Final Report

Former U.S. Coast Guard Loran Station, Cape Christian, Nunavut

Environmental Site Delineation and Material Inventory

EARTH TECH

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Final Report

Former U.S. Coast Guard Loran Station, Cape Christian, Nunavut

Environmental Site Delineation and Material Inventory

Prepared for:
Public Works and Government Services
Environmental Services, Western Region
1000, 9700 Jasper Ave
Edmonton, AB T5J 4E2

Prepared by:

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February 2002

19340-01

Earth Tech Canada Inc.

17203 - 103 Avenue, Edmonton, Alberta T5S 1J4 Canada

February 26, 2002

Refer to File: 19340-01

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Public Works and Government Services Canada
Environmental Services Western Region
1000 - 9700 Jasper Avenue, 9th Floor
Edmonton, Alberta
T5J 4E2

Attention: Mr. Chris Doupe
Senior Environmental Biologist

Dear Sir:

Telephone

780.488.6800

Facsimile

780.488.2121

Re: Former U.S. Coast Guard Loran Station, Cape Christian, Nunavut
Environmental Site Delineation and Material Inventory

Please find enclosed six copies of the final report for the environmental assessment that was completed by Earth Tech at the former U.S. Coast Guard Loran Station at Cape Christian, Nunavut. The on site fieldwork was carried out during August 22-24, 2001.

This report is intended to provide sufficient detailed information to allow for the preparation of a specifications and tender package for the remediation of this remote northern site. It is believed that the surveyed site plans, site delineation data and numerous photographs that have been included will serve this purpose. The Earth Tech Edmonton based project team is very familiar with the Cape Christian site and logistic requirements, and we are available to support PWGSC in the design, planning or implementation of any remediation project.

Please do not hesitate to contact the undersigned at (780) 453-0721 if you have any questions with the enclosed report.

Sincerely,

EARTH TECH (CANADA) INC.
Per:

Will F. Wawrychuk, P.Eng.
Manager, Environmental Group

wfw

Encl.

FORMER U.S. COAST GUARD LORAN STATION

CAPE CHRISTIAN , NUNAVUT

ENVIRONMENTAL SITE DELINEATION AND MATERIAL INVENTORY

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FORMER U.S. COAST GUARD LORAN STATION

CAPE CHRISTIAN , NUNAVUT

ENVIRONMENTAL SITE DELINEATION AND MATERIAL INVENTORY

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EXECUTIVE SUMMARY

Cape Christian, located on the north shore of Baffin Island, Nunavut, was used by the U.S. Coast Guard as a Loran Communication Station, during the Cold War era from 1954 to 1974. The environmental site issues at Cape Christian include landfills, site buildings, hazardous materials (lead paint, asbestos, PCB paint), fuel and petroleum products, fuel storage tanks, and abandoned barrels. Most of the PCB containing material has been removed along with most of the petroleum products.

Indian and Northern Affairs Canada (INAC) retained Environmental Services, Public Works and Government Services Canada (PWGSC) to design a remediation plan for the site at Cape Christian. In order to complete the design additional site assessment work was required. Earth Tech Canada Inc. completed the onsite fieldwork portion of the Cape Christian environmental assessment during August 22, 23, and 24, 2001. This field investigation included the completion of an investigation to delineate subsurface contamination, completion of an inventory of abandoned materials, and inspection of the area to locate potential landfill and borrow sites.

The following conclusions can be drawn from the environmental assessment that has been completed at the former U.S. Coast Guard Loran station at Cape Christian, Nunavut.

- The Cape Christian site is readily accessible to the residents of Clyde River and it poses a significant health and safety risk, as well as an environmental concern.
- Previous environmental investigations and remedial efforts have resulted in the removal of most of the more serious sources of environmental contamination on the site; specifically PCB containing equipment.
- The only site with PCB soil contamination exceeding the CCME 1999 Criteria is the Main Building Area, with a contaminated volume of 2 m^3.
- Metals contamination in soil exceeding CCME 1999 criteria exists in a number of areas at the site. The volume of this soil is 240 m^3, including a 25% contingency.
- Hydrocarbon soil contamination exists at the site, particularly adjacent to the Main Building and ASTs (235 m^3), and the area of the Beach AST and buried barrels near the Air Terminal Building (810 m^3). The soil volume exceeding the CCME CWS-PHC criteria is roughly 1,370 m^3, including a 25% contingency.
- Hazardous and non-hazardous material has been identified and quantified to allow for disposal planning. The volume of non-hazardous material is approximately 2,125 m^3. A detailed hazardous material inventory has been provided.
- Areas for the landfilling of non-hazardous debris and for sources of borrow have been identified. Of these, the best location due to capacity and proximity to the bulk of the debris is the north end of the Raw Water Reservoir. The reservoir will need to be drained and the existing berm provides a huge source of cover material to stabilize and fill the crushed debris.
- A detailed topographic map of the Cape Christian site is provided as Appendix A to this report. This will prove very useful for remediation project planning.

1.0 INTRODUCTION/BACKGROUND

1.1 Background Information

Cape Christian is located on the north shore of Baffin Island, Nunavut. The U.S. Coast Guard used this site as a Loran Communication Station, during the Cold War era from 1954 to 1974. The site is somewhat remote and is located near the mouth of the Clyde River approximately 16 km northeast of the Hamlet of Clyde River, on the northeast coast of Baffin Island. The station coordinates are Latitude $70^0$31'N, and Longitude $68^0$17' W. Access to the former station is either by ATV or fixed wing aircraft with tundra tires. The location of Cape Christian relative to the coastline of Baffin Island is provided in Figure 1.1. Figure 1.2 shows the overall site layout and major features.

The environmental site issues at Cape Christian include landfills, site buildings, hazardous materials (lead paint, asbestos, PCB paint), fuel and petroleum products, fuel storage tanks, and abandoned barrels. Most of the PCB containing material has been removed along with most of the petroleum products.

1.2 Scope of Work and Objectives

As a result of the Treasury Board Federal Contaminated Sites Assessment Initiative (FCSAI), Indian and Northern Affairs Canada (INAC) is undertaking an environmental site assessment and remedial action plan design for the Cape Christian site. The purpose of this undertaking is threefold:

1. To document facility, contaminant and physical site characteristics;

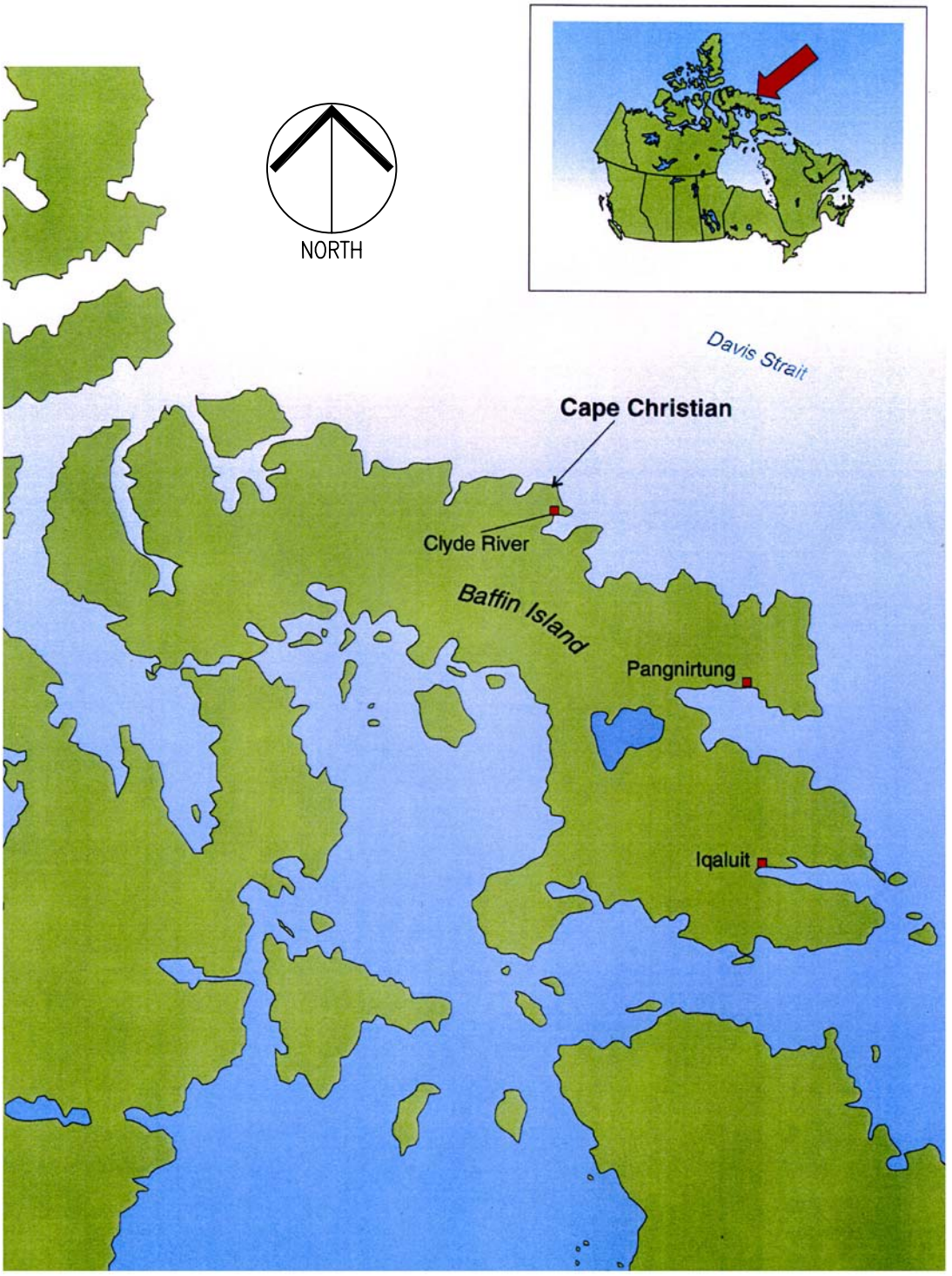
2. To finalize delineation of contamination (degree, nature, estimated extent and media affected) and site conditions (geological, hydrogeological and hydrological) so an effective remedial action plan can be developed; and

3. To develop a remedial design for the sites, complete with specifications, plans and a Class "D" cost estimate to undertake the work.

INAC has retained Environmental Services, Public Works and Government Services Canada (PWGSC) to design a remediation plan for the site at Cape Christian. In order to complete the design, information gaps in the previous site assessment work needed to be identified and additional site assessment work was required. The Cape Christian site was one of four sites completed during the same field trip. The other three sites included in this project were Padloping Island, Bear Island, and Radio Island.

Earth Tech Canada Inc., formerly Reid Crowther, has prepared this report to complete the site assessment of the Cape Christian abandoned military site in accordance with the Terms of Reference provided by PWGSC on August 2, 2001.

The scope of work that was proposed for this environmental assessment has been presented in Table 1.1 on the following page. The table is an overview of the detailed scope of work presented in the project Terms of Reference provided by PWGSC.



CAPE CHRISTIAN, BAFFIN ISLAND, NUNAVUT
LOCATION PLAN

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October, 2001

Figure 1.1

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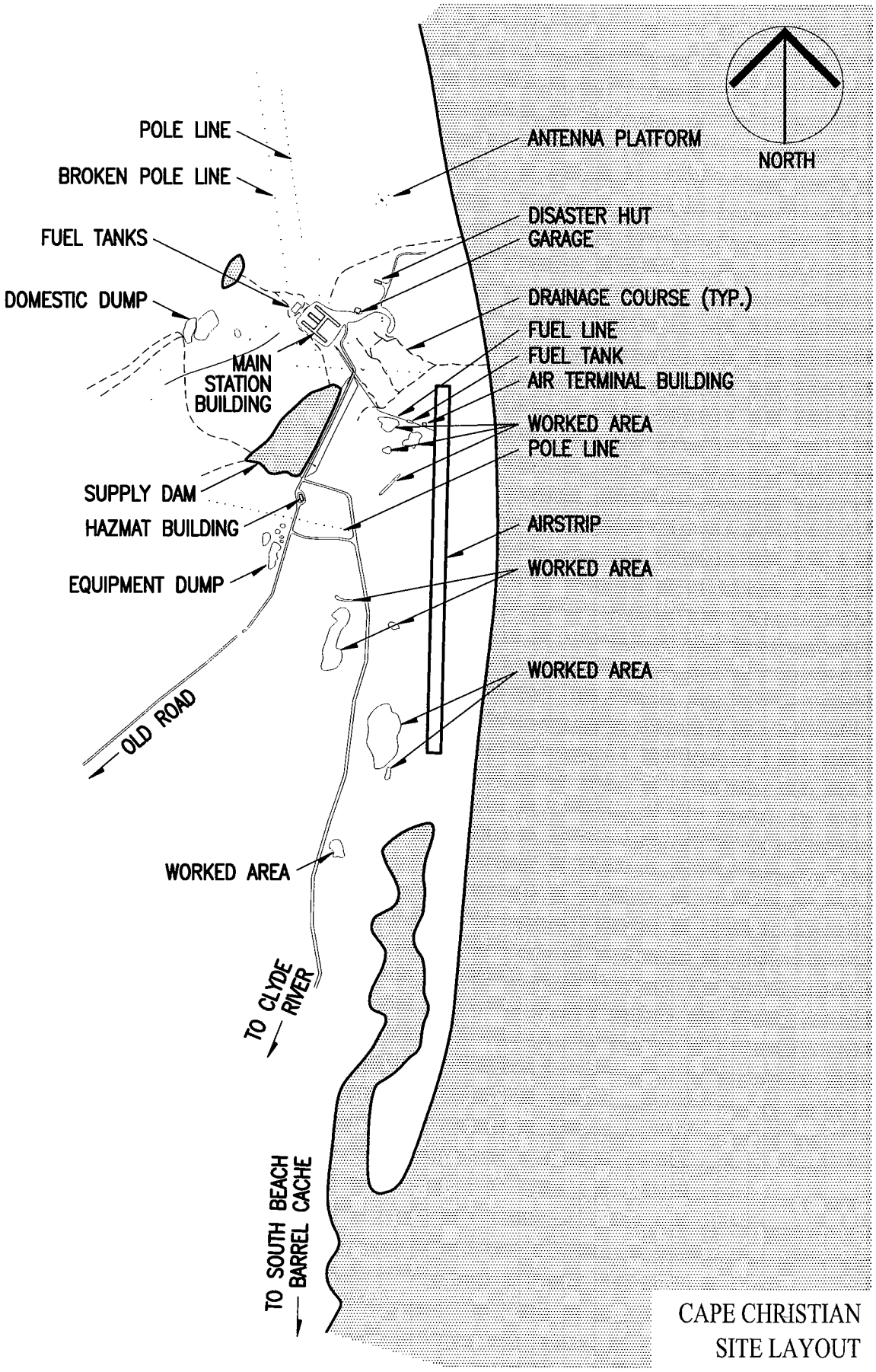

CAPE CHRISTIAN
SITE LAYOUT

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FIGURE 1.2

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Table 1.1 Scope of Work Summary for Cape Christian

Task	Scope of Work	Comments
1. Site Logistics	Travel from Edmonton to Iqaluit. Travel to Clyde River from Iqaluit. Accn/meals at Clyde River Travel to/from Cape Christian (ATVs) Community startup and closure meeting.	Confirm condition of Cape Christian runway. Hire polar bear monitor from local HTA.
2. Geophysical Survey of Landfills	Landfill A – total area 15,000 m^2 Landfill B – total area 25,000 m^2 Landfill C – total area 27,000 m^2	EM 31 survey to be carried out for these areas.
3. Delineation of PHC Impacted Areas	Main site fuel tank farm Runway tank Garage East side of main building	Petroflag field testing CWS for PHC laboratory confirmation
4. Delineate Other Impacted Areas	All areas in ESG report.	Areas are to be delineated for the specific parameter identified in the ESG report.
5. Additional Sampling	Outfall area – three surface and deep samples for PCBs (aroclors), heavy metals, PAHs, chlorinated organic scan with additional analysis if conc. >2 ppm. Two unlined sumps in garage portion of main complex – two surface and deep samples for above parameters.	
6. Tank Dipping and Barrel Sampling	Main station - five 102,000 L tanks Runway – one 616,000 L tank RCMP – one tank Fuel pipeline should also be tested Barrels – assume five with unknown liquids to characterize	Determine volume of water and fuel in each tank. DLCU Barrel Protocol
7. Identify Potential Borrow Sources	Four possible areas identified: - immediately west of main base - beach sediment - drainage ditch west of main base - main building site fill material Identify any other borrow sources.	Provide estimates of volume and characteristics of material at each borrow site.

Task	Scope of Work	Comments
8. Siting Landfill Sites	Potential sites already identified: - fresh water reservoir - upstream to north of reservoir - areas near domestic waste dump Identify any other landfill sites.	Determine potential landfilling capacity at each of the potential landfill sites.
9. Quantify Non-Hazardous Debris	Quantify the volume of all non-hazardous debris with the view to on-site disposal. Includes remains of infrastructure, metal debris, vehicles and vehicle parts, empty barrels, equipment.	Material to be landfilled on site during remediation.
10. Quantify Hazardous Debris	Quantify the volume of all hazardous debris with the view to removal and off-site disposal. Includes PCB material, PCB paint, petroleum products, batteries, gas cylinders, etc.	Asbestos material can be bagged and landfilled on-site.
11. Survey Site, Prepare Drawings	Survey of site to prepare detailed site drawings for the site remediation design package. Identify all features, buildings, equipment and areas, and provide a map with 0.5 m contour intervals.	Total station survey
12. Lab Analysis and Data Evaluation	Submission to a CAEAL accredited laboratory the soil and liquid samples from Tasks 3, 4, 5 and 6 above. Data tabulation and evaluation.	
13. Prepare Draft Report	Prepare draft assessment report (two hard copies and two CD copies) for review by PWGSC and INAC.	Required by October 15, 2001.
14. Submit Final Report	Provide final report (5 hard copies and two CD copies) incorporating review comments.	Provide within two weeks of receipt of review comments from PWGSC and INAC.

1.3 Previous Environmental Investigations

Previous environmental work at the Cape Christian site includes the following reports:

- United States Coast Guard, Inventory and Evaluation, 1974 and 1979.
- Environmental Protection Services, PCB Identification, 1985.
- Envirochem Special Projects Inc, PCB Consolidation, 1989.

- Pollution Control Division Renewable Resources, Baffin, Collection of PCB's, 1989, 1990, 1991.
- AVATI-Norecol, Site Assessment and Soil Sampling, 1992.
- Environmental Protection Division (E.C.)-Renewable Resources (GNWT), Removal of PCB Containing Equipment, 1996.
- Royal Military College, Environmental Sciences Group (ESG), Environmental Assessment, March 1996.
- Royal Military College, ESG, Investigation of PCBs in Paint, March 1997.

The report completed by ESG in March 1996, was used as a template for gathering and compiling information on Cape Christian. This report provided the site history, sampling criteria, and background data needed to design the most recent sampling program and site logistics.

The ESG report indicated that although analytical samples and detailed information were gathered during the July 1995 fieldwork, it was not possible to accurately delineate the extent of contamination or to provide a detailed material and debris inventory during the time on site. Hence, there was a need for an additional site visit to fill the information gaps and to delineate the contamination that was confirmed by the ESG analytical sampling.

1.4 Earth Tech Work Completed

Earth Tech completed the onsite fieldwork portion of the Cape Christian environmental assessment during August 22, 23, and 24, 2001. The information that was gathered is intended to be used for a remediation project design and to prepare a specification package to tender to contractors for implementation of the site clean up. The field investigation that was completed by Earth Tech included the completion of an investigation to delineate subsurface contamination; completion of an inventory of abandoned materials, and inspection of the area to locate potential landfill and borrow sites. An overall full size site drawing showing site features and topography to a 0.5 m contour interval is provided as Figure 1.3, which is included as Appendix A to this report.

It should be noted that the work that was planned and completed by Earth Tech was based on the findings in the ESG report which were based on the DEW Line Clean-up Criteria, DCC I and II, that have been adopted by DND. The data collected during the August 2001 Earth Tech site visit has been compared instead in this report to the 1999 Canadian Council of Ministers of the Environment (CCME) Soil and Groundwater Quality Guidelines for residential/parkland use and the CCME Canada Wide Standards for Petroleum Hydrocarbons in Soil, 2001. These CCME references are the only criteria accepted by INAC for these sites.

1.5 Methodology

1.5.1 Soil Sampling

Soil sampling was completed by first reviewing the information in the ESG report and identifying the areas requiring delineation sampling. The team members responsible for delineation sampling identified and located the areas sampled by the ESG team in 1995 by conducting a short reconnaissance walk over the site. This was somewhat of a challenge as the site plans were vague and not to scale. Most of the areas were found by looking for the identification tags and pegs installed by the ESG team. Many of the tags were still intact making locating the areas of concern a little easier. Tags that were missing had their respective areas located by matching descriptions in the report appendices to site features as well as to site photographs.

Most of the soil sampling to be conducted on site involved delineation of heavy metals and hydrocarbon contamination. Heavy metals cannot readily be identified in soils by visual observation. The metals are usually carried or spread by oxidizing over time and being carried by surface or groundwater, or more commonly and rapidly, carried and spread by a solvent. With this in mind, hydrocarbon staining was used to help identify the outer limits of where delineation samples should be retrieved for heavy metals and hydrocarbons.

Having identified/located the area to be sampled, a small shovel and/or hand auger was used to retrieve the soil samples. As some of the samples were retrieved near an exposed rock face, depth of sampling could often not be achieved with the hand auger and the shovel was used to collect the sample in the shallow soils. The sampling instruments were cleaned with a small wire brush and wiped with a paper towel between sampling points to prevent cross contamination between sample locations.

The samples were placed in sealable plastic bags and labeled accordingly. Samples collected for hydrocarbons were placed in glass jars with Teflon-lined lids as soon as possible after retrieval to prevent volatilization of any light end hydrocarbons that may possibly remain in the sample. Select samples for Petroflag screening were set aside for field analyses. Petroflag methodology is described further in this section. Upon return to base camp each evening, transported samples from the site were placed in ice pack filled coolers for preservation prior to transporting to the laboratory in Edmonton Alberta. Prior to sealing the cooler for transport south, fresh ice packs replaced the original ice packs and a completed chain of custody/analytical request form was sealed in cooler for the courier south.

1.5.2 Product Sampling

The site visit did not yield any petroleum products that could not be identified. The only petroleum products observed on site were seven drums of motor oil near the former garage area. Other containers and tanks onsite have either been emptied or vandalized, and hence they were either empty or contained water. The contents of the motor oil drums were not sampled or analyzed since the labeling indicated that the drums contained motor oil, and the fluid had the viscosity, odour, and texture of motor oil.

1.5.3 Asbestos Sampling

The Earth Tech team was equipped to sample asbestos with proper PPE and had a certified asbestos abatement person on site should the need have arisen. No additional (or previously unidentified by ESG) asbestos containing material (ACM) was located and therefore no sampling was completed.

1.5.4 Paint Sampling

The Earth Tech team did not identify any additional lead or PCB paint impacted that had not been previously identified and sampled as described by the ESG reports dated March 1996 and March 1997. Subsequently, no additional paint samples were collected.

1.5.5 Landfill and Borrow Pit Identification

The landfill and borrow pit areas were identified with the aid of the ESG report, general site reconnaissance, and the examination of potential areas by the Earth Tech project team. The landfill sites were chosen based on their distance from the ocean and/or on site freshwater receptors, accessibility, distance from the site and major debris concentrations, topography and gradient for the prevention of leachate passing through the buried debris, and accessibility to cover material.

Borrow sites were chosen based on the their proximity to the landfill site and the amount of fine grain material in the soil. Completing grain size analyses in a geotechnical laboratory was beyond the scope for the project, but field identification was carried out, and an attempt to complete a rough field sieve analyses was completed. Rudimentary soil grain size analyses were conducted on site using the U.S. Standard sieves No. 4, 10, and 40 to distinguish between gravel, coarse sand, medium sand and fine sand. The sieves were only somewhat useful as the samples were very wet and soil particles did not pass through the sieves in the same manner as had the samples been properly dried in a laboratory.

1.5.6 Site Survey

Procedures undertaken for the site survey initially included all team members walking and quading through the site to examine the lay of the land, identify important structures and significant features, and correlate potential sampling locations with the ESG reports. Based on these findings, survey control points were laid out in key positions across the site to establish the grounds for an efficient survey. The site survey was performed by an experienced surveyor using a TOPCON GTS-212 total station and was assisted by a rod person. Where possible, a second rod person (taken from the sampling crew) was utilized to increase productivity of the survey. The survey scope for each individual site was based on the requirements in the request for proposal from PWGSC, as well as, any information considered to be of use to PWGSC for the cleanup of the sites. Data collected during the survey had descriptor codes attached based on typical Earth Tech coding. A field book was also kept of the survey, which supplemented most survey points with additional information and descriptions to be used in the office once the points were downloaded. At the completion of each day, data collected for that day was downloaded and stored onto a laptop computer and imported into EMXSAcad (AutoCAD based

earthwork program) to check for erroneous data and to plan for the next day's survey. This data was backed up on 3 ½ inch floppy disk and protected in a waterproof bag. Upon return to the Edmonton Earth Tech office all four site surveys were transferred from the laptop, and the site plans and supplemental drawings were created for the report.

1.5.7 EM Survey

The ground conductivity survey was completed using a *Geonics* EM-31 Geophysical Data Logger. The EM-31 measures the difference in electrical conductivity or resistance in shallow soils up to 5 m in depth by inducing a current in one coil of the instrument and measuring the difference in current received by the second coil. Since permafrost is relatively low in conductivity, metallic items (i.e. strong conductors) such as barrels and buried debris create an increase in measured ground conductivity, thus showing up as an anomalous area of interest.

The EM 31 was transported to the site in a rugged field case and assembled for surveying. The battery pack was removed, fresh batteries inserted, and warmed to body temperature for 1 hour prior to conducting the survey. The unit was turned on and calibrated to the background readings away form known anomalous conditions such as buried barrels. Typical background readings in the beach area where the survey was conducted were in the range of –6 parts per thousand (ppt) in wet moss/sand conditions, to +5-7 ppt on solid rock.

Due to the shallow permafrost in this Arctic climate, most of the suspected buried debris is shallow in nature. Given this, the EM 31 survey was completed in the horizontal dipole mode of operation at the 0-100 ppt scale. With the EM 31 in horizontal mode, 70% of the instrument response comes from material shallower than three quarters of the intercoil spacing (i.e. 0.75 x 5 m = depth of interest between 0 and 3.75 m below grade). This is opposed to the vertical dipole mode where 70% of the instrument response comes from material shallower than one and half times of the intercoil spacing (i.e. 1.5 x 5 m =depth of interest between 0.75 and 7.5 m below grade), which, essentially doubles the depth of exploration.

Due to the spread out distribution of the debris along the beach site and time constraints, an official survey grid was not established prior to conducting the EM survey. Rather the instrument was left in continuous read mode and anomalies observed on the instrument in suspected areas. These areas of buried barrels were fairly easy to visually identify due to the ground disturbance and visible parts of barrels. The anomalies were easily identifiable by large and immediate response from the EM 31 instrument readings. At these locations of large anomalous readings, survey flags were placed every 3 m to outline limits of the subsurface anomalies. The total station survey crew then surveyed the flag locations for location.

1.5.8 Petroflag and Enviroguard Field Tests

The Petroflag and Enviroguard tests kits, were used to aid in the on site delineation during the course of the sampling program. The Petroflag analyses were used to determine if some of the samples retrieved were impacted with hydrocarbons. The data

from the Petroflag analytical information was recorded and used the following day to aid in choosing sample locations as well as used in comparison with the analytical data upon return to Edmonton. Although the Petroflag portable field analyses gives relatively reliable information in a short time span, the test is difficult to conduct in cold and windy conditions.

The Enviroguard Immunoassay Kit was used to field test select samples for PCB's. Again the data was recorded and used for comparison purposes with the laboratory data. The Enviroguard kit has many steps and the immunoassay vials must be kept at a specific temperature. This kit is very cumbersome and requires 2-3 hours to complete a set of analyses. This did not prove to be an effective tool on this project due the time of year with diminishing daylight hours, inclement weather, and time restraints.

Any future on site screening using these two field test kits should only be completed with proper shelter and time to dedicate to the screening methodology.

1.5.9 Soil Volumes

Soil volumes were determined based on the depth to either permafrost or bedrock. Soil samples for delineation were collected in areas identified in the ESG report and submitted for analytical testing. Once the laboratory data was reviewed, exceedances to the applied CCME 1999 criteria were plotted on the site plan and a surface area was calculated. The average depth to permafrost or bedrock was then multiplied by the surface area to obtain a volume. Although the volume calculation itself is simple, several assumptions for the depth of contaminant needed to be made.

Several other extensive studies conducted in Arctic have shown that vertical subgrade mobility of hydrocarbons is somewhat limited by the active layer of permafrost and/or bedrock. As hydrocarbons are typically the most common carrier of heavy metal contamination, some finite assumptions can be made as to the depth of heavy metals being limited by the same factors. The investigation at the Cape Christian site was carried out near the time of year when the thickest layer of soil is thawed. In some areas, this provided an opportunity to investigate the depth of actual penetration.

The standard used for calculating depth of contaminants at Cape Christian depended heavily on the setting of the area being investigated. The soil volume for each area (described in detail in Section 2 of this report) is presented in brief below:

- Main Building Area - heavy metals and petroleum hydrocarbons were investigated in soil fill used to level and construct site. Assumed average depth to permafrost is 0.5 m.

- Garage and Disaster Hut Area - heavy metals and petroleum hydrocarbons were investigated in soil around each building and near bedrock outcrops. Assumed depth to permafrost is 0.5 m and average depth to bedrock at the Disaster Hut is 0.5 m.

- Sewage Outfall Area - heavy metal and petroleum hydrocarbons were investigated in sludge at the base of the sewage outfall. The sludge has been frozen into the permafrost over the years and could not be penetrated beyond 0.5 metres. The volume for this area was calculated by assuming that prior to the sewage outfall being constructed, the area was relatively flat (either naturally or during construction of the station). The thickness of the sludge is based on the difference in elevation evident from the mounding of the sewage sludge over the years. The average thickness of the sludge appears to be approximately 1.0 m.

- Beach Area – the contaminant is petroleum hydrocarbons from the runway tank and barrel storage area. Depth to permafrost was identified during hand augering to be at 0.5 m.

This depth of contamination of 0.5 m for the purposes of the estimation of soil volumes is consistent with the findings at other remote arctic locations. The paper "Remediation of former military bases in the Canadian Arctic" by Poland, Mitchell and Rutter, which was published in Cold Regions Science and Technology 32 (2001) 93-105 states:

> "PCB contamination of soils in the Arctic is generally confined to the top 30 cm and this is true of other contaminants. This has several practical applications. In conducting environmental investigations, sampling can be limited to surface samples. Cleanup of the contaminated soils is also simplified as only the top unfrozen layer needs to be excavated."

