9.99	0.01	✓
Nitrite - N	mg/L	<0.005	<0.005	9.990	0.010	✓
Hydroxide	mg/L	<5	<5	10		✓
Carbonate	mg/L	10	9	10		✓
Bicarbonate	mg/L	84	85	10		✓
P-Alkalinity	mg/L	9	8	10	5	✓
T-Alkalinity	mg/L	69	70	10	5	✓

Material Used: Edmonton Duplicate
Date Acquired: Sep 09, 2005
Acquired By: Wilailuk Somjit

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Quality Control

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Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407307**
Control Number: E 241012
Date Received: Sep 09, 2005
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Report Number: 744765

Routine Water (Continued...)

Control Sample		Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Chloride		mg/L	2060	2087.0	1875.2	2298.8	✓
Material Used:	Chloride High						
Date Acquired:	Sep 12, 2005						
Acquired By:	To Thong						
Calcium		mg/L	246	250.0	225.0	275.0	✓
Magnesium		mg/L	96.3	100.0	90.0	110.0	✓
Sodium		mg/L	243	250.0	225.0	275.0	✓
Potassium		mg/L	239	250.0	225.0	275.0	✓
Iron		mg/L	9.75	10.00	9.01	10.99	✓
Manganese		mg/L	2.41	2.500	2.260	2.740	✓
Material Used:	Metals High						
Date Acquired:	Sep 12, 2005						
Acquired By:	Fernando Maglalang						
Calcium		mg/L	5.2	5.0	4.5	5.5	✓
Magnesium		mg/L	2.0	2.0	1.8	2.2	✓
Sodium		mg/L	5.2	5.0	4.4	5.6	✓
Potassium		mg/L	4.9	5.0	4.5	5.5	✓
Iron		mg/L	0.20	0.20	0.18	0.22	✓
Manganese		mg/L	0.051	0.050	0.045	0.055	✓
Material Used:	Metals Low						
Date Acquired:	Sep 12, 2005						
Acquired By:	Fernando Maglalang						
pH			9.18	9.23	9.11	9.35	✓
Electrical Conductivity		dS/m at 25 C	2.74	2.730	2.611	2.849	✓
Chloride		mg/L	81.5	81.0	76.4	85.6	✓
Fluoride		mg/L	9.95	9.95	9.26	10.64	✓
Nitrate - N		mg/L	10.2	10.00	9.61	10.39	✓
Nitrite - N		mg/L	10.1	10.000	9.562	10.438	✓
P-Alkalinity		mg/L	503	507	415	599	✓
T-Alkalinity		mg/L	1010	1009	969	1049	✓
Material Used:	Water High						
Date Acquired:	Sep 09, 2005						
Acquired By:	Wilailuk Somiit						

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Quality Control

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Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
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Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407307**
Control Number: E 241012
Date Received: Sep 09, 2005
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Routine Water (Continued...)

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
pH		6.87	6.90	6.83	6.97	✓
Electrical Conductivity	dS/m at 25 C	0.075	0.076	0.070	0.081	✓
Chloride	mg/L	15.1	14.9	13.2	16.6	✓
Fluoride	mg/L	0.50	0.51	0.43	0.58	✓
Nitrate - N	mg/L	0.51	0.50	0.44	0.56	✓
Nitrite - N	mg/L	0.506	0.495	0.437	0.553	✓
P-Alkalinity	mg/L	53	54	20	88	✓
T-Alkalinity	mg/L	126	127	118	136	✓
Material Used:	Water Low					
Date Acquired:	Sep 09, 2005					
Acquired By:	Wilailuk Somiit					

Mono-Aromatic Hydrocarbons - Soil

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Benzene	ng	43.1	50.00	86.20	77.50-122.50	✓
Toluene	ng	45.3	50.00	90.60	77.50-122.50	✓
Ethylbenzene	ng	48.5	50.00	97.00	77.50-122.50	✓
Total Xylenes (m,p,o)	ng	139.0	150.00	92.67	77.50-122.50	✓
Material Used:	Calibration Check - BTEX					
Date Acquired:	Sep 12, 2005					
Acquired By:	Neil Wood					

Mono-Aromatic Hydrocarbons - Water

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Benzene	mg/L	<0.001	0.000	-0.002	0.002	✓
Toluene	mg/L	<0.001	0.000	-0.002	0.002	✓
Ethylbenzene	mg/L	<0.001	0.000	-0.002	0.002	✓
Total Xylenes (m,p,o)	mg/L	<0.001	0.000	-0.002	0.002	✓
F1 -BTEX	mg/L	<0.01	0.00	-0.02	0.02	✓
F1 C6-C10	mg/L	<0.01	0.00	-0.02	0.02	✓
Material Used:	Method Blank - VHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	Neil Wood					

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Benzene	ng	48.5	50.000	97.000	77.500-122.500	✓
Toluene	ng	50.9	50.000	101.800	77.500-122.500	✓
Ethylbenzene	ng	51.5	50.000	103.000	77.500-122.500	✓
Total Xylenes (m,p,o)	ng	156.0	150.000	104.000	77.500-122.500	✓
Material Used:	Calibration Check - BTEX					
Date Acquired:	Sep 12, 2005					
Acquired By:	Neil Wood					

NORWEST LABS

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Quality Control

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Edmonton, AB, Canada
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Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
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Extractable Petroleum Hydrocarbons - Water

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
F2 C10-C16	mg/L	<0.1	0.0	-0.2	0.2	✓
F3 C16-C34	mg/L	<0.1	0.0	-0.2	0.2	✓
Material Used:	Method Blank - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	My Linh Nguyen					

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
F2 C10-C16	ug/mL	88.2	90.0	98.0	77.5-122.5	✓
F3 C16-C34	ug/mL	695.5	710.0	98.0	77.5-122.5	✓
Material Used:	Calibration Check - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	My Linh Nguyen					

Extractable Petroleum Hydrocarbons - Soxhlet

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
F2 C10-C16	mg/kg	<10	0	-15	15	✓
F3 C16-C34	mg/kg	<10	0	-15	15	✓
F4HTGC C34-C50+	mg/kg	<10	0	-15	15	✓
Material Used:	Method Blank - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	Nancy Yeung					

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
F2 C10-C16	ug/mL	89.0	90	99	78-123	✓
F3 C16-C34	ug/mL	702.1	710	99	78-123	✓
F4HTGC C34-C50+	ug/mL	197.8	200	99	78-123	✓
Material Used:	Calibration Check - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	Nancy Yeung					

Extractable Hydrocarbons (C40) - Water

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Total C11-C40+	mg/L	<0.1	0.0	-0.2	0.2	✓
Material Used:	Method Blank - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	My Linh Nguyen					

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Total C11-C40+	ug/mL	979.6	1000.0	98.0	77.5-122.5	✓
Material Used:	Calibration Check - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	My Linh Nguyen					

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Methodology and Notes

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Attn: Greg Wright
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Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
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NWL Lot ID: **407307**
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Method of Analysis:

MethodName	Reference		Method	Date Analysis Started	Location
Alcohols - Water	US EPA	*	US EPA method, 8000	13-Sep-05	Norwest Labs Calgary
Alkalinity, pH, and EC in water	APHA	*	Conductivity - Laboratory Method, 2510 B	12-Sep-05	Norwest Labs Edmonton
Alkalinity, pH, and EC in water	APHA	*	Electrometric Method, 4500-H+ B	12-Sep-05	Norwest Labs Edmonton
Alkalinity, pH, and EC in water	APHA	*	Titration Method, 2320 B	12-Sep-05	Norwest Labs Edmonton
Anions (Routine) by Ion Chromatography	APHA	*	Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	13-Sep-05	Norwest Labs Edmonton
Boron in general soil	McKeague	*	Hot Water Soluble Boron - Azomethine-H Method, 4.61	13-Sep-05	Norwest Labs Edmonton
BTEX-CCME - Soil	CCME		Reference Method - Canada-Wide Standard for PHC in Soil, CWS PHC	15-Sep-05	Norwest Labs Calgary
BTEX-CCME - Water	US EPA	*	US EPA method, 8021B/5035B	13-Sep-05	Norwest Labs Calgary
Chloride in Water	APHA	*	Automated Ferricyanide Method, 4500-Cl- E	12-Sep-05	Norwest Labs Edmonton
Chlorine (Total) in water	APHA	*	DPD Colorimetric Method, 4500-Cl G	9-Sep-05	Norwest Labs Edmonton
Colour (Apparent) in water	APHA	*	Visual Comparison Method, 2120 B	12-Sep-05	Norwest Labs Edmonton
Glycols - Water	US EPA	*	US EPA method, 8000	16-Sep-05	Norwest Labs Calgary
Mercury (Hot Block) in Soil	US EPA	*	Determination of Hg in Sediment by Cold Vapor Atomic Absorption Spec, 245.5	13-Sep-05	Norwest Labs Edmonton
Mercury (Total) in water	US EPA	*	Determination of Hg in Sediment by Cold Vapor Atomic Absorption Spec, 245.5	12-Sep-05	Norwest Labs Edmonton
Metals ICP-MS (Hot Block) in soil	SW-846	*	Acid Digestion of Sediments, Sludges, and Soils, EPA 3050B	12-Sep-05	Norwest Labs Edmonton
Metals ICP-MS (Total) in water	US EPA	*	Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	12-Sep-05	Norwest Labs Edmonton
Metals ICP-MS (Total) in water	US EPA	*	Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	13-Sep-05	Norwest Labs Edmonton
Metals Trace (Dissolved) in water	APHA	*	Inductively Coupled Plasma (ICP) Method, 3120 B	12-Sep-05	Norwest Labs Edmonton
Metals Trace (Extractable) in water	APHA	*	Inductively Coupled Plasma (ICP) Method, 3120 B	12-Sep-05	Norwest Labs Edmonton
Metals Trace (Total) in water	APHA	*	Inductively Coupled Plasma (ICP) Method, 3120 B	12-Sep-05	Norwest Labs Edmonton
PAH - Soil	US EPA	*	Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry, 8270	15-Sep-05	Norwest Labs Calgary

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Methodology and Notes

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PAH - Water	US EPA	*	Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry, 8270	19-Sep-05	Norwest Labs Calgary
PCB - Soil	US EPA	*	US EPA method, 8082	19-Sep-05	Norwest Labs Calgary
PCB - Water	US EPA	*	US EPA method, 8082	15-Sep-05	Norwest Labs Calgary
Solids Suspended (Total, Fixed and Volatile)	APHA	*	Total Suspended Solids Dried at 103-105'C, 2540 D	13-Sep-05	Norwest Labs Edmonton
TEH - Water	Alta. Env. Method	*	Alta. Env. method, A108.0	13-Sep-05	Norwest Labs Calgary
TEH-CCME - Water	Alta. Env. Method		Hydrocarbon Soil and Water Quality Guidelines, C51260500	13-Sep-05	Norwest Labs Calgary
TEH-CCME-Soil (Soxhlet)	CCME		Reference Method - Canada-Wide Standard for PHC in Soil, CWS PHC	14-Sep-05	Norwest Labs Calgary
Turbidity in Water	APHA	*	Nephelometric Method, 2130 B	12-Sep-05	Norwest Labs Edmonton

* Norwest method(s) is based on reference method

References:

Alta. Env. Method	Alberta Environment Method
APHA	Standard Methods for the Examination of Water and Wastewater
CCME	Canadian Council of Ministers of the Environment
McKeague	Manual on Soil Sampling and Methods of Analysis
SW-846	Test Methods for Evaluating Solid Waste
US EPA	US Environmental Protection Agency Test Methods

Comments:

Talked with Leigh P. In regards to the holding time, Samples are compromised due to the holding time being over the 7 day recommendation. Leigh P will get in touch with client in regards to the holding time.

Sample 1 Sample 407307-1 was color blank corrected for chlorine-total analysis due to sample color. Sept. 09/05. MD

4 Due to sample matrix interferences, lot 407307-4 was analyzed at a reduced volume for the BTEX-CCME Soil analysis. NW. September 15, 2005.

Please direct any inquiries regarding this report to our Client Services group.
Results relate only to samples as submitted
The test report shall not be reproduced except in full, without the written approval of the laboratory

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407307**
Control Number: E 241012
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744765

Petroleum Hydrocarbons in Soil

Batch Notes

1. The method used complies with the Reference Method for the Canada Wide Standards for Petroleum Hydrocarbons in Soil - Tier 1, April 2001 and is accredited for use in Norwest laboratories.
2. Modifications of the method: See Notes and Methodology for Non-conformances (if Applicable).
3. Qualifications on results: See Notes and Methodology for Non-conformances (if applicable).
4. Silica gel treatment is done for fractions F2, F3, F4.
5. F1-BTEX: BTEX has been subtracted from the F1 fraction.
6. F2-naphth and F3-PAH: selected PAHs have been subtracted from the appropriate fractions.
7. F4HTGC is reported when more than 5% of the total carbon envelope elutes past C50.
8. Gravimetric Heavy Hydrocarbons are not reported anymore in Alberta, F4 high temperature is reported instead.
9. When both F4(C34-C50) and FHTGC are reported, F4HTGC is the F4 that is to be used for interpreting the CWS.
10. Quality criteria met for the batch: Data is reported in Quality Control Section of report (if requested).
    -nC6 and nC10 response factors (RF) are within 30% of RF for toluene
    -nC10,nC16 and nC34 RFs are within 10% of each other
    -nC50 RF is within 70% of the average RF for NC10+nC16+nC16+nC34
    -linearity is within 15%
11. Batch data for QC samples is available on request.
12. Extraction and analysis holding times were met: See Notes and Methodology for Non-conformances (if applicable).

Approved by:



Darren Crichton, BSc, PChem
Operations Chemist

NORWEST LABS

Agri-Food & Environmental Group
Calgary Edmonton Winnipeg Lethbridge Surrey

Bay 6, 2712-37 Avenue N.E.
Calgary, AB. T1Y-5L3
Phone: (403) 291-2022
Fax: (403) 291-2021

Hydrocarbon Chromatogram

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.

17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright

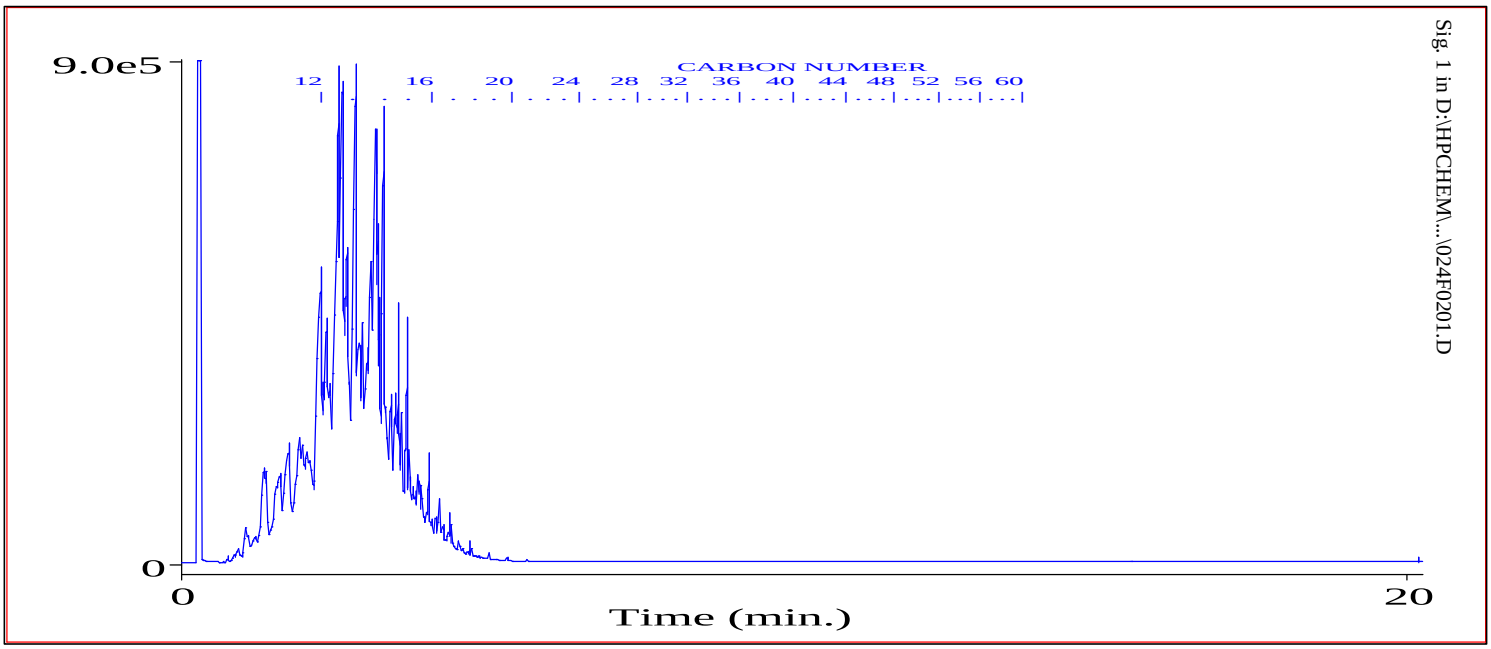
Sampled by: Greg Wright
ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:

NWL Lot ID: **407307**
Control Number: E 241012
Date Received: Sep 9, 2005
Date Reported:

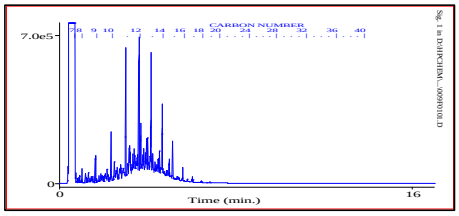
NWL Number: 407307-1
Sample Date: Aug 31, 2005

Sample Description: Barrel Proto

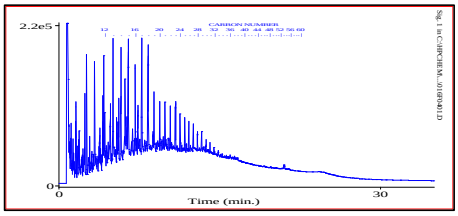


TYPICAL PRODUCT CHROMATOGRAMS

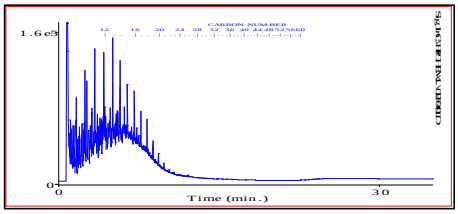
Kerosene



Unweathered Crude



Winter Diesel



Product Carbon Number Ranges

Hydrocarbon Assessment					
Gasoline	C4-C12	Kerosene	C7-C16	Lubricating Oils	C20-C40
Varsol	C8-C12	Diesel	C8-C22	Crude Oils	C3-C60+

Sample appears to contain hydrocarbons that may indicate the possible presence of varsol.

Accredited by the Standards Council of Canada (SCC) and by the Canadian Association for Environmental Analytical Laboratories (CAEAL) for specific tests registered with the Council and the Association

NORWEST LABS

407335

Control Number E 241010

Environmental Sample Information Sheet

NOTE: Proper completion of this form is required in order to proceed with analysis

See reverse for your nearest Norwest location and proper sampling protocol

Billing Address: x	**Copy of Report To:**	**Copy of invoice:** ☐
Company: Earth Tech Canada Inc.	Company: Earth Tech Canada Inc.	Mail invoice to this address for approval x ☐
Address: 17203-103 Ave, Edmonton, AB T5S 1J4	Address: 17203-103 Ave, Edmonton, AB T5S 1J4	
QA/QC Report ☐		
Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-Service ☐		Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-service ☐
Attention: Greg Wright	Attention: Greg Wright	
Phone: (780) 488-6800	Phone: (780) 488-6800	
Fax: (780) 488-2121	Fax: (780) 488-2121	
Cell:	Cell:	
e-mail: greg.wright@earthtech.ca	e-mail: greg.wright@earthtech.ca	

Information to be included on Report and Invoice

Project ID: 88122
Project Name: Phase III Arctic ESA
Project Location: Simpson Lake
Legal Location:
PO#:
Proj. Acct. Code:
Agreement ID: 62449

RUSH Please contact the laboratory to confirm rush dates and times before submitting samples.

Upon filling out this section, client accepts that surcharges will be attached to this analysis

Required on: all analyses **or** as indicated ☐ or ☐

Date Required: _____

Signature: _____

Norwest Authorization: _____

Sample Custody (Please Print)

Relinquished by: Greg Wright

Company ETC Signature GW.

I authorize Norwest Labs to proceed with the work indicated on this form:

Date: Sept 1, 2005

Initial: NW

Received by: ☐ Coolers

Waybill # Date ☐ Boxes

Company Time ☐ Samples

Received By: Date:

Company: Time:

Special Instructions / Comments ☐ Check here if Norwest is required to report results directly to a regulatory body (Please include contact information)

	Sample Identification	Location	Depth IN CM M	Date / Time Sampled	Matrix	Sampling Method	Number of Containers	PCB	METALS	CCMEW	PAH									
							↓	Enter tests above (✓ relevant samples below)												
1	OUTFALL		—	Aug 30	water	grab	2	✓	✓											
2	POL		—	"	"	"	5		✓	✓	✓									
3	PALLET		—	"	"	"	6		✓	✓	✓									
4	FUEL TANKS		—	"	"	"	5	X	X	✓	✓									
5	FUEL TANKS A		—	"	"	"	5			✓	✓									
6	VEHICLE DUMP		—				1		✓											
7	MAIN DUMP		—				2	✓	✓											
8	MAIN DUMPA		—				2	✓	✓											
9			—																	
10			—																	
11			—																	
12			—																	
13			—																	
14			—																	
15			—																	

NOTE: All hazardous samples must be labelled according to WHMIS guidelines.

Accredited by the Standards Council of Canada for specific tests

Analytical Report

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

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Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407335**
Control Number: E 241010
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744803

			NWL Number	407335-1	407335-2	407335-3	
			Sample Date	Aug 30, 2005	Aug 30, 2005	Aug 30, 2005	
			Sample Description	Outfall	POL	Pallet	
			Matrix	Water - General	Water - General	Water - General	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Metals Total							
Iron	Total	mg/L		0.4	1.2	8.2	0.1
Manganese	Total	mg/L		0.144	0.070	0.106	0.005
Silicon	Total	mg/L		4.16	3.70	25.9	0.05
Sulfur	Total	mg/L		44.2	12.7	36.0	0.3
Mercury	Total	mg/L		<0.0001	<0.0001	<0.0001	0.0001
Aluminum	Total	mg/L		0.273	0.367	9.34	0.005
Antimony	Total	mg/L		0.0008	0.0007	0.0003	0.0002
Arsenic	Total	mg/L		0.0004	0.0008	0.0012	0.0002
Barium	Total	mg/L		0.041	0.020	0.118	0.001
Beryllium	Total	mg/L		<0.0001	<0.0001	0.0003	0.0001
Bismuth	Total	mg/L		<0.0005	<0.0005	<0.0005	0.0005
Boron	Total	mg/L		0.022	0.015	0.012	0.002
Cadmium	Total	mg/L		0.00028	0.00003	0.00012	0.00001
Chromium	Total	mg/L		0.0007	0.001	0.0118	0.0005
Cobalt	Total	mg/L		0.001	0.0004	0.0032	0.0001
Copper	Total	mg/L		0.008	0.006	0.01	0.001
Lead	Total	mg/L		0.0004	0.0009	0.0072	0.0001
Lithium	Total	mg/L		0.004	0.004	0.016	0.001
Molybdenum	Total	mg/L		<0.001	<0.001	<0.001	0.001
Nickel	Total	mg/L		0.0034	0.0026	0.0082	0.0005
Selenium	Total	mg/L		<0.0002	<0.0002	<0.0002	0.0002
Silver	Total	mg/L		0.0001	<0.0001	0.0002	0.0001
Strontium	Total	mg/L		0.153	0.106	0.144	0.001
Thallium	Total	mg/L		<0.00005	<0.00005	0.00015	0.00005
Tin	Total	mg/L		<0.001	<0.001	<0.001	0.001
Titanium	Total	mg/L		0.0172	0.0253	0.535	0.0005
Uranium	Total	mg/L		0.0201	0.0016	0.0024	0.0005
Vanadium	Total	mg/L		0.0007	0.0021	0.0171	0.0001
Zinc	Total	mg/L		0.122	0.008	0.045	0.001
Physical and Aggregate Properties							
Temperature of observed pH		°C		20.1	22.0	20.1	
Routine Water							
pH				7.01	7.94	7.60	
Electrical Conductivity		µS/cm at 25 C		447	281	444	1
Calcium	Dissolved	mg/L		38.8	24.6	31.4	0.2

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Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407335**
Control Number: E 241010
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744803

			NWL Number	407335-1	407335-2	407335-3	
			Sample Date	Aug 30, 2005	Aug 30, 2005	Aug 30, 2005	
			Sample Description	Outfall	POL	Pallet	
			Matrix	Water - General	Water - General	Water - General	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Routine Water - Continued							
Magnesium	Dissolved	mg/L		21.1	12.5	18.5	0.1
Sodium	Dissolved	mg/L		20.6	10.3	30.3	0.4
Potassium	Dissolved	mg/L		3.0	3.6	3.9	0.4
Iron	Dissolved	mg/L		0.12	0.82	0.12	0.01
Manganese	Dissolved	mg/L		0.111	0.008	<0.005	0.005
Chloride	Dissolved	mg/L		7.4	5.3	20.0	0.4
Nitrate - N		mg/L		<0.01	<0.01	<0.01	0.01
Nitrite - N		mg/L		<0.005	<0.005	<0.005	0.005
Nitrate and Nitrite - N		mg/L		<0.02	<0.02	<0.02	0.02
Sulfate (SO4)	Dissolved	mg/L		133	46.3	111	0.9
Hydroxide		mg/L		<5	<5	<5	5
Carbonate		mg/L		<6	<6	<6	6
Bicarbonate		mg/L		108	119	100	5
P-Alkalinity	as CaCO3	mg/L		<5	<5	<5	5
T-Alkalinity	as CaCO3	mg/L		88	98	82	5
Total Dissolved Solids	Calculated	mg/L		276	161	265	1
Hardness	Dissolved as CaCO3	mg/L		184	113	154	
Ionic Balance	Dissolved	%		98	93	100	

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NWL Lot ID: **407335**
Control Number: E 241010
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744803

	NWL Number	407335-1	407335-7	407335-8	
	Sample Date	Aug 30, 2005	Aug 30, 2005	Aug 30, 2005	
	Sample Description	Outfall	Main Dump	Main Dump A	
	Matrix	Water - General	Water - General	Water - General	
Analyte	**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Polychlorinated Biphenyls - Water					
Aroclor 1016	ug/L	<0.1	<0.1	<0.1	0.1
Aroclor 1221	ug/L	<0.1	<0.1	<0.1	0.1
Aroclor 1232	ug/L	<0.1	<0.1	<0.1	0.1
Aroclor 1242	ug/L	<0.1	<0.1	<0.1	0.1
Aroclor 1248	ug/L	<0.1	<0.1	<0.1	0.1
Aroclor 1254	ug/L	<0.1	<0.1	<0.1	0.1
Aroclor 1260	ug/L	<0.1	<0.1	<0.1	0.1
Aroclor 1262	ug/L	<0.1	<0.1	<0.1	0.1
Aroclor 1268	ug/L	<0.1	<0.1	<0.1	0.1
Total PCBs	ug/L	<0.1	<0.1	<0.1	<0.1
Polychlorinated Biphenyls - Water - Surrogate					
Decachlorobiphenyl Surrogate	%	113	113	100	50-150

