

**OFFICE COPY**  
DO NOT REMOVE

C 1997-18

**Preliminary Environmental Investigations**

of

**TA 36 Site 13 -- M'Clintock Crossing**

**TA 37 Site 14 -- Yukon River Bridge**

**BC 9 Site 35 -- Dry Creek**

Prepared for:

**Arctic Environmental Strategy**

**Action on Waste**

**DIAND, Whitehorse, Y.T.**

Prepared by:

**W. J. Klassen and Associates Ltd.**

**D. B. Craig, Consulting Engineer**

**Mikro-Tek - M. Kean Resources Inc.**

**February, 1997**

**A Preliminary Environmental Investigation  
of Site 13 -- M'Clintock Crossing**

Prepared for:

Arctic Environmental Strategy

Action on Waste

DIAND, Whitehorse, Y.T.

Prepared by:

W. J. Klassen and Associates Ltd.

D. B. Craig, Consulting Engineer

Mikro-Tek - M. Kean Resources Inc.

February, 1997

## Table of Contents

Executive Summary	
1.0 Introduction	1
2.0 Methodology	1
2.1 Literature Review	1
2.2 Interviews	2
2.3 Field Work	2
2.3.1 Site Identification	2
2.3.2 Site Investigation	3
2.3.3 Analytical Program and Criteria	4
Map of Site 13	5
Photographs of Site 13	6
3.0 Physical Setting	14
3.1 General Description	14
3.2 Geology	14
3.3 Hydrogeology	14
3.4 Biology	14
4.0 Test Results	16
5.0 Discussion and Conclusions	16
6.0 Recommendations	17
References	
Appendix A - Field Lab Process	
Appendix B - Lab Analysis Results	

## Executive Summary

A preliminary environmental investigation of **Site 13 -- M'Clintock Crossing** (Km. 1431.8, Alaska Highway) was conducted in September/October, 1996, under the auspices of the Arctic Environmental Strategy - Action on Waste (DIAND) program. The purpose of this investigation was to determine if further assessment or site remediation work would be required. The primary objective was to determine if contaminants were present on the site and if present, were they migrating from the site and did they pose a human or environmental health hazard. A secondary objective was to identify any physical hazards that might be present on the site.

The investigation of this site consisted of a review of the literature and other background material, interviews, field work, analysis and recommendations. Literature searches, airphoto analysis and interviews were unable to help in locating the dump thought to be located at this site to the west of the bridge and immediately south of the highway. Field work included identifying and delineating the site and mapping and photographing it; test pits were dug and soil samples taken.

The site is heavily vegetated with an apparently healthy white spruce vegetation community and dense willow thickets. It is underlain by alluvial silts and sand containing no visible ground water.

Although there is scattered surface garbage on the site no evidence of buried garbage was found. **Tests for DDT and PCBs, the anticipated contaminants, indicated these substances were either not present or were well below the CCME criteria for Residential/Parkland areas. The same was the case for cadmium, lead, mercury and zinc.**

Except for the possible removal of a military truck box roof canopy frame present on the site, **no further assessment or remediation work is recommended.**

# **A Preliminary Environmental Investigation of Site 13 -- M'Clintock Crossing**

## **1.0 Introduction**

The Arctic Environmental Strategy - Action on Waste program under the auspices of the Department of Indian Affairs and Northern Development (DIAND) identified a number of abandoned waste and disposal sites throughout the Yukon Territory. These sites were generally associated with exploration, mining, industrial or military operations. The Contaminants/Waste Program initiated environmental investigations at a number of such sites.

The purpose of these investigations was to gather preliminary environmental information to determine if further assessment or site remediation work would be required. The primary objective was to determine if contaminants were present on the site. If contaminants were present, the investigation was to determine if they are migrating from the site and whether they pose a human or environmental health hazard. A secondary objective of these investigations was to identify any physical hazards that may be present on the site.

As indicated, the overall objective of the investigations is to obtain preliminary environmental information and to make recommendations on future assessments or remediation of abandoned waste and disposal sites in the Yukon.

Site 13, M'Clintock Crossing, was one of these sites and this report results from its investigation. Information assembled previously on this site was limited. The site is located on the D.P.W. M'Clintock River bridgehead reserve and is described in an unidentified researcher's field notes provided by DIAND as:

"Small clearing by bridge. No obvious evidence of a previous camp or dump, however, there are eyewitness reports of a dump approximately 30m north of present boat launch. Vegetation is generally willow regeneration."

## **2.0 Methodology**

The preliminary environmental investigation of this site consisted of a review of the literature and other background material, interviews, field work on site, analysis and recommendations.

### **2.1 Literature Review**

The Yukon Archives, EPS library, and the DIAND library were checked for references to this site. The site is briefly mentioned in Bisset's (1995) report. No other written record of this site was found.

D.P.W. records pertaining to the bridgehead reserve were reviewed as well for any reference to burial of materials. These records contain no reference to a previously existing dump at this location. Drawings on file indicate, however, that the current location of the bridge is approximately half a bridge width downstream of the original crossing location.

Archived aerial photographs, both those from the 1940's and those taken in 1987 (1:40,000) were studied for any evidence of this suspected dump site. No such evidence was found in the photos.

## **2.2 Interviews**

The 1983 field notes indicate an eyewitness to the alleged burial of material at this site. This person turned out to be Mr. John Suits, a Kwanlin Dun First Nation member, who was interviewed. Mr. Suits recalls that he was about 8 or 9 years of age at the time, early to mid-1940's, when an army camp in the vicinity was being shut down. He remembers watching food stuffs and tents being buried in a large hole at this site immediately to the south of the M'Clintock River bridge (not to the north as the field notes suggest). He did not recollect any fuel drums or oil cans, automotive parts or similar material being dumped but said that as a boy he might well not have known what they were in any event.

## **2.3 Field Work**

Field work at the site consisted of two visits. During the preliminary visit a reconnaissance was conducted to locate and attempt to identify and delineate the site. On the second visit the site was mapped and photographed; test pits were dug and soil samples taken.

### **2.3.1 Site Identification**

The M'Clintock Crossing site was searched for on both the north side and south side of the bridge. It became apparent that although some bulldozer work had taken place on the north side of the Alaska Highway approaching the bridge from the west -- perhaps in conjunction with the highway and bridge relocation -- there was no indication of a dump. The usual litter found in highway ditches was evident on the north side.

There is a boat launch ramp immediately to the south of the Alaska Highway at the approach to the bridge from the west. The location Mr. Suits described may have included the boat launch area as well as the relatively level, revegetated area between the boat launch and the mature forest along the margin of the river, an area of approximately .25 ha. Given that the current bridge and its approach is slightly to the south of the original crossing, the burial site as described by Mr. Suits may well be under the boat launch area.

A reconnaissance of the described area led to the following observations being made.

This site shows evidence of bulldozer activity with irregular berms of earth and stumps evident throughout. No depressions that might indicate a former dump or burial site were discovered. The site is bordered on the west and south by a mature white spruce forest. The site itself is completely and thickly revegetated. Some evidence of a former military presence remains in the form of an olive-drab truck box canopy frame held in place by the 4 m. tall willows that have grown through it. Other domestic garbage such as a smashed galvanized washtub, rusty food tins, a length of cable, and an oil filter suggest this site has had a history of misuse. A small (3 m x 4 m) collapsed log structure is located on the southwest edge of the revegetated area; a one metre tall white spruce is growing in the lichens and mosses of the rotting pole roof.

### **2.3.2 Site Investigation**

The site was mapped to ensure future relocation of test pit sites and other features if necessary (See Site 13 Map on following page). Prior to visiting the site, a grid sampling system had been suggested but following the literature review, interview and reconnaissance of the site it was decided by the field crew to sample in the vicinity of surface garbage in the expectation that this might be an indication of partially-buried garbage and/or potentially contaminated sites. The test pits were marked with orange flagging tape and numbered as indicated on the map. Soil samples were taken at or near the surface and deeper samples were collected from the sidewalls of the test pits. Photographs were taken of the site, surface features, and test pits. These are provided on the following pages.

#### **Site 13-A Test Pit**

This test pit location was selected because there was some surface garbage consisting of several rusty food cans, a length of conduit, a bolt, an oil filter, some strapping, and a five gallon can. On digging the pit, debris apparently cut from steel girders, possibly from bridge reconstruction, was found immediately below the sphagnum moss. The soil profile consisted of a 5 cm duff or organic layer above a 20 cm layer of sand. Clay was found below the sand to a depth greater than one metre. No garbage was found below the surface other than the steel scraps. The location of this site did not appear to have been previously disturbed by mechanical means even though it was adjacent to a bulldozer berm.

### **Site 13-B Test Pit**

There were some rusty food tins on the ground surface at this test pit location. In this pit 20 cm of black organic material overlay a clay layer which continued to a depth in excess of one meter. No garbage was found below the surface and the site did not appear to have been previously disturbed.

### **Site 13-C Test Pit**

This test pit was dug immediately adjacent to a military truck box canopy frame and within a few meters of a bulldozer berm. The pit soil profile consisted of 20 cm of mixed black organic material and sandy soil above more than a metre's depth of clay. The clay was banded and appeared undisturbed. No garbage was found below the surface.

### **2.3.3 Analytical Program and Criteria**

Given the objectives of the environmental investigation, the potential contaminants of concern at Site 13 were PCBs, DDT, and metals. Soil samples were field screened for DDT and PCBs using immunoassay field kits. Field screening determined the need for analytical testing. Tests for the presence of metals were conducted at the ASL laboratory in Vancouver, B.C.

The criteria used for comparison of the analytical results were the "Interim Canadian Environmental Quality Criteria for Contaminated Sites - Report CCME EPC-CS34 September 1991" and the "Draft Contaminated Sites Regulations" of the Yukon Government. The analytical results for the indicated substances of concern were compared to the appropriate criteria established for Residential/Parkland or Residential land areas.

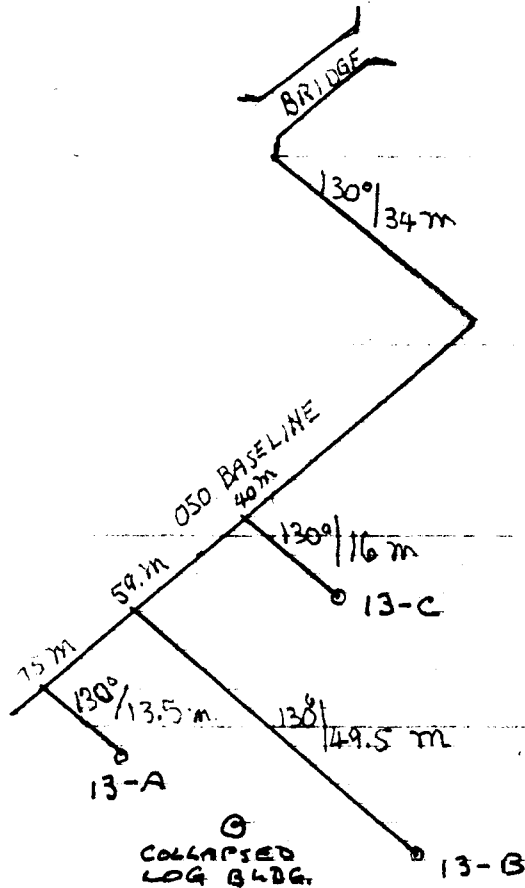
**Map of Site 13 -- M'Clintock Crossing**

SITE 13

McCLINTOCK RIVER BRIDGE

LOCATION OF TEST PITS

BEARINGS GIVEN AS AZIMUTH (0-360°)



D. B. CRAIG

SEPTEMBER 18, 1996

SCALE: 1 cm = 10 m

**Photographs of Site 13 -- M'Clintock Crossing**



Site 13-A Test Pit Site  
(Note bulldozer berm at upper left and scattered domestic garbage.)

**Photographs of Site 13 -- M'Clintock Crossing**



Site 13-A Test Pit Site  
(Note bridge construction debris at bottom of photo.)

**Photographs of Site 13 -- M'Clintock Crossing**



Site 13-A Test Pit  
(Note organic layer and sandy soil underlain by clay.)  
(Root across pit is approximately 7 cm in diameter.)

**Photographs of Site 13 -- M'Clintock Crossing**



Site 13 - Collapsed Log Structure

Photographs of Site 13 -- M'Clintock Crossing



Site 13-B Test Pit Site  
(Note scattered domestic garbage.)

**Photographs of Site 13 -- M'Clintock Crossing**



Site 13-B Test Pit  
(Note soil profile consisting of duff, sand, and clay.)

**Photographs of Site 13 -- M'Clintock Crossing**



Site 13-C Test Pit Site  
(Note canopy frame between shovel and pick.)

**Photographs of Site 13 -- M'Clintock Crossing**



Site 13-C Test Pit  
(Note soil profile of mixed organic and sandy material above clay.)

### **3.0 Physical Setting**

#### **3.1 General Description**

Site 13 - M'Clintock Crossing is located at Km. 1431.8 on the Alaska Highway, immediately to the west of the M'Clintock River Bridge, and adjacent to the south side of the boat launch parking area.

Although there is anecdotal information that this site contains a buried garbage dump no evidence of this was found. As already indicated, relocation of the highway approach to the bridge and development of the parking area of the boat launch may have obliterated or more deeply covered the dump. Evidence of surface garbage was present and has already been described.

#### **3.2 Geology**

Geological mapping of the area, including the M'Clintock River site, indicate that the site is immediately underlain by alluvial silts and sand of Quaternary age (Wheeler, 1961). Bedrock beneath silts would be basic volcanic rock (Wheeler, op. cit.). The test pits confirmed the presence of bands of clayey silts and sand (See photos).

#### **3.3 Hydrogeology**

No ground water was noted in any of the three test pits at this site, all dug to a depth greater than one meter. The site is immediately adjacent to the M'Clintock River but the levelness of the site and the natural levee along the river's margin appear to account for the absence of any indication of seepage or groundwater flow. It is assumed that groundwater flows toward the parking area and thence to the river. Given the absence of ground water at the site and the substantial volume of water flowing in the M'Clintock River it was decided by the field crew that water sampling and analysis would serve no useful purpose.

#### **3.4 Biology**

The white spruce forest at the edge of this site is typical of the description given in Kennedy (1993) for this plant community type:

"Vegetation Community Description: white spruce dominant species in tree canopy, though pine and aspen are frequently present; shrub understory includes willow, soapberry and rose; on moister sites, groundcover is dominated by low bush cranberry, horsetail, moss and forbs; kinnikinic, twinflower, and fescue dominate drier sites."

"Characteristic Species: white spruce (*Picea glauca*), kinnikinnick (*Arctostaphylos uva-ursi*)."

"Associated Species: aspen (*Populus tremuloides*), lodgepole pine (*Pinus contorta*), rose (*Rosa acicularis*), soapberry (*Shepherdia canadensis*), lowbush cranberry (*Vaccinium vitis-idaea*), twinflower (*Linnaea borealis*), horsetail (*Equisetum* spp.), fescue (*Festuca altaica*), bluebell (*Mertensia paniculata*), feathermoss (*Hylocomium splendens*, *Pleurozium schreberi*)."

The vegetative growth around test pits 13-A and 13-B was of the same lush floral type as in the nearby white spruce forest as quoted above. On the remainder of the site the willows formed dense thickets and reached heights of 7 meters. The ground cover consisted of closely growing mosses, horsetails, forbs and lichens. The canopy layer was white spruce, aspen, and, at the edge of the parking area, small cottonwood. The understory contained willow, rose, red raspberry, gooseberry (*Ribes oxycanthoides*), soapberry, high bush cranberry, lowbush cranberry, bastard toad-flax, twinflower, fireweed, lupin, alpine hedsyrum, strawberry, lousewort (*Pedicularis* spp.), bluebell, northern red bearberry, small astragalus, one-sided wintergreen (*Pyrola* spp.), feather moss (*Hylocomium splendens*; *Heurozium schreberi*), horsetail, white gilled mushroom (5cm diameter cap) and lichens, including freckled lichen, pioneer cladonia, pixie cup, waxpaper lichen, coral lichen, and reindeer lichen.

In addition to the above vegetation, around the edge of the parking area yarrow, camomile, dandelion, plantain, bluebell, Alsike clover, fireweed, and field locoweed were all present. Reedgrass (*Calamagrostis* spp.), bluegrass (*Poa* spp.), and barley foxtail (*Hordeum jubatum*) were also in evidence.

The vegetative regrowth on the disturbed portions of this site, including those areas where surface garbage was found, was lush and healthy in appearance and typical of natural regeneration. Given the absence of any indication of buried contaminant materials and the relatively benign metal and plastic waste lying on or near the surface, it was judged by the field crew to be unnecessary to take vegetation samples for testing.

The only evidence of wildlife in the area were old beaver cuttings, a beaver lodge upstream of the bridge, and tracks of waterfowl in the immediate vicinity of the boat launch. The M'Clintock River mouth is used as a staging area for waterfowl, most notably swans in the springtime.

#### **4.0 Test Results**

Although it appeared -- based on the absence of any evidence of buried material, the absence of any staining or apparent disturbance of the soil, and the healthy vegetation at this site -- that it was unlikely that any contaminants would be found, a soil sample was field tested for DDT and PCB.

The field testing, briefly, consisted of the following: A soil extraction was made from a portion of each sample. Each extraction was mixed in an individual enzyme-coated test tube with a substrate. A null test and stepped concentrations of the substance being tested for were mixed in the same way. The substrate competes for enzyme bonding places with the soil extraction. A stop solution was added to the test tube mixture and the resulting colour of each test tube was compared with a clear stop solution tube for refraction. The resulting value for each soil solution was compared with those for the null test tube and the stepped concentrations of the substance being tested for in order to determine the necessity of having each soil sample undergo laboratory analysis. (For a detailed description of the process please refer to Appendix A).

The results of the field test for DDT indicated values lower than those for the "negative control" or null test so no further analysis was required. The field test for PCB suggested there might be between 5 and 10 ppm PCB in the soil at this site. Subsequent analysis by ASL laboratory in Vancouver, B.C., indicated that there was less than .05 ppm PCB material in the soil. The level permitted by the CCME interim remediation criteria in Residential/Parkland areas is 5 ppm.

Laboratory analysis was also conducted on a soil sample from this site for cadmium, lead, mercury and zinc. The values found for each of these in the sample were well below those cited in the CCME interim remediation criteria for soil in Residential/Parkland areas. (The laboratory analysis results are provided in Appendix B).

#### **5.0 Discussion and Conclusions**

The buried dump which was indicated as being located at this site was not located. It may be that the site was covered by subsequent highway and bridge relocation/reconstruction in 1960. The presence of some surface garbage suggests that the area has a history of indiscriminate disposal of domestic waste. The site was investigated and soil samples obtained. The results of the laboratory analysis indicate that of those contaminants which have been indicated as a concern at abandoned sites in the Yukon, none were found at this site except at levels well below those cited as acceptable in the CCME contaminants criteria. This site gives no cause for concern with respect to the indicated substances.

## **6.0 Recommendations**

No further work is required at this site with the possible exception that the presence of the military truck roof canopy framework might be brought to the attention of the Transportation Museum curator in the event that it may be of interest to that organization.

**References:**

Bisset, K. 1995. Research of former military sites and activities in the Yukon. AES, DIAND. Whitehorse, Y.T.

Kennedy, C.E. 1993. Guidelines for reclamation/ revegetation in the Yukon. Yukon Renewable Resources. Whitehorse, Y.T.

Wheeler, J. O. 1961. Whitehorse Map-Area, Yukon Territory. Geological Survey of Canada, Memoir 312. Ottawa.

**Appendix A**  
**Field Lab Process**

# MILLIPORE

## EnviroGard™ DDT in Soil Test Kit

### ENVR 000 31

### Intended Use

The EnviroGard DDT in Soil Test Kit is a qualitative or semi-quantitative field test for the detection of DDT and its metabolites DDD and DDE in soil. The EnviroGard DDT in Soil Test Kit allows rapid semi-quantitative screening for DDT at 0.2, 1.0, and 10.0 parts per million (ppm) in soils.

### Test Principles

The EnviroGard DDT in Soil Test Kit is based on the use of polyclonal antibodies that bind either DDT or DDT-Enzyme Conjugate. These antibodies are immobilized to the walls of the test tubes. When DDT is present in the sample, it competes with the DDT-Enzyme Conjugate for a limited number of antibody binding sites.

- A sample containing DDT is added to a test tube containing Assay Diluent. DDT-Enzyme Conjugate is then added to the test tube. The DDT-Enzyme Conjugate competes with the DDT for the antibody binding sites.
- After the incubation, the unbound molecules are washed away.
- A clear solution of chromogenic Substrate is then added to the test tube. In the presence of bound DDT-Enzyme Conjugate, the clear Substrate is converted to a blue color. One enzyme molecule can convert many Substrate molecules.

Since there are the same number of antibody binding sites on every test tube and each test tube receives the same number of DDT-Enzyme Conjugate molecules, a sample that contains a low concentration of DDT allows the antibody to bind many DDT-Enzyme Conjugate molecules.

Therefore, a low concentration of DDT produces a dark blue solution. Conversely, a high concentration of DDT allows fewer DDT-Enzyme Conjugate molecules to be bound by the antibodies, resulting in a lighter blue solution.