2.0 CONTAMINANT INVESTIGATION

2.1 Main Station Building

Areas at the Main Station Building with suspected soil contamination were sampled by ESG during the July 1995 site visit. These locations were assigned a four-digit number with a letter prefix and the sample point(s) for the location were identified with an ESG tag number. (e.g.: G6508, Tag #9) Where possible, the ESG tags were located in the field and correlated to the site/location description in the report. Where the tags could not be located or there was no tag, the description provided in Appendix C of the ESG report was used to locate the sample area. The locations of identified areas having exceedances and requiring delineation in the vicinity of the Main Station Building are presented in Figure 2.1.

Table 2.1.1 (on the following page) identifies the locations having exceedances in the ESG report and presents the subsequent delineation sampling results for these areas. Appendix B provides site and location sample photographs (Photographs 2.1 to 2.16), and Appendix C contains the laboratory reports.

As indicated in the second paragraph of Section 1.4 on Page 1-4 of this report, the data in Table 2.1.1 is compared to the CCME 1999 Criteria for residential/parkland land usage. In fact, two new sets of relevant criteria have been published by the CCME since the ESG report (which was based on DEW Line Clean-up criteria) was published. The first is the Canadian Environmental Soil Quality Guidelines, 1999, which presents updated scientifically defensible soil chemistry derived from the CCME 1991 Interim Canadian Environmental Quality Criteria for Contaminated Sites. The second set of newly published criteria is the Canada Wide Standards for Petroleum Hydrocarbons in Soil January 2001, (CWS-PHC). The CWS is a 3-tiered, risk-based, remedial standard developed for four generic land uses – agriculture, residential /parkland, commercial, and industrial. The CWS criteria applied to Cape Christian is Residential/Parkland for course-grained soils between 0 and 1.5 m in depth.

The data presented in Table 2.1.1 indicates that there are exceedances of the CCME criteria outside of the ESG sampled areas and delineation has been achieved in some areas. Table 2.1.2 below briefly describes each site in the vicinity of the Main Building and presents the summary of results of the August 2001 assessment. Table 2.1.2 also provides an estimate as to the volume of impacted soil at each location. Contaminated soil delineation is shown on Figure 2.1.

It should be noted that several sample locations across the site that were shown as exceedances in the ESG report did not exhibit exceedances in the Earth Tech 2001 sampling program when compared to the most recent CCME criteria. This indicates the impacted area identified in the ESG report has been delineated or is no longer an exceedance. These areas should be confirmed again for the presence of contamination exceeding the applicable criteria prior to undertaking costly remedial activities such as excavation.

Table 2.1.1 Soil Samples
Summary of Laboratory Results
Cape Christian, Main Station Building

Parameter	Remediation Criteria	East Wing Garage Bay Sumps			
	1999 CCME Residential/ Parkland (mg/kg)	CC-38 at 0.3-0.6 m (mg/kg)	CC-38 at 0.9-1.2 m (mg/kg)	CC-39 at 0.3-0.6 m (mg/kg)	CC-39 at 0.9-1.2m (mg/kg)
Metals					
Arsenic	12	**12.6**	3.3	2.2	3.2
Cadmium	10	6.7	7.4	8.5	6.1
Chromium (total)	64	34.7	29.8	20.9	15.1
Cobalt	50	2.7	1.8	1.9	1.9
Copper	63	**94.7**	**75.2**	49.7	41.8
Lead	140	**231**	**226**	**260**	**7350**
Mercury	6.6	0.09	0.09	0.11	<0.05
Nickel	50	11	5.3	5.1	5.6
Zinc	200	**244**	**303**	**355**	154
TPH		7700	7000	5700	5000
EnviroGuard			0.52		0.688
PCBs		<0.05	<0.05	<0.05	<0.05
VOCs					
Benzene	0.5	0.02	<0.02	<0.02	<0.02
Toluene	0.8	0.18	0.16	0.06	0.05
Ethylbenzene	1.2	0.14	0.09	<0.04	<0.04
Xylenes	1	**2.14**	**1.45**	0.17	<0.11
Chloroform	5	<0.03	<0.03	<0.03	<0.03
Dichlorethane	5				
Dichlormethane	5	0.3	0.5	0.4	0.4
1,2 Dichloropropane	5	<0.05	<0.05	<0.05	<0.05
1,1,2,2 Tetrachloroethane	5	3.2	3.4	0.41	0.87
Carbon Tetrachloride	5	<0.02	<0.02	<0.02	<0.02
PAHs					
Benzo(a)anthracene	1	0.18	0.2	<0.07	<0.06
Benzo(b)Fluoranthene	1	<0.17	<0.23	<0.07	<0.07
Benzo(k)floranthene	1	<0.09	<0.13	<0.07	<0.01
Pyrene	10	0.72	0.74	0.43	0.34
Benzo(a) pyrene	0.7	<0.12	<0.11	<0.03	<0.02
Indeno(1,2,3-c,d)pyrene	1	<0.04	<0.05	<0.02	<0.02
Phenathrene	5	<0.40	<0.49	<0.20	<0.13

BOLD Indicates exceedences to CCME Residential/Parkland Criteria.

Table 2.1.1 Soil Samples
Summary of Laboratory Results
Cape Christian, Main Station Building

	Remediation Criteria		**East of East Wing**					**Above Ground Storage Tanks**			
	1999 CCME Residential/ Parkland (mg/kg)	**Residential Coarse-Grain Eco Soil Contact (mg/kg)**	CC-42 A E-Wing (mg/kg)	CC-43 A E-Wing (mg/kg)	CC-44 E-Wing (mg/kg)	CC-45 E-Wing (mg/kg)	CC-46 E-Wing (mg/kg)	CC-47 ASTs (mg/kg)	CC-48 ASTs (mg/kg)	CC-49 ASTs (mg/kg)	CC-51 ASTs (mg/kg)
Hydrocarbons											
F1 (C6-C10)		130			**130**	**130**	120		110		**190**
F2 (C10-C16)		450			**8800**	**4500**	**6400**		**3500**		**3400**
F3 (C16-C34)		400			**8200**	**8000**	**5300**		**480**		180
F4 (>C34)		2800			260	1800	300		<10		<10
Benzene	0.5				<0.04	<0.04	<0.04		<0.04		<0.04
Toluene	0.8				<0.10	<0.10	<0.10		<0.10		<0.10
Ethylbenzene	1.2				<0.10	<0.10	<0.10		<0.10		<0.10
Xylenes	1				<0.20	<0.20	<0.20		<0.20		<0.20
Petro-Flag			>5000	>5000			>1000	>1000		>1000	>1000

BOLD Indicates exceedences to 2001 CWS-PHC Residential Land Use Criteria

Table 2.2.1 Soil Samples
Summary of Laboratory Results
Cape Christian, Main Station Building

	Remediation Criteria	**Location G6508, ESG Tag # 9**				**Location G6512, ESG Tag # 13**				**Location G5616 ESG Tag #17**			
Parameter	1999 CCME Residential/ Parkland (mg/kg)	East Wing				East Wing				East Wing			
		Exceedance at G6508	CC-32	CC-33	CC-34	Exceedance at G6512	CC-29	CC-30	CC-31	Exceedance at G6516	CC-26	CC-27	CC-28
Metals													
Cadmium	10					6.9	1.6	1.2	0.9				
Lead	140	**290**											
Zinc	200	**4500**	49.5	24	63.1	**1200**	56.2	91.5	42.6				
PCBs	1.3									1.7	0.09		
Enviro Guard											1.303	0.71	1.121

BOLD Indicates exceedences to CCME Residential/Parkland Criteria.

	Remediation Criteria	**Location G6543ESG Tag # 44**				**Location G6576ESG Tag # 78**			
Parameter	1999 CCME Residential/ Parkland (mg/kg)	West Wing				Central Wing			
		Exceedance at G6543	CC-23	CC-24	CC-25	Exceedance at G6576	CC-35	CC-36	CC-37
Metals									
Lead	140	**480**	**415**	<2.0	**723**	**210**	12.5	16.6	36.9

Table 2.1.2 Results of Delineation

Area Description	ESG Identifier	Earth Tech Sample #	Summary of Results	Estimated Volume
East Wing Main Station	G6508, Tag # 9	CC-32, 33, 34	No exceedances of Zinc in delineation samples.	1.0 m^3
East Wing Main Station	G6512, Tag # 13	CC-29, 30, 31	No exceedances of Zinc or Cadmium in delineation samples.	2.0 m^3
East Wing Main Station	G6516, Tag # 17	CC-26, 27, 28	No exceedances of PCB in CC-26, Enviro-guard samples for CC-27 and CC-28 were also below criteria.	2.0 m^3
West Wing Main Station	G6543, Tag # 44	CC-23, 24, 25	Exceedances of CCME 1999 for Lead in ESG sample and delineation samples CC-23 and CC-25.	1.0 m^3
Central Wing Main Station	G6576, Tag # 78	CC-35, 36, 37	No exceedances for Lead in delineation samples.	15.0 m^3
East Side of East Wing, Main Station	No specific identifier, area suspect of hydrocarbon impact on surface soils	CC-42A, 43A, 44, 45, 46	Exceedances for CWS-PHC criteria for hydrocarbons in samples CC-44, 45, 46 and Petro-flag samples for CC-40 and CC-41 were greater than 5,000 ppm. Petro-flag for CC-46 greater than 1000 ppm.	15.0 m^3
AST's Main Station	No specific identifier, area suspect of hydrocarbon impact on surface soils	CC-47, 48, 49, 50, 51, 52	Exceedances for CWS-PHC criteria for hydrocarbons in samples CC-48 and CC-51 and Petro-flag samples for CC-47, 49, and 51 were greater than 1000 ppm.	220.0 m^3
Garage Bays, East Wing, Main Station	No specific identifier, area beneath floor drain suspect of hydrocarbon and heavy metal impact. Horizontal delineation difficult due to concrete pad surrounding floor drains.	CC-38, CC-39	Exceedances in CC-38, 0.3-0.6 m for CCME Arsenic, Copper, Lead, and Zinc. Exceedances in CC-38, 0.9-1.2 m for CCME Copper, Lead, Zinc, and Xylenes. Exceedances in CC-39, 0.3-0.6 m for CCME Lead and Zinc. Exceedances in CC-398, 0.9-1.2 m for CCME Lead and Zinc. Total Petroleum Hydrocarbon Values of greater than 5,000 ppm in all four samples.	10.0 m^3
Total Soil Volume Exceeding CCME Metals Criteria.				**29 m^3**
Total Soil Volume Exceeding CCME PCB Criteria.				**2 m^3**
Total Soil Volume Exceeding CCME CWS-PHC Criteria.				**235 m^3**
Total Soil Volume Exceeding one or more CCME Criteria.				**266 m^3**

It should be noted that the PHC contamination identified at the AST area and shown in Figure 2.1 might continue for a short distance through the drainage patterns and beyond CC49 and CC51. Samples CC49 and CC51 did not show signs of heavy hydrocarbon staining and had no petroleum odour when sampled. In addition, the adjacent sample CC50 did not have any exceedances to the applied criteria. The additional volume of soil

beyond sample locations CC49 and CC51 is considered to be minimal, as the sample retrieved by ESG before the drainage pattern reaches the ponded area, did not have any exceedances to the applied criteria. It is believed the PHC contaminant depleted itself in concentration because of exhaustion through immobility and increased biodegradation due to decreased concentrations as the contaminant traveled further from the source.

2.2 Former Maintenance Garage Area and Disaster Hut

Suspected soil contamination was sampled by ESG at the Garage building area and Disaster Hut during the July 1995 site visit. The locations of identified areas having exceedances and requiring delineation in the vicinity of the former Maintenance Garage and Disaster Hut areas are presented in Figure 2.2.

Table 2.2.1 identifies the locations having exceedances in the ESG report and presents the subsequent delineation sampling results for these areas. Appendix B provides site, and location sample photographs (Photographs 2.17 to 2.22), and Appendix C presents the laboratory reports. The data in Table 2.2.1 is compared to the CCME 1999 and CWS-PHC criteria, as was described in Section 2.1.

The data presented in Table 2.2.1 indicates that there are exceedances outside of the ESG sampled area and delineation in some areas has been achieved. Table 2.2.2 below briefly describes each site in the vicinity of the former garage site and presents the results of the areas investigated for delineation and other areas investigated for various environmental concerns.

The data collected to date on each of the areas has provided an indication as to the volume of impacted soil at each location. These volumes and the identified contaminant are identified in Table 2.2.2. The sites are identified for location and delineation on Figure 2.2.

Table 2.2.1 Soil Samples
Summary of Laboratory Results
Cape Christian, Former Garage Site and Disaster Hut

	Remediation Criteria	**Location G6579, ESG Tag # 81**				**Location G6589, ESG Tag # 91**			**Location G6593, ESG, Tag # 95**			
Parameter	1999 CCME Residential/ Parkland (mg/kg)	Garage				Garage			Disaster Hut			
		Exceedance at G6579	CC-17	CC-18	CC-19	Exceedance at G6589	CC-14	CC-15	Exceedance at G6593	CC-20	CC-21	CC-22
Metals												
Cadmium	10	5.3	3.1	<0.2	0.6	5.9	<0.2	0.6	6	3.4	2.2	0.9

BOLD Indicates exceedences to CCME Residential/Parkland Criteria.

	Remediation Criteria		**East of Garage Site Near Lube Oil Stain**			
	1999 CCME Residential/ Parkland (mg/kg)	**Residential Coarse-Grain Eco Soil Contact (mg/kg)**	CC-53 (mg/kg)	CC-54 (mg/kg)	CC-56 (mg/kg)	CC-58 (mg/kg)
Hydrocarbons						
F1 (C6-C10)		130		24		<10
F2 (C10-C16)		450		**3000**		<10
F3 (C16-C34)		400		**10000**		54
F4 (>C34)		2800		**3200**		23
Benzene	0.5			<0.04		<0.04
Toluene	0.8			<0.10		<0.10
Ethylbenzene	1.2			<0.10		<0.10
Xylenes	1			<0.20		<0.20
Petro-Flag			>1000	>1000	>1000	

BOLD Indicates exceedences to CCME Residential/Parkland Criteria and/or CWS-PHC Criteria for Coarse grained soil from 0-1.5m.

Table 2.2.2 Results of Delineation

Area Description	ESG Identifier	Earth Tech Sample #	Summary of Results	Estimated Volume
Former Maintenance Garage Site	G6579, Tag # 81	CC-17, 18, 19	No exceedances of Cadmium in ESG or delineation samples.	0.0 m^3
Former Maintenance Garage Site	G6589, Tag # 91	CC-14, 15, 16,	No exceedances of Cadmium in ESG or delineation samples.	0.0 m^3
Disaster Hut, Hazardous Material Storage	G6593, Tag # 95	CC-20, 21, 22	No exceedances of Cadmium in ESG or delineation samples.	0.0 m^3
Former Maintenance Garage Site	No specific identifier, area suspect of lubricating oil impact on surface soils	CC-53, 54, 55, 56, 57, 58	Exceedances for CWS-PHC criteria in sample CC-54 and Petro-flag samples for CC-53, 54, and 56 were greater than 1,000 ppm.	50.0 m^3
Total Soil Volume Exceeding CCME Metals Criteria				**0 m^3**
Total Soil Volume Exceeding CCME CWS-PHC Criteria.				**50 m^3**
Total Soil Volume Exceeding one or more CCME Criteria.				**50 m^3**

2.3 Sewage Outfall Area

The sewage outfall area was unable to be sampled during the ESG 1995 site visit due to being covered in ice. The sewage outfall area consists of a relatively flat area at the toe of the slope leading up to the main site. There is a slight gradient to the north towards the ocean where the runoff has created preferential drainage patterns over the years. The actual sewage drain consists of a 100 mm diameter pipe that gravity drains approximately 3 m from ground surface. At the base of the outfall is an accumulation of sludge of unknown thickness due to being frozen 0.5 m below grade (assumed to be approximately 1.0 m thick). The liquid from the outfall appears to have spread in several directions over the years. This is evident do to the increase in green vegetation in the area resulting from the dissolved nutrients in the outfall liquid. The locations of the sewage outfall sample points are indicated on Figure 2.3 on the following page.

Table 2.3.1 identifies the locations having exceedances in the ESG report and presents the subsequent delineation sampling results for these areas. Appendix B provides site and location sample photographs (Photographs 2.23 to 2.25), and Appendix C has the laboratory reports.

The data presented in Table 2.3.1 on the following page indicates that some delineation has been achieved. Table 2.3.2 below briefly describes the sewage outfall area investigation results. The area of contaminant delineation is shown on Figure 2.3.

Table 2.3.1 Soil Samples
Summary of Laboratory Results
Cape Christian, Sewage Outfall Area

Parameter	**Remediation Criteria**	**Sewage Outfall Area**			
	1999 CCME Residential/ Parkland (mg/kg)	CC-40 at 0.0-0.3 m (mg/kg)	CC-41 at 0.0-0.3 m (mg/kg)	CC-42 at 0.0-0.3 m (mg/kg)	CC-43 at 0.0-0.3m (mg/kg)
Metals					
Arsenic	12	1.5	1.4	0.8	1.6
Cadmium	10	2.1	<0.2	<0.2	1.6
Chromium (total)	64	9.4	6.8	5.7	10.7
Cobalt	50	1.3	1.5	1.2	2
Copper	63	**234**	15.3	12.3	**273**
Lead	140	26.7	3.6	<2.0	19.3
Mercury	6.6	0.31	<0.05	<0.05	0.21
Nickel	50	3.1	2	1.7	4.2
Zinc	200	**281**	35.6	23.7	**289**
TPH		7400	340	250	2600
EnviroGuard		0.575			
PCBs		0.62	<0.05	<0.05	0.64
VOCs					
Benzene	0.5	<0.02	0.04	<0.02	<0.02
Toluene	0.8	0.06	0.09	<0.04	<0.04
Ethylbenzene	1.2	<0.04	0.09	<0.04	<0.04
Xylenes	1	<0.11	0.28	<0.09	<0.09
Chloroform	5	<0.3	<0.03	<0.03	<0.03
Dichlorethane	5				
Dichlormethane	5	0.4	0.4	0.3	0.3
1,2 Dichloropropane	5	<0.05	<0.05	<0.05	<0.05
1,1,2,2 Tetrachloroethane	5	0.19	<0.04	<0.04	<0.04
Carbon Tetrachloride	5	<0.02	<0.02	<0.02	<0.02
PAHs					
Benzo(a)anthracene	1	<0.05	<0.02	0.05	0.16
Benzo(b)Fluoranthene	1	<0.04	0.02	0.05	0.17
Benzo(k)floranthene	1	<0.03	<0.01	0.03	0.1
Pyrene	10	<0.15	0.07	0.18	<0.3
Benzo(a) pyrene	0.7	<0.02	<0.01	0.03	<0.07
Indeno(1,2,3-c,d)pyrene	1	<0.02	<0.02	<0.02	0.07
Phenathrene	5	<0.14	<0.04	0.18	<0.20

BOLD Indicates exceedences to CCME Residential/Parkland Criteria.

Table 2.3.2 Results of Delineation

Area Description	ESG Identifier	Earth Tech Sample #	Summary of Results	Estimated Volume
Sewage Outfall	No specific identifier, area under ice cover during previous investigation	CC-40, 41, 42, 43	Samples CC-40 and CC-43 exceeded the CCME 1999 criteria for Copper and Zinc. Both samples had total petroleum hydrocarbon values over 2,600 ppm.	160 m^3 (Based on 160 m^2, 1.0 m thick)
Total Soil Volume Exceeding CCME Metals Criteria				**160 m^3**

2.4 Beach AST and Air Terminal Building

The vicinity of the large beach AST and the air terminal building had suspect areas sampled by ESG during the 1995 site visit. The location of identified areas having exceedances and requiring delineation in the vicinity of the AST and air terminal building are presented in Figure 2.4.

Table 2.4.1 identifies the locations having exceedances in the ESG report and presents the subsequent delineation sampling results for these areas. Appendix B provides site, and location sample photographs (Photographs 2.26 to 2.33), and Appendix C has the laboratory reports.

The data presented in Table 2.4.1 on the following page indicates that there are exceedances outside of the ESG sampled areas and delineation has been achieved in some areas. Table 2.4.2 below briefly describes the investigation results for the areas in the vicinity of the beach AST and air terminal building. The data collected provides an indication as to the volume of impacted soil at each location. These soil volumes and the identified contaminants are identified in Table 2.4.2. The sites are shown for location and delineation on Figure 2.4.

Table 2.4.1 Soil Samples
Summary of Laboratory Results
Cape Christian, AST and Air Terminal Building Area

	Remediation Criteria		**Visible Drum Area, Drainage Trench, Surface Stain**									
	1999 CCME Residential/ Parkland (mg/kg)	**Residential Coarse-Grain Eco Soil Contact (mg/kg)**	CC-01 Drum Area 0.3-0.6m (mg/kg)	CC-03 Drum Area 0-0.3m (mg/kg)	CC-04 Drum Area 0-0.3m (mg/kg)	CC-06 Drum Area 0-0.3m (mg/kg)	CC-07 Drum Area 0-0.3m (mg/kg)	CC-09 Drum Area 0-0.3m (mg/kg)	CC-10 W. of AST 0-0.3m (mg/kg)	CC-11 W. of AST 0-0.3m (mg/kg)	CC-12 W. of AST 0-0.3m (mg/kg)	CC-13 Oil Stain 0-0.3m (mg/kg)
Hydrocarbons												
F1 (C6-C10)		130	42	<10			<10			100		15
F2 (C10-C16)		450	**7100**	**450**			<10			**2700**		90
F3 (C16-C34)		400	**5000**	310			130			130		**13000**
F4 (>C34)		2800	<10	<10			<10			<10		1400
Benzene	0.5		<0.04	<0.04			<0.04			<0.04		<0.04
Toluene	0.8		<0.10	<0.10			<0.10			<0.10		<0.10
Ethylbenzene	1.2		<0.10	<0.10			<0.10			<0.10		<0.10
Xylenes	1		<0.20	<0.20			<0.20			<0.20		<0.20
Petro-Flag			>3125	1621	0	560	1196	925	2068	3578	15	3125

BOLD Indicates exceedences to 2001 CWS-PHC Residential Land Use Criteria

Table 2.4.1 Soil Samples
Summary of Laboratory Results
Cape Christian, AST and Air Terminal Building Area

	Remediation Criteria		**AST and Sea Valve**			
	1999 CCME Residential/ Parkland (mg/kg)	**Residential Coarse-Grain Eco Soil Contact (mg/kg)**	CC-59 (mg/kg)	CC-60 (mg/kg)	CC-61 (mg/kg)	CC-62 (mg/kg)
Hydrocarbons						
F1 (C6-C10)		130		<10		54
F2 (C10-C16)		450		**520**		**2700**
F3 (C16-C34)		400		210		91
F4 (>C34)		2800		<10		<10
Benzene	0.5			<0.04		<0.04
Toluene	0.8			<0.10		<0.10
Ethylbenzene	1.2			<0.10		<0.10
Xylenes	1.0			<0.20		<0.20
Petro-Flag			2622		25	

BOLD Indicates exceedences to 2001 CWS-PHC Residential Land Use Criteria

Table 2.4.2 Results of Delineation

Area Description	ESG Identifier	Earth Tech Sample #	Summary of Results	Estimated Volume
Visible Drum Lay-Down Area near AST	No specific ESG identifier	CC-01, 03, 04, 06, 07, 09, 10, 11, 12, and 13	Exceedances for CWS-PHC criteria for hydrocarbons in samples CC-01, 03, 11, and 13. Petro-flag samples for CC-01, 03, 07, 09, 10, 11, and 13 were greater than 925 ppm.	Highly visible oil stain area around CC-13 = 110 m^3 Area around visible barrel lay-down area = 500 m^3
Beach AST and Sea-Fuel Valve	No specific ESG identifier	CC-59, 60, 61, and 62	Exceedances for CWS-PHC criteria for hydrocarbons in samples CC-60 and CC-62. Petro-flag sample for CC-59 was 2622 ppm. Petro-flag sample for CC-61 was only 25 ppm.	200 m^3
Total Soil Volume Exceeding CCME CWS-PHC Criteria.				**810 m^3**

It should be noted that due to the size of the buried barrel areas identified at the beach area, (Figure 2.4) that confirmatory samples for the entire area were not retrieved. The main area near the AST and former terminal building had the greatest indication of petroleum staining. This area was extensively sampled for hydrocarbon contamination at various depths and some of the samples were submitted for analyses and others field-tested with the Petroflag sampling kits. The drums at the surface were partially accessible and randomly inspected to check if they contained petroleum products. None of the randomly selected drums contained product and the drums that were visible through the surface sands had a hollow sound (empty barrel) when walked on. With the exception of sample CC-01 sampled from 0.3-0.6 m below grade, most of the samples were saturated with melt water below 0.3 m and were subsequently not submitted for analyses. The areas on the site plan are representative of the sampled and delineated areas.

The area around CC13 was delineated by visual observation of the samplers and survey crew. This area had a heavy black stain of what appeared to be used oil and is easily identifiable on the ground surface.

2.5 Hazardous Material Building

The building is located south of the freshwater dam and consists of an insulated metal-clad building. There were several samples retrieved by ESG in this area in 1995, but none of the results were above the applied criteria. Therefore, no delineation samples were retrieved from this area. Figure 2.5 shows the location of the building. Appendix B provides site and location sample photographs (Photographs 2.34 and 2.35).

3.0 MATERIALS AND DEBRIS INVENTORY

3.1 Non Hazardous Debris

A systematic and detailed inventory and volume estimate of non-hazardous material was completed for all areas of the Cape Christian station. The purpose of this estimate is to allow for site remediation planning by establishing the volume of crushed material to be landfilled on site, and to estimate the time and resources required to accomplish this task.

The table below presents the results of this inventory, which was generally conducted north to south. These areas are shown by Photographs 3.1 to 3.15 in Appendix B. The building volumes have been calculated based on building demolition.

Table 3.1 Non-Hazardous Debris Volume

Area	Description	Type of Non-Hazardous Debris	Volume
1	Antenna Platform	Metal cabinets (2), wooden platform, cables, poles, guy wires	50 m^3
2	Cable and Poles	Cables, metal strapping, poles (18 x 25m, 6 m, and 2.5 m high), guy wires	105 m^3
3	Disaster Hut	Steel frame columns, trusses/beams; wooden sill foundation, concrete C channels, metal debris	25 m^3
4	Garage Building Area	Steel frame, wooden foundation sills, metal debris, scraper, truck, steel I beams	55 m^3
5	Fuel Storage Tanks	Five 102,000 L ASTs, concrete support cribs and wooden foundation sills, piping	180 m^3
6	Main Building	Metal wall cladding and insulation, steel frames, concrete C channels, wooden foundation sills, generators, boilers, cabinets, equipment,	950 m^3
7	Domestic Dump Site	Various debris west of main building, RCMP AST, empty barrels (40), tin can dump	25 m^3
8	Fallen Antenna Site	Concrete base, poles, guy wires, antenna (45 m), cables	30 m^3
9	Power Pole Line	Poles (19), 25 m high, cross piece, 3 guy wires each, cables along poles and to main building	140 m^3
10	Equipment Dump	Vehicles/equipment: dozers, scraper, trucks, parts, cable spools, piping, metal sheeting	240 m^3
11	HazMat Building	Barrels, steel clad building, steel frames, building contents, debris, shelving	120 m^3
12	Air Terminal Building	616,000 L AST, concrete brackets, wooden sills, runway roller, steel sheeting, building debris	150 m^3
13	Water Inlet Sewage Outfall	Piping, cable, insulated tray, sewage outfall line, fuel line from beach AST, supports	40 m^3
14	South Beach Barrels	Approximately 3.6 km south of the main site are approximately 150 empty barrels on the beach	15 m^3
		Total crushed volume	**2,125 m^3**

3.2 Hazardous Material

The Earth Tech project team was fortunate to be assisted during the fieldwork at Cape Christian by Robert Eno, Government of Nunavut Environmental Protection Service. Robert had been involved in a number of previous site visits and investigations at the Cape Christian site including the ESG fieldwork during 1996. His knowledge of the site was very valuable when it came to completing the inventory of hazardous materials.

Appendix D presents the detailed hazardous material inventory that was compiled by Robert Eno during the August 2001 fieldwork. This document shows the detailed calculation of the volumes of asbestos piping insulation and wallboard in the Main Station Building, and the detailed count of other hazardous materials on the site. A summary of this information is provided by the table below. A few examples of these hazardous materials are shown by Photographs 3.16 to 3.19 in Appendix B.

It should be noted that the ESG report identified paint containing PCB's at this site. As most of the paint used during the era of construction and maintenance of the site either had high lead concentrations or some level of PCB's, all paint on both the interior and exterior of the buildings should be considered as hazardous.

Table 3.2 Hazardous Material Inventory

Item	Location	Units	No.	Volume
Oxygen cylinders (green)	Pile east of E. wing Road ditch	100 lbs 100 lbs	36 3	7 m^3
Dichlorofluoromethane cyl. (orange)	Pile east of E. wing	100 lbs	5	2 m^3
Acetylene cylinders	Pile east of E. wing	100 lbs 20 lbs 2 lbs	23 9 2	9 m^3
Propane cylinders	Pile east of E. wing	20 lbs	2	0.5 m^3
Unknown cylinders	Pile east of E. wing	100 lbs	2	1 m^3
Carbon dioxide cyl. (fire suppression)	E. and W. generator rooms	100 lbs	13	4 m^3
Lubrication oil in drums	Garage area	205 L	7	5 m^3
Lubrication oil in diesel generators	East and west gen. rooms	202 L	4	3 m^3
Lead acid truck batteries	E. Generator room	12 V	4	0.5 m^3
Paint cans, ruptured and/or burst	Southeast courtyard	4.5 L	30	1.5 m^3
Paint containing lead or PCB's	All painted surfaces	2 m^3	1	2 m^3
Polyurethane coating	Southeast courtyard	22.5 L	1	0.5 m^3
Lead sheathed electrical wire	Vehicle/cable dump	5 mm	100 m	1 m^3
Asbestos wallboard	Main Building	-	10 m^3	10 m^3
Asbestos piping insulation (friable)	Main Building	-	10 m^3	10 m^3
Total Volume of Hazardous Waste				**57 m^3**

The barrels at the maintenance garage were the only barrels identified to have a hazardous substance in them. The contents were clearly marked as motor oil for diesel engines, and the texture, odour, colour, and viscosity of the physical samples retrieved on site all indicated that the substance was motor oil. Other barrels were located on site that contained fluids. When these were opened for sampling the contents turned out be water. No other barrels with hazardous substances were identified during the site inspection.

3.3 Ground Conductivity Survey

The ground conductivity survey was completed using a *Geonics* EM-31 Geophysical Data Logger. The EM-31 measures the difference in electrical conductivity or resistance in shallow soils up to 5 m in depth by inducing a current in one coil of the instrument and measuring the difference in current received by the second coil. Since permafrost is relatively low in conductivity, metallic items (i.e. strong conductors) such as barrels and buried debris create and increase in measured ground conductivity, thus showing up as an anomalous area of interest.