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NWL Lot ID: **407335**
Control Number: E 241010
Date Received: Sep 09, 2005
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		NWL Number	407335-2	407335-3	407335-4	
		Sample Date	Aug 30, 2005	Aug 30, 2005	Aug 30, 2005	
		Sample Description	POL	Pallet	Fuel Tanks	
		Matrix	Water - General	Water - General	Water - General	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Mono-Aromatic Hydrocarbons - Water						
Benzene		mg/L	<0.001	<0.001	<0.001	0.001
Toluene		mg/L	<0.001	<0.001	<0.001	0.001
Ethylbenzene		mg/L	<0.001	<0.001	<0.001	0.001
Total Xylenes (m,p,o)		mg/L	<0.001	<0.001	<0.001	0.001
F1 -BTEX		mg/L	<0.01	<0.01	<0.01	0.01
F1 C6-C10		mg/L	<0.01	<0.01	<0.01	0.01
Volatile Petroleum Hydrocarbons - Water						
F1 C6-C10		mg/L	<0.01	<0.01	<0.01	0.01
F1 -BTEX		mg/L	<0.01	<0.01	<0.01	0.01
Extractable Petroleum Hydrocarbons - Water						
F2 C10-C16		mg/L	<0.1	<0.1	<0.1	0.1
F3 C16-C34		mg/L	<0.1	<0.1	<0.1	0.1
F3+ C34+		mg/L	<0.1	<0.1	<0.1	0.1
Polynuclear Aromatic Hydrocarbons - Water						
Naphthalene		ug/L	<0.01	<0.01	<0.01	0.01
Acenaphthylene		ug/L	<0.01	<0.01	<0.01	0.01
Acenaphthene		ug/L	<0.01	<0.01	<0.01	0.01
Fluorene		ug/L	<0.01	<0.01	<0.01	0.01
Phenanthrene		ug/L	<0.01	<0.01	<0.01	0.01
Anthracene		ug/L	<0.01	<0.01	<0.01	0.01
Acridine		ug/L	<0.01	<0.01	<0.01	0.01
Fluoranthene		ug/L	<0.02	<0.02	<0.02	0.02
Pyrene		ug/L	<0.02	<0.02	<0.02	0.02
Benzo(a)anthracene		ug/L	<0.01	<0.01	<0.01	0.01
Chrysene		ug/L	<0.01	<0.01	<0.01	0.01
Benzo(b)fluoranthene		ug/L	<0.01	<0.01	<0.01	0.01
Benzo(k)fluoranthene		ug/L	<0.01	<0.01	<0.01	0.01
Benzo(a)pyrene		ug/L	<0.01	<0.01	<0.01	0.01
Indeno(1,2,3-c,d)pyrene		ug/L	<0.01	<0.01	<0.01	0.01
Dibenzo(a,h)anthracene		ug/L	<0.01	<0.01	<0.01	0.01
Benzo(g,h,i)perylene		ug/L	<0.01	<0.01	<0.01	0.01
CB(a)P	Carcinogenic Potency Equivalent	ug/L	<0.01	<0.01	<0.01	.01
PAH - Water - Surrogate Recovery						
Nitrobenzene-d5	PAH - Surrogate	%	102	93	103	23-130
2-Fluorobiphenyl	PAH - Surrogate	%	75	59	65	30-130

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NWL Lot ID: **407335**
Control Number: E 241010
Date Received: Sep 09, 2005
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	NWL Number	407335-2	407335-3	407335-4	
	Sample Date	Aug 30, 2005	Aug 30, 2005	Aug 30, 2005	
	Sample Description	POL	Pallet	Fuel Tanks	
	Matrix	Water - General	Water - General	Water - General	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
PAH - Water - Surrogate Recovery - Continued						
p-Terphenyl-d14	PAH - Surrogate	%	100	85	88	18-137

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P.O.:
Acct. Code:

NWL Lot ID: **407335**
Control Number: E 241010
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744803

NWL Number	407335-5
Sample Date	Aug 30, 2005
Sample Description	Fuel Tanks A
Matrix	Water - General

Analyte		Units	Results	Results	Results	Detection Limit
Mono-Aromatic Hydrocarbons - Water						
Benzene		mg/L	<0.001			0.001
Toluene		mg/L	<0.001			0.001
Ethylbenzene		mg/L	<0.001			0.001
Total Xylenes (m,p,o)		mg/L	<0.001			0.001
F1 -BTEX		mg/L	<0.01			0.01
F1 C6-C10		mg/L	<0.01			0.01
Volatile Petroleum Hydrocarbons - Water						
F1 C6-C10		mg/L	<0.01			0.01
F1 -BTEX		mg/L	<0.01			0.01
Extractable Petroleum Hydrocarbons - Water						
F2 C10-C16		mg/L	<0.1			0.1
F3 C16-C34		mg/L	<0.1			0.1
F3+ C34+		mg/L	<0.1			0.1
Polynuclear Aromatic Hydrocarbons - Water						
Naphthalene		ug/L	<0.01			0.01
Acenaphthylene		ug/L	<0.01			0.01
Acenaphthene		ug/L	<0.01			0.01
Fluorene		ug/L	<0.01			0.01
Phenanthrene		ug/L	<0.01			0.01
Anthracene		ug/L	<0.01			0.01
Acridine		ug/L	<0.01			0.01
Fluoranthene		ug/L	<0.02			0.02
Pyrene		ug/L	<0.02			0.02
Benzo(a)anthracene		ug/L	<0.01			0.01
Chrysene		ug/L	<0.01			0.01
Benzo(b)fluoranthene		ug/L	<0.01			0.01
Benzo(k)fluoranthene		ug/L	<0.01			0.01
Benzo(a)pyrene		ug/L	<0.01			0.01
Indeno(1,2,3-c,d)pyrene		ug/L	<0.01			0.01
Dibenzo(a,h)anthracene		ug/L	<0.01			0.01
Benzo(g,h,i)perylene		ug/L	<0.01			0.01
CB(a)P	Carcinogenic Potency Equivalent	ug/L	<0.01			.01
PAH - Water - Surrogate Recovery						
Nitrobenzene-d5	PAH - Surrogate	%	107			23-130
2-Fluorobiphenyl	PAH - Surrogate	%	65			30-130

Norwest Labs
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Fax: (780) 438-0396

Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407335**
Control Number: E 241010
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744803

NWL Number	407335-5
Sample Date	Aug 30, 2005
Sample Description	Fuel Tanks A
Matrix	Water - General

Analyte		Units	Results	Results	Results	Detection Limit
PAH - Water - Surrogate Recovery - Continued						
p-Terphenyl-d14	PAH - Surrogate	%	86			18-137

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Name: Phase III Arctic ESA
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NWL Lot ID: **407335**
Control Number: E 241010
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744803

			NWL Number	407335-6	407335-7	407335-8	
			Sample Date	Aug 30, 2005	Aug 30, 2005	Aug 30, 2005	
			Sample Description	Vehicle Dump	Main Dump	Main Dump A	
			Matrix	Water - General	Water - General	Water - General	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Metals Total							
Iron	Total	mg/L		<0.1	<0.1	<0.1	0.1
Manganese	Total	mg/L		<0.005	0.006	<0.005	0.005
Silicon	Total	mg/L		1.17	3.38	3.27	0.05
Sulfur	Total	mg/L		10.5	31.6	30.8	0.3
Mercury	Total	mg/L		<0.0001	<0.0001	<0.0001	0.0001
Aluminum	Total	mg/L		0.019	0.122	0.082	0.005
Antimony	Total	mg/L		<0.0002	0.0004	0.0004	0.0002
Arsenic	Total	mg/L		0.0005	0.0003	0.0003	0.0002
Barium	Total	mg/L		0.019	0.025	0.024	0.001
Beryllium	Total	mg/L		<0.0001	<0.0001	<0.0001	0.0001
Bismuth	Total	mg/L		<0.0005	<0.0005	<0.0005	0.0005
Boron	Total	mg/L		0.011	0.007	0.007	0.002
Cadmium	Total	mg/L		<0.00001	0.00003	0.00003	0.00001
Chromium	Total	mg/L		<0.0005	<0.0005	<0.0005	0.0005
Cobalt	Total	mg/L		0.0001	0.0001	0.0001	0.0001
Copper	Total	mg/L		0.001	0.004	0.003	0.001
Lead	Total	mg/L		<0.0001	<0.0001	<0.0001	0.0001
Lithium	Total	mg/L		0.005	0.005	0.004	0.001
Molybdenum	Total	mg/L		0.001	0.001	0.001	0.001
Nickel	Total	mg/L		0.0007	0.0022	0.0028	0.0005
Selenium	Total	mg/L		<0.0002	<0.0002	<0.0002	0.0002
Silver	Total	mg/L		0.0001	0.0001	0.0001	0.0001
Strontium	Total	mg/L		0.120	0.120	0.119	0.001
Thallium	Total	mg/L		<0.00005	<0.00005	<0.00005	0.00005
Tin	Total	mg/L		<0.001	<0.001	<0.001	0.001
Titanium	Total	mg/L		0.0014	0.0060	0.0040	0.0005
Uranium	Total	mg/L		0.0074	0.0089	0.0087	0.0005
Vanadium	Total	mg/L		0.0002	0.0004	0.0003	0.0001
Zinc	Total	mg/L		0.004	0.013	0.013	0.001
Physical and Aggregate Properties							
Temperature of observed pH		°C		20.4	20.2	20.1	
Routine Water							
pH				8.04	7.74	7.73	
Electrical Conductivity		µS/cm at 25 C		305	367	366	1
Calcium	Dissolved	mg/L		28.9	26.6	26.1	0.2

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Analytical Report

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Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407335**
Control Number: E 241010
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744803

			NWL Number	407335-6	407335-7	407335-8	
			Sample Date	Aug 30, 2005	Aug 30, 2005	Aug 30, 2005	
			Sample Description	Vehicle Dump	Main Dump	Main Dump A	
			Matrix	Water - General	Water - General	Water - General	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Routine Water - Continued							
Magnesium	Dissolved	mg/L		15.4	16.7	16.4	0.1
Sodium	Dissolved	mg/L		10.8	20.1	20.3	0.4
Potassium	Dissolved	mg/L		3.4	3.0	3.0	0.4
Iron	Dissolved	mg/L		0.03	0.02	0.02	0.01
Manganese	Dissolved	mg/L		<0.005	<0.005	<0.005	0.005
Chloride	Dissolved	mg/L		4.9	10.8	11.4	0.4
Nitrate - N		mg/L		<0.01	<0.01	<0.01	0.01
Nitrite - N		mg/L		<0.005	<0.005	<0.005	0.005
Nitrate and Nitrite - N		mg/L		<0.02	<0.02	<0.02	0.02
Sulfate (SO4)	Dissolved	mg/L		32.4	96.0	96.8	0.9
Hydroxide		mg/L		<5	<5	<5	5
Carbonate		mg/L		<6	<6	<6	6
Bicarbonate		mg/L		149	79	84	5
P-Alkalinity	as CaCO3	mg/L		<5	<5	<5	5
T-Alkalinity	as CaCO3	mg/L		122	65	69	5
Total Dissolved Solids	Calculated	mg/L		169	212	215	1
Hardness	Dissolved as CaCO3	mg/L		136	135	133	
Ionic Balance	Dissolved	%		101	102	98	

Approved by: Anthony Neumann

Anthony Neumann, MSc
Laboratory Operations Manager

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Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407335**
Control Number: E 241010
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744803

Metals Dissolved

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Sulfur	mg/L	<0.3	0.0	-0.3	0.3	✓
Material Used:	Edmonton Method Blank					
Date Acquired:	Sep 12, 2005					
Acquired By:	Fernando Maglalang					

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Sulfur	mg/L	11.9	11.8	10.0	0.1	✓
Material Used:	Edmonton Duplicate					
Date Acquired:	Sep 13, 2005					
Acquired By:	Byul Sim					

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Sulfur	mg/L	50.7	50.0	45.0	55.0	✓
Material Used:	Metals High					
Date Acquired:	Sep 12, 2005					
Acquired By:	Fernando Maglalang					
Sulfur	mg/L	1.0	1.0	0.9	1.2	✓
Material Used:	Metals Low					
Date Acquired:	Sep 12, 2005					
Acquired By:	Fernando Maglalang					

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Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407335**
Control Number: E 241010
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744803

Metals Total

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Iron	mg/L	<0.1	0.0	0.0	0.0	✓
Manganese	mg/L	<0.005	0.000	-0.001	0.001	✓
Silicon	mg/L	<0.05	0.02	-0.04	0.09	✓
Sulfur	mg/L	<0.3	0.0	-0.3	0.3	✓
Mercury	mg/L	<0.0001	0.0000	0.0000	0.0000	✓
Aluminum	ug/L	<5	0	-5	5	✓
Antimony	ug/L	<0.2	0.0	-0.2	0.2	✓
Arsenic	ug/L	<0.2	0.0	-0.2	0.2	✓
Barium	ug/L	<1	0	-1	1	✓
Beryllium	ug/L	<0.1	0.0	-0.1	0.1	✓
Bismuth	ug/L	<0.5	0.0	-0.5	0.5	✓
Boron	ug/L	<2	0	-2	2	✓
Cadmium	ug/L	<0.01	0.00	-0.01	0.01	✓
Chromium	ug/L	<0.5	0.0	-0.5	0.5	✓
Cobalt	ug/L	<0.1	0.0	-0.1	0.1	✓
Copper	ug/L	<1	0	-1	1	✓
Lead	ug/L	<0.1	0.0	-0.1	0.1	✓
Lithium	ug/L	<1	0	-1	1	✓
Molybdenum	ug/L	<1	0	-1	1	✓
Nickel	ug/L	<0.5	0.0	-0.5	0.5	✓
Selenium	ug/L	<0.2	0.0	-0.2	0.2	✓
Silver	ug/L	<0.1	0.0	-0.1	0.1	✓
Strontium	ug/L	<1	0	-1	1	✓
Thallium	ug/L	<0.05	0.00	-0.05	0.05	✓
Tin	ug/L	<1	0	-1	1	✓
Titanium	ug/L	<0.5	0.0	-0.5	0.5	✓
Uranium	ug/L	<0.5	0.0	-0.5	0.5	✓
Vanadium	ug/L	<0.1	0.0	-0.1	0.1	✓
Zinc	ug/L	<1	0	-1	1	✓

Material Used: Edmonton Method Blank
Date Acquired: Sep 13, 2005
Acquired By: Linda Li

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Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407335**
Control Number: E 241010
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744803

Metals Total (Continued...)

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Iron	mg/L	1.5	1.5	15.0	0.2	✓
Manganese	mg/L	1.20	1.20	15.000	0.010	✓
Silicon	mg/L	4.16	4.23	15.00	0.10	✓
Sulfur	mg/L	44.2	44.3	15.0	0.1	✓
Aluminum	ug/L	1700	1500	15	11	✓
Antimony	ug/L	<5	<5	15.0	0.4	✓
Arsenic	ug/L	56	56	15.0	0.4	✓
Barium	ug/L	385	381	15	2	✓
Beryllium	ug/L	<2	<2	15.0	0.2	✓
Bismuth	ug/L	<10	<10	15.0	1.1	✓
Boron	ug/L	872	859	15	4	✓
Cadmium	ug/L	512	531	15.00	0.02	✓
Chromium	ug/L	200	200	15.0	1.1	✓
Cobalt	ug/L	10	10	15.0	0.2	✓
Copper	ug/L	200	200	15	2	✓
Lead	ug/L	83	88	15.0	0.2	✓
Lithium	ug/L	6610	6360	15	2	✓
Molybdenum	ug/L	40	40	15	2	✓
Nickel	ug/L	349	378	15.0	1.1	✓
Selenium	ug/L	<5	<5	15.0	0.4	✓
Silver	ug/L	516	507	15.0	0.2	✓
Strontium	ug/L	58700	57800	15	2	✓
Thallium	ug/L	<1	<1	15.00	0.11	✓
Tin	ug/L	<20	<20	15	2	✓
Titanium	ug/L	56	56	15.0	1.1	✓
Uranium	ug/L	<10	<10	15.0	1.1	✓
Vanadium	ug/L	4	4	15.0	0.2	✓
Zinc	ug/L	720	740	15	2	✓

Material Used: Edmonton Duplicate
Date Acquired: Sep 13, 2005
Acquired By: Alexsandra Robert

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Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407335**
Control Number: E 241010
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744803

Metals Total (Continued...)

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Iron	mg/L	2.0	2.0	1.8	2.2	✓
Manganese	mg/L	0.489	0.500	0.450	0.550	✓
Silicon	mg/L	4.68	5.00	4.50	5.50	✓
Sulfur	mg/L	9.9	10.0	9.0	11.0	✓
Mercury	mg/L	0.0008	0.0008	0.0007	0.0010	✓
Aluminum	ug/L	318	322	273	371	✓
Antimony	ug/L	11.6	11.5	10.2	12.8	✓
Arsenic	ug/L	12.4	11.5	10.3	12.7	✓
Barium	ug/L	60	61	52	69	✓
Beryllium	ug/L	6.0	5.9	4.9	7.0	✓
Bismuth	ug/L	29.3	30.2	26.0	34.4	✓
Boron	ug/L	124	125	102	148	✓
Cadmium	ug/L	0.71	0.63	0.47	0.78	✓
Chromium	ug/L	32.3	31.8	27.5	36.2	✓
Cobalt	ug/L	6.5	6.4	5.4	7.5	✓
Copper	ug/L	64	63	55	70	✓
Lead	ug/L	6.5	6.2	5.4	7.0	✓
Lithium	ug/L	62	65	53	76	✓
Molybdenum	ug/L	64	61	53	69	✓
Nickel	ug/L	31.8	31.4	27.0	35.8	✓
Selenium	ug/L	12.2	11.0	9.7	12.3	✓
Silver	ug/L	6.4	6.2	5.5	7.0	✓
Strontium	ug/L	63	64	55	72	✓
Thallium	ug/L	3.04	3.14	2.56	3.72	✓
Tin	ug/L	58	59	52	66	✓
Titanium	ug/L	33.5	31.5	27.0	36.0	✓
Uranium	ug/L	30.9	30.8	26.9	34.7	✓
Vanadium	ug/L	6.1	6.5	5.4	7.6	✓
Zinc	ug/L	65	59	49	69	✓
Material Used:	Edmonton Digestion Check					
Date Acquired:	Sep 13, 2005					
Acquired By:	Linda Li					
Iron	mg/L	9.8	10.0	9.0	11.0	✓
Manganese	mg/L	2.41	2.500	2.250	2.750	✓
Silicon	mg/L	23.8	25.00	22.50	27.50	✓
Sulfur	mg/L	51.8	50.0	45.0	55.0	✓
Mercury	mg/L	0.0030	0.0031	0.0027	0.0035	✓
Material Used:	Metals High					
Date Acquired:	Sep 12, 2005					
Acquired By:	Byul Sim					

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Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407335**
Control Number: E 241010
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744803

Metals Total (Continued...)

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Iron	mg/L	0.2	0.2	0.2	0.2	✓
Manganese	mg/L	0.051	0.050	0.045	0.055	✓
Silicon	mg/L	0.50	0.50	0.45	0.55	✓
Sulfur	mg/L	1.0	1.0	0.9	1.2	✓
Mercury	mg/L	0.0008	0.0008	-0.0016	0.0032	✓
Aluminum	ug/L	922	1000	850	1150	✓
Antimony	ug/L	39.4	40.0	34.0	46.0	✓
Arsenic	ug/L	42.9	40.0	34.0	46.0	✓
Barium	ug/L	185	200	170	230	✓
Beryllium	ug/L	21.9	20.0	17.0	23.0	✓
Bismuth	ug/L	98.9	100.0	85.0	115.0	✓
Boron	ug/L	393	400	340	460	✓
Cadmium	ug/L	2.19	2.00	1.70	2.30	✓
Chromium	ug/L	99.8	100.0	85.0	115.0	✓
Cobalt	ug/L	20.7	20.0	17.0	23.0	✓
Copper	ug/L	206	200	170	230	✓
Lead	ug/L	21.5	20.0	17.0	23.0	✓
Lithium	ug/L	212	200	170	230	✓
Molybdenum	ug/L	195	200	170	230	✓
Nickel	ug/L	99.6	100.0	85.0	115.0	✓
Selenium	ug/L	43.3	40.0	34.0	46.0	✓
Silver	ug/L	20.6	20.0	17.0	23.0	✓
Strontium	ug/L	207	200	170	230	✓
Thallium	ug/L	9.95	10.00	8.50	11.50	✓
Tin	ug/L	182	200	170	230	✓
Titanium	ug/L	97.5	100.0	85.0	115.0	✓
Uranium	ug/L	96.5	100.0	85.0	115.0	✓
Vanadium	ug/L	18.8	20.0	17.0	23.0	✓
Zinc	ug/L	204	200	170	230	✓

Material Used: Metals Low
Date Acquired: Sep 13, 2005
Acquired By: Linda Li

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Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407335**
Control Number: E 241010
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744803

Metals Total (Continued...)

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Aluminum	ug/L	54	50	43	58	✓
Antimony	ug/L	2.1	2.0	1.7	2.3	✓
Arsenic	ug/L	2.2	2.0	1.7	2.3	✓
Barium	ug/L	11	10	9	12	✓
Beryllium	ug/L	1.1	1.0	0.9	1.2	✓
Bismuth	ug/L	5.2	5.0	4.3	5.8	✓
Boron	ug/L	22	20	17	23	✓
Cadmium	ug/L	0.10	0.10	0.09	0.12	✓
Chromium	ug/L	5.5	5.0	4.3	5.8	✓
Cobalt	ug/L	1.1	1.0	0.9	1.2	✓
Copper	ug/L	11	10	9	12	✓
Lead	ug/L	1.0	1.0	0.9	1.2	✓
Lithium	ug/L	11	10	9	12	✓
Molybdenum	ug/L	11	10	9	12	✓
Nickel	ug/L	5.3	5.0	4.3	5.8	✓
Selenium	ug/L	2.1	2.0	1.7	2.3	✓
Silver	ug/L	1	1.0	0.9	1.2	✓
Strontium	ug/L	11	10	9	12	✓
Thallium	ug/L	0.54	0.50	0.43	0.58	✓
Tin	ug/L	10	10	9	12	✓
Titanium	ug/L	5.1	5.0	4.3	5.8	✓
Uranium	ug/L	5.2	5.0	4.3	5.8	✓
Vanadium	ug/L	1.1	1.0	0.9	1.2	✓
Zinc	ug/L	11	10	9	12	✓

Material Used: Metals Trace
Date Acquired: Sep 13, 2005
Acquired By: Linda Li

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Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407335**
Control Number: E 241010
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744803

Routine Water

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	<0.2	0.0	-0.2	0.2	✓
Magnesium	mg/L	<0.1	0.0	-0.1	0.1	✓
Sodium	mg/L	<0.4	0.0	-0.4	0.4	✓
Potassium	mg/L	<0.4	0.0	-0.4	0.4	✓
Iron	mg/L	<0.01	0.00	-0.01	0.01	✓
Manganese	mg/L	<0.005	0.000	-0.005	0.005	✓
Chloride	mg/L	<0.4	0.0	-0.5	0.5	✓
Nitrate - N	mg/L	<0.01	0.00	-0.01	0.01	✓
Nitrite - N	mg/L	<0.005	0.000	-0.005	0.005	✓

Material Used: Edmonton Method Blank
Date Acquired: Sep 13, 2005
Acquired By: Marc Dzura

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
pH		8.70	8.68	9.99	0.10	✓
Electrical Conductivity	dS/m at 25 C	1.19	1.19	9.990	0.002	✓
Calcium	mg/L	85.5	84.6	10.0	0.6	✓
Magnesium	mg/L	26.3	26.1	10.0	0.7	✓
Sodium	mg/L	38.3	38.5	10.0	1.2	✓
Potassium	mg/L	890	910	10.0	1.2	✓
Iron	mg/L	2.8	2.8	9.99	0.05	✓
Manganese	mg/L	0.009	0.010	9.990	0.010	✓
Chloride	mg/L	8.1	8.4	10.0	0.5	✓
Nitrate - N	mg/L	<0.01	<0.01	9.99	0.01	✓
Nitrite - N	mg/L	<0.005	<0.005	9.990	0.010	✓
Hydroxide	mg/L	<5	<5	10		✓
Carbonate	mg/L	24	25	10		✓
Bicarbonate	mg/L	84	85	10		✓
P-Alkalinity	mg/L	9	8	10	5	✓
T-Alkalinity	mg/L	69	70	10	5	✓

Material Used: Edmonton Duplicate
Date Acquired: Sep 09, 2005
Acquired By: Wilailuk Somjit

NORWEST LABS

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Quality Control

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17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407335**
Control Number: E 241010
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744803

Routine Water (Continued...)

Control Sample		Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Chloride		mg/L	2060	2087.0	1875.2	2298.8	✓
Material Used:	Chloride High						
Date Acquired:	Sep 12, 2005						
Acquired By:	To Thong						
Calcium		mg/L	242	250.0	225.0	275.0	✓
Magnesium		mg/L	95.0	100.0	90.0	110.0	✓
Sodium		mg/L	243	250.0	225.0	275.0	✓
Potassium		mg/L	240	250.0	225.0	275.0	✓
Iron		mg/L	9.57	10.00	9.01	10.99	✓
Manganese		mg/L	2.37	2.500	2.260	2.740	✓
Material Used:	Metals High						
Date Acquired:	Sep 12, 2005						
Acquired By:	Fernando Maglalang						
Calcium		mg/L	5.1	5.0	4.5	5.5	✓
Magnesium		mg/L	2.0	2.0	1.8	2.2	✓
Sodium		mg/L	5.2	5.0	4.5	5.5	✓
Potassium		mg/L	4.8	5.0	4.5	5.5	✓
Iron		mg/L	0.20	0.20	0.18	0.22	✓
Manganese		mg/L	0.050	0.050	0.045	0.055	✓
Material Used:	Metals Low						
Date Acquired:	Sep 12, 2005						
Acquired By:	Fernando Maglalang						
pH			9.20	9.23	9.11	9.35	✓
Electrical Conductivity		dS/m at 25 C	2.80	2.730	2.611	2.849	✓
Chloride		mg/L	81.5	81.0	76.4	85.6	✓
Nitrate - N		mg/L	10.3	10.00	9.61	10.39	✓
Nitrite - N		mg/L	10.1	10.000	9.562	10.438	✓
P-Alkalinity		mg/L	503	507	415	599	✓
T-Alkalinity		mg/L	1010	1009	969	1049	✓
Material Used:	Water High						
Date Acquired:	Sep 09, 2005						
Acquired By:	Wilailuk Somiit						

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Quality Control

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17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407335**
Control Number: E 241010
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Routine Water (Continued...)

