HJ-011

Preliminary Environmental Investigation
Site 44 - Marshall Creek Road

Contract # 96-6130

Draft Report
November 12, 1996

CCSG Associates

TABLE OF CONTENTS

Appendices

List of Photographs

List of Figures

Executive Summary

CCSG Associates conducted a preliminary environmental investigation for Site 39, located approximately 5 km southwest of Haines Junction on the Marshall Creek Road and is immediately adjacent to the Dezadeash River. This report was prepared for the Arctic Environmental Strategy, Action on Waste program of Indian and Northern Affairs Canada.

Site 42 was formerly a waste disposal site for local and military waste from the 1940's.

The objectives of this environmental Investigation were:

1. Develop a site history of physical wastes;
2. Test for specific contaminants: metals, total hydrocarbons ,polycyclic aromatic hydrocarbons, poly chlorinated biphenyls, herbicides, pesticides, pH, and asbestos;
3. Determine a contaminant profile;
4. Suggest recommendations for further assessment, monitoring or remediation.

There were four phases used to accomplish these objectives.

In Phase I, site history was determined through based on literature archival and record searches and interview. Contaminant presence and quantity was predicted.

Phase II tested for presence of contaminants at Site 44 through a field and laboratory program.

Phase III interpreted the results of the field and analytical laboratory testing. Contaminant levels were compared to Canadian Council for the Ministers of the Environment (CCME) guidelines for Interim Assessment Criteria for Site Remediation. Contamination source, nature and extent were delineated, and potential for migration predicted.

Phase IV used the CCME National Classification System to predict potential harm to human and environmental health. Recommendations for further assessment, monitoring or remediation were made based on toxicological interpretation of the site contaminant types, quantities and locations.,

Site 44 is classified as a Class 1 site based on the NCS system. This indicates that Site 44 is a high risk and action is required.

CCSG Associates recommends:

1. Fully characterize Pond Contaminants

Extent of contamination in both ponds was not well established. Point source samples of contaminants were located but not well delineated. A more intensive sampling regime should be conducted for the ponds.

2. Delineate Pond Contaminants

It is known that waste was deposited into the pond depressions. A geophysical survey conducted in winter to determine extent of metal debris would provide an indication of overall contamination in ponds.

3. Remediate Ponds

Barrels and sludge should be removed from the site.

4. Physical Cleanup

The physical surface debris should be collected and correctly disposed of at the Haines Junction municipal landfill.

5. Monitor Future Excavations

Should excavation occur on this site monitoring must be conducted.

1.0 INTRODUCTION

1.1 Project Background

In 1996 the Arctic Environmental Strategy (AES), Action on Waste program of the federal department of Indian and Northern Affairs Canada initiated the preliminary environmental investigation of over one hundred previously identified abandoned waste and disposal sites throughout the Yukon. These sites had been associated with exploration, mining, industrial, pipeline or military operations.

CCSG Associates, a Yukon environmental science consulting team, investigated three abandoned sites between August 1996 and November 1996. These sites were:

- Site 30, Km 1808.3 Alaska Highway north of Burwash Landing;
- Site 39, Kathleen River crossing on the Haines Road;
- Site 44, Approximately 5 km southwest of Haines Junction on the Marshall Creek Road.

This report presents the results of CCSG Associates' environmental investigations at **Site 44, Marshal Creek Road**. Reports on the other two sites are presented separately and in a similar format.

1.2 Site Background

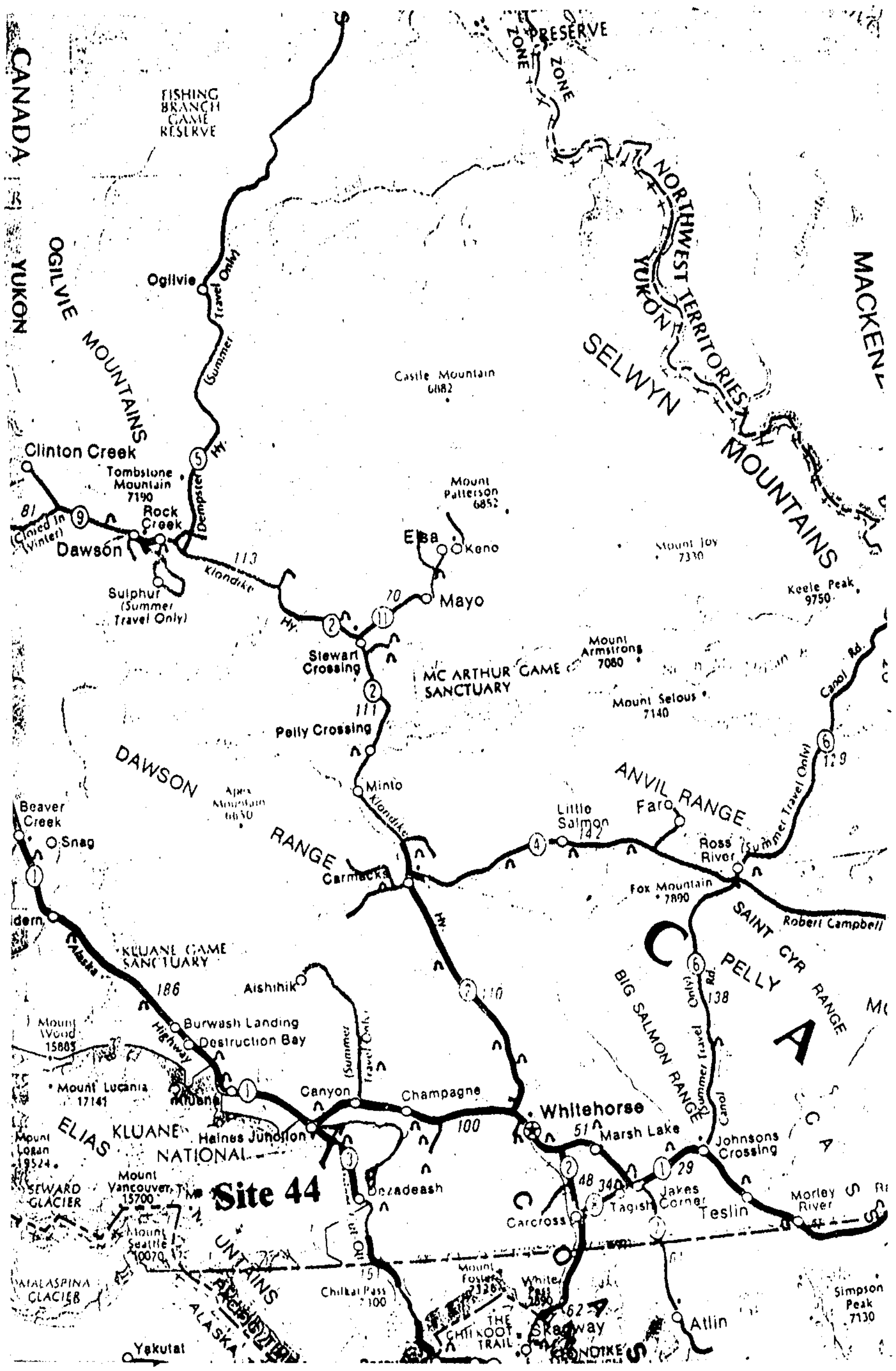
Site 44 is located on the north bank of the Dezadeash River, 5.2 km east of Haines Junction on the Marshall Creek Road (Fig. 1). The site is located 300 metres south of this road and is accessible by a dirt track. The site was originally a military garbage dump site, saw some use as a dumping area for local residents but is now abandoned (Photographs 1 & 2) (AES, Appendix A)(Bisset, page 225, 1995)(Baltimore, interview)

The boundaries of Site 44 are not delineated on any map as the Site has no present legal survey boundaries. Site 44 is located on map sheet 115A/14 at Latitude 137°25', Longitude 60°46'. The UTM Coordinates are Easting: E 368 500 Northing: N 6 739 000

The distinguishing physical features includes old vehicle bodies, drums, tires, surface and buried general household waste such as cans and bottles (AES, Appendix A), some old building lumber, barrels and metal waste submerged in the ponds. These and other common forms of waste generated by military camps have the potential to introduce specific, detectable contaminants into the environment:

Waste Material	***Detectable Contaminant***
Unused oil, petroleum and diesel	Hydrocarbons
Used oil	Polycyclic Aromatic Hydrocarbons (PAHs), Metals
Coolant from electrical transformers	Polychlorinated biphenyls (PCBs)
Building insulation	Asbestos
Pesticides (eg. DDT) for insect control	Organochlorines
Herbicides (eg. 2,4-D) for clearing vegetation	Phenoxy Acids
Garbage in a landfill site	High-metal, high-pH content leachate

These contaminants, as well as construction and miscellaneous debris have the potential to pose environmental and human health risks. For this reason, CCSG Associates looked and tested for the presence of the above-listed waste materials and corresponding contaminants. Where contaminants were found, extent of migration from the site and potential impact were assessed. For the purpose of this study a pollutant was considered to be a human generated waste and a contaminant was considered to be a pollutant with potential to be a human or environmental health risk.


CANADA
YUKON
OGILVIE MOUNTAINS
FISHING BRANCH GAME RESERVE
PRESERVE
NORTHWEST TERRITORIES
YUKON
SELWYN MOUNTAINS
MACKENZ
Ogilvie
Dempster Hy.
Castle Mountain 6882
Clinton Creek
Tombstone Mountain 7190
Rock Creek
Dawson
Sulphur (Summer Travel Only)
Klondike Hy.
Mount Patterson 6852
Elsa
Keno
Mount Joy 7330
Keele Peak 9750
Mayo
Stewart Crossing
MC ARTHUR GAME SANCTUARY
Mount Armstrong 7080
Mount Selous 7140
Pelly Crossing
DAWSON RANGE
Minto
Apex Mountain 6650
ANVIL RANGE
Little Salmon
Faro
Ross River
Canol Rd.
Carmacks
Fox Mountain 7890
Robert Campbell
SAINT CYR RANGE
PELLY
Beaver Creek
Snag
KLUANE GAME SANCTUARY
Aishihik
BIG SALMON RANGE
Mount Wood 15885
Burwash Landing
Destruction Bay
Alaska Highway
Mount Lucania 17141
Canyon
Champagne
Whitehorse
Marsh Lake
Johnsons Crossing
Mount Logan 19524
ELIAS
KLUANE NATIONAL
Haines Junction
Mount Vancouver 15700
Site 44
Dezadeash
Carcross
Tagish
Jakes Corner
Teslin
Morley River
SEWARD GLACIER
Mount Seattle 10070
MALASPINA GLACIER
Chilkat Pass 100
Mount Foster
White Pass
THE CHILKOOT TRAIL
Skagway
Atlin
Simpson Peak 7130
ALASKA
Yakutat

Photograph One: View of the outlet of the west pond into the Dezadeash River as seen from 44-S11.

Photograph Two: North facing view of the west pond from its outlet into the Dezadeash River.

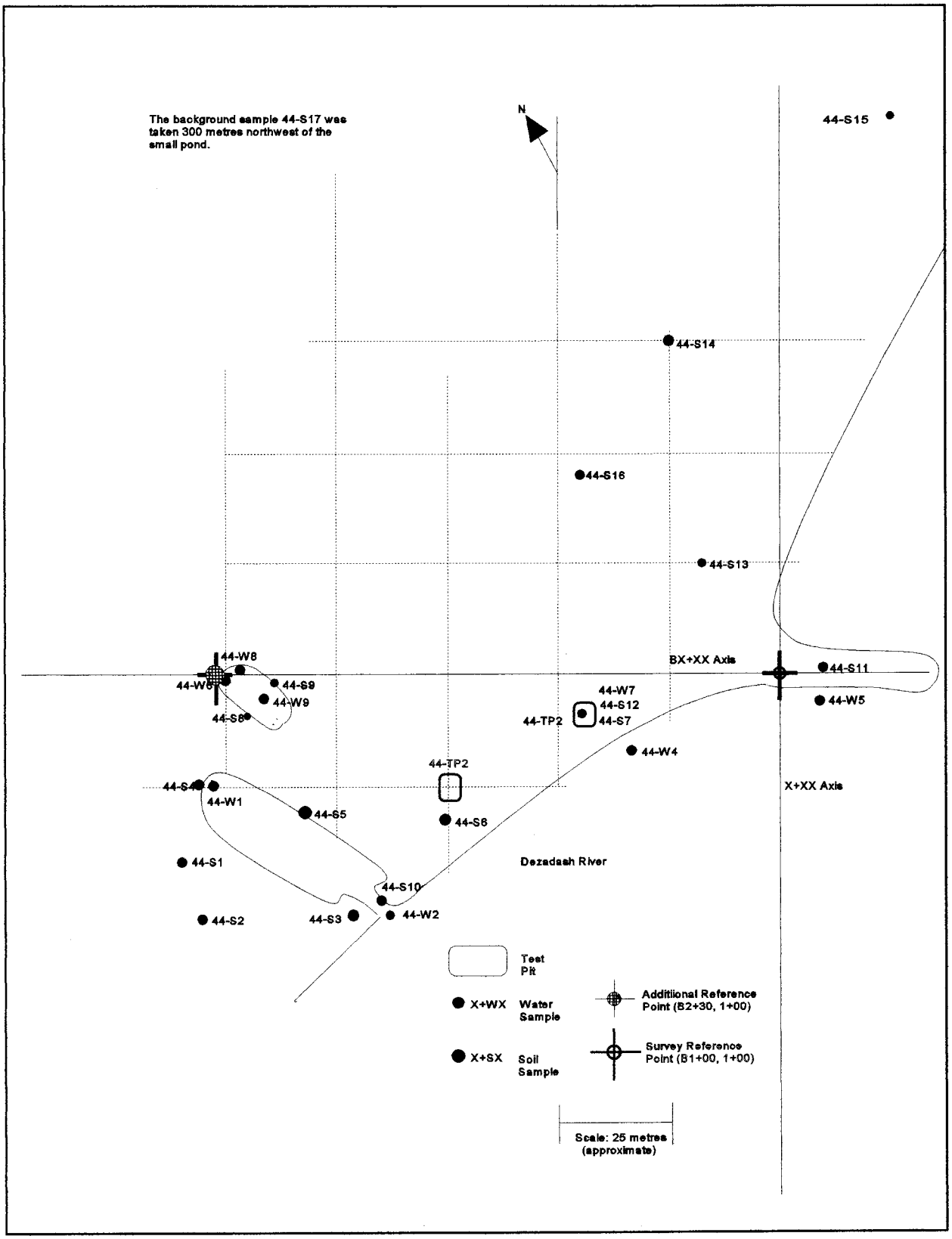


FIGURE TWO
Survey Grid Layout and Sample Sites

1.3 Objectives

The objectives of this environmental investigation were to:

1. Develop a site inventory of physical wastes;
2. Test for specific contaminants: metals, total hydrocarbons, PAH's, PCB's, herbicides, pesticides, pH and asbestos;
3. Determine a contaminant profile;
4. Suggest recommendations for further assessment, monitoring or remediation.

1.4 Project Protocol

The project design was developed according to the four phases of investigation described in the *Canadian Standards Association (CSA) Guidelines for Site Remediation* (CSA,1994):

PHASE I
Determine site history and contaminant profile based on literature, archival and record search and interviews. Predict presence and quantity of contamination.
The AES document *Research of Former Military Sites and Activities in the Yukon* (Bisset, 1995) provided a basis for Phase I of this study.

PHASE II
Test for the presence of contaminants on site to confirm or refute predictions made in Phase I.

PHASE III
Delineate contaminant sources and migration pathways. Determine extent and nature of contamination. Analyse and interpret Phase II results.
The results of Phase II and Phase III testing and characterization were compared to standards established by the *Canadian Council of Minister of the Environment (CCME) Interim Assessment Criteria for Contaminated Sites* (CCME, 1991). The CCME criteria are intended to maintain, improve, or protect environmental quality and human health at contaminated sites. These criteria provide numerical limits for contaminants in soil and water.

PHASE IV
Develop recommendations for further assessment, monitoring or remediation.
The sites were assessed for environmental risk according to the *CCME National Classification System (NCS) for Contaminated Sites* (CCME, 1992). This system evaluated the contaminated sites according to current or potential adverse impact on human health and the environment.

2.0 METHODOLOGY

PHASE I

2.1 Review of Existing Information

Phase I consisted of archival research and interviews to amass existing information about Site 44. This information was critical because the history of site used to predict the potential for certain types and quantities of contaminants currently at the site.

Much of what constituted Phase I research on Site 44 had already been completed and documented in the AES-requisitioned report *Research of Former Military Sites and Activities in the Yukon* (Bisset, 1995). This report included archival and interview research. CCSG Associates did not revisit sources that were researched by the Bisset (1995) study.

2.1.1 Archival Research

Some archival information was provided by AES. In addition the following departments and libraries were searched for relevant material:

- Yukon Archives;
- Whitehorse Public Library;
- Government of Yukon Community and Transportation Services Library;
- INAC Library.

2.1.2 Interviews

CCSG Associates interviewed the following local residents: Mike Crawshay, Ken Anderson, Ken Baltimore, Andy Williams,Richard Anderson, Kam Konduc and Scott Gilbert.

Information was requested from a number of Government Departments:

- Government of Yukon Tourism Heritage Branch

This branch maintains project files on former military sites.

- Water Survey Canada

Site 44 is adjacent to the Dezadeash River.

PHASE II

2.2 Field Program

Field Program was a Phase II component implimented to confirm or refute predictions of contaminant presence noted in Phase I. Phase II was comprised of an initial reconnaissance, survey grid layout and visual survey. Soil, water and vegetation samples were taken from sample locations chosen based on Phase I and survey indications.

2.2.1 Initial Reconnaissance

An initial site reconnaissance was done to establish layout and physical characterization. The following features were noted: signs of stressed vegetation, atypical or nonexistent vegetation, olfactory and staining indications; proximity to water and erosion; surface waste and existing structures.

2.2.2 Survey Grid Layout

A 25 meter by 25 meter grid was laid out over Site 44 using a hip chain to measure distances and a hand held Path Instruments Inc. compass for direction bearings. No cut-lines were made. All lines were set either to or at 90 degrees from magnetic north and no compensation was made for true north. The grid is accurate to approximately five metres. No elevations were recorded while performing the field survey.

The reference point on the survey grid is at the east end of the site on the promitory of land that seperates the Dezadeash River from a marsh area. The coordinates of this point were B1+00, 1+00. The first set of coordinate numbers (with the prefix B) run east/west and the second set of numbers run north/south (Fig. 2). All point sample sites have been referenced in this grid system. The survey marker used by CCSG Associates was not permanent. A subsidary reference point was also established on a distinguishing physical feature (Fig 2).

2.2.3 Visual Survey

Once grid lines had been laid out, a visual survey of the site was conducted by walking parallel to the north/south gridlines at intervals of 15 metres.The size of the site is about 100 meters by 250 meters. The visual survey was extended to 50 metres beyond the predicted extent of impact. Relevant physical features were referenced to the grid.

The survey walk ensured that any visual anomalies were accurately described and mapped in greater detail than provided in the iniatial reconnaissance. Vegetation was examined for signs of stress and anomalies from expected abundance and types of plants, and described in spacial relation to other vegetation regions. Surface debris, topography and structures were noted as indicators of potential contamination and recorded as a surface area layout.

2.2.5 Sampling

Point sample sites had been selected during the visual survey. These sites were chosen form indications derived in the archival research, initial reconnaissance and visual survey.

Ambient conditions were recorded at the time of sampling: air temperature, precipitation, cloud cover and general weather

2.2.5.1 Soil

Soil samples were collected using a 3 1/2 inch hand auger with a 3 foot extension. At every soil sample site a number of observations were recorded; location on survey grid, surface debris, vegetation, location, depth, soil type, colour, moisture and general particle size (Appendix B).

Soil samples were stored in sample bags or glass jars. Soil sample labels consisted of three codes: site number, the letter 'S' for soil and a number which indicated the order in which the sample had been taken. For example the second soil sample taken was labeled 44-S2. Sample bags were also labeled with the survey grid coordinates at the point location where the sample had been taken. All soil samples were stored at approximately four degrees Celsius before transport to the analytical laboratory. Analysis was conducted within two weeks of the sampling date.

2.2.5.2 Water

Water samples were collected by dipping the appropriate storage receptacle into the water source. Water temperature and pH (using an Oakton waterproof field tester) were recorded at the time and place of sampling. Water samples intended for metal analysis were stored in 750 mililitre plastic jars. Nitric acid was

added to these samples to preserve metal content. Water samples not intended for metal analysis were stored in one liter glass jars without preservative.

Water sample labels consisted of three codes: site number, the letter 'W' for water and a number which indicated the order in which the sample had been taken. For example the second water sample taken was labeled 44-W2. Sample bags were also labeled with the survey grid coordinates at the point location where the sample had been taken. All samples were stored at approximately four degrees Celsius before transport to the analytical laboratory. Analysis was conducted within two weeks of the sampling date.

2.2.5.3 Test Pits

Test pits were dug to provide a stratigraphic view of natural soils and waste deposited on Site 44. A Case 580 Super E rubber wheeled backhoe was used for test pit sampling. Test pits were excavated to a depth of 1.75 metres. At this depth soil stratification and some forms of subsurface contamination could be noted. Samples taken from test pits were assigned a label consisting of three codes: site number, the letters 'TP' for test pit and a number which indicated the order in which the pit had been dug. For example the second test pit was labelled 44-TP2. Soil and water samples were obtained and stored following the sampling protocol described in the previous paragraphs.

2.2.5.4 Vegetation

Plants that displayed stress were sampled. A piece of the plant was removed and stored in a sample bag. Stress was defined as any indication that plant health, growth or reproduction was adversely influenced, for example stunted growth, unhealthy appearance, or insect and mold infections.

Microscopic analysis was conducted within two weeks of the sampling date.

2.2.5.5 Waste

Some pieces of miscellaneous waste with potential for dating the site were picked up and stored in sample bags.

2.2.6 Photographs

Photographs were taken of:

- the site from various vantages
- point sample sites
- test pit excavation
- surface debris
- stressed vegetation

2.3 Laboratory Program

The laboratory program consisted of two parts: field and off-site analytical laboratory analysis.

The first analysis on every sample was a PetroFLAG field test for total extractable hydrocarbons. Samples that indicated high total extractable hydrocarbon concentrations were then field tested using DTECH immunoassay analysis for PAH. PCB field analysisusing DTECH immunoassay analysis was performed on samples from sites which indicated a potential concern, for example sites where electrical generation equipment may have been origionally used or stored.

Analyses performed in the field were subject to fluctuations in ambient temperature. The maximum daytime temperature recorded was 19 degrees Celsius. The minimum daytime temperature recorded was four

degrees Celsius. Reaction rates varied with temperature and interpretation of field generated results accounted for these variations.

Some soil, water and other samples were sent to a commercial analytical laboratory where testing took into account a wider range of parameters and guaranteed a higher level of accuracy than field testing. CCSG Associates submitted samples to Chemex Labs Alberta Inc. of Calgary, Alberta. Chemex is approved by the Canadian Association for Environmental Analytical Laboratories (CAEAL). Chemex analysed all samples in compliance with the CCME Interim Canadian Environmental Quality Criteria for Contaminated Sites Guidelines.

Samples were chosen for laboratory analysis based on:

- required replication of field samples to ensure Quality Assurance/Quality Control
- indications of high contamination derived from field results

2.3.1 Quality Assurance/Quality Control

All sampling and testing adhered to the principals outlined in the CCME Guidance Manual on Sampling Analysis and Data Management for Contaminated Sites. CCME Data Quality Objectives were used to develop the experimental design for laboratory analysis.

The experimental design for laboratory analysis was developed and implemented according to the CCME Quality Assurance/Quality Control (QA/QC) guidelines. For quality assurance:

1. blank and spike samples were verified with each sample run;
2. ambient air temperature variation was accounted for;
3. 10% of all field tests were replicated in the field to confirm analysis.

For quality control 10% of field samples were submitted to Chemex Labs to undergo testing for the same compounds (total extractable hydrocarbons, polycyclic aromatic hydrocarbons and/or polychlorinated biphenyls) for which they had been tested in the field.

2.3.2 Field Laboratory Analysis

Samples were tested on-site for:

- total hydrocarbons
- PAH's
- PCB's

Total Hydrocarbons:
Visual and odour observations, and subsequently UVic Photo-ionization, were used to initially detect for total hydrocarbons. The UVic detector was supplied by Span Gas Safety Services Limited, Edmonton, Alberta.

The PetroFLAG hydrocarbon analysis system is a field analytical tool which tests for a broad spectrum of hydrocarbon contamination regardless of the source or the state of hydrocarbon degradation.The PetroFLAG meters and reagents were supplied by Osprey Scientific Inc., St. Albert, Alberta.

Hydrocarbons are extracted from soils using an extraction solvent which contains no chlorofluorocarbons or chlorinated solvents. Extraction efficiency is not affected by soil moisture content. The resulting solution is analysed in an analyser which can be set to a particular response factor based on suspected contamination. This analyser is most sensitive to heavier hydrocarbons such as oils and greases and less sensitive to lighter more volatile hydrocarbon fuels.

Soils with high organic content produce a relatively high hydrocarbon reading using PetroFLAG analysis

because naturally occurring waxes and oils as well as hydrocarbon-like compounds such as terpenes or creosotes are extracted by the solvent.

Field trials conducted to confirm effectiveness of the PetroFLAG method for samples contaminated with diesel fuel, oil and grease of correlated well with EPA laboratory methods. Results indicated there were no false negatives and 10% false positives.

PAH's:
The DTECH immunoassay analysis system provides semiquantitative field analysis for polycyclic aromatic hydrocarbons (PAHs) in soil and water samples. Immunoassay analysis uses antibodies (biological molecules) to bind only the target compound in the sample matrix. The antibodies are then linked to a colour indicator the intensity of which can be measured as an indicator of target compound concentration.

DTECH can detect and measure PAH concentrations in the range of 8 to 250 ppb in water and 0.6 to 25 ppm in soil. It is possible for DTECH to indicate a positive test result for PAH due to cross-reactivity with structurally similar compounds.

The DTECH meters and reagents were supplied by Osprey Scientific Inc., St. Albert, Alberta.

PCBs:
The DTECH immunoassay analysis system provides semiquantitative field analysis for polychlorinated biphenyls in soil or wipe samples. Immunoassay analysis uses antibodies (biological molecules) to bind only the target compound in the sample matrix. The antibodies are then linked to a colour indicator the intensity of which can be measured as an indicator of target compound concentration.

DTECH can detect and measure PCB concentrations in the range of 0.5 ppm to 25 ppm in soil. This test reacts directly with Aroclors 1254,1260, and 1262, reacts well with Aroclors 1242,1248, and 1268, reacts moderately with Aroclors 1232 and 1016, and shows little reactivity with Aroclor 1221.

The DTECH meters and reagents were supplied by Osprey Scientific Inc., St. Albert, Alberta.

2.3.3 Analytical Laboratory Program

Some soil, water and other samples were chosen to be sent to a commercial analytical laboratory. Testing was done for these reasons:
1. To provide more accurate quantitative analysis of parameters already tested in field;
2. To test greater specificity within parameters;
3. To confirm accuracy of field results through replicate samples;
4. To test parameters that could not be tested in the field.

Soil and water samples were sent to Chemex Labs Alberta Inc. of Calgary, Alberta were tested for some or all of the following components:

TYPE OF TEST	METHOD OF TEST	ITEMS TESTED FOR
Total Metal Content	ICP	barium, beryllium, cadmium, chromium, cobalt, copper, lead, molybdenum, nickel, silver, vanadium, thallium, arsenic, selenium, tin, antimony, zinc
Total Extractable Hydrocarbons	Modified Method ASTN D2887	C8-C60
Volatile Organic Hydrocarbons	BTEX EPA Method 8260 Modified	Benzene, Ethylbezene, Toluene, m&p-Xylene, o-Xylene
PAHs	GC/MSD (US EPA SW-846 Method 8270 Modified)	Naphthalene, Acenapthene, Pyrene, Benzo(c)phenanthrene, 7,12-Dibenz(a)anthracene, Benzo(K)fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthracene, Dibenzo(a,h)pyrene, Dibenzo(a,l)pyrene, Acenaphthylene, Flouranthene, Chrysene, Benzo(a)anthracene, Benzo(b&j)fluoranthene, 3-Methylcholanthrene, Indeno(1,2,3-cd)pyrene, Benzo(g,h,i)perylene, Dibenzo(a,i)pyrene
Organochlorine Pesticides	GC/MSD (US EPA SW-846 Method 8270 Modified)	Trifluralin, Triallate, Endosulfan I, Endosulfan II, 4,4'-DDT, Methoxychlor, gamma-Chlordane, beta-BHC, heptachlor, Dieldrin, Endrin Aldehyde, Endosulfan Sulfate, Heptachlor Epoxide, alpha-Chlordane, gamma-BHC (Lindane), Aldrin, Endrin, alpha-BHC, delta-BHC, 4,4'-DDE, 4,4'-DDD
Phenoxy Acid Herbicides	GC/MSD (US EPA SW-846 Method 8270 Modified)	Lontrel, MCPP (Mecoprop), 3,5-Dichlorobenzoate, 2,4-dichlorophenol (2,4-D), 2,4,5-trichlorophenol (2,4,5-T), 2,4-DB, Acifluoren, Dicamba, Bromoxynil, Dinoseb, Pentachlorophenol, Chloramben, Picloram, Diclofop-methyl, MCPA, Dichloroprop, Bentazon, 2,4,5-TP, MCPB, DCPA Diacid

PHASE III

2.4 Delineation

The results of field and Chemex laboratory testing, in conjunction with knowledge of the physical characteristics of the site, were used to:
1. Analyse and interpret levels of contamints detected in Phase II.
2. Determine contaminant sources.
3. Delineate the extent and nature of contamination.
5. Predict the potential for contaminant migration.