**NOTE:** Color is inversely proportional to DDT concentration.

Darker color = Lower concentration  
Lighter color = Higher concentration

### Performance Characteristics

The EnviroGard DDT in Soil Test Kit will not differentiate between DDT, its metabolites, and other structurally similar compounds, but will detect their presence to differing degrees. The following table shows a number of compounds and the approximate concentration of each required to yield a positive result (Lower Limit of Detection or LLD), and the concentration required to inhibit one-half of the color developed by the Negative Control (IC50). Concentration is in parts per million (ppm) in soil.

Compound	LLD	IC50
<i>p,p'</i> -DDT (kit calibrator)	0.04	1.25
<i>p,p'</i> -DDD	0.01	0.3
<i>p,p'</i> -DDE	0.18	3.6
<i>o,p'</i> -DDT	4	93
<i>o,p'</i> -DDD	0.4	11
<i>o,p'</i> -DDE	3	93
DDA	0.002	0.04
Chloropropylate	0.007	0.08
Chlorobenzilate	0.03	0.35
Dicofol	0.14	2
Tetradifon	1.2	14
Thiobencarb	5	52
Tebuconazole	7	95
Neburon	17	284
Chloroxuron	24	216
Monolinuron	25	714
Diclofop	70	>1000

The following compounds have lower limits of detection > 100 ppm:

2,4-D	4-chlorophenoxyacetic acid
Chlorbromuron	Chlordane
Chlortoluron	Dicamba
Diflubenzuron	Diuron
Lindane	Linuron
MCPA acid	MCPB
Mecoprop	

## Precautions

- Treat DDT, solutions that contain DDT and potentially contaminated soil samples as hazardous materials.
- Where appropriate, use gloves, proper protective clothing, and methods to contain and handle hazardous material.
- Store all test kit components at 4°C to 8°C (39°F to 46°F) when not in use.
- Do not freeze test kit components or expose them to temperatures greater than 37°C (99°F).
- Allow all reagents to reach ambient temperature (18°C to 27°C or 64°F to 81°F) before beginning the test.
- Do not use test kit components after the expiration date.
- Do not use reagents or test tubes from one test kit with reagents or test tubes from a different test kit.
- Use approved methodologies to confirm any positive results.
- Do not dilute or adulterate test reagents or use samples not called for in the test procedure; this may give inaccurate results.
- Tightly recap the DDT calibrator vials to prevent evaporative loss.
- Distribution of DDT in soils may be highly variable. The use of a composite sampling technique may be appropriate. Development of a sampling plan that assures adequate sample number and distribution is the responsibility of the analyst.
- DDT is light sensitive. Store soil extracts at 2°C to 7°C, shielded from direct light.

## Materials Provided

### EnviroGard DDT in Soil Test Kit

This test kit contains the following items:

- 20 Antibody-Coated Test Tubes
- 1 vial of Assay Diluent

- 1 vial of Negative Control (methanol)
- 1 vial of 0.2 ppm DDT Calibrator in methanol
- 1 vial of 1.0 ppm DDT Calibrator in methanol
- 1 vial of 10.0 ppm DDT Calibrator in methanol
- 1 vial of DDT-Enzyme Conjugate
- 1 vial of Substrate
- 1 vial of Stop Solution
- 1 20-place Test Tube Rack
- 22 Pipette Tips, yellow (for the Gilson M-25 Micro-man® Positive Displacement Pipettor)

## Materials Required and Ordered Separately

See "Ordering Information" for the appropriate catalogue numbers.

### EnviroGard Soil Extraction Bottle Kit

Use this kit for the extraction of DDT in soil samples. This kit contains enough devices to process 14 samples:

- 14 30 milliliter (mL) LDPE Bottles with screw caps (each bottle contains stainless steel mixing beads)
- 14 filtration caps
- 14 Millex® HV13 filters
- 18 Wooden Spatulas
- 1 Syringe with coupler
- 1 Syringe coupler
- 14 Screw Top Glass Vials, 4.0 mL
- 14 Stoppers
- 18 Weigh Boats

### Methanol

ACS reagent grade Methanol is required for soil extraction, but is not included in the EnviroGard Soil Extraction Kit. You must order it separately. (See "Ordering Information.")

## Materials Required but Not Provided

You will also need several other items, some of which are included in the EnviroGard Soil Field Lab. (See "Ordering Information" for the appropriate catalogue number).

- Gilson M-25 Microman Positive Displacement Pipettor
- Eppendorf™ Repeater® Pipettor and five Combitips® (3 x 12.5 mL, 1 x 5.0 mL, and 1 x 50 mL)
- Balance capable of accurately weighing 5 grams
- Millipore Differential Photometer or Enviro-Quant Photometer
- Indelible marker for labeling test tubes
- Watch or timer
- Clean running water or a wash bottle containing tap or deionized water (500 mL)
- Calculator (optional)

### Suggestions for Pipettor Use

- Practice using both pipettors (positive displacement and Repeater pipettor) with water and extra tips before you analyze your samples.
- Use a new tip each time you use the Repeater pipettor to avoid reagent cross-contamination. Label three 12.5 mL tips "Diluent", "Substrate" and "Stop," and one 5.0 mL tip "Conjugate".
- Draw the desired reagent volume into the Repeater pipettor and dispense one portion of the reagent back into the container to properly engage the ratchet mechanism. If you do not do this, the first volume delivered may be inaccurate.
- To add reagents using the Repeater pipettor, pipette down the side of the test tube just below the rim.
- To add samples and calibrators using the positive displacement pipettor, pipette down the side of the test tube just above the liquid level.
- The carryover volume of the positive displacement tips is minimal, but may affect results if you are going from a high to low DDT concentration. Use a new pipettor tip each time you pipette a new unknown.

## Assay Procedure

### Collect/Store the Sample

1. Collect soil in appropriately-sized and labeled containers.
2. Take care to remove excess twigs, organic matter and rocks or pebbles from the sample. For best results, wet soils should be air-dried overnight and thoroughly mixed before testing.

3. Store soil samples at 4°C (39°F).

### Prepare the Sample/Extract the Soil

1. Please follow the instructions from the EnviroGard Soil Extraction Bottle Kit to prepare the soil extract before the assay.
2. **5 mL of Methanol** will be used to extract DDT residue from a 5 gram soil sample. As per instructions, attach a **50 mL** Combitip to the Repeater pipettor and set the dial to **5**. Deliver once to add **5 mL** of **methanol** to the extraction vial, and cap tightly.

### Perform the Test

**NOTE:** Allow all reagents and sample extracts to reach room temperature before you begin the test. Do not analyze more than 20 test tubes at a time.

1. The choice of calibrators to use in the test will depend on the the selection of the analyst. The use of two calibrators may be appropriate if screening for a single level of DDT.

Remove the test tubes from the plastic bag and label them as follows\*:

<u>Tube Label</u>	<u>Tube Contents</u>
NC	Negative Control
C1	0.2 ppm Calibrator
C2	1.0 ppm Calibrator
C3	10.0 ppm Calibrator
S1	sample 1
S2	sample 2
etc.	

\* You are not required to perform the assay in duplicate; however, doing so will increase the precision.

Place the test tubes in the test tube rack. Push down on each tube so that it is held firmly and does not fall out of the rack when shaken.

**CAUTION:** Do not "snap" the test tubes into the rack as this may result in a cracked tube.

2. Attach the **12.5 mL** Combitip labeled "Diluent" to the Repeater pipettor and adjust the dial to **2**. Add 500 microliters ( $\mu\text{L}$ ) of Assay Diluent to each test tube.
3. Attach a clean pipette tip to the Microman pipettor and adjust the dial to "**250**". Add 25  $\mu\text{L}$  of each calibrator (including Negative Control) to the corresponding test tube by placing the end

of the pipette tip against the side of the tube (just above the level of the Assay Diluent) and dispensing the volume. Use a clean pipette tip each time.

**CAUTION:** Replace the caps on the calibrator vials immediately after use to minimize evaporation.

4. Using a clean tip for each sample, add 25  $\mu\text{L}$  of each sample extract to the appropriately-labeled test tube.
5. Attach the 5.0 mL Combitip labeled "Conjugate" to the Repeater pipettor and adjust the dial to 1. Add 100  $\mu\text{L}$  of DDT-Enzyme Conjugate to each test tube.
6. Shake the test tube rack to mix for 10 to 15 seconds. Leave the test tubes undisturbed for 15 minutes.
7. Vigorously shake out the test tube contents into a sink or suitable container. Fill the test tubes to **overflowing** with cool tap or distilled water, then decant and vigorously shake out the remaining water.

Repeat this wash step three more times, being certain to shake out as much water as possible on each wash. After the final wash, remove as much water as possible by tapping the inverted tubes on absorbant paper.

8. Attach the 12.5 mL Combitip labeled "Substrate" to the Repeater pipettor and set the dial to 2. Add 500  $\mu\text{L}$  of Substrate to each test tube. Leave the test tubes undisturbed for 10 minutes.

**NOTE:** If a blue color does not develop in the Negative Control test tube within 10 minutes after adding the Substrate, the test is invalid and you must repeat it.

## Interpret the Results

You can either interpret the results visually within 10 minutes after adding the Substrate to each test tube, or you can perform a more precise analysis with a photometer after you add the Stop Solution.

### Visual Interpretation

After you add the Substrate, wait 10 minutes then mix the test tubes by shaking them for a few seconds until they are a uniform blue color. Compare the sample test tube to the calibrator test tubes against a white background. The test tube rack in the kit is well-suited for this purpose.

**NOTE:** The word DDT in the interpretation instructions below refers to "total DDT", i.e. the sum of *p,p'*-DDT, *p,p'*-DDD, and *p,p'*-DDE.

- If a sample test tube contains *more* color than the calibrator test tube, the sample contains DDT at a concentration *lower* than the calibrator.
- If a sample test tube contains *less* color than the calibrator test tube, the sample may contain DDT at a concentration *greater* than the calibrator.
- If the sample test tube contains color that is between the calibrator test tubes, the sample contains DDT at a concentration between the calibrator concentrations.
- If a sample test tube contains *approximately the same* amount of color as the calibrator test tube, the sample contains DDT at a concentration *approximately equal* to the calibrator.
- If the sample test tube contains less color than the 10 ppm Calibrator test tube, you may dilute a fraction of the soil extract in methanol (for example, 1:100) and perform the assay again. To determine the concentration of the diluted extract multiply the result by the dilution factor. (Go to "Semi-Quantitative Interpretation" for further details.)

### Photometric Interpretation

After you add the Substrate, wait 10 minutes then add the Stop Solution to each test tube.

**WARNING:** Stop solution is 1N Hydrochloric acid. Handle carefully.

Attach the 12.5 mL Combitip labeled "Stop" to the Repeater pipettor and set the dial to 2. Add 500  $\mu\text{L}$  of Stop Solution to each test tube. This converts the blue color in the test tubes to yellow.

**NOTE:** After you add Stop Solution to the test tubes, results should be read within 30 minutes.

### Millipore Differential Photometer

1. Place a water blank test tube containing 1.5 mL of Milli-RO® or Milli-Q® water, or equivalent in the left (reference) well.
2. Place the Negative Control test tube into the right (sample) well. Record the optical density (OD) of the Negative Control.
3. Remove the Negative Control test tube and replace it with the 0.2 ppm Calibrator test tube

to reactivate the photometer. Record the result. Repeat this step to determine the OD for each of the remaining calibrators and for each sample.

### Semi-quantitative Interpretation

Compare the OD of each sample to the OD of each calibrator:

**NOTE:** The word DDT in the interpretation instructions below refers to "total DDT", i.e. the sum of *p,p'*-DDT, *p,p'*-DDD, and *p,p'*-DDE.

- If a sample OD is *equal* to the OD of a calibrator, the sample contains DDT at a concentration *approximately equal* to the calibrator.
- If a sample OD is *greater* than a calibrator OD, the sample contains *less* DDT than the calibrator.
- If a sample OD is *lower* than a calibrator OD, the sample may contain *more* DDT than that calibrator.
- If an assay result indicates that a soil sample contains greater than 10 ppm total DDT, but you need more specific information, the soil extract may be diluted 1:100 in neat methanol, and assayed again. You must then multiply the results of the re-assay by 100 to determine the approximate sample concentration.

**NOTE:** If you know in advance that the "action level" of interest is greater than 10 ppm total DDT in soil, the assay may be modified to pinpoint that particular concentration. For example:

If you wish to categorize samples as less than or greater than 250 ppm, you should dilute all sample extracts 1:250 in neat methanol (e.g. 20  $\mu$ L extract plus 4.98 mL methanol) and compare the diluted extracts to the 1 ppm DDT kit calibrator. Due to the 250-fold dilution, the 1 ppm calibrator represents 250 ppm in the assay.

**NOTE:** If you are interested in action levels greater than 1000 ppm, please contact Millipore Technical Services for assistance.

### Example

Actual OD values will vary. This data is for demonstration purposes only.

Tube	OD	Interpretation
NC	0.90	
C1 (0.2 ppm)	0.75	
C2 (1.0 ppm)	0.49	
C3 (10.0 ppm)	0.35	
S1	0.68	>0.2 ppm < 1.0 ppm
S2	0.16	> 10.0 ppm

**NOTE:** The EnviroQuant Photometer is also available from Millipore. This dual wavelength instrument measures the OD at 450 nanometers (nm) minus 600 nm of all samples and calibrators, and provides a printout of results. See "Ordering Information" for the appropriate catalogue number.

### Limitations of the Procedure

The EnviroGard DDT in Soil Test Kit is a qualitative/semi-quantitative screening test only. Actual quantitation of DDT by EnviroGard immunoassay is not possible due to the Test kit's cross-reactivity with DDT breakdown products and other similar compounds and to the variations in extraction efficiency inherent in the fast extraction protocol described in this product insert.

Soil sampling error may significantly affect testing reliability. The distribution of pesticides in different soils can be extremely heterogeneous. Soils should be dried and homogenized before analysis by any method. Split samples (i.e. for GC and immunoassay) should always derive from the same homogenate.

EMVIRORGARD™

## PCB in Soil Test Kit User Guide

P31807, Rev. D, 7/95

# MILLIPORE

## Notice

The information in this document is subject to change without notice and should not be construed as a commitment by Millipore Corporation. Millipore Corporation assumes no responsibility for any errors that may appear in this document. This manual is believed to be complete and accurate at the time of publication. In no event shall Millipore Corporation be liable for incidental or consequential damages in connection with or arising from the use of this manual.

© 1995 MILLIPORE CORPORATION. PRINTED IN THE UNITED STATES OF AMERICA. ALL RIGHTS RESERVED. THIS BOOK OR PARTS THEREOF MAY NOT BE REPRODUCED IN ANY FORM WITHOUT THE WRITTEN PERMISSION OF THE PUBLISHERS.

Lit No. TS002, Rev. 7/95

Millipore is a registered trademark of Millipore Corporation or an affiliated company.

EnviroGard is a trademark of Millipore Corporation or an affiliated company.

All other trademarks are trademarks of their respective manufacturers.

# EnviroGard PCB in Soil Test Kit

## Introduction

This document describes how to use the EnviroGard Polychlorinated Biphenyl (PCB) Test Kit. It contains details on:

- Purpose of the kit
- Products and materials you need to perform the test
- Test procedures
- Interpretation of results

**CAUTION:** Store all test components at 4°C to 8°C (39°F to 46°F) on arrival and when not in use to ensure the stability of the kit chemicals. Do not freeze.

## What is the EnviroGard PCB Test Kit?

This kit is an enzyme immunoassay that enables you to perform reliable, rapid testing for PCBs in soil at specified action levels. PCB was originally sold under the trade name Aroclor. This test can detect Aroclors 1016, 1242, 1248, 1254, and 1260. If you want to perform an actual quantification of PCBs, you must know the contaminating Aroclor and the assay must be standardized using that Aroclor. This kit is standardized using Aroclor 1248.

- ▲ **WARNING:** The kit contains a chemical known to the state of California to cause cancer, birth defects, or other reproductive harm. For details, call your local Millipore office to order Material Safety Data Sheet (MSDS) documents P34207, P34210, P34782, or P70002.

## What Does It Do?

The EnviroGard PCB Test Kit enables you to:

- Perform a semi-quantitative test of soil samples for PCBs at the specified action levels of 1, 5, 10, and 50 parts per million (ppm)
- Screen for PCBs with 95% confidence of no false negatives at the specified action level

Use this test to determine the extent of PCB contamination on-site or to monitor clean-up procedures. To run a test, you need the EnviroGard PCB Test Kit, the Soil Extraction Bottle Kit, the equipment contained in the Soil Field Lab, methanol, and water. The test procedure requires that you collect a 5 gram (g) soil sample and extract the PCBs from it using methanol. The soil extract is then ready for analysis. To initiate the PCB test, you add the PCB-enzyme conjugate to the antibody-coated test tubes. Then add the sample or calibrators. After a 15 minute incubation, you decant and rinse the tubes. You then add the color developing solution (substrate) and incubate for five minutes. (The test tube contents should turn blue.) Color development is inversely related to the PCB concentration as shown in this chart:

Color as Compared to a Calibrator	Equals...
Darker	Less PCB than the calibrator
Lighter	More PCB than the calibrator

To measure the absorbance of each tube, you need to use a photometer. This enables you to quantitatively determine and compare the amount of color in a sample or calibrator control. For example, if the soil sample generates a signal greater than the 50 ppm assay calibrator, the soil sample has a 95 percent probability of containing less PCB than the assay calibrator.

**NOTE:** You should confirm positive results with standard methods. If you want to screen soil samples at other action levels, or you require alternative Aroclor standards, contact your local Millipore office. See "Technical Assistance" for phone listings.

## Checklist of EnviroGard Products and Materials You Need

To perform the PCB test, you need to have purchased particular EnviroGard products. You also need to supply certain materials (some required, some recommended). Review this list before going to the test site to make sure you have all the supplies you need.

Kit or Part	Yes	No
EnviroGard PCB Test Kit (ENVR 000 09 or ENVR 0NC 09)—Store at 4°C to 8°C (39°F to 46°F). Do not freeze. Also, check the expiration date of the kit. If expired, do not use it or your results will be invalid. <b>▲ WARNING:</b> The stop solution in the kit is hydrochloric acid. Do not let it come in contact with your skin or eyes.		
EnviroGard Soil Extraction Bottle Kit (ENSP 000 30)		
EnviroGard Soil Field Lab (ENVR L00 09) <b>CAUTION:</b> Make sure the portable balance works and has fresh batteries so you can weigh out the soil sample.		
Methanol (100 milliliter [mL])*		
Tap or distilled water (at least 500 mL)*		
Differential photometer* <b>CAUTION:</b> Make sure the photometer battery is properly charged in case you run the test in an area without a power supply.		
Marker with water-resistant ink**		
Lab coat, gloves, and goggles**		
Absorbent paper (paper towels)**		
Liquid and solid waste containers**		
* Required equipment you supply (You can order the methanol and differential photometer from Millipore. See "Ordering Information" near the back of this booklet.) ** Recommended equipment you supply		

## How to Perform the PCB in Soil Test

Once you have the necessary equipment, you can run the test to detect the range of PCBs in your sample. To do this, you need to complete a number of tasks. This chart overviews the testing process:

Step	Action
1	Collect the soil sample and extract the PCBs from it.
2	Organize your work area.
3	Run the PCB test. This consists of adding specified amounts of the conjugate, negative control, calibrators, and soil extract (sample) to test tubes. You then mix and incubate. Rinse out the tubes with water and add the substrate. Incubate and observe color development.
4	Stop color development and measure the absorbance using a photometer.
5	Interpret the results.

See the following sections to complete the tasks in the order shown.

### Collect the Soil and Extract the Sample

If you have not collected the soil and extracted the sample yet, see the *EnviroGard Soil Extraction Bottle Kit* insert. It describes how to collect the soil and extract the sample for the test.

- ▲ **WARNING:** Treat PCBs, solutions that contain PCBs, and potentially contaminated soil samples as hazardous materials. (Wear gloves and protective clothing.) If appropriate, obtain permits pertaining to the handling, analysis, and transport of PCB containing materials.

In addition, you need to consider the following conditions to ensure accurate results:

Soil Sample Testing Considerations
Use 5 mL of methanol to extract the PCBs from a 5 g soil sample.
The distribution of PCBs in different soils can be heterogeneous. You should thoroughly mix (homogenize) the soil samples before analysis to ensure reliable results. Split samples should always come from the same homogenate.
Clay soil samples may require additional methanol to extract the sample as described in the <i>EnviroGard Soil Extraction Bottle Kit</i> insert. (You also need to factor the dilution into your final calculations. See "Interpret the Photometer Readings" in this document for details.)
Soil samples containing >30% water may affect the efficiency of the extraction step. If you suspect the water content is greater than this, you should dry the sample through evaporation or by mixing it with sodium sulfate. Samples dried with sodium sulfate may require additional methanol to extract the sample as described in the previous consideration. (See the <i>EnviroGard Soil Extraction Bottle Kit</i> insert for details.)
Soil samples containing very high levels of petroleum fuels or transformer oil may affect results. If a sample has a very high concentration of fuel or oil, you see a cloudy suspension when you add the sample extract to the test tubes as described in step 2 of the "Run the PCB Test" section. If you see a cloudy suspension, the results may be invalid. Soil samples with up to 5% by weight of transformer oil and diesel fuel have been tested with no adverse affect on assay performance.