Typical readings for the area ranged from –6 parts per thousand (ppt) in wet moss conditions, to +5-7 ppt on solid rock, and –51 ppt over known/suspected buried metallic objects. Variations due to permafrost thickness were negligible.

Due to the distribution of the debris on the site, and in particular, along the beach, an official survey grid was not established to determine the extent of buried debris on site. This method was opted for due to the numerous single anomalies (i.e. a single barrel outside the buried stock pile) interfering with data originally set up on a standard 10 m x 10 m survey grid. Rather, the locations were visually identified and differences in ground conductivity were recorded with the EM-31 geophysical logger and marked with the use of survey lath. The lath were then surveyed for location utilizing the survey crew's total station and recorded on the site plan. The areas showing the buried barrels and debris are presented in Figures 1.2 and 2.3 and are marked as worked areas.

The total area of the worked areas (not including the south beach area) is 15,000 m^2. Assuming a single 205 litre barrel occupies an area of 0.45 m^2, the total number of possible buried barrels in the worked areas based on a single stacked/buried layer is estimated to be 6,800 barrels. The average metallurgical density of barrels is based on gauge thickness of 16 g for thick walled barrels equaling 25.5 kgs per barrel; mid-gauged barrels at 18 g equaling 19.5 kgs per barrel; and, thin walled barrels at 20 g equaling 17.3 kgs per barrel. Since most of the barrels observed on site were of military issue and of the thickest gauge, it is estimated that the 6,800 barrels at 25.5 kgs each yields a total weight of steel barrels to be 173.4 tonnes.

4.0 POTENTIAL LANDFILL SITES AND BORROW AREAS

4.1 Potential Landfill Sites

The Earth Tech project team investigated the Cape Christian station area for potential sites at which to landfill the non-hazardous physical debris during the site clean-up. A number of possible locations had been identified during previous investigations. Once again Robert Eno was very helpful due to his knowledge of the area.

Three potential sites were identified including:

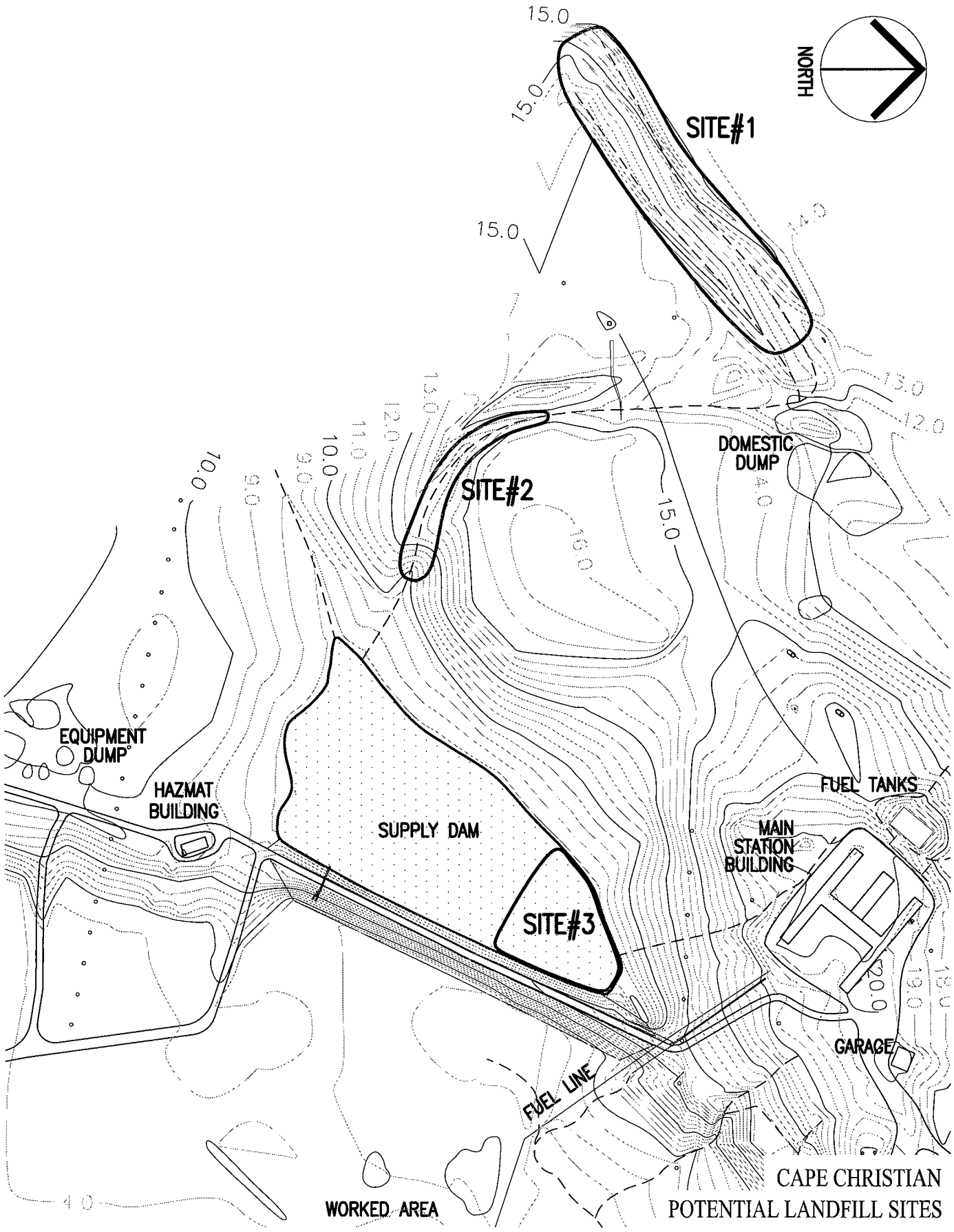
- Site 1 - Man made gulley near the domestic waste dump;
- Site 2 - Diversion channel to the raw water reservoir; and
- Site 3 - Raw water reservoir.

The locations of these sites are shown by Figure 4.1 on the following page.

Site 1 – Domestic Waste Site Gulley, is shown in Photo 4.1. Berms have been developed on both sides to form this gulley, possibly for the purpose of waste disposal. The area is approximately 25 m in width, 150 m long, with berm heights of approximately 3 m. A sieve analysis was attempted during the fieldwork, although this was hampered by the wet conditions at the time. The result of this analysis combined with field observations did indicate that the soil contains virtually no gravel or coarse-grained sand. The soil is mainly silt and it is fairly impermeable (in combination with the underlying permafrost) as evidenced by the standing water in this area. Photo 4.2 shows the results of the field sieve analysis that was conducted using the U.S. Standard sieves No. 4, 10, and 40 to distinguish between gravel, coarse sand, medium sand and fine sand. This area is approximately 400 m from the Main Station Building and approximately 500 m from the Equipment Dump, the two largest areas of physical debris. The capacity of the site assuming debris placed to a depth of 2 m over an area of 20 m by 100 m is 4,000 m^3.

Site 2 – Diversion Channel is shown in Photos 4.3 and 4.4. This gulley was constructed to direct surface runoff to the raw water reservoir and is thus directly in this drainage channel. The gulley is narrower at the start and widens towards the reservoir. The berm heights are approximately 4 m. The soil conditions are very similar to Site 1 with virtually no gravel and coarse sand, and mainly fine grained silty material. Sieve analysis was attempted however the very wet conditions made this very difficult. This area is approximately 350 m from the Main Station Building and approximately 375 m from the Equipment Dump, the two largest areas of physical debris. The capacity of the site assuming debris placed to a depth of 2 m over an area of 15 m by 80 m is 2,400 m^3.

Site 3 – Raw Water Reservoir is shown by Photos 4.5 and 4.6. The reservoir was constructed by a large embankment dam which also doubles as the access road to the site. This road is at risk due to erosion and a wash out at the culvert at the southern end of the reservoir. The soil that forms the embankment was sampled and is mainly sand. It is likely, however that a more fine grained silty material was used to line the bottom of the reservoir which appeared to be very effective in holding water. The depth of water was not determined however the embankment rises approximately 3 m above the water level and it is evident that there is sufficient volume in the reservoir to landfill the non-



CAPE CHRISTIAN
POTENTIAL LANDFILL SITES

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

OCTOBER, 2001
SCALE: 1:3,000

FIGURE 4.1

193401-01/GL-FIGURE4-1.DWG 1=1 LAST EDIT: Oct 30/01

hazardous debris from the site. The development of this site as a landfill would require removal of sufficient embankment material to drain the reservoir. This embankment could also serve as fill material. The distance from the Main Building to a landfill constructed at the north end of the reservoir would be 150 m, while the Equipment Dump is 350 m away. The surface area of the entire water supply reservoir at the time of the investigation was approximately 18,500 m^2 as determined from the site survey data. Using a depth of 3 m, the potential capacity of this reservoir as a landfill site is roughly 55,500 m^3, which far exceeds the requirement for site remediation. It is evident that only a small portion of the northern end of the reservoir, such as shown on Figure 4.1, would be required. The area shown would have an approximate capacity of 10,000 m^3.

4.2 Borrow Material

The Cape Christian station area was investigated to identify sources of borrow material that may be used during the site remediation project. The following sources were identified, with soil characteristics as described:

- Main Building foundation pad – sand and gravel
- Smaller foundation pads (garage and disaster hut) - sand and gravel
- Gulley berms (domestic waste dump and diversion channel) - sandy silt
- Road past the Equipment Dump - sand
- Raw water reservoir embankment - sand
- Gravel mounds near the runway – sand and gravel

Laboratory grain size distribution analysis for the potential borrow pit materials was beyond the scope of work for this investigation. An attempt was made in the field to conduct a very basic sieve analysis at a number of the sites, however, due to inclement weather the samples were too wet to obtain useful results. In general, as stated above the soil conditions at readily available borrow sources were very sandy with little evidence of fine grained less permeable soils to use as landfill cover material.

5.0 DISCUSSION OF SITE REMEDIATION

5.1 ESG Report Recommendations

The Royal Military College ESG report dated March 1996 provided a number of recommendations regarding the remediation of the former U.S. Coast Guard Loran Station at Cape Christian, Nunavut. Implementation requirements were proposed for the disposition of chemical and physical waste at the site relating to landfill disposal, non-hazardous debris, hazardous waste, buildings, contaminated soils, barrels and vegetation. Section IV Recommendations of the ESG report has been included as Appendix E of this report for ease of reference.

Sufficient information to allow for the preparation of a design and specification package for the remediation of the Cape Christian site was lacking from the ESG report. Specifically, volumes of contaminated soil and both hazardous and non-hazardous debris, a surveyed site plan and recommendations for landfilling were not provided. The August 2001 site assessment has now obtained the necessary information as outlined below.

5.2 Earth Tech Assessment Findings

The remediation recommendations are discussed below in the same order as they were presented in the ESG report.

1. New Landfill Site – Three options were investigated for the development of a landfill site; the Domestic Waste site gulley, the Diversion Channel, and the Raw Water Reservoir. A number of criteria should be used to evaluate these sites including capacity, proximity to the site debris, development requirements, site drainage and soil conditions. Using these criteria Earth Tech recommends the use of the north end of the Raw Water Reservoir as a landfill site for contaminated soil and non-hazardous debris. This site has large capacity and is very close (150 to 200 m) and downhill from the Main Building area which has approximately 65% of the non-hazardous debris on the site. It is suspected that the reservoir is already lined with fine grained soil (possibly excavated from the area of the Domestic Waste site gulley), and ample borrow material is readily available to stabilize and cover the site.

2. Beach Area Barrel Dumps – The ESG report had estimated that areas of buried barrels in the beach and runway area were very extensive and covered an area of 500,000 m^2. The August 2001 assessment, through visual inspection of these areas combined with the use of geophysics to verify buried metal, has shown this area to be a significantly smaller 15,000 m^2. These areas are shown on the report site plans. The ESG recommendation to stabilize these buried barrels in place is agreed with, following compaction of those areas where empty barrels are collapsing and creating voids.

3. Non-Hazardous Debris – The assessment estimated the volume of non-hazardous debris at the Cape Christian site to be 2,125 m^3 once it has been crushed, placed and compacted into the landfill site. The remediation plan will need to consider how the Main Building will be safely dismantled, and how the various types of debris will be transported from their current location to the landfill site.

4. Hazardous Waste – Section 3.2 has briefly described the hazardous material at the Cape Christian station. In addition, Appendix D presents a detailed inventory that was prepared by Robert Eno, Government of Nunavut. This material will need to be disposed of in accordance with the applicable regulations and in general will need to be transported off site. The exception to this is the asbestos material which can be double wrapped in plastic and disposed of in the landfill site. The volume of asbestos material has been estimated at 20 m^3.

5. Buildings – Once the hazardous material has been removed from the buildings they can be demolished, taking all appropriate safety precautions, especially for the Main Building. The March 1997 ESG report deals with the issue of PCB paint inside the buildings and whether or not the US EPA proposal for the disposal of PCB painted debris will apply to this site. At the time of building demolition the status of this issue will need to be confirmed. Selection of the Site 3 – Raw Water Reservoir for the landfill site will greatly facilitate the disposal and encapsulation of the Main Building materials since it is a distance of only 150 m down hill to this site.

6. Soils – The ESG report recommends the excavation of contaminated soils which exceed the Dew Line Clean-up criteria (DCC) from eight areas of the Cape Christian site. Disposal in a 'manner that precludes contact with the Arctic ecosystem' is recommended. Petroleum hydrocarbon contamination (PHC) was not investigated to any great extent. The August 2001 assessment has further delineated soil contamination exceeding the CCME 2001 CWS and CCME 1999 criteria. These locations and volumes are detailed in Section 2.0 Contaminant Investigation and summarized below.

- Main Building Area: CCME Metals - 29 m^3, PCB – 2 m^3, CWS-PHC – 235 m^3, and total volume of 266m^3.
- Garage/Disaster Hut: CWS-PHC – 50 m^3.
- Sewer Outfall Area: CCME Metals - 160 m^3.
- Beach AST Area: CCME CWS-PHC - 810 m^3.

Total metals impacted soil equates to 189 m^3, with 25% contingency ~240 m^3. Total PCB impacted soil equates to 2 m^3, with 25% contingency ~2.5 m^3. Total CWS-PHC impacted soil equates to 1095 m^3, with 25% contingency ~1,370 m^3. The total impacted soils at the Cape Christian station that exceed one or more CCME Criteria is approximately **1600 m^3**, including a 25% contingency.

The soils exceeding the CCME 1999 Soil Quality Guidelines or the 2001 Canada Wide Standards for Petroleum Hydrocarbons in Soil are recommended to be disposed of on site in manner that will prevent further contact with the local ecosystem.

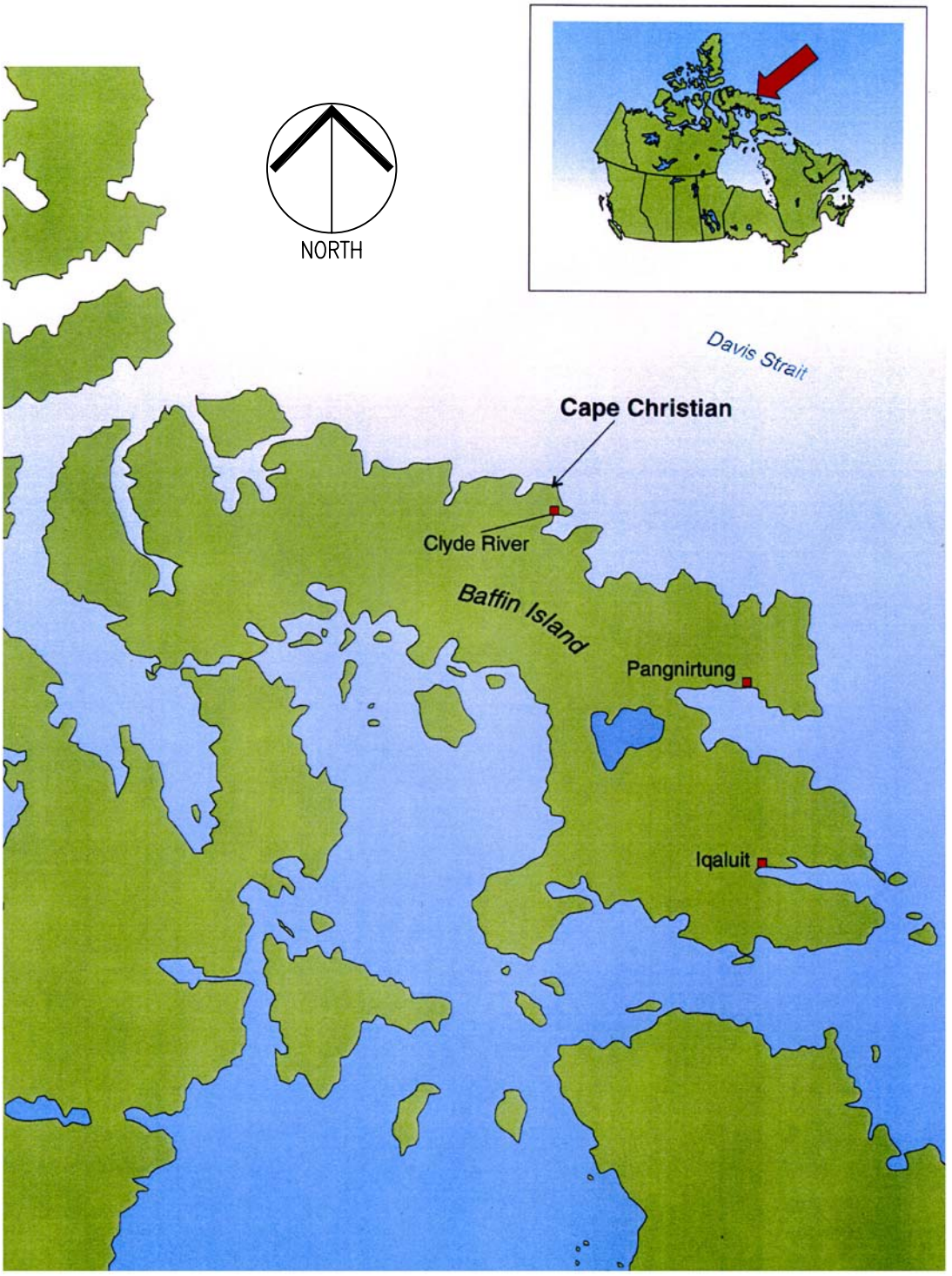
7. Barrels – The recommendations made in the ESG report concerning the handling of barrels are fully supported. The vast majority of these barrels are empty and should be crushed to reduce their volume and then landfilled. Any barrels found to still contain product should be treated in accordance with the DLCU Barrel Protocol. The volume of non-hazardous material detailed in Section 3.1 includes all empty barrels on the Cape Christian site. Section 3.2, Hazardous Material, identifies seven barrels containing lubrication oil in the area of the garage building.

6.0 CONCLUSIONS

The following conclusions can be drawn from the environmental assessment that has been completed during August 2001 at the former U.S. Coast Guard Loran station at Cape Christian, Nunavut.

- The Cape Christian site is readily accessible to the residents of Clyde River. In the current partially demolished condition it poses a significant health and safety risk, as well as an environmental concern.
- Previous environmental investigations and remedial efforts have resulted in the removal of most of the more serious sources of environmental contamination on the site; specifically PCB containing equipment.
- Metals contamination exceeding CCME 1999 criteria exists in a number of areas at the station. Contaminated soil volumes have been delineated at each location of concern and the total volume of metal impacted soil is 189 m^3, or 240 m^3 including a 25% contingency.
- The only site with PCB contamination of soils exceeding the CCME 1999 Criteria is the Main Building Area, with a contaminated volume of 2 m^3.
- Hydrocarbon soil contamination exists in significant quantities at the site, particularly adjacent to the Main Building and ASTs (235 m^3), and the area of the Beach AST and buried barrels near the Air Terminal Building (810 m^3). The total soil volume exceeding the 2001 CCME CWS-PHC criteria is 1,095 m^3, or roughly 1,370 m^3, with a 25% contingency.
- Hazardous and non-hazardous material has been identified and quantified to allow for disposal planning. The volume of non-hazardous material that can be landfilled on site is approximately 2,125 m^3. A detailed hazardous material inventory has been provided. With the exception of 20 m^3 of asbestos material these items should be removed from the site.
- Areas for the landfilling of non-hazardous debris and for sources of borrow have been identified. Of these the best location due to capacity and proximity to the bulk of the debris is the north end of the Raw Water Reservoir. The reservoir will need to be drained and the existing berm provides a huge source of cover material to stabilize and fill the crushed debris.
- A detailed topographic map of the Cape Christian site has been surveyed to a contour interval of 0.5 m, and is provided as Appendix A to this report. This will prove very useful for remediation project planning.

APPENDIX A
SITE PLAN



CAPE CHRISTIAN, BAFFIN ISLAND, NUNAVUT
LOCATION PLAN

EARTH TECH

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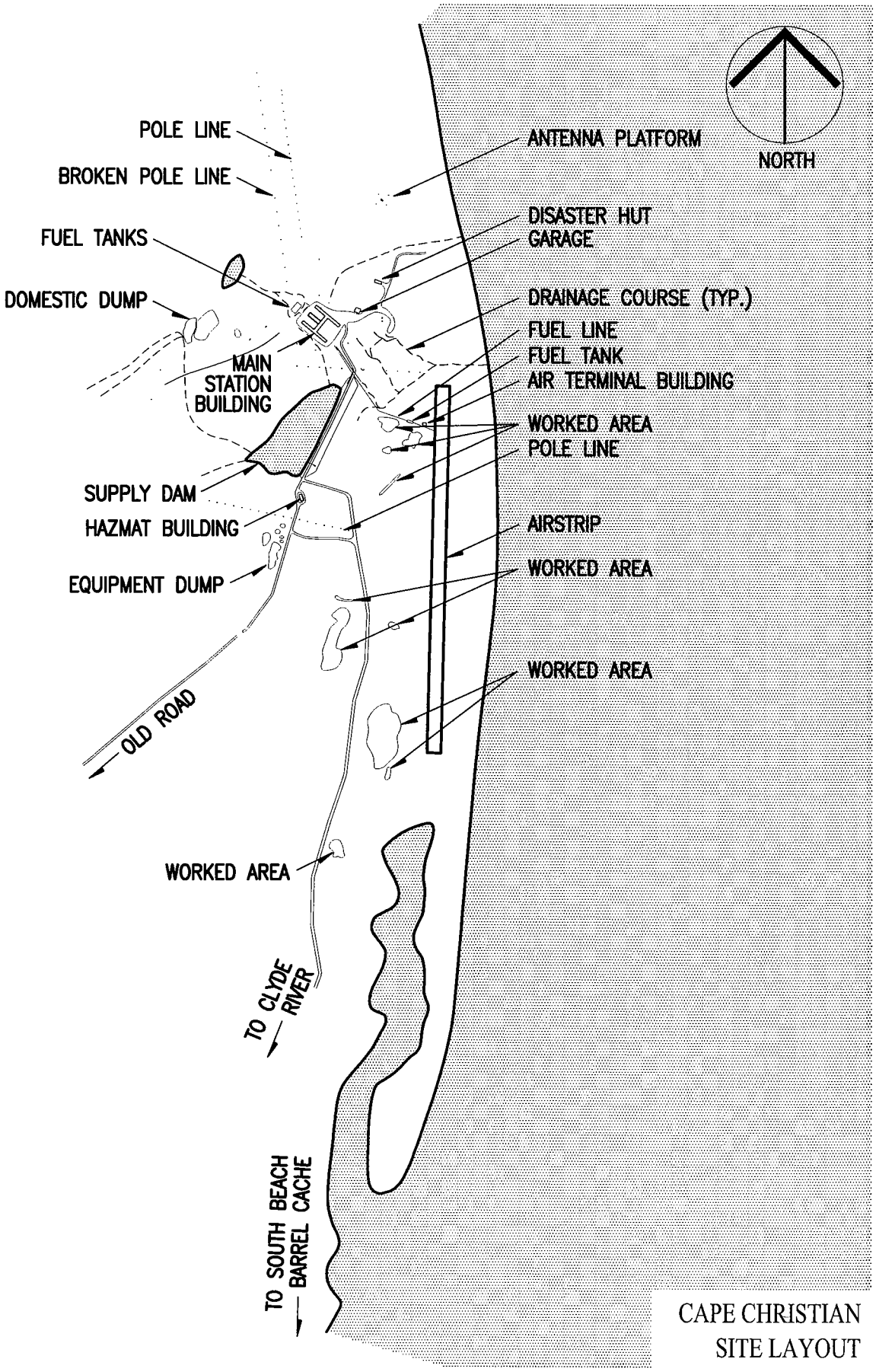
October, 2001