PHASE IV

2.5 Developing Recommendations

Phase IV develops recommendations for further assessment, monitoring or remediation.

Background levels are compared with concentrations found in the site sampling regime, concentrations above the background levels being considered a potential pollutant. CCME Interim Assessment Criteria was used to compare to the sample analysis results to determine level of concern presented.

Interpretation of analytical results included the use of the National Classification System (CCME NCS, 1992) work sheets. This system uses a work sheet scoring system to assess the hazard of a site. Site classification was based on individual characteristics and the site was placed into classes according to their priority for action. These classes are:

Class 1 - Action Required
Class 2 - Action Likely Required
Class 3 - Action May Be Required
Class N - Action Not Likely Required
Class I - Insufficient Information

Determination of these ratings assess potential hazard to human and ecological health by:
1. Establishing contaminants, receptors and pathways involved
2. Combining site specific data with literature review to assess toxicity potential
3. Delineating contaminant sources and assess potential exposure levels and pathways
4. Classifying potential hazard of site and recommend degree of action priority.

The National Classification System evaluates sites by scoring them on a scale from 0 to 100.. In general, sites that exhibit observable or measured impacts on the surrounding environment or have a high potential for causing negative impacts will score high under the system. Sites with minimal observed impacts

or a low potential for causing impacts will generally receive a low score. The system is not designed to provide a quantitative risk assessment, but rather is a tool to screen sites with respect to need for further action (e.g., characterization, risk assessment, remediation, etc.) to protect human and animal health and the environment.

Sites are not ranked relative to one another. Sites are classified on their individual characteristics and will be placed into classes according to their priority for action.

3.0 RESULTS

PHASE 1

3.1. Archival Research and Interviews

A primary source of historical information regarding military activities in the Yukon Territory was the "Research of Former Military Sites and Activities in the Yukon", compiled by K. Bisset and Associates in April, 1995. It was compiled for the Arctic Environmental Strategy of DIAND and essentially comprises a Phase I analysis of all former military sites and activities in the Yukon. Additional information was compiled from the Yukon Archives, the Whitehorse Public Library and the Department of Indian and Northern Affairs, the Heritage Branch of YTG Tourism Department,Yukon Territorial Government Community and Transportation Services, Yukon Weather Centre and the Water Survey of Canada. Residents and commercial companies of the area also provided information. The village of Haines Junction, the Kluane Park Adventure Centre (a river guiding operation based in Haines Junction), Kluane Machine (a Haines Junction based contracting company) and the Arctic Research Institute at Kluane Lake were contacted. Initial site reconnaissance provided basic information about the physical site.

3.1.1 Site History

Site 44 was a dumpsite for old military waste and was also used for road construction waste in early 1940's. This site was still active until the 1960's as the old dump site for Haines Junction (Ken Baltimore, interview). There is little record information about the site, although according to Bisset::

> At Marshall Creek (MP 1006); South side of hwy, near the confluence of the creek and the Dezadeash River, there is scatterd debris from an old military camp along the bank of the river (Bisset, page 225, 1995)

In the information package provided by AES, the site is refererred to as a "old garbage dump".

3.1.2 Type and Quantity of Contaminants

The waste site includes old vehicle bodies, drums, tires, surface and buried general household waste such as cans and bottles (AES, Appendix A).

The approximate size of site is 100 by 250 meters. Quantity of contaminants is uncertain from archival research, but it does indicate that there does not appear to be a pit, only surface garbage (AES, Appendix A).

Straight edged depressions in the ground, probably indicative of human activity, has been mentioned (Scott Gilbert, Interview).

Archival research did not indicate what contaminants would have been stored at Site 44.

3.1.3 Geology of the Area

The geology of the area east of Haines Junction along the Dezadeash River is a greenstone and limestone of the Wrangellia Terraine. This is an accreted insular superterraine from the mid-cretaceous time period. Middle pennsylvannian plutons intrude the basement rocks of Wrangellia.

3.1.4 Depth of Water Table

Groundwater was encountered at a depth of approximately 1.75 meters during the site investigation of Site 44 in the process of digging the test pits.

3.1.5 Annual Rainfall Data

Annual rainfall data for Site 44 is taken from readings from the Haines Junction Highway Maintenance yard for the years 1987 to 1996. The annual rainfall over these years is 166.2 mm/annum. The annual rainfall data for the years 1944 - 1985 is 154.3 mm/annum. However, the location of these readings is unknown, and a yearly breakdown was not provided (Yukon Weather Centre). The 1944- 1985 readings were not included for the CCME analysis. Annual rainfall does not take into account snowpack runoff.

3.1.6 Surface and subsurface stratigraphy

Permafrost is unpredictable in the region (Mike Crawshay, interview).

3.1.7 Proximity to surface water

Archival research gave conflicting information stating a distance of both 8M and 8 KM to Dezadeash River (AES, Appendix A).

Site 44 is imediately adjacent to the Dezadeash River on the south side. One pond at the site contains waste and is directly connected via surface water (Anderson, interview). There are small pockets of waste on the river and the pond edges with water entering around debris (Scott Gilbert, interview).

3.1.8 Flood potential of site

Site 44 is adjacent to the Dezadeash River and has one pond containing waste that is connected via surface water (Scott Gilbert, interview). This area is classified as having high flood potential.

Dezadeash River has a drainage area of 8500 square kilometers. Averaged over forty years, 1953-1992, maximum flows on the Dezadeash River were measured in June at 104 cubic meters per second and July at 94 cubic meters per second, low flows were measured in February at 16.2 cubic meters per second and March at 15.3 cubic meters per second (Water Survey of Canada).

3.1.9 Proximity to drinking water supply

Downstream use of Dezadeash River water might include agricultural use on Leases #620, #612, #614 (AES, Appendix A) and local residence use on Lots #86, #62, #84, #85 (AES, Appendix A). The Village of Haines Junction (5 km downstream) obtains its water supply from the river.

3.1.10 Uses of adjacent water resources

The Dezadeash River is a popular canoe and boating area for local residents and tourists, and is extensively used for fishing and swimming. Site 44 is over 100 kilometres downstream of Dezadeash Lake. This lake is road accessible from the Haines Highway and provides a popular starting point for recreational boating on the Dezadeash River.

3.1.11 Land use information

The site is not currently occupied by any dwelling or structure. Refer to Appendix A for the proximity of Agriculture Leases #620, #612 and #614 and Residental Lots #86, #62, #84, #85.

There are two fuel wood cutting operations along the Dezadeash River between Marshal Creek and Haines

Junction.

Marshall Creek road is used extensively for hunting, trapping, cycling, jogging, skiing, driving snowmachines, sightseeing and paddling access (Ken Anderson, interview).The access track from Marshall Creek Road to Site 44 is used to reach fishing locations along the Dezadeash River bank.

3.1.12 Fish and Wildlife

There is an abundance and diversity of wildlife in the vicinity of Site 44. Squirrels, Whisky Jacks and beaver have been noted.

There is a movement in mid to late winter of an important moose population from the sub-alpine areas of Marshall and Garnet Creeks across the Alaska Highway to their winter and spring grounds along the Dezadeash River, Kathleen River and Quill Creek area. This population is presently quite low (Ken Anderson, 1996).

Fishers use Site 44 to catch fish, mainly greyling, in the Dezadeash River.

PHASE II

3.2 Current Physical Conditions at Site 44

The size of the site is approximately 100 metres by 250 metres as gauged by visible human impact on the site and the extent of surface debris. There are no survey markers or cleared cut lines to indicate boundaries and the one fence line does not appear to follow any legal boundary (Fig. 3).

The site is approached via a 300 metre dirt track running south off the Marshall Creek Road. This turnoff is 5.2 km east of the Village of Haines Junction. At the 300 metre mark, the dirt track heads between two ponds, a small one to the east and a large one to the west. The track then veers east and for 100 metres travels parrallel to the Dezadeash River (which lies to the south of the track at a distance of 25 metres). The track ends at a promitory of land (5 - 10 metres wide, 30 metres long) that has the river on its south side and a marsh on its north side. The promitory ends in the river.

The Dezadeash River is moderately clear with a swift current. At the end of the promitory there is a confluence of two river channels occuring to the east. There is waste on the undercut bank of the Dezadeash River consisting of tires, metal and barrels, Between the ponds and the promitory area there is a small pit in the river bank. It is filled with water and connected to the river. This contains metal, lumber, cans and a caterpillar track.

The west pond is 50 metres long (running north/south) and 25 metres wide. The pond has an open outlet to the Dezadeash River at the south end. There is a sand and gravel bar across the river at the outlet, but water flows accross this with a depth of a 0.5 meters. Extensive waste is submerged on the north and east sides of the pond, and there are pockets of waste on the west side. This waste includes a pickup truck body (photograph 5), at least two vehicle batteries (photograph 8), numerous vehicle tires, 45 gallon barrels and extensive unidentifiable metal and other debris (photograph 17). The depth of the pond 1 metre from the shoreline is 0.5 metres and is unknown in the middle. An Arctic Grayling was seen in the pond, approximately one foot in length.

The east pond is 20 metres long (running north/south) and 7.5 metres wide. It has at least five 45 gallon barrels submerged within a metre of water at the north end (photographs 9 and 10). A pickup truck body is partially submerged at the south end. Additional smaller metal scraps are scattered within the pond. The water depth is at least 1.75 metres. There is no surface water outlet from this pond. Vegetation consists of a moss edge with floating orange scum (particularly at the north end), a bright green algal growth and profuse floating algal blooms. Aquatic plants and marsh grasses were both submerged and partially submergent (photographs 11, 12 and 18). Dragon flies, black flies and horse flies were abundant at the time of the site visit.

Between the ponds (forming a western boundary) , the dirt track (forming a northern boundary) and the promitory (forming a eastern boundary) is an area composed of bare ground, small poplars and underbrush. This area is extensively covered in small debris such as tin cans (including oil cans and motor vehicle product containers),

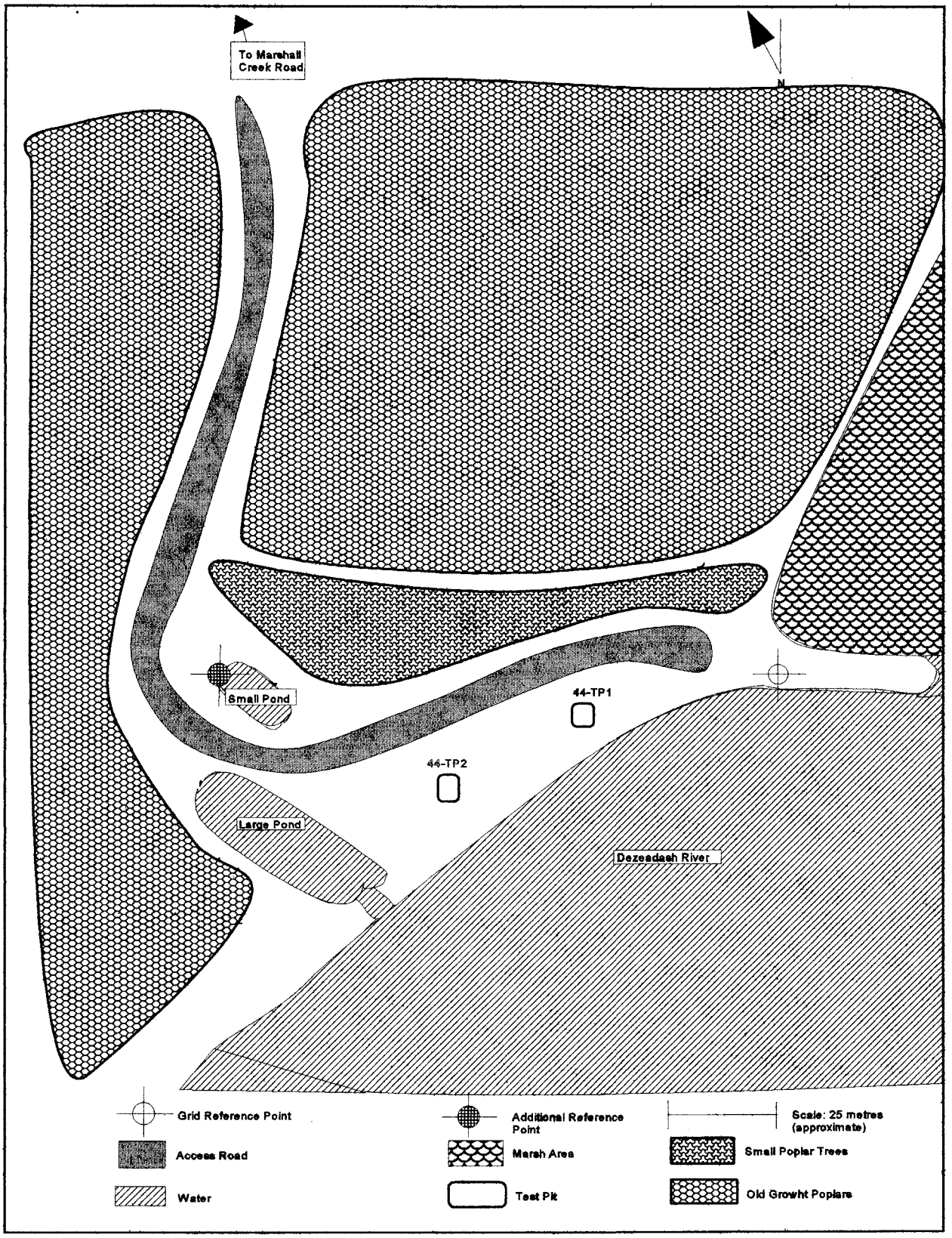


FIGURE THREE
Vegetation Types

broken glass, metal parts and vehicle tires (photographs 1, 2, 13, 14, 15 and 16). In addition, there are three vehicle bodies.

To the north of this area, beyond the dirt access track and with the marsh to the east and the small (east) pond to the west, is a 10 to 25 metre wide band of extremely thick young poplar growth. In this area, but within 15 metres of the pond are five vehicle bodies.

North of the young poplar area, bounded by the access track to the west and the marsh to the east, is an area dominated by by old growth poplars. The western portion of this area has experienced severe blowdown and is difficult to walk through. Surface garbage is scattered in a 100 metre strip 50 metres deep, paralleling the marsh to the east. The majority of this garbage is cans, broken glass and small pieces of metal but there is one vehicle body (photograph 7), some metal office fixtures, numerous tires and empty 20 gallon barrels (photograph 19, 20 and 21). There are small (2 metre diameter, 0.5 metres high) clay mounds in this area, clear of any underbrush and having garbage and debris in and around them.

There is a path which runs along the banks of the marsh area. The marsh appears to be mostly clear of debris, although there is one vehicle body by the land promitory (photograph 6), a 20 gallon drum and some metal wire that is visible. After walking 250 metres up this path, a beaver dam is visible in a stream that flows through the marsh. Gnawed trees seem to be the recent work of beaver activity, and there are trees felled in woods by beavers.

Squirrels and Whisky Jacks were visible throughout the site and according to a local fisher who has lived in the area for his entire life there is grayling at this location.

3.3 Laboratory Analysis Results

The September site visit was part of Phase II and Phase III of the Assessment Plan, to determine the presence of contaminants on site and initiate delineation. This visit included a site survey, a site inventory and soil and water sampling for both field and laboratory testing. Sampling details, such as depth and location, are listed in Appendix B.

3.3.1 Field Laboratory Analysis

Concentration ranges and locations of soil and water samples were tested in the field for total extractable hydrocarbons based on PetroFLAG analysis, and for polycyclic aromatic hydrocarbons and polychlorinated biphenyls DTECH immunossay analysis. These are depicted in Figure 4. Field analysis results are listed in Appendix C.

3.3.1.1 Total Hydrocarbons

Soil samples were tested for total extractactable hydrocarbons using the PetroFLAG broad spectrum analysis system (Appendix C). Sample 44-S1, 44-S5, 44-S13 and 44-S15 were the highest levels of total hydrocarbons tested in the field at Marshall Creek Site 44. Samples 44-S2, 44-S8, 44-S9, 44-S10 and 44-S14 were found to be in the medium range for total extractactable hydrocarbons. Very low presence of total extractactable hydrocarbons was found in samples 44-S3, 44-S4, 44-S6 in 44-TP1, 44-S7 in 44-TP2, 44-S11, 44-S12, 44-S16 and 44-S17.

3.3.1.2 Polycyclic aromatic hydrocarbons

PAH's were detected in the field using the D TECH semiquatitative immunoassay technique for total PAH concentration. Results of field analysis for PAH's are compared to CCME Interim Assessment Criteria for Soil and Water, however the CCME guidelines indicate criteria for individual PAH's (0.1 ppm for soil and 0.01 ppm for water) whereas the immunoassay technique analyses for total PAH concentration (Appendix C). British Columbia Ministry of the Environment remediation criteria indicates total PAH levels for soil at 20 ppm and for freshwater aquatic life at 0.02-0.9 ppm Concentrations of PAH's were below the detectable limits in soil samples 44-S5, 44-S10, 44-S8 and water sample 44-W9. PAH concentrations in soil sample 44-S13 and water sample 44-W8 were analysed at levels which may exceed CCME criteria for individual PAH concentrations, 0.62 ppm and 12.6 ppb respectively.

Photograph Three: View of surface debris near 44-TP1.

Photograph Four: View of surface debris near 44-TP2.

Photograph Five: West facing view of east pond. The vehicle wreck on the east shore.

Photograph Six: East facing view of vehicle wreck in the marsh area. This is 10 metres north of the survey reference point.

Photograph Seven: Vehicle wreck near 44-S16.

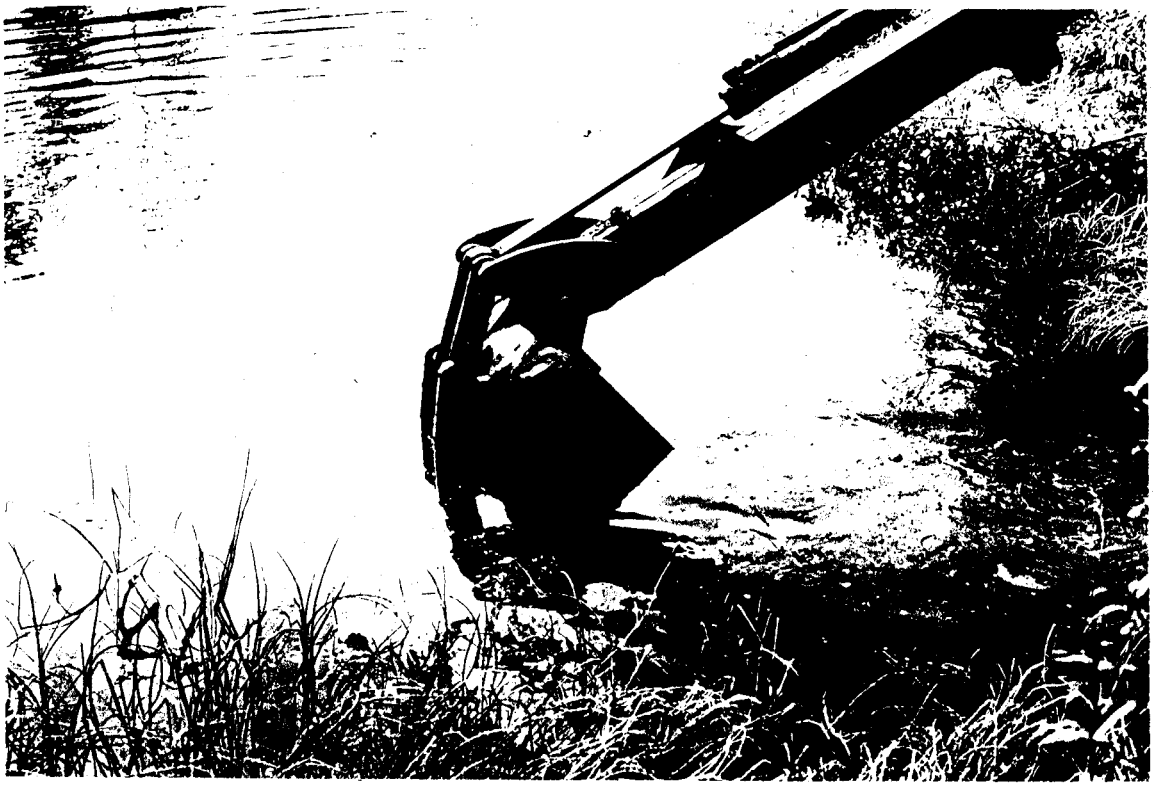
Photograph Eight: Batteries and large metal drums submerged on east side of the west pond.

Photograph Nine: Submerged large metal drums at north end of east pond.

Photograph Ten: Submerged large metal drums of north end of east pond.

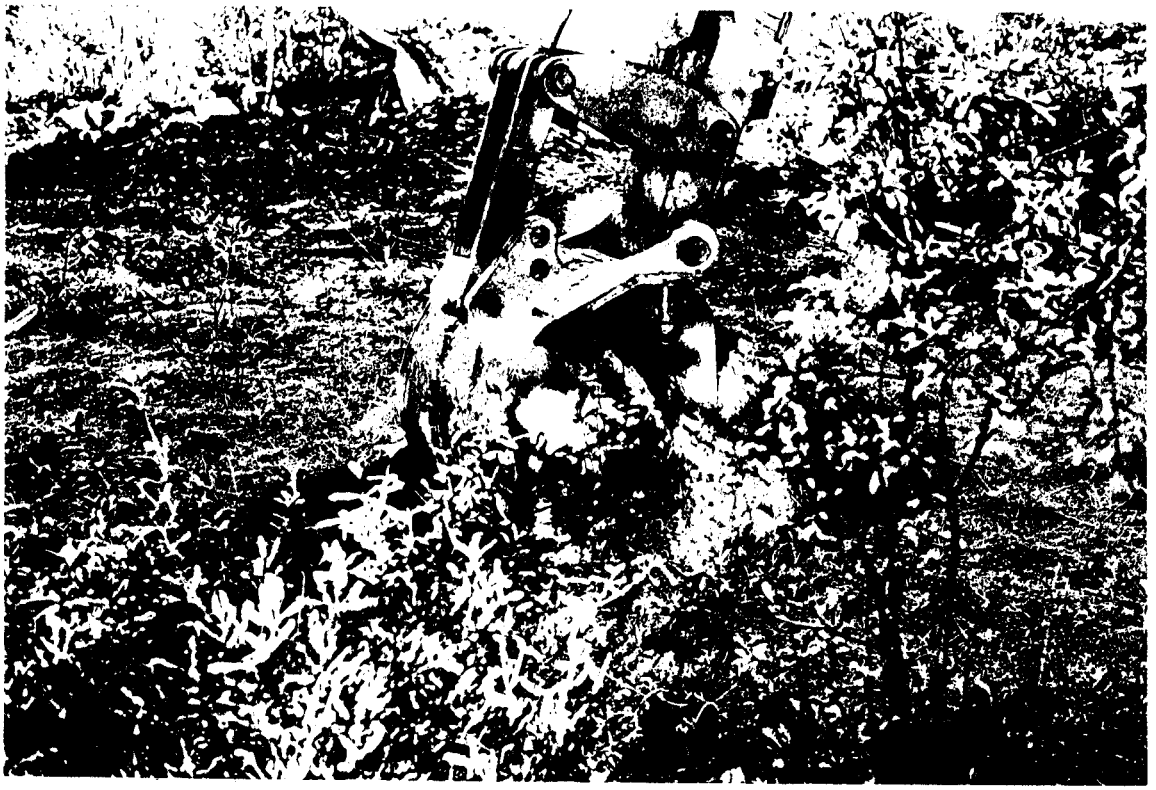
Photograph Eleven: Backhoe on west bank of the east pond.

Photograph Twelve: Backhoe on the west bank of east pond with its bucket in pond.



Photograph Thirteen: West facing view of 44-TP1. The west pond is in the background.

Photograph Fourteen: Backhoe excavating 44-TP2.



Photograph Fifteen: Ground water in 44-TP2.

Photograph Sixteen: Surface at 44-TP2 after excavation and refilling.

Photograph Seventeen: South facing view of west pond. 44-S4 is in the foreground.

Photograph Eighteen: South facing view of east pond. 44-S9 is in the foreground.

Photograph Nineteen: View of surface debris in old growth poplars. 44-S14 is on the left.

Photograph Twenty: View of surface debris in old growth poplars. 44-S15 is on the right.

Photograph Twenty-One: View of surface debris in old growth poplar. 44-S16 is in the centre

Photograph Twenty-Two: Poplars near 44-TP2.

