

**PHASE 3  
ENVIRONMENTAL SITE ASSESSMENT  
Former Alcan Fuels Ltd. Site  
Haines Junction, YT**

0201-98-13537

Submitted to:  
Indian & Northern Affairs Canada

March, 1999

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ENVIRONMENTAL SITE ASSESSMENT**

submitted to:

Indian & Northern Affairs Canada

prepared by:

**EBA Engineering Consultants Ltd.  
Whitehorse, Yukon**

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## EXECUTIVE SUMMARY

EBA Engineering Consultants Ltd. (EBA) was requested by the Department of Indian and Northern Affairs Canada (INAC) to provide a proposal for a Phase 3 Environmental Site Assessment (ESA). The objective of the assessment was to investigate the lateral and vertical extent of contamination in the vicinity of a former bulk fuel storage site. This proposal formed the basis of a Call-up, under Standing Offer 98-6200, to conduct the Phase 3 ESA.

A combination of hand auger holes, test pits and boreholes were advanced on the property to assess soil contamination in the area formerly occupied by three aboveground storage tanks (ASTs). The field work was conducted in two stages to confirm the precision of field screening equipment under the site conditions and then to complete the delineation of hydrocarbon contamination on the property.

A combination of ten hand auger holes and nine test pits were used in the preliminary stage of field work and a total of 21 boreholes were advanced to a maximum depth of 12.3 m in the second stage to collect representative soil samples. On-site screening of soil vapours and soil samples was used to assist in determining the borehole locations, depth of completion and to select appropriate samples for laboratory analysis.

Throughout the field work a total of 72 soil samples were collected and analyzed using field screening equipment. From the soil samples collected, 35 were selected for laboratory analysis to determine hydrocarbon concentrations for comparison with selected criteria. Groundwater was not encountered on the site during this drilling program.

The criteria for determining acceptable concentrations of hydrocarbons in the soil were derived from the Commercial Land Use guidelines and standard contained in either Canadian Council of Ministers of the Environment documents or in the Contaminated Sites Regulations (Yukon). Based on field screening and laboratory results, including those obtained in a previously completed Limited Phase 2 ESA, two areas of contamination were delineated. The volumes of contaminated soil were estimated at 940 m<sup>3</sup> and 110 m<sup>3</sup> for a total of approximately 1050 m<sup>3</sup>.

Remediation options are presented, based on the contaminants and soils found at the site.

## 1.0 INTRODUCTION

EBA Engineering Consultants Ltd. (EBA) received a Call-up under Standing Offer 98-6200 to conduct a Phase 3 Environmental Site Assessment (ESA) of a lot formerly leased to Alcan Fuels Ltd. in Haines Junction, Yukon (Figure 1). The site is located at km 1937 on the Alaska Highway, the UTM coordinates are northing 6 737 750 and easting 363 100 on map sheet 115 A/13.

A previous Limited Phase 2 ESA<sup>1</sup> at this site found concentrations of hydrocarbons in excess of commercial land use standards<sup>2</sup>, near three former bulk tank locations on the site.

All references in this report are to the three former AST locations unless otherwise specified. The information present in this report has also been organized in relation to the former tank locations. This allows for the interpretation of the results based on these three identified sources of the contamination.

This report incorporates and is subject to the attached "Environmental Report - General Conditions".

## 1.1 BACKGROUND

In June 1998, Mr. Thomas Echervogt, on behalf of Source Motors, retained EBA to perform a Limited Phase 2 ESA that included the subject property.

The objectives of the Limited Phase 2 assessment were to identify soil contaminated with hydrocarbons and to determine if there are significant hydrocarbon contamination issues relative to the Contaminated Sites Regulations. A total of four boreholes were advanced by Great Northern Oil Inc. to assess soil conditions in the vicinity of the three former bulk tank locations. EBA was present throughout the drilling program to conduct on-site hydrocarbon vapour testing of representative soil samples from all boreholes and to select appropriate samples for laboratory analysis. Due to limitations with the drilling equipment supplied, these boreholes did not extend beyond 6.4 m depth.