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
pH		6.90	6.90	6.83	6.97	✓
Electrical Conductivity	dS/m at 25 C	0.078	0.076	0.070	0.081	✓
Chloride	mg/L	15.1	14.9	13.2	16.6	✓
Nitrate - N	mg/L	0.51	0.50	0.44	0.56	✓
Nitrite - N	mg/L	0.506	0.495	0.437	0.553	✓
P-Alkalinity	mg/L	54	54	20	88	✓
T-Alkalinity	mg/L	130	127	118	136	✓

Material Used: Water Low
Date Acquired: Sep 13, 2005
Acquired By: Wilailuk Somiit

Mono-Aromatic Hydrocarbons - Water

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Benzene	mg/L	<0.001	0.000	-0.002	0.002	✓
Toluene	mg/L	<0.001	0.000	-0.002	0.002	✓
Ethylbenzene	mg/L	<0.001	0.000	-0.002	0.002	✓
Total Xylenes (m,p,o)	mg/L	<0.001	0.000	-0.002	0.002	✓
F1 -BTEX	mg/L	<0.01	0.00	-0.02	0.02	✓
F1 C6-C10	mg/L	<0.01	0.00	-0.02	0.02	✓

Material Used: Method Blank - VHC
Date Acquired: Sep 12, 2005
Acquired By: Neil Wood

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Benzene	ng	48.5	50.000	97.000	77.500-122.500	✓
Toluene	ng	50.9	50.000	101.800	77.500-122.500	✓
Ethylbenzene	ng	51.5	50.000	103.000	77.500-122.500	✓
Total Xylenes (m,p,o)	ng	156.0	150.000	104.000	77.500-122.500	✓

Material Used: Calibration Check - BTEX
Date Acquired: Sep 12, 2005
Acquired By: Neil Wood

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Quality Control

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17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407335**
Control Number: E 241010
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744803

Extractable Petroleum Hydrocarbons - Water

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
F2 C10-C16	mg/L	<0.1	0.0	-0.2	0.2	✓
F3 C16-C34	mg/L	<0.1	0.0	-0.2	0.2	✓
Material Used:	Method Blank - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	My Linh Nguyen					

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
F2 C10-C16	ug/mL	88.2	90.0	98.0	77.5-122.5	✓
F3 C16-C34	ug/mL	695.5	710.0	98.0	77.5-122.5	✓
Material Used:	Calibration Check - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	My Linh Nguyen					

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Quality Control

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17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
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NWL Lot ID: **407335**
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Date Received: Sep 09, 2005
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Polynuclear Aromatic Hydrocarbons - Water

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Naphthalene	ug/L	<0.01	0.00	-0.15	0.15	✓
Acenaphthylene	ug/L	<0.01	0.00	-0.15	0.15	✓
Acenaphthene	ug/L	<0.01	0.00	-0.15	0.15	✓
Fluorene	ug/L	<0.01	0.00	-0.15	0.15	✓
Phenanthrene	ug/L	<0.01	0.00	-0.15	0.15	✓
Anthracene	ug/L	<0.01	0.00	-0.15	0.15	✓
Acridine	ug/L	<0.01	0.00	-0.08	0.08	✓
Fluoranthene	ug/L	<0.02	0.00	-0.15	0.15	✓
Pyrene	ug/L	<0.02	0.00	-0.03	0.03	✓
Benzo(a)anthracene	ug/L	<0.01	0.00	-0.02	0.02	✓
Chrysene	ug/L	<0.01	0.00	-0.15	0.15	✓
Benzo(b)fluoranthene	ug/L	<0.01	0.00	-0.02	0.02	✓
Benzo(k)fluoranthene	ug/L	<0.01	0.00	-0.02	0.02	✓
Benzo(a)pyrene	ug/L	<0.01	0.00	-0.02	0.02	✓
Indeno(1,2,3-c,d)pyrene	ug/L	<0.01	0.00	-0.15	0.15	✓
Dibenzo(a,h)anthracene	ug/L	<0.01	0.00	-0.02	0.02	✓
Benzo(g,h,i)perylene	ug/L	<0.01	0.00	-0.15	0.15	✓

Material Used: Method Blank - SV
Date Acquired: Sep 15, 2005
Acquired By: Inna Kazakov

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Naphthalene	ng/mL	460.0	500.00	92.00	70.00-130.00	✓
Acenaphthylene	ng/mL	496.0	500.00	99.20	70.00-130.00	✓
Acenaphthene	ng/mL	474.0	500.00	94.80	70.00-130.00	✓
Fluorene	ng/mL	437.0	500.00	87.40	70.00-130.00	✓
Phenanthrene	ng/mL	436.0	500.00	87.20	70.00-130.00	✓
Anthracene	ng/mL	492.0	500.00	98.40	70.00-130.00	✓
Acridine	ng/mL	353.0	390.00	90.51	70.00-130.00	✓
Fluoranthene	ng/mL	520.0	500.00	104.00	70.00-130.00	✓
Pyrene	ng/mL	515.0	500.00	103.00	70.00-130.00	✓
Benzo(a)anthracene	ng/mL	495.0	500.00	99.00	70.00-130.00	✓
Chrysene	ng/mL	466.0	500.00	93.20	70.00-130.00	✓
Benzo(b)fluoranthene	ng/mL	512.0	500.00	102.40	70.00-130.00	✓
Benzo(k)fluoranthene	ng/mL	451.0	500.00	90.20	70.00-130.00	✓
Benzo(a)pyrene	ng/mL	483.0	500.00	96.60	70.00-130.00	✓
Indeno(1,2,3-c,d)pyrene	ng/mL	558.0	500.00	111.60	70.00-130.00	✓
Dibenzo(a,h)anthracene	ng/mL	470.0	500.00	94.00	70.00-130.00	✓
Benzo(g,h,i)perylene	ng/mL	419.0	500.00	83.80	70.00-130.00	✓

Material Used: Standard - PAHs
Date Acquired: Sep 15, 2005
Acquired By: Inna Kazakov

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Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407335**
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Polynuclear Aromatic Hydrocarbons - Water (Continued...)

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Naphthalene	ug/L	0.17	0.16	15.00	0.20	✓
Acenaphthylene	ug/L	0.32	0.32	15.00	0.20	✓
Acenaphthene	ug/L	0.31	0.30	15.00	0.20	✓
Fluorene	ug/L	0.34	0.31	15.00	0.20	✓
Phenanthrene	ug/L	0.33	0.32	15.00	0.20	✓
Anthracene	ug/L	0.34	0.34	15.00	0.20	✓
Acridine	ug/L	0.30	0.29	15.00	0.10	✓
Fluoranthene	ug/L	0.41	0.42	15.00	0.20	✓
Pyrene	ug/L	0.38	0.39	15.00	0.04	✓
Benzo(a)anthracene	ug/L	0.38	0.39	15.00	0.02	✓
Chrysene	ug/L	0.35	0.34	15.00	0.20	✓
Benzo(b)fluoranthene	ug/L	0.38	0.37	15.00	0.02	✓
Benzo(k)fluoranthene	ug/L	0.31	0.32	15.00	0.02	✓
Benzo(a)pyrene	ug/L	0.36	0.34	15.00	0.02	✓
Indeno(1,2,3-c,d)pyrene	ug/L	0.40	0.37	15.00	0.20	✓
Dibenzo(a,h)anthracene	ug/L	0.35	0.33	15.00	0.02	✓
Benzo(g,h,i)perylene	ug/L	0.30	0.27	15.00	0.20	✓

Material Used: Duplicate - Run 2 - SV
Date Acquired: Sep 15, 2005
Acquired By: Inna Kazakov

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Quality Control

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Polynuclear Aromatic Hydrocarbons - Water (Continued...)

Matrix Spike	Units	Measured	Actual	% Recovery	Criteria (%)	Passed QC
Naphthalene	ug/L	172	500	34.40	10.00-190.00	✓
Acenaphthylene	ug/L	315	500	63.00	10.00-190.00	✓
Acenaphthene	ug/L	306	500	61.20	10.00-190.00	✓
Fluorene	ug/L	336	500	67.20	10.00-190.00	✓
Phenanthrene	ug/L	325	500	65.00	10.00-190.00	✓
Anthracene	ug/L	344	500	68.80	10.00-190.00	✓
Acridine	ug/L	302	500	60.40	10.00-190.00	✓
Fluoranthene	ug/L	411	500	82.20	10.00-190.00	✓
Pyrene	ug/L	378	500	75.60	10.00-190.00	✓
Benzo(a)anthracene	ug/L	382	500	76.40	10.00-190.00	✓
Chrysene	ug/L	353	500	70.60	10.00-190.00	✓
Benzo(b)fluoranthene	ug/L	378	500	75.60	10.00-190.00	✓
Benzo(k)fluoranthene	ug/L	312	500	62.40	10.00-190.00	✓
Benzo(a)pyrene	ug/L	355	500	71.00	10.00-190.00	✓
Indeno(1,2,3-c,d)pyrene	ug/L	397	500	79.40	10.00-190.00	✓
Dibenzo(a,h)anthracene	ug/L	347	500	69.40	10.00-190.00	✓
Benzo(g,h,i)perylene	ug/L	295	500	59.00	10.00-190.00	✓

Material Used: Matrix Spike - SV
Date Acquired: Sep 15, 2005
Acquired By: Inna Kazakov

PAH - Water - Surrogate Recovery

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Nitrobenzene-d5	%	108	77	-4	157	✓
2-Fluorobiphenyl	%	57	80	5	155	✓
p-Terphenyl-d14	%	93	78	-12	167	✓

Material Used: Method Blank - SV
Date Acquired: Sep 15, 2005
Acquired By: Inna Kazakov

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Quality Control

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Project
ID: 88122
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Polychlorinated Biphenyls - Water

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Aroclor 1016	ug/L	<0.1	0.0	-0.3	0.3	✓
Aroclor 1221	ug/L	<0.1	0.0	-0.3	0.3	✓
Aroclor 1232	ug/L	<0.1	0.0	-0.3	0.3	✓
Aroclor 1242	ug/L	<0.1	0.0	-0.3	0.3	✓
Aroclor 1248	ug/L	<0.1	0.0	-0.3	0.3	✓
Aroclor 1254	ug/L	<0.1	0.0	-0.3	0.3	✓
Aroclor 1260	ug/L	<0.1	0.0	-0.3	0.3	✓
Aroclor 1262	ug/L	<0.1	0.0	-0.3	0.3	✓
Aroclor 1268	ug/L	<0.1	0.0	-0.3	0.3	✓
Material Used:	Method Blank - SV					
Date Acquired:	Sep 12, 2005					
Acquired By:	Inna Kazakov					

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Aroclor 1260	ug/mL	1.1	1.0	110.0	70.0-130.0	✓
Material Used:	Calibration Check - PCBs					
Date Acquired:	Sep 12, 2005					
Acquired By:	Inna Kazakov					

Polychlorinated Biphenyls - Water - Surrogate

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Decachlorobiphenyl	%	94	100	10	190	✓
Material Used:	Method Blank - SV					
Date Acquired:	Sep 12, 2005					
Acquired By:	Inna Kazakov					

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Methodology and Notes

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Method of Analysis:

MethodName	Reference		Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	*	Conductivity - Laboratory Method, 2510 B	12-Sep-05	Norwest Labs Edmonton
Alkalinity, pH, and EC in water	APHA	*	Conductivity - Laboratory Method, 2510 B	14-Sep-05	Norwest Labs Edmonton
Alkalinity, pH, and EC in water	APHA	*	Electrometric Method, 4500-H+ B	12-Sep-05	Norwest Labs Edmonton
Alkalinity, pH, and EC in water	APHA	*	Electrometric Method, 4500-H+ B	14-Sep-05	Norwest Labs Edmonton
Alkalinity, pH, and EC in water	APHA	*	Titration Method, 2320 B	12-Sep-05	Norwest Labs Edmonton
Alkalinity, pH, and EC in water	APHA	*	Titration Method, 2320 B	14-Sep-05	Norwest Labs Edmonton
Anions (Routine) by Ion Chromatography	APHA	*	Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	13-Sep-05	Norwest Labs Edmonton
Anions (Routine) by Ion Chromatography	APHA	*	Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	14-Sep-05	Norwest Labs Edmonton
BTEX-CCME - Water	US EPA	*	US EPA method, 8021B/5035B	13-Sep-05	Norwest Labs Calgary
Chloride in Water	APHA	*	Automated Ferricyanide Method, 4500-Cl- E	12-Sep-05	Norwest Labs Edmonton
Chloride in Water	APHA	*	Automated Ferricyanide Method, 4500-Cl- E	14-Sep-05	Norwest Labs Edmonton
Mercury (Total) in water	US EPA	*	Determination of Hg in Sediment by Cold Vapor Atomic Absorption Spec, 245.5	12-Sep-05	Norwest Labs Edmonton
Mercury (Total) in water	US EPA	*	Determination of Hg in Sediment by Cold Vapor Atomic Absorption Spec, 245.5	14-Sep-05	Norwest Labs Edmonton
Metals ICP-MS (Total) in water	US EPA	*	Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	12-Sep-05	Norwest Labs Edmonton
Metals ICP-MS (Total) in water	US EPA	*	Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	13-Sep-05	Norwest Labs Edmonton
Metals Trace (Dissolved) in water	APHA	*	Inductively Coupled Plasma (ICP) Method, 3120 B	12-Sep-05	Norwest Labs Edmonton
Metals Trace (Dissolved) in water	APHA	*	Inductively Coupled Plasma (ICP) Method, 3120 B	12-Sep-05	Norwest Labs Edmonton
Metals Trace (Total) in water	APHA	*	Inductively Coupled Plasma (ICP) Method, 3120 B	12-Sep-05	Norwest Labs Edmonton
Metals Trace (Total) in water	APHA	*	Inductively Coupled Plasma (ICP) Method, 3120 B	13-Sep-05	Norwest Labs Edmonton
PAH - Water	US EPA	*	Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry, 8270	19-Sep-05	Norwest Labs Calgary
PCB - Water	US EPA	*	US EPA method, 8082	15-Sep-05	Norwest Labs Calgary

Please direct any inquiries regarding this report to our Client Services group.
Results relate only to samples as submitted

The test report shall not be reproduced except in full, without the written approval of the laboratory

Methodology and Notes

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407335**
Control Number: E 241010
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744803

TEH-CCME - Water	Alta. Env. Method	Hydrocarbon Soil and Water Quality Guidelines, C51260500	13-Sep-05	Norwest Labs Calgary

* Norwest method(s) is based on reference method

References:

Alta. Env. Method	Alberta Environment Method
APHA	Standard Methods for the Examination of Water and Wastewater
US EPA	US Environmental Protection Agency Test Methods

Comments:

Talked with Leigh P. In regards to the holding time, Samples are compromised due to the holding time being over the 7 day recommendation. Leigh P will get in touch with client in regards to the holding time.

Please direct any inquiries regarding this report to our Client Services group.
Results relate only to samples as submitted
The test report shall not be reproduced except in full, without the written approval of the laboratory

NORWEST LABS

407362

Control Number E 241003

Environmental Sample Information Sheet

NOTE: Proper completion of this form is required in order to proceed with analysis

See reverse for your nearest Norwest location and proper sampling protocol

Billing Address:		Copy of Report To:		Copy of invoice:
Company:	Earth Tech Canada Inc.	Company:	Earth Tech Canada Inc.	Mail invoice to this address for approval: x
Address:	17203-103 Ave Edmonton, AB T5S 1J4	Address:	17203-103 Ave Edmonton, AB T5S 1J4	
Attention:	Greg Wright	Attention:	Greg Wright	
Phone:	(780) 488-6800	Phone:	(780) 488-6800	
Fax:	(780) 488-2121	Fax:	(780) 488-2121	
Cell:		Cell:		
e-mail:	greg.wright@earthtech.ca	e-mail:	greg.wright@earthtech.ca	
QA/QC Report	✓			
Report Result:		Report Result:		
Fax		Fax		
Mail		Mail		
Courier		Courier		
e-mail		e-mail		
e-Service	✓	e-service		

Information to be included on Report and Invoice

Project ID: 88122
Project Name: Phase III Arctic ESA
Project Location: Simpson Lake.
Legal Location:
PO#:
Proj. Acct. Code:
Agreement ID: 62449

RUSH Please contact the laboratory to confirm rush dates and times before submitting samples.

Upon filling out this section, client accepts that surcharges will be attached to this analysis

Required on: all analyses **or** as indicated ☐ or ☐

Date Required: _____

Signature: _____

Norwest Authorization: _____

Sample Custody (Please Print)

Relinquished by: Greg Wright

Company ETC Signature GW

I authorize Norwest Labs to proceed with the work indicated on this form:

Date: Aug 29, 2005

Initial: GW

Received by: ☐ Coolers

Waybill # Date ☐ Boxes

Company Time ☐ Samples

Received By: Date:

Company: Time:

Special Instructions / Comments ☐ Check here if Norwest is required to report results directly to a regulatory body (Please include contact information)

	Sample Identification	Location	Depth IN (CM) M	Date / Time Sampled	Matrix	Sampling Method	Number of Containers	COMES	PAH	PCB	METALS								
							↓	Enter tests above (✓ relevant samples below)											
1	AS-ET105		0 – 10	Aug 25	soil	grab	2	✓	✓										
2	AS-ET105		60 – 70	"	"	"	2	✓	✓										
3	AS-ET106		0 – 10	"	"	"	2	✓	✓										
4	AS-ET107		0 – 10	"	"	"	2	✓	✓										
5	AS-ET108		0 – 10	"	"	"	4	✓	✓	✓	✓								
6	AS-ET108		30 – 40	"	"	"	4	✓	✓	✓	✓								
7	AS-ET109		0 – 10	"	"	"	4	✓	✓	✓	✓								
8	OUT-ET110		30 – 40	"	"	"	2			✓	✓								
9	OUT-ET111		0 – 10	"	"	"	2			✓	✓								
10	OUT-ET112		0 – 10	"	"	"	2			✓	✓								
11	OUT-ET113		0 – 10	"	"	"	2			✓	✓								
12	STN-ET114		0 – 100	"	"	comp	1	✓		~~✓~~									
13	STN-ET115		0 – 80	"	"	"	1	✓											
14	STN-ET116		0 – 80	"	"	"	1	✓											
15	STN-ET117		0 – 90	"	"	"	1	✓											

NOTE: All hazardous samples must be labelled according to WHMIS guidelines.

Accredited by the Standards Council of Canada for specific tests

NWL008 800TWL (03/08)

NORWEST LABS

407362.

Control Number E 241004

Environmental Sample Information Sheet

NOTE: Proper completion of this form is required in order to proceed with analysis
See reverse for your nearest Norwest location and proper sampling protocol

Billing Address: x	**Copy of Report To:**	**Copy of invoice:** ☐
Company: **Earth Tech Canada Inc.**	Company: **Earth Tech Canada Inc.**	Mail invoice to this address for approval ☒
Address: **17203-103 Ave, Edmonton, AB T5S 1J4**	Address: **17203-103 Ave, Edmonton, AB T5S 1J4**	
QA/QC Report ☑		
Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-Service ☑		Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-service ☐
Attention: **Greg Wright**	Attention: **Greg Wright**	
Phone: **(780) 488-6800**	Phone: **(780) 488-6800**	
Fax: **(780) 488-2121**	Fax: **(780) 488-2121**	
Cell:	Cell:	
e-mail: **greg.wright@earthtech.ca**	e-mail: **greg.wright@earthtech.ca**	

Information to be included on Report and Invoice

Project ID: 88122
Project Name: **Phase III Arctic ESA**
Project Location: Simpson Lake
Legal Location:
PO#:
Proj. Acct. Code:
Agreement ID: **62449**

RUSH

Please contact the laboratory to confirm rush dates and times before submitting samples.

Upon filling out this section, client accepts that surcharges will be attached to this analysis

Required on: all analyses **or** as indicated ☐ or ☐

Date Required: _____
Signature: _____
Norwest Authorization: _____

Sample Custody (Please Print)

Relinquished by: Greg Wright
Company ETC Signature GW.

I authorize Norwest Labs to proceed with the work indicated on this form:
Date: Aug 29, 2005
Initial: GW.

Received by: ☐ Coolers
Waybill # Date ☐ Boxes
Company Time ☐ Samples

Received By: Date:
Company: Time:

Special Instructions / Comments ☐ Check here if Norwest is required to report results directly to a regulatory body (Please include contact information)

	Sample Identification	Location	Depth IN (CM) M	Date / Time Sampled	Matrix	Sampling Method	Number of Containers	CCMES	PAH	METALS	PCB							
							↓	Enter tests above (✓ relevant samples below)										
1	GAR-ET118		0 – 30	Aug25	Soil	Composite ~~grab~~	2	✓	✓									
2	GAR-ET118		40 – 80	"	"	"	1	✓										
3	GAR-ET118		90 – 110	"	"	"	2	✓	✓									
4	GAR-ET119		0 – 30	"	"	"	1	✓										
5	GAR-ET120		0 – 30	"	"	"	1	✓										
6	GAR-ET121		0 – 30	"	"	"	2	✓		✓								
7	GAR-ET121		40 – 90	"	"	"	2	✓		✓								
8	GAR-ET122		0 – 30	"	"	"	2	✓		✓								
9	GAR-ET122		30 – 60	"	"	"	2	✓		✓								
10	GAR-ET123		0 – 30	"	"	"	2	✓		✓								
11	GAR-ET124		0 – 40	"	"	"	2	✓		✓								
12	OUT-ET111A		0 – 10	"	"	"	2	✓		✓	✓							
13			—															
14			—															
15			—															

NOTE: All hazardous samples must be labelled according to WHMIS guidelines.
Accredited by the Standards Council of Canada for specific tests

NWL008 (08/03)

Analytical Report

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407362**
Control Number: E 241003
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744840

			NWL Number	407362-1	407362-2	407362-3	
			Sample Date	Aug 25, 2005	Aug 25, 2005	Aug 25, 2005	
			Sample Description	AS-ET105 / 0-10 / cm	AS-ET105 / 60-70 / cm	AS-ET106 / 0-10 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Mono-Aromatic Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
Benzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Toluene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Total Xylenes (m,p,o)	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
F1 -BTEX	Dry Weight	mg/kg		<1	<1	<1	1
F1 C6-C10	Dry Weight	mg/kg		<1	<1	<1	1
Volatile Petroleum Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F1 C6-C10	Dry Weight	mg/kg		<1	<1	<1	1
F1 -BTEX	Dry Weight	mg/kg		<1	<1	<1	1
Extractable Petroleum Hydrocarbons - Soxhlet							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F2 C10-C16	Dry Weight	mg/kg		<10	<10	50	10
F3 C16-C34	Dry Weight	mg/kg		130	<10	540	10
F4 C34-C50	Dry Weight	mg/kg		20	<10	90	10
F4HTGC C34-C50+	Dry Weight	mg/kg		20	10	160	10
% C50+		%		0.0	0.0	9.5	
Silica Gel Cleanup							
Silica Gel Cleanup				Not Done	Not Done	Not Done	
Soil % Moisture							
Moisture	Soil % Moisture	%		13.90	11.00	11.30	
Polynuclear Aromatic Hydrocarbons - Soil							
Naphthalene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Acenaphthylene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Acenaphthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluorene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Phenanthrene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Pyrene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(a)anthracene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Chrysene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(b)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(j)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(k)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407362**
Control Number: E 241003
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744840

	NWL Number	407362-1	407362-2	407362-3	
	Sample Date	Aug 25, 2005	Aug 25, 2005	Aug 25, 2005	
	Sample Description	AS-ET105 / 0-10 / cm	AS-ET105 / 60-70 / cm	AS-ET106 / 0-10 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Polynuclear Aromatic Hydrocarbons - Soil - Conti						
Benzo(a)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Indeno(1,2,3-c,d)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Dibenzo(a,h)anthracene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(g,h,i)perylene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
CB(a)P	Carcinogenic Potency Equivalent	mg/kg	<0.0002	<0.0002	<0.0002	0.0002
PAH - Soil - Surrogate Recovery						
Nitrobenzene-d5	PAH - Surrogate	%	109	100	95	23-130
2-Fluorobiphenyl	PAH - Surrogate	%	98	93	101	30-130
p-Terphenyl-d14	PAH - Surrogate	%	116	105	105	18-137

NORWEST LABS

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17203-103 Ave
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Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407362**
Control Number: E 241003
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744840

			NWL Number	407362-4	407362-5	407362-6	
			Sample Date	Aug 25, 2005	Aug 25, 2005	Aug 25, 2005	
			Sample Description	AS-ET107 / 0-10 / cm	AS-ET108 / 0-10 / cm	AS-ET108 / 30-40 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Mono-Aromatic Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
Benzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Toluene	Dry Weight	mg/kg		<0.02	0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Total Xylenes (m,p,o)	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
F1 -BTEX	Dry Weight	mg/kg		<1	<1	<1	1
F1 C6-C10	Dry Weight	mg/kg		<1	<1	<1	1
Volatile Petroleum Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F1 C6-C10	Dry Weight	mg/kg		<1	<1	<1	1
F1 -BTEX	Dry Weight	mg/kg		<1	<1	<1	1
Extractable Petroleum Hydrocarbons - Soxhlet							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F2 C10-C16	Dry Weight	mg/kg		<10	830	20	10
F3 C16-C34	Dry Weight	mg/kg		10	25500	440	10
F4 C34-C50	Dry Weight	mg/kg		<10	4560	70	10
F4HTGC C34-C50+	Dry Weight	mg/kg		<10	6780	110	10
% C50+		%		0.0	6.7	6.8	
Silica Gel Cleanup							
Silica Gel Cleanup				Not Done	Not Done	Not Done	
Soil % Moisture							
Moisture	Soil % Moisture	%		7.82	10.90	10.50	
Polynuclear Aromatic Hydrocarbons - Soil							
Naphthalene	Dry Weight	mg/kg		<0.05	0.13	<0.05	0.05
Acenaphthylene	Dry Weight	mg/kg		<0.05	0.05	<0.05	0.05
Acenaphthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Fluorene	Dry Weight	mg/kg		<0.05	0.14	<0.05	0.05
Phenanthrene	Dry Weight	mg/kg		<0.05	0.75	<0.05	0.05
Anthracene	Dry Weight	mg/kg		<0.05	0.11	<0.05	0.05
Fluoranthene	Dry Weight	mg/kg		<0.05	0.57	<0.05	0.05
Pyrene	Dry Weight	mg/kg		<0.05	1.40	<0.05	0.05
Benzo(a)anthracene	Dry Weight	mg/kg		<0.05	0.20	<0.05	0.05
Chrysene	Dry Weight	mg/kg		<0.05	1.01	<0.05	0.05
Benzo(b)fluoranthene	Dry Weight	mg/kg		<0.05	0.27	<0.05	0.05
Benzo(j)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05
Benzo(k)fluoranthene	Dry Weight	mg/kg		<0.05	<0.05	<0.05	0.05

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407362**
Control Number: E 241003
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744840

		NWL Number	407362-4	407362-5	407362-6	
		Sample Date	Aug 25, 2005	Aug 25, 2005	Aug 25, 2005	
		Sample Description	AS-ET107 / 0-10 / cm	AS-ET108 / 0-10 / cm	AS-ET108 / 30-40 / cm	
		Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Polynuclear Aromatic Hydrocarbons - Soil - Conti						
Benzo(a)pyrene	Dry Weight	mg/kg	<0.05	0.06	<0.05	0.05
Indeno(1,2,3-c,d)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Dibenzo(a,h)anthracene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(g,h,i)perylene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
CB(a)P	Carcinogenic Potency Equivalent	mg/kg	<0.0002	0.1114	<0.0002	0.0002
PAH - Soil - Surrogate Recovery						
Nitrobenzene-d5	PAH - Surrogate	%	89	84	92	23-130
2-Fluorobiphenyl	PAH - Surrogate	%	98	24	94	30-130
p-Terphenyl-d14	PAH - Surrogate	%	105	85	98	18-137

NORWEST LABS

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Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407362**
Control Number: E 241003
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744840