Figure 1.1

19340-00map.DWG 1=1 LAST EDIT: Oct 24/01



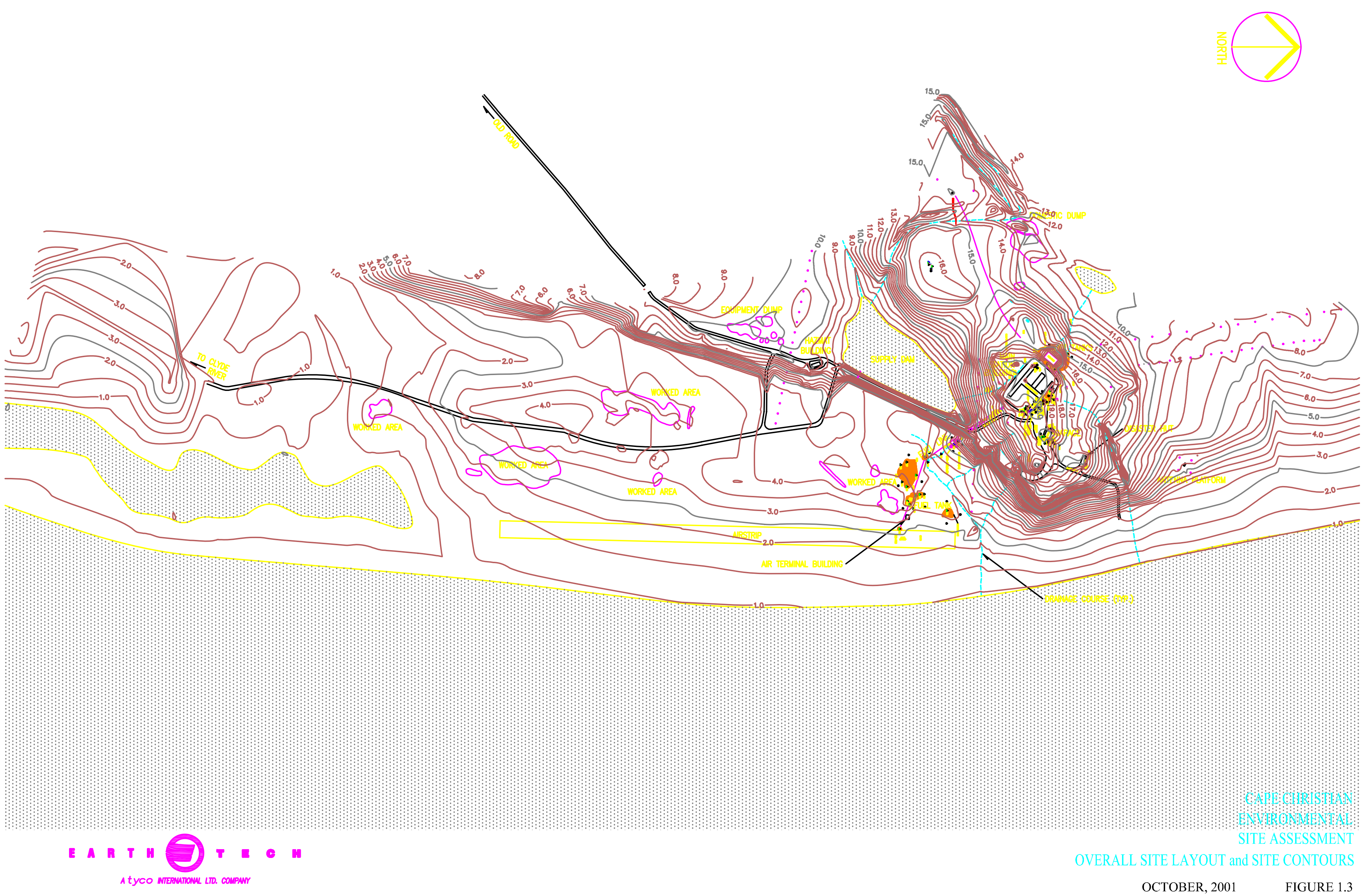
CAPE CHRISTIAN
SITE LAYOUT

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

OCTOBER, 2001
SCALE: 1:12,500

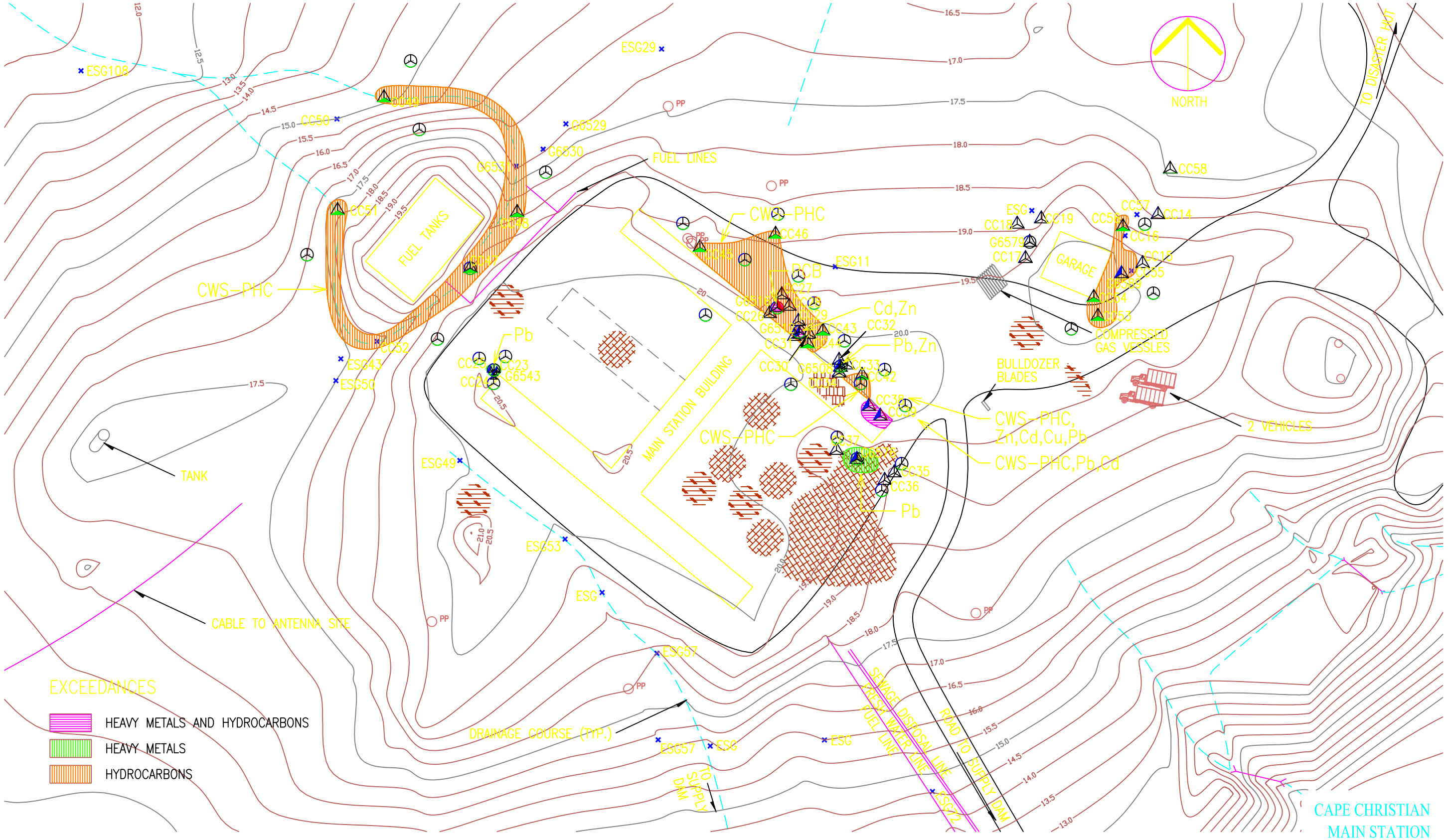
FIGURE 1.2

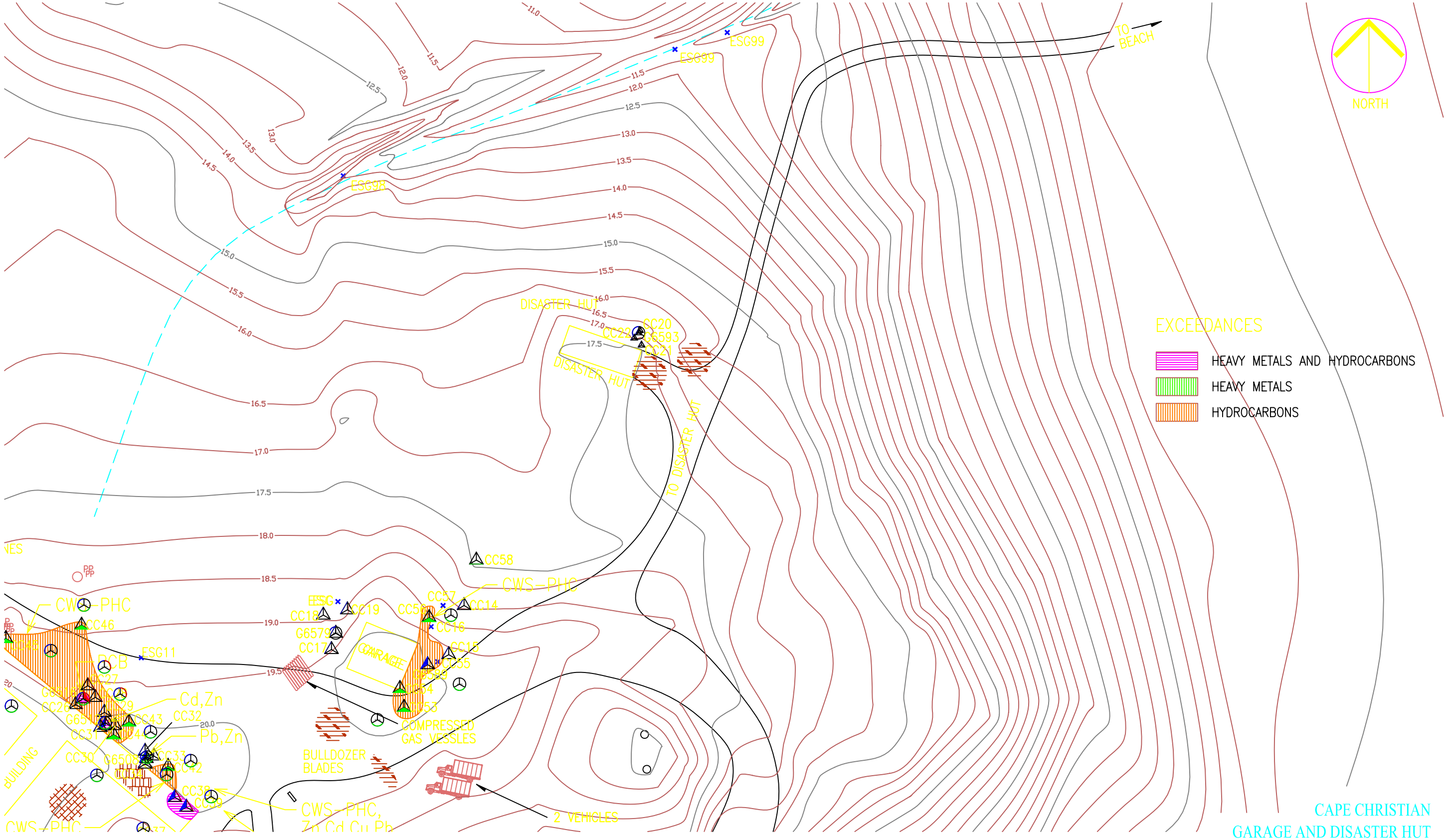
(193401-01/CC ...URE1-2.DWG 1=1 LAST EDIT: Oct 30/01



CAPE CHRISTIAN
ENVIRONMENTAL
SITE ASSESSMENT
OVERALL SITE LAYOUT and SITE CONTOURS

OCTOBER, 2001 FIGURE 1.3
SCALE: 1:3,000


ESG108
ESG29
CC50
G6529
G6530
FUEL LINES
PP
NORTH
TO DISASTER HUT
CC58
CC51
FUEL TANKS
CWS–PHC
CC52
ESG43
ESG50
CWS–PHC
CC46
ESG11
RCB
Cd,Zn
CC32
Pb,Zn
Pb
CC23
G6543
MAIN STATION BUILDING
CWS–PHC
CC35
CC36
Pb
ESG49
ESG53
ESG
ESG57
ESG57
ESG
ESG27
ESG
CC57
CC14
CC16
CC15
CC55
CC54
CC53
GARAGE
COMPRESSED GAS VESSLES
BULLDOZER BLADES
CWS–PHC, Zn,Cd,Cu,Pb
CWS–PHC,Pb,Cd
2 VEHICLES
TANK
CABLE TO ANTENNA SITE
DRAINAGE COURSE (TYP.)
SEWAGE DISPOSAL LINE
WATER LINE
FUEL LINE
ROAD TO SUPPLY DAM
TO SUPPLY DAM
EXCEEDANCES
HEAVY METALS AND HYDROCARBONS
HEAVY METALS
HYDROCARBONS
DEBRIS LEGEND
ASBESTOS BOARD
DOMESTIC GARBAGE
BRICK
METAL
BATTERIES
ELECTRICAL
LEAD PIPE
WOOD
EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY
CAPE CHRISTIAN
MAIN STATION
SAMPLE LOCATIONS AND EXCEEDANCES
OCTOBER, 2001
SCALE: 1:750
FIGURE 2.1
193401-01/CC-FIGURE2-1.DWG 1=1 LAST EDIT: Feb 26/02



DEBRIS LEGEND

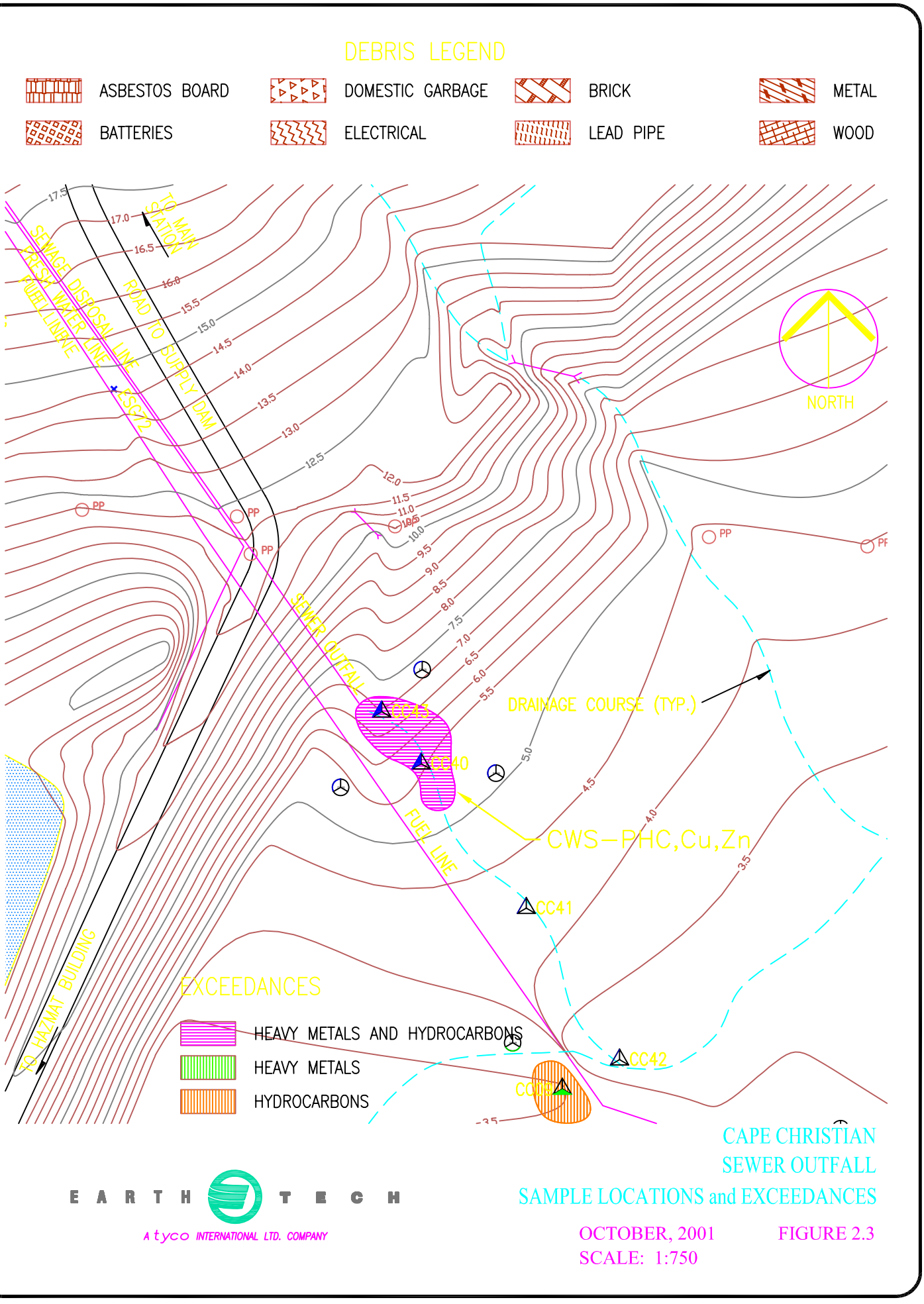
ASBESTOS BOARD	DOMESTIC GARBAGE	BRICK	METAL
BATTERIES	ELECTRICAL	LEAD PIPE	WOOD

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

CAPE CHRISTIAN
GARAGE AND DISASTER HUT
SAMPLE LOCATIONS AND EXCEEDANCES

OCTOBER, 2001 FIGURE 2.2
SCALE: 1:750

193401-01/CC-FIGURE2-2.DWG 1=1 LAST EDIT: Feb 26/02



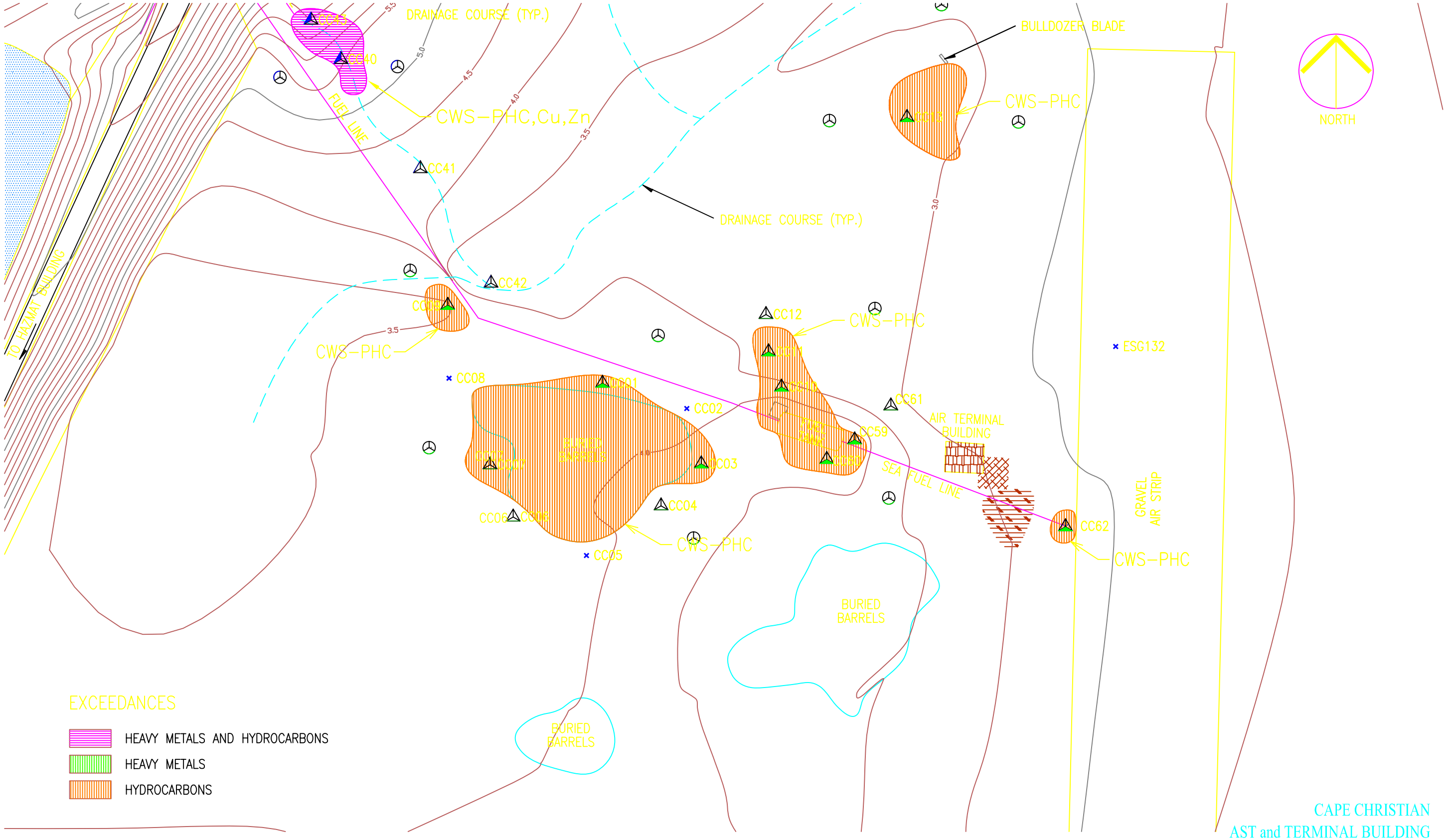
EARTH TECH

A tyco INTERNATIONAL LTD. COMPANY

CAPE CHRISTIAN
SEWER OUTFALL
SAMPLE LOCATIONS and EXCEEDANCES

OCTOBER, 2001 FIGURE 2.3
SCALE: 1:750

(193401-01/CC-FIGURE2-3.DWG 1=1 LAST EDIT: Nov 23/01



EXCEEDANCES

- HEAVY METALS AND HYDROCARBONS
- HEAVY METALS
- HYDROCARBONS

DEBRIS LEGEND

- ASBESTOS BOARD
- DOMESTIC GARBAGE
- BRICK
- METAL
- BATTERIES
- ELECTRICAL
- LEAD PIPE
- WOOD

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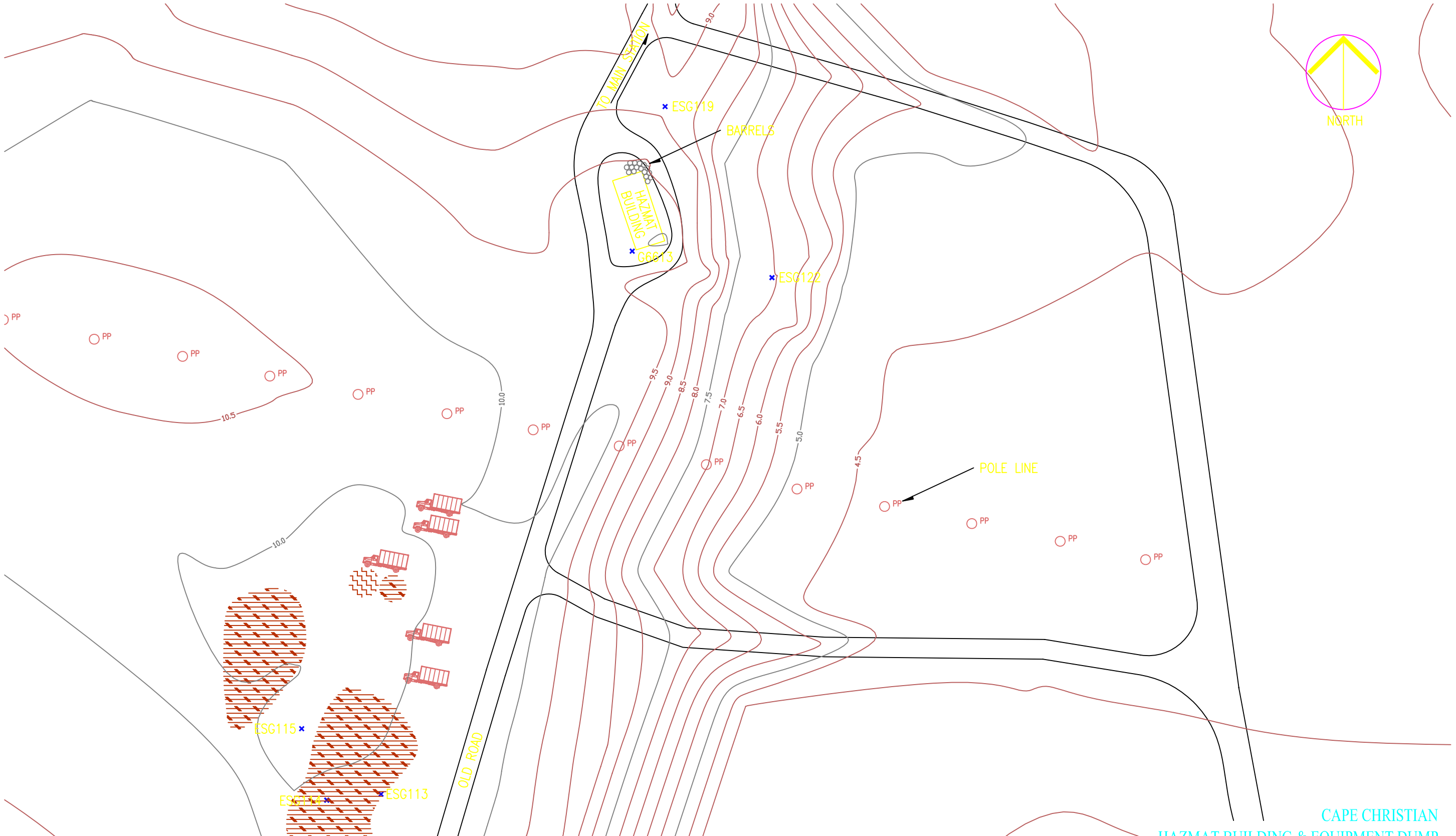
CAPE CHRISTIAN
AST and TERMINAL BUILDING
SAMPLE LOCATIONS and EXCEEDANCES

OCTOBER, 2001 FIGURE 2.4
SCALE: 1:750

(193401-01/CC-FIGURE2-4.DWG 1=1 LAST EDIT: Nov 29/01)



CAPE CHRISTIAN
HAZMAT BUILDING & EQUIPMENT DUMP

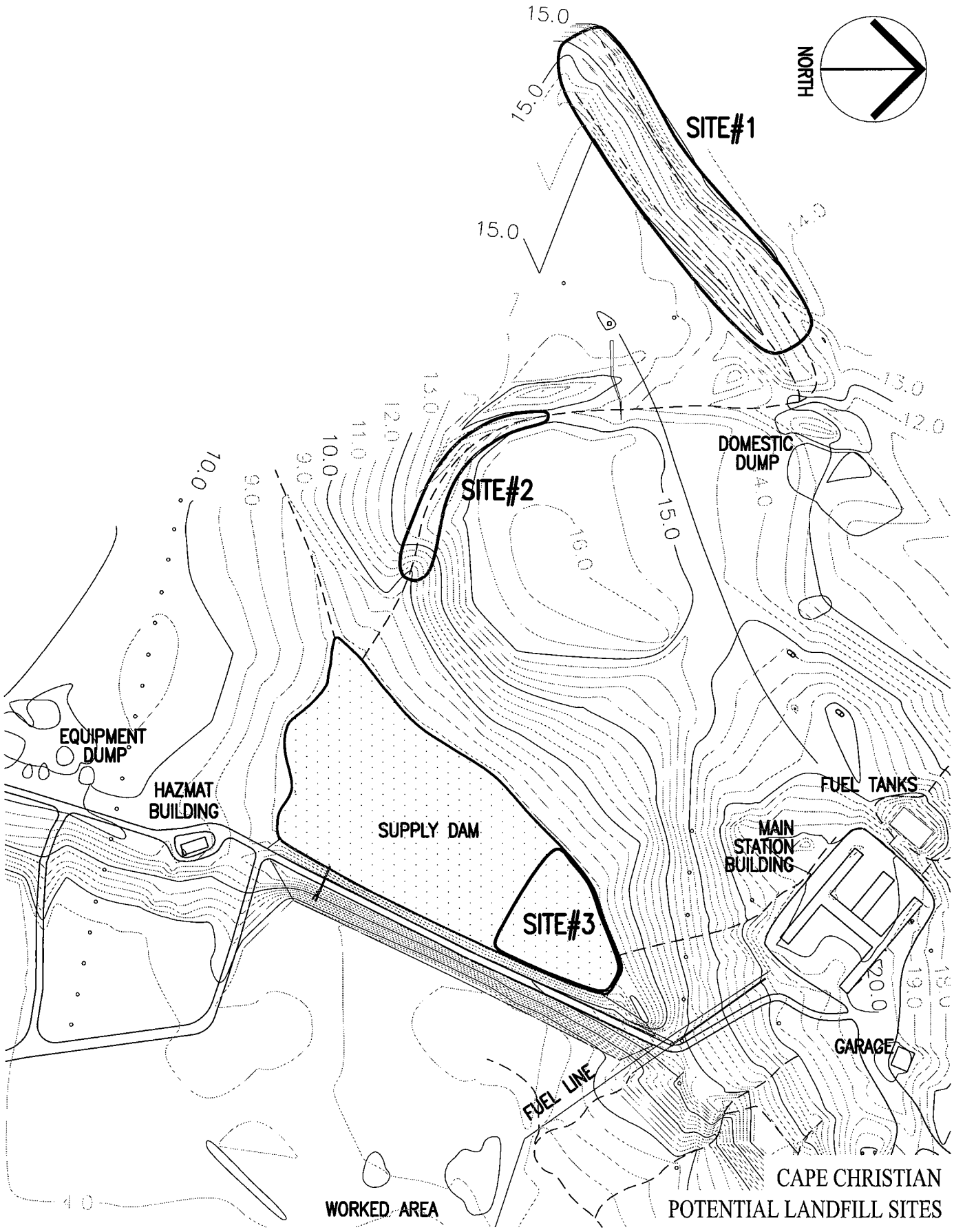
DEBRIS LEGEND

ASBESTOS BOARD	DOMESTIC GARBAGE	BRICK	METAL
BATTERIES	ELECTRICAL	LEAD PIPE	WOOD

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

OCTOBER, 2001 FIGURE 2.5
SCALE: 1:750

193401-01/CC-FIGURE2-4.DWG 1=1 LAST EDIT: Nov 23/01



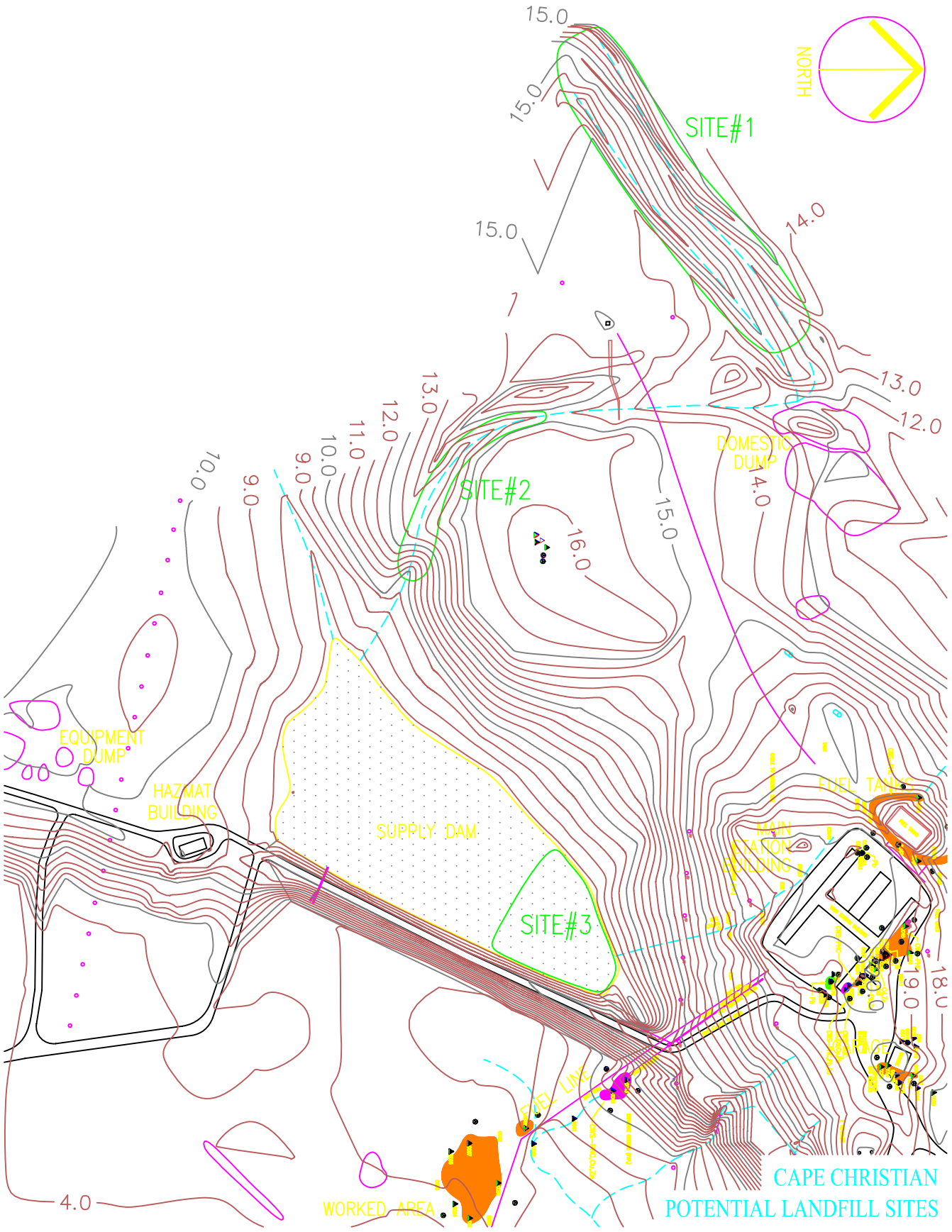
CAPE CHRISTIAN
POTENTIAL LANDFILL SITES

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

OCTOBER, 2001
SCALE: 1:3,000

FIGURE 4.1

193401-01/GL-FIGURE4-1.DWG 1=1 LAST EDIT: Oct 30/01



CAPE CHRISTIAN
POTENTIAL LANDFILL SITES

EARTH TECH
A tyco INTERNATIONAL LTD. COMPANY

OCTOBER, 2001
SCALE: 1:3,000

FIGURE 4.1

193401-01/CC-FIGURE4-1.DWG 1=1 LAST EDIT: Oct 30/01

APPENDIX B
PHOTOGRAPHS

APPENDIX C
LAB DATA

ANALYTICAL SERVICES

9619 42 Avenue
Edmonton, Alberta
Canada T6E 5R2
Tel 780 465 1212
Fax 780 450 4187

Certificate of Analysis

Reported To :

PWGSC - ENVIRONMENTAL

Client Code PG

1000 - 9700 JASPER AVE
EDMONTON, AB
T5J 4E2

Attention : WILL WAWRYCHUK
Phone : (780) 497-3892
FAX : (780) 497-3842

Project Information :

Project ID : 19340-01 CAPE CHRISTIAN, NWT
Submitted By: DON ROY

Requisition Forms :

Form 42012466 shipped on 25-Aug-01 received on 30-Aug-01 logged on 31-Aug-01 completed on 20-Sep-01
Form 42012465 shipped on 25-Aug-01 received on 30-Aug-01 logged on 31-Aug-01 completed on 20-Sep-01
Form 42012467 shipped on 25-Aug-01 received on 30-Aug-01 logged on 31-Aug-01 completed on 20-Sep-01
Form 42012468 shipped on 25-Aug-01 received on 30-Aug-01 logged on 31-Aug-01 completed on 20-Sep-01

Remarks :

+ All organic data is blank corrected except for PCDD/F, Hi-res MS and CLP volatile analyses
+ 'MDL' = Method Detection Limit, '<' = Less than MDL, '---' = Not analyzed
+ Solids results are based on dry weight except Biota Analyses & Special Waste Oil & Grease
+ Organic analyses are not corrected for extraction recovery standards except for Isotope Dilution methods, (i.e. CARB 429 PAH, all PCDD/F and DBD/DBF analyses)
+ All Groundwater samples except BTEX/VOC's or Purgeable Hydrocarbons are decanted and/or filtered prior to analysis unless otherwise mandated by regulatory agency
+ This report shall not be reproduced except in full, without the written approval of the laboratory

Methods used by Philip are based upon those found in 'Standard Methods for the Examination of Water and Wastewater', 20th Edition, published by the American Public Health Association, or on US EPA protocols found in the 'Test Methods For Evaluating Solid Waste, Physical/Chemical Method, SW846', 3rd Edition. Other procedures are based on methodologies accepted by the appropriate regulatory agency. Methodology briefs are available by written request.