The bulk tanks consisted of two vertical above ground storage tanks (ASTs), one gasoline, the other stove oil, and a horizontal AST for furnace oil (Figure 2). Information collected through interviews conducted as part of the Limited Phase 2 ESA indicated that these were the only products stored in the respective tanks. This information was not verified, as records were not available within the Yukon.

Following decommissioning of these tanks it was reported (T. Echervogt) that the berms were pushed inward and the site was levelled. It was anticipated that this may have covered or obscured other signs of contamination such as surface stains or stressed vegetation in the area formerly occupied by the tanks. Details of fuel delivery systems (unloading and dispensing) could not be verified and no plans of the tanks or piping systems were found. The gasoline and stove oil ASTs were located inside a common containment dike. The furnace oil tank did not have a containment dike.

In the Phase 2 ESA laboratory analytical results of concentrations of hydrocarbons in the soil samples were compared to the Commercial Land Use standards established in the Contaminated Sites Regulations. Laboratory results showed soil samples from three of the four boreholes had hydrocarbon concentrations well in excess of the regulatory standards. The type of hydrocarbon contamination detected was not consistent between boreholes, indicating releases of hydrocarbons from more than one source.

From the laboratory analytical results it was known that contamination in the area of the gasoline AST extended to beyond 6.4 m and was thought to be a mixture of gasoline and diesel type products. The mixing of contaminants was thought to indicate the lateral migration of contaminants on the site.

## **1.2 OBJECTIVES OF THE CURRENT STUDY**

The objectives of this Phase 3 ESA were to:

1. determine the vertical and lateral extent of soil contamination which had been identified in the Limited Phase 2 ESA;
2. determine if groundwater contamination had occurred, if groundwater was encountered within a reasonable depth; and
3. suggest remedial options based on the results of the assessment.

For the purpose of assessing contamination, the chemical analytical results have been compared to guidelines in both the Canadian Council of Ministers of the Environment publications and standards in the Contaminated Sites Regulations. A detailed discussion of the assessment criteria is presented in Section 2.4 of this report.

### 1.3 AUTHORIZATION

Call-up number 98-6200-01 was issued to EBA based on a proposal submitted to Indian and Northern Affairs Canada dated July 24, 1998.

### 1.4 SITE DESCRIPTION

Alcan Fuels is located adjacent to the Alaska Highway, approximately 2.1 km west of the Haines Road intersection in Haines Junction, Yukon Figure 1. The subject site is adjacent to the northern side of the service station property (Lot 88 Group 803 of Plan 55189) as shown in Figure 2.

The soil stratigraphy of the site consists of surficial fill from the levelling of the old containment berms, overlying a damp to moist, dense, glacial till consisting of silt and clay with a trace of sand and gravel. There are also sand lenses throughout the till that vary in thickness from 0.1 m to 1.3 m. At depth, this glacial till decreases in moisture content and increases in density. Drilling this material was very difficult. Groundwater was not encountered in any of the boreholes during the subsurface investigation. These soil conditions are consistent with other sites in the Haines Junction area.

Within the old containment cell areas, fill materials were observed to exist from the surface to varying depths of 1.0 m to 1.5 m. After the ASTs were removed from the containment cells the berms of each cell were used as fill and pushed into the depression of the containment cell area. This was substantiated by debris found at approximate depths of 1.0 m to 1.5 m in some of the boreholes.

Groundwater was not encountered in any of the boreholes drilled on the site. The static water level in a well (Figure 2) on the adjacent property was measured at approximately 30.0 m below surface. A dense silty till layer was encountered at depths ranging from approximately 8 to 12 m in boreholes drilled at this site. This layer appears continuous throughout the site and it is

anticipated that it would form a barrier to the vertical migration of contaminants. Penetration of this layer was purposely minimal; to ensure that this protective barrier would be left intact.

The site was cleared of vegetation and generally flat (Photograph #1) with a gentle slope to the southwest. The nearest surface water is the Dezadeash River approximately 400 m south of the site (Figure 1).