			NWL Number	407362-5	407362-6	407362-7	
			Sample Date	Aug 25, 2005	Aug 25, 2005	Aug 25, 2005	
			Sample Description	AS-ET108 / 0-10 / cm	AS-ET108 / 30-40 / cm	AS-ET109 / 0-10 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble							
Boron	Water Soluble	mg/kg		0.4	0.2	0.3	0.1
Metals Strong Acid Digestion							
Mercury	Strong Acid Extractable	ug/g		0.01	<0.01	<0.01	0.01
Antimony	Strong Acid Extractable	ug/g		<0.2	<0.2	<0.2	0.2
Arsenic	Strong Acid Extractable	ug/g		2.8	1.6	1.4	0.2
Barium	Strong Acid Extractable	ug/g		94	82	70	1
Beryllium	Strong Acid Extractable	ug/g		0.4	0.5	0.4	0.1
Cadmium	Strong Acid Extractable	ug/g		3.63	0.19	0.14	0.01
Chromium	Strong Acid Extractable	ug/g		26.8	24.8	21.4	0.5
Cobalt	Strong Acid Extractable	ug/g		7.1	7.7	6.9	0.1
Copper	Strong Acid Extractable	ug/g		107	12	9	1
Lead	Strong Acid Extractable	ug/g		92.3	9.4	7.3	0.1
Molybdenum	Strong Acid Extractable	ug/g		1	<1	<1	1
Nickel	Strong Acid Extractable	ug/g		15.9	13.1	11.1	0.5
Selenium	Strong Acid Extractable	ug/g		<0.3	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	ug/g		0.1	0.1	<0.1	0.1
Thallium	Strong Acid Extractable	ug/g		0.20	0.29	0.24	0.05
Tin	Strong Acid Extractable	ug/g		7	2	2	1
Vanadium	Strong Acid Extractable	ug/g		30.5	37.6	31.6	0.1
Zinc	Strong Acid Extractable	ug/g		1570	144	56	1
Polychlorinated Biphenyls - Soil							
Aroclor 1016	Dry Weight	mg/kg		<0.1	<0.1	<0.1	0.1
Aroclor 1221	Dry Weight	mg/kg		<0.1	<0.1	<0.1	0.1
Aroclor 1232	Dry Weight	mg/kg		<0.1	<0.1	<0.1	0.1
Aroclor 1242	Dry Weight	mg/kg		<0.1	<0.1	<0.1	0.1
Aroclor 1248	Dry Weight	mg/kg		<0.1	<0.1	<0.1	0.1
Aroclor 1254	Dry Weight	mg/kg		<0.1	<0.1	<0.1	0.1
Aroclor 1260	Dry Weight	mg/kg		<0.1	<0.1	<0.1	0.1
Aroclor 1262	Dry Weight	mg/kg		<0.1	<0.1	<0.1	0.1
Aroclor 1268	Dry Weight	mg/kg		<0.1	<0.1	<0.1	0.1
Total PCBs	Dry Weight	mg/kg		<0.1	<0.1	<0.1	0.1
Polychlorinated Biphenyls - Soil - Surrogate							
Decachlorobiphenyl	Surrogate	%		121	105	122	50-150

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Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407362**
Control Number: E 241003
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744840

			NWL Number	407362-7	407362-12	407362-13	
			Sample Date	Aug 25, 2005	Aug 25, 2005	Aug 25, 2005	
			Sample Description	AS-ET109 / 0-10 / cm	STN-ET114 / 0-100 / cm	STN-ET115 / 0-80 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Mono-Aromatic Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
Benzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Toluene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Total Xylenes (m,p,o)	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
F1 -BTEX	Dry Weight	mg/kg		<1	<1	<1	1
F1 C6-C10	Dry Weight	mg/kg		<1	<1	<1	1
Volatile Petroleum Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F1 C6-C10	Dry Weight	mg/kg		<1	<1	<1	1
F1 -BTEX	Dry Weight	mg/kg		<1	<1	<1	1
Extractable Petroleum Hydrocarbons - Soxhlet							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F2 C10-C16	Dry Weight	mg/kg		<10	<10	<10	10
F3 C16-C34	Dry Weight	mg/kg		40	<10	10	10
F4 C34-C50	Dry Weight	mg/kg		<10	<10	<10	10
F4HTGC C34-C50+	Dry Weight	mg/kg		<10	<10	<10	10
% C50+		%		0.0	0.0	0.0	
Silica Gel Cleanup							
Silica Gel Cleanup				Not Done	Not Done	Not Done	
Soil % Moisture							
Moisture	Soil % Moisture	%		12.40	10.10	10.50	

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Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
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NWL Lot ID: **407362**
Control Number: E 241003
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
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	NWL Number	407362-7	407362-16	407362-18	
	Sample Date	Aug 25, 2005	Aug 25, 2005	Aug 25, 2005	
	Sample Description	AS-ET109 / 0-10 / cm	GAR-ET118 / 0-30 / cm	GAR-ET118 / 90-110 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Polynuclear Aromatic Hydrocarbons - Soil						
Naphthalene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Acenaphthylene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Acenaphthene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Fluorene	Dry Weight	mg/kg	<0.05	<0.05	0.14	0.05
Phenanthrene	Dry Weight	mg/kg	<0.05	<0.05	0.23	0.05
Anthracene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Fluoranthene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(a)anthracene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Chrysene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(b)fluoranthene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(j)fluoranthene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(k)fluoranthene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(a)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Indeno(1,2,3-c,d)pyrene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Dibenzo(a,h)anthracene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
Benzo(g,h,i)perylene	Dry Weight	mg/kg	<0.05	<0.05	<0.05	0.05
CB(a)P	Carcinogenic Potency Equivalent	mg/kg	<0.0002	<0.0002	<0.0002	0.0002
PAH - Soil - Surrogate Recovery						
Nitrobenzene-d5	PAH - Surrogate	%	91	126	>130	23-130
2-Fluorobiphenyl	PAH - Surrogate	%	101	86	66	30-130
p-Terphenyl-d14	PAH - Surrogate	%	86	85	80	18-137

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Edmonton, AB, Canada
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Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407362**
Control Number: E 241003
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744840

	NWL Number	407362-8	407362-9	407362-10	
	Sample Date	Aug 25, 2005	Aug 25, 2005	Aug 25, 2005	
	Sample Description	OUT-ET110 / 30-40 / cm	OUT-ET111 / 0-10 / cm	OUT-ET112 / 0-10 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble						
Boron	Water Soluble	mg/kg	0.7	0.3	0.3	0.1
Metals Strong Acid Digestion						
Mercury	Strong Acid Extractable	ug/g	<0.01	<0.01	0.01	0.01
Antimony	Strong Acid Extractable	ug/g	<0.2	<0.2	<0.2	0.2
Arsenic	Strong Acid Extractable	ug/g	1.7	1.4	1.1	0.2
Barium	Strong Acid Extractable	ug/g	91	67	57	1
Beryllium	Strong Acid Extractable	ug/g	0.5	0.4	0.3	0.1
Cadmium	Strong Acid Extractable	ug/g	0.07	0.07	0.33	0.01
Chromium	Strong Acid Extractable	ug/g	25.7	18.2	14.7	0.5
Cobalt	Strong Acid Extractable	ug/g	7.8	6.2	5.0	0.1
Copper	Strong Acid Extractable	ug/g	14	11	15	1
Lead	Strong Acid Extractable	ug/g	6.9	6.3	6.3	0.1
Molybdenum	Strong Acid Extractable	ug/g	<1	<1	<1	1
Nickel	Strong Acid Extractable	ug/g	13.1	9.7	7.9	0.5
Selenium	Strong Acid Extractable	ug/g	<0.3	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	ug/g	0.1	<0.1	<0.1	0.1
Thallium	Strong Acid Extractable	ug/g	0.31	0.23	0.18	0.05
Tin	Strong Acid Extractable	ug/g	2	2	2	1
Vanadium	Strong Acid Extractable	ug/g	40.0	33.2	25.4	0.1
Zinc	Strong Acid Extractable	ug/g	50	46	56	1
Polychlorinated Biphenyls - Soil						
Aroclor 1016	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1221	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1232	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1242	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1248	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1254	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1260	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1262	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Aroclor 1268	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Total PCBs	Dry Weight	mg/kg	<0.1	<0.1	<0.1	0.1
Polychlorinated Biphenyls - Soil - Surrogate						
Decachlorobiphenyl	Surrogate	%	110	70	94	50-150

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Analytical Report

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Report to: Earth Tech Canada Inc.
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Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
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NWL Lot ID: **407362**
Control Number: E 241003
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744840

	NWL Number	407362-11	407362-21	407362-22	
	Sample Date	Aug 25, 2005	Aug 25, 2005	Aug 25, 2005	
	Sample Description	OUT-ET113 / 0-10 / cm	GAR-ET121 / 0-30 / cm	GAR-ET121 / 40-90 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble						
Boron	Water Soluble	mg/kg	0.4	<0.1	<0.1	0.1
Metals Strong Acid Digestion						
Mercury	Strong Acid Extractable	ug/g	0.05	<0.01	<0.01	0.01
Antimony	Strong Acid Extractable	ug/g	<0.2	<0.2	<0.2	0.2
Arsenic	Strong Acid Extractable	ug/g	1.6	0.7	0.8	0.2
Barium	Strong Acid Extractable	ug/g	79	33	20	1
Beryllium	Strong Acid Extractable	ug/g	0.5	0.2	0.3	0.1
Cadmium	Strong Acid Extractable	ug/g	0.26	0.18	0.04	0.01
Chromium	Strong Acid Extractable	ug/g	21.5	6.6	7.0	0.5
Cobalt	Strong Acid Extractable	ug/g	7.1	3.5	3.2	0.1
Copper	Strong Acid Extractable	ug/g	51	5	6	1
Lead	Strong Acid Extractable	ug/g	11.4	6.0	3.8	0.1
Molybdenum	Strong Acid Extractable	ug/g	<1	<1	<1	1
Nickel	Strong Acid Extractable	ug/g	12.4	3.9	4.3	0.5
Selenium	Strong Acid Extractable	ug/g	<0.3	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	ug/g	0.1	<0.1	<0.1	0.1
Thallium	Strong Acid Extractable	ug/g	0.28	0.10	0.09	0.05
Tin	Strong Acid Extractable	ug/g	3	2	2	1
Vanadium	Strong Acid Extractable	ug/g	37.2	16.5	16.1	0.1
Zinc	Strong Acid Extractable	ug/g	74	35	22	1

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Project ID: 88122
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NWL Lot ID: **407362**
Control Number: E 241003
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744840

		NWL Number	407362-11	407362-27		
		Sample Date	Aug 25, 2005	Aug 25, 2005		
		Sample Description	OUT-ET113 / 0-10 / cm	OUT-ET111A / 0-10 / cm		
		Matrix	Soil - general	Soil - general		
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Polychlorinated Biphenyls - Soil						
Aroclor 1016	Dry Weight	mg/kg	<0.1	<0.1		0.1
Aroclor 1221	Dry Weight	mg/kg	<0.1	<0.1		0.1
Aroclor 1232	Dry Weight	mg/kg	<0.1	<0.1		0.1
Aroclor 1242	Dry Weight	mg/kg	<0.1	<0.1		0.1
Aroclor 1248	Dry Weight	mg/kg	<0.1	<0.1		0.1
Aroclor 1254	Dry Weight	mg/kg	0.2	<0.1		0.1
Aroclor 1260	Dry Weight	mg/kg	<0.1	<0.1		0.1
Aroclor 1262	Dry Weight	mg/kg	<0.1	<0.1		0.1
Aroclor 1268	Dry Weight	mg/kg	<0.1	<0.1		0.1
Total PCBs	Dry Weight	mg/kg	0.2	<0.1		0.1
Polychlorinated Biphenyls - Soil - Surrogate						
Decachlorobiphenyl	Surrogate	%	77	61		50-150

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Company: ETC

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Name: Phase III Arctic ESA
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NWL Lot ID: **407362**
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			NWL Number	407362-14	407362-15	407362-16	
			Sample Date	Aug 25, 2005	Aug 25, 2005	Aug 25, 2005	
			Sample Description	STN-ET116 / 0-80 / cm	STN-ET117 / 0-90 / cm	GAR-ET118 / 0-30 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Mono-Aromatic Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
Benzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Toluene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Total Xylenes (m,p,o)	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
F1 -BTEX	Dry Weight	mg/kg		<1	<1	3	1
F1 C6-C10	Dry Weight	mg/kg		<1	<1	3	1
Volatile Petroleum Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F1 C6-C10	Dry Weight	mg/kg		<1	<1	3	1
F1 -BTEX	Dry Weight	mg/kg		<1	<1	3	1
Extractable Petroleum Hydrocarbons - Soxhlet							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F2 C10-C16	Dry Weight	mg/kg		<10	<10	1490	10
F3 C16-C34	Dry Weight	mg/kg		20	<10	550	10
F4 C34-C50	Dry Weight	mg/kg		10	<10	100	10
F4HTGC C34-C50+	Dry Weight	mg/kg		10	<10	110	10
% C50+		%		0.0	0.0	0.6	
Silica Gel Cleanup							
Silica Gel Cleanup				Not Done	Not Done	Not Done	
Soil % Moisture							
Moisture	Soil % Moisture	%		15.20	11.60	8.31	

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			NWL Number	407362-17	407362-18	407362-19	
			Sample Date	Aug 25, 2005	Aug 25, 2005	Aug 25, 2005	
			Sample Description	GAR-ET118 / 40-80 / cm	GAR-ET118 / 90-110 / cm	GAR-ET119 / 0-30 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Mono-Aromatic Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
Benzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Toluene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Total Xylenes (m,p,o)	Dry Weight	mg/kg		<0.02	0.08	<0.02	0.02
F1 -BTEX	Dry Weight	mg/kg		66	102	<1	1
F1 C6-C10	Dry Weight	mg/kg		66	102	<1	1
Volatile Petroleum Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F1 C6-C10	Dry Weight	mg/kg		66	102	<1	1
F1 -BTEX	Dry Weight	mg/kg		66	102	<1	1
Extractable Petroleum Hydrocarbons - Soxhlet							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F2 C10-C16	Dry Weight	mg/kg		4380	1540	60	10
F3 C16-C34	Dry Weight	mg/kg		450	200	200	10
F4 C34-C50	Dry Weight	mg/kg		<10	20	30	10
F4HTGC C34-C50+	Dry Weight	mg/kg		10	40	30	10
% C50+		%		0.0	1.3	0.0	
Silica Gel Cleanup							
Silica Gel Cleanup				Not Done	Not Done	Not Done	
Soil % Moisture							
Moisture	Soil % Moisture	%		7.72	6.56	7.06	

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NWL Lot ID: **407362**
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	NWL Number	407362-20	407362-21	407362-22	
	Sample Date	Aug 25, 2005	Aug 25, 2005	Aug 25, 2005	
	Sample Description	GAR-ET120 / 0-30 / cm	GAR-ET121 / 0-30 / cm	GAR-ET121 / 40-90 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Mono-Aromatic Hydrocarbons - Soil						
Extraction Date			12-Sep-05	12-Sep-05	12-Sep-05	
Benzene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Toluene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.02	<0.02	<0.02	0.02
F1 -BTEX	Dry Weight	mg/kg	<1	<1	6	1
F1 C6-C10	Dry Weight	mg/kg	<1	<1	6	1
Volatile Petroleum Hydrocarbons - Soil						
Extraction Date			12-Sep-05	12-Sep-05	12-Sep-05	
F1 C6-C10	Dry Weight	mg/kg	<1	<1	6	1
F1 -BTEX	Dry Weight	mg/kg	<1	<1	6	1
Extractable Petroleum Hydrocarbons - Soxhlet						
Extraction Date			12-Sep-05	12-Sep-05	12-Sep-05	
F2 C10-C16	Dry Weight	mg/kg	50	170	1320	10
F3 C16-C34	Dry Weight	mg/kg	120	190	150	10
F4 C34-C50	Dry Weight	mg/kg	30	80	40	10
F4HTGC C34-C50+	Dry Weight	mg/kg	50	90	50	10
% C50+		%	7.9	3.0	1.1	
Silica Gel Cleanup						
Silica Gel Cleanup			Not Done	Not Done	Not Done	
Soil % Moisture						
Moisture	Soil % Moisture	%	5.67	9.67	4.84	

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NWL Lot ID: **407362**
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			NWL Number	407362-23	407362-24	407362-25	
			Sample Date	Aug 25, 2005	Aug 25, 2005	Aug 25, 2005	
			Sample Description	GAR-ET122 / 0-30 / cm	GAR-ET122 / 30-60 / cm	GAR-ET123 / 0-30 / cm	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble							
Boron	Water Soluble	mg/kg		0.4	<0.1	0.2	0.1
Metals Strong Acid Digestion							
Mercury	Strong Acid Extractable	ug/g		0.01	<0.01	<0.01	0.01
Antimony	Strong Acid Extractable	ug/g		<0.2	<0.2	0.8	0.2
Arsenic	Strong Acid Extractable	ug/g		1.1	0.6	0.7	0.2
Barium	Strong Acid Extractable	ug/g		92	24	32	1
Beryllium	Strong Acid Extractable	ug/g		0.4	0.2	0.2	0.1
Cadmium	Strong Acid Extractable	ug/g		1.13	0.15	0.51	0.01
Chromium	Strong Acid Extractable	ug/g		17.8	7.6	9.6	0.5
Cobalt	Strong Acid Extractable	ug/g		6.2	2.7	3.8	0.1
Copper	Strong Acid Extractable	ug/g		16	4	8	1
Lead	Strong Acid Extractable	ug/g		17.9	7.0	9.7	0.1
Molybdenum	Strong Acid Extractable	ug/g		<1	<1	<1	1
Nickel	Strong Acid Extractable	ug/g		8.9	3.6	5.1	0.5
Selenium	Strong Acid Extractable	ug/g		<0.3	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	ug/g		<0.1	<0.1	<0.1	0.1
Thallium	Strong Acid Extractable	ug/g		0.21	0.09	0.12	0.05
Tin	Strong Acid Extractable	ug/g		2	2	2	1
Vanadium	Strong Acid Extractable	ug/g		30.3	15.2	17.7	0.1
Zinc	Strong Acid Extractable	ug/g		49	19	49	1
Mono-Aromatic Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
Benzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Toluene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Ethylbenzene	Dry Weight	mg/kg		<0.02	<0.02	<0.02	0.02
Total Xylenes (m,p,o)	Dry Weight	mg/kg		0.08	<0.02	<0.02	0.02
F1 -BTEX	Dry Weight	mg/kg		36	<1	<1	1
F1 C6-C10	Dry Weight	mg/kg		36	<1	<1	1
Volatile Petroleum Hydrocarbons - Soil							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F1 C6-C10	Dry Weight	mg/kg		36	<1	<1	1
F1 -BTEX	Dry Weight	mg/kg		36	<1	<1	1
Extractable Petroleum Hydrocarbons - Soxhlet							
Extraction Date				12-Sep-05	12-Sep-05	12-Sep-05	
F2 C10-C16	Dry Weight	mg/kg		410	<10	70	10

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Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407362**
Control Number: E 241003
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744840

	NWL Number	407362-23	407362-24	407362-25	
	Sample Date	Aug 25, 2005	Aug 25, 2005	Aug 25, 2005	
	Sample Description	GAR-ET122 / 0-30 / cm	GAR-ET122 / 30-60 / cm	GAR-ET123 / 0-30 / cm	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Extractable Petroleum Hydrocarbons - Soxhlet - C						
F3 C16-C34	Dry Weight	mg/kg	3650	120	900	10
F4 C34-C50	Dry Weight	mg/kg	1440	40	190	10
F4HTGC C34-C50+	Dry Weight	mg/kg	2030	60	220	10
% C50+		%	9.6	11.5	1.8	
Silica Gel Cleanup						
Silica Gel Cleanup			Not Done	Not Done	Done	
Soil % Moisture						
Moisture	Soil % Moisture	%	12.70	3.64	7.97	

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NWL Lot ID: **407362**
Control Number: E 241003
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744840

NWL Number	407362-26
Sample Date	Aug 25, 2005
Sample Description	GAR-ET124 / 0-40 / cm
Matrix	Soil - general

Analyte		Units	Results	Results	Results	Detection Limit
Mono-Aromatic Hydrocarbons - Soil						
Extraction Date			12-Sep-05			
Benzene	Dry Weight	mg/kg	<0.02			0.02
Toluene	Dry Weight	mg/kg	<0.02			0.02
Ethylbenzene	Dry Weight	mg/kg	<0.02			0.02
Total Xylenes (m,p,o)	Dry Weight	mg/kg	<0.02			0.02
F1 -BTEX	Dry Weight	mg/kg	<1			1
F1 C6-C10	Dry Weight	mg/kg	<1			1
Volatile Petroleum Hydrocarbons - Soil						
Extraction Date			12-Sep-05			
F1 C6-C10	Dry Weight	mg/kg	<1			1
F1 -BTEX	Dry Weight	mg/kg	<1			1
Extractable Petroleum Hydrocarbons - Soxhlet						
Extraction Date			12-Sep-05			
F2 C10-C16	Dry Weight	mg/kg	<10			10
F3 C16-C34	Dry Weight	mg/kg	110			10
F4 C34-C50	Dry Weight	mg/kg	20			10
F4HTGC C34-C50+	Dry Weight	mg/kg	20			10
% C50+		%	0.0			
Silica Gel Cleanup						
Silica Gel Cleanup			Done			
Soil % Moisture						
Moisture	Soil % Moisture	%	7.74			

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T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407362**
Control Number: E 241003
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744840

	NWL Number	407362-26	407362-27		
	Sample Date	Aug 25, 2005	Aug 25, 2005		
	Sample Description	GAR-ET124 / 0-40 / cm	OUT-ET111A / 0-10 / cm		
	Matrix	Soil - general	Soil - general		
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble						
Boron	Water Soluble	mg/kg	0.2	0.2		0.1
Metals Strong Acid Digestion						
Mercury	Strong Acid Extractable	ug/g	<0.01	0.01		0.01
Antimony	Strong Acid Extractable	ug/g	0.2	<0.2		0.2
Arsenic	Strong Acid Extractable	ug/g	0.8	1.6		0.2
Barium	Strong Acid Extractable	ug/g	34	81		1
Beryllium	Strong Acid Extractable	ug/g	0.2	0.5		0.1
Cadmium	Strong Acid Extractable	ug/g	0.16	0.09		0.01
Chromium	Strong Acid Extractable	ug/g	11.1	23.2		0.5
Cobalt	Strong Acid Extractable	ug/g	4.1	7.5		0.1
Copper	Strong Acid Extractable	ug/g	8	14		1
Lead	Strong Acid Extractable	ug/g	6.6	7.6		0.1
Molybdenum	Strong Acid Extractable	ug/g	<1	<1		1
Nickel	Strong Acid Extractable	ug/g	5.8	11.7		0.5
Selenium	Strong Acid Extractable	ug/g	<0.3	<0.3		0.3
Silver	Strong Acid Extractable	ug/g	<0.1	0.1		0.1
Thallium	Strong Acid Extractable	ug/g	0.14	0.29		0.05
Tin	Strong Acid Extractable	ug/g	2	2		1
Vanadium	Strong Acid Extractable	ug/g	19.6	39.7		0.1
Zinc	Strong Acid Extractable	ug/g	28	52		1

Approved by:

Darren Crichton, BSc, PChem
Operations Chemist

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Quality Control

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Project
ID: 88122
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Hot Water Soluble

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Boron	mg/kg	<0.0	0.0	0.0	0.0	✓
Material Used:	Edmonton Method Blank					
Date Acquired:	Sep 12, 2005					
Acquired By:	To Thong					

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Boron	mg/kg	0.4	0.4	10.0	0.1	✓
Material Used:	Edmonton Duplicate					
Date Acquired:	Sep 12, 2005					
Acquired By:	To Thong					

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Boron	mg/kg	1.3	1.4	1.0	1.8	✓
Material Used:	2001 Farm Soil Standard					
Date Acquired:	Sep 12, 2005					
Acquired By:	To Thong					

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Quality Control

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17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407362**
Control Number: E 241003
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744840

Metals Strong Acid Digestion

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Mercury	ug/g	<0.00	0.00	0.00	0.00	✓
Antimony	ug/g	<0.0	0.0	0.0	0.0	✓
Arsenic	ug/g	<0.0	0.0	-0.1	0.2	✓
Barium	ug/g	<0	1	-2	3	✓
Beryllium	ug/g	<0.0	0.0	0.0	0.0	✓
Cadmium	ug/g	0.00	0.00	-0.03	0.03	✓
Chromium	ug/g	<0.0	-0.3	-1.5	0.9	✓
Cobalt	ug/g	<0.0	0.0	-0.1	0.1	✓
Copper	ug/g	<0	0	-1	1	✓
Lead	ug/g	<0.0	0.1	-0.2	0.4	✓
Molybdenum	ug/g	<0	0	0	0	✓
Nickel	ug/g	<0.0	-0.2	-1.7	1.2	✓
Selenium	ug/g	<0.0	0.0	-0.3	0.2	✓
Silver	ug/g	<0.0	0.0	0.0	0.0	✓
Thallium	ug/g	<0.00	0.00	-0.01	0.01	✓
Tin	ug/g	0	2	2	3	✓
Vanadium	ug/g	<0.0	0.0	-0.2	0.3	✓
Zinc	ug/g	<0	0	-3	3	✓

Material Used: Edmonton Method Blank
Date Acquired: Sep 14, 2005
Acquired By: Linda Li

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Quality Control

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17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
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NWL Lot ID: **407362**
Control Number: E 241003
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744840

Metals Strong Acid Digestion (Continued...)

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	ug/g	0.05	0.05	9.99	0.03	✓
Antimony	ug/g	<0.2	<0.2	20.0	0.4	✓
Arsenic	ug/g	8.3	8.3	20.0	0.4	✓
Barium	ug/g	65	65	20	2	✓
Beryllium	ug/g	1.1	1.1	20.0	0.2	✓
Cadmium	ug/g	5.13	5.21	20.01	0.02	✓
Chromium	ug/g	34.2	34.6	20.0	1.1	✓
Cobalt	ug/g	8.3	9.3	20.0	0.2	✓
Copper	ug/g	26	27	20	2	✓
Lead	ug/g	8.5	8.9	20.0	0.2	✓
Molybdenum	ug/g	<1	<1	20	2	✓
Nickel	ug/g	32.9	33.4	20.0	1.1	✓
Selenium	ug/g	0.3	0.4	20.0	0.7	✓
Silver	ug/g	0.2	0.2	20.0	0.2	✓
Thallium	ug/g	0.28	0.28	20.01	0.11	✓
Tin	ug/g	2	2	20	2	✓
Vanadium	ug/g	60.6	57.7	20.0	0.2	✓
Zinc	ug/g	99	102	20	2	✓

Material Used: Edmonton Duplicate
Date Acquired: Sep 12, 2005
Acquired By: Linda Li

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Quality Control

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17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407362**
Control Number: E 241003
Date Received: Sep 09, 2005
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Report Number: 744840

Metals Strong Acid Digestion (Continued...)