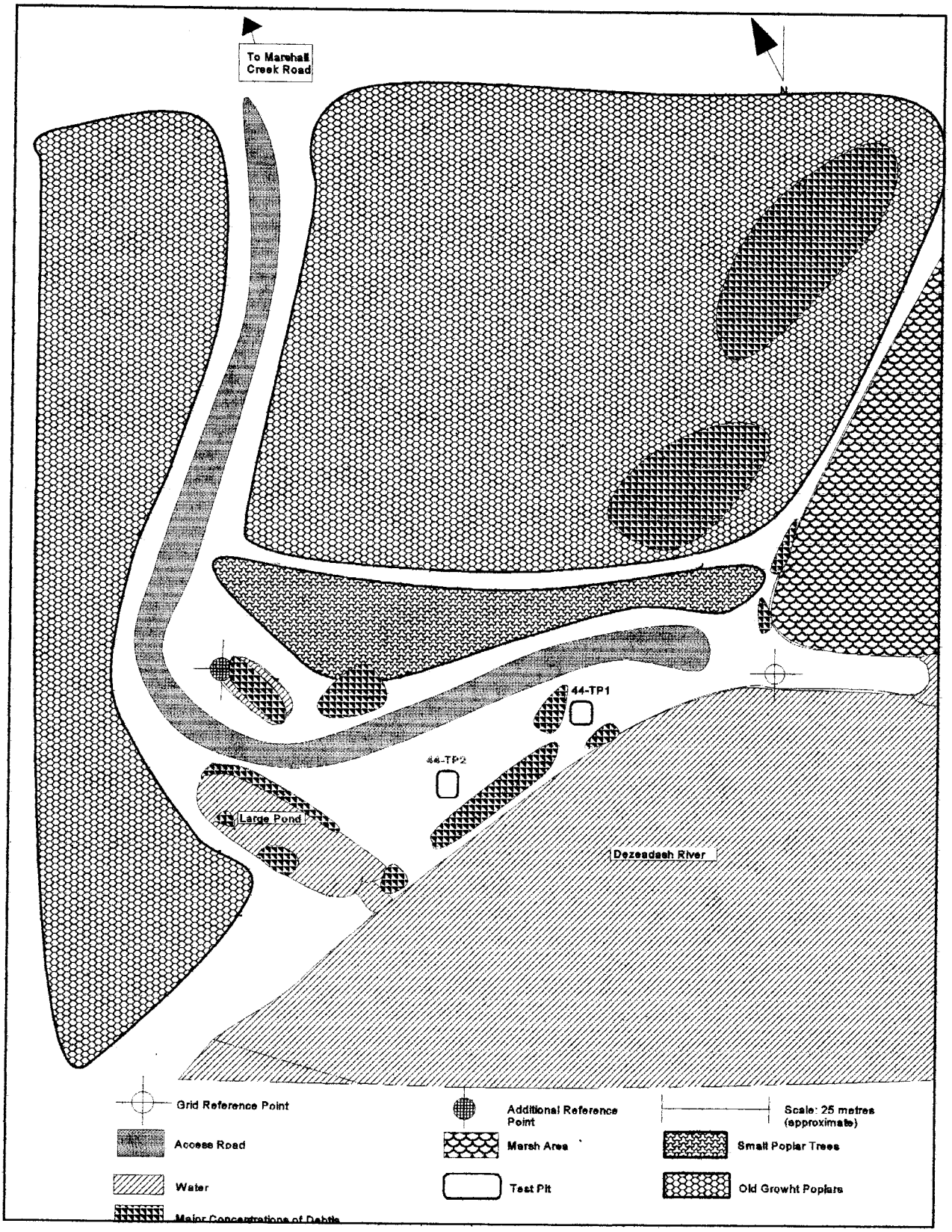


FIGURE FOUR
Debris Location

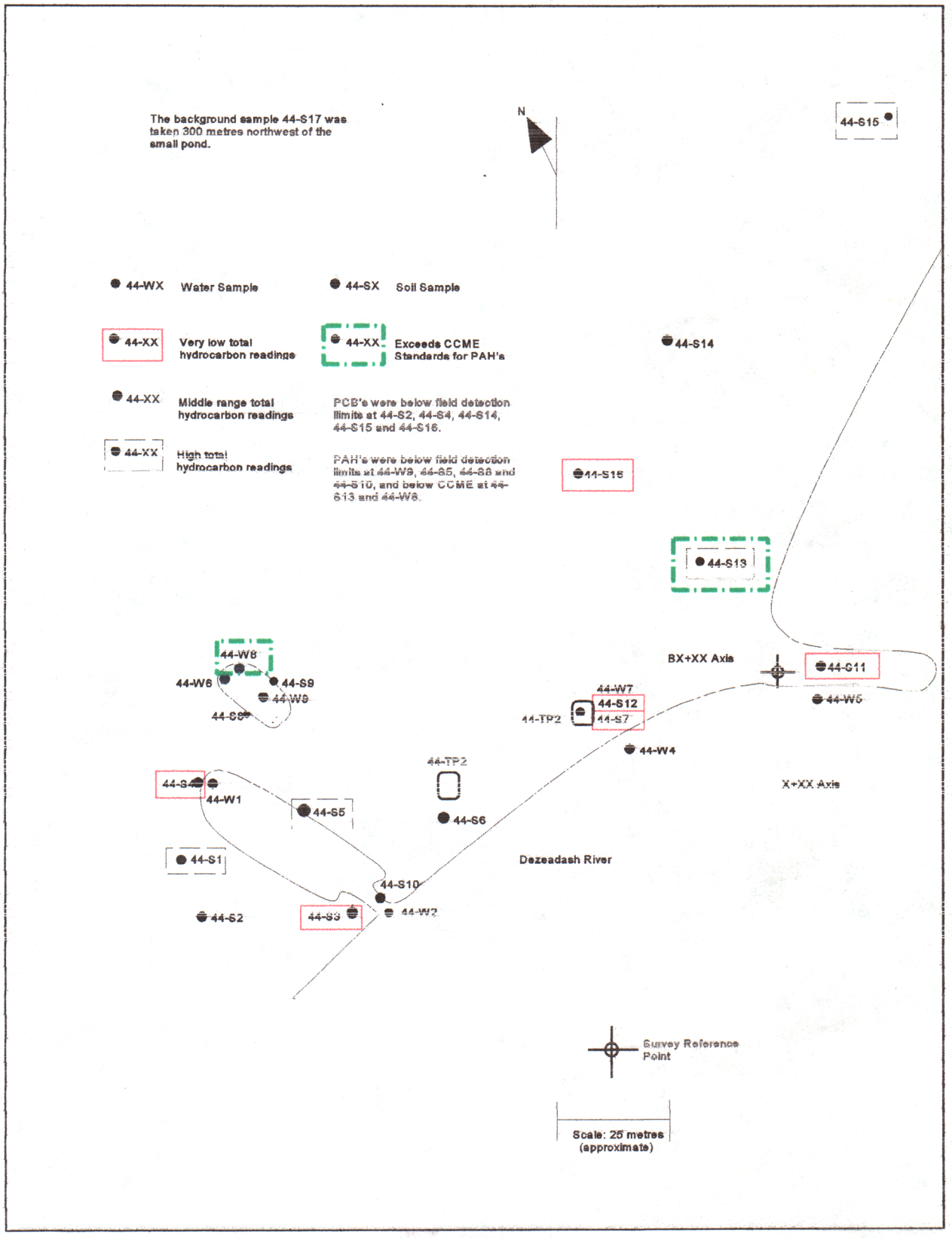


FIGURE FIVE
Field Laboratory Results

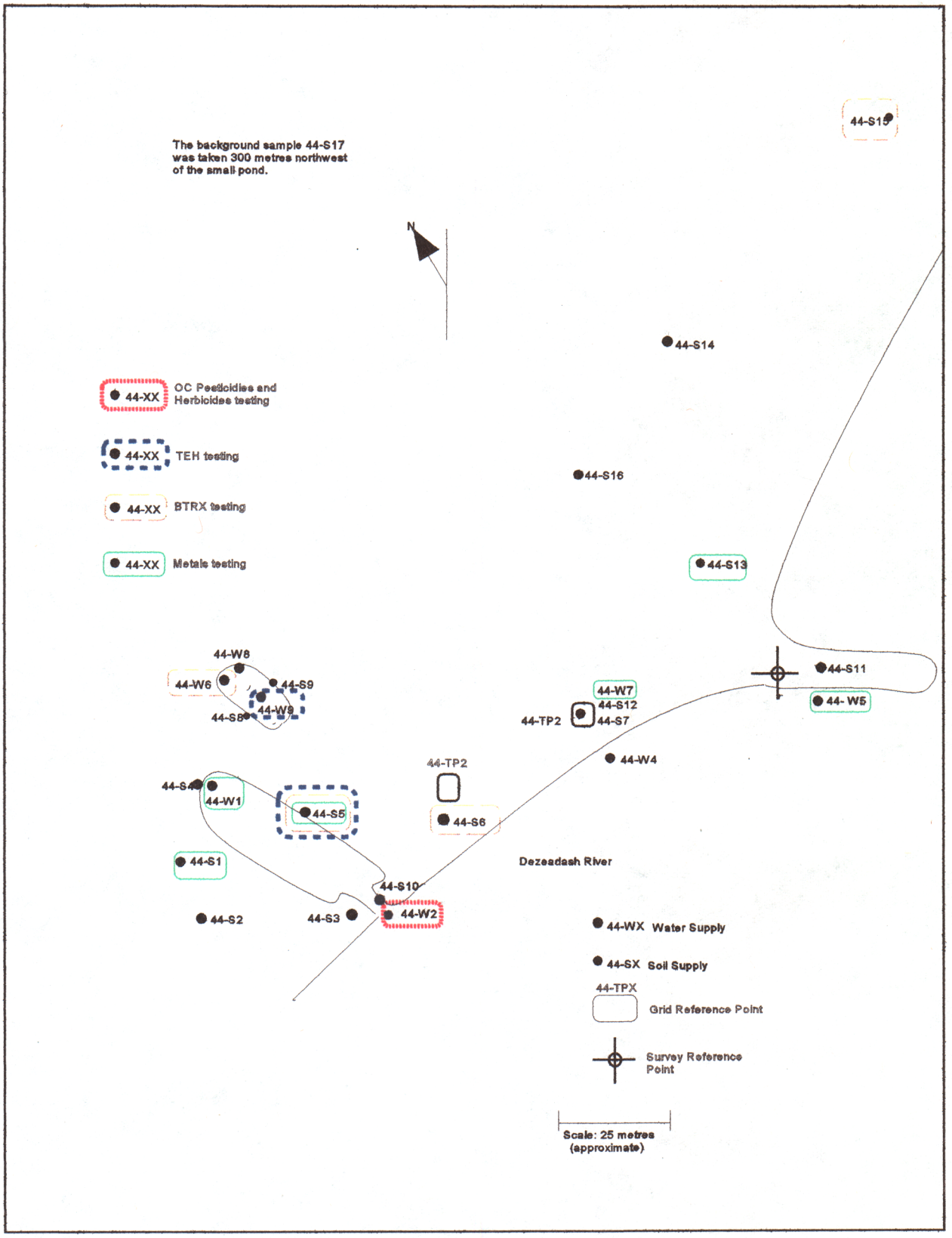


FIGURE SIX
Laboratory Testing

3.3.1.3 Polychlorinated Biphenyls

PCB's were detected in the field using the D TECH semiquatitative immunoassay technique. Results of field analysis for total PCB concentrations are compared to the CCME Interim Assessment Criteria for Soil and Water guidelines for mixtures of PCB's (Appendix C). PCB concentrations were below detection levels for field analysis of samples 44-S2, 44-S4, 44-S14, 44-S15 and 44-S16.

3.3.1.4 Vegetation

Balsam Poplar: *Populus balsamifera*

Irregular shaped silver spots were scattered on top of a leaf with a dusty appearance (located near 44-TP2, see photograph 22). This is possibly a mold infection on plant, or it could be some kind of rust or smut infection.

3.3.2 Analytical Laboratory Analysis

Sampling regime for analytical laboratory analysis confirmed credibility of field analysis and provided greater specificity. Additional parameters were analysed that could not be effectively tested in the field. Figure 5 indicates locations and types of samples sent to the laboratory for analysis. Appendix D lists the data sheets for all samples and quality control tests analysed by Chemex Analytical Laboratories.

3.3.2.1 Metals

Soil: Soil sample 44-S1 exceeded CCME Interim Assessment Criteria for 9 metals, chromium, cobalt, copper, molybdenum, nickel, vanadium, zinc, selenium and tin, and arsenic was comparable to CCME levels. Soil sample 44-S5 exceeded CCME Interim Assessment Criteria for 12 metals, mercury, barium, chromium, cobalt, copper, lead, molybdenum, nickel, vanadium, zinc, arsenic and tin, many of these are very high levels. Soil sample 44-S13 exceeded CCME Interim Assessment Criteria for 9 metals, chromium, cobalt, copper, molybdenum, nickel, vanadium, zinc, arsenic and selenium. Theoretical soil baseline 44-S17 exceeded CCME Interim Assessment Criteria for 8 metals, chromium, cobalt, copper, molybdenum, nickel, vanadium, zinc and arsenic. See charts below for depiction of the laboratory analysis for metal content of soil samples.

Water: Water samples 44-W1, 44-W3 and 44-W5 were analysed for metal content, concentrations were well below the CCME guidelines for Fresh Water Aquatic Life and Interim Assessment Criteria. Water sample 44-W7 was taken from test pit 2 and is considered a ground water sample. 44-W7 exceeded CCME guidelines for Freshwater Aquatic Life in concentrations of iron and aluminum, there are no CCME Interim Assessment Criteria defined for iron and aluminum. See charts below for depiction of the laboratory analysis for metal content of water samples.

3.3.2.2 Total Extractable Hydrocarbons

Soil
See chart below for depiction of total extractable hydrocarbon content of soil samples 44-S5, 44-S9 and 44-S15 and comparing the ranges C8-C10 and C11-C60. Total extractable hydrocarbons for the range C8-C10 were below the method detection limits for all three soil samples 44-S5, 44-S9 and 44-S15. Total extractable hydrocarbons for the range C11-C60 were analysed in soil samples were found to be below method detection levels for soil sample 44-S9. Total extractable hydrocarbons for the range C11-C60 were analysed in soil sample 44-S15 was found to be at 30 mg/Kg primarily in the range C28-C38 with the concentration of 10 mg/Kg of C33 as highest concentration of any single constituent and soil sample 44-S5 at 30 mg/Kg primarily distributed in the C26-C34 range.

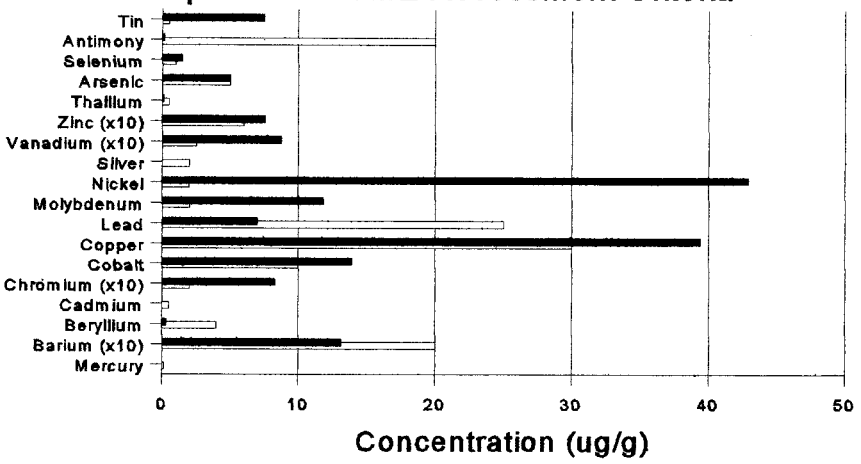
Water:
Water sample 44-W9 was extracted for total hydrocarbons and was found to have no detectable levels for C8-C11, and 0.15 mg/Kg for the range C11-C60 which were primarily found in the C19-C20 range.

3.3.2.3 pH

All water samples tested within a normal range for pH, ranging from 8.4 at 44-W2, 44-W3, 44-W4 and 44-W5 to

Metal Concentrations for Soil Sample 44-s1

Compared to CCME Assessment Criteria



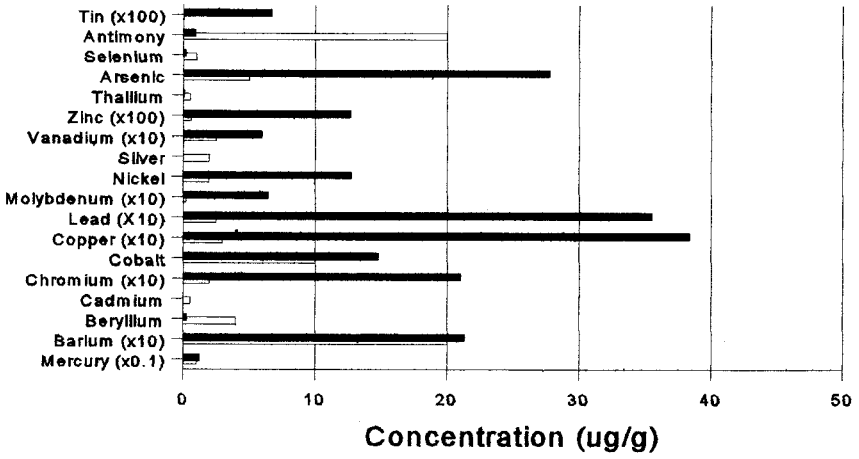
CCME ug/g	44-s1 ug/g
5	**7.5**
20	0.15
1	**1.5**
5	**5.0**
0.5	0.12
60	**75.1**
25	**87.4**
2	< 0.2
20	**42.9**
2	**11.8**
25	7
30	**39.4**
10	**13.9**
20	**82.5**
0.5	<0.3
4	0.50
200	131.00
0.1	<0.02

Soil Sample 44-s1

CCME Interim Assessment Criteria, Table A-1

Metal Concentrations for Soil Sample 44-s5

Compared to CCME Assessment Criteria



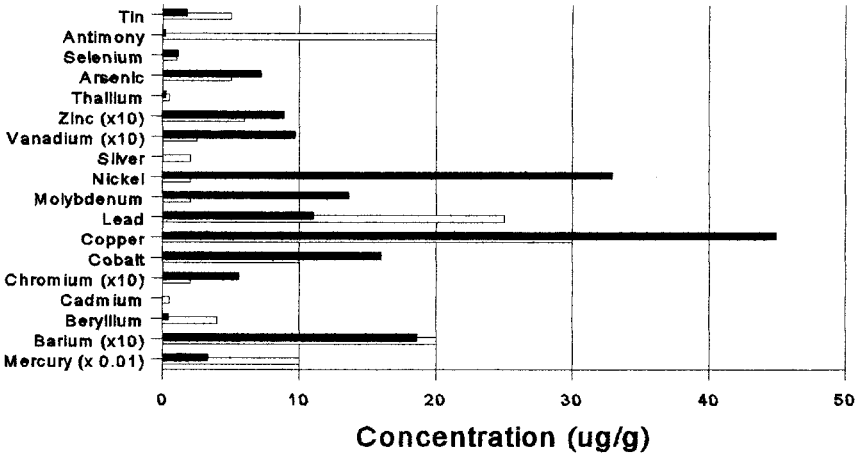
CCME ug/g	44-s5 ug/g
5	**668.00**
20	0.94
1	0.20
5	**27.80**
0.5	0.10
60	**1270.00**
25	**59.60**
2	<0.20
20	**128.00**
2	64.60
25	**355.00**
30	**384.00**
10	**14.80**
20	**210.00**
0.5	<0.30
4	0.30
200	**213.00**
0.1	0.126

Soil Sample 44-s5

CCME Interim Assessment Criteria, Table A-1

Metal Concentrations for Soil Sample 44-s13

Compared to CCME Assessment Criteria

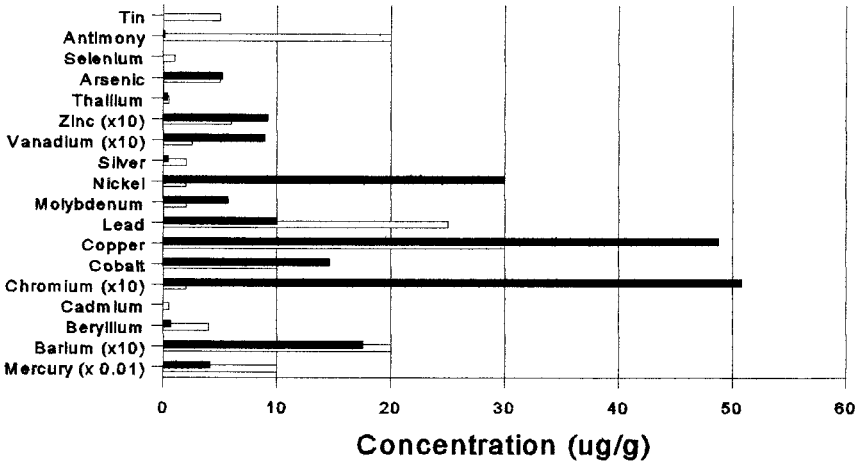


CCME ug/g	44-s13 ug/g
5	1.75
20	0.20
1	1.10
5	**7.20**
0.5	0.23
60	88.90
25	**97.00**
2	<0.20
20	**32.90**
2	**13.60**
25	11.00
30	**44.90**
10	**16.00**
20	**55.70**
0.5	<0.30
4	0.40
200	186.00
0.1	0.033

Soil Sample 44-s13

CCME Interim Assessment Criteria, Table A-1

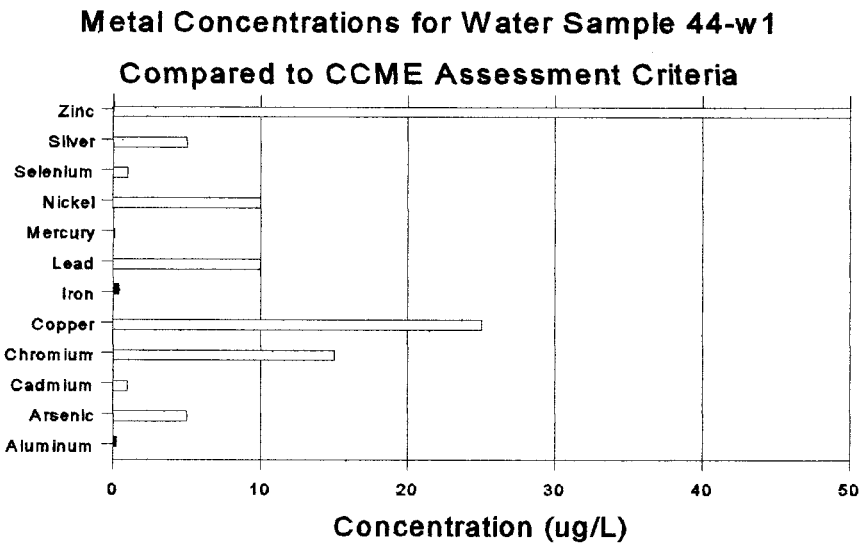
Metal Concentrations for Soil Sample 44-s17, Theoretical Baseline Compared to CCME Assessment Criteria



CCME ug/g	44-s17 ug/g
5	<0.10
20	0.15
1	<0.10
5	**5.18**
0.5	**0.36**
60	**92.10**
25	**89.10**
2	0.40
20	**29.90**
2	**5.7**
25	10.00
30	**48.80**
10	**14.60**
20	**50.80**
0.5	<0.30
4	0.70
200	175
0.1	0.044

Theoretical Baseline Concentrations for Site 44

CCME Interim Assessment Criteria, Table A-1



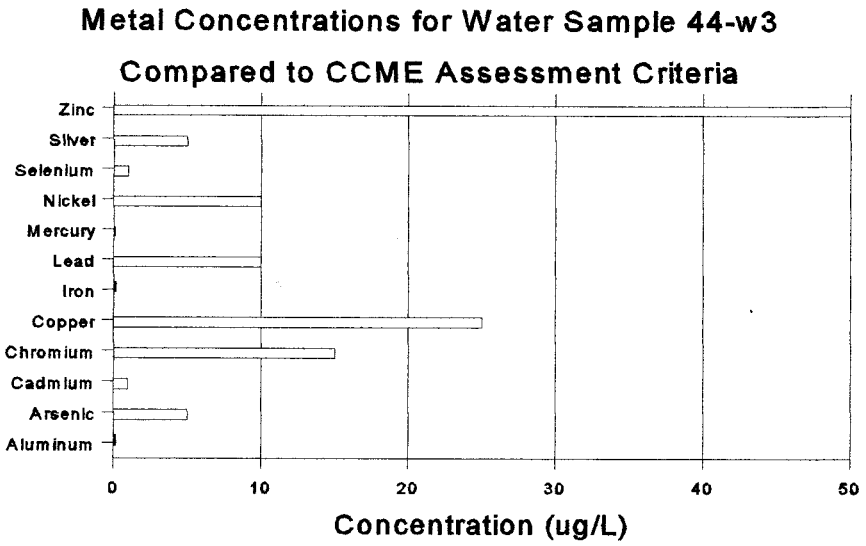
TableA-1 CCME ug/L	TableA-3 Aquatic ug/L**	44-w1 ug/L
50.0		0.044
5.0		< .0001
1.0		0.0002
10.0		< .0005
0.1	0.1	< 0.05
10.0	1.0-7.0	0.0009
*	300.0	0.38
25.0	2.0-4.0	0.001
15.0	2.0-20.0	0.015
1.0	0.2-1.8	<.0002
5.0	50.0	< .0002
*	5.0-100	0.21

Water Sample 44-w1

CCME Interim Assessment Criteria, Table A-1*

* No guidelines are defined on CCME Table A-1 for Aluminum or Iron.

** Guideline varies with pH, calcium, and dissolved organic carbons for aluminum, and hardnessfor cadmium,copper, lead and nickel.



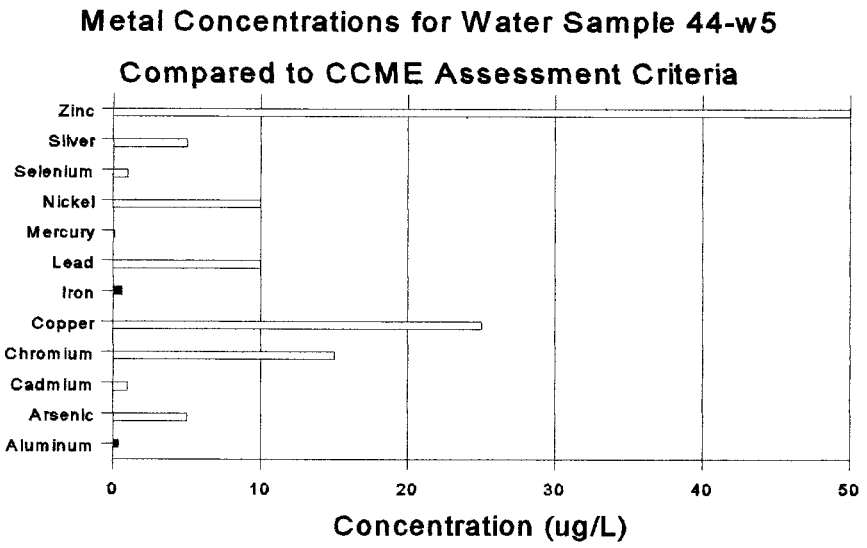
Water Sample 44-w3

CCME Interim Assessment Criteria, Table A-1*

TableA-1 CCME ug/L	TableA-3 Aquatic ug/L**	44-w3 ug/L
50.0		0.024
5.0		< .0001
1.0		<.0002
10.0		<.0005
0.1	0.1	<0.05
10.0	1.0-7.0	<.0003
*	300.0	0.16
25.0	2.0-4.0	0.003
15.0	2.0-20.0	0.006
1.0	0.2-1.8	<.0002
5.0	50.0	0.0003
*	5.0-100	0.014

* No guidelines are defined on CCME Table A-1 for Aluminum or Iron.

** Guideline varies with pH, calcium, and dissolved organic carbons for aluminum, and hardnessfor cadmium,copper, lead and nickel.



TableA-1 CCME ug/L	TableA-3 Aquatic ug/L**	44-w5 ug/L
50.0		0.018
5.0		<.0001
1.0		0.0004
10.0		<.0005
0.1	0.1	<0.05
10.0	1.0-7.0	0.0004
*	300.0	0.58
25.0	2.0-4.0	0.003
15.0	2.0-20.0	0.016
1.0	0.2-1.8	<.0002
5.0	50.0	0.0016
*	5.0-100	0.36

Water Sample 44-w5

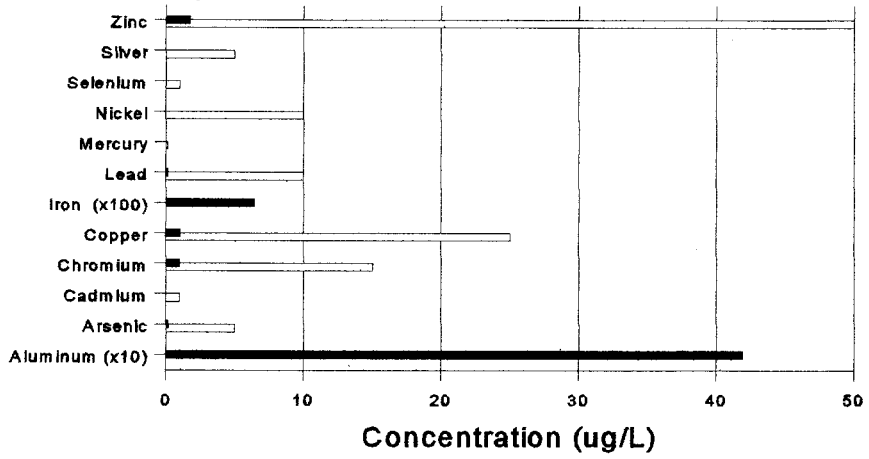
CCME Interim Assessment Criteria, Table A-1*

* No guidelines are defined on CCME Table A-1 for Aluminum or Iron.

** Guideline varies with pH, calcium, and dissolved organic carbons for aluminum, and hardnessfor cadmium,copper, lead and nickel.

Metal Concentrations for Water Sample 44-w7

Compared to CCME Assessment Criteria



Water Sample 44-w7

CCME Interim Assessment Criteria, Table A-1*

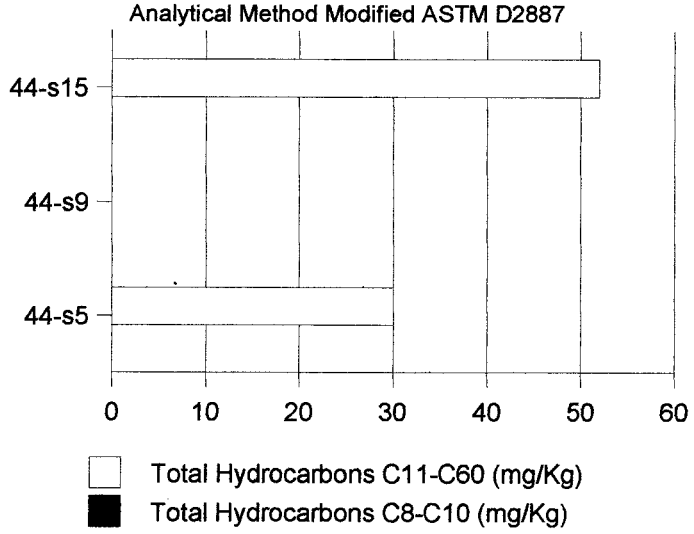
TableA-1 CCME ug/L	TableA-3 Aquatic ug/L**	44-w7 ug/L
50.0		1.71
5.0		0.0044
1.0		0.0019
10.0		< .0005
0.1	0.1	<0.05
10.0	1.0-7.0	0.153
*	300.0	**640.00**
25.0	2.0-4.0	1.02
15.0	2.0-20.0	0.957
1.0	0.2-1.8	0.0034
5.0	50.0	0.150
*	5.0-100	**419.00**

* No guidelines are defined on CCME Table A-1 for Aluminum or Iron.