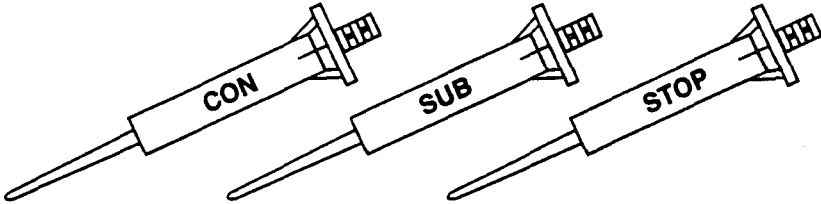
Once you extract the sample, see the next section to organize the work area and run the test.

**Organize the Work Area**

<b>Step</b>	<b>Action</b>
1	<p>Remove the plastic work station tray from the EnviroGard Field Lab suitcase. Then unpack these items from the lower compartment:</p> <ul style="list-style-type: none"><li>■ Photometer (if you supplied or ordered one)</li><li>■ Charger (if necessary)</li><li>■ Repeater™ pipette</li><li>■ Positive displacement pipette</li><li>■ Timer</li><li>■ Wash bottle (500 mL)</li></ul> <p>NOTE: The suitcase contains instructions for each packed component.</p>
2	<p>Place the work station tray back into the suitcase and secure it; you can use this as your work surface. Then remove these items from the upper compartment:</p> <ul style="list-style-type: none"><li>■ 12.5 mL Repeater pipette tips (3)</li><li>■ Repeater pipette tip labels</li><li>■ 6-place test tube rack(s)</li></ul> <p>NOTE: Use the 20-place, cardboard test tube holder in the PCB Test Kit when you are working with more than six tubes at a time.</p>

*Continued*

Organize the Work Area, Continued

Step	Action
<p>3</p>	<p>Place the test tube rack on your work surface. Then label the Repeater pipette tips as follows:</p> <ul style="list-style-type: none"> <li>■ One 12.5 mL tip with the "CON" label for PCB-enzyme conjugate</li> <li>■ One 12.5 mL tip with the "SUB" label for chromogenic substrate</li> <li>■ One 12.5 mL tip with the "STOP" label for stop solution</li> </ul> <div style="text-align: center;">  </div> <p><b>CAUTION:</b> When done, do not throw out the labeled tips. Thoroughly rinse them in clean water (especially the CON tip) before placing them back in the Field Lab case. (The case has individual slots for each tip.) The labeled Repeater pipette tips help you identify the tip you used to dispense a particular reagent. By using the same tip for the same reagent each time you run the test, you can avoid cross contamination.</p>
<p>4</p>	<p>Remove the reagent bottles from the EnviroGard PCB Test Kit packing. Then remove the calibrators and negative control from their protective, sealed containers.</p> <p><b>NOTE:</b> This document reflects the use of all four calibrators and the negative control in the steps to provide a complete overview. Always use the negative control. But only select the relevant calibrators for your action level.</p> <p>Let the reagents warm to an ambient temperature of 18°C to 27°C (64°F to 81°F). This usually takes at least 30 minutes. Also locate your vials of samples that you extracted with the EnviroGard Soil Extraction Bottle Kit.</p> <p><b>CAUTION:</b> Do not expose the substrate to direct sunlight to ensure its stability.</p>

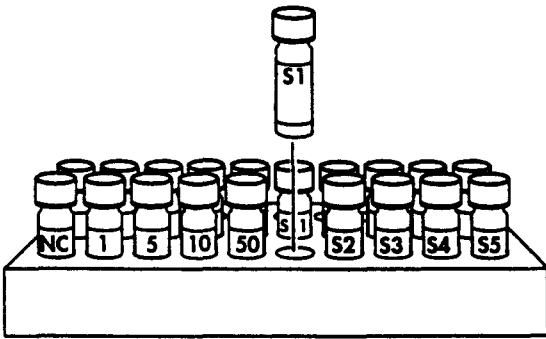
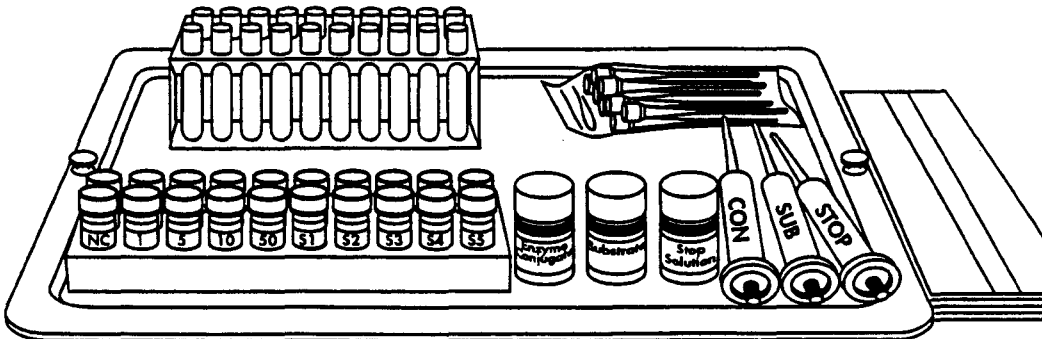
Continued

## Organize the Work Area, Continued

Step	Action																
5	<p data-bbox="305 535 1329 630">Remove the yellow (1 to 25 microliter [<math>\mu</math>L]) positive displacement pipette tips from the EnviroGard PCB Test Kit. Then remove up to 20 of the antibody-coated test tubes from the kit and label them as described in this chart:</p> <table border="1" data-bbox="310 661 1214 1197"> <thead> <tr> <th data-bbox="310 661 647 730">Tube Label</th> <th data-bbox="647 661 1214 730">Indicates ...</th> </tr> </thead> <tbody> <tr> <td data-bbox="310 730 647 787">NC</td> <td data-bbox="647 730 1214 787">Negative Control</td> </tr> <tr> <td data-bbox="310 787 647 844">1 ppm</td> <td data-bbox="647 787 1214 844">1 ppm PCB calibrator*</td> </tr> <tr> <td data-bbox="310 844 647 900">5 ppm</td> <td data-bbox="647 844 1214 900">5 ppm PCB calibrator*</td> </tr> <tr> <td data-bbox="310 900 647 957">10 ppm</td> <td data-bbox="647 900 1214 957">10 ppm PCB calibrator*</td> </tr> <tr> <td data-bbox="310 957 647 1014">50 ppm</td> <td data-bbox="647 957 1214 1014">50 ppm PCB calibrator*</td> </tr> <tr> <td data-bbox="310 1014 647 1071">S1</td> <td data-bbox="647 1014 1214 1071">Sample 1</td> </tr> <tr> <td data-bbox="310 1071 647 1127">S2</td> <td data-bbox="647 1071 1214 1127">Sample 2</td> </tr> </tbody> </table> <p data-bbox="322 1129 1156 1186">* The 1, 5, 10, and 50 ppm calibrators have actual concentrations of 0.5, 3, 5, and 22 ppm of Aroclor 1248, respectively.</p> <p data-bbox="310 1228 1280 1285"><b>NOTE:</b> You may not need to label your tubes exactly as shown in this step; it depends on your requirements. See the "NOTE" in step 4 for details.</p>	Tube Label	Indicates ...	NC	Negative Control	1 ppm	1 ppm PCB calibrator*	5 ppm	5 ppm PCB calibrator*	10 ppm	10 ppm PCB calibrator*	50 ppm	50 ppm PCB calibrator*	S1	Sample 1	S2	Sample 2
Tube Label	Indicates ...																
NC	Negative Control																
1 ppm	1 ppm PCB calibrator*																
5 ppm	5 ppm PCB calibrator*																
10 ppm	10 ppm PCB calibrator*																
50 ppm	50 ppm PCB calibrator*																
S1	Sample 1																
S2	Sample 2																
6	<p data-bbox="305 1312 1329 1375">Insert the labeled tubes into the rack by gently pressing them down from the top until secure.</p>																

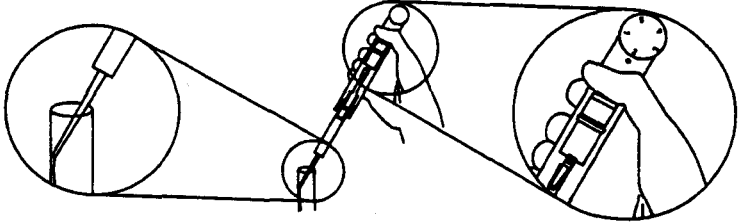
Continued

Organize the Work Area, Continued

Step	Action
7	<p>Unpack the foam workstation from the Field Lab. Use it to line up the sample extraction vials and calibrator solutions in the order you need to use them. For example:</p>  <p><b>CAUTION:</b> Do not mix reagents from test kits with different lot numbers.</p>
8	<p>Locate some paper towels (or absorbent material) and lay a few sheets out near your work surface. Your work area set up should look like this:</p> 
9	<p>Continue to the next section, "Run the PCB Test."</p>

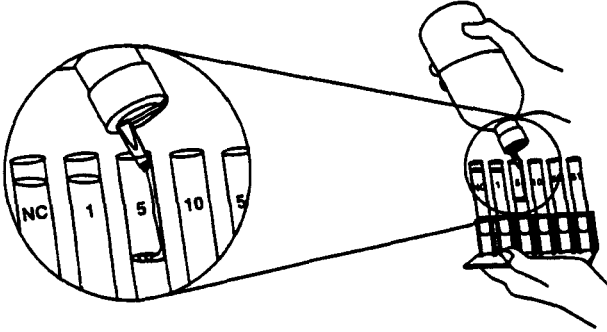
### Run the PCB Test

Once you have a soil sample ready and finish setting up your work area, follow these steps:

Step	Action
1	<p>Position the Repeater pipette setting to 2. Then attach the 12.5 mL Repeater tip marked "CON." Draw up enough volume to dispense 500 <math>\mu</math>L of enzyme conjugate into each tube. Dispense the first 500 <math>\mu</math>L back into the bottle labeled "Enzyme Conjugate" to remove bubbles. Then dispense 500 <math>\mu</math>L of the enzyme conjugate into each tube with the tip at an angle to prevent splash back. Return any unused conjugate to its bottle.</p>  <p><b>NOTE:</b> Do not throw out the tip; rinse it and save it for later use.</p>
2	<p>Attach a clean, yellow pipette tip to the Positive displacement pipette. Position the dial to 250. Dispense 25 <math>\mu</math>L of the negative control, calibrators, and sample reagents into the appropriate test tubes.</p> <p><b>CAUTION:</b> You must change the tips between reagents to avoid cross contamination. Discard tips into a suitable container. Also replace the calibrator vial caps immediately after use to minimize evaporation.</p>
3	<p>Shake the test tube rack thoroughly for five seconds to mix the contents. Then set the timer for 15 minutes and let the tubes incubate undisturbed.</p>

*Continued*

Run the PCB Test, Continued

Step	Action
4	<p>Empty the test tube contents into a sink or suitable container. Fill the tubes with cool tap or distilled water. Then empty them and shake out the remaining drops. Repeat the wash three times. Then invert the tubes and tap them on paper towels to remove excess water.</p> 
5	<p>Check that the Repeater pipette is set to 2. Attach the 12.5 mL pipette tip labeled "SUB." Then draw up enough volume to dispense 500 µL of the substrate into each tube. Dispense the first 500 µL back into the bottle labeled "Substrate" to remove bubbles. Then dispense 500 µL of the substrate into each tube with the tip at an angle to prevent splash back. Return any unused substrate to its bottle.</p>

*Continued*

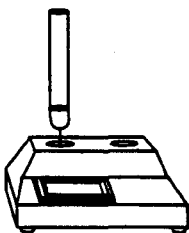
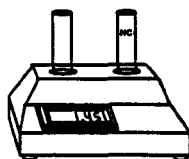
## Run the PCB Test, Continued

Step	Action
6	<p>Set the timer for five minutes and let the tubes incubate. During this time, you should see the tubes turn varying shades of blue, depending on the PCB concentration.</p> <p><b>CAUTION:</b> If a blue color does not develop in the "NC" test tube within five minutes after adding the substrate, the test is invalid and you must repeat it.</p> <p>As described at the beginning of this document, color is inversely related to the PCB concentration. If the color is darker than a calibrator, it indicates a lower PCB concentration. A color lighter than the calibrator indicates a higher PCB concentration.</p>
7	<p>Attach a clean 12.5 mL pipette tip labeled "STOP" to the Repeater pipette. With the pipette still set to 2, draw up enough volume to add 500 <math>\mu</math>L of stop solution to each test tube in the rack. Dispense the first 500 <math>\mu</math>L back into the bottle labeled "Stop Solution." Then add 500 <math>\mu</math>L of the stop solution into each tube with the tip at an angle to prevent splash back. You should see the tube contents turn yellow.</p> <p><b>▲ WARNING:</b> Do not spill the stop solution on your skin or clothing since it is an acid.</p>
8	<p>Read the tube contents with a photometer within 30 minutes after adding the stop solution. See the next section, "How to Interpret Results," for details.</p>

## How to Interpret Results

This section describes how to use the photometer and interpret results.

### Record Results Using a Photometer

Step	Action
1	Locate the photometer. Then attach a rinsed 12.5 mL pipette tip (labeled "STOP") to the Repeater pipette. Set the pipette to 4. Then add 1.0 mL of the stop solution or wash water to a new, empty test tube. (This is the photometer "blank" tube.)
2	Insert the blank tube into the left well of the photometer as shown: 
3	Dry the outside of each labeled tube with clean paper towel and place each tube (one by one) into the right well of the photometer as shown: 
4	Record the absorbance (optical density [OD]) reading of each tube. Then dispose the tube in an appropriate waste container.
5	See the following sections for details on interpreting results.

### Interpret the Photometer Readings

Samples with OD <sub>450</sub> Values...	Contain...	May Contain...
> OD of the 1 ppm PCB calibrator	Less than 1.0 ppm PCB	
≤ OD of the 1 ppm PCB calibrator		More than 1 ppm PCB
> OD of the 5 ppm PCB calibrator	Less than 5 ppm PCB	
≤ OD of the 5 ppm PCB calibrator		More than 5 ppm PCB
> OD of the 10 ppm PCB calibrator	Less than 10 ppm PCB	
≤ OD of the 10 ppm PCB calibrator		More than 10 ppm PCB
> OD of the 50 ppm PCB calibrator	Less than 50 ppm PCB	
≤ OD of the 50 ppm PCB calibrator		More than 50 ppm PCB

**NOTE:** If you extracted soil samples with more than 1.0 mL of methanol per gram of soil (for example, for clay samples), you need to multiply each of the calibrator concentrations by the ratio of the methanol (in milliliters) to soil (in grams). For example, if you extracted a 5.0 g soil sample with 10 mL of methanol, the ratio of methanol to soil is 2 (10 divided by 5). The calibrator levels used for analysis of this sample would represent 2 ppm (2 x 1), 10 ppm (2 x 5), 20 ppm (2 x 10), and 100 ppm (2 x 50).

### Possible Interfering Substances

The following substances were tested and found to have less than 0.5% weight-to-weight of the immunoreactivity of Aroclor 1248:

1, 2-dichlorobenzene  
 1,3-dichlorobenzene  
 1, 4-dichlorobenzene  
 1, 2, 4-trichlorobenzene  
 2, 4-dichlorophenol

2, 5-dichlorophenol  
 2, 4, 5-trichlorophenol  
 2, 4, 6-trichlorophenol  
 biphenyl  
 pentachlorophenol (PCP)

# MILLIPORE

## EnviroGard™ 2,4-D in Soil Test Kit

### ENVR 000 23

For qualitative or semi-quantitative field analysis of 2,4-Dichlorophenoxy Acetic Acid (2,4-D) in soil.

### Intended Use

The EnviroGard 2,4-D in Soil Test Kit is a qualitative (yes/no) or semi-quantitative field test for the detection of 2,4-D in soil. With the EnviroGard 2,4-D in Soil Test Kit, you can read test results visually or perform a semi-quantitative analysis using a photometer.

### Test Principles

The EnviroGard 2,4-D in Soil Test Kit is based on the use of polyclonal antibodies that bind either 2,4-D or 2,4-D-Enzyme Conjugate. These antibodies are immobilized to the walls of the test tubes. When 2,4-D is present in the sample, it competes with the 2,4-D-Enzyme Conjugate for a limited number of antibody binding sites.

- A sample containing 2,4-D is added to a test tube, followed by 2,4-D-Enzyme Conjugate. The 2,4-D-Enzyme Conjugate competes with the 2,4-D for the antibody binding sites.
- After the incubation, the unbound molecules are washed away.
- A clear solution of chromogenic Substrate is then added to the test tube. In the presence of bound 2,4-D-Enzyme Conjugate, the clear Substrate is converted to a blue color. One enzyme molecule can convert many Substrate molecules.

Since there are the same number of antibody binding sites on every test tube and each test tube receives the same number of 2,4-D-Enzyme Conjugate molecules, a sample that contains a low concentration of 2,4-D allows the antibody to bind many 2,4-D-Enzyme Conjugate molecules.

Therefore, a low concentration of 2,4-D produces a dark blue solution. Conversely, a high concentration of 2,4-D allows fewer 2,4-D-Enzyme Conjugate molecules to be bound by the antibodies resulting in a lighter blue solution.

**NOTE:** Color is inversely proportional to 2,4-D concentration.

**Darker color = Lower concentration**  
**Lighter color = Higher concentration**

The determination of 2,4-D level in an unknown sample is interpreted relative to the assay calibrator levels using visual comparison or by reading with a spectrophotometer.

### Performance Characteristics

The EnviroGard 2,4-D in Soil Test Kit will not differentiate between 2,4-D and other closely related compounds, but will detect their presence to differing degrees. The following table shows a number of compounds and the approximate concentration of each required to yield a positive result. Concentration is in parts per million (ppm).

Compound	Concentration Required for Positive Interpretation
2,4-D Acid	0.2
2,4-D butyl ester	0.05
2,4-D Dichlorophenol	3.0
2,4-D isobutyl ester	0.4
2,4-D isopropyl ester	0.4
2,4-D methyl ester	0.2
2,4-DB	0.4
2,4-DB butyl ester	1.8
Dichloroprop	12
Diclofop	85
MCPA	1.6
2,4,5-T acid	14

### Precautions

- Treat 2,4-D, solutions that contain 2,4-D and potentially contaminated soil samples as hazardous materials.
- Use gloves, proper protective clothing, and means to contain and handle hazardous material where appropriate.
- Store all test kit components at 4°C to 8°C (39°F to 46°F) when not in use. Storage at ambient temperature (18°C to 27°C or 64°F to 81°F) on the day of use is acceptable.
- Do not freeze test kit components or expose them to temperatures greater than 37°C (99°F).
- Allow all reagents to reach ambient temperature (18°C to 27°C or 64°F to 81°F) before beginning the test. They require at least 30 minutes to warm from recommended storage conditions.
- If precipitate forms in soil extract, centrifuge or filter prior to analysis.
- Soil extracts must be analyzed within 24 hours after extraction.

- Do not use test kit components after the expiration date.
- Do not use reagents or test tubes from one test kit with reagents or test tubes from a different test kit.
- Use approved methodologies to confirm any positive results.
- Do not expose **substrate** to **direct sunlight**
- Do not dilute or adulterate test reagents or use samples not called for in the test procedure; this may give inaccurate results.
- Tightly recap the 2,4-D calibrator vials to prevent evaporative loss.
- Distribution of 2,4-D in soils may be highly variable and can be minimized through a composite sampling technique. Adequate sample number and distribution is the responsibility of the analyst.

## Materials Provided

### EnviroGard 2,4-D in Soil Test Kit

This test kit contains the following items:

- 20 Antibody-Coated Test Tubes
- 1 PBS Tablet
- 1 vial of Negative Control
- 1 vial of 0.2 ppm 2,4-D Calibrator
- 1 vial of 1.0 ppm 2,4-D Calibrator
- 1 vial of 5.0 ppm 2,4-D Calibrator
- 1 vial of 2,4-D-Enzyme Conjugate
- 1 vial of Chromogenic Substrate
- 1 vial of Stop Solution
- 1 vial of Soil Extraction Solvent
- 22 Pipette Tips, yellow (for the Gilson M-25 Microman® Positive Displacement Pipettor)
- 22 Pipette Tips, pink (for the Gilson M-25 Microman® Positive Displacement Pipettor)
- 14 Polystyrene test tubes for soil extract dilutions.

## Materials Required and/or Ordered Separately

See "Ordering Information" for the appropriate catalogue numbers.

### Methanol

Methanol, ACS reagent grade, 70 milliliters (mL) is required for preparation of the Soil Extraction Solvent, but is not included in the EnviroGard Soil Extraction Bottle Kit. You must order it separately. (see "Ordering Information").

## Other

Milli-RO® or Milli-Q® water, or equivalent.