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Mercury	ug/g	1.46	1.45	1.18	1.72	✓
Antimony	ug/g	<0.2	0.2	0.1	0.3	✓
Arsenic	ug/g	17.5	16.8	14.1	19.5	✓
Barium	ug/g	421	406	330	482	✓
Beryllium	ug/g	1	0.9	0.7	1.1	✓
Cadmium	ug/g	0.40	0.38	0.30	0.45	✓
Chromium	ug/g	84.4	84.7	69.4	100.0	✓
Cobalt	ug/g	14.1	13.4	11.1	15.7	✓
Copper	ug/g	33	33	27	39	✓
Lead	ug/g	14.1	13.4	11.0	15.8	✓
Molybdenum	ug/g	<1	1	1	1	✓
Nickel	ug/g	83.3	81.8	68.5	95.1	✓
Selenium	ug/g	1.6	1.2	0.5	1.9	✓
Silver	ug/g	0.4	0.4	0.2	0.5	✓
Thallium	ug/g	0.35	0.35	0.28	0.41	✓
Tin	ug/g	<1	1	1	1	✓
Vanadium	ug/g	88.8	83.3	63.7	103.0	✓
Zinc	ug/g	110	103	85	121	✓

Material Used: Metals Soils
Date Acquired: Sep 14, 2005
Acquired By: Linda Li

Mono-Aromatic Hydrocarbons - Soil

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Benzene	ng	46.7	50.00	93.40	77.50-122.50	✓
Toluene	ng	49.8	50.00	99.60	77.50-122.50	✓
Ethylbenzene	ng	49.1	50.00	98.20	77.50-122.50	✓
Total Xylenes (m,p,o)	ng	149.0	150.00	99.33	77.50-122.50	✓

Material Used: Calibration Check - BTEX
Date Acquired: Sep 12, 2005
Acquired By: Neil Wood

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
F1 C6-C10	mg/kg	59	59	45		✓

Material Used: Duplicate - Run 2 - F1
Date Acquired: Sep 12, 2005
Acquired By: Neil Wood

Volatile Petroleum Hydrocarbons - Soil

Matrix Spike	Units	Measured	Actual	% Recovery	Criteria (%)	Passed QC
F1 C6-C10	mg/kg	59	49	117	40-160	✓

Material Used: Matrix Spike - F1
Date Acquired: Sep 12, 2005
Acquired By: Neil Wood

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Quality Control

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Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407362**
Control Number: E 241003
Date Received: Sep 09, 2005
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Extractable Petroleum Hydrocarbons - Soxhlet

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
F2 C10-C16	mg/kg	<10	0	-15	15	✓
F3 C16-C34	mg/kg	<10	0	-15	15	✓
F4HTGC C34-C50+	mg/kg	<10	0	-15	15	✓
Material Used:	Method Blank - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	Nancy Yeung					

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
F2 C10-C16	ug/mL	89.0	90	99	78-123	✓
F3 C16-C34	ug/mL	702.1	710	99	78-123	✓
F4HTGC C34-C50+	ug/mL	197.8	200	99	78-123	✓
Material Used:	Calibration Check - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	Nancy Yeung					

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
F2 C10-C16	mg/kg	370	330	30	0	✓
F3 C16-C34	mg/kg	580	520	30	0	✓
F4HTGC C34-C50+	mg/kg	150	160	30	0	✓
Material Used:	Duplicate - Run 2 - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	My Linh Nguyen					

Matrix Spike	Units	Measured	Actual	% Recovery	Criteria (%)	Passed QC
F2 C10-C16	mg/kg	370	398	93	40-160	✓
F3 C16-C34	mg/kg	580	643	91	40-160	✓
F4HTGC C34-C50+	mg/kg	150	170	86	40-160	✓
Material Used:	Matrix Spike - XHC					
Date Acquired:	Sep 12, 2005					
Acquired By:	My Linh Nguyen					

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Quality Control

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Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407362**
Control Number: E 241003
Date Received: Sep 09, 2005
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Polynuclear Aromatic Hydrocarbons - Soil

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Naphthalene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Acenaphthylene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Acenaphthene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Fluorene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Phenanthrene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Anthracene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Fluoranthene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Pyrene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Benzo(a)anthracene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Chrysene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Benzo(b)fluoranthene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Benzo(k)fluoranthene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Benzo(a)pyrene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Dibenzo(a,h)anthracene	mg/kg	<0.05	0.00	-0.08	0.08	✓
Benzo(g,h,i)perylene	mg/kg	<0.05	0.00	-0.08	0.08	✓

Material Used: Method Blank - SV
Date Acquired: Sep 13, 2005
Acquired By: Inna Kazakov

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Naphthalene	ug/mL	500.0	500.00	100.00	70.00-130.00	✓
Acenaphthylene	ng/mL	517.0	500.00	103.40	70.00-130.00	✓
Acenaphthene	ng/mL	527.0	500.00	105.40	70.00-130.00	✓
Fluorene	ng/mL	510.0	500.00	102.00	70.00-130.00	✓
Phenanthrene	ng/mL	505.0	500.00	101.00	70.00-130.00	✓
Anthracene	ng/mL	509.0	500.00	101.80	70.00-130.00	✓
Fluoranthene	ng/mL	601.0	500.00	120.20	70.00-130.00	✓
Pyrene	ng/mL	567.0	500.00	113.40	70.00-130.00	✓
Benzo(a)anthracene	ng/mL	532.0	500.00	106.40	70.00-130.00	✓
Chrysene	ng/mL	488.0	500.00	97.60	70.00-130.00	✓
Benzo(b)fluoranthene	ng/mL	443.0	500.00	88.60	70.00-130.00	✓
Benzo(k)fluoranthene	ng/mL	516.0	500.00	103.20	70.00-130.00	✓
Benzo(a)pyrene	ng/mL	512.0	500.00	102.40	70.00-130.00	✓
Indeno(1,2,3-c,d)pyrene	ng/mL	591.0	500.00	118.20	70.00-130.00	✓
Dibenzo(a,h)anthracene	ng/mL	549.0	500.00	109.80	70.00-130.00	✓
Benzo(g,h,i)perylene	ng/mL	483.0	500.00	96.60	70.00-130.00	✓

Material Used: Standard - PAHs
Date Acquired: Sep 13, 2005
Acquired By: Inna Kazakov

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407362**
Control Number: E 241003
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744840

PAH - Soil - Surrogate Recovery

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Nitrobenzene-d5	%	75	77	-4	157	✓
2-Fluorobiphenyl	%	94	80	5	155	✓
p-Terphenyl-d14	%	91	78	-12	167	✓

Material Used: Method Blank - SV
Date Acquired: Sep 13, 2005
Acquired By: Inna Kazakov

NORWEST LABS

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7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
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Quality Control

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Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407362**
Control Number: E 241003
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744840

Polychlorinated Biphenyls - Soil

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Aroclor 1016	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1221	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1232	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1242	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1248	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1254	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1260	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1262	mg/kg	<0.1	0.0	-0.3	0.3	✓
Aroclor 1268	mg/kg	<0.1	0.0	-0.3	0.3	✓
Material Used:	Method Blank - SV					
Date Acquired:	Sep 12, 2005					
Acquired By:	Inna Kazakov					

Calibration Check	Units	Measured	Target	% Recovery	Criteria (%)	Passed QC
Aroclor 1254	ug/mL	0.9	1.0	90.0	70.0-130.0	✓
Material Used:	Calibration Check - PCBs					
Date Acquired:	Sep 12, 2005					
Acquired By:	Inna Kazakov					

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Aroclor 1016	mg/kg	<0.1	<0.1	15.0	0.2	✓
Aroclor 1221	mg/kg	<0.1	<0.1	15.0	0.2	✓
Aroclor 1232	mg/kg	<0.1	<0.1	15.0	0.2	✓
Aroclor 1242	mg/kg	<0.1	<0.1	15.0	0.2	✓
Aroclor 1248	mg/kg	<0.1	<0.1	15.0	0.2	✓
Aroclor 1254	mg/kg	<0.1	<0.1	15.0	0.2	✓
Aroclor 1260	mg/kg	<0.1	<0.1	15.0	0.2	✓
Aroclor 1262	mg/kg	<0.1	<0.1	15.0	0.2	✓
Aroclor 1268	mg/kg	<0.1	<0.1	15.0	0.2	✓
Material Used:	Duplicate - Run 2 - SV					
Date Acquired:	Sep 12, 2005					
Acquired By:	Inna Kazakov					

Matrix Spike	Units	Measured	Actual	% Recovery	Criteria (%)	Passed QC
Aroclor 1260	mg/kg	0.9	1	90.0	10.0-190.0	✓
Material Used:	Matrix Spike - SV					
Date Acquired:	Sep 12, 2005					
Acquired By:	Inna Kazakov					

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407362**
Control Number: E 241003
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744840

Polychlorinated Biphenyls - Soil - Surrogate

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Decachlorobiphenyl	%	50	100	10	190	✓

Material Used: Method Blank - SV
Date Acquired: Sep 12, 2005
Acquired By: Inna Kazakov

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Methodology and Notes

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407362**
Control Number: E 241003
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744840

Method of Analysis:

MethodName	Reference		Method	Date Analysis Started	Location
Boron in general soil	McKeague	*	Hot Water Soluble Boron - Azomethine-H Method, 4.61	13-Sep-05	Norwest Labs Edmonton
BTEX-CCME - Soil	CCME		Reference Method - Canada-Wide Standard for PHC in Soil, CWS PHC	13-Sep-05	Norwest Labs Calgary
BTEX-CCME - Soil	CCME		Reference Method - Canada-Wide Standard for PHC in Soil, CWS PHC	15-Sep-05	Norwest Labs Calgary
Mercury (Hot Block) in Soil	US EPA	*	Determination of Hg in Sediment by Cold Vapor Atomic Absorption Spec, 245.5	13-Sep-05	Norwest Labs Edmonton
Metals ICP-MS (Hot Block) in soil	SW-846	*	Acid Digestion of Sediments, Sludges, and Soils, EPA 3050B	12-Sep-05	Norwest Labs Edmonton
PAH - Soil	US EPA	*	Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry, 8270	15-Sep-05	Norwest Labs Calgary
PCB - Soil	US EPA	*	US EPA method, 8082	19-Sep-05	Norwest Labs Calgary
TEH-CCME-Soil (Soxhlet)	CCME		Reference Method - Canada-Wide Standard for PHC in Soil, CWS PHC	15-Sep-05	Norwest Labs Calgary
TEH-CCME-Soil (Soxhlet)	CCME		Reference Method - Canada-Wide Standard for PHC in Soil, CWS PHC	14-Sep-05	Norwest Labs Calgary

* Norwest method(s) is based on reference method

References:

CCME	Canadian Council of Ministers of the Environment
McKeague	Manual on Soil Sampling and Methods of Analysis
SW-846	Test Methods for Evaluating Solid Waste
US EPA	US Environmental Protection Agency Test Methods

Comments:

>130 - The surrogate recovery is higher then the range (23-130)% due to interference of Nitrobenzene-d5 with other hydrocarbons contained in the sample.IK 05/09/15

Please direct any inquiries regarding this report to our Client Services group.
Results relate only to samples as submitted
The test report shall not be reproduced except in full, without the written approval of the laboratory

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
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Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
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Edmonton, AB, Canada
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Attn: Greg Wright
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Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407362**
Control Number: E 241003
Date Received: Sep 09, 2005
Date Reported: Sep 19, 2005
Report Number: 744840

Petroleum Hydrocarbons in Soil

Batch Notes

1. The method used complies with the Reference Method for the Canada Wide Standards for Petroleum Hydrocarbons in Soil - Tier 1, April 2001 and is accredited for use in Norwest laboratories.
2. Modifications of the method: See Notes and Methodology for Non-conformances (if Applicable).
3. Qualifications on results: See Notes and Methodology for Non-conformances (if applicable).
4. Silica gel treatment is done for fractions F2, F3, F4.
5. F1-BTEX: BTEX has been subtracted from the F1 fraction.
6. F2-naphth and F3-PAH: selected PAHs have been subtracted from the appropriate fractions.
7. F4HTGC is reported when more than 5% of the total carbon envelope elutes past C50.
8. Gravimetric Heavy Hydrocarbons are not reported anymore in Alberta, F4 high temperature is reported instead.
9. When both F4(C34-C50) and FHTGC are reported, F4HTGC is the F4 that is to be used for interpreting the CWS.
10. Quality criteria met for the batch: Data is reported in Quality Control Section of report (if requested).
    -nC6 and nC10 response factors (RF) are within 30% of RF for toluene
    -nC10,nC16 and nC34 RFs are within 10% of each other
    -nC50 RF is within 70% of the average RF for NC10+nC16+nC16+nC34
    -linearity is within 15%
11. Batch data for QC samples is available on request.
12. Extraction and analysis holding times were met: See Notes and Methodology for Non-conformances (if applicable).

Approved by:



Darren Crichton, BSc, PChem
Operations Chemist

NORWEST LABS

Control Number E 241013

Environmental Sample Information Sheet

NOTE: Proper completion of this form is required in order to proceed with analysis
See reverse for your nearest Norwest location and proper sampling protocol

Billing Address:		**Copy of Report To:**		**Copy of invoice:**
Company:	Earth Tech Canada Inc.	Company:	Earth Tech Canada Inc.	
Address:	17203-103 Ave Edmonton, AB T5S 1J4	Address:	17203-103 Ave Edmonton, AB T5S 1J4	Mail invoice to this address for approval x
QA/QC Report	✓			
Attention:	Greg Wright	Attention:	Greg Wright	
Phone:	(780) 488-6800	Phone:	(780) 488-6800	
Fax:	(780) 488-2121	Fax:	(780) 488-2121	
Cell:		Cell:		
e-mail:	greg.wright@earthtech.ca	e-mail:	greg.wright@earthtech.ca	
Report Result:	Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-Service ✓	**Report Result:**	Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-service ☐	

Information to be included on Report and Invoice

Project ID: 88122
Project Name: Phase III Arctic ESA
Project Location: Simpson Lake
Legal Location:
PO#:
Proj. Acct. Code:
Agreement ID: 62449

RUSH

Please contact the laboratory to confirm rush dates and times before submitting samples.

Upon filling out this section, client accepts that surcharges will be attached to this analysis

Required on: all analyses **or** as indicated ☐ or ☐

Date Required: _____

Signature: _____

Norwest Authorization: _____

Sample Custody (Please Print)

Relinquished by: Greg Wright
Company ETC Signature GW.

I authorize Norwest Labs to proceed with the work indicated on this form:
Date: Sept 1, 2005
Initial: GW.

Received by: ☐ Coolers
Waybill # Date ☐ Boxes
Company Time ☐ Samples

Received By: Date:
Company: Time:

Special Instructions / Comments

☐ Check here if Norwest is required to report results directly to a regulatory body (Please include contact information)

Plant 1B → separate roots from soil and analyze separately

	Sample Identification	Location	Depth IN CM M	Date / Time Sampled	Matrix	Sampling Method	Number of Containers	METALS	Enter tests above (✓ relevant samples below)
1	BACK 1		—		soil	grab	1	✓	
2	BACK 2		—		"	"	1	✓	
3	BACK 3		—		"	"	1	✓	
4	BACK 4		—		"	"	1	✓	
5	BACK 5		—		"	"	1	✓	
6	BACK 6		—		"	"	1	✓	
7	BACK 6A		—		"	"	1	✓	
8	BACK 7		—		"	"	1	✓	
9	BACK 8		—		"	"	1	✓	
10	BACK 9		—		"	"	1	✓	
11	Plant 1A		—		plant tissue	"	1	✓	
12	Plant 1B		—		plant tissue / soil	"	1	✓	
13	Plant 2A Root		—		plant tissue	"	1	✓	
14	Plant 2B stem		—		"	"	1	✓	
15	Plant 2C		—		soil	"	1	✓	

NOTE: All hazardous samples must be labelled according to WHMIS guidelines.
Accredited by the Standards Council of Canada for specific tests

NWL008 (08/03)

NORWEST LABS

407553 Control Number E 241014

Environmental Sample Information Sheet

NOTE: Proper completion of this form is required in order to proceed with analysis
See reverse for your nearest Norwest location and proper sampling protocol

Billing Address: x	**Copy of Report To:**	**Copy of invoice:** ☐
Company: Earth Tech Canada Inc.	Company: Earth Tech Canada Inc.	Mail invoice to this address for approval x ☐
Address: 17203-103 Ave, Edmonton, AB T5S 1J4	Address: 17203-103 Ave, Edmonton, AB T5S 1J4	
QA/QC Report ☑		
Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-Service ☑	Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-service ☐	
Attention: Greg Wright	Attention: Greg Wright	
Phone: (780) 488-6800	Phone: (780) 488-6800	
Fax: (780) 488-2121	Fax: (780) 488-2121	
Cell:	Cell:	
e-mail: ~~greg.wright@earthtech.ca~~	e-mail: greg.wright@earthtech.ca	

Information to be included on Report and Invoice

Project ID: 88122
Project Name: Phase III Arctic ESA
Project Location: Simpson Lake
Legal Location:
PO#:
Proj. Acct. Code:
Agreement ID: 62449

RUSH Please contact the laboratory to confirm rush dates and times before submitting samples.

Upon filling out this section, client accepts that surcharges will be attached to this analysis

Required on: all analyses **or** as indicated ☐ or ☐

Date Required: _____

Signature: _____

Norwest Authorization: _____

Sample Custody (Please Print)

Relinquished by: Greg Wright
Company ETC Signature GW.

I authorize Norwest Labs to proceed with the work indicated on this form:
Date: Sept 1, 2005
Initial: GW.

Received by: ☐ Coolers
Waybill # Date ☐ Boxes
Company Time ☐ Samples

Received By: Date:
Company: Time:

Special Instructions / Comments ☐ Check here if Norwest is required to report results directly to a regulatory body (Please include contact information)

Plant 3B, Plant 5B, Plant 6B, Plant 7B → separate roots from soil and analyze separately

	Sample Identification	Location	Depth IN CM M	Date / Time Sampled	Matrix	Sampling Method	Number of Containers	METALS
							↓	Enter tests above (✓ relevant samples below)
1	Plant 3A		—		plant tissue	grab	1	✓
2	Plant 3B		—		plant tissue /soil	"	1	✓
3	Plant 4		—		plant tissue	"	1	✓
4	Plant 5A		—		plant tissue	"	1	✓
5	Plant 5B		—		plant tissue /soil	"	1	✓
6	Plant 6A		—		plant tissue	"	1	✓
7	Plant 6B		—		plant tissue /soil	"	1	✓
8	Plant 7A		—		plant tissue	"	1	✓
9	Plant 7B		—		plant tissue /soil	"	1	✓
10	Plant 8A		—		plant tissue	"	1	✓
11	Plant 8B		—		plant tissue	"	1	✓
12	Plant 8C		—		soil	"	1	✓
13	Plant 9		—		plant tissue	"	1	✓
14			—			"	1	✓
15			—			"	1	✓

NOTE: All hazardous samples must be labelled according to WHMIS guidelines.
Accredited by the Standards Council of Canada for specific tests

NWL008 (08/03)

NORWEST LABS

407553

Control Number E 241015

Environmental Sample Information Sheet

NOTE: Proper completion of this form is required in order to proceed with analysis
See reverse for your nearest Norwest location and proper sampling protocol

Billing Address:

Company: Earth Tech Canada Inc.
Address: 17203-103 Ave
Edmonton, AB T5S 1J4
Attention: Greg Wright
Phone: (780) 488-6800
Fax: (780) 488-2121
Cell:
e-mail: greg.wright@earthtech.ca

QA/QC Report: ✓
Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-Service ✓

Copy of Report To:

Company: Earth Tech Canada Inc.
Address: 17203-103 Ave
Edmonton, AB T5S 1J4
Attention: Greg Wright
Phone: (780) 488-6800
Fax: (780) 488-2121
Cell:
e-mail: greg.wright@earthtech.ca

Copy of invoice: ☐
Mail invoice to this address for approval: x
Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-service ☐

Information to be included on Report and Invoice

Project ID: 88122
Project Name: Phase III Arctic ESA
Project Location: Simpson Lake
Legal Location:
PO#:
Proj. Acct. Code:
Agreement ID: 62449

RUSH Please contact the laboratory to confirm rush dates and times before submitting samples.

Upon filling out this section, client accepts that surcharges will be attached to this analysis

Required on: all analyses or as indicated ☐ or ☐

Date Required: _____
Signature: _____
Norwest Authorization: _____

Sample Custody (Please Print)

Relinquished by: Greg Wright
Company ETC Signature GW.

I authorize Norwest Labs to proceed with the work indicated on this form:
Date: Sept 1, 2005
Initial: GW.

Received by: ☐ Coolers
Waybill # Date ☐ Boxes
Company Time ☐ Samples

Received By: Date:
Company: Time:

Special Instructions / Comments ☐ Check here if Norwest is required to report results directly to a regulatory body (Please include contact information)

Plant 12B → separate soil & roots and analyze separately

	Sample Identification	Location	Depth IN CM M	Date / Time Sampled	Matrix	Sampling Method	Number of Containers	METALS
							↓	Enter tests above (✓ relevant samples below)
1	Plant 10A		—		plant tissue	grab	1	✓
2	Plant 10B		—		plant tissue	"	1	✓
3	Plant 10C		—		soil	"	1	✓
4	Plant 11		—		plant tissue	"	1	✓
5	Plant 12A		—		plant tissue	"	1	✓
6	Plant 12B		—		plant tissue/soil	"	1	✓
7	Plant 13A		—		plant tissue	"	1	✓
8	Plant 13B		—		plant tissue	"	1	✓
9	Plant 13C		—		soil	"	1	✓
10			—					
11			—					
12			—					
13			—					
14			—					
15			—					

NOTE: All hazardous samples must be labelled according to WHMIS guidelines.
Accredited by the Standards Council of Canada for specific tests

NWL008 (08/03)

Analytical Report

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407553**
Control Number: E 241013
Date Received: Sep 12, 2005
Date Reported: Sep 16, 2005
Report Number: 745378
Preliminary

			NWL Number	407553-1	407553-2	407553-3	
			Sample Date	Sep 01, 2005	Sep 01, 2005	Sep 01, 2005	
			Sample Description	Back 1	Back 2	Back 3	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble							
Boron	Water Soluble	mg/kg		<0.1	0.2	<0.1	0.1
Metals Strong Acid Digestion							
Mercury	Strong Acid Extractable	ug/g		<0.01	<0.01	<0.01	0.01
Antimony	Strong Acid Extractable	ug/g		<0.2	<0.2	<0.2	0.2
Arsenic	Strong Acid Extractable	ug/g		1.6	1.6	1.7	0.2
Barium	Strong Acid Extractable	ug/g		66	86	62	1
Beryllium	Strong Acid Extractable	ug/g		0.4	0.5	0.4	0.1
Cadmium	Strong Acid Extractable	ug/g		0.06	0.06	0.07	0.01
Chromium	Strong Acid Extractable	ug/g		19.8	23.3	17.7	0.5
Cobalt	Strong Acid Extractable	ug/g		7.7	8.4	6.6	0.1
Copper	Strong Acid Extractable	ug/g		9	12	9	1
Lead	Strong Acid Extractable	ug/g		6.4	6.9	6.5	0.1
Molybdenum	Strong Acid Extractable	ug/g		<1	<1	<1	1
Nickel	Strong Acid Extractable	ug/g		10.4	12.8	10.0	0.5
Selenium	Strong Acid Extractable	ug/g		<0.3	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	ug/g		<0.1	0.1	<0.1	0.1
Thallium	Strong Acid Extractable	ug/g		0.25	0.32	0.24	0.05
Tin	Strong Acid Extractable	ug/g		2	2	2	1
Vanadium	Strong Acid Extractable	ug/g		35.1	42.3	32.7	0.1
Zinc	Strong Acid Extractable	ug/g		38	47	36	1

NORWEST LABS

Norwest Labs
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Fax: (780) 438-0396

Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407553**
Control Number: E 241013
Date Received: Sep 12, 2005
Date Reported: Sep 16, 2005
Report Number: 745378
Preliminary

			NWL Number	407553-4	407553-5	407553-6	
			Sample Date	Sep 01, 2005	Sep 01, 2005	Sep 01, 2005	
			Sample Description	Back 4	Back 5	Back 6	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble							
Boron	Water Soluble	mg/kg		<0.1	<0.1	<0.1	0.1
Metals Strong Acid Digestion							
Mercury	Strong Acid Extractable	ug/g		<0.01	<0.01	<0.01	0.01
Antimony	Strong Acid Extractable	ug/g		<0.2	<0.2	<0.2	0.2
Arsenic	Strong Acid Extractable	ug/g		1.6	1.0	0.9	0.2
Barium	Strong Acid Extractable	ug/g		66	35	34	1
Beryllium	Strong Acid Extractable	ug/g		0.4	0.2	0.3	0.1
Cadmium	Strong Acid Extractable	ug/g		0.05	0.04	0.05	0.01
Chromium	Strong Acid Extractable	ug/g		20.3	12.6	9.7	0.5
Cobalt	Strong Acid Extractable	ug/g		7.2	4.6	4.3	0.1
Copper	Strong Acid Extractable	ug/g		8	4	4	1
Lead	Strong Acid Extractable	ug/g		6.3	4.8	4.4	0.1
Molybdenum	Strong Acid Extractable	ug/g		<1	<1	<1	1
Nickel	Strong Acid Extractable	ug/g		10.8	6.4	5.8	0.5
Selenium	Strong Acid Extractable	ug/g		<0.3	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	ug/g		<0.1	<0.1	<0.1	0.1
Thallium	Strong Acid Extractable	ug/g		0.24	0.14	0.12	0.05
Tin	Strong Acid Extractable	ug/g		2	2	2	1
Vanadium	Strong Acid Extractable	ug/g		34.4	21.7	19.5	0.1
Zinc	Strong Acid Extractable	ug/g		38	24	19	1

NORWEST LABS

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407553**
Control Number: E 241013
Date Received: Sep 12, 2005
Date Reported: Sep 16, 2005
Report Number: 745378
Preliminary

			NWL Number	407553-7	407553-8	407553-9	
			Sample Date	Sep 01, 2005	Sep 01, 2005	Sep 01, 2005	
			Sample Description	Back 6A	Back 7	Back 8	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble							
Boron	Water Soluble	mg/kg		<0.1	<0.1	<0.1	0.1
Metals Strong Acid Digestion							
Mercury	Strong Acid Extractable	ug/g		<0.01	<0.01	0.02	0.01
Antimony	Strong Acid Extractable	ug/g		<0.2	<0.2	<0.2	0.2
Arsenic	Strong Acid Extractable	ug/g		2.3	1.1	0.9	0.2
Barium	Strong Acid Extractable	ug/g		120	48	33	1
Beryllium	Strong Acid Extractable	ug/g		0.6	0.3	0.2	0.1
Cadmium	Strong Acid Extractable	ug/g		0.07	0.05	0.05	0.01
Chromium	Strong Acid Extractable	ug/g		32.4	13.7	10.0	0.5
Cobalt	Strong Acid Extractable	ug/g		10.6	5.1	4.3	0.1
Copper	Strong Acid Extractable	ug/g		16	7	5	1
Lead	Strong Acid Extractable	ug/g		9.0	5.0	4.5	0.1
Molybdenum	Strong Acid Extractable	ug/g		<1	<1	<1	1
Nickel	Strong Acid Extractable	ug/g		18.0	7.7	5.8	0.5
Selenium	Strong Acid Extractable	ug/g		<0.3	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	ug/g		0.1	<0.1	<0.1	0.1
Thallium	Strong Acid Extractable	ug/g		0.43	0.17	0.13	0.05
Tin	Strong Acid Extractable	ug/g		2	2	2	1
Vanadium	Strong Acid Extractable	ug/g		53.9	25.1	20.1	0.1
Zinc	Strong Acid Extractable	ug/g		62	26	20	1