## 1.5 SCOPE OF WORK

The Phase 3 ESA was based on information obtained during the Limited Phase 2 ESA. Since fine grained soils (low void ratio) were encountered in the earlier field work program, there was concern that the field screening equipment may not provide a level of precision that would allow decisions to be made during the drilling program. To determine if field screening could be relied upon to make decisions in the field, a preliminary soil investigation was undertaken to determine the precision of the vapour monitoring equipment and immunoassay soil test kits, given the soil conditions at this site.

The scope of work completed for this Phase 3 Environmental Site Assessment was as follows:

- Conducted additional information review to locate background material on piping locations, as-built drawings and tank usage.
- Designed a field program to identify the vertical and lateral extent of soil and groundwater contamination using the commercial land use classification and criteria in CCME publications and CSR.
- Conducted a preliminary soil investigation to identify the lateral extent of contamination and to determine the precision of the field screening equipment under the site conditions.
- Conducted a drilling program to delineate contaminant plumes on the site.
- Submitted soil samples for analysis of benzene, toluene, ethylbenzene and xylenes (BTEX), extractable hydrocarbons, volatile petroleum hydrocarbons, and Polycyclic Aromatic Hydrocarbons (PAHs) for comparison with selected guidelines and standards.
- Prepared a report discussing the field program, chemical analysis results, environmental concerns associated with the site and remediation options based on the contamination found at the site.

## 2.0 METHODOLOGY

The field program was conducted in two stages; the first was designed to test field screening equipment under the site conditions present and to establish the lateral extent of near surface contamination. This allowed for a better understanding of the near surface contamination and maximized the efficiency of the second stage drilling program.

### 2.1 PRELIMINARY SOIL INVESTIGATION

Available information indicated that contaminant releases were at or near the surface of the site. Therefore, a preliminary stage of the field investigation was used to determine the approximate lateral extent of contamination in the upper two metres of soil. This stage was also used to determine the precision of the field screening equipment.

A soil vapour probe was used in conjunction with a hollow stem hand auger and test pitting (dug by hand) to collect soil and soil vapour samples down to approximately two metres below surface. The vapour probe would be inserted into the soil and vapours drawn up into testing instrumentation through a Teflon® tube. The vapour probe system was first field tested by inserting the probe approximately 0.5 m into the soil in an area of known contamination on the site (Borehole 13413-BH01 Phase 2 ESA) to compare instrument readings with laboratory results obtained during the Phase 2 assessment. Soil samples were collected by inserting a core sampler with a clean stainless steel tube liner through the hollow stem auger and retrieving a sample from the undisturbed soils below the auger tip. Soil samples from the test pits were collected from the bottom of the test pit using a clean sampling trowel.

Sampling equipment was cleaned with a soap and water mixture and rinsed with water prior to sampling at each sample depth. Auger flights were cleaned in a similar fashion between each test hole.

Ionizable soil vapour concentrations were used as an indicator of hydrocarbon contamination in the soil. The vapours were analyzed with either a Photovac MicroTIP® or a Rae MiniRae® photoionization detector (PID) using a 10.6 eV lamp. These instruments provide a digital readout of the level of ionizable components of the vapour. The PID readings provide a semi-quantitative



comparison of ionizable vapour levels in soil which were used to select soil samples with the highest apparent hydrocarbon contamination in each borehole.

Selected soil samples were analysed using an EnviroGard™ Soil Field Lab with Total Petroleum Hydrocarbons (TPH) specific test kits as a second field screening tool. This is an immunoassay kit that produces a reaction specific to total petroleum hydrocarbons (TPH). The extent of reaction is measured by a colourmetric change and compared to standards with known concentrations using a photometer.

Hand auger holes and test pits were located in a step out pattern to identify the lateral extent of contamination. PID readings were recorded at 0.5 m intervals from hand auger holes and test pit locations, and duplicate soil samples were collected from approximately every metre during this preliminary stage of the site investigation. One sample, from selected duplicate sets, was analyzed using the immunoassay TPH field kit; the second sample was retained for laboratory analysis.