### EnviroGard Soil Extraction Bottle Kit

Use this kit (ENSP 000 30) for the extraction of 2,4-D from soil samples. [Previously, the Soil Extraction Kit (ENSP 000 20) was used.] The Soil Extraction Bottle Kit contains the following items to test 14 samples:

- 14 LDPE bottles with screw caps, 30 mL (each contains 3 stainless steel mixing beads)
- 14 Filtration caps, comprised of 14 Luer-tipped caps with frits and 14 Millex® filters
- 1 20 mL Syringe with attached bottle coupler
- 1 Extra syringe-to-bottle coupler
- 18 wooden spatulas
- 14 Screw top glass storage vials, 4 mL
- 18 weigh boats
- 14 Luer plugs

### EnviroGard Soil Field Lab

(Starter Accessory Kit)

This kit contains the following items:

- 1 Gilson M-25 Microman Positive Displacement Pipettor, adjustable (2-250 microliters (µL))
- 1 Eppendorf™ Repeater® Pipettor
- 1 Electronic timer
- 6 Polystyrene test tubes, 12 mm x 75 mm (for blanking spectrophotometer and dilutions)
- 1 Portable balance with a 100 gram (g) calibrator weight
- 1 Wash bottle, 500 mL
- 4 Six-position test tube racks
- 3 5.0 mL Combitips® for the Repeater pipettor (for 0.1 mL to 0.5 mL dispensing volumes)
- 6 12.5 mL Combitips® for the Repeater pipettor (for 0.25 mL to 1.250 mL dispensing volumes)
- 1 50.0 mL Combitips® for the Repeater pipettor (for 1.0 mL to 5.0 mL dispensing volumes)
- 1 125 mL large mouth bottle
- 2 work stations
- 1 Soil extraction rack

**NOTE:** Order replacement pipettors and tips separately. See "Ordering Information" section.

## Materials Suggested but Not Required

- Protective clothing (e.g. latex gloves)
- Absorbent paper for blotting test tubes
- Liquid and solid waste containers
- Calculator

## Suggestions for Pipettor Use

1. Practice using both pipettors (positive displacement and Repeater pipettor) with water and extra tips before you analyze your samples.
2. Use a different tip each time you change reagents when using the Repeater pipettor to avoid reagent cross-contamination. Label two, 12.5 mL tips "Substrate" and "Stop," and one 5.0 mL tip "Conjugate".
3. Draw the desired reagent volume into the Repeater pipettor and dispense one portion of the reagent back into the container to properly engage the ratchet mechanism. If you do not do this, the first volume delivered may be inaccurate.
4. To add reagents using the Repeater pipettor, pipette down the side of the tube just below the rim. Hold pipettor at an angle to the test tube to minimize splash back.
5. To add samples and calibrators using the positive displacement pipettor, pipette directly into the bottom of the test tube.
6. The carryover volume of the positive displacement tips is minimal, but may affect results if you are going from a high to low 2,4-D concentration. Use a new pipettor tip each time you pipette a new sample or calibrator.

## Assay Procedure

### Prepare the Sample Diluent

1. Add the PBS tablet to 25 mls of Milli-Q or Milli-RO water or equivalent water. Mix until dissolved.

### Prepare the Soil Extraction Solvent

1. Add methanol to the Soil Extraction Solvent vial. Fill the vial with methanol up to the neck of the vial. Cap tightly and shake.

## Collect/Store the Sample

1. Collect soil in the appropriately-sized and labeled containers.
2. Take care to remove excess twigs, organic matter and rocks or pebbles from the sample. For best results, wet soils should be air-dried overnight and thoroughly mixed before testing.
3. Store soil samples at 4°C (39°F)

## Prepare the Sample/Extract the Soil

1. Please follow the instructions from the EnviroGard Soil Extraction Bottle Kit to prepare the soil extract before the assay.
2. **5 mL of soil extraction solvent** will be used to extract 2,4-D residue from a 5 gram soil sample. As per instructions, attach a **50 mL** Combitip to the Repeater pipettor and set the dial to 5. Deliver once to add **5 mL of soil extraction solvent** to the extraction vial, and cap tightly.
3. Shake vial for 2 minutes, then allow extract to incubate **overnight (>16 hours)**. After overnight incubation, proceed with soil extraction instructions in the EnviroGard Soil Extraction Bottle Kit.

**NOTE:** When extracting clay samples, the sample may soak up all of the soil extraction solvent, leaving little or no excess liquid to decant. You should add an additional 5.0 mL of extraction solvent to the sample and shake vigorously for an additional 15 minutes. Make sure to factor the dilution into the calculations. See the "Results Interpretation" section.

## Dilute the Extracts

1. Label the sample dilution test tubes or arrange in rack corresponding to the samples to be run.
2. Pipet 1.0 mL of the sample diluent into each sample dilution test tube.
3. Attach a clean yellow pipette tip to the positive displacement pipet and adjust the dial to "100" to pipet 10 µL. Remove 10 µL of the soil extract from the extract vial, and dispense into the sample dilution test tube and mix.

## Perform the Test

**NOTE:** Allow all reagents and sample extracts to come to ambient temperature (approximately 30-60 minutes) before use. Do not run more than 20 tubes per assay.

Remove the antibody coated test tubes from the plastic bag and label them as follows:

<u>Tube Label</u>	<u>Tube Contents</u>
NC	Negative Control
C1	0.2 ppm Calibrator
C2	1.0 ppm Calibrator
C3	5.0 ppm Calibrator
S1	Sample 1
S2	Sample 2
S3	Sample 3

You do not have to perform the assay in duplicate; however, doing so increases the precision of the test.

1. Place the test tubes in the test tube rack. Push down on each tube so that it is held firmly and does not fall out of the rack when shaken.

**CAUTION:** Do not "snap" the test tubes into the rack as this may result in a cracked tube.

2. Attach a clean pink pipette tip to the Microman pipettor and adjust the dial to **200**. Add 200  $\mu$ L of each calibrator (including Negative Control) to the corresponding marked test tube by placing the end of the pipette tip directly into the bottom of the test tube and dispensing the volume.

**CAUTION:** Replace the caps on the calibrator vials immediately after use to minimize evaporation.

3. Using a clean pipette tip for each diluted sample, add 200  $\mu$ L of each diluted sample extract to the appropriately-labeled test tube(s).
4. Attach the **5.0 mL** Combitip labeled "Conjugate" to the Repeater pipettor and set the dial to **2**. Add 200  $\mu$ L of 2,4-D-Enzyme Conjugate to each test tube.
5. Shake the test tube rack for 10 seconds. Then leave the test tubes undisturbed for 20 minutes.
6. Vigorously shake out the test tube contents into a sink or suitable container. Fill the test tubes to the top with water then decant and vigorously shake out the remaining water.

Repeat this wash step four more times, being certain to shake out as much water as possible on each wash. After the final wash, remove as much water as possible by tapping the inverted tubes on absorbent paper.

7. Attach the **12.5 mL** Combitip labeled "Substrate" to the Repeater pipettor and set the dial to **2**. Add 500  $\mu$ L of Substrate to each test tube. Then leave the test tubes undisturbed for 10 minutes.

**NOTE:** If a blue color does not develop in the Negative Control test tube within 10 minutes after adding the Substrate, the test is invalid and you must repeat it.

## Interpret the Results

You can either interpret the results visually within 10 minutes after adding the Substrate to each test tube, or you can perform a more precise analysis with a photometer after you add the Stop Solution.

### Visual Interpretation

After you add the Substrate, wait 10 minutes then mix the test tubes by shaking them for a few seconds until they are a uniform blue color. Compare the sample test tube to the calibrator test tubes against a white background. The test tube rack in the kit is well-suited for this purpose.

- If a sample test tube contains more color than the calibrator test tube, the sample may contain 2,4-D at a concentration lower than the calibrator.
- If a sample test tube contains less color than the calibrator test tube, the sample contains 2,4-D at a concentration greater than the calibrator.
- If the sample test tube contains color that is between the calibrator test tubes, the sample contains 2,4-D at a concentration between the calibrator concentrations.
- If a sample test tube contains approximately the same amount of color as the calibrator test tube, the sample contains 2,4-D at a concentration approximately equal to the calibrator.
- If the sample test tube contains less color than the 5.0 ppm Calibrator test tube, dilute a fraction of the **diluted soil extract** in the sample diluent (for example, 1:100) and perform the assay again. To determine the concentration of the **diluted** extract multiply the result by the dilution factor (e. g. 100).

### Photometric Interpretation

After you add the Substrate, wait 10 minutes then add the Stop Solution to each test tube.

**WARNING:** Stop solution is 1.0 N hydrochloric acid. Handle carefully.

Attach the **12.5 mL** Combitip labeled "Stop" to the Repeater pipettor and set the dial to **2**. Add 500  $\mu$ L of Stop Solution to each test tube. This converts the blue color in the tubes to yellow.

**NOTE:** Results should be read within 30 minutes after addition of Stop Solution.

**Millipore Differential Photometer**

1. Place a water blank test tube containing 1.5 mL of Milli-RO or Milli-Q water, or equivalent in the left (reference) well.
2. Place the Negative Control test tube into the right (sample) well. Record the optical density (OD) of the Negative Control
3. Remove the Negative Control test tube and replace it with the 0.2 ppm Calibrator test tube to reactivate the photometer. Record the result. Repeat this step to determine the OD for the remaining calibrators and for each sample.

**Semi-quantitative Interpretation**

Compare the OD of each sample to the OD of each calibrator:

**Ordering Information**

The following table lists descriptions and catalogue numbers for the EnviroGard 2,4-D in Soil Test Kit and related products.

Description	Catalogue Number
EnviroGard 2,4-D in Soil Test Kit	ENVR 000 23
EnviroGard Soil Extraction Bottle Kit	ENSP 000 30
Methanol for soil extraction, 100 mL bottle	ELCR 000 07
EnviroGard Soil Field Lab includes: <ul style="list-style-type: none"> <li>• 1 Portable balance with a 100 gram calibrator weight</li> <li>• 1 Eppendorf Repeater pipettor</li> <li>• 3 5.0 mL Pipette tips for the Repeater pipettor, (for 0.1 mL to 0.5 mL dispensing volumes)</li> <li>• 6 12.5 mL Pipette tips for the Repeater pipettor, (for 0.25 mL to 1.25 mL dispensing volumes)</li> <li>• 1 50 mL Pipette tip for the Repeater pipettor (for 1.0 mL to 5.0 mL dispensing volumes)</li> <li>• 1 Positive displacement precision pipettor, adjustable (2-250 µL)</li> <li>• 1 Electronic timer</li> <li>• 6 Polystyrene test tubes, 12 mm X 75 mm (for blanking the spectrophotometer and dilutions)</li> <li>• 4 Test tube racks, six-position</li> <li>• 1 Wash bottle, 500 mL</li> <li>• 1 125 mL large mouth bottle</li> <li>• 2 Assay work stations</li> <li>• 1 Soil extraction bottle rack</li> </ul>	ENVR L00 09
Millipore Differential Photometer: <ul style="list-style-type: none"> <li>• 115 volt (V), or</li> <li>• 230 V</li> </ul>	ENVR 000 00 ENVR 002 30
EnviroGard Replacement Pipettor Tips (available separately): <ul style="list-style-type: none"> <li>• Positive displacement pipettor tips, 1.0- 25 µL, 200/pk</li> <li>• Positive displacement pipettor tips, 50- 250 µL 200/pk</li> <li>• Eppendorf Repeater Pipettor Replacement Pack:                             <ul style="list-style-type: none"> <li>3 5.0 mL pipette tips</li> <li>6 12.5 mL pipette tips</li> <li>1 50.0 mL pipette tip</li> </ul> </li> </ul> Also includes 6 polystyrene test tubes for photometer blanking	ENVR L04 09 ENVR L07 09 ENVR LRP 09

- If a sample OD is between 90% and 110% of a calibrator OD, the sample contains 2,4-D at a concentration approximately equal to the calibrator.
- If a sample OD is greater than 110% of a calibrator OD, the sample contains less 2,4-D than the calibrator.
- If a sample OD is less than 90% of a calibrator OD, the sample contains more 2,4-D than the calibrator.
- If the sample test tube contains less color than the 5.0 ppm Calibrator test tube, dilute a fraction of the **diluted** soil extract in the sample diluent (for example, 1:100) and perform the assay again. To determine the concentration of the diluted extract multiply the result by the dilution factor.

## Technical Assistance

For additional information about Millipore products, call the Millipore office nearest you.

### Millipore Worldwide:

#### Australia

A•C•N: (001) 239-818  
Toll Free (008) 222-111  
In Sydney Area (02) 428-7333

#### Austria, Central Europe, C.I.S., Africa, Middle-East, and Gulf

In Austria: (43) 1-877-8926

#### Baltic Republics

In Finland: (90) 801 90 77

#### Belgium and Luxembourg

(02) 242-17-40

#### Brazil

Tel. (011) 548-7011

#### Canada

Toll Free 1-800-268-4881  
In Toronto Area: 416-678-2161

#### China, People's Republic of

Beijing: (86) 1-5135114  
Guangzhou: (86) 20-686217  
Shanghai: (86) 21-3203856

#### Czech Republic

Tel. (42) 2-35-02-27  
(42) 2-35-23-75

#### Denmark

Tel. (46) 59-00-23

#### Finland

Tel. (90) 8045110

#### France

Tel. (1) 30-12-70-00

#### Germany

Tel. (06196) 494-0

#### Hong Kong

Tel. (852) 803-9111

#### Hungary

Tel. (36) 11-66-86-74

#### India

Bangalore: Tel. (812) 394657

#### Italy

Milano: (02) 25078-1  
Roma: (06) 5203600  
Padova: (049) 8803720

#### Japan

Tel. (03) 3474-9111

#### Korea

Tel. (82-2) 5548305

#### Malaysia

Tel. (60) 3-7571322

#### Mexico

Tel. (525) 576-96-88

#### The Netherlands

Tel. (01608) 22000

#### Norway

Tel. 472- 267-82-53

#### Poland

Tel. (48) 2-669-12-25  
(48) 2-663-70-31

#### Puerto Rico

Tel. (809) 747-8444

#### Singapore

Tel. (65) 253-2733

#### Spain

Madrid: 91-729-03-00  
Barcelona: 93-325-96-16  
Sevilla: 95-425-68-77

#### Sweden

Sundbyberg: 08-628-69-60

#### Switzerland

Tel. (01) 945-3242

#### Taiwan

Tel. (886-2) 7001742

#### UK and Ireland

Tel. (0923) 816375

#### United States of America

Tel. Toll Free  
800-MILLIPORE (800-645-5476)  
In Puerto Rico: (809) 747-8444

#### In All Other Countries:

Millipore Intertech, U.S.A.  
397 Williams Street  
Marlborough, MA 01752-9162 U.S.A.  
Tel. (508) 624-8622 Fax (508) 624-8630

## General Limited Warranty

Millipore Corporation ("Millipore") warrants the products manufactured by it against defects in materials and workmanship when used in accordance with the applicable instructions for a period of one year from the date of shipment of the products or where applicable, for a period not to extend beyond a product's printed expiration date. **MILLIPORE MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED. THERE IS NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.** The warranty provided herein and the data, specifications and descriptions of Millipore products appearing in Millipore's published catalogues and product literature may not be altered except by express written agreement signed by an officer of Millipore. Representations, oral or written, which are inconsistent with this warranty or such publications are not authorized and if given, should not be relied upon.

In the event of a breach of the foregoing warranty, Millipore's sole obligation shall be to repair or replace, at its option, any product or part thereof that proves defective in materials or workmanship within the warranty period, provided the customer notifies Millipore promptly of any such defect. The exclusive remedy provided herein shall not be deemed to have failed of its essential purpose so long as Millipore is willing to repair or replace any nonconforming Millipore product or part. **Millipore shall not be liable for consequential, incidental, special or any other indirect damages resulting from economic loss or property damage sustained by a customer from the use of its products.** However, in some states the purchaser may have rights under state law in addition to those provided by this warranty.

## Safety

To receive complete safety information on this product, contact the nearest Millipore office and request Material Safety Data Sheet documents P34207, P34782, P70002, and P70008.

Copyright© 1993 Millipore Corporation

Millipore is a registered trademark of Millipore Corporation.

EnviroGard, Milli-Q, Milli-RO and Millex are trademarks of Millipore Corporation.

Combitip, Eppendorf and Repeater are trademarks of Eppendorf-Netheler-Hinz GmbH

Microman is a trademark of Gilson Medical Electronics

P35671 Rev.- 2/27/95

**Appendix B**  
**Laboratory Analysis Results**

service

laboratories

ltd.



## CHEMICAL ANALYSIS REPORT

---

**Date:** October 25, 1996

**ASL File No.** G5809

**Report On:** AES Waste - Soil Analysis

**Report To:** **W.J. Klassen & Associates Ltd.**  
PO Box 4896  
Whitehorse, YT  
Y1A 4N6


**Attention:** **Mr. Bill Klassen**

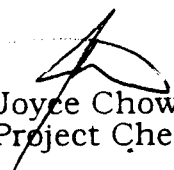
**Received:** October 7, 1996

---

**ASL ANALYTICAL SERVICE LABORATORIES LTD.**

per:

  
Joanne Patrick, B.Sc.  
Project Chemist

  
Joyce Chow, B.Sc.  
Project Chemist





**REMARKS**

File No. G5809

The detection limit for Polychlorinated Biphenyls was increased for the sample identified as "35-C-5-3" due to hydrocarbon interferences.



**RESULTS OF ANALYSIS - Sediment/Soil**

File No. G5809

	35-C-1-2	35-C-2-1	35-C-2-2	35-C-3-1	35-C-3-2
	96 09 13	96 09 13	96 09 13	96 09 13	96 09 13
<hr/>					
<b><u>Physical Tests</u></b>					
Moisture %	58.5	37.0	29.4	59.9	3.7
<b><u>Total Metals</u></b>					
Cadmium T-Cd	0.3	<0.1	<0.1	32.2	<0.1
Lead T-Pb	3	53	5	7	3
Mercury T-Hg	0.032	0.030	0.016	0.107	0.008
Zinc T-Zn	35.3	71.4	53.6	11600	50.7
<b><u>Polychlorinated Biphenyls</u></b>					
Total Polychlorinated Biphenyls	<0.05	<0.05	<0.05	<0.05	<0.05

---

Remarks regarding the analyses appear at the beginning of this report.  
 Results are expressed as milligrams per dry kilogram except where noted.  
 < = Less than the detection limit indicated.  
 EPH = Extractable Petroleum Hydrocarbons.



**RESULTS OF ANALYSIS - Sediment/Soil**

File No. G5809

	35-C-5-1	35-C-5-2	35-C-5-3	35-B-1	13-C-1
	96 09 13	96 09 13	96 09 13	96 09 13	96 09 18

---

**Physical Tests**

Moisture	%	68.9	30.5	13.8	56.8	21.6
----------	---	------	------	------	------	------

**Total Metals**

Cadmium	T-Cd	0.2	<0.1	-	0.3	0.3
Lead	T-Pb	4	6	-	4	10
Mercury	T-Hg	0.046	0.026	-	0.020	0.020
Zinc	T-Zn	37.5	64.2	-	97.2	52.1

**Polychlorinated Biphenyls**

Total Polychlorinated Biphenyls	<0.05	<0.05	<5	<0.05	<0.05
---------------------------------	-------	-------	----	-------	-------

**Extractables**

EPH (C10-18)	-	-	1120	-	-
EPH (C19-31)	-	-	95500	-	-
Oil and Grease	-	-	180000	-	-
Total Extr Hydrocarbons (C10-30)	-	-	74300	-	-

---

Remarks regarding the analyses appear at the beginning of this report.  
 Results are expressed as milligrams per dry kilogram except where noted.  
 < = Less than the detection limit indicated.  
 EPH = Extractable Petroleum Hydrocarbons.



**RESULTS OF ANALYSIS - Sediment/Soil**

File No. G5809

35-D-1	14-B-2-1	14-B-2-2	14-B-2-3
96 09 13	96 09 17	96 09 17	96 09 17

**Physical Tests**

Moisture	%	7.3	1.8	5.5	12.5
----------	---	-----	-----	-----	------

**Total Metals**

Cadmium	T-Cd	-	0.1	<0.1	26.4
Lead	T-Pb	-	6	4	4920
Mercury	T-Hg	-	0.020	0.012	0.073
Zinc	T-Zn	-	34.6	27.4	851

**Polychlorinated Biphenyls**

Total Polychlorinated Biphenyls	<0.05	<0.05	<0.05	-
---------------------------------	-------	-------	-------	---

**Extractables**

EPH (C10-18)	<250	313	4340	<250
EPH (C19-31)	11700	<250	<250	<250
Oil and Grease	7500	-	-	-
Total Extr Hydrocarbons (C10-30)	9890	306	3730	<40

Remarks regarding the analyses appear at the beginning of this report.  
 Results are expressed as milligrams per dry kilogram except where noted.  
 < = Less than the detection limit indicated.  
 EPH = Extractable Petroleum Hydrocarbons.



**Appendix 1 - QUALITY CONTROL - Replicates**

File No. G5809

Sediment/Soil	<b>13-C-1</b>	<b>13-C-1</b>
	96 09 18	QC # 74659

---

**Physical Tests**

Moisture	%	21.6	23.6
----------	---	------	------

**Total Metals**

Cadmium	T-Cd	0.3	0.3
Lead	T-Pb	10	12
Mercury	T-Hg	0.020	0.020
Zinc	T-Zn	52.1	44.5

**Polychlorinated Biphenyls**

Total Polychlorinated Biphenyls	<0.05	<0.05
---------------------------------	-------	-------

---

Remarks regarding the analyses appear at the beginning of this report.  
Results are expressed as milligrams per dry kilogram except where noted.  
< = Less than the detection limit indicated.  
EPH = Extractable Petroleum Hydrocarbons.



## **Appendix 2 - METHODOLOGY**

File No. G5809

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

### **Moisture**

This analysis is carried out gravimetrically by drying the sample to constant weight at 103 C.