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies, quality assurance and quality control procedures except where otherwise agreed to by the client and testing company in writing. Liability for any and all use of these test results shall be limited to the actual cost of the pertinent analysis done. There is no other warranty expressed or implied.
Your samples will be retained at Philip for a period of 30 days from receipt of data or as per contract.

PHILIP Project Manager: Maureen Brown

ANALYTICAL SERVICES

26-Oct-01

ANALYTICAL REPORT

Client : PWGSC - ENVIRONMENTAL
Project : 19340-01 CAPE CHRISTIAN, NWT

				Philip ID :	31010931	31010932	31010933	31010934
				Client ID :	CC-01@1-2'	CC-03@0-1'	CC-07@0-1'	CC-11@0-1'
Sparcode	**Parameter**	**Unit**	**MDL**					
PHYSICAL								
00250760	Moisture	%(W/W)	0.3		12.8	2.8	17.4	6.7
HYDROCARBONS								
EX995149	PHC EXT F2 - 4	date			01/09/05	01/09/05	01/09/05	01/09/05
EX995170	Volat. Soil Extract.	date			01/09/04	01/09/04	01/09/04	01/09/04
PHC1PHCV	CCME PHC F1 C6-10	ug/g	10		42	< 10	< 10	100
HC1-CALC	CCME PHC Fl-BTEX	ug/g			42	< 10	< 10	100
PHC2PHCS	CCME PHC F2 C10-16	ug/g	10		7100	450	< 10	2700
PHC3PHCS	CCME PHC F3 C16-34	ug/g	10		5000	310	130	130
PHC4PHCS	CCME PHC F4 C34-50+	ug/g	10		< 10	< 10	< 10	< 10
BASEPHCS	PHC F2-4 BASELINE 0	Y/N	Yes		Yes	Yes	Yes	Yes
VOLATILE ORGANICS								
B020PT12	Benzene	ug/g	0.04		< 0.04	< 0.04	< 0.04	< 0.04
T001PT12	Toluene	ug/g	0.10		< 0.10	< 0.10	< 0.10	< 0.10
B021PT12	Ethylbenzene	ug/g	0.10		< 0.10	< 0.10	< 0.10	< 0.10
X003PT12	m+p - Xylene	ug/g	0.10		< 0.10	< 0.10	< 0.10	< 0.10
X002PT12	o - Xylene	ug/g	0.10		< 0.10	< 0.10	< 0.10	< 0.10
SURROGATE RECOVERY								
VS01PT12	Bromofluorobenzene	%	0		96	90	91	97
VS03PT12	d8-Toluene	%	0		99	96	98	98
Ed10PT12	Ethylbenzene-d10	%	60		79	78	73	77
				Matrix :	Soil	Soil	Soil	Soil
				Sampled on:	01/08/22 16:00	01/08/22 16:00	01/08/22 16:00	01/08/22 16:00

ANALYTICAL SERVICES

26-Oct-01

ANALYTICAL REPORT

Client : PWGSC - ENVIRONMENTAL
Project : 19340-01 CAPE CHRISTIAN, NWT

Sparcode	Parameter	Unit	MDL	Philip ID : 31010935 Client ID : CC-13@0-1'	31010936 CC-14 0-1'	31010937 CC-15 0-1'	31010938 CC-16 0-1'
PHYSICAL							
00250760	Moisture	%(W/W)	0.3	< 0.3	---	---	---
METALS TOTAL							
Cd-TIR03	Cadmium	ug/g	0.2	---	< 0.2	0.6	0.5
EX994288	Dry & Grind	date		---	01/09/04	01/09/04	01/09/04
HYDROCARBONS							
EX995149	PHC EXT F2 - 4	date		01/09/05	---	---	---
EX995170	Volat. Soil Extract.	date		01/09/04	---	---	---
PHC1PHCV	CCME PHC F1 C6-10	ug/g	10	15	---	---	---
HC1-CALC	CCME PHC F1-BTEX	ug/g		15	---	---	---
PHC2PHCS	CCME PHC F2 C10-16	ug/g	10	90	---	---	---
PHC3PHCS	CCME PHC F3 C16-34	ug/g	10	13000	---	---	---
PHC4PHCS	CCME PHC F4 C34-50+	ug/g	10	1400	---	---	---
BASEPHCS	PHC F2-4 BASELINE 0	Y/N	Yes	Yes	---	---	---
VOLATILE ORGANICS							
B020PT12	Benzene	ug/g	0.04	< 0.04	---	---	---
T001PT12	Toluene	ug/g	0.10	< 0.10	---	---	---
B021PT12	Ethylbenzene	ug/g	0.10	< 0.10	---	---	---
X003PT12	m+p - Xylene	ug/g	0.10	< 0.10	---	---	---
X002PT12	o - Xylene	ug/g	0.10	< 0.10	---	---	---
SURROGATE RECOVERY							
VS01PT12	Bromofluorobenzene	%	0	94	---	---	---
VS03PT12	d8-Toluene	%	0	97	---	---	---
Ed10PT12	Ethylbenzene-d10	%	60	81	---	---	---
				Matrix : Soil	Soil	Soil	Soil
				Sampled on: 01/08/22 16:00	01/08/23 16:00	01/08/23 16:00	01/08/23 16:00

ANALYTICAL SERVICES

ANALYTICAL REPORT

Client : PWGSC - ENVIRONMENTAL
Project : 19340-01 CAPE CHRISTIAN, NWT

Sparcode	Parameter	Unit	MDL	Philip ID : 31010939 Client ID : CC-17 0-1'	31010940 CC-18 0-1'	31010941 CC-19 0-1'	31010942 CC-20 0-1'
METALS TOTAL							
Cd-TIR03	Cadmium	ug/g	0.2	3.1	< 0.2	0.6	3.4
EX994288	Dry & Grind	date		01/09/04	01/09/04	01/09/04	01/09/04
			Matrix :	Soil	Soil	Soil	Soil
			Sampled on:	01/08/23 16:00	01/08/23 16:00	01/08/23 16:00	01/08/23 16:00

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ANALYTICAL REPORT

Client : PWGSC - ENVIRONMENTAL
Project : 19340-01 CAPE CHRISTIAN, NWT

Sparcode	Parameter	Unit	MDL	Philip ID : 31010943 Client ID : CC-21 0-1'	31010944 CC-22 0-1'	31010945 CC-23 0-1'	31010946 CC-24 0-1'
METALS TOTAL							
Cd-TIR03	Cadmium	ug/g	0.2	2.2	0.9	---	---
EX994288	Dry & Grind	date		01/09/04	01/09/04	01/09/04	01/09/04
Pb-TIR03	Lead	ug/g	2.0	---	---	415	< 2.0
				Matrix : Soil	Soil	Soil	Soil
				Sampled on: 01/08/23 16:00	01/08/23 16:00	01/08/23 16:00	01/08/23 16:00

ANALYTICAL SERVICES

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ANALYTICAL REPORT

Client : PWGSC - ENVIRONMENTAL
Project : 19340-01 CAPE CHRISTIAN, NWT

				Philip ID :	31010947	31010948	31010949	31010950
				Client ID :	CC-25 0-1'	CC-26 0-1'	CC-29 0-1'	CC-30 0-1'
Sparcode	**Parameter**	**Unit**	**MDL**					
STRGDONE	Storage Charge	Y/N	Yes		---	Yes	---	---
PHYSICAL								
00250760	Moisture	%(W/W)	0.3		---	6.5	---	---
METALS TOTAL								
Cd-TIR03	Cadmium	ug/g	0.2		---	---	1.6	1.2
EX994288	Dry & Grind	date			01/09/04	---	01/09/04	01/09/04
Pb-TIR03	Lead	ug/g	2.0		723	---	---	---
Zn-TIR03	Zinc	ug/g	0.5		---	---	56.2	91.5
POLYCHLORINATED BIPHENYLS								
P019P021	PCB's - Total	ug/g	0.05		---	0.09	---	---
SURROGATE RECOVERY								
EX9946ZM	PCB Prep - Soils	date			---	01/09/06	---	---
MBBPP021	Monobromobiphenyl	%	40		---	84	---	---
				Matrix :	Soil	Soil	Soil	Soil
				Sampled on:	01/08/23 16:00	01/08/23 16:00	01/08/23 16:00	01/08/23 16:00

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ANALYTICAL REPORT

Client : PWGSC - ENVIRONMENTAL
Project : 19340-01 CAPE CHRISTIAN, NWT

Sparcode	Parameter	Unit	MDL	Philip ID : 31010951 Client ID : CC-31 0-1'	31010952 CC-32 0-1'	31010953 CC-33 0-1'	31010954 CC-34 0-1'
METALS TOTAL							
Cd-TIR03	Cadmium	ug/g	0.2	0.9	---	---	---
EX994288	Dry & Grind	date		01/09/04	01/09/04	01/09/04	01/09/04
Zn-TIR03	Zinc	ug/g	0.5	42.6	49.5	24.0	63.1
				Matrix : Soil	Soil	Soil	Soil
				Sampled on: 01/08/23 16:00	01/08/23 16:00	01/08/23 16:00	01/08/23 16:00

ANALYTICAL SERVICES

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ANALYTICAL REPORT

Client : PWGSC - ENVIRONMENTAL
Project : 19340-01 CAPE CHRISTIAN, NWT

				Philip ID :	31010955	31010956	31010957	31010958
				Client ID :	CC-35 0-1'	CC-36 0-1'	CC-37 0-1'	CC-38 1-2'
Sparcode	**Parameter**	**Unit**	**MDL**					
PHYSICAL								
00250760	Moisture	%(W/W)	0.3		---	---	---	8.6
METALS TOTAL								
Al-TIR03	Aluminum	ug/g	10		---	---	---	1070
Sb-TIR03	Antimony	ug/g	2.0		---	---	---	29.9
As-TIR03	Arsenic	ug/g	0.7		---	---	---	12.6 (1)
Ba-TIR03	Barium	ug/g	0.2		---	---	---	161
Be-TIR03	Beryllium	ug/g	0.1		---	---	---	< 0.1
Bi-TIR03	Bismuth	ug/g	10		---	---	---	< 10
B--TIR03	Boron	ug/g	10		---	---	---	< 10
Cd-TIR03	Cadmium	ug/g	0.2		---	---	---	6.7
Ca-TIR03	Calcium	ug/g	20		---	---	---	2370
Cr-TIR03	Chromium	ug/g	0.2		---	---	---	34.7
Co-TIR03	Cobalt	ug/g	0.3		---	---	---	2.7 (2)
Cu-TIR03	Copper	ug/g	0.5		---	---	---	94.7
EX994288	Dry & Grind	date			01/09/04	01/09/04	01/09/04	01/09/05
Fe-TIR03	Iron	ug/g	10		---	---	---	35100 (3)
Pb-TIR03	Lead	ug/g	2.0		12.5	16.6	36.9	231
Li-TIR03	Lithium	ug/g	0.1		---	---	---	1.8
Mg-TIR03	Magnesium	ug/g	10		---	---	---	563
Mn-TIR03	Manganese	ug/g	0.2		---	---	---	84.2 (5)
Hg-T200M	Mercury	ug/g	0.05		---	---	---	0.09
Mo-TIR03	Molybdenum	ug/g	0.4		---	---	---	23.8
Ni-TIR03	Nickel	ug/g	0.8		---	---	---	11.0 (6)
P--TIR03	Phosphorus Total (P)	ug/g	4.0		---	---	---	461
K--TIR03	Potassium	ug/g	20		---	---	---	285 (4)
Se-TIR03	Selenium	ug/g	1.0		---	---	---	< 1.0
Ag-TIR03	Silver	ug/g	1.0		---	---	---	< 1.0
Na-TIR03	Sodium	ug/g	10		---	---	---	86
Sr-TIR03	Strontium	ug/g	0.1		---	---	---	13.5
S--TIR03	Sulphur	ug/g	20		---	---	---	252
Te-TIR03	Tellurium	ug/g	5.0		---	---	---	< 5.0
Tl-T200G	Thallium	ug/g	1.0		---	---	---	< 1.0
Sn-TIR03	Tin	ug/g	2.0		---	---	---	10.0 (7)
Ti-TIR03	Titanium	ug/g	0.3		---	---	---	240
U--TIR03	Uranium	ug/g	5.0		---	---	---	< 5.0
V--TIR03	Vanadium	ug/g	0.4		---	---	---	25.5

Matrix :	Soil	Soil	Soil	Soil
Sampled on:	01/08/23 16:00	01/08/23 16:00	01/08/23 16:00	01/08/23 16:00

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ANALYTICAL REPORT

Client : PWGSC - ENVIRONMENTAL
Project : 19340-01 CAPE CHRISTIAN, NWT

				Philip ID :	31010955	31010956	31010957	31010958
				Client ID :	CC-35 0-1'	CC-36 0-1'	CC-37 0-1'	CC-38 1-2'
Sparcode	**Parameter**	**Unit**	**MDL**					
Zn-TIR03	Zinc	ug/g	0.5		---	---	---	244 (8)
Zr-TIR03	Zirconium	ug/g	0.5		---	---	---	< 0.5
POLYCHLORINATED BIPHENYLS								
P019P021	PCB's - Total	ug/g	0.05		---	---	---	< 0.05
SURROGATE RECOVERY								
EX9946ZM	PCB Prep - Soils	date			---	---	---	01/09/06
MBBPP021	Monobromobiphenyl	%	40		---	---	---	58
HYDROCARBONS								
H104MSA2	Hydrocarbons C5-C10	ug/g	10		---	---	---	500
EX995143	TEH Prep - soils	date			---	---	---	01/09/01
H109P108	TEH (C11 - C30)	ug/g	10		---	---	---	7200
H910CALC	TPH (Alta MUST)	ug/g			---	---	---	7700
EXTRACTABLE HYDROCARBONS SURROGATE RECOVERY								
T140P108	o-Terphenyl	%	0		---	---	---	52
POLYCYCLIC AROMATIC HYDROCARBONS								
PA04OS12	Benz(a)anthracene	ug/g	0.01		---	---	---	0.18
PA23OS12	7,12-Dimethyl(a)anthracene	ug/g	0.1		---	---	---	< 0.1
PA10OS12	Dibenz(a,h)anthracene	ug/g	0.02		---	---	---	< 0.02
PA09OS12	Chrysene	ug/g	0.01		---	---	---	< 0.25 (9)
PA24OS12	3-Methylcholanthrene	ug/g	0.1		---	---	---	< 0.1
PA06OS12	Benzo(b)Fluoranthene	ug/g	0.01		---	---	---	< 0.17 (9)
PA08OS12	Benzo(k)fluoranthene	ug/g	0.01		---	---	---	< 0.09 (9)
PA22OS12	Benzo(j)fluoranthene	ug/g	0.01		---	---	---	< 0.17 (9)
PA07OS12	Benzo(g,h,i)perylene	ug/g	0.02		---	---	---	< 0.05 (9)
PA21OS12	Benzo(c)phenanthrene	ug/g	0.02		---	---	---	< 0.02
PA16OS12	Pyrene	ug/g	0.01		---	---	---	0.72
PA05OS12	Benzo(a)pyrene	ug/g	0.01		---	---	---	< 0.12 (9)
PA27OS12	Dibenzo(a,h)pyrene	ug/g	0.1		---	---	---	< 0.1
PA26OS12	Dibenzo(a,i)pyrene	ug/g	0.1		---	---	---	< 0.1
PA25OS12	Dibenzo(a,l)pyrene	ug/g	0.1		---	---	---	< 0.1
PA13OS12	Indeno(1,2,3-c,d)pyrene	ug/g	0.02		---	---	---	< 0.04 (9)
PA01OS12	Acenaphthene	ug/g	0.01		---	---	---	< 0.01
PA02OS12	Acenaphthylene	ug/g	0.01		---	---	---	< 0.01
PA03OS12	Anthracene	ug/g	0.01		---	---	---	< 0.01
				Matrix :	Soil	Soil	Soil	Soil
				Sampled on:	01/08/23 16:00	01/08/23 16:00	01/08/23 16:00	01/08/23 16:00

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ANALYTICAL REPORT

Client : PWGSC - ENVIRONMENTAL
Project : 19340-01 CAPE CHRISTIAN, NWT

				Philip ID :	31010955	31010956	31010957	31010958
				Client ID :	CC-35 0-1'	CC-36 0-1'	CC-37 0-1'	CC-38 1-2'
Sparcode	**Parameter**	**Unit**	**MDL**					
PA11OS12	Fluoranthene	ug/g	0.01		---	---	---	< 0.18 (9)
PA12OS12	Fluorene	ug/g	0.01		---	---	---	< 0.01
PA15OS12	Phenanthrene	ug/g	0.01		---	---	---	< 0.40 (9)
PAHtCAL2	Total PAH's	ug/g			---	---	---	0.90
PAH_CAL2	Total Low MW PAH's	ug/g			---	---	---	< 0.010
PAHhCAL2	Total High MW PAH's	ug/g			---	---	---	0.90
SURROGATE RECOVERY								
EX9946Z2	Soil prep for PAH	date			---	---	---	01/09/05
AcenOS12	d10-Acenaphthene	%	0		---	---	---	92
PhenOS12	d10-Phenanthrene	%	0		---	---	---	71
ChryOS12	d12-Chrysene	%	0		---	---	---	66
PeryOS12	d12-Perylene	%	0		---	---	---	47
VOLATILE ORGANICS								
EX995161	VOC soil prep	date			---	---	---	01/09/01
V901MSA2	Chloromethane	ug/g	0.2		---	---	---	< 0.2
V902MSA2	Vinyl Chloride	ug/g	0.05		---	---	---	< 0.05
V903MSA2	Bromomethane	ug/g	0.2		---	---	---	< 0.2
V905MSA2	Trichlorofluoromethane	ug/g	0.06		---	---	---	< 0.06
V906MSA2	1,1-Dichloroethene	ug/g	0.04		---	---	---	< 0.04
V907MSA2	Dichloromethane	ug/g	0.1		---	---	---	0.3
V908MSA2	trans 1,2-Dichloroethene	ug/g	0.02		---	---	---	< 0.02
V909MSA2	1,1-Dichloroethane	ug/g	0.05		---	---	---	< 0.05
V910MSA2	cis 1,2-Dichloroethene	ug/g	0.03		---	---	---	< 0.03
V933MSA2	Bromochloromethane	ug/g	0.05		---	---	---	< 0.05
C032MSA2	Chloroform	ug/g	0.03		---	---	---	< 0.03
V911MSA2	1,1,1-Trichloroethane	ug/g	0.05		---	---	---	0.11
MTBEMSA2	Methyl t-butyl ether	ug/g	0.05		---	---	---	< 0.05
C034MSA2	Carbon tetrachloride	ug/g	0.02		---	---	---	< 0.02
B020MSA2	Benzene	ug/g	0.02		---	---	---	0.02
V912MSA2	1,2-Dichloroethane	ug/g	0.04		---	---	---	< 0.04
T029MSA2	Trichloroethene	ug/g	0.03		---	---	---	2.5
V913MSA2	1,2-Dichloropropane	ug/g	0.05		---	---	---	< 0.05
B012MSA2	Bromodichloromethane	ug/g	0.05		---	---	---	0.09
V915MSA2	cis 1,3-Dichloropropene	ug/g	0.05		---	---	---	< 0.05
T001MSA2	Toluene	ug/g	0.04		---	---	---	0.18
V916MSA2	trans 1,3-Dichloropropene	ug/g	0.05		---	---	---	< 0.05
V917MSA2	1,1,2-Trichloroethane	ug/g	0.05		---	---	---	0.30
				Matrix :	Soil	Soil	Soil	Soil
				Sampled on:	01/08/23 16:00	01/08/23 16:00	01/08/23 16:00	01/08/23 16:00

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ANALYTICAL SERVICES

ANALYTICAL REPORT

Client : PWGSC - ENVIRONMENTAL
Project : 19340-01 CAPE CHRISTIAN, NWT

Sparcode	Parameter	Unit	MDL	Philip ID : 31010955 Client ID : CC-35 0-1'	31010956 CC-36 0-1'	31010957 CC-37 0-1'	31010958 CC-38 1-2'
T030MSA2	Tetrachloroethene	ug/g	0.02	---	---	---	< 0.02
C033MSA2	Dibromochloromethane	ug/g	0.03	---	---	---	< 0.03
V918MSA2	Ethylene Dibromide	ug/g	0.05	---	---	---	< 0.05
V919MSA2	Chlorobenzene	ug/g	0.05	---	---	---	< 0.05
B021MSA2	Ethylbenzene	ug/g	0.04	---	---	---	0.14
V920MSA2	m+p-Xylenes	ug/g	0.05	---	---	---	0.84
V921MSA2	Styrene	ug/g	0.04	---	---	---	0.74
B013MSA2	Bromoform	ug/g	0.03	---	---	---	< 0.03
V922MSA2	o-Xylene	ug/g	0.04	---	---	---	1.3
PA14OS12	Naphthalene	ug/g	0.01	---	---	---	< 1.9 (9)
V923MSA2	1,1,2,2-Tetrachloroethane	ug/g	0.04	---	---	---	3.2
V926MSA2	1,4-Dichlorobenzene	ug/g	0.02	---	---	---	< 0.02
V924MSA2	1,2-Dichlorobenzene	ug/g	0.04	---	---	---	< 0.04
V925MSA2	1,3-Dichlorobenzene	ug/g	0.03	---	---	---	< 0.03
SURROGATE RECOVERY							
VS01MSA2	Bromofluorobenzene	%	0	---	---	---	82
VS02MSA2	d4-1,2-dichloroethane	%	0	---	---	---	89
VS03MSA2	d8-Toluene	%	0	---	---	---	89
				Matrix : Soil	Soil	Soil	Soil
				Sampled on: 01/08/23 16:00	01/08/23 16:00	01/08/23 16:00	01/08/23 16:00

Result comments and/or text results :

(1) DUPLICATES DO NOT MATCH FOR ARSENIC DUE TO NON-HOMOGENEOUS SAMPLE
(2) DUPLICATES DO NOT MATCH FOR COBALT DUE TO NON-HOMOGENEOUS SAMPLE
(3) DUPLICATES DO NOT MATCH FOR IRON DUE TO NON-HOMOGENEOUS SAMPLE
(4) DUPLICATES DO NOT MATCH FOR POTASSIUM DUE TO NON-HOMOGENEOUS SAMPLE
(5) DUPLICATES DO NOT MATCH FOR MANGANESE DUE TO NON-HOMOGENEOUS SAMPLE
(6) DUPLICATES DO NOT MATCH FOR NICKEL DUE TO NON-HOMOGENEOUS SAMPLE
(7) DUPLICATES DO NOT MATCH FOR TIN DUE TO NON-HOMOGENEOUS SAMPLE
(8) DUPLICATES DO NOT MATCH FOR ZINC DUE TO NON-HOMOGENEOUS SAMPLE
(9) MDL raised due to failed ion ratio.

ANALYTICAL REPORT

Client : PWGSC - ENVIRONMENTAL
Project : 19340-01 CAPE CHRISTIAN, NWT

Sparcode	Parameter	Unit	MDL	Philip ID : 31010959 Client ID : CC-38 3-4'	31010960 CC-39 1-2'	31010961 CC-39 3-4'	31010962 CC-40 0-1'
PHYSICAL							
00250760	Moisture	%(W/W)	0.3	7.3	9.4	7.0	19.2
METALS TOTAL							
Al-TIR03	Aluminum	ug/g	10	970	1680	1650	1210
Sb-TIR03	Antimony	ug/g	2.0	28.8	9.1	31.0	8.4
As-TIR03	Arsenic	ug/g	0.7	3.3	2.2	3.2	1.5
Ba-TIR03	Barium	ug/g	0.2	138	39.5	35.3	15.5
Be-TIR03	Beryllium	ug/g	0.1	< 0.1	0.1	0.1	< 0.1
Bi-TIR03	Bismuth	ug/g	10	< 10	< 10	< 10	< 10
B--TIR03	Boron	ug/g	10	< 10	< 10	< 10	< 10
Cd-TIR03	Cadmium	ug/g	0.2	7.4	8.5	6.1	2.1
Ca-TIR03	Calcium	ug/g	20	2230	7160	5360	2470
Cr-TIR03	Chromium	ug/g	0.2	29.8	20.9	15.1	9.4
Co-TIR03	Cobalt	ug/g	0.3	1.8	1.9	1.9	1.3
Cu-TIR03	Copper	ug/g	0.5	75.2	49.7	41.8	234
EX994288	Dry & Grind	date		01/09/05	01/09/05	01/09/05	01/09/05
Fe-TIR03	Iron	ug/g	10	18000	13400	14500	11600
Pb-TIR03	Lead	ug/g	2.0	226	260	7350	26.7
Li-TIR03	Lithium	ug/g	0.1	1.6	2.4	3.0	1.9
Mg-TIR03	Magnesium	ug/g	10	543	1040	1120	675
Mn-TIR03	Manganese	ug/g	0.2	74.5	84.9	70.2	47.0
Hg-T200M	Mercury	ug/g	0.05	0.09	0.11	< 0.05	0.31
Mo-TIR03	Molybdenum	ug/g	0.4	20.0	1.1	0.6	< 0.4
Ni-TIR03	Nickel	ug/g	0.8	5.3	5.1	5.6	3.1
P--TIR03	Phosphorus Total (P)	ug/g	4.0	397	368	309	1290
K--TIR03	Potassium	ug/g	20	262	436	393	349
Se-TIR03	Selenium	ug/g	1.0	< 1.0	1.0	< 1.0	< 1.0
Ag-TIR03	Silver	ug/g	1.0	< 1.0	< 1.0	< 1.0	7.3
Na-TIR03	Sodium	ug/g	10	76	124	80	79
Sr-TIR03	Strontium	ug/g	0.1	13.3	19.9	14.9	4.3
S--TIR03	Sulphur	ug/g	20	261	262	231	530
Te-TIR03	Tellurium	ug/g	5.0	< 5.0	< 5.0	< 5.0	< 5.0
Tl-T200G	Thallium	ug/g	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Sn-TIR03	Tin	ug/g	2.0	6.8	5.5	5.0	20.8
Ti-TIR03	Titanium	ug/g	0.3	198	278	218	193
				Matrix : Soil	Soil	Soil	Soil
				Sampled on: 01/08/23 16:00	01/08/23 16:00	01/08/23 16:00	01/08/23 16:00

Sample 31010962 comment : SURROGATE RECOVERY HIGH DUE TO SAMPLE MATRIX INTERFERENCE

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ANALYTICAL REPORT

Client : PWGSC - ENVIRONMENTAL
Project : 19340-01 CAPE CHRISTIAN, NWT

Sparcode	Parameter	Unit	MDL	Philip ID : 31010959 Client ID : CC-38 3-4'	31010960 CC-39 1-2'	31010961 CC-39 3-4'	31010962 CC-40 0-1'
U--TIR03	Uranium	ug/g	5.0	< 5.0	< 5.0	< 5.0	< 5.0
V--TIR03	Vanadium	ug/g	0.4	25.9	18.8	21.1	15.1
Zn-TIR03	Zinc	ug/g	0.5	303	355	154	281
Zr-TIR03	Zirconium	ug/g	0.5	< 0.5	0.5	< 0.5	< 0.5
POLYCHLORINATED BIPHENYLS							
P019P021	PCB's - Total	ug/g	0.05	< 0.05	< 0.05	< 0.05	0.62
SURROGATE RECOVERY							
EX9946ZM	PCB Prep - Soils	date		01/09/06	01/09/06	01/09/06	01/09/06
MBBPP021	Monobromobiphenyl	%	40	88	79	80	82
HYDROCARBONS							
H104MSA2	Hydrocarbons C5-C10	ug/g	10	580	100	220	< 10
EX995143	TEH Prep - soils	date		01/09/01	01/09/01	01/09/01	01/09/01
H109P108	TEH (C11 - C30)	ug/g	10	6400	5600	4800	7400
H910CALC	TPH (Alta MUST)	ug/g		7000	5700	5000	7400
EXTRACTABLE HYDROCARBONS SURROGATE RECOVERY							
T140P108	o-Terphenyl	%	0	55	51	52	384
POLYCYCLIC AROMATIC HYDROCARBONS							
PA04OS12	Benz(a)anthracene	ug/g	0.01	0.20	< 0.07 (1)	< 0.06 (1)	< 0.05 (1)
PA23OS12	7,12-Dimethyl(a)anthracene	ug/g	0.1	< 0.1	< 0.1	< 0.1	< 0.1
PA10OS12	Dibenz(a,h)anthracene	ug/g	0.02	< 0.02	< 0.02	< 0.02	< 0.02
PA09OS12	Chrysene	ug/g	0.01	< 0.25 (1)	< 0.18 (1)	< 0.15 (1)	0.07
PA24OS12	3-Methylcholanthrene	ug/g	0.1	< 0.1	< 0.1	< 0.1	< 0.1
PA06OS12	Benzo(b)Fluoranthene	ug/g	0.01	< 0.23 (1)	< 0.07 (1)	< 0.07 (1)	< 0.04 (1)
PA08OS12	Benzo(k)fluoranthene	ug/g	0.01	< 0.13 (1)	< 0.04 (1)	< 0.01	< 0.03 (1)
PA22OS12	Benzo(j)fluoranthene	ug/g	0.01	< 0.23 (1)	< 0.07 (1)	< 0.07 (1)	< 0.04 (1)
PA07OS12	Benzo(g,h,i)perylene	ug/g	0.02	< 0.05 (1)	< 0.03 (1)	< 0.02	< 0.02
PA21OS12	Benzo(c)phenanthrene	ug/g	0.02	< 0.03 (1)	< 0.02	< 0.02	< 0.02 (1)
PA16OS12	Pyrene	ug/g	0.01	0.74	0.43	0.34	< 0.15 (1)
PA05OS12	Benzo(a)pyrene	ug/g	0.01	< 0.11 (1)	< 0.03 (1)	< 0.02 (1)	< 0.02 (1)
PA27OS12	Dibenzo(a,h)pyrene	ug/g	0.1	< 0.1	< 0.1	< 0.1	< 0.1
PA26OS12	Dibenzo(a,i)pyrene	ug/g	0.1	< 0.1	< 0.1	< 0.1	< 0.1
PA25OS12	Dibenzo(a,l)pyrene	ug/g	0.1	< 0.1	< 0.1	< 0.1	< 0.1
				Matrix : Soil	Soil	Soil	Soil
				Sampled on: 01/08/23 16:00	01/08/23 16:00	01/08/23 16:00	01/08/23 16:00