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Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407553**
Control Number: E 241013
Date Received: Sep 12, 2005
Date Reported: Sep 16, 2005
Report Number: 745378
Preliminary

			NWL Number	407553-10	407553-12	407553-16	
			Sample Date	Sep 01, 2005	Sep 01, 2005	Sep 01, 2005	
			Sample Description	Back 9	Plant 1B	Plant 2C	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble							
Boron	Water Soluble	mg/kg		<0.1	0.2	0.2	0.1
Metals Strong Acid Digestion							
Mercury	Strong Acid Extractable	ug/g		<0.01	<0.01	<0.01	0.01
Antimony	Strong Acid Extractable	ug/g		<0.2	<0.2	<0.2	0.2
Arsenic	Strong Acid Extractable	ug/g		1.4	1.7	1.3	0.2
Barium	Strong Acid Extractable	ug/g		58	71	59	1
Beryllium	Strong Acid Extractable	ug/g		0.4	0.4	0.4	0.1
Cadmium	Strong Acid Extractable	ug/g		0.06	0.08	0.10	0.01
Chromium	Strong Acid Extractable	ug/g		17.0	21.6	16.7	0.5
Cobalt	Strong Acid Extractable	ug/g		6.2	7.4	5.9	0.1
Copper	Strong Acid Extractable	ug/g		8	10	8	1
Lead	Strong Acid Extractable	ug/g		5.7	9.9	7.2	0.1
Molybdenum	Strong Acid Extractable	ug/g		<1	<1	<1	1
Nickel	Strong Acid Extractable	ug/g		8.8	11.5	9.0	0.5
Selenium	Strong Acid Extractable	ug/g		<0.3	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	ug/g		<0.1	0.1	<0.1	0.1
Thallium	Strong Acid Extractable	ug/g		0.22	0.27	0.21	0.05
Tin	Strong Acid Extractable	ug/g		2	2	2	1
Vanadium	Strong Acid Extractable	ug/g		31.0	36.8	30.3	0.1
Zinc	Strong Acid Extractable	ug/g		34	48	38	1

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T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407553**
Control Number: E 241013
Date Received: Sep 12, 2005
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Report Number: 745378
Preliminary

			NWL Number	407553-18	407553-21	407553-24	
			Sample Date	Sep 01, 2005	Sep 01, 2005	Sep 01, 2005	
			Sample Description	Plant 3B	Plant 5B	Plant 6B	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble							
Boron	Water Soluble	mg/kg		0.2	0.3	0.4	0.1
Metals Strong Acid Digestion							
Mercury	Strong Acid Extractable	ug/g		<0.01	<0.01	<0.01	0.01
Antimony	Strong Acid Extractable	ug/g		<0.2	<0.2	<0.2	0.2
Arsenic	Strong Acid Extractable	ug/g		0.7	0.9	1	0.2
Barium	Strong Acid Extractable	ug/g		29	46	32	1
Beryllium	Strong Acid Extractable	ug/g		0.2	0.3	0.2	0.1
Cadmium	Strong Acid Extractable	ug/g		0.07	0.12	0.14	0.01
Chromium	Strong Acid Extractable	ug/g		10.3	13.7	11.8	0.5
Cobalt	Strong Acid Extractable	ug/g		3.8	5.0	4.3	0.1
Copper	Strong Acid Extractable	ug/g		4	6	6	1
Lead	Strong Acid Extractable	ug/g		4.0	5.3	10.3	0.1
Molybdenum	Strong Acid Extractable	ug/g		<1	<1	<1	1
Nickel	Strong Acid Extractable	ug/g		6.1	7.7	6.5	0.5
Selenium	Strong Acid Extractable	ug/g		<0.3	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	ug/g		<0.1	<0.1	<0.1	0.1
Thallium	Strong Acid Extractable	ug/g		0.11	0.18	0.14	0.05
Tin	Strong Acid Extractable	ug/g		2	2	2	1
Vanadium	Strong Acid Extractable	ug/g		18.8	24.8	20.0	0.1
Zinc	Strong Acid Extractable	ug/g		22	44	26	1

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Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407553**
Control Number: E 241013
Date Received: Sep 12, 2005
Date Reported: Sep 16, 2005
Report Number: 745378
Preliminary

			NWL Number	407553-27	407553-31	407553-35	
			Sample Date	Sep 01, 2005	Sep 01, 2005	Sep 01, 2005	
			Sample Description	Plant 7B	Plant 8C	Plant 10C	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble							
Boron	Water Soluble	mg/kg		0.4	0.2	0.6	0.1
Metals Strong Acid Digestion							
Mercury	Strong Acid Extractable	ug/g		<0.01	<0.01	0.01	0.01
Antimony	Strong Acid Extractable	ug/g		<0.2	<0.2	0.3	0.2
Arsenic	Strong Acid Extractable	ug/g		0.9	1.6	1	0.2
Barium	Strong Acid Extractable	ug/g		29	78	61	1
Beryllium	Strong Acid Extractable	ug/g		0.3	0.5	0.3	0.1
Cadmium	Strong Acid Extractable	ug/g		0.07	0.07	0.11	0.01
Chromium	Strong Acid Extractable	ug/g		10.4	23.0	13.9	0.5
Cobalt	Strong Acid Extractable	ug/g		4.3	7.6	5.0	0.1
Copper	Strong Acid Extractable	ug/g		5	11	7	1
Lead	Strong Acid Extractable	ug/g		5.8	27.3	6.9	0.1
Molybdenum	Strong Acid Extractable	ug/g		<1	<1	<1	1
Nickel	Strong Acid Extractable	ug/g		6.4	12.4	8.1	0.5
Selenium	Strong Acid Extractable	ug/g		<0.3	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	ug/g		<0.1	<0.1	<0.1	0.1
Thallium	Strong Acid Extractable	ug/g		0.14	0.27	0.19	0.05
Tin	Strong Acid Extractable	ug/g		2	2	2	1
Vanadium	Strong Acid Extractable	ug/g		19.3	37.6	25.0	0.1
Zinc	Strong Acid Extractable	ug/g		25	49	40	1

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Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407553**
Control Number: E 241013
Date Received: Sep 12, 2005
Date Reported: Sep 16, 2005
Report Number: 745378
Preliminary

	NWL Number	407553-38	407553-42		
	Sample Date	Sep 01, 2005	Sep 01, 2005		
	Sample Description	Plant 12B	Plant 13C		
	Matrix	Soil - general	Soil - general		
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble						
Boron	Water Soluble	mg/kg	0.2	0.2		0.1
Metals Strong Acid Digestion						
Mercury	Strong Acid Extractable	ug/g	<0.01	<0.01		0.01
Antimony	Strong Acid Extractable	ug/g	<0.2	<0.2		0.2
Arsenic	Strong Acid Extractable	ug/g	1	1.2		0.2
Barium	Strong Acid Extractable	ug/g	40	63		1
Beryllium	Strong Acid Extractable	ug/g	0.3	0.4		0.1
Cadmium	Strong Acid Extractable	ug/g	0.11	0.06		0.01
Chromium	Strong Acid Extractable	ug/g	12.0	16.8		0.5
Cobalt	Strong Acid Extractable	ug/g	5.4	5.4		0.1
Copper	Strong Acid Extractable	ug/g	6	7		1
Lead	Strong Acid Extractable	ug/g	8.8	6.1		0.1
Molybdenum	Strong Acid Extractable	ug/g	<1	<1		1
Nickel	Strong Acid Extractable	ug/g	7.1	8.9		0.5
Selenium	Strong Acid Extractable	ug/g	<0.3	<0.3		0.3
Silver	Strong Acid Extractable	ug/g	<0.1	<0.1		0.1
Thallium	Strong Acid Extractable	ug/g	0.15	0.22		0.05
Tin	Strong Acid Extractable	ug/g	2	2		1
Vanadium	Strong Acid Extractable	ug/g	22.2	30.4		0.1
Zinc	Strong Acid Extractable	ug/g	62	38		1

Approved by:

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Quality Control

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407553**
Control Number: E 241013
Date Received: Sep 12, 2005
Date Reported: Sep 16, 2005
Report Number: 745378
Preliminary

Hot Water Soluble

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Boron	mg/kg	<0.0	0.0	0.0	0.0	✓
Material Used:	Edmonton Method Blank					
Date Acquired:	Sep 13, 2005					
Acquired By:	Fernando Maglalang					

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Boron	mg/kg	<0.1	<0.1	10.0	0.1	✓
Material Used:	Edmonton Duplicate					
Date Acquired:	Sep 13, 2005					
Acquired By:	Fernando Maglalang					

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Boron	mg/kg	1.6	1.4	1.0	1.8	✓
Material Used:	2001 Farm Soil Standard					
Date Acquired:	Sep 13, 2005					
Acquired By:	Fernando Maglalang					

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Quality Control

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17203-103 Ave
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T5S 1J4
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Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407553**
Control Number: E 241013
Date Received: Sep 12, 2005
Date Reported: Sep 16, 2005
Report Number: 745378
Preliminary

Metals Strong Acid Digestion

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Mercury	ug/g	<0.00	0.00	0.00	0.00	✓
Antimony	ug/g	<0.0	0.0	0.0	0.0	✓
Arsenic	ug/g	<0.0	0.0	-0.1	0.2	✓
Barium	ug/g	<0	1	-2	3	✓
Beryllium	ug/g	<0.0	0.0	0.0	0.0	✓
Cadmium	ug/g	0.00	0.00	-0.03	0.03	✓
Chromium	ug/g	<0.0	-0.3	-1.5	0.9	✓
Cobalt	ug/g	<0.0	0.0	-0.1	0.1	✓
Copper	ug/g	<0	0	-1	1	✓
Lead	ug/g	<0.0	0.1	-0.2	0.4	✓
Molybdenum	ug/g	<0	0	0	0	✓
Nickel	ug/g	<0.0	-0.2	-1.7	1.2	✓
Selenium	ug/g	<0.0	0.0	-0.3	0.2	✓
Silver	ug/g	<0.0	0.0	0.0	0.0	✓
Thallium	ug/g	<0.00	0.00	-0.01	0.01	✓
Tin	ug/g	0	2	2	3	✓
Vanadium	ug/g	0.0	0.0	-0.2	0.3	✓
Zinc	ug/g	0	0	-3	3	✓

Material Used: Edmonton Method Blank
Date Acquired: Sep 13, 2005
Acquired By: Alexsandra Robert

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Quality Control

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17203-103 Ave
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T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407553**
Control Number: E 241013
Date Received: Sep 12, 2005
Date Reported: Sep 16, 2005
Report Number: 745378
Preliminary

Metals Strong Acid Digestion (Continued...)

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	ug/g	0.02	0.04	9.99	0.03	✓
Antimony	ug/g	<0.2	<0.2	20.0	0.4	✓
Arsenic	ug/g	3.6	3.5	20.0	0.4	✓
Barium	ug/g	40	39	20	2	✓
Beryllium	ug/g	0.4	0.4	20.0	0.2	✓
Cadmium	ug/g	0.16	0.16	20.01	0.02	✓
Chromium	ug/g	9.7	9.7	20.0	1.1	✓
Cobalt	ug/g	7.0	6.9	20.0	0.2	✓
Copper	ug/g	6	6	20	2	✓
Lead	ug/g	8.8	8.7	20.0	0.2	✓
Molybdenum	ug/g	<1	<1	20	2	✓
Nickel	ug/g	7.1	6.8	20.0	1.1	✓
Selenium	ug/g	<0.3	<0.3	20.0	0.7	✓
Silver	ug/g	0.1	<0.1	20.0	0.2	✓
Thallium	ug/g	0.15	0.15	20.01	0.11	✓
Tin	ug/g	2	2	20	2	✓
Vanadium	ug/g	26.3	27.5	20.0	0.2	✓
Zinc	ug/g	62	56	20	2	✓

Material Used: Edmonton Duplicate
Date Acquired: Sep 13, 2005
Acquired By: Alexsandra Robert

Norwest Labs
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Quality Control

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17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407553**
Control Number: E 241013
Date Received: Sep 12, 2005
Date Reported: Sep 16, 2005
Report Number: 745378
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Metals Strong Acid Digestion (Continued...)

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Mercury	ug/g	1.35	1.45	1.18	1.72	✓
Antimony	ug/g	<0.2	0.2	0.1	0.3	✓
Arsenic	ug/g	17.0	16.8	14.1	19.5	✓
Barium	ug/g	424	406	330	482	✓
Beryllium	ug/g	0.9	0.9	0.7	1.1	✓
Cadmium	ug/g	0.43	0.38	0.30	0.45	✓
Chromium	ug/g	81.9	84.7	69.4	100.0	✓
Cobalt	ug/g	13.8	13.4	11.1	15.7	✓
Copper	ug/g	32	33	27	39	✓
Lead	ug/g	13.3	13.4	11.0	15.8	✓
Molybdenum	ug/g	<1	1	1	1	✓
Nickel	ug/g	79.8	81.8	68.5	95.1	✓
Selenium	ug/g	1.4	1.2	0.5	1.9	✓
Silver	ug/g	0.4	0.4	0.2	0.5	✓
Thallium	ug/g	0.36	0.35	0.28	0.41	✓
Tin	ug/g	<1	1	1	1	✓
Vanadium	ug/g	81.6	83.3	63.7	103.0	✓
Zinc	ug/g	105	103	85	121	✓

Material Used: Metals Soils
Date Acquired: Sep 13, 2005
Acquired By: Alexsandra Robert

Metals Total

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Mercury	ug/g		0.034	0.028	0.040	✓

Material Used: S0157 NIST 1573a - metals in tomato leaves
Date Acquired: Sep 16, 2005
Acquired By:

Mercury	ug/g		0.031	0.021	0.042	✓

Material Used: S0167 NIST 1547 - metals in peach leaves
Date Acquired: Sep 16, 2005
Acquired By:

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Methodology and Notes

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
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NWL Lot ID: **407553**
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Method of Analysis:

MethodName	Reference		Method	Date Analysis Started	Location
Boron in general soil	McKeague	*	Hot Water Soluble Boron - Azomethine-H Method, 4.61	13-Sep-05	Norwest Labs Edmonton
Mercury (Hot Block) in Soil	US EPA	*	Determination of Hg in Sediment by Cold Vapor Atomic Absorption Spec, 245.5	13-Sep-05	Norwest Labs Edmonton
Metals ICP-MS (Hot Block) in soil	SW-846	*	Acid Digestion of Sediments, Sludges, and Soils, EPA 3050B	13-Sep-05	Norwest Labs Edmonton

* Norwest method(s) is based on reference method

References:

McKeague	Manual on Soil Sampling and Methods of Analysis
SW-846	Test Methods for Evaluating Solid Waste
US EPA	US Environmental Protection Agency Test Methods

Comments:

Received extra sample Plant 5 that was not listed on COC, and missing sample Plant 4

Please direct any inquiries regarding this report to our Client Services group.
Results relate only to samples as submitted
The test report shall not be reproduced except in full, without the written approval of the laboratory

NORWEST LABS

Control Number E 241013

Environmental Sample Information Sheet

NOTE: Proper completion of this form is required in order to proceed with analysis
See reverse for your nearest Norwest location and proper sampling protocol

Billing Address:		**Copy of Report To:**		**Copy of invoice:**
Company:	Earth Tech Canada Inc.	Company:	Earth Tech Canada Inc.	
Address:	17203-103 Ave Edmonton, AB T5S 1J4	Address:	17203-103 Ave Edmonton, AB T5S 1J4	Mail invoice to this address for approval x
QA/QC Report	✓			
Attention:	Greg Wright	Attention:	Greg Wright	
Phone:	(780) 488-6800	Phone:	(780) 488-6800	
Fax:	(780) 488-2121	Fax:	(780) 488-2121	
Cell:		Cell:		
e-mail:	greg.wright@earthtech.ca	e-mail:	greg.wright@earthtech.ca	
Report Result:	Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-Service ✓	**Report Result:**	Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-service ☐	

Information to be included on Report and Invoice

Project ID: 88122
Project Name: Phase III Arctic ESA
Project Location: Simpson Lake
Legal Location:
PO#:
Proj. Acct. Code:
Agreement ID: 62449

RUSH

Please contact the laboratory to confirm rush dates and times before submitting samples.

Upon filling out this section, client accepts that surcharges will be attached to this analysis

Required on: all analyses **or** as indicated ☐ or ☐

Date Required: _____

Signature: _____

Norwest Authorization: _____

Sample Custody (Please Print)

Relinquished by: Greg Wright
Company ETC Signature GW.

I authorize Norwest Labs to proceed with the work indicated on this form:
Date: Sept 1, 2005
Initial: GW.

Received by: ☐ Coolers
Waybill # Date ☐ Boxes
Company Time ☐ Samples

Received By: Date:
Company: Time:

Special Instructions / Comments

☐ Check here if Norwest is required to report results directly to a regulatory body (Please include contact information)

Plant 1B → separate roots from soil and analyze separately

	Sample Identification	Location	Depth IN CM M	Date / Time Sampled	Matrix	Sampling Method	Number of Containers	METALS	Enter tests above (✓ relevant samples below)
1	BACK 1		—		soil	grab	1	✓	
2	BACK 2		—		"	"	1	✓	
3	BACK 3		—		"	"	1	✓	
4	BACK 4		—		"	"	1	✓	
5	BACK 5		—		"	"	1	✓	
6	BACK 6		—		"	"	1	✓	
7	BACK 6A		—		"	"	1	✓	
8	BACK 7		—		"	"	1	✓	
9	BACK 8		—		"	"	1	✓	
10	BACK 9		—		"	"	1	✓	
11	Plant 1A		—		plant tissue	"	1	✓	
12	Plant 1B		—		plant tissue / soil	"	1	✓	
13	Plant 2A Root		—		plant tissue	"	1	✓	
14	Plant 2B stem		—		"	"	1	✓	
15	Plant 2C		—		soil	"	1	✓	

NOTE: All hazardous samples must be labelled according to WHMIS guidelines.
Accredited by the Standards Council of Canada for specific tests

NWL008 (08/03)

NORWEST LABS

407553 Control Number E 241014

Environmental Sample Information Sheet

NOTE: Proper completion of this form is required in order to proceed with analysis
See reverse for your nearest Norwest location and proper sampling protocol

Billing Address: x	**Copy of Report To:**	**Copy of invoice:** ☐
Company: Earth Tech Canada Inc.	Company: Earth Tech Canada Inc.	Mail invoice to this address for approval x ☐
Address: 17203-103 Ave, Edmonton, AB T5S 1J4	Address: 17203-103 Ave, Edmonton, AB T5S 1J4	
QA/QC Report ☑		
Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-Service ☑	Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-service ☐	
Attention: Greg Wright	Attention: Greg Wright	
Phone: (780) 488-6800	Phone: (780) 488-6800	
Fax: (780) 488-2121	Fax: (780) 488-2121	
Cell:	Cell:	
e-mail: ~~greg.wright@earthtech.ca~~	e-mail: greg.wright@earthtech.ca	

Information to be included on Report and Invoice

Project ID: 88122
Project Name: Phase III Arctic ESA
Project Location: Simpson Lake
Legal Location:
PO#:
Proj. Acct. Code:
Agreement ID: 62449

RUSH Please contact the laboratory to confirm rush dates and times before submitting samples.

Upon filling out this section, client accepts that surcharges will be attached to this analysis

Required on: all analyses **or** as indicated ☐ or ☐

Date Required: _____

Signature: _____

Norwest Authorization: _____

Sample Custody (Please Print)

Relinquished by: Greg Wright
Company ETC Signature GW.

I authorize Norwest Labs to proceed with the work indicated on this form:
Date: Sept 1, 2005
Initial: GW.

Received by: ☐ Coolers
Waybill # Date ☐ Boxes
Company Time ☐ Samples

Received By: Date:
Company: Time:

Special Instructions / Comments ☐ Check here if Norwest is required to report results directly to a regulatory body (Please include contact information)

Plant 3B, Plant 5B, Plant 6B, Plant 7B → separate roots from soil and analyze separately

	Sample Identification	Location	Depth IN CM M	Date / Time Sampled	Matrix	Sampling Method	Number of Containers	METALS
							↓	Enter tests above (✓ relevant samples below)
1	Plant 3A		—		plant tissue	grab	1	✓
2	Plant 3B		—		plant tissue /soil	"	1	✓
3	Plant 4		—		plant tissue	"	1	✓
4	Plant 5A		—		plant tissue	"	1	✓
5	Plant 5B		—		plant tissue /soil	"	1	✓
6	Plant 6A		—		plant tissue	"	1	✓
7	Plant 6B		—		plant tissue /soil	"	1	✓
8	Plant 7A		—		plant tissue	"	1	✓
9	Plant 7B		—		plant tissue /soil	"	1	✓
10	Plant 8A		—		plant tissue	"	1	✓
11	Plant 8B		—		plant tissue	"	1	✓
12	Plant 8C		—		soil	"	1	✓
13	Plant 9		—		plant tissue	"	1	✓
14			—			"	1	✓
15			—			"	1	✓

NOTE: All hazardous samples must be labelled according to WHMIS guidelines.
Accredited by the Standards Council of Canada for specific tests

NWL008 (08/03)

NORWEST LABS

407553

Control Number E 241015

Environmental Sample Information Sheet

NOTE: Proper completion of this form is required in order to proceed with analysis
See reverse for your nearest Norwest location and proper sampling protocol

Billing Address:

Company: Earth Tech Canada Inc.
Address: 17203-103 Ave
Edmonton, AB T5S 1J4
Attention: Greg Wright
Phone: (780) 488-6800
Fax: (780) 488-2121
Cell:
e-mail: greg.wright@earthtech.ca

QA/QC Report: ✓
Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-Service ✓

Copy of Report To:

Company: Earth Tech Canada Inc.
Address: 17203-103 Ave
Edmonton, AB T5S 1J4
Attention: Greg Wright
Phone: (780) 488-6800
Fax: (780) 488-2121
Cell:
e-mail: greg.wright@earthtech.ca

Copy of invoice: ☐
Mail invoice to this address for approval: x
Report Result: Fax ☐ Mail ☐ Courier ☐ e-mail ☐ e-service ☐

Information to be included on Report and Invoice

Project ID: 88122
Project Name: Phase III Arctic ESA
Project Location: Simpson Lake
Legal Location:
PO#:
Proj. Acct. Code:
Agreement ID: 62449

RUSH Please contact the laboratory to confirm rush dates and times before submitting samples.

Upon filling out this section, client accepts that surcharges will be attached to this analysis

Required on: all analyses or as indicated ☐ or ☐

Date Required: _____
Signature: _____
Norwest Authorization: _____

Sample Custody (Please Print)

Relinquished by: Greg Wright
Company ETC Signature GW.

I authorize Norwest Labs to proceed with the work indicated on this form:
Date: Sept 1, 2005
Initial: GW.

Received by: ☐ Coolers
Waybill # Date ☐ Boxes
Company Time ☐ Samples

Received By: Date:
Company: Time:

Special Instructions / Comments ☐ Check here if Norwest is required to report results directly to a regulatory body (Please include contact information)

Plant 12B → separate soil & roots and analyze separately

	Sample Identification	Location	Depth IN CM M	Date / Time Sampled	Matrix	Sampling Method	Number of Containers	METALS
							↓	Enter tests above (✓ relevant samples below)
1	Plant 10A		—		plant tissue	grab	1	✓
2	Plant 10B		—		plant tissue	"	1	✓
3	Plant 10C		—		soil	"	1	✓
4	Plant 11		—		plant tissue	"	1	✓
5	Plant 12A		—		plant tissue	"	1	✓
6	Plant 12B		—		plant tissue/soil	"	1	✓
7	Plant 13A		—		plant tissue	"	1	✓
8	Plant 13B		—		plant tissue	"	1	✓
9	Plant 13C		—		soil	"	1	✓
10			—					
11			—					
12			—					
13			—					
14			—					
15			—					

NOTE: All hazardous samples must be labelled according to WHMIS guidelines.
Accredited by the Standards Council of Canada for specific tests

NWL008 (08/03)

Analytical Report

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407553**
Control Number: E 241013
Date Received: Sep 12, 2005
Date Reported: Sep 22, 2005
Report Number: 746656

	NWL Number	407553-1	407553-2	407553-3	
	Sample Date	Sep 01, 2005	Sep 01, 2005	Sep 01, 2005	
	Sample Description	Back 1	Back 2	Back 3	
	Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble						
Boron	Water Soluble	mg/kg	<0.1	0.2	<0.1	0.1
Metals Strong Acid Digestion						
Mercury	Strong Acid Extractable	ug/g	<0.01	<0.01	<0.01	0.01
Antimony	Strong Acid Extractable	ug/g	<0.2	<0.2	<0.2	0.2
Arsenic	Strong Acid Extractable	ug/g	1.6	1.6	1.7	0.2
Barium	Strong Acid Extractable	ug/g	66	86	62	1
Beryllium	Strong Acid Extractable	ug/g	0.4	0.5	0.4	0.1
Cadmium	Strong Acid Extractable	ug/g	0.06	0.06	0.07	0.01
Chromium	Strong Acid Extractable	ug/g	19.8	23.3	17.7	0.5
Cobalt	Strong Acid Extractable	ug/g	7.7	8.4	6.6	0.1
Copper	Strong Acid Extractable	ug/g	9	12	9	1
Lead	Strong Acid Extractable	ug/g	6.4	6.9	6.5	0.1
Molybdenum	Strong Acid Extractable	ug/g	<1	<1	<1	1
Nickel	Strong Acid Extractable	ug/g	10.4	12.8	10.0	0.5
Selenium	Strong Acid Extractable	ug/g	<0.3	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	ug/g	<0.1	0.1	<0.1	0.1
Thallium	Strong Acid Extractable	ug/g	0.25	0.32	0.24	0.05
Tin	Strong Acid Extractable	ug/g	2	2	2	1
Vanadium	Strong Acid Extractable	ug/g	35.1	42.3	32.7	0.1
Zinc	Strong Acid Extractable	ug/g	38	47	36	1

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407553**
Control Number: E 241013
Date Received: Sep 12, 2005
Date Reported: Sep 22, 2005
Report Number: 746656

			NWL Number	407553-4	407553-5	407553-6	
			Sample Date	Sep 01, 2005	Sep 01, 2005	Sep 01, 2005	
			Sample Description	Back 4	Back 5	Back 6	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble							
Boron	Water Soluble	mg/kg		<0.1	<0.1	<0.1	0.1
Metals Strong Acid Digestion							
Mercury	Strong Acid Extractable	ug/g		<0.01	<0.01	<0.01	0.01
Antimony	Strong Acid Extractable	ug/g		<0.2	<0.2	<0.2	0.2
Arsenic	Strong Acid Extractable	ug/g		1.6	1.0	0.9	0.2
Barium	Strong Acid Extractable	ug/g		66	35	34	1
Beryllium	Strong Acid Extractable	ug/g		0.4	0.2	0.3	0.1
Cadmium	Strong Acid Extractable	ug/g		0.05	0.04	0.05	0.01
Chromium	Strong Acid Extractable	ug/g		20.3	12.6	9.7	0.5
Cobalt	Strong Acid Extractable	ug/g		7.2	4.6	4.3	0.1
Copper	Strong Acid Extractable	ug/g		8	4	4	1
Lead	Strong Acid Extractable	ug/g		6.3	4.8	4.4	0.1
Molybdenum	Strong Acid Extractable	ug/g		<1	<1	<1	1
Nickel	Strong Acid Extractable	ug/g		10.8	6.4	5.8	0.5
Selenium	Strong Acid Extractable	ug/g		<0.3	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	ug/g		<0.1	<0.1	<0.1	0.1
Thallium	Strong Acid Extractable	ug/g		0.24	0.14	0.12	0.05
Tin	Strong Acid Extractable	ug/g		2	2	2	1
Vanadium	Strong Acid Extractable	ug/g		34.4	21.7	19.5	0.1
Zinc	Strong Acid Extractable	ug/g		38	24	19	1