** Guideline varies with pH, calcium, and dissolved organic carbons for aluminum, and hardnessfor cadmium,copper, lead and nickel.

Total Extractable Hydrocarbons For Soil Samples At Site 44

Analytical Method Modified ASTM D2887



* no bar depiction indicates total extractable hydrocarbon content was below the method detection level

8.8 at 44-W6.

3.3.2.4 Volatile Organic Hydrocarbons

Soil samples 44-S5 and 44-S6 were analysed for volatile organic hydrocarbon (BTEX) content. In both samples, BTEX content was below the method detection limit and below the CCME Interim Assessment Criteria.

3.3.2.5 Polycyclic Aromatic Hydrocarbons

Analysis of water sample 44-W8 indicated PAH content exceeded CCME Interim Assessment Criteria for Benzo(b&j)fluoranthene at 0.011 ug/L and Benzo(k)fluoranthene at 0.011 ug/L.

3.3.2.7 Polychlorinated Biphenyls

Water sample 44-W9 was intended to be analysed for PCB's but was extracted in the analytical laboratory for total extractable hydrocarbons.

4.0 INTERPRETATION

4.1 Site Survey

Surface debris layout indicates garbage was dumped into and along the river bank. It is unclear if debris was bulldozed into the river, but the finding of a bulldozer track could mean this happened. No evidence of buried material was found in either test pit. There is no other indication that garbage was buried.

The garbage in the old growth poplars means that this site has been active over a long period of time. Within these poplars is a car body that appears to have been there before the trees around it grew to 60'. Garbage in the more accessible areas is rusted and weather beaten, indicating that it too is old. However, there is some recent garbage (modern beer bottles). While no longer used as a dump site, the mere presence of old garbage could attract new garbage disposal to the site.

The barrels in the ponds appear to be empty, as gaping holes can be seen in some (although not all) of them. The small pond has a sheen on it and when the bottom of the pond was disturbed by the backhoe a very dark sediment was raised. The barrels or some other garbage would appear to have contaminanted the sediment at the bottom of the pond.

Marshall Creek is a relatively flat area. Signs of erosion are noted at the bank of the Dezadeash River due to fast flowing current (Water Survey data, Appendix F). Material taken from test pits indicates stratigraphy is primarily sand and gravel after a very thin organic layer. Potentially high permeability of soil raises concerns about contaminants which are highly mobile in water. The rainfall data of the area was 166.2 milimeters per annum based on the 1987 to 1996 figures which should not highly influence erosion, however, snow pack is not included in this data and snow melt may play a large role in stream flows and bank erosion.

4.2 Site Contamination

4.2.1 Soil

Soil sample 44-S5, taken from the edge of the West pond indicated extremely high metal concentrations compared to the theoretical baseline sample 44-S17, and the CCME Interim Assessment Criteria. Mercury (0.128 ug/g), lead (355 ug/g), tin (668 ug/g), arsenic (27.8 ug/g), zinc (1270 ug/g), copper (384 ug/g), cobalt (210 ug/g), molybdenum (64.6 ug/g) and nickel (128 ug/g) are all very high concentrations. Soil sample 44-S1 metal content was comparable to theoretical baseline except for two metals which were indicated as high concentrations and exceeded CCME Interim Assessment Criteria, chromium (82.5 ug/g) and nickel (42.9 ug/g).

Field testing of total hydrocarbons indicated the highest levels were found in 44-S1, 44-S5, 44-S13and 44-S15. Concentrations of total hydrocarbon for other samples were below levels of concern. Based on carbon ranges detected through analytical laboratory sampling, pollution source at 44-S15 was likely mineral oil and grease (range C10-C40), however, the level detected (30 mg/Kg) was well below the recommended BCMOE remediation criteria 1000mg/Kg.

Soil sample 44-S13 was the only site testing positive for field analysis of total PAH content in soil at 0.62 ppm. Metal content was analysed for in this sample and indicated levels which exceeded CCME Interim Assessment Criteria for eight metals but at levels which were comparable to the theoretical baseline sample 44-S17 except for molybdenum which was analysed at 13.6 ug/g, approximately twice the concentration in the baseline.

Field laboratory results indicated that concentrations of total PAH constituents in soil samples 44-S5, 44-S10 and 44-S8 were below method detection limits and CCME Interim Assessment Criteria.

Volatile organic hydrocarbons (BTEX) are readily mobile in water and therefore present a concern for both ground water and surface water contamination by moving through soil. Two soil samples, 44-S6 a subsurface soil sample from 44-TP1 which was within 10 metres to the Dezadeash River and 44-S5 taken on the central east edge of the

West pond , were sent to the analytical laboratory as representatives of potential migration routes for BTEX contamination. BTEX concentrations were below method detection limits and below CCME Interim Assessment Criteria. Ground water samples were not analysed for BTEX.

No polychlorinated biphenyls were detected on Site 44 Marshall Creek.

4.2.2 Water

Metal analysis of water samples 44-W3 and 44-W5 taken from the Dezadeash River and sample 44-W1 from the West pond indicated very low metal content in all cases. Sample 44-W7 was taken from the test pit and is considered a ground water sample. Metal content for 44-W7 greatly exceeded CCME Guidelines for Freshwater Aquatic Life for the constituents iron and aluminum, at 640.0 ug/L and 419 ug/L respectively (there are no CCME Interim Assesssment Criteria for iron and aluminum).

Water sample 44-W9 has not been well characterised. This water sample was taken from a visible surface sheen on the East pond. Field analysis for PAH indicated a total content in this water sample that was below detectable limits. The sample was mistakenly extracted for total extractable hydrocarbons in the analytical laboratory. This test result indicated 0.15mg/L total extractable hydrocarbon content primarily in the range C19-C23. The chromatograph is not easily indentified compared to sample standards. Since there was no appreciable PAH content, it is unlikely that water sample 44-W9 was waste oil or diesel unless there was undetected experimental error in field analysis. Water sample 44-W8 was taken from the edge of the East pond. PAH analysis of 44-W8 in the field indicated a total content of 12.6 ppb which could potentially exceed CCME Interim Assessment Criteria for individual PAH constituents. Analytical laboratory results confirmed this indicating that PAH content in water sample 44-W8 marginally exceeded CCME Interim Assessment Criteria (10 ppb) for two specific PAH's, Benzo(b&j)fluoranthene and Benzo(k)fluoranthene, each at 11 ppb.

4.3 Impact Potential

4.3.1 Metals

The chemical behaviour of any element in the environment depends on the nature of its compounds and species. Pysiological, ecological and toxicological effects of a metal are usually strongly structure specific, that is, they depend on the species. Physiological effect of an essential element on an organism depends on concentration range of the element and other contributing chemical influences. A very low concentration range of an essential element limits growth, in an optimum range growth is obtained, in high concentrations toxic effects are observed. Toxicity ranges are specific to the metals and the organisms involved. Other contributing chemical influences are variables such as the total concentrations of the metal in question, pH, alkalinity, the concentration of natural chelators, the concentration of competing metals, and the prsence of adsorptive surfaces all can affect the concentration of free metal ions and thus affect the response of an organism to that particular metal.

44-S1:

Molybdenum was detected at 13.6 ug/g, a level above the background concentration of 10 ug/g and above CCMEInterim Assessment Criteria, in soil sample 44-S1. This concentration of molybdenum is unlikely to cause extensive chronic effects in grazing animals, however, bioaccumulation factors are difficult to predict. Geological metal concentrations of this area are naturally high in molybdenum and can exhibit a wide range of natural levels.

Chromium is a potentially hazardous metal, and was found in high concentrations in 44-S1. Molybdenum was detected at levels above background concentration of 10 ug/g and above CCME criteria in soil sample 44-S1 at 42.9 ug/g. Molybdenum can be a health risk to grazing animals causing chronic effects at concentrations above 20 ug/g. Moose or caribou could be affected in this area.

44-S5:

Analysis of soil sample 44-S5 indicated very high metal concentrations.

Mercury, lead and chromium are potentially hazardous metals found in high concentrations in soil sample 44-S5. Mercury can act as a sulfur seeking toxicant and is most toxic in methyl or alkyl form. Since this sample site is in close proximity to the West pond, the chemical form of the mercury will influence the degree of impact to the aquatic system through the combined effects on mobility potential and overall aquatic toxicity of a particular

mercury species. This level of detail was not accomplished in general chemical analysis regime, however, the high concentration of mercury (12.6 ppb) and close proximity to surface water is cause for concern. Lead was analysed at extremely high concentration 355 ug/g. Lead can act as a sulfur seeking toxicant. In aquatic systems, lead has a strong tendency to be adsorbed on particle surfaces, usually only very small concentrations are found dissolved in rivers and ground waters, small quantities of organic and inorganic complexes are formed. Movement of lead from location of soil sample 44-S5 could occur during high water levels through overall soil particle movement as bank erodes. Chromium was detected at 210 ug/g in soil sample 44-S5. Chromium can be found adsorbed and dissolved in aquatic systems and therefore can move to surface water through water movement or bank errosion.

Many of the metals detected at elevated concentrations in soil sample 44-S5 were biologically essential metals. Zinc is a biologically essential metal which is found in at the very high concentration of 1270 ug/g in 44-S5. However, zinc does not accumulate in biological systems with continued exposure, homeostasis is maintained by overall absorption and liver levels. The biologically essential metals copper (protein and enzyme metal), molybdenum (an enzyme cofactor and in plants is necessary for fixing atmospheric nitrogen by bacteria) , and cobalt (component of vitamin B12) also have a potential for toxicity. Copper was detected in this soil sample at concentrations both higher than the CCME guidelines (30 ug/g) and higher than the theoretical baseline (48.8 ug/g) with a concentration of 384.0 ug/g. Molybdenum was detected at levels above background and above CCME in soil sample 44-S17. Molybdenum can be a health risk to grazing animals causing chronic effects at concentrations above 20 ug/g. Presence of high copper concentrations at the same location may lower accumulation of molybdenum in liver of animals eating this vegetation and decrease the overall absorption of molybdenum to its biological system. However, concentrations of both copper and molybdenum are quite high and biological systems could be overloaded by these levels. Cobalt was detected at a level of 210.0 ug/g, one hundred times the CCME guidelines and four times greater than the theoretical background sample 44-S5 which indicated a level of 50.8 ug/g of cobalt. Cobalt will readily mobilize in water in a free chemical form depening on pH influences.

Other metals detected in high concentrations in soil sample 44-S5 were the minor toxic metals nickel, vanadium, tin and major toxic arsenic. Each can take many forms, and are generally more toxic as organic compounds. Nickel, tin and vanadium tend to be a concern when potential for chronic inhalation is high, sample 44-S5 does not present a high concern for inhalation risks. Other chronic effects of nickel and vanadium are not well characterised in toxicological literature. Nickel and tin are not extremely toxic through oral ingestion due to poor gastrointestinal absorption. Tin can be readily moved to aquatic system in a free metal form depending on pH influence. Arsenic was detected at almost six times both the background levels and the CCME Interim Assessment Criteria (approximately 5 ug/g) at 27.8 ug/g. Arsenic can have multiple toxic effects to varying degrees which depend on extent of exposure, both chronic and acute effects can occur at low concentrations. Acute exposure through plant uptake is unlikely, but chronic effects are possible in locally grazing animals. These chronic effects include liver and kidney toxicity,carcinogenicity and teratogenicity.

Water:

From the East pond, laboratory analysis water sample 44-W9 (visible surface slick) was extracted for total extractable hydrocarbons rather than PCB's, since PAH's in field analysis were below detectable limits of 8ppb, it is unlikely that this sample was diesel or waste oil.

In soils and sediments, the speciation in the dissolved aqueous phase is primarily important to assess bioavailability and toxicity. The total concentration (adsorbed and solid phase) gives an idea of the capacity of a reactive element which could under certain circumstances (acidification, complex formation) be mobilized. Sediment toxicity to benthic organisms (amphipodes, oligochaetes and snails) is essentislly related to the free metal ions in solubility equilibrium with the solid metal sulphides present; low surface water concentrations of metals at Dezadeash River indicates it is likely that metal impact to aquatic life at this site is low. The slightly basic pH of the surface waters will lower metal mobility for most metals. Of the high concentration metals fdetected at this site, only molybdenum is more readily mobile with basic solutions.

High aluminum and iron content in ground water sample 44-W7 and very high metal content in close proximity to the West pond in soil sample 44-S5 indicates a possibility that the high flows of the Dezadeash River have provided a high dilution factor in the river samples adjacent to this site. Through seasonal variation in water flows, rainfall and particularly during ice melt, flushing of metal contaminants from the site to the river may be apparent, both as free metal compounds and adhered to eroded soil particles. Overall impact and chronic effects to aquatic ecosystems and crops watered with water from the Dezadeash River downstream of Site 44, is difficult to estimate

based on a single site visit. Aluminum is of particular concern as a health risk to fish because it chelates in fish gills and at high concentrations will suffocate the fish.

4.3.2 Hydrocarbons

44-S15:
Soil sample 44-S15 indicated the highest hydrocarbon content analysed in the field and off-site laboratory from Site 44. The hydrocarbon present was likely mineral oil and grease (range C10-C40) This sample is does not present a serious concern because the level detected was low, and the high viscosity of the heavy greases and oils detected have low toxicity potential.

Water:
The predominant soil type on Site 44 is a sand gravel mix. This provides little resistence for movement of water and contaminants carried in water. Consequently, contaminants with high mobility in water may be of concern as contamination to the surface water ponds and Dezadeash River. Since the water of this area tends to be slightly basic, mobility of most metals will be low. Flow rates will influence the deposition rates, and distances from source, of water borne contaminants from the site. This in turn will be influenced by seasonal changes such as snow melt versus rainfall.

Since BTEX is both volatile and readily mobile in water, it is likely that little BTEX residue would be still present at Site 44.

4.3.3 Physical Debris

Surface debris could present a potential physical hazard. This site is in close proximity to Haines Junction and Marshall Creek Road, provides access to the Dezadeash River and fish resources. This area has high potential for human and wildlife contact with the physical hazards. The site is a visual eyesore from the Dezadeash River. Representatives from the Kluane Adventure Centre, who conduct trips along this river, contacted CCSG Associates about this site and the concerns they have about it.

5.0 PRELIMINARY ENVIRONMENTAL RISK ASSESSMENT

5.1 CCME Classification

CCSG Associates gives Site 44 a site score of 80.2 (+/- 11) points and classify it as Class 1 (Appendix E). CCME defines this as:

Class 1 (Score 50 to 99.9) Action Required

The available information indicates that action (e.g. further site characterization, risk management, remediation, etc.) is required to address existing concerns. Typically, Class 1 sites show a propensity to high concern for several factors, and measured or observed impacts have been documented. (NCS, 1992)

It must be emphasised that this is a preliminary environmental assessment and that the determination of contaminants was not exhaustive.

5.2 Risk Assessment

The primary concerns at Site 44 are impact potential to aquatic ecosystem, and drinking water for humans and wildlife. High erosion potential combined with high contamination immediately adjacent to surface water and directly within ponds, is a serious concern. Contamination point sources have been determined, but higher concentrations in ponds have not been well delineated. The East pond in particular needs to be better characterised for contaminant sources.

There is an abundance and diversity of wildlife which could potentially be affected through vegetation uptake of contaminants.

6.0 RECOMMENDATIONS

This site is class 2 as per CCME Interim guidelines.

The following items should be done:

1. Fully characterize Pond Contaminants

Extent of contamination in both ponds was not well established. Point source samples of contaminants were located but not well delineated. A more intensive sampling regime should be conducted for the ponds.

2. Delineate Pond Contaminants

It is known that waste was deposited into the pond depressions. A geophysical survey conducted in winter to determine extent of metal debris would provide an indication of overall contamination in ponds.

3. Remediate Ponds

Barrels and sludge should be removed from the site.

4. Physical Cleanup

The physical surface debris should be collected and correctly disposed of at the Haines Junction municipal landfill.

5. Monitor Future Excavations

Should excavation occur on this site monitoring must be conducted.

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Appendix A: Arctic Environmental Strategy Information Package

115 A-11 A044

YUKON AES WASTE SITE INVENTORY X

UPDATED: 10.04.95 **DISTRICT:** HJ **SITE NUMBER:** 011

GENERAL: OLD MARSHALL CREEK ROAD 8 KM FROM DEZADEASH RIVER

LATITUDE: 60 46 **LONGITUDE:** 137 25 0

PRESENT LAND TENURE: FEDERAL **STATUS:** INVENTORIED

SITE DESCRIPTION: OLD GARBAGE SITE ADJACENT TO DEZADEASH RIVER. SITE INCLUDES OLD VEHICLE BODIES, DRUMS, TIRES, GENERAL HOUSEHOLD CANS & BOTTLES

SIZE OF SITE:

SITE ACTIVITY: **E.P. RANK:** 0 **ABANDONED:** YES

WASTE MATERIAL: DRUMS, REFUSE

DRUMS NUMBER: **FULL:** **EMPTY:**

CONTENTS:

ACCESS:

PRESENT OCCUPANT:

PREVIOUS OCCUPANT:

PERMANENT IMPROVEMENTS:

VEGETATION:

IMPACT POTENTIAL:

ASPECT AFFECTED:

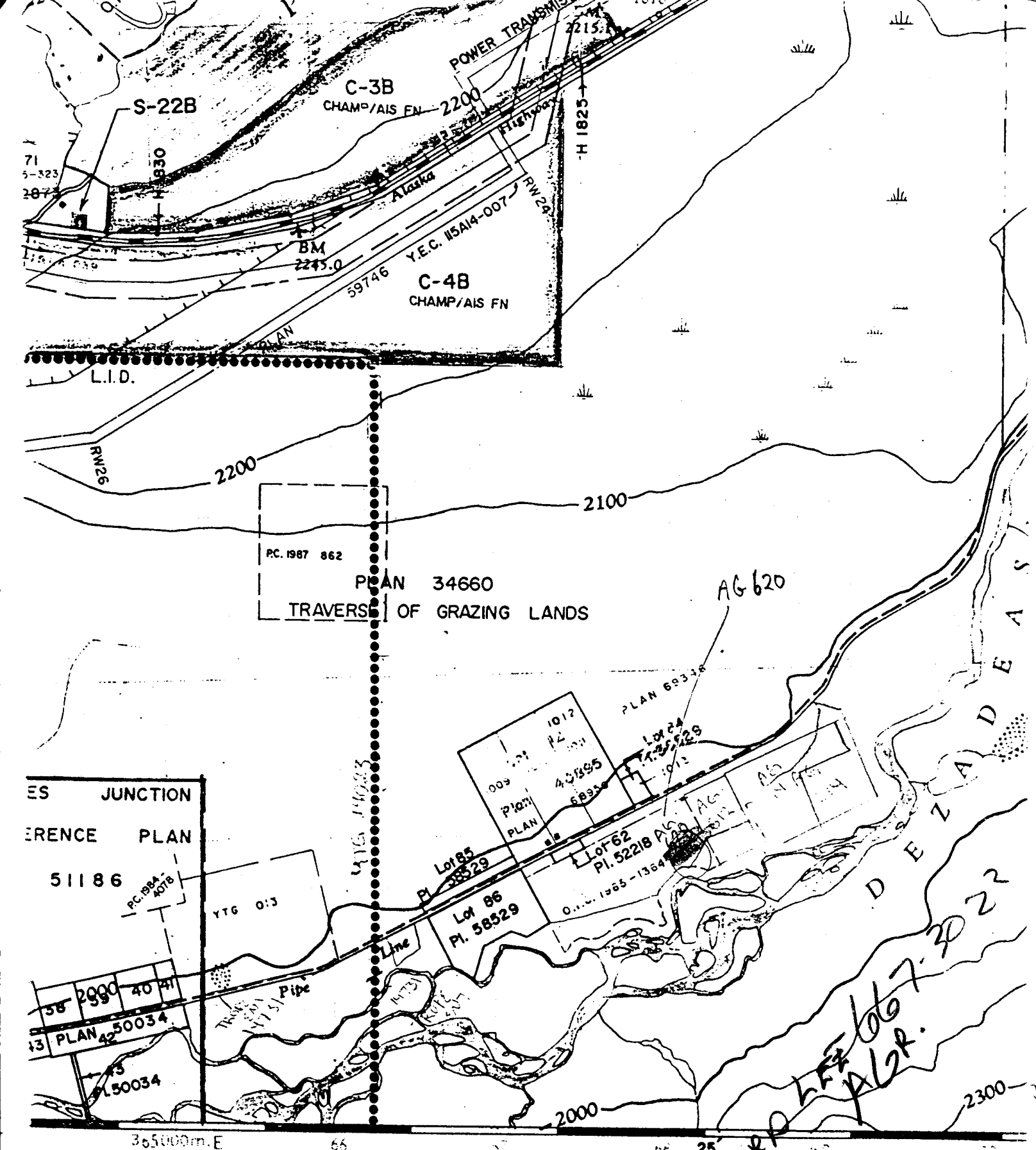
RECOMMENDATIONS: SOIL SAMPLES SHOULD BE TAKEN FOR POSSIBLE CONTAMINANTS. IF SATISFACTORY ALL ITEMS SHOULD BE REMOVED TO THE HAINES JUNCTION DISPOSAL SITE. THERE DOES NOT APPEAR TO BE A PIT, ONLY SURFACE LITTER. THIS SITE IS LOCATED 8M FROM THE RIVER'S EDGE.

DISTRICT AND SITE: HJ 011

CLEAN-UP COST ESTIMATE:

INSPECTOR: J.TROTTTER **INSPECTION DATE:** 28.10.92

FOLLOW UP: SITE WAS TO BE CLEANED UP SUMMER OF 1994 BY Y2C2, BUT WAS NOT STARTED.



S ...yed, compiled, drawn and printed
by ...e Army Survey Est. R.C.E. 1950-52.
...erial photography by R.C.A.F. 1947.

MAGNETIC DECLINATION 31°16' EAST
AT CENTRE OF SHEET, 1952
Annual magnetic change 3' westerly

Appendix B: Sampling Details

Marshal Creek Sampling Record

Water Sampling Record

Sample: 44-W1 Coodinates: B2+30, 0+75 Date: September 06, 1996

Location: North end of west (large) pond.

Clarity: Clear Water Temperature: 10°C pH: 8.5

Comments: Silt bottom. Smell of hydrocarbons. Barrels, tire and lumber visible in pond. Grass and rhubarb visible along shallow edge. Close to 44-S4

Sample: 44-W2 Coodinates: B1+80, 0+50 Date: September 06, 1996

Location: South end of west (large) pond, near confluence with Dezadeash River.

Clarity: Clear Water Temperature: 10°C pH: 8.4

Comments: Silt bottom. Grasses on pond edge along with conifers and small vegetation. Close to 44-S10.

Sample: 44-W3 Coodinates: B2+00, 0+20 Date: September 06, 1996

Location: On Dezadeash, west of western (large) pond outlet. Water 6" deep with drop off 1 metre off shore.

Clarity: Clear Water Temperature: 10°C pH: 8.4

Comments: Bottom 80% silt, gravel and stone 20%.

Sample: 44-W4 Coodinates: B1+40, 0+80 Date: September 06, 1996

Location: On Dezadeash River, just prior to promotory that seperates the marsh area and the main river channel. Adjacent to a small bank indentation that is filled with garbage.

Clarity: Moderate green/gray Water Temperature: 10°C pH: 8.2

Comments: The pH in the indentation was 8.2.

Sample: 44-W5 Coodinates: B0+90, 1+40 Date: September 06, 1996

Location: On marsh adjacent to the Dezadeash River.

Clarity: Clear Water Temperature: 9°C pH: 8.4

Comments: Shallow silt bottom with drop off into centre.

Sample: 44-W6 Coodinates: B2+30, 0+98 Date: September 06, 1996

Location: East (small) pond, north west side.

Clarity: Moderate Water Temperature: 9°C pH: 8.8

Comments: Taken amidst swamp grass.

Sample: 44-W7 Coodinates: B1+45, 0+90 Date: September 06, 1996

Location: In Test Pit # 2 (44-TP2).

Comments: Taken at same depth as 44-S7.

Sample: 44-W8 Coodinates:B2+20, 1+06 Date: September 06, 1996

Location:East (small) pond, north west side.

Comments: Taken in the middle of the pond.

Sample: 44-W9 Coodinates:B2+20, 0+95 Date: September 06, 1996

Location:East (small) pond, north west side.

Comments: Taken in the middle of the pond.

Test Pit Sampling Record

Sample: 44-TP1 Coordinates: B1+75, 0+75 Date: September 06, 1996

Location: 4 metres south of the west (large) pond, 4 metres away from the Dezadeash River.

Ground Description:Gravel from the surface to the 1.75 metre depth, where groundwater was found.

Sample Profile: See 44-S6

Sample: 44-TP2 Coordinates: B1+45, 0+96 Date: September 06, 1996

Location:Equidistant from the west (large) pond and the marsh, 4 metres away from the Dezadeash River.

Ground Description: Gravel from the surface to the 1.75 metre depth.

Sample Profile: See 44-S7 and 44-W7.

Soil Sampling Record

Sample: 44-S1 Coordinates: B2+40, 0+60 Date: September 06, 1996

Location: 5 metres north of west (large) pond.

Sample Profile: Light grey, fine soil/gravel. Sample depth 1.5 feet.

Sample:44-S2 Coordinates: B2+35, 0+45 Date: September 06, 1996

Location: 5 metres north of west (large) pond.

Sample Profile: 10 cm organic layer. Wet grey fine clay. Hitting solid (possibly rock) at 6".

Comment: 2nd auger hole. 80% stones and 20% grey fine clay. Water seeping in at 1.5 foot level.

Sample:44-S3 Coordinates: B1+65, 0+50 Date: September 06, 1996

Location: On south side of channel joining west (large) pond and Dezadeash pond. Near 44-W2.

Sample Profile: Fine grey clay - wet.

Sample: 44-S4 Coordinates: B2+35, 0+75 Date: September 06, 1996

Location: North end of west (large) pond. Near 44-W2.

Ground Description: Grasses growing, smell of hydrocarbons.

Sample Profile: Sample 6". Silt grey clay first 2". Sand clay down to 6".

Sample: 44-S5 Coordinates: B1+80, 0+65 Date: September 07, 1996

Location: Between 44-TP1 and west (large) pond.

Ground Description: Grass, some debris.

Sample Profile: Sample depth 8 inches. Wet gravel, black fine silt.

Sample: 44-S6 Coordinates: B1+75, 0+70 Date: September 07, 1996

Location: 4 metres south of the west (large) pond, 4 metres away from the Dezadeash River.

Ground Description:Gravel from the surface to the 1.75 metre depth, where groundwater was found.

Sample Profile: Bottom of 44-TP1

Sample: 44-S7 Coordinates: B1+45,0+90 Date: September 07, 1996

Location: Equidistant from the west (large) pond and the marsh, 4 metres away from the Dezadeash River.

Ground Description: Gravel from the surface to the 1.75 metre depth.

Sample Profile: See 44-W7. Bottom of 44-TP2. Mostly gravel.

Sample: 44-S8 Coordinates: B2+15, 0+90 Date: September 07, 1996

Location: Taken from small (east) pond on the west side, at the end of the beaver trail connecting both ponds.

Sample Profile: Water saturated sample taken at water level: fine silt, pebbles, sand, grey in colour. 5% of the sample was rock. This was discarded. Sample depth was 0 - 6 inches.

Sample: 44-S9 Coordinates: B2+55, 0+98 Date: September 07, 1996

Location: Taken from small (east) pond on the north side on the bank. Bank height was approx. 2 inches above the pond water level.

Sample Profile: 1" active layer, sample silty gravel, taken from 2-8" depth.

Sample:44-S10 Coordinates: B1+75, 0+50 Date: September 07, 1996

Location: Confluence between the large (west) pond and the Dezadeash River. Taken from the NE side of the channel, 4inches below the water surface and 0.5metres from the pond bank.

Sample Profile: Very fine grey silt.

Comment: The first sample attempt was taken 0.25 metres further towards the river. The sample contained a piece of glass and an old spring. This sample was discarded.

Sample:44-S11 Coordinates: B0+90, 1+00 Date: September 07, 1996

Location: Promitory between the main river channel and the marsh downstream from the beaver dam. Sample taken on the marsh side.

Sample Profile: Taken from 4-10 inches depth. Very fine silt/grey clay, very moist, 5% trace of plant matter.

Comment: Stick used to remove sample from auger, stick broke into sample. 50% of sample discarded due to small size of sample bag.

Sample: 44-S12 Coordinates: B1+40, 0+90 Date: September 07, 1996

Location: Adjacent to 39-TP2.

Sample Profile: Gravel/grey sand mix. 60% of sample was gravel and it was not discarded. Sample not moist.

Comment: Sample fell out of auger into sample hole. Removed and bagged by hand. 5mm moss covering sample site, along with scattered debris.

Sample:44-S13 Coordinates: B1+20, 1+25 Date: September 07, 1996

Location: Mound of dry grey sand within poplar forest.