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ANALYTICAL SERVICES

ANALYTICAL REPORT

Client : PWGSC - ENVIRONMENTAL
Project : 19340-01 CAPE CHRISTIAN, NWT

Sparcode	Parameter	Unit	MDL	Philip ID : 31010959 Client ID : CC-38 3-4'	31010960 CC-39 1-2'	31010961 CC-39 3-4'	31010962 CC-40 0-1'
PA13OS12	Indeno(1,2,3-c,d)pyrene	ug/g	0.02	< 0.05 (1)	< 0.02	< 0.02	< 0.02
PA01OS12	Acenaphthene	ug/g	0.01	< 0.01	< 0.20 (2)	< 0.20 (2)	< 0.01
PA02OS12	Acenaphthylene	ug/g	0.01	< 0.34 (1)	< 0.20 (2)	< 0.20 (2)	< 0.03 (1)
PA03OS12	Anthracene	ug/g	0.01	< 0.01	< 0.20 (2)	< 0.20 (2)	< 0.03 (1)
PA11OS12	Fluoranthene	ug/g	0.01	< 0.23 (1)	< 0.20 (2)	< 0.01	< 0.18 (1)
PA12OS12	Fluorene	ug/g	0.01	< 0.01	< 0.20 (2)	< 0.20 (2)	< 0.01
PA15OS12	Phenanthrene	ug/g	0.01	< 0.49 (1)	< 0.20 (3)	< 0.13 (1)	< 0.14 (1)
PAHtCAL2	Total PAH's	ug/g		0.94	0.63	0.34	0.11
PAH_CAL2	Total Low MW PAH's	ug/g		< 0.010	0.20	< 0.010	0.040
PAHhCAL2	Total High MW PAH's	ug/g		0.94	0.43	0.34	0.070
SURROGATE RECOVERY							
EX9946Z2	Soil prep for PAH	date		01/09/05	01/09/05	01/09/05	01/09/05
AcenOS12	d10-Acenaphthene	%	0	109	80	82	75
PhenOS12	d10-Phenanthrene	%	0	95	98	86	83
ChryOS12	d12-Chrysene	%	0	98	110	97	90
PeryOS12	d12-Perylene	%	0	68	77	69	67
VOLATILE ORGANICS							
EX995161	VOC soil prep	date		01/09/01	01/09/01	01/09/01	01/09/01
V901MSA2	Chloromethane	ug/g	0.2	< 0.2	< 0.2	< 0.2	< 0.2
V902MSA2	Vinyl Chloride	ug/g	0.05	< 0.05	< 0.05	< 0.05	< 0.05
V903MSA2	Bromomethane	ug/g	0.2	< 0.2	< 0.2	< 0.2	< 0.2
V905MSA2	Trichlorofluoromethane	ug/g	0.06	< 0.06	< 0.06	< 0.06	< 0.06
V906MSA2	1,1-Dichloroethene	ug/g	0.04	< 0.04	< 0.04	< 0.04	< 0.04
V907MSA2	Dichloromethane	ug/g	0.1	0.5	0.4	0.4	0.4
V908MSA2	trans 1,2-Dichloroethene	ug/g	0.02	< 0.02	< 0.02	< 0.02	< 0.02
V909MSA2	1,1-Dichloroethane	ug/g	0.05	< 0.05	< 0.05	< 0.05	< 0.05
V910MSA2	cis 1,2-Dichloroethene	ug/g	0.03	< 0.03	< 0.03	< 0.03	< 0.03
V933MSA2	Bromochloromethane	ug/g	0.05	< 0.05	< 0.05	< 0.05	< 0.05
C032MSA2	Chloroform	ug/g	0.03	< 0.03	< 0.03	< 0.03	< 0.03
V911MSA2	1,1,1-Trichloroethane	ug/g	0.05	0.13	< 0.05	< 0.05	< 0.05
MTBEMSA2	Methyl t-butyl ether	ug/g	0.05	< 0.05	< 0.05	< 0.05	< 0.05
C034MSA2	Carbon tetrachloride	ug/g	0.02	< 0.02	< 0.02	< 0.02	< 0.02
B020MSA2	Benzene	ug/g	0.02	< 0.02	< 0.02	< 0.02	< 0.02
V912MSA2	1,2-Dichloroethane	ug/g	0.04	< 0.04	< 0.04	< 0.04	< 0.04
T029MSA2	Trichloroethene	ug/g	0.03	2.5	0.18	0.29	< 0.03
				Matrix : Soil	Soil	Soil	Soil
				Sampled on: 01/08/23 16:00	01/08/23 16:00	01/08/23 16:00	01/08/23 16:00

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ANALYTICAL SERVICES

26-Oct-01

ANALYTICAL REPORT

Client : PWGSC - ENVIRONMENTAL
Project : 19340-01 CAPE CHRISTIAN, NWT

Sparcode	Parameter	Unit	MDL	Philip ID : 31010959 Client ID : CC-38 3-4'	31010960 CC-39 1-2'	31010961 CC-39 3-4'	31010962 CC-40 0-1'
V913MSA2	1,2-Dichloropropane	ug/g	0.05	< 0.05	< 0.05	< 0.05	< 0.05
B012MSA2	Bromodichloromethane	ug/g	0.05	< 0.05	< 0.05	< 0.05	< 0.05
V915MSA2	cis 1,3-Dichloropropene	ug/g	0.05	< 0.05	< 0.05	< 0.05	< 0.05
T001MSA2	Toluene	ug/g	0.04	0.16	0.06	0.05	0.06
V916MSA2	trans 1,3-Dichloropropene	ug/g	0.05	< 0.05	< 0.05	< 0.05	< 0.05
V917MSA2	1,1,2-Trichloroethane	ug/g	0.05	0.32	< 0.05	< 0.05	< 0.05
T030MSA2	Tetrachloroethene	ug/g	0.02	< 0.02	< 0.02	< 0.02	< 0.02
C033MSA2	Dibromochloromethane	ug/g	0.03	< 0.03	< 0.03	< 0.03	< 0.03
V918MSA2	Ethylene Dibromide	ug/g	0.05	< 0.05	< 0.05	< 0.05	< 0.05
V919MSA2	Chlorobenzene	ug/g	0.05	< 0.05	< 0.05	< 0.05	< 0.05
B021MSA2	Ethylbenzene	ug/g	0.04	0.09	< 0.04	< 0.04	< 0.04
V920MSA2	m+p-Xylenes	ug/g	0.05	0.45	0.11	0.07	0.07
V921MSA2	Styrene	ug/g	0.04	0.34	< 0.04	< 0.04	0.07
B013MSA2	Bromoform	ug/g	0.03	< 0.03	< 0.03	< 0.03	< 0.03
V922MSA2	o-Xylene	ug/g	0.04	1.0	0.06	< 0.04	< 0.04
PA14OS12	Naphthalene	ug/g	0.01	< 2.4 (1)	0.20	< 0.21 (1)	0.04
V923MSA2	1,1,2,2-Tetrachloroethane	ug/g	0.04	3.4	0.41	0.87	0.19
V926MSA2	1,4-Dichlorobenzene	ug/g	0.02	< 0.02	< 0.02	< 0.02	0.11
V924MSA2	1,2-Dichlorobenzene	ug/g	0.04	< 0.04	< 0.04	< 0.04	< 0.04
V925MSA2	1,3-Dichlorobenzene	ug/g	0.03	< 0.03	< 0.03	< 0.03	< 0.03
SURROGATE RECOVERY							
VS01MSA2	Bromofluorobenzene	%	0	85	85	83	83
VS02MSA2	d4-1,2-dichloroethane	%	0	88	89	88	87
VS03MSA2	d8-Toluene	%	0	91	89	89	91
				Matrix : Soil	Soil	Soil	Soil
				Sampled on: 01/08/23 16:00	01/08/23 16:00	01/08/23 16:00	01/08/23 16:00

Result comments and/or text results :

(1) MDL raised due to failed ion ratio.
(2) MDL raised due to high sample background.
(3) MDL raised due to high sample background.,

ANALYTICAL SERVICES

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ANALYTICAL REPORT

Client : PWGSC - ENVIRONMENTAL
Project : 19340-01 CAPE CHRISTIAN, NWT

				Philip ID :	31010963	31010964	31010965	31010966
				Client ID :	CC-41 0-1'	CC-42 0-1'	CC-43 0-1'	CC-44 0-1'
Sparcode	**Parameter**	**Unit**	**MDL**					
PHYSICAL								
00250760	Moisture	%(W/W)	0.3		12.7	13.4	25.9	6.8
METALS TOTAL								
Al-TIR03	Aluminum	ug/g	10		1360	1090	1860	---
Sb-TIR03	Antimony	ug/g	2.0		< 2.0	< 2.0	14.6	---
As-TIR03	Arsenic	ug/g	0.7		1.4	0.8	1.6	---
Ba-TIR03	Barium	ug/g	0.2		9.8	7.2	22.2	---
Be-TIR03	Beryllium	ug/g	0.1		< 0.1	< 0.1	< 0.1	---
Bi-TIR03	Bismuth	ug/g	10		< 10	< 10	< 10	---
B--TIR03	Boron	ug/g	10		< 10	< 10	< 10	---
Cd-TIR03	Cadmium	ug/g	0.2		< 0.2	< 0.2	1.6	---
Ca-TIR03	Calcium	ug/g	20		1260	1200	1720	---
Cr-TIR03	Chromium	ug/g	0.2		6.8	5.7	10.7	---
Co-TIR03	Cobalt	ug/g	0.3		1.5	1.2	2.0	---
Cu-TIR03	Copper	ug/g	0.5		15.3	12.3	273	---
EX994288	Dry & Grind	date			01/09/05	01/09/05	01/09/05	---
Fe-TIR03	Iron	ug/g	10		9220	6960	12200	---
Pb-TIR03	Lead	ug/g	2.0		3.6	< 2.0	19.3	---
Li-TIR03	Lithium	ug/g	0.1		2.2	2.0	2.7	---
Mg-TIR03	Magnesium	ug/g	10		757	638	961	---
Mn-TIR03	Manganese	ug/g	0.2		33.2	27.6	45.4	---
Hg-T200M	Mercury	ug/g	0.05		< 0.05	< 0.05	0.21	---
Mo-TIR03	Molybdenum	ug/g	0.4		< 0.4	< 0.4	< 0.4	---
Ni-TIR03	Nickel	ug/g	0.8		2.0	1.7	4.2	---
P--TIR03	Phosphorus Total (P)	ug/g	4.0		507	434	1080	---
K--TIR03	Potassium	ug/g	20		476	358	540	---
Se-TIR03	Selenium	ug/g	1.0		< 1.0	< 1.0	< 1.0	---
Ag-TIR03	Silver	ug/g	1.0		< 1.0	< 1.0	6.8	---
Na-TIR03	Sodium	ug/g	10		71	47	77	---
Sr-TIR03	Strontium	ug/g	0.1		2.7	2.4	5.7	---
S--TIR03	Sulphur	ug/g	20		103	97	457	---
Te-TIR03	Tellurium	ug/g	5.0		< 5.0	< 5.0	< 5.0	---
Tl-T200G	Thallium	ug/g	1.0		< 1.0	< 1.0	< 1.0	---
Sn-TIR03	Tin	ug/g	2.0		2.6	< 2.0	14.2	---

Matrix :	Soil	Soil	Soil	Soil
Sampled on:	01/08/23 16:00	01/08/24 16:00	01/08/24 16:00	01/08/24 16:00

Sample 31010963 comment : SPIKE RECOVERY LOW DUE TO NON-HOMOGENEOUS SAMPLE
Sample 31010964 comment : DUPLICATES DO NOT MATCH DUE TO NON-HOMOGENEOUS SAMPLE

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ANALYTICAL SERVICES

ANALYTICAL REPORT

Client : PWGSC - ENVIRONMENTAL
Project : 19340-01 CAPE CHRISTIAN, NWT

Sparcode	Parameter	Unit	MDL	Philip ID : 31010963 Client ID : CC-41 0-1'	31010964 CC-42 0-1'	31010965 CC-43 0-1'	31010966 CC-44 0-1'
Ti-TIR03	Titanium	ug/g	0.3	226	180	276	---
U--TIR03	Uranium	ug/g	5.0	< 5.0	< 5.0	< 5.0	---
V--TIR03	Vanadium	ug/g	0.4	18.6	13.9	20.1	---
Zn-TIR03	Zinc	ug/g	0.5	35.6	23.7	289	---
Zr-TIR03	Zirconium	ug/g	0.5	< 0.5	< 0.5	< 0.5	---
POLYCHLORINATED BIPHENYLS							
P019P021	PCB's - Total	ug/g	0.05	< 0.05	< 0.05	0.64	---
SURROGATE RECOVERY							
EX9946ZM	PCB Prep - Soils	date		01/09/06	01/09/06	01/09/06	---
MBBPP021	Monobromobiphenyl	%	40	84	78	85	---
HYDROCARBONS							
H104MSA2	Hydrocarbons C5-C10	ug/g	10	< 10	< 10	< 10	---
EX995149	PHC EXT F2 - 4	date		---	---	---	01/09/05
EX995143	TEH Prep - soils	date		01/09/01	01/09/01	01/09/01	---
EX995170	Volat. Soil Extract.	date		---	---	---	01/09/04
H109P108	TEH (C11 - C30)	ug/g	10	340	250	2600	---
H910CALC	TPH (Alta MUST)	ug/g		340	250	2600	---
PHC1PHCV	CCME PHC F1 C6-10	ug/g	10	---	---	---	130
HC1-CALC	CCME PHC Fl-BTEX	ug/g		---	---	---	130
PHC2PHCS	CCME PHC F2 C10-16	ug/g	10	---	---	---	8800
PHC3PHCS	CCME PHC F3 C16-34	ug/g	10	---	---	---	8200
PHC4PHCS	CCME PHC F4 C34-50+	ug/g	10	---	---	---	260
BASEPHCS	PHC F2-4 BASELINE 0	Y/N	Yes	---	---	---	Yes
EXTRACTABLE HYDROCARBONS SURROGATE RECOVERY							
T140P108	o-Terphenyl	%	0	84	85	105	---
POLYCYCLIC AROMATIC HYDROCARBONS							
PA04OS12	Benz(a)anthracene	ug/g	0.01	< 0.02 (1)	0.05	0.16	---
PA23OS12	7,12-Dimethyl(a)anthracene	ug/g	0.1	< 0.1	< 0.1	< 0.1	---
PA10OS12	Dibenz(a,h)anthracene	ug/g	0.02	< 0.02	< 0.02	< 0.02	---
PA09OS12	Chrysene	ug/g	0.01	0.03	0.07	0.18	---
PA24OS12	3-Methylcholanthrene	ug/g	0.1	< 0.1	< 0.1	< 0.1	---
				Matrix : Soil	Soil	Soil	Soil
				Sampled on: 01/08/23 16:00	01/08/24 16:00	01/08/24 16:00	01/08/24 16:00

Sample 31010963 comment : SPIKE RECOVERY LOW DUE TO NON-HOMOGENEOUS SAMPLE
Sample 31010964 comment : DUPLICATES DO NOT MATCH DUE TO NON-HOMOGENEOUS SAMPLE

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ANALYTICAL REPORT

Client : PWGSC - ENVIRONMENTAL
Project : 19340-01 CAPE CHRISTIAN, NWT

Sparcode	Parameter	Unit	MDL	Philip ID : 31010963 Client ID : CC-41 0-1'	31010964 CC-42 0-1'	31010965 CC-43 0-1'	31010966 CC-44 0-1'
PA06OS12	Benzo(b)Fluoranthene	ug/g	0.01	0.02	0.05	0.17	---
PA08OS12	Benzo(k)fluoranthene	ug/g	0.01	< 0.01 (1)	0.03	0.10	---
PA22OS12	Benzo(j)fluoranthene	ug/g	0.01	0.02	0.05	0.17	---
PA07OS12	Benzo(g,h,i)perylene	ug/g	0.02	< 0.02	< 0.02	< 0.03 (1)	---
PA21OS12	Benzo(c)phenanthrene	ug/g	0.02	< 0.02	< 0.02	< 0.02 (1)	---
PA16OS12	Pyrene	ug/g	0.01	0.07	0.18	< 0.30 (1)	---
PA05OS12	Benzo(a)pyrene	ug/g	0.01	< 0.01	0.03	< 0.07 (1)	---
PA27OS12	Dibenzo(a,h)pyrene	ug/g	0.1	< 0.1	< 0.1	< 0.1	---
PA26OS12	Dibenzo(a,i)pyrene	ug/g	0.1	< 0.1	< 0.1	< 0.1	---
PA25OS12	Dibenzo(a,l)pyrene	ug/g	0.1	< 0.1	< 0.1	< 0.1	---
PA13OS12	Indeno(1,2,3-c,d)pyrene	ug/g	0.02	< 0.02	< 0.02	0.07	---
PA01OS12	Acenaphthene	ug/g	0.01	0.02	0.17	0.15	---
PA02OS12	Acenaphthylene	ug/g	0.01	< 0.01	< 0.02 (1)	< 0.02 (1)	---
PA03OS12	Anthracene	ug/g	0.01	< 0.01	< 0.02 (1)	< 0.04 (1)	---
PA11OS12	Fluoranthene	ug/g	0.01	0.10	0.23	< 0.33 (1)	---
PA12OS12	Fluorene	ug/g	0.01	< 0.01	0.07	0.07	---
PA15OS12	Phenanthrene	ug/g	0.01	< 0.04 (1)	0.18	< 0.20 (1)	---
PAHtCAL2	Total PAH's	ug/g		0.26	1.1	1.1	---
PAH_CAL2	Total Low MW PAH's	ug/g		0.020	0.42	0.25	---
PAHhCAL2	Total High MW PAH's	ug/g		0.24	0.69	0.85	---
SURROGATE RECOVERY							
EX9946Z2	Soil prep for PAH	date		01/09/05	01/09/05	01/09/05	---
AcenOS12	d10-Acenaphthene	%	0	69	74	89	---
PhenOS12	d10-Phenanthrene	%	0	77	81	109	---
ChryOS12	d12-Chrysene	%	0	78	85	120	---
PeryOS12	d12-Perylene	%	0	72	78	91	---
VOLATILE ORGANICS							
EX995161	VOC soil prep	date		01/09/01	01/09/01	01/09/01	---
V901MSA2	Chloromethane	ug/g	0.2	< 0.2	< 0.2	< 0.2	---
V902MSA2	Vinyl Chloride	ug/g	0.05	< 0.05	< 0.05	< 0.05	---
V903MSA2	Bromomethane	ug/g	0.2	< 0.2	< 0.2	< 0.2	---
V905MSA2	Trichlorofluoromethane	ug/g	0.06	< 0.06	< 0.06	< 0.06	---
V906MSA2	1,1-Dichloroethene	ug/g	0.04	< 0.04	< 0.04	< 0.04	---
V907MSA2	Dichloromethane	ug/g	0.1	0.4	0.3	0.3	---
			Matrix :	Soil	Soil	Soil	Soil
			Sampled on:	01/08/23 16:00	01/08/24 16:00	01/08/24 16:00	01/08/24 16:00

Sample 31010963 comment : SPIKE RECOVERY LOW DUE TO NON-HOMOGENEOUS SAMPLE
Sample 31010964 comment : DUPLICATES DO NOT MATCH DUE TO NON-HOMOGENEOUS SAMPLE

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ANALYTICAL REPORT

Client : PWGSC - ENVIRONMENTAL
Project : 19340-01 CAPE CHRISTIAN, NWT

Sparcode	Parameter	Unit	MDL	Philip ID : 31010963 Client ID : CC-41 0-1'	31010964 CC-42 0-1'	31010965 CC-43 0-1'	31010966 CC-44 0-1'
V908MSA2	trans 1,2-Dichloroethene	ug/g	0.02	< 0.02	< 0.02	< 0.02	---
V909MSA2	1,1-Dichloroethane	ug/g	0.05	< 0.05	< 0.05	< 0.05	---
V910MSA2	cis 1,2-Dichloroethene	ug/g	0.03	< 0.03	< 0.03	< 0.03	---
V933MSA2	Bromochloromethane	ug/g	0.05	< 0.05	< 0.05	< 0.05	---
C032MSA2	Chloroform	ug/g	0.03	< 0.03	< 0.03	< 0.03	---
V911MSA2	1,1,1-Trichloroethane	ug/g	0.05	< 0.05	< 0.05	< 0.05	---
MTBEMSA2	Methyl t-butyl ether	ug/g	0.05	< 0.05	< 0.05	< 0.05	---
C034MSA2	Carbon tetrachloride	ug/g	0.02	< 0.02	< 0.02	< 0.02	---
B020MSA2	Benzene	ug/g	0.02	0.04	< 0.02	< 0.02	---
B020PT12	Benzene	ug/g	0.04	---	---	---	< 0.04
V912MSA2	1,2-Dichloroethane	ug/g	0.04	< 0.04	< 0.04	< 0.04	---
T029MSA2	Trichloroethene	ug/g	0.03	< 0.03	< 0.03	< 0.03	---
V913MSA2	1,2-Dichloropropane	ug/g	0.05	< 0.05	< 0.05	< 0.05	---
B012MSA2	Bromodichloromethane	ug/g	0.05	0.10	< 0.05	< 0.05	---
V915MSA2	cis 1,3-Dichloropropene	ug/g	0.05	< 0.05	< 0.05	< 0.05	---
T001MSA2	Toluene	ug/g	0.04	0.09	< 0.04	< 0.04	---
T001PT12	Toluene	ug/g	0.10	---	---	---	< 0.10
V916MSA2	trans 1,3-Dichloropropene	ug/g	0.05	< 0.05	< 0.05	< 0.05	---
V917MSA2	1,1,2-Trichloroethane	ug/g	0.05	< 0.05	< 0.05	< 0.05	---
T030MSA2	Tetrachloroethene	ug/g	0.02	< 0.02	< 0.02	< 0.02	---
C033MSA2	Dibromochloromethane	ug/g	0.03	< 0.03	< 0.03	< 0.03	---
V918MSA2	Ethylene Dibromide	ug/g	0.05	< 0.05	< 0.05	< 0.05	---
V919MSA2	Chlorobenzene	ug/g	0.05	< 0.05	< 0.05	< 0.05	---
B021MSA2	Ethylbenzene	ug/g	0.04	0.09	< 0.04	< 0.04	---
B021PT12	Ethylbenzene	ug/g	0.10	---	---	---	< 0.10
X003PT12	m+p - Xylene	ug/g	0.10	---	---	---	< 0.10
V920MSA2	m+p-Xylenes	ug/g	0.05	0.19	< 0.05	< 0.05	---
V921MSA2	Styrene	ug/g	0.04	0.05	< 0.04	< 0.04	---
B013MSA2	Bromoform	ug/g	0.03	< 0.03	< 0.03	< 0.03	---
V922MSA2	o-Xylene	ug/g	0.04	0.09	< 0.04	< 0.04	---
PA14OS12	Naphthalene	ug/g	0.01	< 0.01	< 0.01	0.03	---
V923MSA2	1,1,2,2-Tetrachloroethane	ug/g	0.04	< 0.04	< 0.04	< 0.04	---
V926MSA2	1,4-Dichlorobenzene	ug/g	0.02	0.22	< 0.02	0.32	---
V924MSA2	1,2-Dichlorobenzene	ug/g	0.04	0.22	< 0.04	< 0.04	---
V925MSA2	1,3-Dichlorobenzene	ug/g	0.03	0.22	< 0.03	< 0.03	---
X002PT12	o - Xylene	ug/g	0.10	---	---	---	< 0.10
				Matrix : Soil	Soil	Soil	Soil
				Sampled on: 01/08/23 16:00	01/08/24 16:00	01/08/24 16:00	01/08/24 16:00

Sample 31010963 comment : SPIKE RECOVERY LOW DUE TO NON-HOMOGENEOUS SAMPLE
Sample 31010964 comment : DUPLICATES DO NOT MATCH DUE TO NON-HOMOGENEOUS SAMPLE

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ANALYTICAL SERVICES

ANALYTICAL REPORT

Client : PWGSC - ENVIRONMENTAL
Project : 19340-01 CAPE CHRISTIAN, NWT

				Philip ID :	31010963	31010964	31010965	31010966
				Client ID :	CC-41 0-1'	CC-42 0-1'	CC-43 0-1'	CC-44 0-1'
Sparcode	**Parameter**	**Unit**	**MDL**					
SURROGATE RECOVERY								
VS01MSA2	Bromofluorobenzene	%	0		83	83	84	---
VS01PT12	Bromofluorobenzene	%	0		---	---	---	104
VS02MSA2	d4-1,2-dichloroethane	%	0		74	69	67	---
VS03MSA2	d8-Toluene	%	0		94	96	96	---
VS03PT12	d8-Toluene	%	0		---	---	---	98
Ed10PT12	Ethylbenzene-d10	%	60		---	---	---	77
				Matrix :	Soil	Soil	Soil	Soil
				Sampled on:	01/08/23 16:00	01/08/24 16:00	01/08/24 16:00	01/08/24 16:00

Sample 31010963 comment : SPIKE RECOVERY LOW DUE TO NON-HOMOGENEOUS SAMPLE
Sample 31010964 comment : DUPLICATES DO NOT MATCH DUE TO NON-HOMOGENEOUS SAMPLE

Result comments and/or text results :

(1) MDL raised due to failed ion ratio.

ANALYTICAL SERVICES

26-Oct-01

ANALYTICAL REPORT

Client : PWGSC - ENVIRONMENTAL
Project : 19340-01 CAPE CHRISTIAN, NWT

Sparcode	Parameter	Unit	MDL	Philip ID : 31010967 Client ID : CC-45 0-1'	31010968 CC-46 0-1'	31010969 CC-48 0-1'	31010970 CC-51 0-1'
PHYSICAL							
00250760	Moisture	%(W/W)	0.3	6.7	13.2	11.5	13.3
HYDROCARBONS							
EX995149	PHC EXT F2 - 4	date		01/09/05	01/09/06	01/09/06	01/09/06
EX995170	Volat. Soil Extract.	date		01/09/04	01/09/04	01/09/04	01/09/04
PHC1PHCV	CCME PHC F1 C6-10	ug/g	10	130	120	110	190
HC1-CALC	CCME PHC F1-BTEX	ug/g		130	120	110	190
PHC2PHCS	CCME PHC F2 C10-16	ug/g	10	4500	6400	3500	3400
PHC3PHCS	CCME PHC F3 C16-34	ug/g	10	8000	5300	480	180
PHC4PHCS	CCME PHC F4 C34-50+	ug/g	10	1800	300	< 10	< 10
BASEPHCS	PHC F2-4 BASELINE 0	Y/N	Yes	Yes	Yes	Yes	Yes
VOLATILE ORGANICS							
B020PT12	Benzene	ug/g	0.04	< 0.04	< 0.04	< 0.04	< 0.04
T001PT12	Toluene	ug/g	0.10	< 0.10	< 0.10	< 0.10	< 0.10
B021PT12	Ethylbenzene	ug/g	0.10	< 0.10	< 0.10	< 0.10	< 0.10
X003PT12	m+p - Xylene	ug/g	0.10	< 0.10	< 0.10	< 0.10	< 0.10
X002PT12	o - Xylene	ug/g	0.10	< 0.10	< 0.10	< 0.10	< 0.10
SURROGATE RECOVERY							
VS01PT12	Bromofluorobenzene	%	0	103	108	87	80
VS03PT12	d8-Toluene	%	0	100	97	94	97
Ed10PT12	Ethylbenzene-d10	%	60	79	77	85	85
				Matrix : Soil	Soil	Soil	Soil
				Sampled on: 01/08/24 16:00	01/08/24 16:00	01/08/24 16:00	01/08/24 16:00

ANALYTICAL SERVICES

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ANALYTICAL REPORT

Client : PWGSC - ENVIRONMENTAL
Project : 19340-01 CAPE CHRISTIAN, NWT

				Philip ID :	31010971	31010972	31010973	31010974
				Client ID :	CC-54 0-1'	CC-58 0-1'	CC-60 0-1'	CC-62 0-1'
Sparcode	**Parameter**	**Unit**	**MDL**					
PHYSICAL								
00250760	Moisture	%(W/W)	0.3		6.1	13.4	4.3	11.1
HYDROCARBONS								
EX995149	PHC EXT F2 - 4	date			01/09/06	01/09/06	01/09/07	01/09/07
EX995170	Volat. Soil Extract.	date			01/09/04	01/09/04	01/09/04	01/09/04
PHC1PHCV	CCME PHC F1 C6-10	ug/g	10		24	< 10	< 10	54
HC1-CALC	CCME PHC F1-BTEX	ug/g			24	< 10	< 10	54
PHC2PHCS	CCME PHC F2 C10-16	ug/g	10		3000	< 10	520	2700
PHC3PHCS	CCME PHC F3 C16-34	ug/g	10		10000	54	210	91
PHC4PHCS	CCME PHC F4 C34-50+	ug/g	10		3200	23	< 10	< 10
BASEPHCS	PHC F2-4 BASELINE 0	Y/N	Yes		No	Yes	Yes	Yes
VOLATILE ORGANICS								
B020PT12	Benzene	ug/g	0.04		< 0.04	< 0.04	< 0.04	< 0.04
T001PT12	Toluene	ug/g	0.10		< 0.10	< 0.10	< 0.10	< 0.10
B021PT12	Ethylbenzene	ug/g	0.10		< 0.10	< 0.10	< 0.10	< 0.10
X003PT12	m+p - Xylene	ug/g	0.10		< 0.10	< 0.10	< 0.10	< 0.10
X002PT12	o - Xylene	ug/g	0.10		< 0.10	< 0.10	< 0.10	< 0.10
SURROGATE RECOVERY								
VS01PT12	Bromofluorobenzene	%	0		114	98	96	111
VS03PT12	d8-Toluene	%	0		96	99	97	93
Ed10PT12	Ethylbenzene-d10	%	60		80	75	80	81
				Matrix :	Soil	Soil	Soil	Soil
				Sampled on:	01/08/24 16:00	01/08/24 16:00	01/08/24 16:00	01/08/24 16:00