### **Metals in Sediment/Soil**

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 Method 3050 or Method 3051, published by the United States Environmental Protection Agency (EPA). The procedures involve a digestion using a 1:1 ratio of nitric acid and hydrochloric acid, along with hotplate or microwave heating. Instrumental analysis is by atomic absorption spectrophotometry (EPA Method 7000) and/or inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010).

Method Limitation: The stated acid digestion will provide excellent results for total recoverable metals; however, it is only partially effective on mineralized or non-environmentally available metals.

### **Polychlorinated Biphenyls in Sediment**

This analysis is carried out using a procedure adapted from EPA Method 8082 (Publ. # SW-846 3rd ed., Washington, DC 20460). The procedure involves a solid-liquid extraction of the sample with hexane/acetone and back extraction with water. The hexane extract is cleaned and analysed by capillary column gas chromatography with electron capture detection.

### **Extractable Petroleum Hydrocarbons in Sediment/Soil**

This analysis is equivalent to British Columbia Ministry of Environment, Lands and Parks Method for "Extractable Petroleum Hydrocarbons in Soil by GC/FID", January 1996 but does not provide correction for Polycyclic Aromatic Hydrocarbons (PAHs). The procedure involves a hexane/acetone solvent extraction followed by analysis of the extract by capillary column gas chromatography with flame ionization detection.



**Oil and Grease in Sediment/Soil**

This analysis is carried out by extracting the sample with hexane. The extract thus produced is evaporated to dryness and the residue weighed to determine gravimetric oil and grease.

**Total Extractable Hydrocarbons in Sediment/Soil**

This analysis is carried out in accordance with U.S. EPA Method 3500/8015 (Publ. # SW-846 3rd ed., Washington, DC 20460). This procedure involves hexane/acetone extraction followed by analysis of the extract by capillary column gas chromatography with flame ionization detection.

**End of Report**

HYDROCARBON DISTRIBUTION REPORT

SAMPLE NAME: G5809 8

35-C-5-3

Sample acquired: OCT 15, 1996 05:40:52

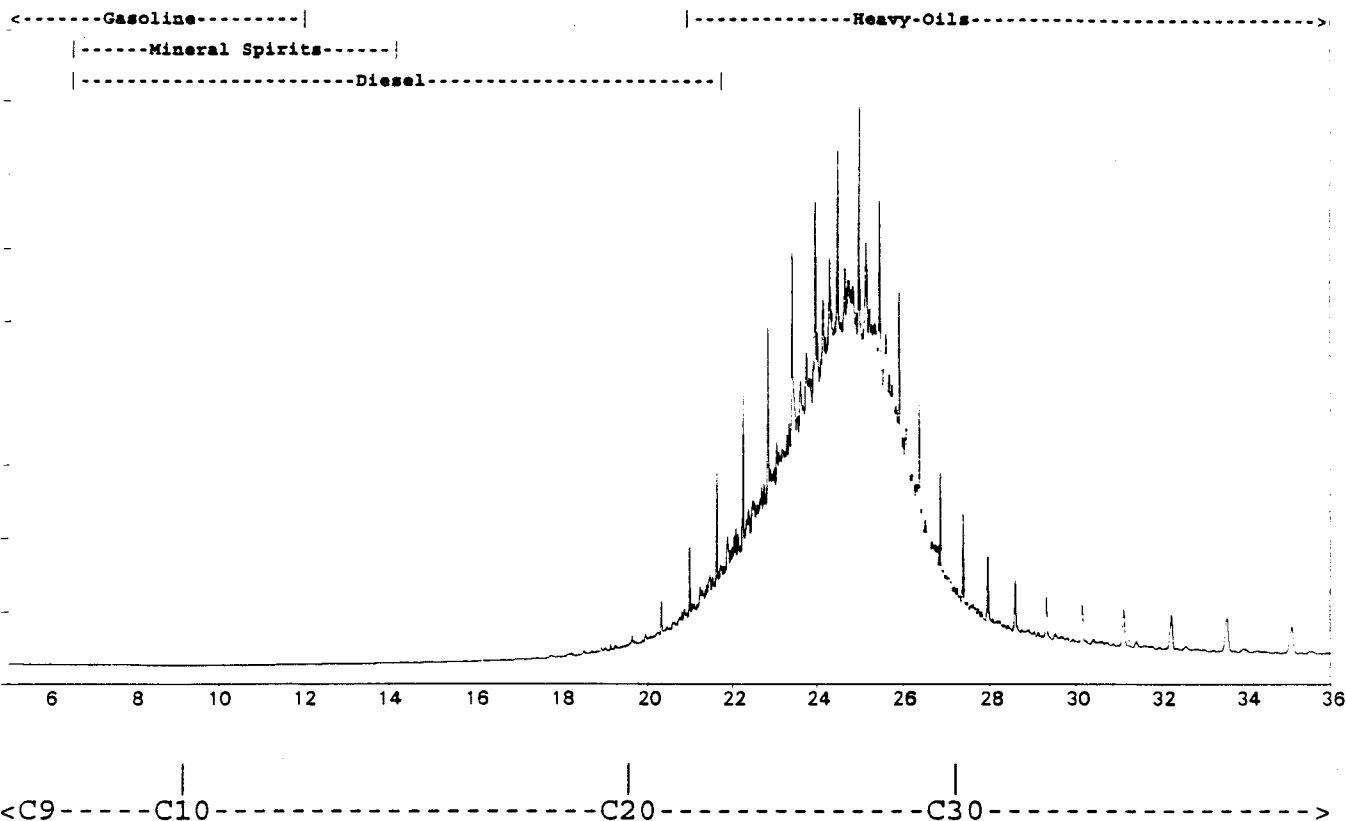
File Name: c:\TEH\TEHOCT14.51R , Sample Name: G5809 8

Sequence file: TEHOCT14

Response

(mV)

Time (min)



ASL Sample ID: G5809 8\* 160.0Dilution

HYDROCARBON RANGE (C#)	RELATIVE AMOUNT (%)
Less than Carbon 10 (<C10)	0.0
Carbon 10 to Carbon 20 (C10-C20)	2.9
Carbon 20 to Carbon 30 (C20-C30)	79.5
Greater than Carbon 30 (>C30)	17.6

The Hydrocarbon Distribution Report is intended to assist you in characterizing the hydrocarbon product present in a given sample. The scale at the top of the chromatographic trace represents the hydrocarbon range of common petroleum products. Comparison of this report with those of reference standards may also assist you in the identification of the hydrocarbon product detected in your sample. The second part of the report is a table that expresses the relative amount of hydrocarbon product present in the ranges specified.

# HYDROCARBON DISTRIBUTION REPORT

SAMPLE NAME: G5809 11

35-D-1

Sample acquired: OCT 15, 1996 04:53:56

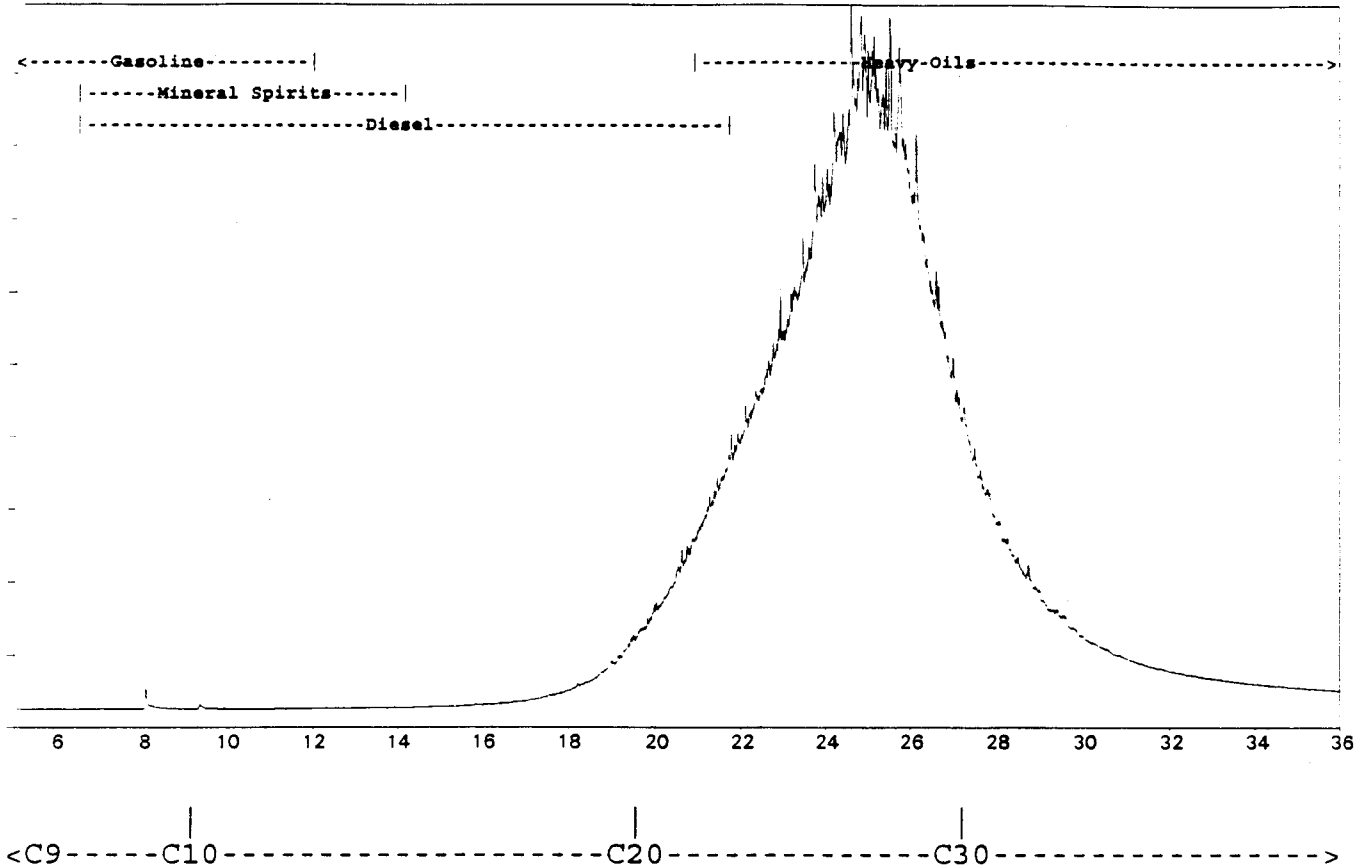
File Name: c:\TEH\TEHOCT14.50R , Sample Name: G5809 11

Sequence file: TEHOCT14

R  
e  
s  
p  
o  
n  
s  
e

(mV)

Time  
(min)



ASL Sample ID: G5809 11\*      16.0Dilution

HYDROCARBON RANGE (C#)	RELATIVE AMOUNT (%)
Less than Carbon 10 (<C10)	0.1
Carbon 10 to Carbon 20 (C10-C20)	4.4
Carbon 20 to Carbon 30 (C20-C30)	71.3
Greater than Carbon 30 (>C30)	24.3

The Hydrocarbon Distribution Report is intended to assist you in characterizing the hydrocarbon product present in a given sample. The scale at the top of the chromatographic trace represents the hydrocarbon range of common petroleum products. Comparison of this report with those of reference standards may also assist you in the identification of the hydrocarbon product detected in your sample. The second part of the report is a table that expresses the relative amount of hydrocarbon product present in the ranges specified.

# HYDROCARBON DISTRIBUTION REPORT

SAMPLE NAME: G5809 12

14-B-2-1

Sample acquired: OCT 15, 1996 03:20:42

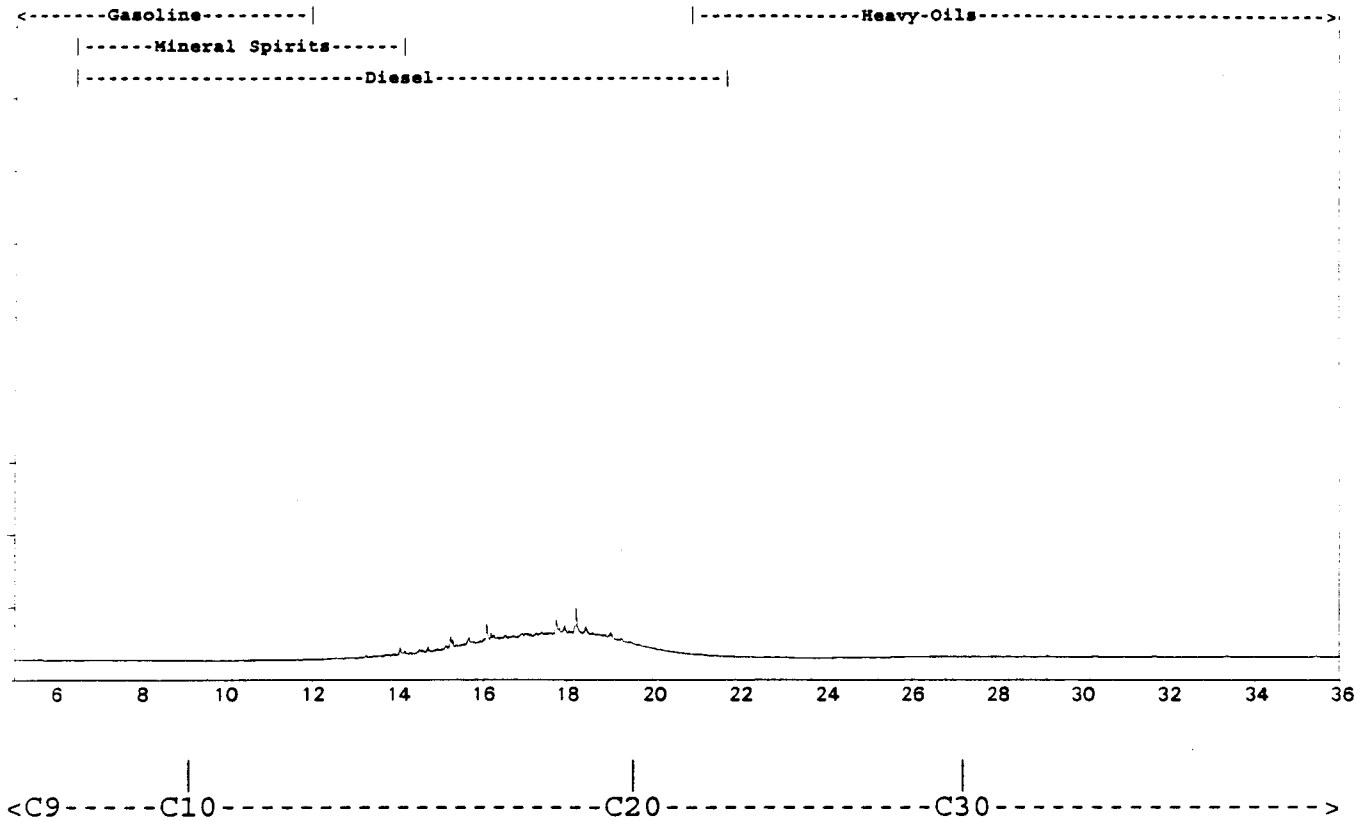
File Name: c:\TEH\TEHOCT14.45R , Sample Name: G5809 12

Sequence file: TEHOCT14

Response

(mV)

Time (min)



ASL Sample ID: G5809 12\*      8.0Dilution

HYDROCARBON RANGE (C#)	RELATIVE AMOUNT (%)
Less than Carbon 10 (<C10)	0.0
Carbon 10 to Carbon 20 (C10-C20)	94.6
Carbon 20 to Carbon 30 (C20-C30)	2.8
Greater than Carbon 30 (>C30)	2.7

The Hydrocarbon Distribution Report is intended to assist you in characterizing the hydrocarbon product present in a given sample. The scale at the top of the chromatographic trace represents the hydrocarbon range of common petroleum products. Comparison of this report with those of reference standards may also assist you in the identification of the hydrocarbon product detected in your sample. The second part of the report is a table that expresses the relative amount of hydrocarbon product present in the ranges specified.

# HYDROCARBON DISTRIBUTION REPORT

SAMPLE NAME: G5809 13

14-B-2-2

Sample acquired: OCT 15, 1996 03:20:42

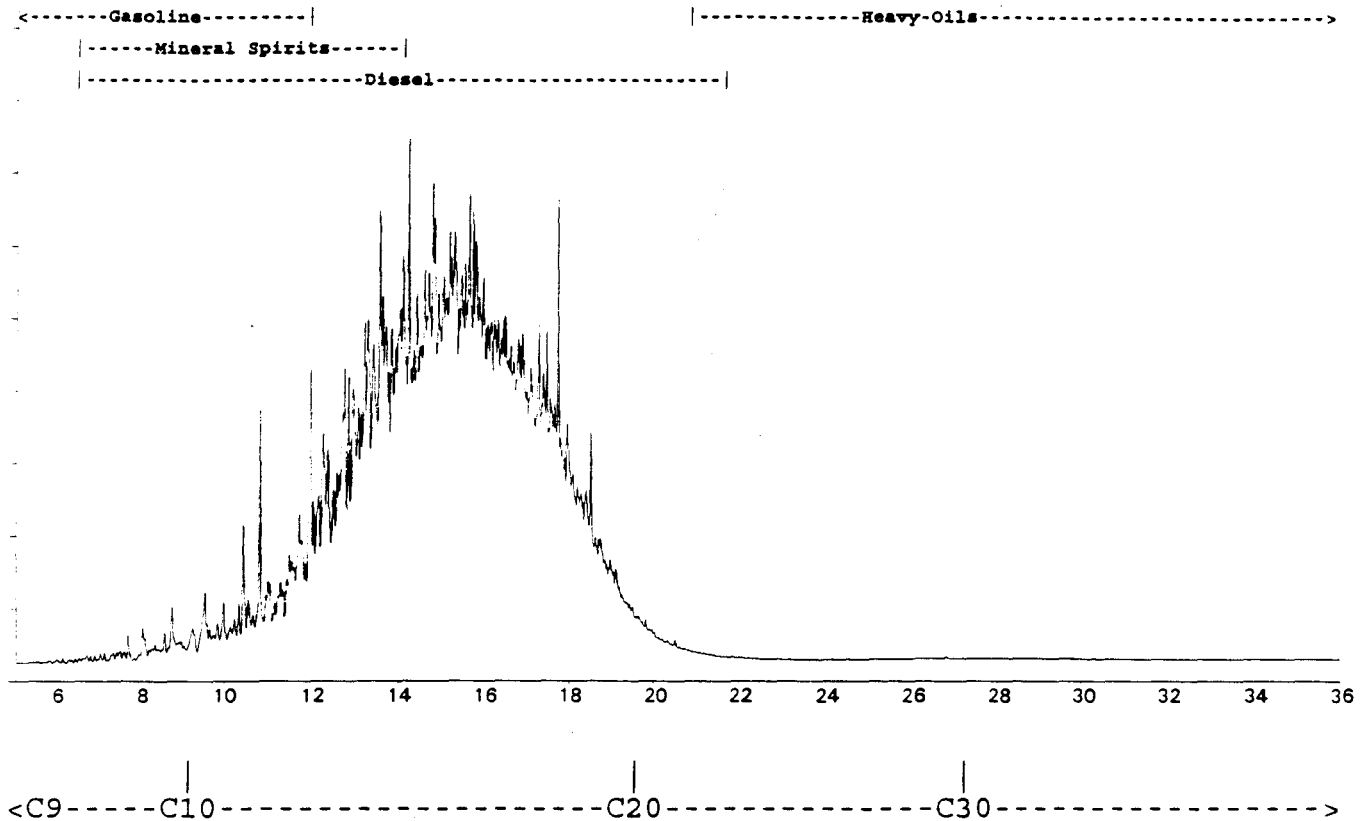
File Name: c:\TEH\TEHOCT14.46R , Sample Name: G5809 13

Sequence file: TEHOCT14

RESPONSE

(mV)

Time (min)



ASL Sample ID: G5809 13\*      8.0Dilution

HYDROCARBON RANGE (C#)	RELATIVE AMOUNT (%)
Less than Carbon 10 (<C10)	1.2
Carbon 10 to Carbon 20 (C10-C20)	98.4
Carbon 20 to Carbon 30 (C20-C30)	0.3
Greater than Carbon 30 (>C30)	0.1

The Hydrocarbon Distribution Report is intended to assist you in characterizing the hydrocarbon product present in a given sample. The scale at the top of the chromatographic trace represents the hydrocarbon range of common petroleum products. Comparison of this report with those of reference standards may also assist you in the identification of the hydrocarbon product detected in your sample. The second part of the report is a table that expresses the relative amount of hydrocarbon product present in the ranges specified.