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407553**
Control Number: E 241013
Date Received: Sep 12, 2005
Date Reported: Sep 22, 2005
Report Number: 746656

			NWL Number	407553-7	407553-8	407553-9	
			Sample Date	Sep 01, 2005	Sep 01, 2005	Sep 01, 2005	
			Sample Description	Back 6A	Back 7	Back 8	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble							
Boron	Water Soluble	mg/kg		<0.1	<0.1	<0.1	0.1
Metals Strong Acid Digestion							
Mercury	Strong Acid Extractable	ug/g		<0.01	<0.01	0.02	0.01
Antimony	Strong Acid Extractable	ug/g		<0.2	<0.2	<0.2	0.2
Arsenic	Strong Acid Extractable	ug/g		2.3	1.1	0.9	0.2
Barium	Strong Acid Extractable	ug/g		120	48	33	1
Beryllium	Strong Acid Extractable	ug/g		0.6	0.3	0.2	0.1
Cadmium	Strong Acid Extractable	ug/g		0.07	0.05	0.05	0.01
Chromium	Strong Acid Extractable	ug/g		32.4	13.7	10.0	0.5
Cobalt	Strong Acid Extractable	ug/g		10.6	5.1	4.3	0.1
Copper	Strong Acid Extractable	ug/g		16	7	5	1
Lead	Strong Acid Extractable	ug/g		9.0	5.0	4.5	0.1
Molybdenum	Strong Acid Extractable	ug/g		<1	<1	<1	1
Nickel	Strong Acid Extractable	ug/g		18.0	7.7	5.8	0.5
Selenium	Strong Acid Extractable	ug/g		<0.3	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	ug/g		0.1	<0.1	<0.1	0.1
Thallium	Strong Acid Extractable	ug/g		0.43	0.17	0.13	0.05
Tin	Strong Acid Extractable	ug/g		2	2	2	1
Vanadium	Strong Acid Extractable	ug/g		53.9	25.1	20.1	0.1
Zinc	Strong Acid Extractable	ug/g		62	26	20	1

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407553**
Control Number: E 241013
Date Received: Sep 12, 2005
Date Reported: Sep 22, 2005
Report Number: 746656

			NWL Number	407553-10	407553-12	407553-16	
			Sample Date	Sep 01, 2005	Sep 01, 2005	Sep 01, 2005	
			Sample Description	Back 9	Plant 1B	Plant 2C	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble							
Boron	Water Soluble	mg/kg		<0.1	0.2	0.2	0.1
Metals Strong Acid Digestion							
Mercury	Strong Acid Extractable	ug/g		<0.01	<0.01	<0.01	0.01
Antimony	Strong Acid Extractable	ug/g		<0.2	<0.2	<0.2	0.2
Arsenic	Strong Acid Extractable	ug/g		1.4	1.7	1.3	0.2
Barium	Strong Acid Extractable	ug/g		58	71	59	1
Beryllium	Strong Acid Extractable	ug/g		0.4	0.4	0.4	0.1
Cadmium	Strong Acid Extractable	ug/g		0.06	0.08	0.10	0.01
Chromium	Strong Acid Extractable	ug/g		17.0	21.6	16.7	0.5
Cobalt	Strong Acid Extractable	ug/g		6.2	7.4	5.9	0.1
Copper	Strong Acid Extractable	ug/g		8	10	8	1
Lead	Strong Acid Extractable	ug/g		5.7	9.9	7.2	0.1
Molybdenum	Strong Acid Extractable	ug/g		<1	<1	<1	1
Nickel	Strong Acid Extractable	ug/g		8.8	11.5	9.0	0.5
Selenium	Strong Acid Extractable	ug/g		<0.3	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	ug/g		<0.1	0.1	<0.1	0.1
Thallium	Strong Acid Extractable	ug/g		0.22	0.27	0.21	0.05
Tin	Strong Acid Extractable	ug/g		2	2	2	1
Vanadium	Strong Acid Extractable	ug/g		31.0	36.8	30.3	0.1
Zinc	Strong Acid Extractable	ug/g		34	48	38	1

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407553**
Control Number: E 241013
Date Received: Sep 12, 2005
Date Reported: Sep 22, 2005
Report Number: 746656

			NWL Number	407553-11	407553-13	407553-14	
			Sample Date	Sep 01, 2005	Sep 01, 2005	Sep 01, 2005	
			Sample Description	Plant 1A	Plant 1B-Root	Plant 2A-Root	
			Matrix	Tissue	Tissue	Tissue	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Metals Total							
Aluminum	Total (dry weight)	ug/g		13300	10400	4970	1
Antimony	Total (dry weight)	ug/g		3	4	<1	3
Arsenic	Total (dry weight)	ug/g		<0.35	<0.3	<0.3	0.7
Barium	Total (dry weight)	ug/g		126	91.1	71.2	0.4
Beryllium	Total (dry weight)	ug/g		0.39	0.31	0.13	0.01
Bismuth	Total (dry weight)	ug/g		<1	<1	<1	3
Cadmium	Total (dry weight)	ug/g		0.05	0.3	2.3	0.1
Calcium	Total (dry weight)	ug/g		4070	2830	8120	1
Chromium	Total (dry weight)	ug/g		63.2	528	10.6	0.2
Cobalt	Total (dry weight)	ug/g		4.0	7.05	2.0	0.2
Copper	Total (dry weight)	ug/g		15.4	73.4	12.0	0.2
Iron	Total (dry weight)	ug/g		7310	9030	2550	0.4
Lead	Total (dry weight)	ug/g		40.8	14.8	2.6	1
Lithium	Total (dry weight)	ug/g		9.67	9.19	4.9	0.3
Magnesium	Total (dry weight)	ug/g		2600	2380	1830	2
Manganese	Total (dry weight)	ug/g		179	178	102	0.1
Mercury	Total (dry weight)	ug/g		0.023	0.012	0.014	0.005
Molybdenum	Total (dry weight)	ug/g		1.6	6.29	0.2	0.2
Nickel	Total (dry weight)	ug/g		30.0	285	9.94	0.5
Phosphorus	Total (dry weight)	ug/g		984	589	1460	2
Potassium	Total (dry weight)	ug/g		7140	4700	6470	4
Selenium	Total (dry weight)	ug/g		<0.50	<0.50	<0.50	1
Silver	Total (dry weight)	ug/g		<0.4	<0.4	<0.4	0.7
Sodium	Total (dry weight)	ug/g		3060	2170	964	0.2
Strontium	Total (dry weight)	ug/g		67.3	47.9	51.1	0.01
Titanium	Total (dry weight)	ug/g		440	387	132	0.2
Vanadium	Total (dry weight)	ug/g		12.6	17.5	4.98	0.4
Zinc	Total (dry weight)	ug/g		140	91.1	230	0.1
Zirconium	Total (dry weight)	ug/g		21.9	11.6	2.6	0.2

Norwest Labs
7217 Roper Road NW
Edmonton, AB. T6B 3J4
Phone: (780) 438-5522
Fax: (780) 438-0396

Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407553**
Control Number: E 241013
Date Received: Sep 12, 2005
Date Reported: Sep 22, 2005
Report Number: 746656

			NWL Number	407553-15	407553-17	407553-19	
			Sample Date	Sep 01, 2005	Sep 01, 2005	Sep 01, 2005	
			Sample Description	Plant 2B-Stem	Plant 3A	Plant 3B-Root	
			Matrix	Tissue	Tissue	Tissue	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Metals Total							
Aluminum	Total (dry weight)	ug/g		820	539	12100	1
Antimony	Total (dry weight)	ug/g		<1	<1	2	3
Arsenic	Total (dry weight)	ug/g		<0.4	<0.3	<0.3	0.7
Barium	Total (dry weight)	ug/g		35.8	11.9	81.4	0.4
Beryllium	Total (dry weight)	ug/g		0.02	0.01	0.37	0.01
Bismuth	Total (dry weight)	ug/g		<1	<1	<1	3
Cadmium	Total (dry weight)	ug/g		4.5	0.1	0.2	0.1
Calcium	Total (dry weight)	ug/g		6370	4280	2770	1
Chromium	Total (dry weight)	ug/g		3.1	2.6	428	0.2
Cobalt	Total (dry weight)	ug/g		1.3	0.51	9.28	0.2
Copper	Total (dry weight)	ug/g		9.40	7.87	18.5	0.2
Iron	Total (dry weight)	ug/g		375	611	13500	0.4
Lead	Total (dry weight)	ug/g		0.75	0.72	5.10	1
Lithium	Total (dry weight)	ug/g		1.4	1.3	18.0	0.3
Magnesium	Total (dry weight)	ug/g		1310	1420	3220	2
Manganese	Total (dry weight)	ug/g		119	459	230	0.1
Mercury	Total (dry weight)	ug/g		0.012	0.0624	0.011	0.005
Molybdenum	Total (dry weight)	ug/g		0.1	2.1	8.49	0.2
Nickel	Total (dry weight)	ug/g		4.3	4.4	197	0.5
Phosphorus	Total (dry weight)	ug/g		1150	4280	1100	2
Potassium	Total (dry weight)	ug/g		4060	21000	7640	4
Selenium	Total (dry weight)	ug/g		<0.5	<0.5	<0.50	1
Silver	Total (dry weight)	ug/g		<0.4	<0.4	<0.4	0.7
Sodium	Total (dry weight)	ug/g		310	628	2660	0.2
Strontium	Total (dry weight)	ug/g		38.2	17.8	42.4	0.01
Titanium	Total (dry weight)	ug/g		26.4	12.9	488	0.2
Vanadium	Total (dry weight)	ug/g		0.68	0.4	19.7	0.4
Zinc	Total (dry weight)	ug/g		417	44.0	45.9	0.1
Zirconium	Total (dry weight)	ug/g		1.2	0.90	15.3	0.2

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Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407553**
Control Number: E 241013
Date Received: Sep 12, 2005
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Report Number: 746656

			NWL Number	407553-18	407553-21	407553-24	
			Sample Date	Sep 01, 2005	Sep 01, 2005	Sep 01, 2005	
			Sample Description	Plant 3B	Plant 5B	Plant 6B	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble							
Boron	Water Soluble	mg/kg		0.2	0.3	0.4	0.1
Metals Strong Acid Digestion							
Mercury	Strong Acid Extractable	ug/g		<0.01	<0.01	<0.01	0.01
Antimony	Strong Acid Extractable	ug/g		<0.2	<0.2	<0.2	0.2
Arsenic	Strong Acid Extractable	ug/g		0.7	0.9	1	0.2
Barium	Strong Acid Extractable	ug/g		29	46	32	1
Beryllium	Strong Acid Extractable	ug/g		0.2	0.3	0.2	0.1
Cadmium	Strong Acid Extractable	ug/g		0.07	0.12	0.14	0.01
Chromium	Strong Acid Extractable	ug/g		10.3	13.7	11.8	0.5
Cobalt	Strong Acid Extractable	ug/g		3.8	5.0	4.3	0.1
Copper	Strong Acid Extractable	ug/g		4	6	6	1
Lead	Strong Acid Extractable	ug/g		4.0	5.3	10.3	0.1
Molybdenum	Strong Acid Extractable	ug/g		<1	<1	<1	1
Nickel	Strong Acid Extractable	ug/g		6.1	7.7	6.5	0.5
Selenium	Strong Acid Extractable	ug/g		<0.3	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	ug/g		<0.1	<0.1	<0.1	0.1
Thallium	Strong Acid Extractable	ug/g		0.11	0.18	0.14	0.05
Tin	Strong Acid Extractable	ug/g		2	2	2	1
Vanadium	Strong Acid Extractable	ug/g		18.8	24.8	20.0	0.1
Zinc	Strong Acid Extractable	ug/g		22	44	26	1

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			NWL Number	407553-20	407553-22	407553-23	
			Sample Date	Sep 01, 2005	Sep 01, 2005	Sep 01, 2005	
			Sample Description	Plant 5A	Plant 5B-Root	Plant 6A- Stems	
			Matrix	Tissue	Tissue	Tissue	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Metals Total							
Aluminum	Total (dry weight)	ug/g		1110	10400	190	1
Antimony	Total (dry weight)	ug/g		2	<1	<1	3
Arsenic	Total (dry weight)	ug/g		<0.3	8.55	<0.3	0.7
Barium	Total (dry weight)	ug/g		24.0	102	11.8	0.4
Beryllium	Total (dry weight)	ug/g		0.04	0.30	<0.005	0.01
Bismuth	Total (dry weight)	ug/g		<1	<1	<1	3
Cadmium	Total (dry weight)	ug/g		53.5	0.88	0.4	0.1
Calcium	Total (dry weight)	ug/g		5860	4380	4600	1
Chromium	Total (dry weight)	ug/g		10.5	238	1.1	0.2
Cobalt	Total (dry weight)	ug/g		1.1	7.00	0.80	0.2
Copper	Total (dry weight)	ug/g		11.9	15.7	12.6	0.2
Iron	Total (dry weight)	ug/g		574	17600	701	0.4
Lead	Total (dry weight)	ug/g		18.6	4.8	0.95	1
Lithium	Total (dry weight)	ug/g		1.6	10.9	1.2	0.3
Magnesium	Total (dry weight)	ug/g		1740	2780	1740	2
Manganese	Total (dry weight)	ug/g		420	594	716	0.1
Mercury	Total (dry weight)	ug/g		0.042	0.010	0.016	0.005
Molybdenum	Total (dry weight)	ug/g		4.4	4.99	5.71	0.2
Nickel	Total (dry weight)	ug/g		7.02	114	3.1	0.5
Phosphorus	Total (dry weight)	ug/g		2790	1070	3250	2
Potassium	Total (dry weight)	ug/g		8770	5650	18500	4
Selenium	Total (dry weight)	ug/g		<0.5	<0.50	<0.5	1
Silver	Total (dry weight)	ug/g		<0.4	<0.4	<0.4	0.7
Sodium	Total (dry weight)	ug/g		611	2710	410	0.2
Strontium	Total (dry weight)	ug/g		29.3	54.4	25.4	0.01
Titanium	Total (dry weight)	ug/g		27.5	439	4.3	0.2
Vanadium	Total (dry weight)	ug/g		0.79	20.0	<0.2	0.4
Zinc	Total (dry weight)	ug/g		80.7	28.7	35.6	0.1
Zirconium	Total (dry weight)	ug/g		1.1	15.3	0.4	0.2

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	NWL Number	407553-25	407553-26	407553-28	
	Sample Date	Sep 01, 2005	Sep 01, 2005	Sep 01, 2005	
	Sample Description	Plant 6B-Root	Plant 7A- Stem	Plant 7B-Root	
	Matrix	Tissue	Tissue	Tissue	
Analyte	**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Metals Total					
Aluminum Total (dry weight)	ug/g	8280	1240	3300	1
Antimony Total (dry weight)	ug/g	<1	<1	<2	3
Arsenic Total (dry weight)	ug/g	7.77	<0.3	<0.4	0.7
Barium Total (dry weight)	ug/g	70.1	19.6	120	0.4
Beryllium Total (dry weight)	ug/g	0.27	0.03	0.088	0.01
Bismuth Total (dry weight)	ug/g	<1	<1	<2	3
Cadmium Total (dry weight)	ug/g	0.59	<0.05	55.5	0.1
Calcium Total (dry weight)	ug/g	3500	2340	5290	1
Chromium Total (dry weight)	ug/g	102	23.3	13.2	0.2
Cobalt Total (dry weight)	ug/g	4.3	0.53	2.6	0.2
Copper Total (dry weight)	ug/g	12.8	8.41	45.2	0.2
Iron Total (dry weight)	ug/g	14700	576	3610	0.4
Lead Total (dry weight)	ug/g	8.32	0.91	99.1	1
Lithium Total (dry weight)	ug/g	8.43	1.2	3.4	0.3
Magnesium Total (dry weight)	ug/g	2160	868	1660	2
Manganese Total (dry weight)	ug/g	482	164	296	0.1
Mercury Total (dry weight)	ug/g	0.010	0.031	0.0918	0.005
Molybdenum Total (dry weight)	ug/g	3.3	5.18	0.89	0.2
Nickel Total (dry weight)	ug/g	49.8	12.2	28.4	0.5
Phosphorus Total (dry weight)	ug/g	1090	1110	2090	2
Potassium Total (dry weight)	ug/g	7360	7420	9500	4
Selenium Total (dry weight)	ug/g	<0.50	<0.5	<0.63	1
Silver Total (dry weight)	ug/g	<0.4	<0.4	<0.5	0.7
Sodium Total (dry weight)	ug/g	2560	519	951	0.2
Strontium Total (dry weight)	ug/g	45.8	14.3	36.4	0.01
Titanium Total (dry weight)	ug/g	239	27.3	95.2	0.2
Vanadium Total (dry weight)	ug/g	13.0	0.83	3.5	0.4
Zinc Total (dry weight)	ug/g	35.1	23.8	654	0.1
Zirconium Total (dry weight)	ug/g	10.4	1.5	2.7	0.2

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			NWL Number	407553-27	407553-31	407553-35	
			Sample Date	Sep 01, 2005	Sep 01, 2005	Sep 01, 2005	
			Sample Description	Plant 7B	Plant 8C	Plant 10C	
			Matrix	Soil - general	Soil - general	Soil - general	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble							
Boron	Water Soluble	mg/kg		0.4	0.2	0.6	0.1
Metals Strong Acid Digestion							
Mercury	Strong Acid Extractable	ug/g		<0.01	<0.01	0.01	0.01
Antimony	Strong Acid Extractable	ug/g		<0.2	<0.2	0.3	0.2
Arsenic	Strong Acid Extractable	ug/g		0.9	1.6	1	0.2
Barium	Strong Acid Extractable	ug/g		29	78	61	1
Beryllium	Strong Acid Extractable	ug/g		0.3	0.5	0.3	0.1
Cadmium	Strong Acid Extractable	ug/g		0.07	0.07	0.11	0.01
Chromium	Strong Acid Extractable	ug/g		10.4	23.0	13.9	0.5
Cobalt	Strong Acid Extractable	ug/g		4.3	7.6	5.0	0.1
Copper	Strong Acid Extractable	ug/g		5	11	7	1
Lead	Strong Acid Extractable	ug/g		5.8	27.3	6.9	0.1
Molybdenum	Strong Acid Extractable	ug/g		<1	<1	<1	1
Nickel	Strong Acid Extractable	ug/g		6.4	12.4	8.1	0.5
Selenium	Strong Acid Extractable	ug/g		<0.3	<0.3	<0.3	0.3
Silver	Strong Acid Extractable	ug/g		<0.1	<0.1	<0.1	0.1
Thallium	Strong Acid Extractable	ug/g		0.14	0.27	0.19	0.05
Tin	Strong Acid Extractable	ug/g		2	2	2	1
Vanadium	Strong Acid Extractable	ug/g		19.3	37.6	25.0	0.1
Zinc	Strong Acid Extractable	ug/g		25	49	40	1

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NWL Lot ID: **407553**
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			NWL Number	407553-29	407553-30	407553-32	
			Sample Date	Sep 01, 2005	Sep 01, 2005	Sep 01, 2005	
			Sample Description	Plant 8A	Plant 8B	Plant 9	
			Matrix	Tissue	Tissue	Tissue	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Metals Total							
Aluminum	Total (dry weight)	ug/g		3450	1330	1320	1
Antimony	Total (dry weight)	ug/g		<1	<2	<1	3
Arsenic	Total (dry weight)	ug/g		<0.3	<0.4	<0.3	0.7
Barium	Total (dry weight)	ug/g		36.8	21.5	51.8	0.4
Beryllium	Total (dry weight)	ug/g		0.10	0.03	0.03	0.01
Bismuth	Total (dry weight)	ug/g		<1	<2	<1	3
Cadmium	Total (dry weight)	ug/g		2.6	1.2	7.32	0.1
Calcium	Total (dry weight)	ug/g		6460	5070	10800	1
Chromium	Total (dry weight)	ug/g		10.2	7.20	22.1	0.2
Cobalt	Total (dry weight)	ug/g		1.1	0.74	0.88	0.2
Copper	Total (dry weight)	ug/g		8.62	13.8	15.7	0.2
Iron	Total (dry weight)	ug/g		1050	772	736	0.4
Lead	Total (dry weight)	ug/g		1.4	1.1	1.0	1
Lithium	Total (dry weight)	ug/g		2.8	2.0	2.2	0.3
Magnesium	Total (dry weight)	ug/g		1620	1130	1120	2
Manganese	Total (dry weight)	ug/g		101	43.6	92.8	0.1
Mercury	Total (dry weight)	ug/g		0.0080	0.0055	0.016	0.005
Molybdenum	Total (dry weight)	ug/g		0.3	0.3	0.4	0.2
Nickel	Total (dry weight)	ug/g		6.22	9.87	20.2	0.5
Phosphorus	Total (dry weight)	ug/g		1800	1810	1050	2
Potassium	Total (dry weight)	ug/g		6220	4290	4070	4
Selenium	Total (dry weight)	ug/g		<0.5	<0.5	<0.5	1
Silver	Total (dry weight)	ug/g		<0.4	<0.4	<0.4	0.7
Sodium	Total (dry weight)	ug/g		982	320	440	0.2
Strontium	Total (dry weight)	ug/g		48.1	28.1	51.8	0.01
Titanium	Total (dry weight)	ug/g		60.4	46.3	28.9	0.2
Vanadium	Total (dry weight)	ug/g		2.0	1.7	1.6	0.4
Zinc	Total (dry weight)	ug/g		192	84.4	449	0.1
Zirconium	Total (dry weight)	ug/g		2.2	1.2	2.3	0.2

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			NWL Number	407553-33	407553-34	407553-36	
			Sample Date	Sep 01, 2005	Sep 01, 2005	Sep 01, 2005	
			Sample Description	Plant 10A	Plant 10B	Plant 11	
			Matrix	Tissue	Tissue	Tissue	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Metals Total							
Aluminum	Total (dry weight)	ug/g		1280	3590	3080	1
Antimony	Total (dry weight)	ug/g		<1	2	<1	3
Arsenic	Total (dry weight)	ug/g		<0.3	<0.3	<0.3	0.7
Barium	Total (dry weight)	ug/g		41.5	69.4	33.8	0.4
Beryllium	Total (dry weight)	ug/g		0.03	0.10	0.089	0.01
Bismuth	Total (dry weight)	ug/g		<1	<1	<1	3
Cadmium	Total (dry weight)	ug/g		7.30	6.06	0.56	0.1
Calcium	Total (dry weight)	ug/g		7090	7440	2320	1
Chromium	Total (dry weight)	ug/g		2.4	31.9	10.7	0.2
Cobalt	Total (dry weight)	ug/g		0.70	1.6	2.1	0.2
Copper	Total (dry weight)	ug/g		8.15	16.5	19.3	0.2
Iron	Total (dry weight)	ug/g		366	1920	2250	0.4
Lead	Total (dry weight)	ug/g		0.65	2.0	2.8	1
Lithium	Total (dry weight)	ug/g		1.6	4.0	3.5	0.3
Magnesium	Total (dry weight)	ug/g		1130	1600	1480	2
Manganese	Total (dry weight)	ug/g		85.8	79.7	235	0.1
Mercury	Total (dry weight)	ug/g		0.0090	0.017	0.013	0.005
Molybdenum	Total (dry weight)	ug/g		0.2	0.63	3.4	0.2
Nickel	Total (dry weight)	ug/g		3.7	23.5	9.57	0.5
Phosphorus	Total (dry weight)	ug/g		1370	1770	823	2
Potassium	Total (dry weight)	ug/g		5070	6260	9900	4
Selenium	Total (dry weight)	ug/g		<0.5	<0.50	<0.50	1
Silver	Total (dry weight)	ug/g		<0.4	<0.4	<0.4	0.7
Sodium	Total (dry weight)	ug/g		460	912	905	0.2
Strontium	Total (dry weight)	ug/g		46.3	57.9	18.8	0.01
Titanium	Total (dry weight)	ug/g		22.7	98.4	112	0.2
Vanadium	Total (dry weight)	ug/g		0.77	4.5	4.5	0.4
Zinc	Total (dry weight)	ug/g		515	343	22.8	0.1
Zirconium	Total (dry weight)	ug/g		0.92	2.4	3.9	0.2

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NWL Lot ID: **407553**
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			NWL Number	407553-37	407553-39	407553-40	
			Sample Date	Sep 01, 2005	Sep 01, 2005	Sep 01, 2005	
			Sample Description	Plant 12A	Plant 12B-Root	Plant 13A	
			Matrix	Tissue	Tissue	Tissue	
Analyte		**Units**		**Results**	**Results**	**Results**	**Detection Limit**
Metals Total							
Aluminum	Total (dry weight)	ug/g		3460	9220	303	1
Antimony	Total (dry weight)	ug/g		<1	<2	<1	3
Arsenic	Total (dry weight)	ug/g		<0.3	<0.6	<0.3	0.7
Barium	Total (dry weight)	ug/g		44.5	83.5	28.5	0.4
Beryllium	Total (dry weight)	ug/g		0.11	0.29	0.005	0.01
Bismuth	Total (dry weight)	ug/g		<1	<2	<1	3
Cadmium	Total (dry weight)	ug/g		0.4	3.0	7.82	0.1
Calcium	Total (dry weight)	ug/g		3290	4790	5340	1
Chromium	Total (dry weight)	ug/g		48.5	80.0	10.3	0.2
Cobalt	Total (dry weight)	ug/g		1.7	4.9	0.61	0.2
Copper	Total (dry weight)	ug/g		14.9	20.1	8.91	0.2
Iron	Total (dry weight)	ug/g		1620	6510	190	0.4
Lead	Total (dry weight)	ug/g		10.5	7.5	2.2	1
Lithium	Total (dry weight)	ug/g		2.8	7.7	1.0	0.3
Magnesium	Total (dry weight)	ug/g		1430	2440	1240	2
Manganese	Total (dry weight)	ug/g		227	302	120	0.1
Mercury	Total (dry weight)	ug/g		0.048	0.026	0.0089	0.005
Molybdenum	Total (dry weight)	ug/g		1.3	1.6	0.2	0.2
Nickel	Total (dry weight)	ug/g		25.6	46.6	10.2	0.5
Phosphorus	Total (dry weight)	ug/g		853	800	1130	2
Potassium	Total (dry weight)	ug/g		3800	5150	3640	4
Selenium	Total (dry weight)	ug/g		<0.50	<0.81	<0.5	1
Silver	Total (dry weight)	ug/g		<0.4	<0.6	<0.4	0.7
Sodium	Total (dry weight)	ug/g		862	2260	190	0.2
Strontium	Total (dry weight)	ug/g		27.9	58.7	41.7	0.01
Titanium	Total (dry weight)	ug/g		81.3	286	8.59	0.2
Vanadium	Total (dry weight)	ug/g		2.7	12.7	0.2	0.4
Zinc	Total (dry weight)	ug/g		112	348	675	0.1
Zirconium	Total (dry weight)	ug/g		4.5	8.46	0.3	0.2