Ground Description: Mound of dry grey sand 2.5 metres in diametre. Poplar trees growing around the edge, 40 cm to 1m in height. These plants have white spots and brown spots on their leaves.

Sample Profile: Depth taken was 8 inches to 14 inches. Dry grey sand with 5% trace of plant material.

Sample: 44-S14 Coordinates: B1+25, 1+75 Date: September 07, 1996

Location: Mound of dry grey sand within poplar forest, about 50 metres further in that 44-S13

Adjacent Vegetation: Tall poplars, 8 metres high but very little underbrush.

Ground Description: Metal debris, scattered. Includes cans, bottles, small car parts.

Sample Profile: 1 inch surface layer of dead leaves. 2 inches - 6 inches grey silty clay.

Sample: 44-S15 Coordinates: B0+75, 2+25 Date: September 07, 1996

Location: Mound of dry grey sand within poplar forest, about 50 metres away from the beaver pond marsh.

Ground Description: No vegetaton on mound. Mound diameter is 2 metres, with lots of buried metal - cans, wheel rims etc.

Sample Profile: Grey silty clay, 2" -8" sample depth.

Comment: The mound was dug into with a shovel. Buried can and a broken concrete block were found.

Sample: 44-S16 Coordinates: B1+49, 1+45 Date: September 07, 1996

Location: Depression with lots of surface debris. Close to upside down abondend car.

Adjacent Vegetation:

Ground Description: Depression 30 cm deep and 2 metres in diameter. Extensive small garbage:oil + pop cans, glass, small misellaneous: filing cabinet.

Sample Profile: 0" to 4 " composed of debris and leaves cleared by shovel. 4" to 9" grey silty clay.

Appendix C: Field Charts

APPENDIX C

PETROCHEM : TOTAL HYDROCARBON (RESPONSE FACTOR 5)

SITE	DATE	TIME	TEMP	SOIL / WATER	SAMPLE CODE	READING (ppm)	COMMENT
44	7-Sep-96	5:45	23	soil	44-1	285	
44	7-Sep-96	5:45	23	soil	44-2	109	
44	7-Sep-96	5:45	23	soil	44-3	35	
44	7-Sep-96	5:45	23	soil	44-4	12	
44	7-Sep-96	5:45	23	soil	44-5	288	
44	7-Sep-96	5:45	23	soil	44-6	0	
44	7-Sep-96	5:45	23	soil	44-7	0	
44	7-Sep-96	7:00	8	soil	44-8	117	
44	7-Sep-96	7:00	8	soil	44-9	98	
44	7-Sep-96	7:00	8	soil	44-10	108	
44	7-Sep-96	7:00	8	soil	44-11	61	
44	7-Sep-96	7:00	8	soil	44-12	18	
44	8-Sep-96	9:00	16.1	soil	44-13	230	
44	8-Sep-96	9:00	16.1	soil	44-14	107	
44	8-Sep-96	9:00	16.1	soil	44-15	185	
44	8-Sep-96	9:00	16.1	soil	44-16	63	
44	8-Sep-96	9:00	16.1	soil	44-17	69	
44	8-Sep-96	9:00	16.1	soil	44-5	386	

APPENDIX C, CONTINUED

DTECH ANALYSIS : POLYCYCLIC AROMATIC HYDROCARBONS (PAH's)

DATE	TEMP	SOIL / WATER	SAMPLE CODE	REFER-ENCE	READING (%)	ACTUAL (ppm)	*concentration exceeds CCME
07-Sep-96	7	water	44-w8	394	3%	12.6 ppb	*concentration may exceed CCME
07-Sep-96	7	water	44-w9	380	LO	<8 ppb	
08-Sep-96	16.2	soil	44-5	398	LO	< 0.6 ppm	
08-Sep-96	16.2	soil	44-10	400	LO	< 0.6 ppm	
08-Sep-96	16.2	soil	44-8	398	LO	< 0.6 ppm	
08-Sep-96	16.2	soil	44-13	406	1%	0.62	*concentration may exceed CCME

DTECH ANALYSIS: POLYCCHLORINATED BIPHENYLS (PCB's)

DATE	TEMP (DEG C)	SOIL / WATER	SAMPLE CODE	REFER-ENCE	READING (%)	ACTUAL (ppm)	COMMENT
08-Sep-96	16.5	soil	44-4	335	LO	< 0.5 ppm	
08-Sep-96	16.5	soil	44-16	356	LO	< 0.5 ppm	
08-Sep-96	15.7	soil	44-14	342	LO	< 0.5 ppm	
08-Sep-96	15.7	soil	44-15	337	LO	< 0.5 ppm	
08-Sep-96	15.7	soil	44-2	331	LO	< 0.5 ppm	

Appendix D: Chemex Analytical Laboratories Data

CHEMEX Labs Alberta Inc.

Calgary : 2021 - 41st Avenue N.E., T2E 6P2. Telephone (403) 291-3077, FAX (403) 291-9468
Edmonton : 9331 - 48th Street, T6B 2R4, Telephone (403) 465-9877, FAX (403) 466-3332

CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-5
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : COMPOSITE
Sample Received Date: September 17, 1996
Sample Station Code :

Chemex Worksheet Number : 96-03349-7
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : SOIL
Report Date : September 30, 1996
Analysis Date : September 20, 1996

PARAMETER DESCRIPTION	NAQUADAT CODE	UNITS	RESULTS	DETECTION LIMIT
Total Mercury- (CVAA)		ug/kg	126.	20.
Barium (ICP)		ug/g	213.	1.
Beryllium (ICP)		ug/g	0.3	0.1
Cadmium (ICP)		ug/g	< 0.3	0.3
Chromium (ICP)		ug/g	210.	0.2
Cobalt (ICP)		ug/g	14.8	0.3
Copper (ICP)		ug/g	384.	0.1
Lead (ICP)		ug/g	355.	2.
Molybdenum (ICP)		ug/g	64.6	0.3
Nickel (ICP)		ug/g	128.	0.5
Silver (ICP)		ug/g	< 0.2	0.2
Vanadium (ICP)		ug/g	59.6	0.2
Zinc (ICP)		ug/g	1270.	0.1
Thallium (ICP-MS)		ug/g	0.10	0.02
Arsenic (ICP-MS)		ug/g	27.8	0.1
Selenium (ICP-MS)		ug/g	0.2	0.1
Antimony (ICP-MS)		ug/g	0.94	0.02
Tin (ICP-MS)		ug/g	668.	0.02

CHEMEX Labs Alberta Inc.

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-5
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : COMPOSITE
Sample Station Code :

Chemex Worksheet Number : 96-03349-7
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : SOIL
Report Date : September 30, 1996

BATCH SPECIFIC QUALITY ASSURANCE REPORT

PARAMETER	DATE ANALYZED (DD-MM-YY)	QA/QC BATCH NUM ANAL	RELATIVE PERCENT DIFFERENCE	REFERENCE VALUE	CONTROL LIMITS LOWER	CONTROL LIMITS UPPER	CALIBRATION CHECK RECOV %	CONTROL LIMITS LOWER	CONTROL LIMITS UPPER
Total Mercury- (CVAA)	20-09-96	1 CH	2.40	0.17	0.11	0.20	NOT APPLICABLE		
Barium (ICP)	27-09-96	11 JCG	4.88	278.00	231.60	283.60	103.8	93.6	105.6
Beryllium (ICP)	27-09-96	11 JCG	3.92	3.95	3.26	4.91	102.9	89.2	110.9
Cadmium (ICP)	27-09-96	11 JCG	0.00	0.00	0.00	1.69	101.7	86.6	113.1
Chromium (ICP)	27-09-96	11 JCG	2.35	47.57	37.84	55.65	100.3	89.8	109.8
Cobalt (ICP)	27-09-96	11 JCG	0.96	19.57	14.89	21.09	100.4	88.3	107.8
Copper (ICP)	27-09-96	11 JCG	1.96	46.75	37.17	49.97	99.9	90.7	105.0
Lead (ICP)	27-09-96	11 JCG	0.00	28.79	19.91	34.23	99.9	91.6	106.7
Molybdenum (ICP)	27-09-96	11 JCG	6.37	21.00	9.96	21.51	101.5	90.5	109.8
Nickel (ICP)	27-09-96	11 JCG	4.70	40.95	35.56	48.92	97.7	90.4	108.1
Silver (ICP)	27-09-96	11 JCG	0.00	NOT APPLICABLE			102.4	93.1	104.1
Vanadium (ICP)	27-09-96	11 JCG	2.16	129.00	99.60	136.95	104.4	93.1	108.8
Zinc (ICP)	27-09-96	11 JCG	0.81	82.47	69.09	95.47	102.0	89.4	109.7
Thallium (ICP-MS)	26-09-96	21 WEM	12.32	NOT APPLICABLE			97.1	80.0	120.0
Arsenic (ICP-MS)	26-09-96	21 WEM	4.06	122.50	38.00	157.30	110.5	81.5	112.6
Selenium (ICP-MS)	26-09-96	21 WEM	50.00	7.81	0.85	18.23	102.6	86.0	105.9
Antimony (ICP-MS)	27-09-96	21 WEM	3.92	NOT APPLICABLE			109.7	80.0	120.0
Tin (ICP-MS)	27-09-96	21 WEM	22.35	NOT APPLICABLE			113.3	80.0	120.0

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-5
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : COMPOSITE
Sample Received Date: September 17, 1996
Sample Station Code :

Chemex Worksheet Number : 96-03349-7
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : SOIL
Report Date : September 30, 1996
Analysis Date : September 17, 1996

TOTAL EXTRACTABLE HYDROCARBONS METHOD MODIFIED ASTM D2887

COMPONENT	mg/Kg	BOILING RANGE	COMPONENT	mg/Kg	BOILING RANGE
C 08	< 1.	98.5 TO 125.7	C 35	< 2.	483.1 TO 491.0
C 09	< 1.	125.8 TO 150.8	C 36	< 2.	491.1 TO 498.0
C 10	< 1.	150.9 TO 174.2	C 37	< 2.	498.1 TO 505.0
C 11	< 1.	174.3 TO 196.0	C 38	< 2.	505.1 TO 512.0
C 12	< 1.	196.1 TO 216.0	C 39	< 2.	512.1 TO 519.0
C 13	< 1.	216.1 TO 236.0	C 40	< 5.	519.1 TO 525.0
C 14	< 1.	236.1 TO 253.0	C 41	< 5.	525.1 TO 535.0
C 15	< 1.	253.1 TO 271.0	C 42	< 5.	531.1 TO 537.0
C 16	< 1.	271.1 TO 287.0	C 43	< 5.	537.1 TO 543.0
C 17	< 1.	287.1 TO 302.0	C 44	< 5.	543.1 TO 548.0
C 18	< 1.	302.1 TO 317.0	C 45	< 5.	548.1 TO 554.0
C 19	< 1.	317.1 TO 331.0	C 46	< 5.	554.1 TO 559.0
C 20	< 1.	331.1 TO 344.0	C 47	< 5.	559.1 TO 565.0
C 21	< 1.	344.1 TO 357.0	C 48	< 5.	565.1 TO 570.0
C 22	< 1.	357.1 TO 366.0	C 49	< 5.	570.1 TO 576.0
C 23	< 1.	366.1 TO 380.0	C 50	< 5.	576.1 TO 581.0
C 24	< 1.	380.1 TO 391.0	C 51	< 5.	581.1 TO 584.0
C 25	< 1.	391.1 TO 402.0	C 52	< 5.	584.1 TO 588.0
C 26	(1.)	402.1 TO 412.0	C 53	< 5.	588.1 TO 592.0
C 27	3.	412.1 TO 422.0	C 54	< 5.	592.1 TO 596.0
C 28	6.	422.1 TO 432.0	C 55	< 5.	596.1 TO 600.0
C 29	5.	432.1 TO 441.0	C 56	< 5.	600.1 TO 604.0
C 30	5.	441.1 TO 449.0	C 57	< 5.	604.1 TO 608.0
C 31	(2.)	449.1 TO 459.0	C 58	< 5.	608.1 TO 612.0
C 32	(3.)	459.1 TO 468.0	C 59	< 5.	612.1 TO 615.0
C 33	(3.)	468.1 TO 476.0	C 60	< 5.	615.1 TO 619.0
C 34	(3.)	476.1 TO 483.0			

Average molecular weight : 404 AMU

TOTAL HYDROCARBONS C8-C10 N.D.
TOTAL HYDROCARBONS C11-C60 30. mg/Kg

Surrogate recovery : 118% SOIL surrogate limits : 66% - 140%.
MDL per component : 1. mg/Kg below C31 and 2. mg/Kg above C30
5. mg/Kg above C39 and 5. mg/Kg above C49

Results are reported in accordance with CCME guidelines. All results are corrected for blank levels.

MDL - Method detection level. The reliable detection level is twice the method detection level.

( ) - Bracketed results are values below the reliable detection level, and are subject to reduced levels of confidence.

Results are uncorrected for moisture unless otherwise noted.

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-5
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : COMPOSITE
Sample Received Date: September 17, 1996
Sample Station Code :

Chemex Worksheet Number : 96-03349-7
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : SOIL
Report Date : September 30, 1996
Analysis Date : September 17, 1996

BATCH SPECIFIC QUALITY ASSURANCE REPORT

BATCH : 4	BLANK	DUPLICATE			MATRIX SPIKE			CALIBRATION CHECK		
DATE : September 17, 1996	CONC.	CONC.1	CONC.2	RPD	RECOV	CONTROL LIMITS		RECOV	CONTROL LIMITS	
ANALYST:ZBN	mg/Kg	mg/Kg	mg/Kg	%	%	LOWER	UPPER	%	LOWER	UPPER
C 08	< 1.	< 1.	< 1.	0				107	73.	130.
C 09	< 1.	< 1.	< 1.	0				97	74.	120.
C 10	< 1.	< 1.	< 1.	0				102	69.	130.
C 11	< 1.	< 1.	< 1.	0						
C 12	< 1.	< 1.	< 1.	0						
C 13	< 1.	< 1.	< 1.	0						
C 14	< 1.	< 1.	< 1.	0						
C 15	< 1.	< 1.	< 1.	0				101	70.	130.
C 16	< 1.	< 1.	< 1.	0						
C 17	< 1.	< 1.	< 1.	0						
C 18	< 1.	< 1.	< 1.	0						
C 19	< 1.	< 1.	< 1.	0						
C 20	< 1.	< 1.	< 1.	0				102	70.	130.
C 21	< 1.	< 1.	< 1.	0						
C 22	< 1.	< 1.	< 1.	0						
C 23	< 1.	< 1.	< 1.	0						
C 24	< 1.	< 1.	< 1.	0						
C 25	< 1.	< 1.	< 1.	0				96	71.	130.
C 26	< 1.	< 1.	< 1.	0						
C 27	< 1.	< 1.	< 1.	200						
C 28	< 1.	< 1.	< 1.	0						
C 29	< 1.	< 1.	< 1.	200						
C 30	< 1.	< 1.	< 1.	0				98	67.	130.
C 31	< 2.	< 2.	< 2.	200						
C 32	< 2.	(3.)	< 2.	128						
C 33	< 2.	8.	8.	5						
C 34	< 2.	5.	(4.)	21						
C 35	< 2.	(3.)	< 2.	43						
C 36	< 2.	(2.)	< 2.	74						
C 37	< 2.	(4.)	< 2.	69						
C 38	< 2.	< 2.	< 2.	43						
C 39	< 2.	< 2.	< 2.	28						
C 40	< 5.	< 5.	< 5.	58				100		
C 41	< 5.	< 5.	< 5.	0						
C 42	< 5.	< 5.	< 5.	25						
C 43	< 5.	< 5.	< 5.	0						
C 44	< 5.	< 5.	< 5.	0						
C 45	< 5.	< 5.	< 5.	0						

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-5
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : COMPOSITE
Sample Received Date: September 17, 1996
Sample Station Code :

Chemex Worksheet Number : 96-03349-7
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : SOIL
Report Date : September 30, 1996
Analysis Date : September 17, 1996

BATCH SPECIFIC QUALITY ASSURANCE REPORT

BATCH : 4	BLANK	DUPLICATE			MATRIX SPIKE			CALIBRATION CHECK		
DATE : September 17, 1996	CONC.	CONC.1	CONC.2	RPD	RECOV	CONTROL LIMITS		RECOV	CONTROL LIMITS	
ANALYST:ZBN	mg/Kg	mg/Kg	mg/Kg	%	%	LOWER	UPPER	%	LOWER	UPPER
C 46	< 5.	< 5.	< 5.	27						
C 47	< 5.	< 5.	< 5.	0						
C 48	< 5.	< 5.	< 5.	16						
C 49	< 5.	< 5.	< 5.	0						
C 50	< 5.	< 5.	< 5.	7				101		
C 51	< 5.	< 5.	< 5.	32						
C 52	< 5.	< 5.	< 5.	6						
C 53	< 5.	(6.)	(6.)	2						
C 54	< 5.	< 5.	< 5.	81						
C 55	< 5.	< 5.	< 5.	0						
C 56	< 5.	< 5.	< 5.	0						
C 57	< 5.	< 5.	< 5.	0						
C 58	< 5.	< 5.	< 5.	0						
C 59	< 5.	< 5.	< 5.	0						
C 60	< 5.	< 5.	< 5.	0				102		

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-5
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : COMPOSITE
Sample Received Date: September 17, 1996
Sample Station Code :

Chemex Worksheet Number : 96-03349-7
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : SOIL
Report Date : September 30, 1996
Analysis Date : September 21, 1996

VOLATILE ORGANICS ANALYSIS - BTEX EPA METHOD 8260 MODIFIED

PARAMETER	CONC	BLANK CONC	UNITS	MDL
Benzene	< 0.0042	< 0.005	mg/Kg	0.0042
Ethylbenzene	< 0.0042	< 0.005	mg/Kg	0.0042
Toluene	< 0.0042	< 0.005	mg/Kg	0.0042
m & p-Xylene	< 0.0042	< 0.005	mg/Kg	0.0042
o-Xylene	< 0.0042	< 0.005	mg/Kg	0.0042

NOTES :

Results are reported in accordance with CCME guidelines, "Guidance Manual on Sampling, Analysis, and Data Management for Contaminated Sites, Volume I". All results are corrected for blank levels.

MDL - Method detection level. - Calculated on the basis of the instrument detection level, the dilution used, and the weight of the sample.

( ) - Bracketed results are values below the reliable detection level, and are subject to reduced levels of confidence. The reliable detection level is twice the method detection level.

QA/QC SUMMARY

All samples were spiked with a component whose recovery was monitored to maintain analysis accuracy.
Guidelines from SW846 for suggested surrogate recoveries for each matrix are shown below.
Results are uncorrected for moisture unless otherwise noted.

Instrument : GC/MS
Surrogate Recovery : 91% SOIL surrogate limits : 80% - 117%.

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-1
Sample Date & Time : 06-09-96
Sampled By : SM
Sample Type : COMPOSITE
Sample Received Date: September 17, 1996
Sample Station Code :

Chemex Worksheet Number : 96-03349-8
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : SOIL
Report Date : September 30, 1996
Analysis Date : September 20, 1996

PARAMETER DESCRIPTION	NAQUADAT CODE	UNITS	R E S U L T S	DETECTION LIMIT
Total Mercury- (CVAA)		ug/kg	< 20	20.
Barium (ICP)		ug/g	131.	1.
Beryllium (ICP)		ug/g	0.3	0.1
Cadmium (ICP)		ug/g	< 0.3	0.3
Chromium (ICP)		ug/g	82.5	0.2
Cobalt (ICP)		ug/g	13.9	0.3
Copper (ICP)		ug/g	39.4	0.1
Lead (ICP)		ug/g	7.	2.
Molybdenum (ICP)		ug/g	11.8	0.3
Nickel (ICP)		ug/g	42.9	0.5
Silver (ICP)		ug/g	< 0.2	0.2
Vanadium (ICP)		ug/g	87.4	0.2
Zinc (ICP)		ug/g	75.1	0.1
Thallium (ICP-MS)		ug/g	0.12	0.02
Arsenic (ICP-MS)		ug/g	5.0	0.1
Selenium (ICP-MS)		ug/g	1.5	0.1
Antimony (ICP-MS)		ug/g	0.15	0.02
Tin (ICP-MS)		ug/g	7.50	0.02

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-1
Sample Date & Time : 06-09-96
Sampled By : SM
Sample Type : COMPOSITE
Sample Station Code :

Chemex Worksheet Number : 96-03349-8
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : SOIL
Report Date : September 30, 1996

BATCH SPECIFIC QUALITY ASSURANCE REPORT

PARAMETER	DATE ANALYZED (DD-MM-YY)	QA/QC BATCH NUM ANAL	RELATIVE PERCENT DIFFERENCE	REFERENCE CONTROL LIMITS VALUE	LOWER	UPPER	CALIBRATION CHECK RECOV %	CONTROL LIMITS LOWER	UPPER
Total Mercury- (CVAA)	20-09-96	1 CH	2.40	0.17	0.11	0.20	NOT APPLICABLE		
Barium (ICP)	27-09-96	11 JCG	4.88	278.00	231.60	283.60	103.8	93.6	105.6
Beryllium (ICP)	27-09-96	11 JCG	3.92	3.95	3.26	4.91	102.9	89.2	110.9
Cadmium (ICP)	27-09-96	11 JCG	0.00	0.00	0.00	1.69	101.7	86.6	113.1
Chromium (ICP)	27-09-96	11 JCG	2.35	47.57	37.84	55.65	100.3	89.8	109.8
Cobalt (ICP)	27-09-96	11 JCG	0.96	19.57	14.89	21.09	100.4	88.3	107.8
Copper (ICP)	27-09-96	11 JCG	1.96	46.75	37.17	49.97	99.9	90.7	105.0
Lead (ICP)	27-09-96	11 JCG	0.00	28.79	19.91	34.23	99.9	91.6	106.7
Molybdenum (ICP)	27-09-96	11 JCG	6.37	21.00	9.96	21.51	101.5	90.5	109.8
Nickel (ICP)	27-09-96	11 JCG	4.70	40.95	35.56	48.92	97.7	90.4	108.1
Silver (ICP)	27-09-96	11 JCG	0.00	NOT APPLICABLE			102.4	93.1	104.1
Vanadium (ICP)	27-09-96	11 JCG	2.16	129.00	99.60	136.95	104.4	93.1	108.8
Zinc (ICP)	27-09-96	11 JCG	0.81	82.47	69.09	95.47	102.0	89.4	109.7
Thallium (ICP-MS)	26-09-96	21 WEM	12.32	NOT APPLICABLE			97.1	80.0	120.0
Arsenic (ICP-MS)	26-09-96	21 WEM	4.06	122.50	38.00	157.30	110.5	81.5	112.6
Selenium (ICP-MS)	26-09-96	21 WEM	50.00	7.81	0.85	18.23	102.6	86.0	105.9
Antimony (ICP-MS)	27-09-96	21 WEM	3.92	NOT APPLICABLE			109.7	80.0	120.0
Tin (ICP-MS)	27-09-96	21 WEM	22.35	NOT APPLICABLE			113.3	80.0	120.0

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-13
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : COMPOSITE
Sample Received Date: September 17, 1996
Sample Station Code :

Chemex Worksheet Number : 96-03349-9
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : SOIL
Report Date : September 30, 1996
Analysis Date : September 20, 1996

PARAMETER DESCRIPTION	NAQUADAT CODE	UNITS	RESULTS	DETECTION LIMIT
Total Mercury- (CVAA)		ug/kg	33.	20.
Barium (ICP)		ug/g	186.	1.
Beryllium (ICP)		ug/g	0.4	0.1
Cadmium (ICP)		ug/g	< 0.3	0.3
Chromium (ICP)		ug/g	55.7	0.2
Cobalt (ICP)		ug/g	16.0	0.3
Copper (ICP)		ug/g	44.9	0.1
Lead (ICP)		ug/g	11.	2.
Molybdenum (ICP)		ug/g	13.6	0.3
Nickel (ICP)		ug/g	32.9	0.5
Silver (ICP)		ug/g	< 0.2	0.2
Vanadium (ICP)		ug/g	97.0	0.2
Zinc (ICP)		ug/g	88.9	0.1
Thallium (ICP-MS)		ug/g	0.23	0.02
Arsenic (ICP-MS)		ug/g	7.2	0.1
Selenium (ICP-MS)		ug/g	1.1	0.1
Antimony (ICP-MS)		ug/g	0.20	0.02
Tin (ICP-MS)		ug/g	1.75	0.02

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-13
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : COMPOSITE
Sample Station Code :

Chemex Worksheet Number : 96-03349-9
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : SOIL
Report Date : September 30, 1996

BATCH SPECIFIC QUALITY ASSURANCE REPORT

PARAMETER	DATE ANALYZED (DD-MM-YY)	QA/QC BATCH NUM ANAL	RELATIVE PERCENT DIFFERENCE	REFERENCE VALUE	CONTROL LIMITS LOWER	CONTROL LIMITS UPPER	CALIBRATION CHECK RECOV %	CONTROL LIMITS LOWER	CONTROL LIMITS UPPER
Total Mercury- (CVAA)	20-09-96	1 CH	2.40	0.17	0.11	0.20	NOT APPLICABLE		
Barium (ICP)	27-09-96	11 JCG	4.88	278.00	231.60	283.60	103.8	93.6	105.6
Beryllium (ICP)	27-09-96	11 JCG	3.92	3.95	3.26	4.91	102.9	89.2	110.9
Cadmium (ICP)	27-09-96	11 JCG	0.00	0.00	0.00	1.69	101.7	86.6	113.1
Chromium (ICP)	27-09-96	11 JCG	2.35	47.57	37.84	55.65	100.3	89.8	109.8
Cobalt (ICP)	27-09-96	11 JCG	0.96	19.57	14.89	21.09	100.4	88.3	107.8
Copper (ICP)	27-09-96	11 JCG	1.96	46.75	37.17	49.97	99.9	90.7	105.0
Lead (ICP)	27-09-96	11 JCG	0.00	28.79	19.91	34.23	99.9	91.6	106.7
Molybdenum (ICP)	27-09-96	11 JCG	6.37	21.00	9.96	21.51	101.5	90.5	109.8
Nickel (ICP)	27-09-96	11 JCG	4.70	40.95	35.56	48.92	97.7	90.4	108.1
Silver (ICP)	27-09-96	11 JCG	0.00	NOT APPLICABLE			102.4	93.1	104.1
Vanadium (ICP)	27-09-96	11 JCG	2.16	129.00	99.60	136.95	104.4	93.1	108.8
Zinc (ICP)	27-09-96	11 JCG	0.81	82.47	69.09	95.47	102.0	89.4	109.7
Thallium (ICP-MS)	26-09-96	21 WEM	12.32	NOT APPLICABLE			97.1	80.0	120.0
Arsenic (ICP-MS)	26-09-96	21 WEM	4.06	122.50	38.00	157.30	110.5	81.5	112.6
Selenium (ICP-MS)	26-09-96	21 WEM	50.00	7.81	0.85	18.23	102.6	86.0	105.9
Antimony (ICP-MS)	27-09-96	21 WEM	3.92	NOT APPLICABLE			109.7	80.0	120.0
Tin (ICP-MS)	27-09-96	21 WEM	22.35	NOT APPLICABLE			113.3	80.0	120.0

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-9
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : COMPOSITE
Sample Received Date: September 17, 1996
Sample Station Code :

Chemex Worksheet Number : 96-03349-10
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : SOIL
Report Date : September 30, 1996
Analysis Date : September 17, 1996

TOTAL EXTRACTABLE HYDROCARBONS METHOD MODIFIED ASTM D2887

COMPONENT	mg/Kg	BOILING RANGE	COMPONENT	mg/Kg	BOILING RANGE
C 08	< 1.	98.5 TO 125.7	C 35	< 2.	483.1 TO 491.0
C 09	< 1.	125.8 TO 150.8	C 36	< 2.	491.1 TO 498.0
C 10	< 1.	150.9 TO 174.2	C 37	< 2.	498.1 TO 505.0
C 11	< 1.	174.3 TO 196.0	C 38	< 2.	505.1 TO 512.0
C 12	< 1.	196.1 TO 216.0	C 39	< 2.	512.1 TO 519.0
C 13	< 1.	216.1 TO 236.0	C 40	< 6.	519.1 TO 525.0
C 14	< 1.	236.1 TO 253.0	C 41	< 6.	525.1 TO 535.0
C 15	< 1.	253.1 TO 271.0	C 42	< 6.	531.1 TO 537.0
C 16	< 1.	271.1 TO 287.0	C 43	< 6.	537.1 TO 543.0
C 17	< 1.	287.1 TO 302.0	C 44	< 6.	543.1 TO 548.0
C 18	< 1.	302.1 TO 317.0	C 45	< 6.	548.1 TO 554.0
C 19	< 1.	317.1 TO 331.0	C 46	< 6.	554.1 TO 559.0
C 20	< 1.	331.1 TO 344.0	C 47	< 6.	559.1 TO 565.0
C 21	< 1.	344.1 TO 357.0	C 48	< 6.	565.1 TO 570.0
C 22	< 1.	357.1 TO 366.0	C 49	< 6.	570.1 TO 576.0
C 23	< 1.	366.1 TO 380.0	C 50	< 6.	576.1 TO 581.0
C 24	< 1.	380.1 TO 391.0	C 51	< 6.	581.1 TO 584.0
C 25	< 1.	391.1 TO 402.0	C 52	< 6.	584.1 TO 588.0
C 26	< 1.	402.1 TO 412.0	C 53	< 6.	588.1 TO 592.0
C 27	< 1.	412.1 TO 422.0	C 54	< 6.	592.1 TO 596.0
C 28	< 1.	422.1 TO 432.0	C 55	< 6.	596.1 TO 600.0
C 29	< 1.	432.1 TO 441.0	C 56	< 6.	600.1 TO 604.0
C 30	< 1.	441.1 TO 449.0	C 57	< 6.	604.1 TO 608.0
C 31	< 2.	449.1 TO 459.0	C 58	< 6.	608.1 TO 612.0
C 32	< 2.	459.1 TO 468.0	C 59	< 6.	612.1 TO 615.0
C 33	< 2.	468.1 TO 476.0	C 60	< 6.	615.1 TO 619.0
C 34	< 2.	476.1 TO 483.0			

Average molecular weight : N.D. AMU

TOTAL HYDROCARBONS C8-C10 N.D.
TOTAL HYDROCARBONS C11-C60 N.D.