ANALYTICAL SERVICES

DUPLICATE SUMMARY

Parameter	Client ID	Philip ID	Sample Conc.	Duplicate Conc.	MDL	Unit	Relative % Diff.
CCME PHC F1 C6-10	CC-11@0-1'	31010934	100	110	10	ug/g	-9.52
Benzene	CC-11@0-1'	31010934	< 0.04	< 0.04	0.04	ug/g	0.00
Ethylbenzene	CC-11@0-1'	31010934	< 0.10	< 0.10	0.10	ug/g	0.00
Toluene	CC-11@0-1'	31010934	< 0.10	< 0.10	0.10	ug/g	0.00
o - Xylene	CC-11@0-1'	31010934	< 0.10	< 0.10	0.10	ug/g	0.00
m+p - Xylene	CC-11@0-1'	31010934	< 0.10	< 0.10	0.10	ug/g	0.00
Moisture	CC-26 0-1'	31010948	6.5	6.4	0.3	%(W/W)	1.55
PCB's - Total	CC-26 0-1'	31010948	0.09	0.07	0.05	ug/g	25.00
Cadmium	CC-30 0-1'	31010950	1.2	1.3	0.2	ug/g	-8.00
Zinc	CC-30 0-1'	31010950	91.5	72.1	0.5	ug/g	23.72
Silver	CC-38 1-2'	31010958	< 1.0	< 1.0	1.0	ug/g	0.00
Aluminum	CC-38 1-2'	31010958	1070	1210	10	ug/g	-12.28
Arsenic	CC-38 1-2'	31010958	12.6	3.1	0.7	ug/g	121.02
Boron	CC-38 1-2'	31010958	< 10	< 10	10	ug/g	0.00
Barium	CC-38 1-2'	31010958	161	160	0.2	ug/g	0.62
Beryllium	CC-38 1-2'	31010958	< 0.1	< 0.1	0.1	ug/g	0.00
Bismuth	CC-38 1-2'	31010958	< 10	< 10	10	ug/g	0.00
Calcium	CC-38 1-2'	31010958	2370	2210	20	ug/g	6.99
Cadmium	CC-38 1-2'	31010958	6.7	6.0	0.2	ug/g	11.02
Cobalt	CC-38 1-2'	31010958	2.7	2.1	0.3	ug/g	25.00
Chromium	CC-38 1-2'	31010958	34.7	29.6	0.2	ug/g	15.86
Copper	CC-38 1-2'	31010958	94.7	79.4	0.5	ug/g	17.58
Iron	CC-38 1-2'	31010958	35100	17800	10	ug/g	65.41
Potassium	CC-38 1-2'	31010958	285	440	20	ug/g	-42.76
Lithium	CC-38 1-2'	31010958	1.8	1.9	0.1	ug/g	-5.41
Magnesium	CC-38 1-2'	31010958	563	673	10	ug/g	-17.80
Manganese	CC-38 1-2'	31010958	84.2	66.5	0.2	ug/g	23.49
Molybdenum	CC-38 1-2'	31010958	23.8	29.1	0.4	ug/g	-20.04
Sodium	CC-38 1-2'	31010958	86	81	10	ug/g	5.99
Nickel	CC-38 1-2'	31010958	11.0	4.9	0.8	ug/g	76.73
Phosphorus Total (P)	CC-38 1-2'	31010958	461	510	4.0	ug/g	-10.09
Lead	CC-38 1-2'	31010958	231	254	2.0	ug/g	-9.48
Sulphur	CC-38 1-2'	31010958	252	237	20	ug/g	6.13
Antimony	CC-38 1-2'	31010958	29.9	35.2	2.0	ug/g	-16.28
Selenium	CC-38 1-2'	31010958	< 1.0	< 1.0	1.0	ug/g	0.00
Tin	CC-38 1-2'	31010958	10.0	6.8	2.0	ug/g	38.10
Strontium	CC-38 1-2'	31010958	13.5	13.2	0.1	ug/g	2.25
Tellurium	CC-38 1-2'	31010958	< 5.0	< 5.0	5.0	ug/g	0.00

ANALYTICAL SERVICES

DUPLICATE SUMMARY

Parameter	Client ID	Philip ID	Sample Conc.	Duplicate Conc.	MDL	Unit	Relative % Diff.
Titanium	CC-38 1-2'	31010958	240	283	0.3	ug/g	-16.44
Uranium	CC-38 1-2'	31010958	< 5.0	< 5.0	5.0	ug/g	0.00
Vanadium	CC-38 1-2'	31010958	25.5	24.1	0.4	ug/g	5.65
Zinc	CC-38 1-2'	31010958	244	311	0.5	ug/g	-24.14
Zirconium	CC-38 1-2'	31010958	< 0.5	< 0.5	0.5	ug/g	0.00
1,1,2,2-Tetrachloroethane	CC-40 0-1'	31010962	0.19	< 0.04	0.04	ug/g	130.43
1,1,1-Trichloroethane	CC-40 0-1'	31010962	< 0.05	< 0.05	0.05	ug/g	0.00
1,1,2-Trichloroethane	CC-40 0-1'	31010962	< 0.05	< 0.05	0.05	ug/g	0.00
1,1-Dichloroethane	CC-40 0-1'	31010962	< 0.05	< 0.05	0.05	ug/g	0.00
1,1-Dichloroethene	CC-40 0-1'	31010962	< 0.04	< 0.04	0.04	ug/g	0.00
1,2-Dichlorobenzene	CC-40 0-1'	31010962	< 0.04	< 0.04	0.04	ug/g	0.00
1,2-Dichloroethane	CC-40 0-1'	31010962	< 0.04	< 0.04	0.04	ug/g	0.00
1,2-Dichloropropane	CC-40 0-1'	31010962	< 0.05	< 0.05	0.05	ug/g	0.00
1,3-Dichlorobenzene	CC-40 0-1'	31010962	< 0.03	< 0.03	0.03	ug/g	0.00
1,4-Dichlorobenzene	CC-40 0-1'	31010962	0.11	0.04	0.02	ug/g	93.33
Bromochloromethane	CC-40 0-1'	31010962	< 0.05	< 0.05	0.05	ug/g	0.00
Bromoform	CC-40 0-1'	31010962	< 0.03	< 0.03	0.03	ug/g	0.00
Bromomethane	CC-40 0-1'	31010962	< 0.2	< 0.2	0.2	ug/g	0.00
Carbon tetrachloride	CC-40 0-1'	31010962	< 0.02	< 0.02	0.02	ug/g	0.00
Chlorobenzene	CC-40 0-1'	31010962	< 0.05	< 0.05	0.05	ug/g	0.00
Chloroform	CC-40 0-1'	31010962	< 0.03	< 0.03	0.03	ug/g	0.00
Chloromethane	CC-40 0-1'	31010962	< 0.2	< 0.2	0.2	ug/g	0.00
Dibromochloromethane	CC-40 0-1'	31010962	< 0.03	< 0.03	0.03	ug/g	0.00
cis 1,2-Dichloroethene	CC-40 0-1'	31010962	< 0.03	< 0.03	0.03	ug/g	0.00
trans 1,2-Dichloroethene	CC-40 0-1'	31010962	< 0.02	< 0.02	0.02	ug/g	0.00
Dichloromethane	CC-40 0-1'	31010962	0.4	0.3	0.1	ug/g	28.57
cis 1,3-Dichloropropene	CC-40 0-1'	31010962	< 0.05	< 0.05	0.05	ug/g	0.00
trans 1,3-Dichloropropene	CC-40 0-1'	31010962	< 0.05	< 0.05	0.05	ug/g	0.00
Ethylene Dibromide	CC-40 0-1'	31010962	< 0.05	< 0.05	0.05	ug/g	0.00
Methyl t-butyl ether	CC-40 0-1'	31010962	< 0.05	< 0.05	0.05	ug/g	0.00
Tetrachloroethene	CC-40 0-1'	31010962	< 0.02	< 0.02	0.02	ug/g	0.00
Trichloroethene	CC-40 0-1'	31010962	< 0.03	< 0.03	0.03	ug/g	0.00
Trichlorofluoromethane	CC-40 0-1'	31010962	< 0.06	< 0.06	0.06	ug/g	0.00
Vinyl Chloride	CC-40 0-1'	31010962	< 0.05	< 0.05	0.05	ug/g	0.00
Bromodichloromethane	CC-40 0-1'	31010962	< 0.05	< 0.05	0.05	ug/g	0.00
Benzene	CC-40 0-1'	31010962	< 0.02	< 0.02	0.02	ug/g	0.00
Styrene	CC-40 0-1'	31010962	0.07	< 0.04	0.04	ug/g	54.55
Toluene	CC-40 0-1'	31010962	0.06	< 0.04	0.04	ug/g	40.00

ANALYTICAL SERVICES

DUPLICATE SUMMARY

Parameter	Client ID	Philip ID	Sample Conc.	Duplicate Conc.	MDL	Unit	Relative % Diff.
o-Xylene	CC-40 0-1'	31010962	< 0.04	< 0.04	0.04	ug/g	0.00
m+p-Xylenes	CC-40 0-1'	31010962	0.07	< 0.05	0.05	ug/g	33.33
Ethylbenzene	CC-40 0-1'	31010962	< 0.04	< 0.04	0.04	ug/g	0.00
Hydrocarbons C5-C10	CC-40 0-1'	31010962	< 10	< 10	10	ug/g	0.00
TEH (C11 - C30)	CC-42 0-1'	31010964	250	120	10	ug/g	70.27
o-Terphenyl	CC-42 0-1'	31010964	85	91	0	%	-6.82
Moisture	CC-44 0-1'	31010966	6.8	6.7	0.3	%(W/W)	1.48

ANALYTICAL SERVICES

SPIKE SUMMARY

Parameter	Client ID	Philip ID	Sample Conc.	Sample & Spike Conc.	Spike Amount	Unit	Percent Recovery
CCME PHC F2 C10-16	Blank Spike. Batch :	15201469	< 10	470	476.2	ug/g	98
CCME PHC F3 C16-34	Blank Spike. Batch :	15201469	< 10	1600	1543.4	ug/g	102
CCME PHC F4 C34-50+	Blank Spike. Batch :	15201469	< 10	100	95.92	ug/g	105
Benzene	CC-01@1-2'	31010931	< 0.04	1.7	2.2713	ug/g	74
Benzene	Blank Spike. Batch :	15201471	< 0.04	2.0	2.15	ug/g	92
Ethylbenzene	CC-01@1-2'	31010931	< 0.10	1.9	2.2713	ug/g	82
Ethylbenzene	Blank Spike. Batch :	15201471	< 0.10	2.0	2.15	ug/g	95
Toluene	CC-01@1-2'	31010931	< 0.10	1.8	2.2713	ug/g	79
Toluene	Blank Spike. Batch :	15201471	< 0.10	2.0	2.15	ug/g	94
o - Xylene	CC-01@1-2'	31010931	< 0.10	1.9	2.2713	ug/g	82
o - Xylene	Blank Spike. Batch :	15201471	< 0.10	2.0	2.15	ug/g	95
m+p - Xylene	CC-01@1-2'	31010931	< 0.10	3.6	4.55407	ug/g	80
m+p - Xylene	Blank Spike. Batch :	15201471	< 0.10	4.0	4.3	ug/g	93
Cadmium	Blank Spike. Batch :	14201817	< 0.2	258	250	ug/g	103
Lead	Blank Spike. Batch :	14201817	< 2.0	488	500	ug/g	98
PCB's - Total	Blank Spike. Batch :	14500137	< 0.05	0.07	.1	ug/g	73
Zinc	Blank Spike. Batch :	14201817	< 0.5	247	250	ug/g	99
Cadmium	CC-30 0-1'	31010950	1.2	125	125	ug/g	99
Zinc	CC-30 0-1'	31010950	91.5	208	125	ug/g	93
Cadmium	Blank Spike. Batch :	14201818	< 0.2	258	250	ug/g	103
Zinc	Blank Spike. Batch :	14201818	< 0.5	247	250	ug/g	99
Lead	Blank Spike. Batch :	14201818	< 2.0	488	500	ug/g	98
TEH (C11 - C30)	Blank Spike. Batch :	15201423	< 10	68	68	ug/g	92
Silver	Blank Spike. Batch :	14201814	< 1.0	61.9	62.5	ug/g	99
Aluminum	Blank Spike. Batch :	14201814	< 10	249	250	ug/g	99
Arsenic	CC-38 1-2'	31010958	12.6	259	250	ug/g	99
Arsenic	Blank Spike. Batch :	14201814	0.9	498	500	ug/g	99
Boron	CC-38 1-2'	31010958	< 10	129	125	ug/g	100
Boron	Blank Spike. Batch :	14201814	< 10	259	250	ug/g	104
Barium	CC-38 1-2'	31010958	161	283	125	ug/g	98
Barium	Blank Spike. Batch :	14201814	< 0.2	256	250	ug/g	102
Beryllium	CC-38 1-2'	31010958	< 0.1	133	125	ug/g	106
Beryllium	Blank Spike. Batch :	14201814	< 0.1	268	250	ug/g	107
Bismuth	Blank Spike. Batch :	14201814	< 10	266	250	ug/g	106
Calcium	Blank Spike. Batch :	14201814	< 20	256	250	ug/g	101
Cadmium	CC-38 1-2'	31010958	6.7	138	125	ug/g	105
Cadmium	Blank Spike. Batch :	14201814	< 0.2	263	250	ug/g	105
Cobalt	CC-38 1-2'	31010958	2.7	126	125	ug/g	99

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SPIKE SUMMARY

Parameter	Client ID	Philip ID	Sample Conc.	Sample & Spike Conc.	Spike Amount	Unit	Percent Recovery
Cobalt	Blank Spike. Batch :	14201814	< 0.3	259	250	ug/g	104
Chromium	CC-38 1-2'	31010958	34.7	159	125	ug/g	99
Chromium	Blank Spike. Batch :	14201814	< 0.2	252	250	ug/g	101
Copper	CC-38 1-2'	31010958	94.7	218	125	ug/g	98
Copper	Blank Spike. Batch :	14201814	< 0.5	254	250	ug/g	102
Iron	Blank Spike. Batch :	14201814	< 10	255	250	ug/g	99
Potassium	Blank Spike. Batch :	14201814	< 20	1150	1250	ug/g	92
Lithium	CC-38 1-2'	31010958	1.8	133	125	ug/g	105
Lithium	Blank Spike. Batch :	14201814	0.1	263	250	ug/g	105
Magnesium	Blank Spike. Batch :	14201814	< 10	258	250	ug/g	103
Manganese	CC-38 1-2'	31010958	84.2	205	125	ug/g	97
Manganese	Blank Spike. Batch :	14201814	< 0.2	259	250	ug/g	104
Molybdenum	CC-38 1-2'	31010958	23.8	158	125	ug/g	107
Molybdenum	Blank Spike. Batch :	14201814	< 0.4	273	250	ug/g	109
Sodium	Blank Spike. Batch :	14201814	< 10	247	250	ug/g	99
Nickel	CC-38 1-2'	31010958	11.0	136	125	ug/g	100
Nickel	Blank Spike. Batch :	14201814	< 0.8	257	250	ug/g	103
Phosphorus Total (P)	Blank Spike. Batch :	14201814	< 4.0	1180	1250	ug/g	94
Lead	CC-38 1-2'	31010958	231	467	250	ug/g	94
Lead	Blank Spike. Batch :	14201814	< 2.0	501	500	ug/g	100
Antimony	CC-38 1-2'	31010958	29.9	342	250	ug/g	125
Antimony	Blank Spike. Batch :	14201814	< 2.0	610	500	ug/g	122
Selenium	CC-38 1-2'	31010958	< 1.0	137	125	ug/g	109
Selenium	Blank Spike. Batch :	14201814	< 1.0	256	250	ug/g	102
Tin	Blank Spike. Batch :	14201814	< 2.0	1320	1250	ug/g	105
Strontium	CC-38 1-2'	31010958	13.5	141	125	ug/g	102
Strontium	Blank Spike. Batch :	14201814	< 0.1	259	250	ug/g	104
Titanium	CC-38 1-2'	31010958	240	362	125	ug/g	98
Titanium	Blank Spike. Batch :	14201814	0.4	282	250	ug/g	112
Uranium	Blank Spike. Batch :	14201814	< 5.0	276	250	ug/g	110
Vanadium	CC-38 1-2'	31010958	25.5	154	125	ug/g	102
Vanadium	Blank Spike. Batch :	14201814	< 0.4	258	250	ug/g	103
Zinc	CC-38 1-2'	31010958	244	367	125	ug/g	98
Zinc	Blank Spike. Batch :	14201814	0.7	249	250	ug/g	99
Zirconium	Blank Spike. Batch :	14201814	< 0.5	262	250	ug/g	105
Thallium	Blank Spike. Batch :	14201804	< 1.0	75.0	75	ug/g	100
Acenaphthene	Blank Spike. Batch :	14500142	< 0.01	0.11	.1	ug/g	107
Acenaphthylene	Blank Spike. Batch :	14500142	< 0.01	0.11	.1	ug/g	107

ANALYTICAL SERVICES

SPIKE SUMMARY

Parameter	Client ID	Philip ID	Sample Conc.	Sample & Spike Conc.	Spike Amount	Unit	Percent Recovery
Anthracene	Blank Spike. Batch :	14500142	< 0.01	0.12	.1	ug/g	120
Benz(a)anthracene	Blank Spike. Batch :	14500142	< 0.01	0.10	.1	ug/g	103
Benzo(a)pyrene	Blank Spike. Batch :	14500142	< 0.01	0.09	.1	ug/g	86
Benzo(b)Fluoranthene	Blank Spike. Batch :	14500142	< 0.01	0.10	.1	ug/g	97
Benzo(g,h,i)perylene	Blank Spike. Batch :	14500142	< 0.02	0.04	.1	ug/g	42
Benzo(k)fluoranthene	Blank Spike. Batch :	14500142	< 0.01	0.09	.1	ug/g	92
Chrysene	Blank Spike. Batch :	14500142	< 0.01	0.10	.1	ug/g	103
Dibenz(a,h)anthracene	Blank Spike. Batch :	14500142	< 0.02	0.05	.1	ug/g	52
Fluoranthene	Blank Spike. Batch :	14500142	< 0.01	0.11	.1	ug/g	111
Fluorene	Blank Spike. Batch :	14500142	< 0.01	0.10	.1	ug/g	102
Indeno(1,2,3-c,d)pyrene	Blank Spike. Batch :	14500142	< 0.02	0.05	.1	ug/g	49
Naphthalene	Blank Spike. Batch :	14500142	< 0.01	0.08	.1	ug/g	81
Phenanthrene	Blank Spike. Batch :	14500142	< 0.01	0.11	.1	ug/g	112
Pyrene	Blank Spike. Batch :	14500142	< 0.01	0.11	.1	ug/g	111
Thallium	Blank Spike. Batch :	14201852	< 1.0	6.7	7.5	ug/g	89
TEH (C11 - C30)	CC-41 0-1'	31010963	340	360	77.8585	ug/g	31
CCME PHC F2 C10-16	Blank Spike. Batch :	15201472	< 10	440	476.2	ug/g	93
CCME PHC F3 C16-34	Blank Spike. Batch :	15201472	< 10	1500	1543.4	ug/g	100
CCME PHC F4 C34-50+	Blank Spike. Batch :	15201472	< 10	110	95.92	ug/g	113
Benzene	Blank Spike. Batch :	15201473	< 0.04	1.9	2.15	ug/g	87
Ethylbenzene	Blank Spike. Batch :	15201473	< 0.10	1.6	2.15	ug/g	76
Toluene	Blank Spike. Batch :	15201473	< 0.10	1.8	2.15	ug/g	84
o - Xylene	Blank Spike. Batch :	15201473	< 0.10	1.8	2.15	ug/g	83
m+p - Xylene	Blank Spike. Batch :	15201473	< 0.10	3.6	4.3	ug/g	84
CCME PHC F2 C10-16	Blank Spike. Batch :	15201479	< 10	440	476.2	ug/g	93
CCME PHC F3 C16-34	Blank Spike. Batch :	15201479	< 10	1500	1543.4	ug/g	97
CCME PHC F4 C34-50+	Blank Spike. Batch :	15201479	< 10	120	95.92	ug/g	124

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ANALYSIS DATES

	Philip ID:	31010931	31010932	31010933	31010934
	Client ID:	CC-01@1-2'	CC-03@0-1'	CC-07@0-1'	CC-11@0-1'
00250760	Moisture	07-SEP-2001	07-SEP-2001	07-SEP-2001	07-SEP-2001
PHC1PHCV	CCME PHC F1 C6-10	06-SEP-2001	06-SEP-2001	06-SEP-2001	06-SEP-2001
CCMEPHCS	CCMEPHCS	06-SEP-2001	06-SEP-2001	06-SEP-2001	06-SEP-2001
PKG-BT17	BTEX by P&T	09-SEP-2001	09-SEP-2001	09-SEP-2001	09-SEP-2001
	Matrix:	Soil	Soil	Soil	Soil
	Sampled on:	22-AUG-2001	22-AUG-2001	22-AUG-2001	22-AUG-2001

	Philip ID:	31010935	31010936	31010937	31010938
	Client ID:	CC-13@0-1'	CC-14 0-1'	CC-15 0-1'	CC-16 0-1'
00250760	Moisture	07-SEP-2001	---	---	---
Cd-TIR03	Cadmium	---	10-SEP-2001	10-SEP-2001	10-SEP-2001
PHC1PHCV	CCME PHC F1 C6-10	06-SEP-2001	---	---	---
CCMEPHCS	CCMEPHCS	09-SEP-2001	---	---	---
PKG-BT17	BTEX by P&T	09-SEP-2001	---	---	---
	Matrix:	Soil	Soil	Soil	Soil
	Sampled on:	22-AUG-2001	23-AUG-2001	23-AUG-2001	23-AUG-2001

	Philip ID:	31010939	31010940	31010941	31010942
	Client ID:	CC-17 0-1'	CC-18 0-1'	CC-19 0-1'	CC-20 0-1'
Cd-TIR03	Cadmium	10-SEP-2001	10-SEP-2001	10-SEP-2001	10-SEP-2001
	Matrix:	Soil	Soil	Soil	Soil
	Sampled on:	23-AUG-2001	23-AUG-2001	23-AUG-2001	23-AUG-2001

	Philip ID:	31010943	31010944	31010945	31010946
	Client ID:	CC-21 0-1'	CC-22 0-1'	CC-23 0-1'	CC-24 0-1'
Cd-TIR03	Cadmium	10-SEP-2001	10-SEP-2001	---	---
Pb-TIR03	Lead	---	---	10-SEP-2001	10-SEP-2001
	Matrix:	Soil	Soil	Soil	Soil
	Sampled on:	23-AUG-2001	23-AUG-2001	23-AUG-2001	23-AUG-2001

ANALYSIS DATES

	Philip ID:	31010947	31010948	31010949	31010950
	Client ID:	CC-25 0-1'	CC-26 0-1'	CC-29 0-1'	CC-30 0-1'
STRGDONE	Storage Charge	---	31-AUG-2001	---	---
00250760	Moisture	---	07-SEP-2001	---	---
Cd-TIR03	Cadmium	---	---	10-SEP-2001	10-SEP-2001
Pb-TIR03	Lead	10-SEP-2001	---	---	---
Zn-TIR03	Zinc	---	---	10-SEP-2001	10-SEP-2001
P019P021	PCB's in Soil	---	06-SEP-2001	---	---
	Matrix:	Soil	Soil	Soil	Soil
	Sampled on:	23-AUG-2001	23-AUG-2001	23-AUG-2001	23-AUG-2001

	Philip ID:	31010951	31010952	31010953	31010954
	Client ID:	CC-31 0-1'	CC-32 0-1'	CC-33 0-1'	CC-34 0-1'
Cd-TIR03	Cadmium	10-SEP-2001	---	---	---
Zn-TIR03	Zinc	10-SEP-2001	10-SEP-2001	10-SEP-2001	10-SEP-2001
	Matrix:	Soil	Soil	Soil	Soil
	Sampled on:	23-AUG-2001	23-AUG-2001	23-AUG-2001	23-AUG-2001

	Philip ID:	31010955	31010956	31010957	31010958
	Client ID:	CC-35 0-1'	CC-36 0-1'	CC-37 0-1'	CC-38 1-2'
00250760	Moisture	---	---	---	07-SEP-2001
CCMESOIL	CCME 99 SOILS	---	---	---	07-SEP-2001
Pb-TIR03	Lead	10-SEP-2001	10-SEP-2001	10-SEP-2001	---
Hg-T200M	Mercury	---	---	---	06-SEP-2001
Tl-T200G	Thallium	---	---	---	07-SEP-2001
P019P021	PCB's in Soil	---	---	---	06-SEP-2001
TEHS	TEH SOILS	---	---	---	09-SEP-2001
PAHL-S	PAHS - SOIL	---	---	---	17-SEP-2001
VOC-AS	VOC SOIL ALBERTA	---	---	---	14-SEP-2001
VOCASR4	VOC Surr+LH Soil(Alberta Lab)	---	---	---	14-SEP-2001
	Matrix:	Soil	Soil	Soil	Soil
	Sampled on:	23-AUG-2001	23-AUG-2001	23-AUG-2001	23-AUG-2001

ANALYSIS DATES

	Philip ID:	31010959	31010960	31010961	31010962
	Client ID:	CC-38 3-4'	CC-39 1-2'	CC-39 3-4'	CC-40 0-1'
00250760	Moisture	07-SEP-2001	07-SEP-2001	07-SEP-2001	07-SEP-2001
CCMESOIL	CCME 99 SOILS	07-SEP-2001	07-SEP-2001	07-SEP-2001	07-SEP-2001
Hg-T200M	Mercury	06-SEP-2001	06-SEP-2001	06-SEP-2001	06-SEP-2001
Tl-T200G	Thallium	07-SEP-2001	07-SEP-2001	10-SEP-2001	10-SEP-2001
P019P021	PCB's in Soil	06-SEP-2001	06-SEP-2001	06-SEP-2001	06-SEP-2001
TEHS	TEH SOILS	09-SEP-2001	12-SEP-2001	12-SEP-2001	15-SEP-2001
PAHL-S	PAHS - SOIL	17-SEP-2001	17-SEP-2001	17-SEP-2001	17-SEP-2001
VOC-AS	VOC SOIL ALBERTA	14-SEP-2001	14-SEP-2001	14-SEP-2001	14-SEP-2001
VOCASR4	VOC Surr+LH Soil(Alberta Lab)	14-SEP-2001	14-SEP-2001	14-SEP-2001	14-SEP-2001
	Matrix:	Soil	Soil	Soil	Soil
	Sampled on:	23-AUG-2001	23-AUG-2001	23-AUG-2001	23-AUG-2001

	Philip ID:	31010963	31010964	31010965	31010966
	Client ID:	CC-41 0-1'	CC-42 0-1'	CC-43 0-1'	CC-44 0-1'
00250760	Moisture	07-SEP-2001	07-SEP-2001	07-SEP-2001	07-SEP-2001
CCMESOIL	CCME 99 SOILS	07-SEP-2001	07-SEP-2001	07-SEP-2001	---
Hg-T200M	Mercury	06-SEP-2001	06-SEP-2001	06-SEP-2001	---
Tl-T200G	Thallium	10-SEP-2001	10-SEP-2001	10-SEP-2001	---
P019P021	PCB's in Soil	06-SEP-2001	06-SEP-2001	06-SEP-2001	---
TEHS	TEH SOILS	08-SEP-2001	08-SEP-2001	15-SEP-2001	---
PHC1PHCV	CCME PHC F1 C6-10	---	---	---	06-SEP-2001
CCMEPHCS	CCMEPHCS	---	---	---	06-SEP-2001
PAHL-S	PAHS - SOIL	17-SEP-2001	17-SEP-2001	17-SEP-2001	---
PKG-BT17	BTEX by P&T	---	---	---	09-SEP-2001
VOC-AS	VOC SOIL ALBERTA	14-SEP-2001	14-SEP-2001	14-SEP-2001	---
VOCASR4	VOC Surr+LH Soil(Alberta Lab)	14-SEP-2001	14-SEP-2001	14-SEP-2001	---
	Matrix:	Soil	Soil	Soil	Soil
	Sampled on:	23-AUG-2001	24-AUG-2001	24-AUG-2001	24-AUG-2001

ANALYSIS DATES

	Philip ID:	31010967	31010968	31010969	31010970
	Client ID:	CC-45 0-1'	CC-46 0-1'	CC-48 0-1'	CC-51 0-1'
00250760	Moisture	07-SEP-2001	07-SEP-2001	07-SEP-2001	07-SEP-2001
PHC1PHCV	CCME PHC F1 C6-10	06-SEP-2001	06-SEP-2001	06-SEP-2001	06-SEP-2001
CCMEPHCS	CCMEPHCS	06-SEP-2001	09-SEP-2001	09-SEP-2001	09-SEP-2001
PKG-BT17	BTEX by P&T	09-SEP-2001	09-SEP-2001	09-SEP-2001	09-SEP-2001
	Matrix:	Soil	Soil	Soil	Soil
	Sampled on:	24-AUG-2001	24-AUG-2001	24-AUG-2001	24-AUG-2001

	Philip ID:	31010971	31010972	31010973	31010974
	Client ID:	CC-54 0-1'	CC-58 0-1'	CC-60 0-1'	CC-62 0-1'
00250760	Moisture	07-SEP-2001	07-SEP-2001	07-SEP-2001	07-SEP-2001
PHC1PHCV	CCME PHC F1 C6-10	06-SEP-2001	06-SEP-2001	06-SEP-2001	06-SEP-2001
CCMEPHCS	CCMEPHCS	09-SEP-2001	09-SEP-2001	11-SEP-2001	11-SEP-2001
PKG-BT17	BTEX by P&T	09-SEP-2001	09-SEP-2001	09-SEP-2001	09-SEP-2001
	Matrix:	Soil	Soil	Soil	Soil
	Sampled on:	24-AUG-2001	24-AUG-2001	24-AUG-2001	24-AUG-2001

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BATCH NUMBERS

	Philip ID:	31010931	31010932	31010933	31010934
	Client ID:	CC-01@1-2'	CC-03@0-1'	CC-07@0-1'	CC-11@0-1'
00250760	Moisture	14401648	14401648	14401648	14401648
PHC1PHCV	CCME PHC F1 C6-10	15201470	15201470	15201470	15201470
CCMEPHCS	CCMEPHCS	15201469	15201469	15201469	15201469
PKG-BT17	BTEX by P&T	15201471	15201471	15201471	15201471
	Matrix:	Soil	Soil	Soil	Soil
	Sampled on:	22-AUG-2001	22-AUG-2001	22-AUG-2001	22-AUG-2001

	Philip ID:	31010935	31010936	31010937	31010938
	Client ID:	CC-13@0-1'	CC-14 0-1'	CC-15 0-1'	CC-16 0-1'
00250760	Moisture	14401648	---	---	---
Cd-TIR03	Cadmium	---	14201817	14201817	14201817
PHC1PHCV	CCME PHC F1 C6-10	15201470	---	---	---
CCMEPHCS	CCMEPHCS	15201469	---	---	---
PKG-BT17	BTEX by P&T	15201471	---	---	---
	Matrix:	Soil	Soil	Soil	Soil
	Sampled on:	22-AUG-2001	23-AUG-2001	23-AUG-2001	23-AUG-2001

	Philip ID:	31010939	31010940	31010941	31010942
	Client ID:	CC-17 0-1'	CC-18 0-1'	CC-19 0-1'	CC-20 0-1'
Cd-TIR03	Cadmium	14201817	14201817	14201817	14201817
	Matrix:	Soil	Soil	Soil	Soil
	Sampled on:	23-AUG-2001	23-AUG-2001	23-AUG-2001	23-AUG-2001

	Philip ID:	31010943	31010944	31010945	31010946
	Client ID:	CC-21 0-1'	CC-22 0-1'	CC-23 0-1'	CC-24 0-1'
Cd-TIR03	Cadmium	14201817	14201817	---	---
Pb-TIR03	Lead	---	---	14201817	14201817
	Matrix:	Soil	Soil	Soil	Soil
	Sampled on:	23-AUG-2001	23-AUG-2001	23-AUG-2001	23-AUG-2001