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Analytical Report

Bill to: Earth Tech Canada Inc.
Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407553**
Control Number: E 241013
Date Received: Sep 12, 2005
Date Reported: Sep 22, 2005
Report Number: 746656

	NWL Number	407553-38	407553-42		
	Sample Date	Sep 01, 2005	Sep 01, 2005		
	Sample Description	Plant 12B	Plant 13C		
	Matrix	Soil - general	Soil - general		
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Hot Water Soluble						
Boron	Water Soluble	mg/kg	0.2	0.2		0.1
Metals Strong Acid Digestion						
Mercury	Strong Acid Extractable	ug/g	<0.01	<0.01		0.01
Antimony	Strong Acid Extractable	ug/g	<0.2	<0.2		0.2
Arsenic	Strong Acid Extractable	ug/g	1	1.2		0.2
Barium	Strong Acid Extractable	ug/g	40	63		1
Beryllium	Strong Acid Extractable	ug/g	0.3	0.4		0.1
Cadmium	Strong Acid Extractable	ug/g	0.11	0.06		0.01
Chromium	Strong Acid Extractable	ug/g	12.0	16.8		0.5
Cobalt	Strong Acid Extractable	ug/g	5.4	5.4		0.1
Copper	Strong Acid Extractable	ug/g	6	7		1
Lead	Strong Acid Extractable	ug/g	8.8	6.1		0.1
Molybdenum	Strong Acid Extractable	ug/g	<1	<1		1
Nickel	Strong Acid Extractable	ug/g	7.1	8.9		0.5
Selenium	Strong Acid Extractable	ug/g	<0.3	<0.3		0.3
Silver	Strong Acid Extractable	ug/g	<0.1	<0.1		0.1
Thallium	Strong Acid Extractable	ug/g	0.15	0.22		0.05
Tin	Strong Acid Extractable	ug/g	2	2		1
Vanadium	Strong Acid Extractable	ug/g	22.2	30.4		0.1
Zinc	Strong Acid Extractable	ug/g	62	38		1

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Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407553**
Control Number: E 241013
Date Received: Sep 12, 2005
Date Reported: Sep 22, 2005
Report Number: 746656

	NWL Number	407553-41	407553-43		
	Sample Date	Sep 01, 2005	Sep 01, 2005		
	Sample Description	Plant 13B	Plant 5 (Extra)		
	Matrix	Tissue	Tissue		
Analyte		**Units**	**Results**	**Results**	**Results**	**Detection Limit**
Metals Total						
Aluminum	Total (dry weight)	ug/g	7730	1040		1
Antimony	Total (dry weight)	ug/g	2	<4		3
Arsenic	Total (dry weight)	ug/g	<0.35	2.0		0.7
Barium	Total (dry weight)	ug/g	88.9	43.1		0.4
Beryllium	Total (dry weight)	ug/g	0.23	0.01		0.01
Bismuth	Total (dry weight)	ug/g	<1	<4		3
Cadmium	Total (dry weight)	ug/g	6.00	6.3		0.1
Calcium	Total (dry weight)	ug/g	6850	3620		1
Chromium	Total (dry weight)	ug/g	31.0	6.8		0.2
Cobalt	Total (dry weight)	ug/g	2.9	3.6		0.2
Copper	Total (dry weight)	ug/g	15.5	8.5		0.2
Iron	Total (dry weight)	ug/g	3980	9800		0.4
Lead	Total (dry weight)	ug/g	6.37	3.6		1
Lithium	Total (dry weight)	ug/g	6.91	1.6		0.3
Magnesium	Total (dry weight)	ug/g	2390	1400		2
Manganese	Total (dry weight)	ug/g	160	747		0.1
Mercury	Total (dry weight)	ug/g	0.017	0.021		0.005
Molybdenum	Total (dry weight)	ug/g	0.51	1.8		0.2
Nickel	Total (dry weight)	ug/g	24.1	7.9		0.5
Phosphorus	Total (dry weight)	ug/g	1250	3560		2
Potassium	Total (dry weight)	ug/g	5580	12400		4
Selenium	Total (dry weight)	ug/g	<0.50	<1.3		1
Silver	Total (dry weight)	ug/g	<0.4	<1		0.7
Sodium	Total (dry weight)	ug/g	1760	740		0.2
Strontium	Total (dry weight)	ug/g	67.0	26.3		0.01
Titanium	Total (dry weight)	ug/g	210	30.4		0.2
Vanadium	Total (dry weight)	ug/g	7.88	1.4		0.4
Zinc	Total (dry weight)	ug/g	471	113		0.1
Zirconium	Total (dry weight)	ug/g	5.70	0.8		0.2

Approved by:



Darren Crichton, BSc, PChem
Operations Chemist

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Quality Control

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Report to: Earth Tech Canada Inc.
17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407553**
Control Number: E 241013
Date Received: Sep 12, 2005
Date Reported: Sep 22, 2005
Report Number: 746656

Hot Water Soluble

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Boron	mg/kg	<0.0	0.0	0.0	0.0	✓
Material Used:	Edmonton Method Blank					
Date Acquired:	Sep 13, 2005					
Acquired By:	Fernando Maglalang					

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Boron	mg/kg	<0.1	<0.1	10.0	0.1	✓
Material Used:	Edmonton Duplicate					
Date Acquired:	Sep 13, 2005					
Acquired By:	Fernando Maglalang					

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Boron	mg/kg	1.6	1.4	1.0	1.8	✓
Material Used:	2001 Farm Soil Standard					
Date Acquired:	Sep 13, 2005					
Acquired By:	Fernando Maglalang					

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Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407553**
Control Number: E 241013
Date Received: Sep 12, 2005
Date Reported: Sep 22, 2005
Report Number: 746656

Metals Strong Acid Digestion

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Mercury	ug/g	<0.00	0.00	0.00	0.00	✓
Antimony	ug/g	<0.0	0.0	0.0	0.0	✓
Arsenic	ug/g	<0.0	0.0	-0.1	0.2	✓
Barium	ug/g	<0	1	-2	3	✓
Beryllium	ug/g	<0.0	0.0	0.0	0.0	✓
Cadmium	ug/g	0.00	0.00	-0.03	0.03	✓
Chromium	ug/g	<0.0	-0.3	-1.5	0.9	✓
Cobalt	ug/g	<0.0	0.0	-0.1	0.1	✓
Copper	ug/g	<0	0	-1	1	✓
Lead	ug/g	<0.0	0.1	-0.2	0.4	✓
Molybdenum	ug/g	<0	0	0	0	✓
Nickel	ug/g	<0.0	-0.2	-1.7	1.2	✓
Selenium	ug/g	<0.0	0.0	-0.3	0.2	✓
Silver	ug/g	<0.0	0.0	0.0	0.0	✓
Thallium	ug/g	<0.00	0.00	-0.01	0.01	✓
Tin	ug/g	0	2	2	3	✓
Vanadium	ug/g	0.0	0.0	-0.2	0.3	✓
Zinc	ug/g	0	0	-3	3	✓

Material Used: Edmonton Method Blank
Date Acquired: Sep 13, 2005
Acquired By: Alexsandra Robert

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T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407553**
Control Number: E 241013
Date Received: Sep 12, 2005
Date Reported: Sep 22, 2005
Report Number: 746656

Metals Strong Acid Digestion (Continued...)

Replicates	Units	Replicate1	Replicate2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	ug/g	0.02	0.04	9.99	0.03	✓
Antimony	ug/g	<0.2	<0.2	20.0	0.4	✓
Arsenic	ug/g	3.6	3.5	20.0	0.4	✓
Barium	ug/g	40	39	20	2	✓
Beryllium	ug/g	0.4	0.4	20.0	0.2	✓
Cadmium	ug/g	0.16	0.16	20.01	0.02	✓
Chromium	ug/g	9.7	9.7	20.0	1.1	✓
Cobalt	ug/g	7.0	6.9	20.0	0.2	✓
Copper	ug/g	6	6	20	2	✓
Lead	ug/g	8.8	8.7	20.0	0.2	✓
Molybdenum	ug/g	<1	<1	20	2	✓
Nickel	ug/g	7.1	6.8	20.0	1.1	✓
Selenium	ug/g	<0.3	<0.3	20.0	0.7	✓
Silver	ug/g	0.1	<0.1	20.0	0.2	✓
Thallium	ug/g	0.15	0.15	20.01	0.11	✓
Tin	ug/g	2	2	20	2	✓
Vanadium	ug/g	26.3	27.5	20.0	0.2	✓
Zinc	ug/g	62	56	20	2	✓

Material Used: Edmonton Duplicate
Date Acquired: Sep 13, 2005
Acquired By: Alexsandra Robert

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Quality Control

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17203-103 Ave
Edmonton, AB, Canada
T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407553**
Control Number: E 241013
Date Received: Sep 12, 2005
Date Reported: Sep 22, 2005
Report Number: 746656

Metals Strong Acid Digestion (Continued...)

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Mercury	ug/g	1.35	1.45	1.18	1.72	✓
Antimony	ug/g	<0.2	0.2	0.1	0.3	✓
Arsenic	ug/g	17.0	16.8	14.1	19.5	✓
Barium	ug/g	424	406	330	482	✓
Beryllium	ug/g	0.9	0.9	0.7	1.1	✓
Cadmium	ug/g	0.43	0.38	0.30	0.45	✓
Chromium	ug/g	81.9	84.7	69.4	100.0	✓
Cobalt	ug/g	13.8	13.4	11.1	15.7	✓
Copper	ug/g	32	33	27	39	✓
Lead	ug/g	13.3	13.4	11.0	15.8	✓
Molybdenum	ug/g	<1	1	1	1	✓
Nickel	ug/g	79.8	81.8	68.5	95.1	✓
Selenium	ug/g	1.4	1.2	0.5	1.9	✓
Silver	ug/g	0.4	0.4	0.2	0.5	✓
Thallium	ug/g	0.36	0.35	0.28	0.41	✓
Tin	ug/g	<1	1	1	1	✓
Vanadium	ug/g	81.6	83.3	63.7	103.0	✓
Zinc	ug/g	105	103	85	121	✓

Material Used: Metals Soils
Date Acquired: Sep 13, 2005
Acquired By: Alexsandra Robert

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Quality Control

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17203-103 Ave
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T5S 1J4
Attn: Greg Wright
Sampled By: Greg Wright
Company: ETC

Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407553**
Control Number: E 241013
Date Received: Sep 12, 2005
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Report Number: 746656

Metals Total

Blanks	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Aluminum	ug/g	<0.5	0.000	-0.060	0.060	✓
Antimony	ug/g	<1	0.000	-0.030	0.030	✓
Arsenic	ug/g	<0.4	0.000	-0.008	0.008	✓
Barium	ug/g	<0.2	0.000	-0.006	0.006	✓
Beryllium	ug/g	<0.005	0.000	-0.001	0.001	✓
Bismuth	ug/g	<1	0.000	-0.030	0.030	✓
Cadmium	ug/g	<0.05	0.000	-0.003	0.003	✓
Calcium	ug/g	11.5	0.000	-0.030	0.030	✓
Chromium	ug/g	<0.1	0.000	-0.003	0.003	✓
Cobalt	ug/g	<0.1	0.000	-0.003	0.003	✓
Copper	ug/g	<0.1	0.000	-0.003	0.003	✓
Iron	ug/g	5.22	0.000	-0.006	0.006	✓
Lead	ug/g	<0.5	0.000	-0.030	0.030	✓
Lithium	ug/g	0.4	0.000	-0.006	0.006	✓
Magnesium	ug/g	2	0.000	-0.045	0.045	✓
Manganese	ug/g	0.06	0.000	-0.003	0.003	✓
Molybdenum	ug/g	<0.1	0.000	-0.003	0.003	✓
Nickel	ug/g	<0.2	0.000	-0.006	0.006	✓
Phosphorus	ug/g	<1	0.000	-0.060	0.060	✓
Potassium	ug/g	17	0.000	-0.060	0.060	✓
Selenium	ug/g	<0.5	0.000	-0.030	0.030	✓
Silicon	ug/g	0.5	0.000	-0.030	0.030	✓
Silver	ug/g	<0.4	0.000	-0.008	0.008	✓
Sodium	ug/g	<5	0.000	-0.300	0.300	✓
Strontium	ug/g	0.015	0.000	0.000	0.000	✓
Sulfur	ug/g	3	0.000	-0.060	0.060	✓
Thorium	ug/g	n	0.000	-0.005	0.005	✓
Tin	ug/g	<0.5	0.010	-0.080	0.100	✓
Titanium	ug/g	<0.1	0.000	-0.003	0.003	✓
Uranium	ug/g	<5	0.000	-0.300	0.300	✓
Vanadium	ug/g	<0.2	0.000	-0.006	0.006	✓
Zinc	ug/g	0.1	0.000	-0.003	0.003	✓
Zirconium	ug/g	<0.1	0.000	-0.003	0.003	✓

Material Used: Metals Blank - solids
Date Acquired: Sep 16, 2005
Acquired By: Kelly Restiaux

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Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407553**
Control Number: E 241013
Date Received: Sep 12, 2005
Date Reported: Sep 22, 2005
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Metals Total (Continued...)

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Aluminum	ug/g	556	598.000	448.000	748.000	✓
Antimony	ug/g	<1	0.100	-1.400	1.600	✓
Arsenic	ug/g	<0.3	0.100	-0.920	1.120	✓
Cadmium	ug/g	1.3	1.340	0.920	1.760	✓
Calcium	ug/g	45200	50560.000	43270.000	57850.000	✓
Chromium	ug/g	0.78	1.800	0.510	3.090	✓
Cobalt	ug/g	0.4	0.810	-0.300	1.920	✓
Copper	ug/g	4.2	5.000	3.680	6.320	✓
Iron	ug/g	273	374.000	224.000	524.000	✓
Manganese	ug/g	200	230.000	140.000	320.000	✓
Mercury	ug/g	0.034	0.034	0.028	0.040	✓
Nickel	ug/g	1.8	1.860	1.380	2.340	✓
Phosphorus	ug/g	2040	2140.000	1336.000	2944.000	✓
Potassium	ug/g	20800	28200.000	19500.000	36900.000	✓
Selenium	ug/g	<0.5	0.100	-0.920	1.120	✓
Sodium	ug/g	130	132.000	27.000	237.000	✓
Vanadium	ug/g	0.51	0.480	-0.390	1.350	✓
Zinc	ug/g	27.5	28.400	12.500	44.300	✓

Material Used: S0157 NIST 1573a - metals in tomato leaves
Date Acquired: Sep 16, 2005
Acquired By: Kelly Restiaux

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Project
ID: 88122
Name: Phase III Arctic ESA
Location: Simpson Lake
LSD:
P.O.:
Acct. Code:

NWL Lot ID: **407553**
Control Number: E 241013
Date Received: Sep 12, 2005
Date Reported: Sep 22, 2005
Report Number: 746656

Metals Total (Continued...)

Control Sample	Units	Measured	Mean	Lower Limit	Upper Limit	Passed QC
Aluminum	ug/g	252	249.000	174.000	324.000	✓
Arsenic	ug/g	<0.4	0.200	-0.820	1.220	✓
Barium	ug/g	107	124.000	37.000	211.000	✓
Cadmium	ug/g	<0.05	0.060	-0.360	0.480	✓
Calcium	ug/g	15000	15600.000	11430.000	19770.000	✓
Copper	ug/g	3.2	3.900	1.440	6.360	✓
Iron	ug/g	172	212.000	125.000	299.000	✓
Lead	ug/g	0.96	1.000	0.100	1.900	✓
Magnesium	ug/g	3730	4031.000	2441.000	5621.000	✓
Manganese	ug/g	82.0	91.000	28.000	154.000	✓
Mercury	ug/g	0.026	0.031	0.021	0.042	✓
Nickel	ug/g	0.83	1.400	0.200	2.600	✓
Phosphorus	ug/g	1330	1260.000	600.000	1920.000	✓
Potassium	ug/g	19400	22300.000	5800.000	38800.000	✓
Selenium	ug/g	<0.5	1.000	-0.020	2.020	✓
Sodium	ug/g	30	155.000	-145.000	455.000	✓
Strontium	ug/g	53.6	56.000	17.000	95.000	✓
Vanadium	ug/g	<0.2	0.440	-0.280	1.160	✓
Zinc	ug/g	16.9	19.000	1.600	36.400	✓

Material Used: S0167 NIST 1547 - metals in peach leaves
Date Acquired: Sep 16, 2005
Acquired By: Kelly Restiaux

Methodology and Notes

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Date Received: Sep 12, 2005
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Method of Analysis:

MethodName	Reference		Method	Date Analysis Started	Location
Boron in general soil	McKeague	*	Hot Water Soluble Boron - Azomethine-H Method, 4.61	13-Sep-05	Norwest Labs Edmonton
Mercury (Hot Block) in Soil	US EPA	*	Determination of Hg in Sediment by Cold Vapor Atomic Absorption Spec, 245.5	13-Sep-05	Norwest Labs Edmonton
Metals (Total) in vegetation (Surrey)	US EPA	*	Determination of Hg in Sediment by Cold Vapor Atomic Absorption Spec, 245.5	19-Sep-05	Norwest Labs Surrey
Metals (Total) in vegetation (Surrey)	US EPA		Metals & Trace Elements by ICP-AES, 6010B	19-Sep-05	Norwest Labs Surrey
Metals ICP-MS (Hot Block) in soil	SW-846	*	Acid Digestion of Sediments, Sludges, and Soils, EPA 3050B	13-Sep-05	Norwest Labs Edmonton

* Norwest method(s) is based on reference method

References:

McKeague	Manual on Soil Sampling and Methods of Analysis
SW-846	Test Methods for Evaluating Solid Waste
US EPA	US Environmental Protection Agency Test Methods

Comments:

Received extra sample Plant 5 that was not listed on COC, and missing sample Plant 4

Please direct any inquiries regarding this report to our Client Services group.
Results relate only to samples as submitted
The test report shall not be reproduced except in full, without the written approval of the laboratory

APPENDIX H



NCS SCORING

Site Information: Simpson Lake DEW Line SIte

Site No.: Not Entered
Site Name: Simpson Lake DEW Line SIte
Province/Territory: N.W. Territories
Custodian Dept.: INAC
Facility Name: CAM-D DEW Line Site
Site Operator/Mngr.: INAC
Type of Site: Intermediated DEW Line Site
Site Owner: INAC
Zone:
UTM Coordinates: Easting
Northing
Latitude: 68 deg. 35 min. sec.
Longitude: 91 deg. 57 min. sec.
Location: 120 km Southeast of Taloyoak (Spence Bay), Nunavut
Legal Land Desc.: Not Entered
Address: Not Entered
Provincial Parcel No.: Not Entered

Brief Description of Site:
Abandoned Military Site

Site Land Use: **Current:** Not Entered **Proposed:** Not Entered

Comments:
Not Entered

Detailed Evaluation: Simpson Lake DEW Line Site

I. Contaminants Characteristics

A Degree of Hazard

List possible contaminants and estimated concentrations:

several contaminants, moderate-high concentations

Scoring Rationale & Information Source:

High concern contaminants - moderate concentration

Score: 12

B Contaminant Quantity

Estimated or measured area/volume of contaminated zone:

None

Scoring Rationale & Information Source:

>1000 cubic meters

Score: 10

C Physical State of Contaminants

Does the site contain a) Predominantly liquids/gases, b) Primarily sludges, c) Primarily solids:

None

Scoring Rationale & Information Source:

predominantly solid

Score: 6

Special Considerations

Document any other important contaminant characteristics not addressed above:

None

Scoring Rationale & Information Source:

None

Score: 0

II. Exposure Pathways

A Groundwater

1. Known Contamination of Groundwater at or beyond the Property Boundary

Document information on known groundwater contamination:

no groundwater sampling was conducted

Scoring Rationale & Information Source:

None

Score: 0

2. Potential for Groundwater Contamination
   a) Engineered subsurface containment

Document engineered systems protecting groundwater:

None

Scoring Rationale & Information Source:

no containment

Score: 4

2. Potential for Groundwater Contamination
   b) Thickness of confining layer over aquifer

Document local geological conditions and identify water-bearing zones used for water supply:

None

Scoring Rationale & Information Source:

None

Score: 1

2. Potential for Groundwater Contamination
c) Hydraulic conductivity of the confining layer

Estimate hydraulic conductivity of any confining layer:

None

Scoring Rationale & Information Source:

None

Score: 0.5

2. Potential for Groundwater Contamination
d) Annual rainfall

Document rainfall data:

None

Scoring Rationale & Information Source:

None

Score: 0.4

2. Potential for Groundwater Contamination
e) Hydraulic conductivity of aquifer(s) of concern

Estimate hydraulic conductivity of relevant aquifer(s):

None

Scoring Rationale & Information Source:

None

Score: 0.5

3. Special Considerations

Document any other important groundwater issues not addressed above:

None

Scoring Rationale & Information Source:

None

Score: 0

II. Exposure Pathways
B Surface Water

1. Observed or Measured Contamination of Water/Effluent Discharged from Site

Document information on surface water contamination:

None

Scoring Rationale & Information Source:

> 2x criteria

Score: 11

2. Potential for Surface Water Contamination
a) Surface containment

Review and document engineered or natural systems protecting surface water:

None

Scoring Rationale & Information Source:

no containment

Score: 5

2. Potential for Surface Water Contamination
b) Distance to perennial surface water

Estimate distance from site to nearest stream or other water body:

None

Scoring Rationale & Information Source:

>300m

Score: 0.5

2. Potential for Surface Water Contamination
c) Topography

Document terrain conditions and document positions of contaminants (are they above ground or buried?):

None

Scoring Rationale & Information Source:

contaminants are above ground and slope is moderate

Score: 1

2. Potential for Surface Water Contamination
d) Run-off potential

Document geological and rainfall conditions:

None

Scoring Rationale & Information Source:

<500 mm rainfall and relatively low permeability

Score: 0.4

2. Potential for Surface Water Contamination
e) Flood potential

Estimate flood frequency of nearby water courses or water bodies:

None

Scoring Rationale & Information Source:

1 in 50

Score: 0.1

3. Special Considerations

Document any other important surface water conditions not addressed above:

None

Scoring Rationale & Information Source:

None

Score: 0

II. Exposure Pathways
C Direct Contact

1. Known Contamination of Media Off-site

Document reports of off-site contamination due to contact with contaminated soil, dust, air, etc.:

None

Scoring Rationale & Information Source:

None

Score: 0

2. Potential for Direct Human and/or Animal Contact
a) Airborne Emissions (gases, vapours, contaminated dust, etc.)

Document incidents or complaints about fumes, gases, dust, odours, etc.:

None

Scoring Rationale & Information Source:

vapours restricted to site

Score: 0

2. Potential for Direct Human and/or Animal Contact
b) Accessibility of Site (Ability to Contact Materials)

Review and document avenues of site access by humans and animals:

None

Scoring Rationale & Information Source:

no barriers to prevent site access

Score: 4

2. Potential for Direct Human and/or Animal Contact
   c) Hazardous soil gas migration from the site

   Review potential for hazardous soil gas production and migration from site:

   None

   Scoring Rationale & Information Source:

   None

Score: 0

3. Special Considerations

   Document any other conditions whereby humans/animals could contact contamination:

   None

   Scoring Rationale & Information Source:

   None

Score: 0

III. Receptors

A Human and Animal Uses

1. Known Impact on Humans or Animals

   Record known or suspected adverse effects on humans or domestic animals:

   None

   Scoring Rationale & Information Source:

   None

Score: 0

2. Potential for Impact on Humans or Animals
   a) Drinking Water Supply
      i) Known impact on drinking water supply

   Record known or suspected incidents of contamination of drinking water:

   None

   Scoring Rationale & Information Source:

   drinking water requiring some treatment to be potable

Score: 3

2. Potential for Impact on Humans or Animals
   a) Drinking Water Supply
      ii) Potential for impact on drinking water supply
         - Proximity to drinking water supply

   Identify nearest drinking water well and measure distance to site:

   None

   Scoring Rationale & Information Source:

   1 to 5 km

Score: 3

2. Potential for Impact on Humans or Animals
   a) Drinking Water Supply
      ii) Potential for impact on drinking water supply
         - "Availability" of alternate drinking water supply

   Document availability of alternate sources of drinking water and ease of implementation:

   None

   Scoring Rationale & Information Source:

   alternate water supply difficult to obtain

Score: 2

2. Potential for Impact on Humans or Animals
b) Other Water Resources
i) Known impact on water resources

Record information on water resource that is or is potentially affected by site contamination:

None

Scoring Rationale & Information Source:

None

Score: 0

2. Potential for Impact on Humans or Animals
b) Other Water Resources
ii) Potential for impact on water resources
- Proximity to water resources used for activities (specified below)

Locate and measure nearest water resource areas to site:

None

Scoring Rationale & Information Source:

1 to 5km

Score: 0.5

2. Potential for Impact on Humans or Animals
b) Other Water Resources
ii) Potential for impact on water resources
- Use of water resources

Record uses of nearby water resources:

None

Scoring Rationale & Information Source:

occasional fishing

Score: 1

2. Potential for Impact on Humans or Animals
c) Direct Human Exposure
i) Known contamination of land used by humans

Record land use type (current or proposed) and level of contamination for land known to be contaminated due to site:

None

Scoring Rationale & Information Source:

known contamination

Score: 5

2. Potential for Impact on Humans or Animals
c) Direct Human Exposure
ii) Potential human exposure through land use
- Use of land at and around site

Document land uses (current and proposed) for up to five kilometers from the site:

None

Scoring Rationale & Information Source:

residential < 300m

Score: 5

3. Special Considerations

Document any other important human or animal use information, including details of air contamination if known:

None

Scoring Rationale & Information Source:

None

Score: 0

III. Receptors

B Environmental Receptors

1. Known Adverse Impact on the Environment as a Result of the Contaminated Site

Record known impact(s) on any sensitive biological environment at and/or around the site:

None

Scoring Rationale & Information Source:

plant stress

Score: 14

2. Potential for Impact on Sensitive Environments
a) Distance from the site to the nearest sensitive environment

Document location, distance, type and details of any nearby sensitive environments or habitats:

None

Scoring Rationale & Information Source:

sensitive environments <500 m

Score: 10

2. Potential for Impact on Sensitive Environments
b) Groundwater

Measure distance to major recharge or discharge area:

None

Scoring Rationale & Information Source:

None

Score: 0

3. Special Considerations

Document any other important impacts on the environment not addressed above:

None

Scoring Rationale & Information Source:

None

Score: 0

Evaluation Totals

	Known:	Estimated:	Combined:
I. Contaminant Characteristics	28	0	28
II. Exposure Pathways			
A. Ground Water	4	2.4	6.4
B. Surface Water	11	0	11
C. Direct Contact	4	0	4
Section II Totals:	19	2.4	21.4
III. Receptors			
A. Human and Animal Uses	11.5	0	11.5
B. Environment	14	0	14
Section III Totals:	25.5	0	25.5
TOTAL SCORES FOR THIS SITE	**72.5**	**2.4**	**74.9**

CLASSIFICATION:	**Class 1**
Risk Potential:	**High**
Action Required:	**Yes**
Evaluation Last Updated:	**Oct-27-2005**

APPENDIX I



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.