Surrogate recovery : 116% SOIL surrogate limits : 66% - 140%.
MDL per component : 1. mg/Kg below C31 and 2. mg/Kg above C30
6. mg/Kg above C39 and 6. mg/Kg above C49

Results are reported in accordance with CCME guidelines. All results are corrected for blank levels.
MDL - Method detection level. The reliable detection level is twice the method detection level.
( ) - Bracketed results are values below the reliable detection level, and are subject to reduced levels of confidence.
Results are uncorrected for moisture unless otherwise noted.

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-9
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : COMPOSITE
Sample Received Date: September 17, 1996
Sample Station Code :

Chemex Worksheet Number : 96-03349-10
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : SOIL
Report Date : September 30, 1996
Analysis Date : September 17, 1996

BATCH SPECIFIC QUALITY ASSURANCE REPORT

BATCH : 4	BLANK	DUPLICATE			MATRIX SPIKE			CALIBRATION CHECK		
DATE : September 17, 1996	CONC.	CONC.1	CONC.2	RPD	RECOV	CONTROL LIMITS		RECOV	CONTROL LIMITS	
ANALYST:ZBN	mg/Kg	mg/Kg	mg/Kg	%	%	LOWER	UPPER	%	LOWER	UPPER
C 08	< 1.	< 1.	< 1.	0				107	73.	130.
C 09	< 1.	< 1.	< 1.	0				97	74.	120.
C 10	< 1.	< 1.	< 1.	0				102	69.	130.
C 11	< 1.	< 1.	< 1.	0						
C 12	< 1.	< 1.	< 1.	0						
C 13	< 1.	< 1.	< 1.	0						
C 14	< 1.	< 1.	< 1.	0						
C 15	< 1.	< 1.	< 1.	0				101	70.	130.
C 16	< 1.	< 1.	< 1.	0						
C 17	< 1.	< 1.	< 1.	0						
C 18	< 1.	< 1.	< 1.	0						
C 19	< 1.	< 1.	< 1.	0						
C 20	< 1.	< 1.	< 1.	0				102	70.	130.
C 21	< 1.	< 1.	< 1.	0						
C 22	< 1.	< 1.	< 1.	0						
C 23	< 1.	< 1.	< 1.	0						
C 24	< 1.	< 1.	< 1.	0						
C 25	< 1.	< 1.	< 1.	0				96	71.	130.
C 26	< 1.	< 1.	< 1.	0						
C 27	< 1.	< 1.	< 1.	200						
C 28	< 1.	< 1.	< 1.	0						
C 29	< 1.	< 1.	< 1.	200						
C 30	< 1.	< 1.	< 1.	0				98	67.	130.
C 31	< 2.	< 2.	< 2.	200						
C 32	< 2.	(3.)	< 2.	128						
C 33	< 2.	8.	8.	5						
C 34	< 2.	5.	(4.)	21						
C 35	< 2.	(3.)	< 2.	43						
C 36	< 2.	(2.)	< 2.	74						
C 37	< 2.	(4.)	< 2.	69						
C 38	< 2.	< 2.	< 2.	43						
C 39	< 2.	< 2.	< 2.	28						
C 40	< 5.	< 5.	< 5.	58				100		
C 41	< 5.	< 5.	< 5.	0						
C 42	< 5.	< 5.	< 5.	25						
C 43	< 5.	< 5.	< 5.	0						
C 44	< 5.	< 5.	< 5.	0						
C 45	< 5.	< 5.	< 5.	0						

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-9
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : COMPOSITE
Sample Received Date: September 17, 1996
Sample Station Code :

Chemex Worksheet Number : 96-03349-10
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : SOIL
Report Date : September 30, 1996
Analysis Date : September 17, 1996

BATCH SPECIFIC QUALITY ASSURANCE REPORT

BATCH : 4	BLANK	DUPLICATE			MATRIX SPIKE			CALIBRATION CHECK		
DATE : September 17, 1996	CONC.	CONC.1	CONC.2	RPD	RECOV	CONTROL LIMITS		RECOV	CONTROL LIMITS	
ANALYST:ZBN	mg/Kg	mg/Kg	mg/Kg	%	%	LOWER	UPPER	%	LOWER	UPPER
C 46	< 5.	< 5.	< 5.	27						
C 47	< 5.	< 5.	< 5.	0						
C 48	< 5.	< 5.	< 5.	16						
C 49	< 5.	< 5.	< 5.	0						
C 50	< 5.	< 5.	< 5.	7				101		
C 51	< 5.	< 5.	< 5.	32						
C 52	< 5.	< 5.	< 5.	6						
C 53	< 5.	(6.)	(6.)	2						
C 54	< 5.	< 5.	< 5.	81						
C 55	< 5.	< 5.	< 5.	0						
C 56	< 5.	< 5.	< 5.	0						
C 57	< 5.	< 5.	< 5.	0						
C 58	< 5.	< 5.	< 5.	0						
C 59	< 5.	< 5.	< 5.	0						
C 60	< 5.	< 5.	< 5.	0				102		

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-15
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : COMPOSITE
Sample Received Date: September 17, 1996
Sample Station Code :

Chemex Worksheet Number : 96-03349-11
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : SOIL
Report Date : September 30, 1996
Analysis Date : September 17, 1996

TOTAL EXTRACTABLE HYDROCARBONS METHOD MODIFIED ASTM D2887

COMPONENT	mg/Kg	BOILING RANGE	COMPONENT	mg/Kg	BOILING RANGE
C 08	< 1.	98.5 TO 125.7	C 35	(3.)	483.1 TO 491.0
C 09	< 1.	125.8 TO 150.8	C 36	< 2.	491.1 TO 498.0
C 10	< 1.	150.9 TO 174.2	C 37	(2.)	498.1 TO 505.0
C 11	< 1.	174.3 TO 196.0	C 38	(3.)	505.1 TO 512.0
C 12	< 1.	196.1 TO 216.0	C 39	< 2.	512.1 TO 519.0
C 13	< 1.	216.1 TO 236.0	C 40	< 5.	519.1 TO 525.0
C 14	< 1.	236.1 TO 253.0	C 41	< 5.	525.1 TO 535.0
C 15	< 1.	253.1 TO 271.0	C 42	< 5.	531.1 TO 537.0
C 16	< 1.	271.1 TO 287.0	C 43	< 5.	537.1 TO 543.0
C 17	< 1.	287.1 TO 302.0	C 44	< 5.	543.1 TO 548.0
C 18	< 1.	302.1 TO 317.0	C 45	< 5.	548.1 TO 554.0
C 19	< 1.	317.1 TO 331.0	C 46	< 5.	554.1 TO 559.0
C 20	< 1.	331.1 TO 344.0	C 47	< 5.	559.1 TO 565.0
C 21	< 1.	344.1 TO 357.0	C 48	< 5.	565.1 TO 570.0
C 22	< 1.	357.1 TO 366.0	C 49	< 5.	570.1 TO 576.0
C 23	< 1.	366.1 TO 380.0	C 50	< 5.	576.1 TO 581.0
C 24	< 1.	380.1 TO 391.0	C 51	< 5.	581.1 TO 584.0
C 25	< 1.	391.1 TO 402.0	C 52	< 5.	584.1 TO 588.0
C 26	< 1.	402.1 TO 412.0	C 53	< 5.	588.1 TO 592.0
C 27	< 1.	412.1 TO 422.0	C 54	< 5.	592.1 TO 596.0
C 28	< 1.	422.1 TO 432.0	C 55	< 5.	596.1 TO 600.0
C 29	4.	432.1 TO 441.0	C 56	(6.)	600.1 TO 604.0
C 30	< 1.	441.1 TO 449.0	C 57	< 5.	604.1 TO 608.0
C 31	(3.)	449.1 TO 459.0	C 58	(9.)	608.1 TO 612.0
C 32	4.	459.1 TO 468.0	C 59	< 5.	612.1 TO 615.0
C 33	10.	468.1 TO 476.0	C 60	< 5.	615.1 TO 619.0
C 34	8.	476.1 TO 483.0			

Average molecular weight : 510 AMU

TOTAL HYDROCARBONS C8-C10 N.D.
TOTAL HYDROCARBONS C11-C60 52. mg/Kg

Surrogate recovery : 122% SOIL surrogate limits : 66% - 140%.
MDL per component : 1. mg/Kg below C31 and 2. mg/Kg above C30
5. mg/Kg above C39 and 5. mg/Kg above C49

Results are reported in accordance with CCME guidelines. All results are corrected for blank levels.

MDL - Method detection level. The reliable detection level is twice the method detection level.

( ) - Bracketed results are values below the reliable detection level, and are subject to reduced levels of confidence.

Results are uncorrected for moisture unless otherwise noted.

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-15
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : COMPOSITE
Sample Received Date: September 17, 1996
Sample Station Code :

Chemex Worksheet Number : 96-03349-11
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : SOIL
Report Date : September 30, 1996
Analysis Date : September 17, 1996

BATCH SPECIFIC QUALITY ASSURANCE REPORT

BATCH : 4	BLANK	DUPLICATE			MATRIX SPIKE			CALIBRATION CHECK		
DATE : September 17, 1996	CONC.	CONC.1	CONC.2	RPD	RECOV	CONTROL LIMITS		RECOV	CONTROL LIMITS	
ANALYST:ZBN	mg/Kg	mg/Kg	mg/Kg	%	%	LOWER	UPPER	%	LOWER	UPPER
C 08	< 1.	< 1.	< 1.	0				107	73.	130.
C 09	< 1.	< 1.	< 1.	0				97	74.	120.
C 10	< 1.	< 1.	< 1.	0				102	69.	130.
C 11	< 1.	< 1.	< 1.	0						
C 12	< 1.	< 1.	< 1.	0						
C 13	< 1.	< 1.	< 1.	0						
C 14	< 1.	< 1.	< 1.	0						
C 15	< 1.	< 1.	< 1.	0				101	70.	130.
C 16	< 1.	< 1.	< 1.	0						
C 17	< 1.	< 1.	< 1.	0						
C 18	< 1.	< 1.	< 1.	0						
C 19	< 1.	< 1.	< 1.	0						
C 20	< 1.	< 1.	< 1.	0				102	70.	130.
C 21	< 1.	< 1.	< 1.	0						
C 22	< 1.	< 1.	< 1.	0						
C 23	< 1.	< 1.	< 1.	0						
C 24	< 1.	< 1.	< 1.	0						
C 25	< 1.	< 1.	< 1.	0				96	71.	130.
C 26	< 1.	< 1.	< 1.	0						
C 27	< 1.	< 1.	< 1.	200						
C 28	< 1.	< 1.	< 1.	0						
C 29	< 1.	< 1.	< 1.	200						
C 30	< 1.	< 1.	< 1.	0				98	67.	130.
C 31	< 2.	< 2.	< 2.	200						
C 32	< 2.	(3.)	< 2.	128						
C 33	< 2.	8.	8.	5						
C 34	< 2.	5.	(4.)	21						
C 35	< 2.	(3.)	< 2.	43						
C 36	< 2.	(2.)	< 2.	74						
C 37	< 2.	(4.)	< 2.	69						
C 38	< 2.	< 2.	< 2.	43						
C 39	< 2.	< 2.	< 2.	28						
C 40	< 5.	< 5.	< 5.	58				100		
C 41	< 5.	< 5.	< 5.	0						
C 42	< 5.	< 5.	< 5.	25						
C 43	< 5.	< 5.	< 5.	0						
C 44	< 5.	< 5.	< 5.	0						
C 45	< 5.	< 5.	< 5.	0						

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-15
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : COMPOSITE
Sample Received Date: September 17, 1996
Sample Station Code :

Chemex Worksheet Number : 96-03349-11
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : SOIL
Report Date : September 30, 1996
Analysis Date : September 17, 1996

BATCH SPECIFIC QUALITY ASSURANCE REPORT

BATCH : 4	BLANK	DUPLICATE			MATRIX SPIKE			CALIBRATION CHECK	
DATE : September 17, 1996	CONC.	CONC.1	CONC.2	RPD	RECOV	CONTROL LIMITS		RECOV	CONTROL LIMITS
ANALYST:ZBN	mg/Kg	mg/Kg	mg/Kg	%	%	LOWER	UPPER	%	LOWER UPPER
C 46	< 5.	< 5.	< 5.	27					
C 47	< 5.	< 5.	< 5.	0					
C 48	< 5.	< 5.	< 5.	16					
C 49	< 5.	< 5.	< 5.	0					
C 50	< 5.	< 5.	< 5.	7				101	
C 51	< 5.	< 5.	< 5.	32					
C 52	< 5.	< 5.	< 5.	6					
C 53	< 5.	(6.)	(6.)	2					
C 54	< 5.	< 5.	< 5.	81					
C 55	< 5.	< 5.	< 5.	0					
C 56	< 5.	< 5.	< 5.	0					
C 57	< 5.	< 5.	< 5.	0					
C 58	< 5.	< 5.	< 5.	0					
C 59	< 5.	< 5.	< 5.	0					
C 60	< 5.	< 5.	< 5.	0				102	

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-6
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : COMPOSITE
Sample Received Date: September 17, 1996
Sample Station Code :

Chemex Worksheet Number : 96-03349-12
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : SOIL
Report Date : September 30, 1996
Analysis Date : September 21, 1996

VOLATILE ORGANICS ANALYSIS - BTEX EPA METHOD 8260 MODIFIED

PARAMETER	CONC	BLANK CONC	UNITS	MDL
Benzene	< 0.0034	< 0.005	mg/Kg	0.0034
Ethylbenzene	< 0.0034	< 0.005	mg/Kg	0.0034
Toluene	< 0.0034	< 0.005	mg/Kg	0.0034
m & p-Xylene	< 0.0034	< 0.005	mg/Kg	0.0034
o-Xylene	< 0.0034	< 0.005	mg/Kg	0.0034

NOTES :

Results are reported in accordance with CCME guidelines, "Guidance Manual on Sampling, Analysis, and Data Management for Contaminated Sites, Volume I". All results are corrected for blank levels.

MDL - Method detection level. - Calculated on the basis of the instrument detection level, the dilution used, and the weight of the sample.

( ) - Bracketed results are values below the reliable detection level, and are subject to reduced levels of confidence. The reliable detection level is twice the method detection level.

QA/QC SUMMARY

All samples were spiked with a component whose recovery was monitored to maintain analysis accuracy.
Guidelines from SW846 for suggested surrogate recoveries for each matrix are shown below.
Results are uncorrected for moisture unless otherwise noted.

Instrument : GC/MS
Surrogate Recovery : 105% SOIL surrogate limits : 80% - 117%.

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-W1
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : GRAB
Sample Received Date: September 17, 1996
Sample Station Code :

Chemex Worksheet Number : 96-03349-20
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : WATER
Report Date : September 30, 1996
Analysis Date : September 26, 1996

PARAMETER DESCRIPTION	NAQUADAT CODE	UNITS	R E S U L T S	DETECTION LIMIT
Aluminum - Total (ICP-AES)	013009	mg/L	0.21	0.01
Arsenic - Total (AA)	033005	mg/L	< 0.0002	0.0002
Cadmium - Total (ICP-MS)	048023	mg/L	< 0.0002	0.0002
Chromium - Total (ICP-AES)	024009	mg/L	0.015	0.002
Copper - Total (ICP-AES)	029501	mg/L	0.001	0.001
Iron - Total (ICP-AES)	026009	mg/L	0.38	0.01
Lead - Total (ICP-MS)	082016	mg/L	0.0009	0.0003
Mercury - Total (CVAA)	080011	ug/L	< 0.05	0.05
Nickel - Total (ICP-MS)	028016	mg/L	< 0.0005	0.0005
Selenium - Total (AA)	034005	mg/L	0.0002	0.0002
Silver - Total (ICP-MS)	047016	mg/L	< 0.0001	0.0001
Zinc - Total (ICP-AES)	030501	mg/L	0.044	0.001

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-W1
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : GRAB
Sample Station Code :

Chemex Worksheet Number : 96-03349-20
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : WATER
Report Date : September 30, 1996

BATCH SPECIFIC QUALITY ASSURANCE REPORT

PARAMETER	DATE ANALYZED (DD-MM-YY)	QA/QC BATCH NUM ANAL	MATRIX SPIKES DUP Rr	MATRIX SPIKES RECOV %	MATRIX SPIKES CONTROL LIMITS LOWER	MATRIX SPIKES CONTROL LIMITS UPPER	CALIBRATION CHECK RECOV %	CALIBRATION CHECK CONTROL LIMITS LOWER	CALIBRATION CHECK CONTROL LIMITS UPPER
Aluminum - Total (ICP-AES)	26-09-96	10 SW	0.0	99.4	89.8	115.5	100.1	94.2	111.5
Arsenic - Total (AA)	23-09-96	1 RJL	0.0	105.9	72.1	119.4	113.7	75.3	122.4
Cadmium - Total (ICP-MS)	27-09-96	20 WEM	3.2	92.0	78.1	120.3	100.2	83.4	114.8
Chromium - Total (ICP-AES)	26-09-96	10 SW	0.0	98.7	87.0	116.3	96.3	89.8	109.8
Copper - Total (ICP-AES)	26-09-96	10 SW	1.0	100.0	90.1	104.7	97.8	90.7	105.0
Iron - Total (ICP-AES)	26-09-96	10 SW	0.0	96.5	88.8	114.6	98.2	92.2	112.0
Lead - Total (ICP-MS)	27-09-96	20 WEM	0.4	99.8	80.5	116.9	97.6	77.8	129.8
Mercury - Total (CVAA)	26-09-96	2 CH	0.0	108.0	66.0	132.7	82.5	69.9	131.2
Nickel - Total (ICP-MS)	27-09-96	20 WEM	3.2	103.8	78.4	116.6	113.6	83.3	118.4
Selenium - Total (AA)	23-09-96	1 RJL	0.0	98.0	79.2	120.7	102.0	76.6	122.4
Silver - Total (ICP-MS)	27-09-96	20 WEM	3.2	95.2	77.7	117.7	100.8	87.3	111.0
Zinc - Total (ICP-AES)	26-09-96	10 SW	0.0	100.6	86.1	117.4	97.7	89.4	109.7

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-W3
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : GRAB
Sample Received Date: September 17, 1996
Sample Station Code :

Chemex Worksheet Number : 96-03349-21
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : WATER
Report Date : September 30, 1996
Analysis Date : September 26, 1996

PARAMETER DESCRIPTION	NAQUADAT CODE	UNITS	R E S U L T S	DETECTION LIMIT
Aluminum - Total (ICP-AES)	013009	mg/L	0.14	0.01
Arsenic - Total (AA)	033005	mg/L	0.0003	0.0002
Cadmium - Total (ICP-MS)	048023	mg/L	< 0.0002	0.0002
Chromium - Total (ICP-AES)	024009	mg/L	0.006	0.002
Copper - Total (ICP-AES)	029501	mg/L	0.003	0.001
Iron - Total (ICP-AES)	026009	mg/L	0.16	0.01
Lead - Total (ICP-MS)	082016	mg/L	< 0.0003	0.0003
Mercury - Total (CVAA)	080011	ug/L	< 0.05	0.05
Nickel - Total (ICP-MS)	028016	mg/L	< 0.0005	0.0005
Selenium - Total (AA)	034005	mg/L	< 0.0002	0.0002
Silver - Total (ICP-MS)	047016	mg/L	< 0.0001	0.0001
Zinc - Total (ICP-AES)	030501	mg/L	0.024	0.001

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-W3
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : GRAB
Sample Station Code :

Chemex Worksheet Number : 96-03349-21
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : WATER
Report Date : September 30, 1996

BATCH SPECIFIC QUALITY ASSURANCE REPORT

PARAMETER	DATE ANALYZED (DD-MM-YY)	QA/QC BATCH NUM	ANAL	MATRIX SPIKES DUP Rr	RECOV %	CONTROL LIMITS LOWER	UPPER	CALIBRATION CHECK RECOV %	CONTROL LIMITS LOWER	UPPER
Aluminum - Total (ICP-AES)	26-09-96	10	SW	0.0	99.4	89.8	115.5	100.1	94.2	111.5
Arsenic - Total (AA)	23-09-96	1	RJL	0.0	105.9	72.1	119.4	113.7	75.3	122.4
Cadmium - Total (ICP-MS)	27-09-96	20	WEM	3.2	92.0	78.1	120.3	100.2	83.4	114.8
Chromium - Total (ICP-AES)	26-09-96	10	SW	0.0	98.7	87.0	116.3	96.3	89.8	109.8
Copper - Total (ICP-AES)	26-09-96	10	SW	1.0	100.0	90.1	104.7	97.8	90.7	105.0
Iron - Total (ICP-AES)	26-09-96	10	SW	0.0	96.5	88.8	114.6	98.2	92.2	112.0
Lead - Total (ICP-MS)	27-09-96	20	WEM	0.4	99.8	80.5	116.9	97.6	77.8	129.8
Mercury - Total (CVAA)	26-09-96	2	CH	0.0	108.0	66.0	132.7	82.5	69.9	131.2
Nickel - Total (ICP-MS)	27-09-96	20	WEM	3.2	103.8	78.4	116.6	113.6	83.3	118.4
Selenium - Total (AA)	23-09-96	1	RJL	0.0	98.0	79.2	120.7	102.0	76.6	122.4
Silver - Total (ICP-MS)	27-09-96	20	WEM	3.2	95.2	77.7	117.7	100.8	87.3	111.0
Zinc - Total (ICP-AES)	26-09-96	10	SW	0.0	100.6	86.1	117.4	97.7	89.4	109.7

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-W7
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : GRAB
Sample Received Date: September 17, 1996
Sample Station Code :

Chemex Worksheet Number : 96-03349-22
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : WATER
Report Date : September 30, 1996
Analysis Date : September 26, 1996

PARAMETER DESCRIPTION	NAQUADAT CODE	UNITS	R E S U L T S	DETECTION LIMIT
Aluminum - Total (ICP-AES)	013009	mg/L	419.	0.01
Arsenic - Total (AA)	033005	mg/L	0.150	0.0002
Cadmium - Total (ICP-MS)	048023	mg/L	0.0034	0.0002
Chromium - Total (ICP-AES)	024009	mg/L	0.957	0.002
Copper - Total (ICP-AES)	029501	mg/L	1.02	0.001
Iron - Total (ICP-AES)	026009	mg/L	640.	0.01
Lead - Total (ICP-MS)	082016	mg/L	0.153	0.0003
Mercury - Total (CVAA)	080011	ug/L	< 0.05	0.05
Nickel - Total (ICP-MS)	028016	mg/L	< 0.0005	0.0005
Selenium - Total (AA)	034005	mg/L	0.0019	0.0002
Silver - Total (ICP-MS)	047016	mg/L	0.0044	0.0001
Zinc - Total (ICP-AES)	030501	mg/L	1.71	0.001

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-W7
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : GRAB
Sample Station Code :

Chemex Worksheet Number : 96-03349-22
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : WATER
Report Date : September 30, 1996

BATCH SPECIFIC QUALITY ASSURANCE REPORT

PARAMETER	DATE ANALYZED (DD-MM-YY)	QA/QC BATCH NUM ANAL	MATRIX SPIKES DUP Rr	MATRIX SPIKES RECOV %	MATRIX SPIKES CONTROL LIMITS LOWER	MATRIX SPIKES CONTROL LIMITS UPPER	CALIBRATION CHECK RECOV %	CALIBRATION CHECK CONTROL LIMITS LOWER	CALIBRATION CHECK CONTROL LIMITS UPPER
Aluminum - Total (ICP-AES)	26-09-96	10 SW	0.0	99.4	89.8	115.5	100.1	94.2	111.5
Arsenic - Total (AA)	23-09-96	1 RJL	0.0	105.9	72.1	119.4	113.7	75.3	122.4
Cadmium - Total (ICP-MS)	27-09-96	20 WEM	3.2	92.0	78.1	120.3	100.2	83.4	114.8
Chromium - Total (ICP-AES)	26-09-96	10 SW	0.0	98.7	87.0	116.3	96.3	89.8	109.8
Copper - Total (ICP-AES)	26-09-96	10 SW	1.0	100.0	90.1	104.7	97.8	90.7	105.0
Iron - Total (ICP-AES)	26-09-96	10 SW	0.0	96.5	88.8	114.6	98.2	92.2	112.0
Lead - Total (ICP-MS)	27-09-96	20 WEM	0.4	99.8	80.5	116.9	97.6	77.8	129.8
Mercury - Total (CVAA)	26-09-96	2 CH	0.0	108.0	66.0	132.7	82.5	69.9	131.2
Nickel - Total (ICP-MS)	27-09-96	20 WEM	3.2	103.8	78.4	116.6	113.6	83.3	118.4
Selenium - Total (AA)	23-09-96	1 RJL	0.0	98.0	79.2	120.7	102.0	76.6	122.4
Silver - Total (ICP-MS)	27-09-96	20 WEM	3.2	95.2	77.7	117.7	100.8	87.3	111.0
Zinc - Total (ICP-AES)	26-09-96	10 SW	0.0	100.6	86.1	117.4	97.7	89.4	109.7

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-W5
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : GRAB
Sample Received Date: September 17, 1996
Sample Station Code :

Chemex Worksheet Number : 96-03349-23
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : WATER
Report Date : September 30, 1996
Analysis Date : September 26, 1996

PARAMETER DESCRIPTION	NAQUADAT CODE	UNITS	R E S U L T S	DETECTION LIMIT
Aluminum - Total (ICP-AES)	013009	mg/L	0.36	0.01
Arsenic - Total (AA)	033005	mg/L	0.0016	0.0002
Cadmium - Total (ICP-MS)	048023	mg/L	< 0.0002	0.0002
Chromium - Total (ICP-AES)	024009	mg/L	0.016	0.002
Copper - Total (ICP-AES)	029501	mg/L	0.003	0.001
Iron - Total (ICP-AES)	026009	mg/L	0.58	0.01
Lead - Total (ICP-MS)	082016	mg/L	0.0004	0.0003
Mercury - Total (CVAA)	080011	ug/L	< 0.05	0.05
Nickel - Total (ICP-MS)	028016	mg/L	< 0.0005	0.0005
Selenium - Total (AA)	034005	mg/L	0.0004	0.0002
Silver - Total (ICP-MS)	047016	mg/L	< 0.0001	0.0001
Zinc - Total (ICP-AES)	030501	mg/L	0.018	0.001

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-W5
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : GRAB
Sample Station Code :

Chemex Worksheet Number : 96-03349-23
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : WATER
Report Date : September 30, 1996