# CHAIN OF CUSTODY / ANALYTICAL REQUEST FORM



Specialists in Environmental Chemistry

1988 Triumph Street  
Vancouver, BC  
Canada V5L 1K5  
FAX: (604) 253-6700  
TEL: (604) 253-4188  
TOLL FREE: (800) 665-0243

CLIENT W. J. KLASSEN  
& ASSOCIATES LTD  
P.O. Box 4896  
WHITEHORSE, Y.T.  
PH/FAX# 403 633 2443  
CONTACT FAX 403 668 2763  
SAMPLED BY BILL KLASSEN

PAGE 1 OF 1  
ASL CONTACT JOANNE PATRICK  
CLIENT PROJECT # AES WASTE  
PO # \_\_\_\_\_  
DATE SUBMITTED 96-10-4  
RESULTS REQUIRED BY 96-10-31

## ANALYSIS REQUESTED

PCB, Cd, Pb, Zn, Hg  
PCB, TEH, Zn, Hg  
TEH, Pb, Zn, Hg  
Cd, Pb, Zn, Hg

LAB USE	SAMPLE IDENTIFICATION	SAMPLE TYPE	DATE/TIME Y M D	SAMPLED	FIELD PRESERVATION															COMMENTS
	1 35-C-1-2	SOIL	96 9 13		AM PM	NIL	X													
	2 35-C-2-1	"	96 9 13		AM PM	"	X													
	3 35-C-2-2	SOIL	96 9 13		AM PM	NIL	X													
	4 35-C-3-1	"	96 9 13		AM PM	"	X													
	5 35-C-3-2	SOIL	96 9 13		AM PM	NIL	X													
	6 35-C-5-1	"	96 9 13		AM PM	"	X													
	7 35-C-5-2	SOIL	96 9 13		AM PM	NIL	X													
	8 35-C-5-3	GREASE	96 9 13		AM PM	"		X												
	9 35-B-1	SOIL	96 9 13		AM PM	NIL	X													
	10 13-C-1	"	96 9 18		AM PM	"	X													
	11 35-D-1	SOIL	96 9 13		AM PM	NIL		X												
	12 14-B-2-1	"	96 9 17		AM PM	"	X		X											
	13 14-B-2-2	SOIL	96 9 17		AM PM	NIL	X		X											
	14 14-B-2-3	COAL?	96 9 17		AM PM	"			X	X										

NOTES/COMMENTS	CONDITION RECEIVED	RELINQUISHED BY	<i>Bill Klassen</i>
	FROZEN _____	AFFILIATION	
	COLD _____	RECEIVED BY	<i>DB</i> 96/10/07
	AMBIENT _____	AFFILIATION	
	TOTAL PACKAGES		

service

laboratories

ltd.



## CHEMICAL ANALYSIS REPORT

---


**Date:** September 27, 1996  
**ASL File No.** G5094  
**Report On:** AES Waste Water Analysis  
**Report To:** **W.J. Klassen & Associates Ltd.**  
PO Box 4896  
Whitehorse, YT  
Y1A 4N6  
**Attention:** **Mr. Bill Klassen**  
**Received:** September 16, 1996

---

**ASL ANALYTICAL SERVICE LABORATORIES LTD.**

per:

  
Joanne Patrick, B.Sc.  
Project Chemist

  
Joyce Chow, B.Sc.  
Project Chemist





**RESULTS OF ANALYSIS - Water**

File No. G5094

	35-C-W-1	35-C-W-2	35-C-W-3
	96 09 13 15:00	96 09 13 15:10	96 09 14 13:00
<hr/>			
<b><u>Total Metals</u></b>			
Cadmium T-Cd	0.0037	0.0029	-
Lead T-Pb	0.003	<0.001	-
Mercury T-Hg	<0.00005	<0.00005	-
Zinc T-Zn	<0.005	<0.005	-
<b><u>Extractables</u></b>			
Oil and Grease	-	-	6

Results are expressed as milligrams per litre.  
< = Less than the detection limit indicated.



## **METHODOLOGY**

File No. G5094

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

### **Metals in Water**

This analysis is carried out in accordance with procedures described in "Standard Methods for the Examination of Water and Wastewater" 19th Edition 1995 published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion or filtration (EPA Method 3005), followed by instrumental analysis by atomic absorption spectrophotometry (EPA Method 7000), inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010), and/or inductively coupled plasma - mass spectrometry (EPA Method 6020).

### **Mercury in Water**

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" 19th Edition 1995 published by the American Public Health Association. A cold-oxidation procedure involving bromine monochloride is used, followed by instrumental analysis by cold-vapour atomic absorption spectrophotometry (CVAAS).

### **Oil and Grease in Water (Gravimetric)**

This analysis is carried out in accordance to procedures described in "A Laboratory Manual for the Chemical Analysis of Waters, Wastewaters, Sediments, and Biological Tissues" 5th Edition, published by B.C. Ministry of Environment, 1994. The procedure involves extraction of the sample with hexane. The resulting extract is evaporated to dryness and the residue is weighed to determine gravimetric oil and grease.

**End of Report**



**A Preliminary Environmental Investigation  
of Site 14 - Yukon River Bridge**

Prepared for:

**Arctic Environmental Strategy**

**Action on Waste**

**DIAND, Whitehorse, Y.T.**

Prepared by:

**W. J. Klassen and Associates Ltd.**

**D. B. Craig, Consulting Engineer**

**Mikro-Tek - M. Kean Resources Inc.**

**February, 1997**

## Table of Contents

Executive Summary	
1.0 Introduction	1
2.0 Methodology	1
2.1 Literature Review	2
2.2 Interviews	2
2.3 Field Work	2
2.3.1 Site Identification	2
2.3.2 Site Investigation	3
2.3.3 Analytical Program and Criteria	4
Map of Site 14	5
Photographs of Site 14	6
3.0 Physical Setting	17
3.1 General Description	17
3.2 Geology	17
3.3 Hydrogeology	17
3.4 Biology	17
4.0 Test Results	19
4.1 DDT and PCBs	19
4.2 Metals	19
4.3 Total Extractable Hydrocarbons	20
5.0 Discussion and Conclusions	20
6.0 Recommendations	21
References	
Appendix A - Field Lab Process	
Appendix B - Lab Analysis Results	

## Executive Summary

A preliminary environmental investigation of **Site 14 -- Yukon River Bridge** (Km. 1441.8, Alaska Highway) was conducted in September/October, 1996, under the auspices of the Arctic Environmental Strategy - Action on Waste (DIAND) program. The purpose of this investigation was to determine if further assessment or site remediation work would be required. The primary objective was to determine if contaminants were present on the site and if present, were they migrating from the site and did they pose a human or environmental health hazard. A secondary objective was to identify any physical hazards that might be present on the site.

The investigation of this site consisted of a review of the literature and other background material, interviews, field work, analysis and recommendations. Literature searches, airphoto analysis and interviews confirmed the location of this fairly extensive site immediately to the west of the bridge and on both sides of the highway with surface garbage at several locations and building sites at three locations. Field work included identifying and delineating the site and mapping and photographing it; test pits were dug and soil samples taken.

The site is heavily vegetated with an apparently healthy white spruce vegetation community, some lodgepole pine, balsam poplar and willow. It is underlain by alluvial silts and sand containing no visible ground water.

Although there is ~~scattered surface garbage at a number of locations~~ on the site no evidence of buried garbage was found. Tests for **DDT and PCBs**, the anticipated contaminants, indicated these substances were **either not present** or were well below the CCME criteria for Residential/Parkland areas. The **same** was the **case for cadmium, lead, mercury and zinc levels in soil samples** from this site. A sample from a **small pile of crushed coal found at this site**, however, was substantially **above the CCME criteria** for cadmium, lead, and zinc. One soil sample contained concentrations of **light extractable petroleum hydrocarbons (LEPHs)** well **above the permissible levels** in the Yukon Government draft "Contaminated Sites Regulations."

The potential physical hazards should be dealt with by cleaning up the surface garbage and debris; some of this material is potentially recyclable. This cleanup should be undertaken after consultation and in conjunction with the Kwanlin Dun First Nation. The contaminated coal should be removed from the site and disposed of appropriately. Further soil tests should be conducted at this site to determine the extent of the contamination by LEPHs.

## **A Preliminary Environmental Investigation**

### **of Site 14 -- Yukon River Bridge**

#### **1.0 Introduction**

The Arctic Environmental Strategy -- Action on Waste program, under the auspices of the Department of Indian Affairs and Northern Development (DIAND), identified a number of abandoned waste and disposal sites throughout the Yukon Territory. These sites were generally associated with exploration, mining, industrial or military operations. The Contaminants/Waste Program initiated environmental investigations at a number of such sites.

The purpose of these investigations was to gather preliminary environmental information to determine if further assessment or site remediation work would be required. The primary objective was to determine if contaminants were present on the site. If contaminants were present, the investigation was to determine if they are migrating from the site and whether they pose a human or environmental health hazard. A secondary objective of these investigations was to identify any physical hazards that may be present on the site.

As indicated, the overall objective of the investigations is to obtain preliminary environmental information and to make recommendations on future assessments or remediation of abandoned waste and disposal sites in the Yukon.

Site 14, Yukon River Bridge, was one of these sites and this report results from its investigation. Information assembled previously on this site was limited. The site is located near the Yukon (or Lewes) River Bridge on the Alaska Highway. It is described in an inventory report as:

"Old military site. Wood debris, exposed pipe 20 m from Yukon River. No obvious signs of a dump site. Area has been significantly altered by highway relocation, dam construction and other human activities. Vegetation is generally poplar and willow regeneration."

#### **2.0 Methodology**

The preliminary environmental investigation of this site consisted of a review of the literature and other background material, interviews, field work on site, analysis and recommendations.

## **2.1 Literature Review**

The Yukon Archives, EPS library, and the DIAND library were checked for references to this site. The site is briefly mentioned in Bisset's (1995) report. No other written record of this site was found.

D.P.W. records pertaining to the bridgehead reserve were reviewed as well for any reference to burial of materials. These records contain no reference to a garbage dump at this location. Field notes in those records refer to a number of buildings at this location but the maps on file do not show the location of these buildings. The notes also refer to a clean-up in 1956 of steel, lumber and a "shed" in relation to bridge construction.

Aerial photographs taken in 1967 were reviewed for any evidence of this camp and/or dump location. While the photos do not show buildings (presumably long since moved or demolished) the scale is of sufficient detail to show the wooden steps still on site. Garbage, screened by vegetation, was not visible.

## **2.2 Interviews**

Mrs. Emma Shorty, a Kwanlin Dun First Nation elder, lives between the Yukon River and the Alaska Highway downstream of the Yukon River Bridge. Mrs. Shorty was interviewed by Dr. and Mrs. Craig and Bill Trerice. She indicated that the camp buildings had been located on both the north and south side of the Alaska Highway immediately to the west of the river and the road to the Yukon River Timber sawmill. Mrs. Shorty also pointed out the location of a number of small surface garbage dumps consisting of domestic garbage and military camp garbage. She suggested also that truck bodies had been dumped in the Yukon River below the hydroelectric control structure.

## **2.3 Field Work**

Field work at the site consisted of two visits. During the preliminary visit a reconnaissance was conducted to locate and attempt to identify and delineate the site. On the second visit the site was mapped and photographed; test pits were dug and soil samples taken.

### **2.3.1 Site Identification**

The Yukon River Bridge site, Site 14, was located on both the north side and south side of the Alaska Highway west of the bridge. Site identification consisted of a visit to the site in conjunction with the interview with Mrs. Shorty. She took the investigators to some of the surface dump sites, one of which is approximately 200 m downstream of her home on a terrace above and about 100 m from the river. This location is approximately 1200 m from the bridge.

The Yukon River Bridge site is extensive with surface garbage at several locations and building sites at three locations. One building site is located between the river and the access road leading off the Alaska Highway immediately west of the bridge. The other main site is on a bench south of the highway but west of the sawmill road, the third being a wrecked greenhouse beside the sawmill road and the trail leading to the site on the bench. Outhouse pit depressions were noted near both building location sites.

The building sites appeared to have been leveled with a bulldozer prior to construction at this site. Wood debris remaining at the building locations was rotten.

Above the site on the bench south of the highway is the spirit house graveyard of the Whitehorse Billy family. Wooden stairs lead from this graveyard down to the building location.

### **2.3.2 Site Investigation**

The site was mapped to ensure future relocation of test pit sites and other features if necessary (See Site 14 Maps on following pages). Prior to visiting the site a grid sampling system had been suggested but following the literature review, interview and reconnaissance of the site it was decided by the field crew to sample in the vicinity of building sites in the expectation that there might be pesticides (DDT) or other contaminants to be found in these locations. The test pits were marked with orange flagging tape and numbered as indicated on the map. Soil samples were taken at or near the surface and deeper samples were collected from the sidewalls of the test pits. Photographs were taken of the site, surface features, and test pits and are provided in this report on the following pages.

#### **Site 14-A Test Pit**

This pit was dug on a former building (water pump house?) site where, under broken concrete slabs, were found what was concluded to be a water line and valves. A rotting wooden cribbing filled with sawdust (presumably as insulation) was dug out to a depth greater than one metre to a horizontal pipe to which makeshift iron-rod valve handles were attached. Beside the galvanized iron pipe was a 10 cm diameter cast iron pipe which was plugged with soil. The soil here was sandy and there was no obvious indication of contaminants, e.g. staining, smell. No soil samples were taken. The concrete slabs were replaced to reduce the potential hazard of the pipe and valve housing.

### **Site 14-B-1 Test Pit**

This test pit was located within what appeared to be a building outline. It was dug adjacent to a 5 cm diameter pipe sticking out of the ground, approximately 20 m from the Yukon River. The purpose of the pipe, whether as a drain or to draw water from the river, was not determined. There was wooden debris and charcoal on the site surface. The soil profile consisted of 60 cm of rusty sand, 40 cm of clay, and then sandy gravel to a depth in excess of one metre.

### **Site 14-B-2 Test Pit**

This test pit was dug outside the building outline adjacent to a small surface deposit of coal. Surface debris on the site consisted of rotting timbers containing several square 25 cm spikes. There was also a portion of a coal grate from a stove. The soil profile of this pit was as follows: 20 cm of sandy gravel, 5 cm of organic material mixed with charcoal, 35 cm of sand with clay beneath this to a depth greater than one metre.

In this pit there was a strong smell of petroleum products.

Surface garbage at other locations mentioned consisted of rusty one gallon antifreeze and food products cans, several rusted fuel drums, cable, bread pans, cookie sheets, seat springs, a leaf spring, broken glass, telephone wire, a pickup truck hulk, and scraps of sheet metal. Some of this material, such as the broken glass, the rotting wooden stair cases near the graveyard, and the telephone wire could be considered potentially a physical hazard.

### **2.3.3 Analytical Program and Criteria**

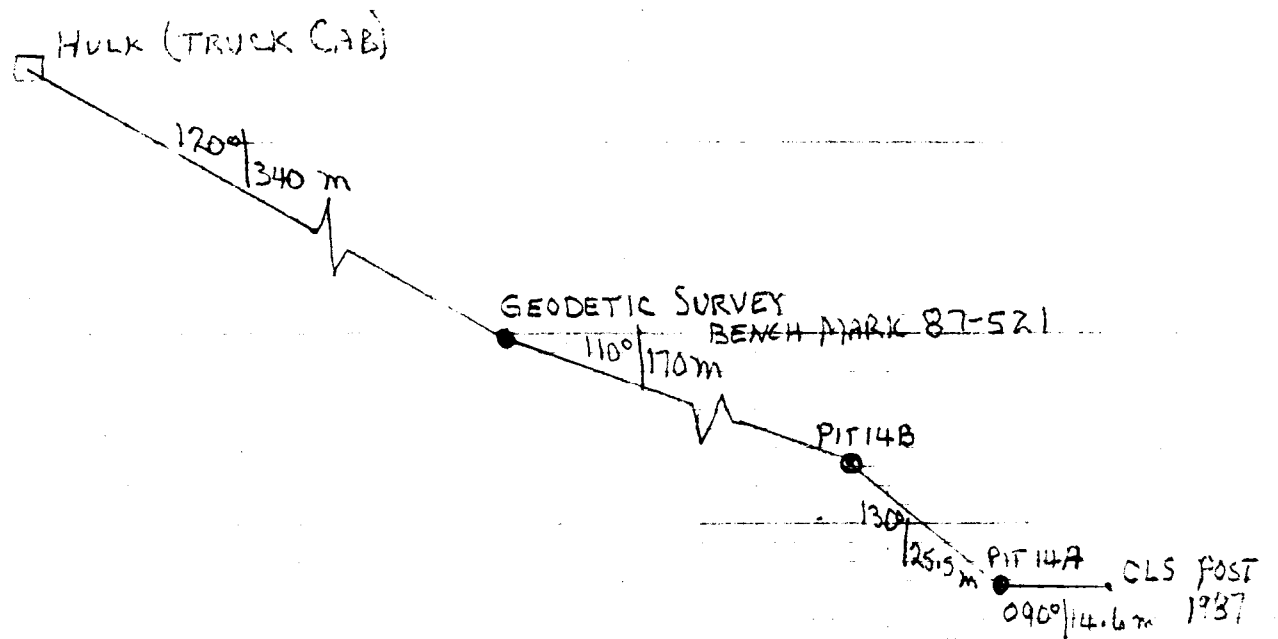
Given the objectives of the environmental investigation, the potential contaminants of concern at Site 14 were PCBs, DDT, metals and hydrocarbons. Soil samples were field screened for DDT and PCBs using immunoassay field kits. Field screening determined the need for analytical testing. Testing for metals and extractable hydrocarbons was carried out by the laboratory.

The criteria used for comparison of the analytical results were the "Interim Canadian Environmental Quality Criteria for Contaminated Sites - Report CCME EPC-CS34 September 1991" and the "Draft Contaminated Sites Regulations" of the Yukon Government. The analytical results for the indicated substance of concern were compared to the appropriate criteria established for Residential/Parkland or Residential land areas.

**Maps of Site 14 -- Yukon River Bridge**

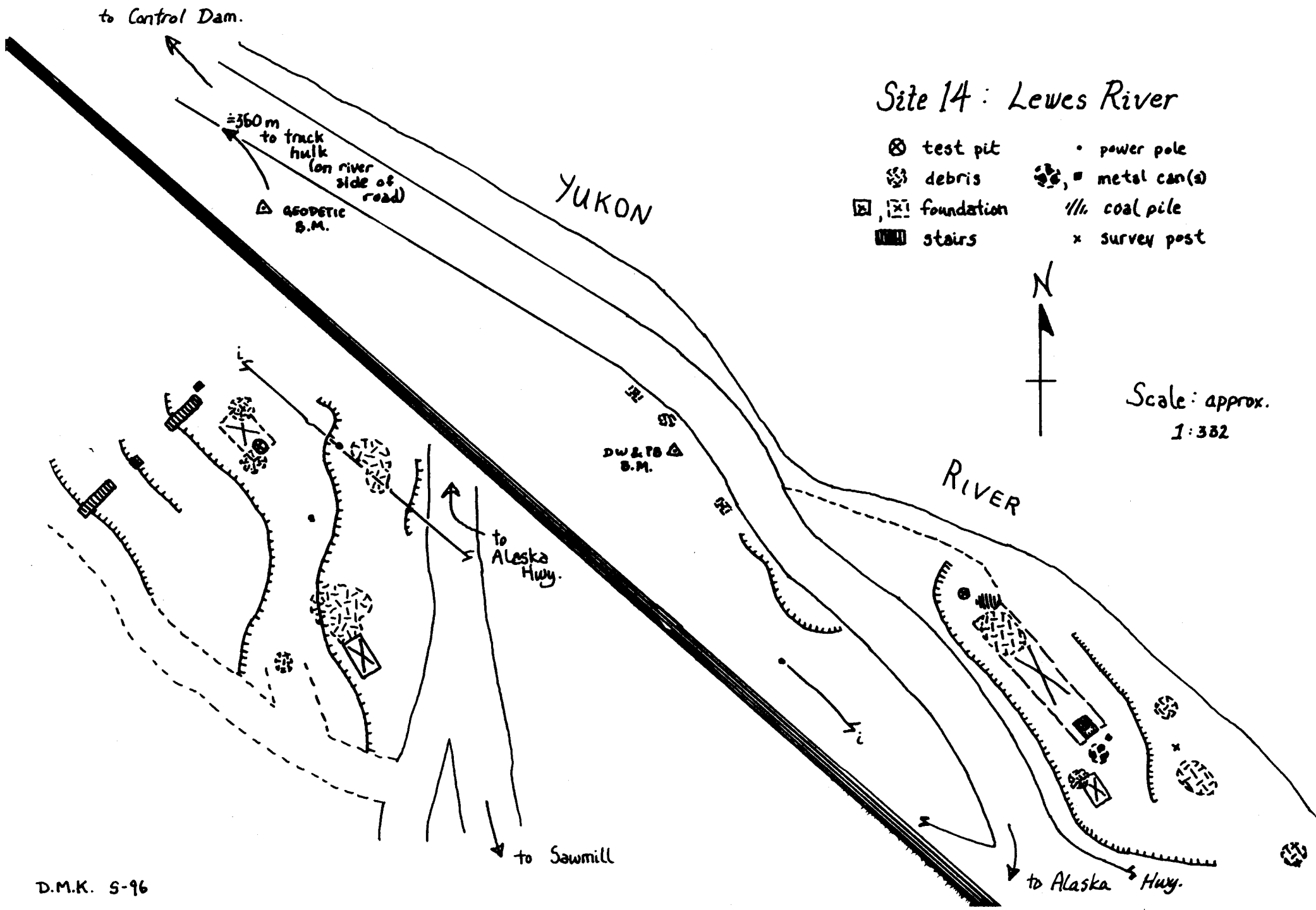
SITE 14  
YUKON RIVER BRIDGE

LOCATION OF TEST PITS  
BEARINGS GIVEN AS AZIMUTH (0-360°)



D. B. CRAIG  
SEPTEMBER 17, 1996

SCALE: 1 cm = 10 m



Site 14: Lewes River

- ⊗ test pit
- ⊗ debris
- ⊠, ⊞ foundation
- ▩ stairs
- power pole
- ⊠, ⊞ metal can(s)
- /// coal pile
- x survey post



Scale: approx.  
1:382

to Control Dam.