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BATCH NUMBERS

	Philip ID:	31010947	31010948	31010949	31010950
	Client ID:	CC-25 0-1'	CC-26 0-1'	CC-29 0-1'	CC-30 0-1'
00250760	Moisture	---	14401649	---	---
Cd-TIR03	Cadmium	---	---	14201817	14201817
Pb-TIR03	Lead	14201817	---	---	---
Zn-TIR03	Zinc	---	---	14201817	14201817
P019P021	PCB's in Soil	---	14500137	---	---
	Matrix:	Soil	Soil	Soil	Soil
	Sampled on:	23-AUG-2001	23-AUG-2001	23-AUG-2001	23-AUG-2001

	Philip ID:	31010951	31010952	31010953	31010954
	Client ID:	CC-31 0-1'	CC-32 0-1'	CC-33 0-1'	CC-34 0-1'
Cd-TIR03	Cadmium	14201818	---	---	---
Zn-TIR03	Zinc	14201818	14201818	14201818	14201818
	Matrix:	Soil	Soil	Soil	Soil
	Sampled on:	23-AUG-2001	23-AUG-2001	23-AUG-2001	23-AUG-2001

	Philip ID:	31010955	31010956	31010957	31010958
	Client ID:	CC-35 0-1'	CC-36 0-1'	CC-37 0-1'	CC-38 1-2'
00250760	Moisture	---	---	---	14401649
CCMESOIL	CCME 99 SOILS	---	---	---	14201814
Pb-TIR03	Lead	14201818	14201818	14201818	---
Hg-T200M	Mercury	---	---	---	14201865
Tl-T200G	Thallium	---	---	---	14201804
P019P021	PCB's in Soil	---	---	---	14500137
TEHS	TEH SOILS	---	---	---	15201423
PAHL-S	PAHS - SOIL	---	---	---	14500142
VOC-AS	VOC SOIL ALBERTA	---	---	---	15201483
VOCASR4	VOC Surr+LH Soil(Alberta Lab)	---	---	---	15201483
	Matrix:	Soil	Soil	Soil	Soil
	Sampled on:	23-AUG-2001	23-AUG-2001	23-AUG-2001	23-AUG-2001

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BATCH NUMBERS

	Philip ID:	31010959	31010960	31010961	31010962
	Client ID:	CC-38 3-4'	CC-39 1-2'	CC-39 3-4'	CC-40 0-1'
00250760	Moisture	14401649	14401649	14401649	14401649
CCMESOIL	CCME 99 SOILS	14201814	14201814	14201814	14201814
Hg-T200M	Mercury	14201865	14201865	14201865	14201865
Tl-T200G	Thallium	14201804	14201804	14201852	14201852
P019P021	PCB's in Soil	14500137	14500137	14500137	14500138
TEHS	TEH SOILS	15201423	15201432	15201432	15201432
PAHL-S	PAHS - SOIL	14500142	14500142	14500142	14500142
VOC-AS	VOC SOIL ALBERTA	15201483	15201483	15201483	15201483
VOCASR4	VOC Surr+LH Soil(Alberta Lab)	15201483	15201483	15201483	15201483
	Matrix:	Soil	Soil	Soil	Soil
	Sampled on:	23-AUG-2001	23-AUG-2001	23-AUG-2001	23-AUG-2001

	Philip ID:	31010963	31010964	31010965	31010966
	Client ID:	CC-41 0-1'	CC-42 0-1'	CC-43 0-1'	CC-44 0-1'
00250760	Moisture	14401649	14401649	14401649	14401648
CCMESOIL	CCME 99 SOILS	14201814	14201814	14201814	---
Hg-T200M	Mercury	14201865	14201865	14201865	---
Tl-T200G	Thallium	14201852	14201852	14201852	---
P019P021	PCB's in Soil	14500137	14500137	14500137	---
TEHS	TEH SOILS	---	---	15201432	---
PHC1PHCV	CCME PHC F1 C6-10	---	---	---	15201470
CCMEPHCS	CCMEPHCS	---	---	---	15201469
PAHL-S	PAHS - SOIL	14500142	14500142	14500142	---
PKG-BT17	BTEX by P&T	---	---	---	15201471
VOC-AS	VOC SOIL ALBERTA	15201483	15201483	15201483	---
VOCASR4	VOC Surr+LH Soil(Alberta Lab)	15201483	15201483	15201483	---
	Matrix:	Soil	Soil	Soil	Soil
	Sampled on:	23-AUG-2001	24-AUG-2001	24-AUG-2001	24-AUG-2001

ANALYTICAL SERVICES

26-Oct-01

BATCH NUMBERS

	Philip ID:	31010967	31010968	31010969	31010970
	Client ID:	CC-45 0-1'	CC-46 0-1'	CC-48 0-1'	CC-51 0-1'
00250760	Moisture	14401649	14401649	14401649	14401649
PHC1PHCV	CCME PHC F1 C6-10	15201470	15201470	15201470	15201470
CCMEPHCS	CCMEPHCS	15201469	15201472	15201472	15201472
PKG-BT17	BTEX by P&T	15201471	15201471	15201473	15201473
	Matrix:	Soil	Soil	Soil	Soil
	Sampled on:	24-AUG-2001	24-AUG-2001	24-AUG-2001	24-AUG-2001

	Philip ID:	31010971	31010972	31010973	31010974
	Client ID:	CC-54 0-1'	CC-58 0-1'	CC-60 0-1'	CC-62 0-1'
00250760	Moisture	14401649	14401649	14401649	14401649
PHC1PHCV	CCME PHC F1 C6-10	15201470	15201470	15201470	15201470
CCMEPHCS	CCMEPHCS	15201472	15201472	15201479	15201479
PKG-BT17	BTEX by P&T	15201473	15201473	15201473	15201473
	Matrix:	Soil	Soil	Soil	Soil
	Sampled on:	24-AUG-2001	24-AUG-2001	24-AUG-2001	24-AUG-2001

ANALYTICAL SERVICES

BLANK SUMMARY

All method blanks were less than MDL, except the following:

Parameter	Batch	Sparcode	Blank Conc.	MDL	Unit
Dibromochloromethane	15201483	C033MSA2	0.14	0.03	ug/g
m+p-Xylenes	15201483	V920MSA2	0.07	0.05	ug/g
Arsenic	14201814	As-TIR03	0.9	0.7	ug/g
Lithium	14201814	Li-TIR03	0.1	0.1	ug/g
Titanium	14201814	Ti-TIR03	0.4	0.3	ug/g
Zinc	14201814	Zn-TIR03	0.7	0.5	ug/g

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9619 - 42nd Avenue
Edmonton, AB T6E 5R2
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Fax: (780) 450-4187
Toll Free: 1-877-465-8889

PHILIP SERVICES

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

ANALYSIS REQUEST 42012466

COMPANY NAME: EarthTech
PH. #: 488-6800
FAX #: 488-2121
COMPANY ADDRESS: Edm
CLIENT PROJECT ID: (#) # 19340-01 Cape Christian, NT
SAMPLER NAME (PRINT): Don Roy
PROJECT MANAGER: Will Wawrychuk

FIELD SAMPLE ID	PHILIP LAB # (Lab Use Only)	MATRIX: GROUND WATER	MATRIX: SURFACE WATER	MATRIX: SOIL	MATRIX: OTHER	# CONTAINERS	SAMPLING: DATE	SAMPLING: TIME	SAMPLING: HEADSPACE VAPOUR	CCME F1-F4 per Annette Aug 31/01	CWS-TPH	Cadmium (Cd)
1 CC-01@1-2'	10931			✓		1	Aug 23			✓	✓	
2 CC-03@0-1'	10932			✓		1	✓			✓	✓	
3 CC-07@0-1'	10933			✓		1	✓			✓	✓	
4 CC-12@0-1'	10934			✓		1	✓			✓	✓	
5 CC-13@0-1'	10935			✓		1	✓			✓	✓	
6 CC-14 0-1'	10936			✓		1	Aug 23				✓	
7 CC-15 ✓	10937			✓		1					✓	
8 CC-16 ✓	10938			✓		1					✓	
9 CC-17 ✓	10939			✓		1					✓	
10 CC-18 ✓	10940			✓		1					✓	
11 CC-19 ✓	10941			✓		1					✓	
12												

TAT
- Two Week ☑
- One Week ☐
- 48 Hours ☐
- 24 Hours ☐
- Other: _____

P.O. NUMBER:

SPECIAL DETECTION LIMITS / CONTAMINANT TYPE

ACCOUNTING CONTACT:

SPECIAL REPORTING OR BILLING INSTRUCTIONS
CWS-TPM
EDT ☐

LAB USE ONLY
ARRIVAL TEMPERATURE °C: 10°
LAB INFORMATION: Dept. 10101 ff

CUSTODY RECORD

RELINQUISHED BY SAMPLER: Don Roy	DATE Aug 25, 01	TIME	RECEIVED BY: First Air
RELINQUISHED BY: First Air	DATE	TIME	RECEIVED BY: Air Canada
RELINQUISHED BY: Air Canada	DATE 26/01	TIME 3:45	RECEIVED BY LABORATORY: ETC Annette Cauv.

AL - PH YEL HILIP K - CL

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Edmonton, AB T6E 5R2
Phone: (780) 465-1212
Fax: (780) 450-4187
Toll Free: 1-877-465-8889

PHILIP SERVICES

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

ANALYSIS REQUEST 42012465

COMPANY NAME:	PH. #: 488-6800
Earth Tech	FAX #: 488-2121
COMPANY ADDRESS:	CLIENT PROJECT ID: (#)
Edm	19340-01 Cape Christian, NT
SAMPLER NAME (PRINT):	PROJECT MANAGER:
Don Roy	Will Wanrychuk

FIELD SAMPLE ID	PHILIP LAB # (Lab Use Only)	MATRIX: GROUND WATER	MATRIX: SURFACE WATER	MATRIX: SOIL	MATRIX: OTHER	# CONTAINERS	SAMPLING: DATE	SAMPLING: TIME	SAMPLING: HEADSPACE VAPOUR	Cadmium (Cd)	Lead (Pb)	PCB	Zinc
1 CC-20 0-1'	10942			✓		1	Aug 23			✓			
2 CC-21 ✓	10943			✓		1	✓			✓			
3 CC-22 ✓	10944			✓		1	✓			✓			
4 CC-23 ✓	10945			✓		1	✓				✓		
5 CC-24 ✓	10946			✓		1	✓				✓		
6 CC-25 ✓	10947			✓		1	✓				✓		
7 CC-26 ✓	10948			✓		1	✓					✓	
8 CC-29 ✓	10949			✓		1	✓			✓			✓
9 CC-30 ✓	10950			✓		1	✓			✓			✓
10 CC-31 ✓	10951			✓		1	✓			✓			✓
11													
12													

TAT
- Two Week ☑
- One Week ☐
- 48 Hours ☐
- 24 Hours ☐
- Other: ____

P.O. NUMBER:

SPECIAL DETECTION LIMITS / CONTAMINANT TYPE

ACCOUNTING CONTACT:

SPECIAL REPORTING OR BILLING INSTRUCTIONS

EDT ☐

LAB USE ONLY
ARRIVAL TEMPERATURE °C: 10°
LAB INFORMATION: Sept 10/01 JR

CUSTODY RECORD

RELINQUISHED BY SAMPLER: Don Roy	DATE 01/8/25	TIME	RECEIVED BY: First Air.
RELINQUISHED BY: First Air	DATE	TIME	RECEIVED BY: Air Canada
RELINQUISHED BY: Air Canada	DATE Ap. 30/01	TIME 3:45	RECEIVED BY LABORATORY: ETC Anneth Lear.

WHITE - PHILIP YELLOW - PHILIP PINK - CLIENT

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PHILIP SERVICES

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

ANALYSIS REQUEST 42012467

COMPANY NAME: Earth Tech	PH. #: 488-6800
COMPANY ADDRESS: Edm	FAX #: 488-3121
SAMPLER NAME (PRINT): Don Roy	CLIENT PROJECT ID: (#) 19340-01 Cape Christian, NT
	PROJECT MANAGER: Will Wawrychuk

FIELD SAMPLE ID	PHILIP LAB # (Lab Use Only)	MATRIX: GROUND WATER	SURFACE WATER	SOIL	OTHER	# CONTAINERS	SAMPLING: DATE	TIME	HEADSPACE VAPOUR	Zinc (2u)	Lead (Pb)	PCB's	VOC's (Including BTEX)	T.P.H. (Total Petro. Hydrocarbons C6+)	PAH's	Metals (HWR-1)	CCME '99 per call from Annette Aug-31/01
1 CC-32 0-1'	10952			✓		1	Aug23			✓							
2 CC-33 ✓	10953			✓		1	✓			✓							
3 CC-34 ✓	10954			✓		1	✓			✓							
4 CC-35 ✓	10955			✓		1	✓				✓						
5 CC-36 ✓	10956			✓		1	✓				✓						
6 CC-37 ✓	10957			✓		1	✓				✓						
7 CC-38 1-2'	10958					3						✓	✓	✓	✓	✓	
8 CC-38 3-4'	10959					3						✓	✓	✓	✓	✓	
9 CC-39 1-2'	10960					3						✓	✓	✓	✓	✓	
10 CC-39 3-4'	10961					3						✓	✓	✓	✓	✓	
11 CC-40 0-1'	10962					3						✓	✓	✓	✓	✓	
12 CC-41 0-1'	10963					3						✓	✓	✓	✓	✓	

TAT
- Two Week ☑
- One Week ☐
- 48 Hours ☐
- 24 Hours ☐
- Other: _____

P.O. NUMBER:

SPECIAL DETECTION LIMITS / CONTAMINANT TYPE

ACCOUNTING CONTACT:

SPECIAL REPORTING OR BILLING INSTRUCTIONS

EDT ☐

LAB USE ONLY
ARRIVAL TEMPERATURE °C: 10°
LAB INFORMATION: Dept. 10/01 JR

CUSTODY RECORD

RELINQUISHED BY SAMPLER: Don Roy	DATE	TIME	RECEIVED BY: First Air
RELINQUISHED BY: First Air	DATE	TIME	RECEIVED BY: Air Canada
RELINQUISHED BY: Air Canada	DATE Aug 31/01	TIME 3:40	RECEIVED BY LABORATORY: STC Annette Tear

ORIGINAL - PHILIP YELLOW - PHILIP PINK - CLIENT

PHILIP SERVICES

PHILIP ANALYTICAL SERVICES
9619 - 42nd Avenue
Edmonton, AB T6E 5R2
Phone: (780) 465-1212
Fax: (780) 450-4187
Toll Free: 1-877-465-8889

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST

42012468

COMPANY NAME: Earth Tech
PH. #: 488-6800
FAX #: 488-2121
COMPANY ADDRESS: Edm.
CLIENT PROJECT ID: (#) 19340-01 cape christian NT [illegible]
SAMPLER NAME (PRINT): Don Roy
PROJECT MANAGER: Will Wawrychuk

ANALYSIS REQUEST: PCB'S; VOC'S; TPH (total Petro Hydro) (Not CWS); PAH'S; Metals CCME per Annette Aug 31/01; CWS-TPH; CCME PHC's F1→F4 per Annette Aug 31/01

FIELD SAMPLE ID	PHILIP LAB # (Lab Use Only)	MATRIX: GROUND WATER	MATRIX: SURFACE WATER	MATRIX: SOIL	MATRIX: OTHER	# CONTAINERS	SAMPLING: DATE	SAMPLING: TIME	SAMPLING: HEADSPACE VAPOUR	PCB'S	VOC'S	TPH	PAH'S	Metals	CWS-TPH
1 CC-42 0-1'	10964			✓		3	Aug 24			✓	✓	✓	✓	✓	
2 CC-43 0-1'	10965			✓		3	✓			✓	✓	✓	✓	✓	
3 CC-44 0-1	10966			✓		1	✓								✓
4 CC-45 0-1	10967			✓		1	✓								✓
5 CC-46 0-1'	10968			✓		1	✓								✓
6 CC-48 ✓	10969			✓		1	✓								✓
7 CC-51 ✓	10970			✓		1	✓								✓
8 CC-54 ✓	10971			✓		1	✓								✓
9 CC-58 ✓	10972			✓		1	✓								✓
10 CC-60 ✓	10973			✓		1	✓								✓
11 CC-62 ✓	10974			✓		1	✓								✓
12															

TAT: Two Week ☑; One Week ☐; 48 Hours ☐; 24 Hours ☐; Other: ____

P.O. NUMBER:

SPECIAL DETECTION LIMITS / CONTAMINANT TYPE: CWS -TPH

ACCOUNTING CONTACT:

SPECIAL REPORTING OR BILLING INSTRUCTIONS — EDT ☐

LAB USE ONLY — ARRIVAL TEMPERATURE °C: 10. — LAB INFORMATION: Sept 10/01

CUSTODY RECORD

RELINQUISHED BY SAMPLER: Don Roy	DATE	TIME	RECEIVED BY: First Air
RELINQUISHED BY: First Air	DATE	TIME	RECEIVED BY: Air Canada
RELINQUISHED BY: Air Canada	DATE Aug 30/01	TIME 3:40	RECEIVED BY LABORATORY: ETC - An the Gear

APPENDIX D
HAZARDOUS MATERIAL INVENTORY

Hazardous Materials Inventory of Cape Christian

Compiled by: Robert Eno, Manager, Pollution Control,
Environmental Protection Service, Dept. of Sustainable Development, Government of Nunavut
Iqaluit, Nunavut

Note: The following does not purport to be a complete and thorough survey of the remaining hazardous materials at Cape Christian; only those items which were readily identifiable by a visual examination of the site. The inspector has worked at Cape Christian, off and on, for the past ten summers (and one winter), during which time, countless items of hazardous materials have been detected and removed; most significantly, 40 drums of hazardous wastes in the form of PCB-electrical equipment, rubidium timer units, chlorinated solvents and four solid fuel rockets. It has been the inspector's experience that, with each successive visit, new items which had previously remained undetected, revealed themselves simply by chance; more often that not, because the inspector's gaze was focused on the right spot, at the right time. For example, in 1998, as the inspector and his crew were taking a lunch break in the vicinity of landfill "B" – a portion of which had previously been covered with water but which, during that particular year, was dry – the inspector spotted a partially buried 3.7 U.S. gallon capacitor which was subsequently removed and tested for the presence of PCB's. The results yielded levels of Aroclor 1250 at 230,000 ppm (23%). Chances are, there are other, as yet undetected hazardous materials on this site; some of which may never be found.

General

(All compressed gas cylinders are located in a pile immediately east of the east wing, unless otherwise stated).

1.Oxygen Cylinders:100 lb. X 36 (green).

2. Dichlorofluoromethane Cylinders:100 lb. X 5 (orange).

3. Acetylene Cylinders:
   100 lbs. X 23
   20 lbs. X 9
   2 (?) lbs. X 2.

4. Propane Cylinders: 20 lbs. X 2.

5. UNK Cylinders: 100 lbs. X 2.

6. Lubrication Oil (new, used?): 6 drums, full & 1 drum, partial (located in vicinity of the garage).

7. Lubrication Oil, contained in 4 diesel-electric generators (approx. 202 litres per engine x 4 = 808 litres; presumed, not confirmed).

8. Carbon Dioxide Cylinders: 100 lbs. (fire suppression system in East and West Generator rooms) X 13.

9. Lead Acid Truck Batteries (east generator room) X 4 (two might contain acid).

10. Paint: one gallon cans X (approx.) 30 (southeast courtyard).

11. Polyurethane Coating, 5 gallon pail X 1 (southeast courtyard).

12. Oxygen Cylinders, 100 lbs. X 3 (in ditch beside road leading away from upper site).

13. Lead-Sheathed Electrical Wire. Approx. 5mm x 100 meters on a roll. Located at Vehicle/Cable dump.

Asbestos

Wallboard

Notes on Calculations:

These calculations are rough in the extreme. All dimensions were estimated either by pacing or, in the case of heights, by "eyeballing"; using other objects/features of known dimensions, then making a visual comparison. In all cases, the inspector has deliberately overestimated in order to err on the generous side. For example, the (broken pieces of) asbestos wallboard was found in two thicknesses: 7 mm and 10 mm; however, it was not always possible to determine the thickness of each wall, therefore, the higher number was used in all calculations. Furthermore, it was not always possible to access all parts of the building train due to serious structural and mechanical hazards as was the case for the radio and radar rooms. It should be noted that after conducting the asbestos inventory, it became apparent to the inspector that each room in the building train is separated by a double firewall of asbestos wallboard.

2 Vehicle Bay Garage (East Wing):

5 m X 4 m X .010 m	=	0.20 m^3

East Generator Room:

5 m X 4 m X .010 m	=	0.20m^3
8 m X 4 m X .010 m (x2)	=	0.64m^3

Connecting Hall from East Generator Room:

12m X 4 m X .010 m	=	0.48m^3

Radio Equipment/Component Storage Room:

8 m X 4 m X .010 m (x2)	=	0.64m^3
8 m X 4 m X .010 m (x2)	=	0.64m^3

Kitchen/Mess Hall/Recreation Room:

10 m X 4 m X .010 m (x4)	=	1.60m^3
6m X 14 m X .010 m (ceiling)	=	0.84m^3

West Generator Room:

8 m X 4 m X .010 m (x4)	=	1.28m^3

Air Exchange/Fan Room:

9 m X 4 m X .010 m (x2)	=	$0.72m^3$
5 m X 4 m X .010 m (x4)	=	$0.80m^3$
Total Wallboard (calculated):		$8.04m^3$
Total Estimated:		**$10.0m^3$**

Friable Asbestos

Notes on Calculations:

This was a bit more difficult to calculate due to the state of the building train and the fact that this was essentially a one-man operation. Asbestos-clad piping runs throughout the length and breadth of the building train; in some areas, there are from 4 - 6 lengths. This does not include asbestos clad piping in the two generator rooms. The largest diameter piping was found to measure approximately 13 cm overall, with the inner piping at 8 cm. The calculations did not take into account, the demolished centre wing. The calculations were made based on the following assumptions:

1. Three building trains: East and West Wings (67 metres long) and a Connecting Wing (57 metres long).

2. Total longitudinal dimension of all three wings combined: 191 metres

3. 5 lengths of asbestos-clad piping running the length of all three wings = 191 x 5 = 955 meters of asbestos-clad piping.

Calculations:

Volume of cylinder = πR^2 x length.

Overall pipe volume including asbestos cladding:

$3.1415927 \times (.065\ m)^2 \times 955 = 12.6759m^3$

Volume of Inner Pipe, excluding asbestos cladding:

$3.1415927 \times (0.04)^2 \times 955 = 4.8003m^3$

Volume of Asbestos Cladding:

$12.68m^3 - 04.88m^3 = 7.88m^3$

Total Estimated Volume of Friable Asbestos = $10m^3$
Total Estimated Volume of Asbestos; friable and wallboard = $20m^3$

29/08/2001

APPENDIX E
ESG REPORT REMEDIATION RECOMMENDATIONS

IV. RECOMMENDATIONS

A. GENERAL

The remediation of the Loran Station at Cape Christian requires the cleanup of chemical contaminants and physical debris. The chemical contaminants include hazardous materials (batteries and compressed gas cylinders), soil contaminated with PCBs and inorganic elements, barrel contents, PCB-containing equipment and asbestos-containing building materials. In the case of PCB-containing paint exceeding the CEPA, the material will have to be dealt wih according to the regulations arising from the Canadian Environmental Protection Act. All other contaminated material should be treated according to the DEW Line Cleanup Protocol. It should be stressed that the volume of soil contaminated with PCBs or inorganic elements is minimal at this site.

Physical cleanup includes the removal and disposal of all non-hazardous materials located at the site including building structures, fuel tanks, barrels, antenna poles, tower and varied and extensive debris scattered on site.

B. IMPLEMENTATION REQUIREMENTS

Based on the results and information available the following conclusions and proposals for the disposition of chemical and physical waste at the site are made.

1. New Landfill

The non-hazardous materials and DCC I contaminated soil at the site should be contained in a new landfill developed on site.

2. Landfill Closures

Three landfills located in the Beach Area require closure. These landfills appear to have been established in these locations in order to stabilize the airstrip. If the airstrip is to be retained, removal of the landfills will require extensive excavation and backfilling. Since contaminants are not leaching from these landfills, it is proposed that they be stabilized in place. This is an extensive area and a large quantity of gravel will be required. The estimated area of the three landfills requiring closure is 500,000 m^2. Debris associated with the Domestic Dump, including exposed and partially buried barrels, should be relocated to the new landfill.

3. *Non-Hazardous Debris*

After removal of the paint and PCB-containing equipment, and containment of the asbestos from the Main Station Building, the remaining building material constitutes non-hazardous waste. Vehicles and vehicle parts, mechanical equipment and construction materials need to be removed and landfilled. Prior to landfilling, the batteries located in the vehicles must be relocated. The creosote-treated poles should be landfilled on site. Other non-hazardous debris needs to be collected and landfilled on site.

4. *Hazardous Waste*

Hazardous waste has been identified at the site and will need to be treated accordingly. This includes batteries, gas cylinders and asbestos and any other hazardous material discovered during the remediation program.

5. *Buildings*

Only the Hazmat Building on site is intact and of any potential salvageable value. All other buildings are either partially demolished or in a state of disrepair. The Main Station Building requires some pre-treatment prior to disposal of the physical debris.

The Main Station Building interior painted surfaces must be tested for PCBs, and paint stripped from surfaces with levels of PCBs above 50 ppm (CEPA); this waste must be disposed of according to CEPA regulations. Any additional PCB-containing equipment discovered should be containerized and shipped south for disposal. The remaining non-hazardous Main Station Building materials should be landfilled on site, along with the asbestos material (pipe and wall insulation - double wrapped in plastic) from the building and surrounding area. Demolition and landfilling of the remaining buildings and physical structures (Garage, Antenna Platform and Terminal Building) is required.

Subsequent to this study hazardous materials which were stored in the Hazmat Building were removed from the site for disposal (see Chapter II, Section C.5.). The interior of the Hazmat Building floor should be tested for PCB contamination and, if it is found to be contaminated above DCC II, should be remediated to below this criterion. When tests show that it is no longer contaminated, it could be secured and left in place for use as an emergency shelter or summer camp.

6. Soils

Contaminated soils which exceed the DLCU criteria should be excavated from eight areas of the site. Several extensive areas of the site are stained with hydrocarbons. These areas do not require excavation but will be remediated through the general regrading of the site.

i. DCC II contaminated soils

Delineation, excavation of DCC II contaminated soils is required at five locations. These include two areas at the East Wing: a localized zinc stained area at G6508 and a localized Cd and Zn stained area at G6512; two areas beside the Garage: a large stain below debris beside the Garage at G6579 and an extensive stain from the Garage entrance around the east side of the building at G6589; and one area beside the Disaster Hut: G6593, a small stain next to the gravel pad.The total volume of DCC II soil is estimated to be 14 m^3. These soils should be disposed of in a manner the precludes contact with the Arctic ecosystem.

ii. DCC I contaminated soils

Delineation and excavation of DCC I contaminated soils is required at three locations. These include the East Wing at G6516, a stain 2 m from the east side of the building, the West Wing at G6543, small stained drainage pooling depression at the north end of the building, and the Central Wing at G6576 in an area covered with debris from the central wing and the paint shop. Approximately 8 m^3 of DCC I contaminated soil from these areas should be excavated and landfilled on site.

7. Barrels

A number of barrels, estimated at 230, are present at several locations around the site: Garage, Disaster Hut, Hazmat Building and North and South Beaches. There is a cache of approximately 120 barrels 3.6 km south of the site. All barrels and physical debris on the site and on North and South Beach should be buried in the landfill. Only five barrels were found on the North Beach and the barrel cache on the South beach, including the buried or partially buried barrels. These should laso be buried on site. Any untested barrels need to be treated according to the DLCU Barrel Protocol. The total number of barrels located on the South beach is approximately 150. There are five fuel tanks (106,000 L each) at the Main Station Building, one in the RCMP Outpost area and

one larger tank (616,000 L) on the beach. These- including the fuel pipe line - should be tested for product, remediated as necessary, and either removed or - once remediated to below the criteria - made available to the Clyde River Hamlet Council. A large number of barrels buried, estimated at several thousands, in Landfills A, B and C should be capped in place.

8. Vegetation

No criteria are available for the remediation of vegetation samples that contain elevated levels of contaminants. A comparison of the data with the background data indicates that two of the vegetation samples analyzed contained elevated levels of inorganic elements while the corresponding soil samples did not. The only inorganic element source likely to have impacted on the plants in this way is well removed from the plant sampling locations. Consequently the elevated levels of contaminants in the vegetation samples can only have resulted from a long-term bioaccumulation from exposure to low concentrations of contaminants (a phenomenon known to occur with zinc). Cadmium was present at detectable levels in three of the five *Salix arctica* background vegetation samples. This indicates that these plants might have a propensity to bioaccumulate cadmium from extremely low concentrations. None of the corresponding background samples analyzed contained cadmium at detectable concentrations.

Vegetation remediation will be achieved through removal of the potential contaminant point sources. These are probably the cadmium stains around the Disaster Hut and possibly the Garage, both of which will be remediated as part of the soil remediation program.

Table IV-1: Summary of Cleanup Actions for Cape Christian

Area	Non-Hazardous Materials[a]	Hazardous or Potentially Hazardous Materials	DCC Tier I Contaminated Soil[b]	DCC Tier II Contaminated Soil[b]
Area A: Upper Base	- remains of infrastructure (buildings, poles, tower, cables, ground wire, antenna platform, outfall and water supply pipes) - metal debris - vehicles and vehicle parts - empty barrels (20)	- tiles and insulation containing asbestos - batteries (2) - compressed gas cylinders - barrels with unknown contents (30) - Fuel Tanks and pipe line	- G6516 (2 m^3) - G6543 (2 m^3) - G6576 (4 m^3)	- G6508 (1 m^3) - G6512 (1 m^3) - G6579 (3 m^3) - G6589 (8 m^3) - G6593 (1 m^3)
Area B: Fresh Water Supply Dam	- remains of infrastructure (poles, cables, ground wire, water supply pipe) - metal debris - vehicles and vehicle parts - empty barrels (20) - pump house platform - mechanical equipment	- transportation tank - batteries (5) - barrels with unknown contents (10)	N/A	N/A
Area C: Beach	- remains of infrastructure (buildings, poles, cables, outfall pipe) - metal debris - vehicles and vehicle parts - buried barrels	- Fuel Tank and pipe line - tiles containing asbestos -CC6522 (20 L)	N/A	N/A

Area	Non-Hazardous Materials[a]	Hazardous or Potentially Hazardous Materials	DCC Tier I Contaminated Soil[b]	DCC Tier II Contaminated Soil[b]
North Beach	- metal debris - empty barrels (5)	N/A	N/A	N/A
South Beach	- metal debris - vehicles and vehicle parts - empty barrels (50)	- barrels with unknown contents (100)	N/A	N/A

a. The numbers of barrels listed are rough order of magnitude estimates.
b. Volumes were calculated based on a depth of 0.3 m.

APPENDIX F
SPECIAL PROVISIONS ENVIRONMENTAL SERVICES

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.