BATCH SPECIFIC QUALITY ASSURANCE REPORT

PARAMETER	DATE ANALYZED (DD-MM-YY)	QA/QC BATCH NUM ANAL	MATRIX SPIKES DUP Rr	MATRIX SPIKES RECOV %	MATRIX SPIKES CONTROL LIMITS LOWER	MATRIX SPIKES CONTROL LIMITS UPPER	CALIBRATION CHECK RECOV %	CALIBRATION CHECK CONTROL LIMITS LOWER	CALIBRATION CHECK CONTROL LIMITS UPPER
Aluminum - Total (ICP-AES)	26-09-96	10 SW	0.0	99.4	89.8	115.5	100.1	94.2	111.5
Arsenic - Total (AA)	23-09-96	1 RJL	0.0	105.9	72.1	119.4	113.7	75.3	122.4
Cadmium - Total (ICP-MS)	27-09-96	20 WEM	3.2	92.0	78.1	120.3	100.2	83.4	114.8
Chromium - Total (ICP-AES)	26-09-96	10 SW	0.0	98.7	87.0	116.3	96.3	89.8	109.8
Copper - Total (ICP-AES)	26-09-96	10 SW	1.0	100.0	90.1	104.7	97.8	90.7	105.0
Iron - Total (ICP-AES)	26-09-96	10 SW	0.0	96.5	88.8	114.6	98.2	92.2	112.0
Lead - Total (ICP-MS)	27-09-96	20 WEM	0.4	99.8	80.5	116.9	97.6	77.8	129.8
Mercury - Total (CVAA)	26-09-96	2 CH	0.0	108.0	66.0	132.7	82.5	69.9	131.2
Nickel - Total (ICP-MS)	27-09-96	20 WEM	3.2	103.8	78.4	116.6	113.6	83.3	118.4
Selenium - Total (AA)	23-09-96	1 RJL	0.0	98.0	79.2	120.7	102.0	76.6	122.4
Silver - Total (ICP-MS)	27-09-96	20 WEM	3.2	95.2	77.7	117.7	100.8	87.3	111.0
Zinc - Total (ICP-AES)	26-09-96	10 SW	0.0	100.6	86.1	117.4	97.7	89.4	109.7

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-W6
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : GRAB
Sample Received Date: September 17, 1996
Sample Station Code :

Chemex Worksheet Number : 96-03349-24
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : WATER
Report Date : September 30, 1996
Analysis Date : September 18, 1996

BATCH SPECIFIC QUALITY ASSURANCE REPORT

BATCH : 3	BLANK	DUPLICATE			MATRIX SPIKE			CALIBRATION CHECK		
DATE : September 18, 1996	CONC.	CONC.1	CONC.2	RPD	RECOV	CONTROL LIMITS		RECOV	CONTROL LIMITS	
ANALYST:ZBN	mg/L	mg/L	mg/L	%	%	LOWER	UPPER	%	LOWER	UPPER
C 08	< 0.01							107	73.	130.
C 09	< 0.01							105	74.	120.
C 10	< 0.01							102	69.	130.
C 11	< 0.01									
C 12	< 0.01									
C 13	< 0.01									
C 14	< 0.01									
C 15	< 0.01							101	70.	130.
C 16	< 0.01									
C 17	< 0.01									
C 18	< 0.01									
C 19	< 0.01									
C 20	< 0.01							102	70.	130.
C 21	< 0.01									
C 22	< 0.01									
C 23	< 0.01									
C 24	< 0.01									
C 25	< 0.01							96	71.	130.
C 26	< 0.01									
C 27	< 0.01									
C 28	< 0.01									
C 29	< 0.01									
C 30	< 0.01							89	67.	130.
C 31	< 0.02									
C 32	< 0.02									
C 33	< 0.02									
C 34	< 0.02									
C 35	< 0.02									
C 36	< 0.02									
C 37	< 0.02									
C 38	< 0.02									
C 39	< 0.02									
C 40	< 0.05							56		
C 41	< 0.05									
C 42	< 0.05									
C 43	< 0.05									
C 44	< 0.05									
C 45	< 0.05									

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-W6
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : GRAB
Sample Received Date: September 17, 1996
Sample Station Code :

Chemex Worksheet Number : 96-03349-24
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : WATER
Report Date : September 30, 1996
Analysis Date : September 18, 1996

TOTAL EXTRACTABLE HYDROCARBONS METHOD MODIFIED ASTM D2887

COMPONENT	mg/L	BOILING RANGE	COMPONENT	mg/L	BOILING RANGE
C 08	< 0.04	98.5 TO 125.7	C 35	< 0.08	483.1 TO 491.0
C 09	< 0.04	125.8 TO 150.8	C 36	< 0.08	491.1 TO 498.0
C 10	< 0.04	150.9 TO 174.2	C 37	< 0.08	498.1 TO 505.0
C 11	< 0.04	174.3 TO 196.0	C 38	< 0.08	505.1 TO 512.0
C 12	< 0.04	196.1 TO 216.0	C 39	< 0.08	512.1 TO 519.0
C 13	< 0.04	216.1 TO 236.0	C 40	< 0.2	519.1 TO 525.0
C 14	< 0.04	236.1 TO 253.0	C 41	< 0.2	525.1 TO 535.0
C 15	< 0.04	253.1 TO 271.0	C 42	< 0.2	531.1 TO 537.0
C 16	< 0.04	271.1 TO 287.0	C 43	< 0.2	537.1 TO 543.0
C 17	< 0.04	287.1 TO 302.0	C 44	< 0.2	543.1 TO 548.0
C 18	< 0.04	302.1 TO 317.0	C 45	< 0.2	548.1 TO 554.0
C 19	< 0.04	317.1 TO 331.0	C 46	< 0.2	554.1 TO 559.0
C 20	< 0.04	331.1 TO 344.0	C 47	< 0.2	559.1 TO 565.0
C 21	< 0.04	344.1 TO 357.0	C 48	< 0.2	565.1 TO 570.0
C 22	< 0.04	357.1 TO 366.0	C 49	< 0.2	570.1 TO 576.0
C 23	< 0.04	366.1 TO 380.0	C 50	< 0.2	576.1 TO 581.0
C 24	< 0.04	380.1 TO 391.0	C 51	< 0.2	581.1 TO 584.0
C 25	< 0.04	391.1 TO 402.0	C 52	< 0.2	584.1 TO 588.0
C 26	< 0.04	402.1 TO 412.0	C 53	< 0.2	588.1 TO 592.0
C 27	< 0.04	412.1 TO 422.0	C 54	< 0.2	592.1 TO 596.0
C 28	< 0.04	422.1 TO 432.0	C 55	< 0.2	596.1 TO 600.0
C 29	< 0.04	432.1 TO 441.0	C 56	< 0.2	600.1 TO 604.0
C 30	< 0.04	441.1 TO 449.0	C 57	< 0.2	604.1 TO 608.0
C 31	< 0.08	449.1 TO 459.0	C 58	< 0.2	608.1 TO 612.0
C 32	< 0.08	459.1 TO 468.0	C 59	< 0.2	612.1 TO 615.0
C 33	< 0.08	468.1 TO 476.0	C 60	< 0.2	615.1 TO 619.0
C 34	< 0.08	476.1 TO 483.0			

Average molecular weight : N.D. AMU

TOTAL HYDROCARBONS C8-C10 N.D.
TOTAL HYDROCARBONS C11-C60 N.D.

Surrogate recovery : 108% WATER surrogate limits : 57% - 135%.

MDL per component : 0.04 mg/L below C31 and 0.08 mg/L above C30
0.2 mg/L above C39 and 0.2 mg/L above C49

Results are reported in accordance with CCME guidelines. All results are corrected for blank levels.

MDL - Method detection level. The reliable detection level is twice the method detection level.

( ) - Bracketed results are values below the reliable detection level, and are subject to reduced levels of confidence.

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-W6
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : GRAB
Sample Received Date: September 17, 1996
Sample Station Code :

Chemex Worksheet Number : 96-03349-24
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : WATER
Report Date : September 30, 1996
Analysis Date : September 18, 1996

BATCH SPECIFIC QUALITY ASSURANCE REPORT

BATCH : 3	BLANK	DUPLICATE			MATRIX SPIKE			CALIBRATION CHECK		
DATE : September 18, 1996	CONC.	CONC.1	CONC.2	RPD	RECOV	CONTROL LIMITS		RECOV	CONTROL LIMITS	
ANALYST:ZBN	mg/L	mg/L	mg/L	%	%	LOWER	UPPER	%	LOWER	UPPER
C 46	< 0.05									
C 47	< 0.05									
C 48	< 0.05									
C 49	< 0.05									
C 50	< 0.05							42		
C 51	< 0.05									
C 52	< 0.05									
C 53	< 0.05									
C 54	< 0.05									
C 55	< 0.05									
C 56	< 0.05									
C 57	< 0.05									
C 58	< 0.05									
C 59	< 0.05									
C 60	< 0.05							25		

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-W9
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : GRAB
Sample Received Date: September 17, 1996
Sample Station Code :

Chemex Worksheet Number : 96-03349-25
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : WATER
Report Date : September 30, 1996
Analysis Date : September 20, 1996

TOTAL EXTRACTABLE HYDROCARBONS METHOD MODIFIED ASTM D2887

COMPONENT	mg/L	BOILING RANGE	COMPONENT	mg/L	BOILING RANGE
C 08	< 0.01	98.5 TO 125.7	C 35	< 0.02	483.1 TO 491.0
C 09	< 0.01	125.8 TO 150.8	C 36	< 0.02	491.1 TO 498.0
C 10	< 0.01	150.9 TO 174.2	C 37	< 0.02	498.1 TO 505.0
C 11	< 0.01	174.3 TO 196.0	C 38	< 0.02	505.1 TO 512.0
C 12	< 0.01	196.1 TO 216.0	C 39	< 0.02	512.1 TO 519.0
C 13	< 0.01	216.1 TO 236.0	C 40	< 0.05	519.1 TO 525.0
C 14	< 0.01	236.1 TO 253.0	C 41	< 0.05	525.1 TO 535.0
C 15	< 0.01	253.1 TO 271.0	C 42	< 0.05	531.1 TO 537.0
C 16	< 0.01	271.1 TO 287.0	C 43	< 0.05	537.1 TO 543.0
C 17	< 0.01	287.1 TO 302.0	C 44	< 0.05	543.1 TO 548.0
C 18	< 0.01	302.1 TO 317.0	C 45	< 0.05	548.1 TO 554.0
C 19	0.02	317.1 TO 331.0	C 46	< 0.05	554.1 TO 559.0
C 20	0.03	331.1 TO 344.0	C 47	< 0.05	559.1 TO 565.0
C 21	0.03	344.1 TO 357.0	C 48	< 0.05	565.1 TO 570.0
C 22	0.03	357.1 TO 366.0	C 49	< 0.05	570.1 TO 576.0
C 23	(0.02)	366.1 TO 380.0	C 50	< 0.05	576.1 TO 581.0
C 24	< 0.01	380.1 TO 391.0	C 51	< 0.05	581.1 TO 584.0
C 25	< 0.01	391.1 TO 402.0	C 52	< 0.05	584.1 TO 588.0
C 26	< 0.01	402.1 TO 412.0	C 53	< 0.05	588.1 TO 592.0
C 27	< 0.01	412.1 TO 422.0	C 54	< 0.05	592.1 TO 596.0
C 28	(0.01)	422.1 TO 432.0	C 55	< 0.05	596.1 TO 600.0
C 29	(0.01)	432.1 TO 441.0	C 56	< 0.05	600.1 TO 604.0
C 30	< 0.01	441.1 TO 449.0	C 57	< 0.05	604.1 TO 608.0
C 31	< 0.02	449.1 TO 459.0	C 58	< 0.05	608.1 TO 612.0
C 32	< 0.02	459.1 TO 468.0	C 59	< 0.05	612.1 TO 615.0
C 33	< 0.02	468.1 TO 476.0	C 60	< 0.05	615.1 TO 619.0
C 34	< 0.02	476.1 TO 483.0			

Average molecular weight : 297 AMU

TOTAL HYDROCARBONS C8-C10 N.D.
TOTAL HYDROCARBONS C11-C60 0.15 mg/L

Surrogate recovery : 103% WATER surrogate limits : 57% - 135%.

MDL per component : 0.01 mg/L below C31 and 0.02 mg/L above C30
0.05 mg/L above C39 and 0.05 mg/L above C49

Results are reported in accordance with CCME guidelines. All results are corrected for blank levels.

MDL - Method detection level. The reliable detection level is twice the method detection level.

( ) - Bracketed results are values below the reliable detection level, and are subject to reduced levels of confidence.

CHEMEX Labs Alberta Inc.

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Edmonton : 9331 - 48th Street, T6B 2R4, Telephone (403) 465-9877, FAX (403) 466-3332

CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-W9
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : GRAB
Sample Received Date: September 17, 1996
Sample Station Code :

Chemex Worksheet Number : 96-03349-25
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : WATER
Report Date : September 30, 1996
Analysis Date : September 20, 1996

BATCH SPECIFIC QUALITY ASSURANCE REPORT

BATCH : 9	BLANK	DUPLICATE			MATRIX SPIKE			CALIBRATION CHECK		
DATE : September 20, 1996	CONC.	CONC.1	CONC.2	RPD	RECOV	CONTROL LIMITS		RECOV	CONTROL LIMITS	
ANALYST:ZBN	mg/L	mg/L	mg/L	%	%	LOWER	UPPER	%	LOWER	UPPER
C 08	< 0.01							107	73.	130.
C 09	< 0.01							97	74.	120.
C 10	< 0.01							102	69.	130.
C 11	< 0.01									
C 12	< 0.01									
C 13	< 0.01									
C 14	< 0.01									
C 15	< 0.01							101	70.	130.
C 16	< 0.01									
C 17	< 0.01									
C 18	< 0.01									
C 19	< 0.01									
C 20	< 0.01							102	70.	130.
C 21	< 0.01									
C 22	< 0.01									
C 23	< 0.01									
C 24	< 0.01									
C 25	< 0.01							115	71.	130.
C 26	< 0.01									
C 27	< 0.01									
C 28	< 0.01									
C 29	< 0.01									
C 30	< 0.01							116	67.	130.
C 31	< 0.02									
C 32	< 0.02									
C 33	< 0.02									
C 34	< 0.02									
C 35	< 0.02									
C 36	< 0.02									
C 37	< 0.02									
C 38	< 0.02									
C 39	< 0.02									
C 40	< 0.05							116		
C 41	< 0.05									
C 42	< 0.05									
C 43	< 0.05									
C 44	< 0.05									
C 45	< 0.05									

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CCSG ASSOCIATES
ATTENTION : SUE MOODIE

Sample Description : 44-W9
Sample Date & Time : 07-09-96
Sampled By : SM
Sample Type : GRAB
Sample Received Date: September 17, 1996
Sample Station Code :

Chemex Worksheet Number : 96-03349-25
Chemex Project Number : CCSG010-0501
Sample Access :
Sample Matrix : WATER
Report Date : September 30, 1996
Analysis Date : September 20, 1996

BATCH SPECIFIC QUALITY ASSURANCE REPORT

BATCH : 9	BLANK	DUPLICATE			MATRIX SPIKE			CALIBRATION CHECK		
DATE : September 20, 1996	CONC.	CONC.1	CONC.2	RPD	RECOV	CONTROL LIMITS		RECOV	CONTROL LIMITS	
ANALYST:ZBN	mg/L	mg/L	mg/L	%	%	LOWER	UPPER	%	LOWER	UPPER
C 46	< 0.05									
C 47	< 0.05									
C 48	< 0.05									
C 49	< 0.05									
C 50	< 0.05							92		
C 51	< 0.05									
C 52	< 0.05									
C 53	< 0.05									
C 54	< 0.05									
C 55	< 0.05									
C 56	< 0.05									
C 57	< 0.05									
C 58	< 0.05									
C 59	< 0.05									
C 60	< 0.05							69		

FILE NO.: 1001-96-03349
Date : Sep 19, 1996

Company Name : CCSG Associates
Attention : Sue Moodie

Project ID : None specified

Client ID : 44-W8
Chemex ID : 96-03349-26
Date Sampled : Sep 07, 1996
Date Received : Sep 13, 1996

Date Extracted : Sep 17, 1996
Date Analyzed : Sep 18, 1996
Matrix : Water
Dilution Factor : 1

Polyaromatic Hydrocarbons by GC/MSD (US EPA SW-846 Method 8270 Modified)

Parameter	Result	Unit	RDL	MDL
Naphthalene	< 0.055	µg/L	0.11	0.055
Acenaphthylene	< 0.055	µg/L	0.11	0.055
Acenaphthene	< 0.055	µg/L	0.11	0.055
Fluorene	< 0.055	µg/L	0.11	0.055
Phenanthrene	< 0.055	µg/L	0.11	0.055
Anthracene	< 0.055	µg/L	0.11	0.055
Acridine	< 0.55	µg/L	1.1	0.55
Fluoranthene	< 0.055	µg/L	0.11	0.055
Pyrene	< 0.055	µg/L	0.11	0.055
Benzo[c]phenanthrene	< 0.055	µg/L	0.11	0.055
Benzo[a]anthracene	< 0.011	µg/L	0.022	0.011
Chrysene	< 0.055	µg/L	0.11	0.055
7,12-Dibenz[a]anthracene	< 0.55	µg/L	1.1	0.55
Benzo[b&j]fluoranthene	[0.011]	µg/L	0.022	0.011
Benzo[k]fluoranthene	[0.011]	µg/L	0.022	0.011
3-Methylcholanthrene	< 0.055	µg/L	0.11	0.055
Benzo[a]pyrene	< 0.011	µg/L	0.022	0.011
Indeno[1,2,3-cd]pyrene	< 0.055	µg/L	0.11	0.055
Dibenzo[a,h]anthracene	< 0.011	µg/L	0.022	0.011
Benzo[g,h,i]perylene	< 0.055	µg/L	0.11	0.055
Dibenzo[a,h]pyrene	< 0.11	µg/L	0.22	0.11
Dibenzo[a,i]pyrene	< 0.11	µg/L	0.22	0.11
Dibenzo[a,l]pyrene	< 0.11	µg/L	0.22	0.11

Surrogates	% Recovery	Limits	FLAG
Nitrobenzene-d5	44.3	35 - 114	Pass
2-Fluorobiphenyl	91.1	43 - 116	Pass
p-Terphenyl-d14	77.6	33 - 141	Pass

NA - Denotes compound not analyzed
MDL - Method Detection Level
RDL - Reliable Detection Level (as per CCME guidelines 2 X MDL)

Note : Bracketed results denote concentrations which fall between the MDL and RDL. As per CCME guidelines confidence levels for the bracketed values are reduced.

Comments : All samples have been corrected for blank values.

CCSGSOILS

Lab number: 0501-96-04160- 3
Date Sampled: 18-09-96
Date Received: 24-10-96
Target Date : 03-11-96
Bottles Received: SOILS/SLUDGES
Packages: CCME2S
Quotes : CCME2S CHEM502R95

Priority : NORMAL
Naquadat Code Set: DOE

Sample Description: 44-17
Sampled By :
Station Code :
Sample Date : 18-09-96
Sample Time :
Sample Type : COMPOSITE
Matrix : SOIL

Company : CCSG ASSOCIATES
Attention : MS SUE MOODIE
Address : BOX 3946

City : WHITEHORSE
Province : YUKON
Postal Code : Y1A 5M6
Job Number :
Reference :

Seq	Description	Units	Result	Date Analysed	Batch	Department #
0120	3050 Acid Digestion		999.0	30-10-96	0	0501
0630	Sample Drying /Grinding		999.0	25-10-96	0	0502
3766	Total Mercury- (CVAA)	ug/kg	44.	30-10-96	1	0501
3776	Barium (ICP)	ug/g	175.	31-10-96	11	0501
3779	Beryllium (ICP)	ug/g	0.7	31-10-96	11	0501
3785	Cadmium (ICP)	ug/g	< 0.3	31-10-96	11	0501
3791	Chromium (ICP)	ug/g	50.8	31-10-96	11	0501
3794	Cobalt (ICP)	ug/g	14.6	31-10-96	11	0501
3797	Copper (ICP)	ug/g	48.8	31-10-96	11	0501
3806	Lead (ICP)	ug/g	10.	31-10-96	11	0501
3821	Molybdenum (ICP)	ug/g	5.7	31-10-96	11	0501
3824	Nickel (ICP)	ug/g	29.9	31-10-96	11	0501
3842	Silver (ICP)	ug/g	0.4	31-10-96	11	0501
3866	Vanadium (ICP)	ug/g	89.1	31-10-96	11	0501
3869	Zinc (ICP)	ug/g	92.1	31-10-96	11	0501
3924	Thallium (ICP-MS)	ug/g	0.36			0501
3926	Arsenic (ICP-MS)	ug/g	5.18			0501
3928	Selenium (ICP-MS)	ug/g	< 0.1			0501
3930	Antimony (ICP-MS)	ug/g	0.15			0501
3938	Tin (ICP-MS)	ug/g	< 0.1			0501

PRELIMINARY
RESULTS ONLY

FILE NO.: 1001-96-03349

Date : 96-09-23

Company Name : CCSG Associates
Attention : Sue Moodie

Client ID : Method Spike
Chemex ID : 96-03349-mb spike
Date Sampled :
Date Received :

Date Extracted : 96-09-18
Date Analyzed : 96-09-19
Matrix : Solid
Dilution Factor : 1

Organo Chloride Pesticides by GC/MSD (US EPA SW-846 Method 8270 Modified)

Parameter	% Recovery	Limits	FLAG
Trifluralin	NA	35 - 120	NA
alpha-BHC	68	35 - 120	Pass
beta-BHC	77	35 - 120	Pass
gamma-BHC (Lindane)	69	35 - 120	Pass
Triallate	NA	35 - 120	NA
delta-BHC	77	35 - 120	Pass
Heptachlor	56	35 - 120	Pass
Aldrin	72	35 - 120	Pass
Heptachlor Epoxide	77	35 - 120	Pass
gamma-Chlordane	80	35 - 120	Pass
Endosulfan I	81	35 - 120	Pass
alpha-Chlordane	86	35 - 120	Pass
4,4'-DDE	97	35 - 120	Pass
Dieldrin	86	35 - 120	Pass
Endrin	86	35 - 120	Pass
Endosulfan II	82	35 - 120	Pass
4,4'-DDD	90	35 - 120	Pass
Endrin Aldehyde	47	35 - 120	Pass
Endosulfan Sulfate	94	35 - 120	Pass
4,4'-DDT	66	35 - 120	Pass
Methoxychlor	74	35 - 120	Pass

Surrogate	% Recovery	Limits	FLAG
2,4,5,6-TMX	65.4	35 - 114	Pass

NA - Denotes compound not analyzed
MDL - Method Detection Level
RDL - Reliable Detection Level (as per CCME guidelines 2 X MDL)

Note : Bracketed results denote concentrations which fall between the MDL and RDL. As per CCME guidelines confidence levels for the bracketed values are reduced.

FILE NO.: 1001-96-03349

Date : 96-09-23

Company Name : CCSG Associates
Attention : Sue Moodie

Client ID : Method Blank
Chemex ID : 96-03349-mb
Date Sampled :
Date Received :

Date Extracted : 96-09-18
Date Analyzed : 96-09-19
Matrix : Solid
Dilution Factor : 1

Organo Chloride Pesticides by GC/MSD (US EPA SW-846 Method 8270 Modified)

Parameter	Result	Unit	RDL	MDL
Trifluralin	< 0.0050	mg/Kg	0.010	0.0050
alpha-BHC	< 0.0050	mg/Kg	0.010	0.0050
beta-BHC	< 0.0050	mg/Kg	0.010	0.0050
gamma-BHC (Lindane)	< 0.0050	mg/Kg	0.010	0.0050
Triallate	< 0.0050	mg/Kg	0.010	0.0050
delta-BHC	< 0.0050	mg/Kg	0.010	0.0050
Heptachlor	< 0.0050	mg/Kg	0.010	0.0050
Aldrin	< 0.0050	mg/Kg	0.010	0.0050
Heptachlor Epoxide	< 0.0050	mg/Kg	0.010	0.0050
gamma-Chlordane	< 0.0050	mg/Kg	0.010	0.0050
Endosulfan I	< 0.0050	mg/Kg	0.010	0.0050
alpha-Chlordane	< 0.0050	mg/Kg	0.010	0.0050
4,4'-DDE	[0.0075]	mg/Kg	0.010	0.0050
Dieldrin	< 0.0050	mg/Kg	0.010	0.0050
Endrin	< 0.0050	mg/Kg	0.010	0.0050
Endosulfan II	< 0.0050	mg/Kg	0.010	0.0050
4,4'-DDD	< 0.0050	mg/Kg	0.010	0.0050
Endrin Aldehyde	< 0.0050	mg/Kg	0.010	0.0050
Endosulfan Sulfate	< 0.0050	mg/Kg	0.010	0.0050
4,4'-DDT	< 0.0050	mg/Kg	0.010	0.0050
Methoxychlor	< 0.0050	mg/Kg	0.010	0.0050

Surrogate	% Recovery	Limits	Flag
2,4,5,6-TMX	70.4	23 - 120	Pass

NA - Denotes compound not analyzed
MDL - Method Detection Level
RDL - Reliable Detection Level (as per CCME guidelines 2 X MDL)

Note : Bracketed results denote concentrations which fall between the MDL and RDL. As per CCME guidelines confidence levels for the bracketed values are reduced.

Comments :

FILE NO.: 1001-96-03349
Date : Sep 19, 1996

Company Name : CCSG Associates
Attention : Sue Moodie

Project ID : None specified

Client ID : Water Spike
Chemex ID : 96-03349-WSPK
Date Sampled :
Date Received :

Date Extracted : Sep 17, 1996
Date Analyzed : Sep 18, 1996
Matrix : Water
Dilution Factor : 1

Polyaromatic Hydrocarbons by GC/MSD (US EPA SW-846 Method 8270 Modified)

Parameter	% Recovery	Limits	FLAG
Acenaphthene	82.1	43 - 118	Pass
Pyrene	106.1	26 - 127	Pass

Surrogates	% Recovery	Limits	FLAG
Nitrobenzene-d5	49.4	35 - 114	Pass
2-Fluorobiphenyl	78.4	43 - 116	Pass
p-Terphenyl-d14	87.2	33 - 141	Pass

NA - Denotes compound not analyzed
MDL - Method Detection Level
RDL - Reliable Detection Level (as per CCME guidelines 2 X MDL)

Note : Bracketed results denote concentrations which fall between the MDL and RDL. As per CCME guidelines confidence levels for the bracketed values are reduced.

FILE NO.: 1001-96-03349
Date : Sep 19, 1996

Company Name : CCSG Associates
Attention : Sue Moodie

Project ID : None specified

Client ID : Water Blank
Chemex ID : 96-03349-WBLK
Date Sampled :
Date Received :

Date Extracted : Sep 17, 1996
Date Analyzed : Sep 18, 1996
Matrix : Water
Dilution Factor : 1

Polyaromatic Hydrocarbons by GC/MSD (US EPA SW-846 Method 8270 Modified)

Parameter	Result	Unit	RDL	MDL
Naphthalene	< 0.050	µg/L	0.10	0.050
Acenaphthylene	< 0.050	µg/L	0.10	0.050
Acenaphthene	< 0.050	µg/L	0.10	0.050
Fluorene	< 0.050	µg/L	0.10	0.050
Phenanthrene	< 0.050	µg/L	0.10	0.050
Anthracene	< 0.050	µg/L	0.10	0.050
Acridine	< 0.50	µg/L	1.0	0.50
Fluoranthene	< 0.050	µg/L	0.10	0.050
Pyrene	< 0.050	µg/L	0.10	0.050
Benzo[c]phenanthrene	< 0.050	µg/L	0.10	0.050
Benzo[a]anthracene	[0.010]	µg/L	0.020	0.010
Chrysene	< 0.050	µg/L	0.10	0.050
7,12-Dibenz[a]anthracene	< 0.50	µg/L	1.0	0.50
Benzo[b&j]fluoranthene	< 0.010	µg/L	0.020	0.010
Benzo[k]fluoranthene	< 0.010	µg/L	0.020	0.010
3-Methylcholanthrene	< 0.050	µg/L	0.10	0.050
Benzo[a]pyrene	[0.010]	µg/L	0.020	0.010
Indeno[1,2,3-cd]pyrene	< 0.050	µg/L	0.10	0.050
Dibenzo[a,h]anthracene	[0.010]	µg/L	0.020	0.010
Benzo[g,h,i]perylene	< 0.050	µg/L	0.10	0.050
Dibenzo[a,h]pyrene	< 0.10	µg/L	0.20	0.10
Dibenzo[a,i]pyrene	< 0.10	µg/L	0.20	0.10
Dibenzo[a,l]pyrene	< 0.10	µg/L	0.20	0.10

Surrogates	% Recovery	Limits	FLAG
Nitrobenzene-d5	45.8	35 - 114	Pass
2-Fluorobiphenyl	80.6	43 - 116	Pass
p-Terphenyl-d14	95.1	33 - 141	Pass

NA - Denotes compound not analyzed
MDL - Method Detection Level
RDL - Reliable Detection Level (as per CCME guidelines 2 X MDL)

Note : Bracketed results denote concentrations which fall between the MDL and RDL. As per CCME guidelines confidence levels for the bracketed values are reduced.