≈360 m  
to truck  
hulk  
(on river  
side of  
road)

△ GEODETIC  
B.M.

YUKON

DW & TB  
B.M.

RIVER

to Alaska  
Hwy.

to Sawmill

to Alaska  
Hwy.

Photographs of Site 14



Site 14-A  
(Note valve handle beside shovel.)  
(Note broken concrete at bottom of photograph.)

**Photographs of Site 14**



Site 14-A  
(Note valve rod, galvanized and cast iron pipes.)

Photographs of Site 14



Site 14 A - Lower Staircases

Photographs of Site 14



Site 14 - A Upper Staircase

Photographs of Site 14



Demolished Greenhouse Beside Sawmill Road

Photographs of Site 14



Site 14 - B Wooden Debris

Photographs of Site 14



Site 14 - B - 1  
(Note 5 cm galvanized iron pipe.)

Photographs of Site 14



Site 14 - B - 2 Wood Debris

Photographs of Site 14



Site 14 - B - 1 Test Pit

Photographs of Site 14



Site 14 - B - 2 Test Pit

**Photographs of Site 14**



Site 14 One of Several Surface Garbage Locations

### **3.0 Physical Setting**

#### **3.1 General Description**

Site 14 - Yukon River Bridge is located at Km. 1441.8 on the Alaska Highway, immediately to the west of the bridge. As described above, this is a fairly extensive site, extending from the bridge to approximately 1200 m downstream of the bridge -- if one includes the several surface garbage deposits -- and to both sides of the Alaska Highway.

This location has undergone significant construction and reconstruction activity related to the bridge, the Alaska Highway realignment and the Yukon Electrical Company Ltd. control dam located downstream of the bridge. The former military camp location surfaces, however, remain largely undisturbed although the buildings have long since been removed.

#### **3.2 Geology**

Geological mapping of the area including the Yukon River Bridge site indicate the valley is filled with alluvial deposits, glacial deposits and minor volcanic ash. The material at the site itself consists of silts and sands of this valley alluvium (Wheeler, 1961).

Bedrock was not observed but beneath the unconsolidated material would most likely consist of Laberge Group greywacke, arkose and siltstone, based on the nearest outcrops, 1.5 km to the southwest. These rocks are of lower Jurassic and later age.

#### **3.3 Hydrogeology**

No ground water was noted in any of the test pits at this site, all dug to a depth greater than one meter. This includes the test pit sites within 20 m of the Yukon River.

#### **3.4 Biology**

That portion of the site which is located south of the Alaska Highway is surrounded by mature white spruce forest which conforms substantially to the characteristics of such a plant community as described in "Guidelines for Reclamation/ Revegetation in the Yukon " (Kennedy, 1993).

Plants which were found on the north side of Mrs. Emma Shorty's home on the north side of the Alaska Highway included white spruce, lodgepole pine, aspen, cottonwood, willow, soapberry, rose, kinnikinnick, strawberry, lowbush cranberry,

field locoweed (*Oxytropis compestris*), cutleaf anemone (*Anemone multifida*), lupine (*Lupinus spp.*), goldenrod (*Solidago canadensis*), bastard toad flax (*Geocaulon livida*) and feathermoss.

In the apparently undisturbed areas of the site lichens were abundant on the forest floor: freckled lichen (*Peltigera aphthosa*), toad pelt (*Peltigera scabrosa*), orange lichen (*Zanthoria candelaria*), reindeer lichen (*Cladina rangifera*), waxpaper lichen (*Parmelia sulcata*), pixie cup lichen (*Cladonia pyxidata*), pioneer cladonia (*Cladonia cornata*), common coral lichen (*Stereocaulon paschale*), brittle horsehair lichen (*Bryoria lanestris*) and wolf lichen (*Letharia vulpina*).

On disturbed land adjacent to the old road under the bank of the present Alaska Highway, sanfoin, sweet clover (*Melilotus alba*), red clover (*Trifolium pratense*), field locoweed, fireweed (*Epilobium angustifolium*), wormwood (*Artemesia spp.*), and goldenrod were identified. There was a large stand of horsetail (*Equisetum scorpioides*) on the slope toward the Alaska Highway. Large white spruce and thick mats of feather moss are to be found on the undisturbed moist area south of the bank with the horsetails.

On the disturbed land adjacent to the river near test pit Sites 14-B-1 and 14-B-2, the canopy trees were aspen, small cottonwood and willow five meters high. A half meter white spruce also was growing here. Kinnikinnick, lowbush cranberry, juniper (*Juniperus communis*), soapberry, rose, strawberry, bastard toad-flax, fireweed, goldenrod, twinflower, wintergreen (*Pyrola spp.*), milk vetch (*Astragalus alpinus*), reedgrass (*Calamagrostis spp.*), fowl bluegrass (*Poa palustris*), feather moss, freckled lichen, and russet sedge (*Carex saxatilis*) formed the flora at and around this site.

Aspen and willow regrowth formed the canopy on the south side of the Alaska Highway near the broken greenhouse adjacent to the sawmill road. Soapberry, rose, red raspberry (*Rubus idaeus*), fireweed, kinnikinnick, strawberry, rockcress, dandelion (*Taraxacum officinale*), plantain (*Plantago canescens*), yarrow (*Achillea millifolium*), barley foxtail (*Hordium jubatum*), spike trisetum (*Trisetum spicatum*), and common sweetgrass (*Hierochloa odorata*) formed the vegetative cover on the disturbed area. Pioneer cladonia and tiny moss are starting to grow on the rotting wood.

The vegetation that has reinvaded the sites appears to be healthy and unstressed.

No evidence of wildlife other than red squirrels was noted.

#### 4.0 Test Results

Because of the nature of the use to which this site had been subjected, soil samples were field tested for DDT and PCBs. Soils samples were also tested for metals and extractable petroleum hydrocarbons.

The field testing, briefly, consisted of the following. A soil extraction was made from a portion of each sample. Each extraction was mixed in an individual enzyme-coated test tube with a substrate. A null test and stepped concentrations of the substance being tested for were mixed in the same way. The substrate competes for enzyme bonding places with the soil extraction. A stop solution was added to the test tube mixture and the resulting colour of each test tube was compared with a clear stop solution tube for refraction. The resulting value for each soil solution was compared with those for the null test tube and the stepped concentrations of the substance being tested for in order to determine the necessity of having each soil sample undergo the laboratory analysis. (For a detailed description of the process please refer to Appendix A).

#### 4.1 DDT and PCBs

The results of the field test for DDT indicated values lower than those for the "negative control" or null test so no further analysis was required. The field test for PCB suggested that there might be between 10 and 50 ppm PCB in the soil at this site. Subsequent analysis by ASL laboratory in Vancouver, B.C., indicated, however, that there was less than .05 ppm PCB material in the soil. The level of PCBs permitted by the CCME interim remediation criteria in Residential/Parkland areas is 5 ppm.

#### 4.2 Metals

Laboratory analysis was also conducted on the soil sampled from this site for cadmium, lead, mercury and zinc. The values found for these metals in the soil samples from this site were well below those cited in the CCME interim remediation criteria for soil in Residential/Parkland areas. The coal sample from the surface deposit at this site was well below the mentioned criterion for mercury. The same sample, however, was well above these criteria for the other three metals (given as mg per dry kg), as follows:

Total Metals	CCME Criteria	Lab Results
Cadmium	5	26.4
Lead	500	4920
Zinc	500	851

### **4.3 Total Extractable Hydrocarbons**

Soil samples from Test Pit 14-B-2, where a strong petroleum products smell was detected, showed under laboratory analysis to contain hydrocarbons in the Carbon 10 to Carbon 20 range suggesting that diesel fuel may have been spilled into the soil at this site. The concentration increased from the surface sample (313 mg/kg) to the sample taken from approximately .5 m below the surface (4340 mg/kg). The latter concentration is well above the Generic Numerical Soil Standards given in the Yukon Government draft "Contaminated Sites Regulations" where the permissible level for LEPHs (light extractable petroleum hydrocarbons) in Urban Park and Residential areas is 1000 mg/kg.

(The complete laboratory analysis results are provided in Appendix B).

### **5.0 Discussion and Conclusions**

No evidence of buried garbage or military camp debris was noted at this site. This rather extensive site contains a number of surface deposits of garbage. For the most part these appear to be relatively benign. The garbage/debris consisting of a pickup truck hulk, other rusting metal products, broken concrete, broken glass, rotting wooden staircases, and loose coils of telephone wire could constitute a physical hazard to hikers or to children playing in the area.

The soil, at least at one location on this site, contains LEPHs in concentrations higher than those considered permissible in Urban Park and Residential areas under the draft "Contaminated Sites Regulations" to be promulgated under the Yukon Government's "Environment Act". At the same location a small (under a cubic metre) surface deposit of crushed coal was found to contain levels of cadmium, lead, and zinc which were well above those permitted under the mentioned CCME quality criteria for contaminated sites.

## **6.0 Recommendations**

A number of further actions are necessary at this site. The potential physical hazards should be dealt with by cleaning up these locations. The surface garbage and debris should be removed and disposed of appropriately; some of this material is potentially recyclable. This cleanup should be undertaken after consultation and in conjunction with the Kwanlin Dun First Nation, given the site's proximity to KDFN members' land holdings and the First Nation grave sites.

The contaminated coal should be removed from the site and disposed of appropriately. If possible the source of the coal should be ascertained (there is some suggestion that it may have come from the Coal Lake area south of Whitehorse) in the event the indicated metal levels are naturally occurring. This could have a bearing on whether coal from such a source should be used as a fuel.

Further soil tests should be conducted at this site to determine the extent of the contamination by LEPHs.

**References:**

- Bisset, K. 1995. Research of former military sites and activities in the Yukon. AES, DIAND. Whitehorse, Y.T.
- Kennedy, C.E. 1993. Guidelines for reclamation/ revegetation in the Yukon. Yukon Renewable Resources. Whitehorse, Y.T.
- Wheeler, J. O. 1961. Whitehorse Map-Area, Yukon Territory. Geological Survey of Canada, Memoir 312. Ottawa.

**Appendix A**  
**Field Lab Process**

Please refer to cumulative Appendix A  
provided for Site 13

**Appendix B**

**Laboratory Analysis Results**

Please refer to cumulative Appendix B  
provided for Site 13

**A Preliminary Environmental Investigation  
of Site 35 - Dry Creek**

**Prepared for:**

**Arctic Environmental Strategy**

**Action on Waste**

**DIAND, Whitehorse, Y.T.**

**Prepared by:**

**W. J. Klassen and Associates Ltd.**

**D. B. Craig, Consulting Engineer**

**Mikro-Tek - M. Kean Resources Inc.**

**February, 1997**

## Table of Contents

Executive Summary	
1.0 Introduction	1
2.0 Methodology	2
2.1 Literature Review	2
2.2 Interviews	2
2.3 Field Work	3
2.3.1 Site Identification	3
2.3.2 Site Investigation	4
2.3.3 Analytical Program and Criteria	6
Map of Site 35	7
Photographs of Site 35	8
3.0 Physical Setting	22
3.1 General Description	22
3.2 Geology	22
3.3 Hydrogeology	23
3.4 Biology	23
4.0 Test Results	25
4.1 DDT and 2,4-D	25
4.2 PCBs	25
4.3 Metals	26
4.4 Total Extractable Hydrocarbons	26
4.5 Water Samples	26
5.0 Discussion and Conclusions	27
6.0 Recommendations	27
References	
Appendix A - Field Lab Process	
Appendix B - Lab Analysis Results	

## Executive Summary

A preliminary environmental investigation of **Site 35 -- Dry Creek** (Km. 1904.5, Alaska Highway, and along the Snag winter trail) was conducted in September/October, 1996, under the auspices of the Arctic Environmental Strategy - Action on Waste (DIAND) program. The purpose of this investigation was to determine if further assessment or site remediation work would be required. The primary objective was to determine if contaminants were present on the site and if present, were they migrating from the site and did they pose a human or environmental health hazard. A secondary objective was to identify any physical hazards that might be present on the site.

Literature searches, airphoto analysis and interviews confirmed the location of this fairly extensive site immediately to the west of the Alaska Highway at the Dry Creek crossing and approximately one km. east of the highway along the winter trail. **Surface garbage was found at several locations but building sites only to the west of the highway.** Field work included identifying and delineating the site and mapping and photographing it; test pits were dug and soil samples taken. The Haines - Fairbanks pipeline right-of-way and a portion of the pipeline form the western boundary of the site.

The site is vegetated with apparently healthy black spruce and willow/sedge plant communities. It is underlain by permafrost and alluvial silts, sand and gravel; some ground water seepage was noted in one test pit.

**No evidence of buried garbage was found.** Tests for DDT, 2,4-D and PCBs, the anticipated contaminants, indicated these substances were either **not present** or were below the CCME criteria for Residential/Parkland areas. The same was the case for mercury and lead in soil samples from this site. At one test pit site the surface soil sample was **substantially above the CCME criteria for cadmium and zinc.** Water samples from Dry Creek contained total metals substantially below the CCME criteria for freshwater aquatic life. **Another soil sample contained concentrations of total extractable hydrocarbons (TEHs) above the permissible levels but the contaminated site is small.** A water sample drawn from standing water adjacent to the remnant pipeline had an oil and grease measure of 6.

The potential physical hazards should be dealt with by cleaning up the surface garbage and debris. This cleanup should be undertaken after consultation and in conjunction with the White River First Nation. **The lead acid battery and the dry cell battery packs should be removed to prevent any further leaching of lead, zinc, and cadmium.** **The old grease drums and areas of oil contaminated soil should be removed as should the remaining portion of the pipeline.** The two sites along the Snag trail can be left as they are.

# A Preliminary Environmental Investigation

## of Site 35 -- Dry Creek

### 1.0 Introduction

The Arctic Environmental Strategy -- Action on Waste program, under the auspices of the Department of Indian Affairs and Northern Development (DIAND), identified a number of abandoned waste and disposal sites throughout the Yukon Territory. These sites were generally associated with exploration, mining, industrial or military operations. The Contaminants/Waste Program initiated environmental investigations at a number of such sites.

The purpose of these investigations was to gather preliminary environmental information to determine if further assessment or site remediation work would be required. The primary objective was to determine if contaminants were present on the site. If contaminants were present, the investigation was to determine if they are migrating from the site and whether they pose a human or environmental health hazard. A secondary objective of these investigations was to identify any physical hazards that may be present on the site.

As indicated, the overall objective of the investigations is to obtain preliminary environmental information and to make recommendations on future assessments or remediation of abandoned waste and disposal sites in the Yukon.

Site 35, Dry Creek, was one of these sites and this report results from its investigation. Information assembled previously on this site was limited. This multiple location site is located near the Dry Creek crossing on the Alaska Highway at Km 1904.5 and along the winter trail to Snag, also known as the Chisana Trail. It is described by an inventory report as:

- "Mile 1184.0 - Dry Creek
  - 18 Buildings
  - Crown
  - Conditions:
    - two building foundations
    - scattered wood debris
    - 25 drums
    - stove
    - 3 hulks
    - 3 refuse dumps
  - Vegetation: - Heavy aspen advance growth. Muskeg, wet low depressional areas along Dry Creek.
  - Restoration:
    - Collect and burn wood debris
    - Remove metal to Mile 1161 for disposal
    - Retain dump as is"

"Comment: - Access via trail to the two refuse dumps approx. 1/2 mile from the Alaska hwy would create unnecessary further disturbance to the stabilized trail."

## **2.0 Methodology**

The preliminary environmental investigation of this site consisted of a review of the literature and other background material, interviews, field work on site, analysis and recommendations.

### **2.1 Literature Review**

The Yukon Archives, EPS library, and the DIAND library were checked for references to this site. The site is briefly mentioned in Bisset's (1995) report. No other written record of this site was found.

D.P.W. records pertaining to the highway reconstruction were reviewed as well for any reference to burial of materials. These records contain no reference to a garbage dump at this location.

Aerial photographs in the Yukon Archives were reviewed for any evidence of this camp and/or dump location(s). While the photos indicate the location of the Haines - Fairbanks pipeline, the original and relocated Alaska Highway (Shakwak Project) routing, and the approximate camp location the scale is not sufficient to show the garbage dump locations. The early photos (1948?) show a great number of trails approaching the Dry Creek crossing from both sides. A creek flowing into Dry Creek from the south on the east side of the highway was apparently rerouted to avoid what is later shown as a portion of the camp site on the map accompanying the quoted inventory report.

### **2.2 Interviews**

Mr. Billy Blair, an elder with the White River First Nation and former resident of the Dry Creek area (there was formerly an Indian village east of the highway and south of the creek), was interviewed in Beaver Creek. He spoke of garbage being dumped on the east side of the highway at the top of the hill to the north of the creek. He mentioned dumps at Dry Creek west of the former camp/lodge site as well as the two along the trail to Snag. His father, Billy Blair, Sr., and Mr. Pete Eiklund, both deceased, had told of food and other stores being buried in a trench on the east side of the highway, south of the creek "where the willow [and balsam poplar] regrowth is." Mr. Blair had no knowledge of any pesticides being used in the area. There is still a trapper's cabin on the north side of the creek near the pipeline right-of-way.

Mr. Beat Ledergerber, a resident of the Beaver Creek area for approximately 40 years, mentioned that the Utah Construction Company -- under contract to the US Army -- had had a camp at Dry Creek (Camp 284W). BYN (White Pass & Yukon Route) purchased that camp and built a lodge site including five to seven buildings in the 1950s from salvaged camp building materials. The main lodge building had burned in the early 1960s but he was uncertain as to the date. Mr. Ledergerber had a photograph of the lodge, taken from the top of the Dry Creek hill to the north but the scale of the photo shows no detail. He doubted that there would have been any PCBs on the site since there were no transformers used there, only small lighting plants. He was not aware of any pesticides being used there nor of any garbage or useful material being buried.

### **2.3 Field Work**

Field work at the site consisted of two visits. During the preliminary visit a reconnaissance was conducted to locate the dump sites on the Snag trail and attempt to identify and delineate the site at the Dry Creek crossing. On the second visit the site was mapped and photographed; test pits were dug and soil samples taken.

#### **2.3.1 Site Identification**

The dump sites along the Snag trail are approximately 1 km east of the Alaska Highway and about 105 m south of Dry Creek. These dump sites are about 45 m apart and both cover an area measuring 6.0 m by 3.5 m. Both are on the surface and vegetation is reinvading the sites.

The Dry Creek crossing site is located to the west of a pull-out on the west side of the Alaska Highway, south of the creek. There is one building on skids just off the edge of the pull-out, and a number of collapsed buildings (presumably part of the White Pass Lodge complex) between it and the pipeline to the west of the highway. An outhouse in poor repair is still standing. Garbage sites are scattered indiscriminately in the area between the highway and the pipeline. A trapper's cabin is located across the creek from this site well up the hillside, facing south.

The dump which Mr. Blair mentioned as being on the north side of the creek at the top of the hill could not be found. It may be that the road reconstruction has obliterated it. Nor was any evidence found of the trench in which materials were said to have been buried.

### **2.3.2 Site Investigation**

The site was mapped to ensure easy future relocation of garbage sites, test pit sites and other features if necessary (See Site 35 Maps on following pages). Prior to visiting the site a grid sampling system had been suggested but following the literature review, interview and reconnaissance of the site it was decided by the field crew to sample in the vicinity of the surface garbage in the expectation that contaminants might be found in these locations. The test pits were marked with orange or yellow flagging tape and numbered as indicated on the map. Soil samples were taken at or near the surface and deeper samples were collected from the sidewalls of the test pits. Water samples were taken from Dry Creek as well as from standing water next to the pipeline. Photographs were taken of the site, surface features, and test pits and are provided in this report on the following pages.

The following test pits were dug at this site:

#### **Site 35 - A Test Pit**

A test pit was dug at this location because of the surface garbage which included rusty 2 lb. "Golden West" coffee cans, milk cans, one No. 4 double spring foot hold trap with toggle (this site may have attracted wolves or wolverine, hence a trap of this size), antifreeze cans, glass bottles, plywood scraps, rotting wooden apple boxes and orange crates, and bits of bare as well as insulated wire. The soil profile in the test pit consisted of 15 cm of black organic material, a 35 cm gravel and sand layer, 10 - 15 cm of clay, some more organic material and then gravel. Some moisture was seeping into the bottom of the pit. There was no garbage below the surface.

#### **Site 35 - B Test Pit**

At this location garbage had been thrown into a natural depression. The garbage consisted of rusty antifreeze, pyrene, coffee, catsup, milk, ham and other cans. There were also drum and keg bands, a cat track roller, an olive drab truck wheel, lengths of cable, an oil bath air breather (filter), welding rods, wire scraps, apple box, orange crate and broken ceramic cups. The test pit soil profile consisted of 15 cm of black organic material over dry coarse gravel to a depth of greater than one metre.

### **Site 35 - C - 1 Test Pit**

This site is located downslope of surface garbage deposits at Sites 35 - C - 2,3 (the closest garbage consisted of 6 empty paint cans) and 12 m from Dry Creek. Sphagnum moss covered the ground surface. Beneath the moss was a thickness of approximately 50 to 60 cm of organic material before permafrost was encountered.