Comments :

FILE NO.: 1001-96-03349
Date : Sep 19, 1996

Company Name : CCSG Associates
Attention : Sue Moodie

Project ID : None specified

Client ID : Soil Spike
Chemex ID : 96-03349-SSPK
Date Sampled :
Date Received :

Date Extracted : Sep 17, 1996
Date Analyzed : Sep 18, 1996
Matrix : Soil
Dilution Factor : 1

Polyaromatic Hydrocarbons by GC/MSD (US EPA SW-846 Method 8270 Modified)

Parameter	% Recovery	Limits	FLAG
Acenaphthene	91.4	31 - 137	Pass
Pyrene	115.3	35 - 142	Pass

Surrogates	% Recovery	Limits	FLAG
Nitrobenzene-d5	33.2	23 - 120	Pass
2-Fluorobiphenyl	79.4	30 - 115	Pass
p-Terphenyl-d14	89.3	18 - 137	Pass

NA - Denotes compound not analyzed
MDL - Method Detection Level
RDL - Reliable Detection Level (as per CCME guidelines 2 X MDL)

Note : Bracketed results denote concentrations which fall between the MDL and RDL. As per CCME guidelines confidence levels for the bracketed values are reduced.

FILE NO.: 1001-96-03349
Date : Sep 19, 1996

Company Name : CCSG Associates
Attention : Sue Moodie

Project ID : None specified

Client ID : Soil Blank
Chemex ID : 96-03349-SBLK
Date Sampled :
Date Received :

Date Extracted : Sep 17, 1996
Date Analyzed : Sep 18, 1996
Matrix : Soil
Dilution Factor : 1

Polyaromatic Hydrocarbons by GC/MSD (US EPA SW-846 Method 8270 Modified)

Parameter	Result	Unit	RDL	MDL
Naphthalene	[0.0045]	mg/Kg	0.0050	0.0025
Acenaphthylene	< 0.0025	mg/Kg	0.0050	0.0025
Acenaphthene	< 0.0025	mg/Kg	0.0050	0.0025
Fluorene	< 0.0025	mg/Kg	0.0050	0.0025
Phenanthrene	< 0.0025	mg/Kg	0.0050	0.0025
Anthracene	< 0.0025	mg/Kg	0.0050	0.0025
Acridine	< 0.025	mg/Kg	0.050	0.025
Fluoranthene	< 0.0025	mg/Kg	0.0050	0.0025
Pyrene	< 0.0025	mg/Kg	0.0050	0.0025
Benzo[c]phenanthrene	< 0.0025	mg/Kg	0.0050	0.0025
Benzo[a]anthracene	[0.0005]	mg/Kg	0.0010	0.0005
Chrysene	< 0.0025	mg/Kg	0.0050	0.0025
7,12-Dibenz[a]anthracene	< 0.025	mg/Kg	0.050	0.025
Benzo[b&j]fluoranthene	[0.0005]	mg/Kg	0.0010	0.0005
Benzo[k]fluoranthene	[0.0005]	mg/Kg	0.0010	0.0005
3-Methylcholanthrene	< 0.0025	mg/Kg	0.0050	0.0025
Benzo[a]pyrene	< 0.0005	mg/Kg	0.0010	0.0005
Indeno[1,2,3-cd]pyrene	< 0.0025	mg/Kg	0.0050	0.0025
Dibenzo[a,h]anthracene	< 0.0005	mg/Kg	0.0010	0.0005
Benzo[g,h,i]perylene	< 0.0025	mg/Kg	0.0050	0.0025
Dibenzo[a,h]pyrene	< 0.0050	mg/Kg	0.010	0.0050
Dibenzo[a,i]pyrene	< 0.0050	mg/Kg	0.010	0.0050
Dibenzo[a,l]pyrene	< 0.0050	mg/Kg	0.010	0.0050

Surrogates	% Recovery	Limits	FLAG
Nitrobenzene-d5	54.7	23 - 120	Pass
2-Fluorobiphenyl	89.8	30 - 115	Pass
p-Terphenyl-d14	91.3	18 - 137	Pass

NA - Denotes compound not analyzed
MDL - Method Detection Level
RDL - Reliable Detection Level (as per CCME guidelines 2 X MDL)

Note : Bracketed results denote concentrations which fall between the MDL and RDL. As per CCME guidelines confidence levels for the bracketed values are reduced.

Comments :

Appendix E: National Classification System Worksheets

FACILITY SITE DESCRIPTION

Site No: **Site 44**
Site Name: **Marshall Creek**
Province/Territory: **Yukon Territory**
Custodian Dept.:
Facility Name:
Site Operator/Manager
Type of Site: **Old Refuse Site**
Site Owner:
Zone:
UTM Coordiantes: **368 500** Easting Latitude: **60** deg. **46** min. sec.
6 739 000 Northing Longitude: **137** deg.**25** min. sec.
Location: **5.2 km east of Haines Juncion on the Marshall Creek Road**
Legal Land Description:
Address:
Provincial Parcel No.:
Brief Description of Site: **South side of the Marshall Creek road, 300 metres down a dirt track.**
Site Land Use: Current: **Informal fishing spot** Proposed: **Unknown**

Comments:

Summary of Site Classification Information:
Completed Evaluation Form: Detailed: ✓ Short
Site Score:**80.2** Total ± **11** Estimated Score
Class: (1,2,3, N, or I) **1** Risk:**High**
Notes:

Contact Name: **Sue Moodie/Lewis Rifkind**
Position:
Address: **Box 3946**
City: **Whitehorse** Prov./Terr.: **Y.T.** Postal Code: **Y1A 3T3**
Phone No.: **(403) 668-6828** Fax No.:
Site Classified by above ✓ or

Degree of familiarity with Site:✓ Very familiar Moderately Familiar Indirectly Familiar Unfamiliar
Visited Site:✓ Yes No

I CONTAMINANTS CHARACTERISTICS

A	**Degree of hazards**	**List possible contaminants and Estimated Concentrations**	**Information Source**	**Score**
	Medium concern contaminants - high concentration	PAH, metals, HC - exceed CCME	Field test 44-W8, 44-S13	8 ✓
B	**Contaminant Quantity**	**Estimated or measured area/ Volume of contaminated zone**	**Information Source**	**Score**
	>10 ha or 1000 cubic metres or drums of liquid	5 drums	Site visit of Sept. 06, 1996	10 ✓
C	**Physical State of Contaminants**	**Does the site contain primarily liquids/gases, sludges or solids?**	**Information Source**	**Score**
	Liquid/gas	Waste oil	Site visit of Sept. 06, 1996	9 ✓

			Total ✓	**Total ?**	**Total ✓ + ?**
Total site score for CONTAMINANT CHARACTERISTICS		Section A	8		8
		Section B	10		10
		Section C	9		9
		Total	**27**		**27**

II EXPOSURE PATHWAYS

A Groundwater

2 Potential for Groundwater Contamination

a) Engineered subsurface containment	**Document engineered systems protecting groundwater**	**Information Source**	**Score**
No containment	None	Site visit of Sept. 06, 1996	4 ✓
b) Thickness of confining layer over aquifer	**Document local geological conditions/Identify water-bearing zones used for water supply**		
Unknown		Site visit of Sept. 06, 1996	0.75 **?**
c) Hydraulic conductivity of the confining layer	**Estimate hydraulic conductivity of Any confining layer**		
>10E-4 cm/sec	Test pits revealed sand/gravel but no laboratory testing done on it.	Site visit of Sept. 06, 1996	1.5 ?
d) Annual Rainfall	**Document Rainfall Data**		
<200 mm/annum	166.2 mm/annum for years 1987 - 1966, HJ YTG Yard - not 30 year average.		0.2 ✓
e) Hydraulic conductivity of aquifer(s) of concern	**Estimate hydraulic conductivity of relevant aquifer(s)**		
>10E-2 cm/sec	Refer to "Range of Values of Hydraulic Conductivity and Permability"	Supplied with CCME guidelines	3 ?

			Total ✓	**Total ?**	**Total ✓ + ?**
Total site score for GROUNDWATER		Section 2	4.2	5.25	9.45
		Total	**4.2**	**5.25**	**9.45**

B Surface Water

2 Potential for Surface Water Contamination

a) Surface Containment	**Review and document engineered or natural systems protecting surface water**	**Information Source**		**Score**
Partial containment	Barrels in small pond	Site visit of Sept. 06, 1996		3 ✓
b) Distance to perennial surface water	**Estimate distance from site to nearest stream or other water body**			
0 to < 100 metres	0 metres	Site visit of Sept. 06, 1996		3 ✓
c) Topography	**Document terrain conditions**			
Contaminants at or below ground level	Visual site inspection	Site visit of Sept. 06, 1996		0 ✓
d) Run-off Potential	**Document geological and rainfall conditions**			
Unknown	Unknown			0.5 ?
e) Flood potential	**Estimate flood frequency of nearby water courses or water bodies**			
1 in 2 years	Nearby water courses or large water bodies	Site visit of Sept. 06, 1996		0.25 ✓

		Total ✓	**Total ?**	**Total ✓ + ?**
Total site score for SURFACE WATER	Section B	6	0.75	6.75
	Total	**6**	**0.75**	**6.75**

C Direct Contact

2 Potential for Direct Human and/or Animal Contact

a)Airborne Emissions	**Document reports of off-site contamination due to contact contaminated soil, dust, air etc.**	**Information Source**		**Score**
No airborne emissions	No reports discovered	Archival research		2.5 ?
b)Accessibility of Site	**Review and document avenues of site access by humans and animals**			
Limited barriers to prevent site access; contaminants not covered	Site visits	Site visit of Sept. 06, 1996		4 ✓
c)Hazardous soil gas migration	**Review potential for hazardous soil gas production and migration from site**			
Contaminants are putrescible and soil permeability is high	It is not known if contaminants are putrescible, but permeability is high			2 ?

		Total ✓	**Total ?**	**Total ✓ + ?**
Total site score for DIRECT CONTACT	Section A	4	4.5	8.5
	Total	**4**	**4.5**	**8.5**

III RECEPTORS

A Human and Animal Users

2 Potential for Impact on Humans or Animals

a) ii)Potential for impact on drinking water supply **Proximaty to drinking water supply**	**Identify nearest drinking water well and measure distance to site**	**Information Source**	**Score**
1 to 3 km	HJ water intake over 5 km from site	Site visit of Sept. 06, 1996	3 ✓
Potential for impact on drinking water supply **Availability of alternate drinking water supply**	**Document availability of alternate sources of drinking water and ease of implementation**		
Alternate drinking water supply available	Groundwater wells		0.5 ?
b) ii)Potential for impact on water resources	**Locate and measure nearest water resource areas to site**		
0 to < 100 km	8 metres	Site visit of Sept. 06, 1996	2 ✓
Use of water resources	**Record use of nearby water resources**		
Recreationa (fishing, swimming)	Site visit is accessible to highway public	Site visit of Sept. 06, 1996	2 ✓
c) i)Known contmaination of land used by humans	**Record land use type (current or proposed) and level of contamination for land known to be contaminated due to site**		
Known contamination of land used for agricultural or residential/parkland/school purposes above AG or R/P EQC values	Site used for fishing	Site visit of Sept. 06, 1996	5 ✓

		Total ✓	**Total ?**	**Total ✓ + ?**
Total site score for HUMAN AND ANIMAL RECEPTORS	Section A	12	0.5	12.5
	Total	**12**	**0.5**	**12.5**

B Environmental Receptors

1 Known Adverse Impact on the Environment as a Result of the Contaminated Sites	**Record known impact(s) on any sensitive biological environment at and/or around the site**	**Informatin Sourc**	**Score**
Known adverse impact on sensitive environment	Visual observations	Site visit of Sept. 06, 1996	16 ✓

		Total ✓	**Total ?**	**Total ✓ + ?**
Total site score for ENVIRONMENTAL RECEPTORS	Section B	16		16
	Total	**16**		**16**

			Category Score -CS (✓ + ?)	Estimated Score -ES (? Only)	Total Category Score (CS)	Total Estimate Score (ES)
I	**CONTAMINANT CHARACTERISTICS (33)**		27		27	± 0
II	**EXPOSURE PATHWAYS(33)**					
	A	Groundwater (11)	9.45	5.25	9.45	± 5.25
	B	Surface Water (11)	6.75	0.75	6.75	± 0.75
	C	Direct Contact (11)	8.5	4.5	8.5	± 4.5
III	**RECEPTORS (34)**					
	A	Human and Animal (18)	12.5	0.5	12.5	± 0.5
	B	Environment (16)	16	0	16	± 0
Total					**80.2**	**± 11**
					Total Score for The Site (TS)	Estimated Score For Site (ES)
					Classification:	Class 1

Appendix F: Water Survey of Canada Data

YUKON TERRITORY

DEZADEASH RIVER AT HAINES JUNCTION - STATION NO. 08AA003

ANNUAL EXTREMES OF DISCHARGE AND ANNUAL TOTAL DISCHARGE FOR THE PERIOD OF RECORD

YEAR	MAXIMUM INSTANTANEOUS DISCHARGE (m^3/s)	MAXIMUM DAILY DISCHARGE (m^3/s)	MINIMUM DAILY DISCHARGE (m^3/s)	TOTAL DISCHARGE (dam^3)	YEAR
1953	---	133 ON JUL 16	8.16B ON MAR 20	1 390 000	1953
1954	---	164 E ON JUN 07	11.3 B ON APR 27	1 390 000	1954
1955	---	184 ON JUN 26	12.7 B ON DEC 31	1 510 000	1955
1956	---	125 ON JUN 29	10.5 B ON MAR 14	1 180 000	1956
1957	---	210 ON JUN 13	13.9 B ON MAR 14	1 780 000	1957
1958	170.8	170.8 ON JUN 07	14.3 B ON MAR 31	1 650 000	1958
1959	---	157 ON JUN 24	10.2 B ON MAR 30	1 360 000	1959
1960	---	141 ON MAY 31	11.3 B ON APR 16	1 360 000	1960
1961	---	296 ON JUN 29	11.9 B ON APR 01	1 450 000	1961
1962	---	275 ON JUN 21	6.91E ON MAR 01	1 800 000	1962
1963	---	180 ON JUL 07	13.9 B ON APR 01	1 910 000	1963
1964	---	236 ON JUN 08	14.1 B ON DEC 26	1 920 000	1964
1965	---	111 ON JUL 09	12.3 B ON MAR 26	1 020 000	1965
1966	---	159 ON JUN 22	8.92B ON FEB 24	1 730 000	1966
1967	---	139 ON JUN 06	6.74B ON MAR 01	1 470 000	1967
1968	---	291 ON MAY 22	12.6 B ON FEB 24	1 490 000	1968
1969	---	123 ON MAY 25	12.7 B ON MAR 17	1 130 000	1969
1970	---	81.0 ON JUN 17	14.4 B ON DEC 31	1 130 000	1970
1971	151 AT 05:56 YST ON JUN 29	148 ON JUN 29	9.23B ON MAR 14	1 110 000	1971
1972	198 AT 07:30 YST ON MAY 31	190 ON MAY 31	9.77B ON JAN 18	1 300 000	1972
1973	124 AT 08:15 YST ON JUN 21	119 ON JUN 21	10.5 B ON APR 05	1 100 000	1973
1974	98.8 AT 20:26 YST ON JUN 24	91.7 ON JUN 24	7.93B ON MAR 09	1 030 000	1974
1975	---	---	7.50B ON APR 06	---	1975
1976	184 AT 13:06 YST ON JUL 12	183 ON JUL 12	15.9 B ON APR 06	1 510 000	1976
1977	172 AT 12:27 YST ON JUN 03	166 ON JUN 01	20.0 B ON FEB 16	1 400 000	1977
1978	96.6 AT 07:00 YST ON JUN 06	90.3 ON JUN 06	16.4 B ON APR 21	1 090 000	1978
1979	150 AT 16:25 YST ON JUN 23	147 ON JUN 24	13.2 B ON DEC 22	1 360 000	1979
1980	124 AT 01:10 YST ON JUN 08	121 ON JUN 07	12.1 B ON APR 05	1 110 000	1980
1981	87.9 AT 09:00 YST ON MAY 28	86.2A ON MAY 28	11.4 B ON FEB 16	1 140 000	1981
1982	---	700 E ON JUN 08 *	10.0 B ON MAR 08	1 670 000	1982
1983	131 AT 06:20 YST ON JUN 01	121 ON JUN 01	11.6 B ON MAR 29	1 220 000	1983
1984	108 AT 05:46 YST ON JUL 01	105 ON JUL 01	11.0 B ON JAN 13	1 020 000	1984
1985	152 AT 11:08 YST ON JUN 05	148 ON JUN 05	11.2 B ON DEC 31	1 320 000	1985
1986	168 AT 09:47 YST ON JUL 03	160 ON JUL 03	10.6 B ON JAN 09	1 390 000	1986
1987	160 AT 07:33 YST ON JUN 01	168 ON JUN 01	21.0 B ON FEB 27	1 770 000	1987
1988	155 AT 13:23 YST ON JUL 17	137 ON JUL 17	19.2 B ON APR 07	1 120 000	1988
1989	141 AT 06:43 YST ON MAY 31	130 ON MAY 31	21.5 B ON APR 07	1 560 000	1989
1990	171 AT 07:55 YST ON JUN 02	166 ON JUN 02	18.9 B ON DEC 14	1 470 000	1990
1991	174 AT 05:00 YST ON JUL 29	136 ON JUL 29	20.1 B ON JAN 07	1 640 000	1991
1992	197 AT 16:59 YST ON JUL 15	192 ON JUL 15	22.2 B ON FEB 12	1 840 000	1992
				1 380 000	MEAN

A - MANUAL GAUGE B - ICE CONDITIONS * - EXTREME RECORDED FOR THE PERIOD OF RECORD
(SEE REFERENCE INDEX) E - ESTIMATED

DONJEK RIVER BELOW KLUANE RIVER - STATION NO. 09CA003

MONTHLY AND ANNUAL MEAN DISCHARGES IN CUBIC METRES PER SECOND FOR THE PERIOD OF RECORD

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN	YEAR
1979	---	---	---	---	---	---	---	---	---	187	57.4	26.5	---	1979
1980	20.6	19.8	26.6	44.7	77.2	277	515	438	232	149	69.1	39.3	159	1980
1981	24.4	20.2	18.7	22.2	119	210	460	478	271	142	41.1	27.3	153	1981
1982	14.5	14.8	16.7	19.6	80.0	296	480	470	217	56.7	30.3	21.3	141	1982
1983	19.1	19.8	20.5	28.7	69.7	274	554	519	254	135	63.2	26.7	167	1983
1984	---	---	---	---	---	---	458	---	---	---	---	---	---	1984
1985	---	---	---	---	---	---	---	---	---	---	---	---	---	1985
1986	---	---	---	---	---	---	---	---	---	118	56.6	28.5	---	1986
1987	22.3	18.8	17.2	20.8	78.4	---	---	---	---	---	---	---	---	1987
1988	31.5	19.9	16.5	20.4	97.4	231	689	502	221	97.4	54.3	41.9	169	1988
1989	31.5	24.7	18.9	18.3	94.9	236	504	421	188	72.3	27.5	16.9	139	1989
1990	13.4	11.9	11.2	12.8	72.9	348	481	400	145	56.4	26.8	24.0	135	1990
1991	19.8	21.7	23.4	34.2	112	364	619	518	407	183	56.8	30.0	199	1991
1992	24.5	21.9	32.8	46.6	102	251	673	517	245	114	56.1	40.4	179	1992
MEAN	20.9	18.2	19.5	26.9	87.4	276	543	474	242	119	49.0	27.6	160	MEAN

LOCATION - LAT 62 04 56 N DRAINAGE AREA, 12 400 km²
LONG 139 51 35 W NATURAL FLOW

DONJEK RIVER BELOW KLUANE RIVER - STATION NO. 09CA003

ANNUAL EXTREMES OF DISCHARGE AND ANNUAL TOTAL DISCHARGE FOR THE PERIOD OF RECORD

YEAR	MAXIMUM INSTANTANEOUS DISCHARGE (m^3/s)	MAXIMUM DAILY DISCHARGE (m^3/s)	MINIMUM DAILY DISCHARGE (m^3/s)	TOTAL DISCHARGE (dam^3)	YEAR
1979	---	---	---	---	1979
1980	673 AT 17:51 YST ON AUG 13	642 ON JUL 15	18.7B ON FEB 18	5 030 000	1980
1981	758 AT 16:18 YST ON JUL 11	705 ON JUL 11	15.0B ON DEC 31	4 630 000	1981
1982	868 AT 12:20 YST ON JUL 11	746 ON JUL 11	13.5B ON JAN 25	4 470 000	1982
1983	693 AT 12:17 YST ON JUL 06	662 ON JUL 06	17.9B ON JAN 22	5 260 000	1983
1984	777 AT 15:19 YST ON AUG 08	756 ON AUG 08	---	---	1984
1985	---	---	---	---	1985
1986	---	---	---	---	1986
1987	---	---	16.4B ON MAR 22	---	1987
1988	1 700 AT 21:20 YST ON JUL 16 *	1 430 ON JUL 16 *	15.9B ON MAR 26	5 340 000	1988
1989	762 AT 13:39 YST ON JUL 13	712 ON JUL 13	14.7B ON DEC 31	4 380 000	1989
1990	---	701A ON JUL 22	10.9B ON MAR 25 *	4 270 000	1990
1991	813 AT 19:00 YST ON JUL 02	788 ON JUL 02	14.1B ON FEB 27	6 260 000	1991
1992	850 AT 10:13 YST ON JUL 14	826 ON JUL 14	20.3B ON FEB 19	5 660 000	1992
				5 060 000	MEAN

A - MANUAL GAUGE B - ICE CONDITIONS * - EXTREME RECORDED FOR THE PERIOD OF RECORD
(SEE REFERENCE INDEX)

YUKON TERRITORY

CLINTON CREEK ABOVE WOLVERINE CREEK - STATION NO. 09EC001

MONTHLY AND ANNUAL MEAN DISCHARGES IN CUBIC METRES PER SECOND FOR THE PERIOD OF RECORD

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN	YEAR
1964	---	---	---	---	---	5.86	0.367	0.253	0.208	---	---	---	---	1964
1965	---	---	---	---	5.07	7.57	8.40	1.82	0.598	---	---	---	---	1965
MEAN	---	---	---	---	5.07	6.72	4.38	1.04	0.403	---	---	---	---	MEAN

LOCATION - LAT 64 26 54 N
LONG 140 42 24 W NATURAL FLOW

CLINTON CREEK ABOVE WOLVERINE CREEK - STATION NO. 09EC001

ANNUAL EXTREMES OF DISCHARGE AND ANNUAL TOTAL DISCHARGE FOR THE PERIOD OF RECORD

YEAR	MAXIMUM INSTANTANEOUS DISCHARGE (m^3/s)	MAXIMUM DAILY DISCHARGE (m^3/s)	MINIMUM DAILY DISCHARGE (m^3/s)	TOTAL DISCHARGE (dam^3)	YEAR
1964	---	---	---	---	1964
1965	---	---	OB ON JAN 20 *	---	1965
				---	MEAN

B - ICE CONDITIONS * - EXTREME RECORDED FOR THE PERIOD OF RECORD

DEZADEASH RIVER AT HAINES JUNCTION - STATION NO. 08AA003

MONTHLY AND ANNUAL MEAN DISCHARGES IN CUBIC METRES PER SECOND FOR THE PERIOD OF RECORD

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN	YEAR
1953	13.2	9.70	8.89	12.6	49.5	87.6	100	71.0	56.7	50.6	35.2	21.1	44.1	1953
1954	14.6	13.6	12.9	12.0	61.2	106	94.4	72.4	53.4	41.9	25.2	18.9		1954
1955	17.2	15.6	15.0	15.2	40.2	102	142	87.6	59.2	41.6	21.9	14.1	47.8	1955
1956	12.7	11.9	10.9	14.9	48.0	97.9	80.4	55.1	45.7	42.9	22.5	14.7	37.1	1956
1957	18.2	15.4	14.3	16.2	71.6	124	78.0	63.5	52.0	30.2	19.2	16.1	36.1	1957
1958	16.7	15.7	14.8	19.5	46.0	98.0	97.5	26.8	29.6	24.8	18.1	15.5	27.0	1958
1959	13.3	11.4	10.5	10.7	53.6	125	72.1	70.3	55.5	43.4	27.4	21.3	43.0	1959
1960	17.8	15.2	13.5	12.5	71.4	96.7	92.8	70.8	49.5	33.9	21.0	19.3	43.0	1960
1961	17.0	14.4	12.7	13.0	54.1	147	119	67.0	51.2	38.7	24.4	22.1	45.9	1961
1962	17.0	13.1	9.91	9.91	36.1	171	152	95.1	64.8	37.3	26.6	23.6	37.2	1962
1963	21.5	17.6	16.4	15.9	65.4	101	156	95.5	74.1	58.9	35.5	27.8	57.5	1963
1964	23.6	19.9	17.5	18.5	40.3	189	109	68.1	68.9	42.5	21.9	14.6	54.5	1964
1965	13.8	13.3	12.6	12.6	34.2	71.4	88.8	45.5	32.7	27.8	17.8	15.4	32.3	1965
1966	13.1	9.06	10.3	16.3	56.7	111	79.4	54.5	43.7	32.2	19.5	14.6	36.0	1966
1967	12.1	9.04	9.09	17.9	64.8	150	105	75.9	67.5	45.0	23.9	17.1	46.8	1967
1968	14.8	14.5	14.7	18.8	52.5	77.6	101	74.4	71.5	54.2	27.7	20.3	47.1	1968
1969	16.4	15.8	14.4	22.7	52.5	86.0	60.3	63.5	68.4	69.4	42.1	29.4	45.2	1969
1970	19.3	17.0	16.3	22.7	44.7	70.5	68.2	50.7	42.3	34.7	25.8	17.2	35.8	1970
1971	12.2	11.0	9.93	10.2	51.8	92.8	83.5	62.7	43.6	30.6	18.3	12.5	32.9	1971
1972	10.5	11.3	12.3	12.8	53.9	109	84.2	76.5	50.0	36.9	20.8	15.4	41.5	1972
1973	13.6	11.7	11.3	13.7	33.2	66.3	77.9	66.2	52.6	36.9	17.7	14.6	32.6	1973
1974	11.8	9.16	8.49	9.55	42.5	65.4	61.1	59.1	53.6	32.9	18.6	17.8		1974
1975	15.1	11.6	8.40	10.3	50.3	---	---	99.9	117	77.6	23.8	22.4	---	1975
1976	19.3	19.7	20.4	18.1	41.4	115	132	67.7	41.0	38.5	29.9	26.2	47.9	1976
1977	22.4	21.6	22.3	28.0	31.2	102	97.6	65.7	44.4	38.2	31.3	28.7	44.3	1977
1978	22.6	19.3	17.9	18.4	42.2	70.6	50.7	47.8	40.3	35.1	28.6	21.7	34.6	1978
1979	18.7	16.1	18.4	22.3	51.1	98.4	97.4	57.6	54.9	42.3	23.3	15.3	43.1	1979
1980	16.7	19.9	17.8	20.9	44.8	85.2	55.2	42.4	37.4	35.6	27.5	16.5	35.0	1980
1981	16.6	15.5	15.3	17.6	58.1	61.5	54.3	44.5	46.2	44.8	30.8	22.3	33.9	1981
1982	20.3	16.5	14.9	17.9	62.1	274	62.5	47.5	40.0	33.1	21.7	17.9	52.9	1982
1983	19.2	17.8	17.2	22.5	44.0	75.9	69.0	45.6	36.9	30.0	21.0	16.1	32.1	1983
1984	11.1	13.4	17.6	31.8	35.0	64.0	62.6	46.2	43.9	27.3	13.8	16.3	32.1	1984
1985	17.8	21.0	20.1	26.4	61.4	84.9	106	55.6	41.5	30.4	21.0	13.3	41.8	1985
1986	11.7	11.3	15.8	23.9	28.5	107	134	65.4	63.7	41.5	27.8	23.7	47.3	1986
1987	23.2	22.4	22.6	26.6	43.9	74.0	64.1	51.2	51.7	45.5	27.0	20.4	40.4	1987
1988	24.2	21.5	20.5	25.5	71.1	130	179	127	71.6	54.8	32.6	24.8	67.0	1988
1989	29.2	26.3	23.0	29.7	84.5	104	85.8	56.1	46.2	41.5	32.6	31.7	49.3	1989
1990	29.8	24.9	23.2	33.0	64.7	119	85.5	51.8	45.4	35.3	24.8	19.8	46.5	1990
1991	21.1	24.4	22.0	23.8	38.0	77.0	98.0	87.4	102	65.8	31.0	25.9	51.8	1991
1992	26.2	23.2	24.2	30.6	48.8	124	157	94.2	66.7	40.7	34.0	27.3	58.1	1992
MEAN	17.6	16.2	15.3	18.7	49.5	104	94.3	67.3	55.0	42.1	26.3	20.7	43.8	MEAN

LOCATION - LAT 60 44 54 N DRAINAGE AREA 8 500 km^2
LONG 137 30 19 W REGULATED SINCE 1974