### **Site 35 - C - 2 Test Pit**

The surface garbage at this location included bottles, oil cans, a roofing tar can, a lead acid battery, dry cell battery packs, antifreeze cans, a tire, a clutch bell housing, and broken crockery. The active layer here was greater than one metre in depth. The soil profile consisted of 10 cm of organic material over more than a metre of sandy silt. There was no garbage below the surface.

### **Site 35 - C - 3 Test Pit**

This test pit location was selected because of surface garbage which was made up of bottles, milk cans, oil cans, disintegrating dry cell battery packs, empty wax containers, a galvanized pail, and a military truck window frame and floor boards. The soil in this pit consisted of 10 cm of black/brown organics above 40 cm of clay bands above more than 60 cm of layers of sand. There was no garbage below the surface.

### **Site 35 - C - 4 Test Pit**

Surface garbage at this location included beer bottles, milk cans, a five gallon pail, and plywood scraps. The soil profile was 25 cm of black organic material, then 20 cm of silty clay, then sand to a depth of more than a metre. No garbage was found below the surface.

### **Site 35 - C - 5 Test Pit**

At this location were found two barrel stoves, seven empty open-topped 45 gallon drums that contained grease residue, barrel lids, bottles, a galvanized pail, oil cans, milk cans, paint cans and antifreeze cans. Telephone wire was also found off the ground, through the willows, near this location. The soil profile consisted of 20 cm of organic material atop 25 cm of clay beneath which was

found gravel to a depth of more than one metre. No garbage was found below the surface.

Two water samples were taken from Dry Creek adjacent to Site 35 - C - 1. One water sample was also taken from the swampy area beside the remnants of the pipeline on the south side of the creek where an oily sheen was observed. One soil sample, cited as 35 - D - 1 was taken from an oily looking patch of ground on the access trail to the borrow pit on the east side of the the Alaska Highway, opposite the access to the pull-out on the west. This appeared to be where someone had drained engine crankcase oil onto the ground.

### **2.3.3 Analytical Program and Criteria**

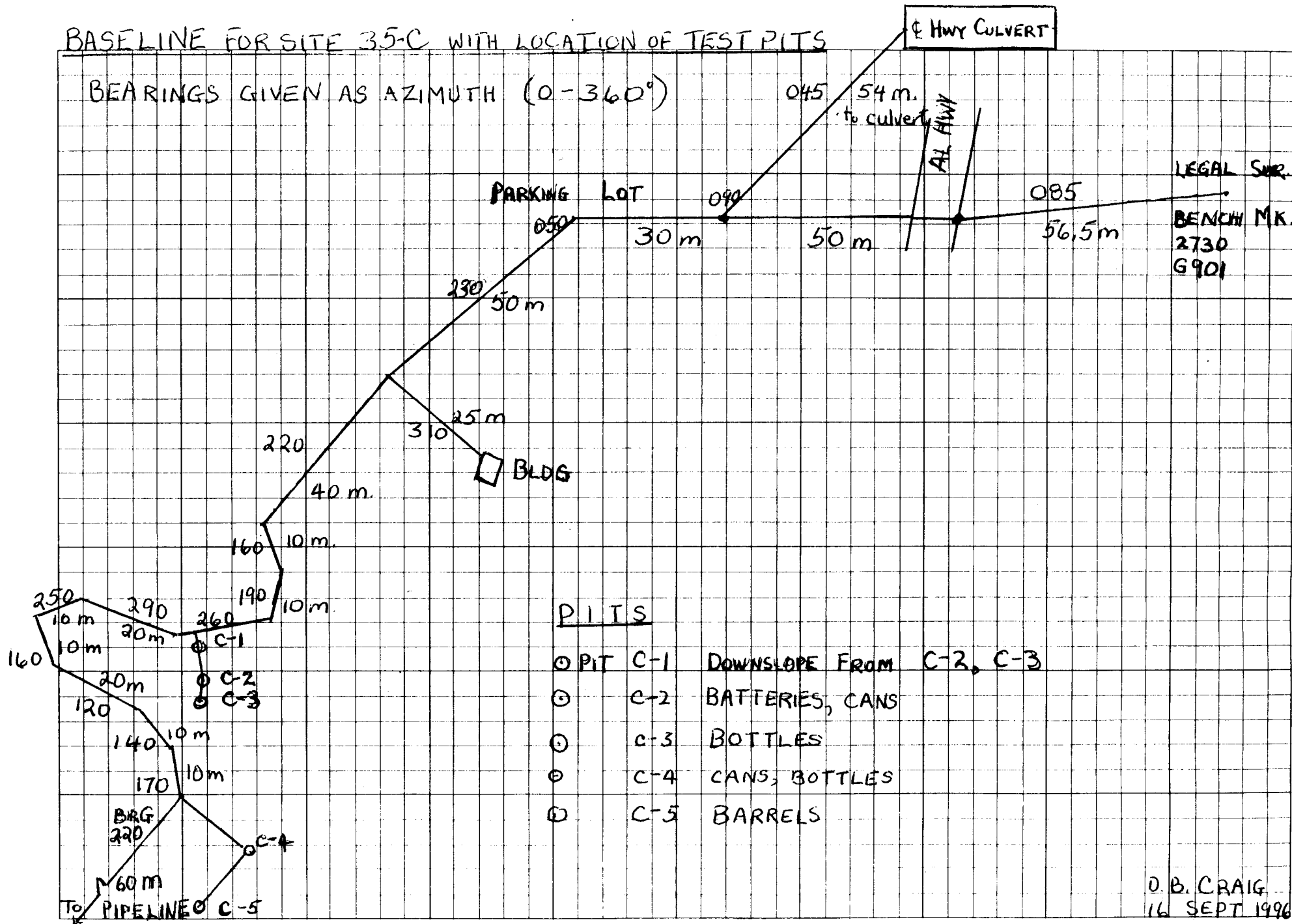
Given the objectives of the environmental investigation, the potential contaminants of concern at Site 35 were PCBs, DDT, 2,4-D, metals and hydrocarbons. It was felt that PCBs might have found their way to this site in oils, that DDT might have been used as pesticide and that the pipeline right-of-way might have been sprayed with 2,4-D. Soil samples were therefore field screened for 2,4-D, DDT and PCBs using immunoassay field kits. Field screening determined the need for analytical testing. Testing for metals and extractable hydrocarbons was carried out by the ASL laboratory in Vancouver, B.C.

The criteria used for comparison of the analytical results were the "Interim Canadian Environmental Quality Criteria for Contaminated Sites - Report CCME EPC-CS34 September 1991" and the "Draft Contaminated Sites Regulations" of the Yukon Government. The analytical results for the indicated substance of concern were compared to the appropriate criteria established for Residential/Parkland or Residential land areas.

**Maps of Site 35 -- Dry Creek**

BASELINE FOR SITE 35-C WITH LOCATION OF TEST PITS

BEARINGS GIVEN AS AZIMUTH (0-360°)



PITS

- PIT C-1 DOWNSLOPE FROM C-2, C-3
- C-2 BATTERIES, CANS
- C-3 BOTTLES
- C-4 CANS, BOTTLES
- C-5 BARRELS

D. B. CRAIG  
16 SEPT 1996

SCALE: 1 cm = 10 m.



Photographs of Site 35



Site 35 - A

Photographs of Site 35



Site 35 - A Test Pit

Photographs of Site 35



Site 35 - B

Photographs of Site 35



Site 35 - B Test Pit

**Photographs of Site 35**



Site 35 - C Dry Creek  
Collapsed Building

**Photographs of Site 35**



Site 35 - C Milk Can Collection

**Photographs of Site 35**



Site 35 - C Oil Can Collection

Photographs of Site 35



Site 35 - C -1 Test Pit  
Permafrost in Bottom

Photographs of Site 35



Site 35 - C -2

Photographs of Site 35



Site 35 - C - 3

Photographs of Site 35



Site 35 - C - 4

Photographs of Site 35



Site 35 - C - 5

Photographs of Site 35



Site 35 Haines - Fairbanks Pipeline Relict  
(Note beaver dam at left center.)

Photographs of Site 35



Trapper's Cabin Opposite Dry Creek Site

### **3.0 Physical Setting**

#### **3.1 General Description**

The bulk of Site 35 - Dry Creek is located at Km. 1904.5 on the Alaska Highway, immediately to the west of the pull-out off the highway south of the creek. As already indicated, this is a fairly extensive site, running from the highway to the pipeline r-o-w, a distance of approximately 500 m. Two of the surface garbage locations are found approximately one kilometre to the east of the main site, along the Snag winter trail and about 100 m south of Dry Creek.

The main location has undergone significant reconstruction activity related to the original bridge removal, culvert placement and replacement, and the Alaska Highway creek approach realignment. The former military/contractor construction camp and highway lodge location has also been affected by fire and a portion of the campsite formerly on the east side of the original highway location appears to have been incorporated into the present highway right-of-way. Natural reclamation and revegetation on the east side of the road also appears to have obliterated the location referred to by Mr. Blair as a possible burial site of food and other stores.

The sites are on a gentle north-facing slope with black spruce and willow/sedge communities with permafrost close to the surface in some locations.

To the west of this site is the Haines - Fairbanks pipeline right-of-way. Most of this pipeline was removed some years ago but there is a portion of this line still in place at the Dry Creek crossing. It extends perhaps 75 m to the south of the creek, under the creek, and perhaps another 100 to 150 m north of the creek. It apparently was left in place because it had sunk or been overgrown and it was judged that more environmental disturbance would be caused by removing it than by leaving it in place. Frost heaving of the empty line is now bringing the pipeline above the soil surface.

#### **3.2 Geology**

The surficial material at the immediate site consists of alluvial silts, sand and gravel.

Bedrock type, based on the nearest mapped outcrops immediately northwest of the site, would consist of dark green massive greenstone ( Tempelman - Kluit, 1973) of Paleozoic or Mesozoic age.

### 3.3 Hydrogeology

Ground water seepage was noted in one of the test pits at this site, all dug to a depth greater than one meter. The test pit containing the seepage was 105 m from Dry Creek. The general absence of groundwater may be due in part to the high incidence of permafrost in the area.

### 3.4 Biology

Two plant communities cover the site, the Black Spruce community and the Willow/Sedge community (Kennedy, 1993).

Part of the Dry Creek site area is described as a willow/sedge (*Salix/ Carex*) community. The overstory has sparse, stunted black spruce (*Picea mariana*) and small willow (*Salix* spp.). The tussock tundra groundcover is dominated by water sedge (*Carex* spp.) and mosses (*Bryophyte* spp.). Associated species are shrub birch (*Betula glandulosa*), shrubby cinquefoil (*Potentilla fruticosa*), sedge (*Carex* spp.), grass (*Gramineae* spp.), horsetail (*Equisetum* spp.), coltsfoot (*Petasites frigidus*) and bluebell (*Mertensia paniculata*). Lichens also grow on this site.

The canopy layer of trees included black spruce (*Picea mariana*), balsam poplar (*Populus balsamifera*), aspen (*Populus tremuloides*) and paper birch (*Betula papyrifera*). The understory layer had willow (*Salix* spp.), red swamp currant (*Ribes triste*), red raspberry (*Rubus idaeus*), shrubby cinquefoil (*Potentilla fruticosa*), shrub birch (*Betula glandulosa*), labrador tea (*Ledum groenlandicum*), alder (*Alnus* spp.), soapberry (*Sheperdia canadensis*), and rose (*Rosa acicularis*). The dwarf shrub layer had low bush cranberry (*Vaccinium vitis-idaeus*), bog blueberry (*Viburnum edule*), kinnikinic (*Arctostaphylos uva-ursi*), strawberry (*Fragaria* spp.), and crowberry (*Empetrum nigrum*). Fireweed (*Epilobium angustifolium*), bluebell (*Mertensia paniculata*), sweet coltsfoot (*Petasites frigidus*), larkspur (*Delphinium glaucum*), monkshood (*Aconitum delphinifolium*), graceful cinquefoil (*Potentilla anserina*), curly dock (*Rumex crispus*), dandelions (*Taraxacum officinale*), wintergreen (*Pyrola* spp.), yarrow (*Achillea millifolium*), lupine (*Lupinus arctica*), plantain (*Plantago canescens*) and purple peavine (*Lathyrus* spp. ) were identified.

Two gilled beige mushrooms, one 2 cm across the cap and the other 6 cm across were found here as well.

Mosses were located here. Grasses were reedgrass (*Calamagrostis canadensis*), wheatgrass (*Agropyron* spp.) and tufted hairgrass (*Deschampsia caespitosa*). Lichens found are the same as those above.

Plant growth is heavier on the west side of the highway near the creek bank baseline than at Sites 35 - A and B. Willows and spruce trees grew in thickets.

Polargrass (*Arctagrostis latifolia*) grew 0.5 to 1.0 meters tall. High bush cranberry grew along the creek bank. A small alder was also found here.

In the muskeg 0.5 meters or less from the buried or partially exposed pipeline, the sedges seemed to be as healthy as those growing further away. A sheen of some substance appeared on the surface of the muskeg water near the pipeline.

The mosses and other flora were growing around and over the dumped waste and pipeline. The vegetation cover could easily be pulled away to the original soil surface. On the building foundations the wooden boards were rotting and being slowly covered with vegetation.

Site 35 - A is located on the east side of the Alaska Highway. The canopy layer is black spruce (*Picea mariana*), balsam poplar (*Populus balsamifera*), willow (*Salix* spp.) and paper birch (*Betula papyrifera*). The understory has shrub birch (*Betula glandulosa*), red swamp currant (*Ribes triste*), shrubby cinquefoil (*Potentilla fruticosa*) and lapland rosebay (*Rhododendron lapponicum*). The dwarf shrub layer has bog blueberry (*Vaccinium uliginosum*), red bearberry (*Arctostaphylos rubra*), kinnikinnik (*Arctostaphylos uva-ursi*) and low bush cranberry (*Vaccinium vitis-idaea*). Grasses were not identified as no inflorescence was found. Sedges (*Carex* spp.) mosses and lichens were present. Lupine (*Lupinus arctica*) and bluebell (*Mertensia paniculata*) were identified.

Site 35 - B is located 45 meters further along the winter trail from site 35 - A. The canopy layer was black spruce (*Picea mariana*), balsam poplar (*Populus balsamifera*) and paper birch (*Betula papyrifera*). The understory has shrub birch (*Betula glandulosa*), Labrador tea (*Ledum groenlandicum*), shrubby cinquefoil (*Potentilla fruticosa*), rose (*Rosa acicularis*) and lapland rosebay (*Rhododendron lapponicum*). The dwarf shrub layer has low bush cranberry (*Vaccinium vitis-idaea*), kinnikinnik (*Arctostaphylos uva-ursi*), crowberry (*Empetrum nigrum*), bog blueberry (*Viburnum edule*) and yellow dryas (*Dryas drummondii*). Lupines (*Lupinus arcticus*), bluebell (*Mertensia paniculata*) and sweet coltsfoot (*Petasites frigidus*) were found. Dwarf scouring rush (*Equisetum scirpoides*) was found nearby.

Mosses were difficult to identify as no seta were observed. Feather mosses (*Pleurozium schreberi*, *Hylocomium splendens*) and, on nearby wet places, sphagnum (*Sphagnum* spp.) seemed abundant.

Lichens identified at this site include freckled lichen (*Peltigera aphthosa*), reindeer lichen (*Cladina rangifera*), Pioneer cladonia (*Cladonia cornata*), pixie cup lichen (*Cladonia pyxidata*), toad pelt (*Peltigera scabrosa*) and starburst lichen (*Parmeliopsis hyperopta*) attached to a rotting fruit box.

All plants that were growing at these two sites, both in the space around the waste debris and in the immediate environs, seemed to be healthy. Mosses actually growing inside the cans or through the wooden boxes were similar in every respect to those nearby.

Evidence of wildlife consisted of moose sign throughout the site. Beaver houses and dams were noted in Dry Creek adjacent to the site.

#### **4.0 Test Results**

Because of the nature of the use to which this site had been subjected, soil samples were field tested for 2,4-D, DDT and PCBs. Soils samples were also tested for metals and extractable petroleum hydrocarbons.

The field testing, briefly, consisted of the following. A soil extraction was made from a portion of each sample. Each extraction was mixed in an individual enzyme-coated test tube with a substrate. A null test and stepped concentrations of the substance being tested for were mixed in the same way. The substrate competes for enzyme bonding places with the soil extraction. A stop solution was added to the test tube mixture and the resulting colour of each test tube was compared with a clear stop solution tube for refraction. The resulting value for each soil solution was compared with those for the null test tube and the stepped concentrations of the substance being tested for in order to determine the necessity of having each soil sample undergo the laboratory analysis. (For a detailed description of the process please refer to Appendix A).

#### **4.1 DDT and 2,4-D**

The results of the field test for DDT and 2,4-D indicated values lower than those for the "negative control" or null test so no further analysis was required.

#### **4.2 PCBs**

The field test for PCB suggested there might be between 1 and 10 ppm PCB in the soil at this site. Subsequent analysis by ASL laboratory in Vancouver, B.C., indicated, however, that there was less than .05 ppm PCB material in all of the soil samples except one. In the case of that one sample the PCB level was less than 5 ppm. The level of PCBs permitted by the CCME interim remediation criteria in Residential/Parkland areas is 5 ppm.

### 4.3 Metals

Laboratory analysis was also conducted on the soil sampled from this site for cadmium, lead, mercury and zinc. The values found for these metals in the soil samples from this site were generally well below those cited in the CCME interim remediation criteria for soil in Residential/Parkland areas, with the following exceptions:

**Cadmium** was found at 32.2 ppm in the surface soil sample and at less than .1 ppm several cm below the surface. The CCME criterion for cadmium in a Residential/Parkland setting is 5 ppm. This anomaly may be explained by the presence of the disintegrating dry cell battery pack at this site, 35-C-3; earlier dry cells' zinc component may have contained high levels of cadmium. In any event, the substance does not appear to be penetrating the soil to any extent.

**Zinc** was found at 11,600 ppm at the surface at Site 35-C-3 and only at 50.7 ppm several cm below the surface. Again, this anomaly may be explained by the presence of the disintegrating dry cell battery pack at this site. Here too, the zinc does not appear to be penetrating the soil to any great extent. The CCME criterion for zinc in a Residential/Parkland setting is 500 ppm.

### 4.4 Total Extractable Hydrocarbons

Extractable hydrocarbons were found only in the grease sample scraped from the residue in one of the seven barrels found at Site 35-C-5 and in the soil sampled at Site 35-D-1. The former contained a total of 74,300 TEHs in the Carbon 10-30 range and the latter 9,890 TEHs in the Carbon 10-30 range. Since in both instances the samples were taken from a very contained area, no great danger is presented.

### 4.5 Water Samples

The water samples contained total metals substantially below even the CCME criteria for freshwater aquatic life. The water sample drawn from standing surface water near the pipeline which appeared to have an oily sheen on it was determined by ASL laboratory to have an oil and grease measure of 6. No standard appears to have as yet been established either in the CCME criteria nor in the draft Yukon Government regulations.

(The complete laboratory analysis results are provided in Appendix B).

## 5.0 Discussion and Conclusions

No evidence of buried garbage or military camp debris was noted at this site. This rather extensive site contains a number of surface deposits of garbage. For the most part these appear to be relatively benign except for the unusually high concentrations of cadmium and zinc at the surface of one site. The garbage/debris consisting of waste building material with protruding nails, broken glass bottles, and loose telephone wire could constitute a physical hazard to hikers or hunters/trappers and wildlife in the area.

## 6.0 Recommendations

A number of further actions are necessary at this site. The potential physical hazards should be dealt with by cleaning up these locations. The surface garbage and debris should be removed and disposed of appropriately; some of this material such as the glass bottles is potentially recyclable. This cleanup should be undertaken after consultation and in conjunction with the White River First Nation, given the site's proximity to a former First Nation village site and existing trapper's cabin and especially since the WRFN has not as yet completed its land claim agreement.

An exception to this recommendation is remediation of the two sites along the Snag trail. These sites are being invaded by vegetation and unless the removal could be achieved in the wintertime, gaining access to this site overland would be difficult and probably cause more damage than the clean-up of the two sites would offset.

Particular care should be taken to remove the lead acid battery and the dry cell battery packs from this site to prevent any further leaching of lead, zinc, and cadmium into the ground at this site. The drums containing grease residue should also be removed and disposed of appropriately as should the identified areas of oil contaminated soils.

While there is not necessarily a connection between the oil on the water adjacent to the pipeline and the pipeline itself, since this line is now starting to surface due to frost action, consideration should be given to removing the remaining portion at this site.

**References:**

- Bisset, K. 1995. Research of former military sites and activities in the Yukon. AES, DIAND. Whitehorse, Y.T.
- Kennedy, C.E. 1993. Guidelines for reclamation/ revegetation in the Yukon. Yukon Renewable Resources. Whitehorse, Y.T.
- Tempelman - Kluit, D. J. 1974. Reconnaissance Geology of Aishihik Lake, Snag and Part of Stewart River Map Areas, West Central Yukon, Geological Survey of Canada, Paper 73-41.

**Appendix A**  
**Field Lab Process**

Please refer to cumulative Appendix A  
provided for Site 13

**Appendix B**

**Laboratory Analysis Results**

Please refer to cumulative Appendix B

provided for Site 13