Samples for laboratory analysis were selected based on PID and immunoassay test results. The selected samples covered the full range of field screening results to establish field screening results indicative of contaminant concentrations in excess of criteria and to detect false negatives. Laboratory results from selected samples were used to confirm contaminant levels and to establish levels of confidence in the PID and immunoassay field test results in order to focus the second stage drilling program.

## **2.2 DRILLING AND SOIL SAMPLING PROGRAM**

Following the collation of field screening and laboratory results the second stage drilling plan was developed. The drilling plan involved first collecting grab samples (disturbed soil samples) along the lateral edge of the near surface contaminant plume in order to supplement information on the lateral extent of near surface contamination. Once the lateral extent of contamination had been clearly defined, hollow stem augers and a 50 mm diameter sampling spoon were used to collect undisturbed samples to determine the vertical extent of contamination.

The drilling program was undertaken from September 14 to 17, 1998. The drilling program employed an all-terrain vehicle mounted CME 750 drill rig for both solid and hollow stem augering to collect soil samples. A total of 9 solid stem boreholes and 12 hollow stem boreholes

were drilled in the locations as shown in Figures 3 to 5. Field screening equipment was used to assist in determining the extent of drilling as well as selection of samples for laboratory analysis.

Soil samples were collected approximately every 1.5 m from each borehole. Sampling was more frequent when apparent contamination or stratigraphic changes were detected. Grab samples were collected by first trimming the exterior soils on the auger flights and sampling the newly exposed soil from between the auger flights for each of the boreholes. Undisturbed soil samples were collected by advancing the 50 mm split spoon through the hollow stem augers and sampling in the undisturbed soils beyond the auger tip.

Field analysis of soil vapours was conducted on all soil samples collected; results are recorded on the individual borehole logs. Following completion of the boreholes, samples were selected (based on PID readings and sample location) for analysis using the immunoassay field kit. Samples were selected for laboratory analysis based on field screening results and sample location. Field screening results were also used to assist in determining borehole locations and the efficient use of drilling equipment. Laboratory analysis was used to determine soil contaminant concentrations for comparison to selected criteria.

### 2.3 LABORATORY ANALYSIS

Soil samples collected for analysis were stored and shipped in a cooler packed with ice to Enviro-Test Laboratories (ETL) in Edmonton. ETL is an accredited laboratory under The Canadian Association for Environmental Analytical Laboratories (CAEAL).

Soil samples were submitted for chemical analysis of benzene, toluene, ethylbenzene and xylenes (BTEX), Volatile Petroleum Hydrocarbons (VPH), Extractable Petroleum Hydrocarbons (C10-C18) and Extractable Petroleum Hydrocarbons (C19-C32) concentrations. Following these analyses, five samples with the highest Extractable Petroleum Hydrocarbon concentrations were selected for Polycyclic Aromatic Hydrocarbons (PAHs) analyses.

## 2.4 ASSESSMENT CRITERIA

For the purpose of this assessment, both the Canadian Council of Ministers of the Environment (CCME) guidelines<sup>3</sup> and Contaminated Sites Regulations (CSR) have been used in the evaluation of the concentration of contaminants in the soil, as directed by INAC. The commercial land use category was selected as the applicable land use for this site based on current use of the property.

The CCME guidelines were used as the primary reference. Where guidelines have not been listed for particular parameters, the CSR standards were used. For the CCME criteria, generally the 1997 recommended guidelines are listed. The provisional guidelines and check values were also review to determine which criteria was the most stringent.

For volatile petroleum hydrocarbons, light extractable petroleum hydrocarbons and heavy extractable petroleum hydrocarbons only the CSR generic numeric soil standards are available. It should be noted that the hydrocarbon concentrations are reported as Extractable Petroleum Hydrocarbons (EPH) followed by the carbon range. The Contaminated Sites Regulations specify commercial land use standards for Light Extractable Petroleum Hydrocarbons (C10 - C18) and Heavy Extractable Petroleum Hydrocarbons (C19 - C 32) which are 2000 ppm and 5000 ppm respectively. The concentrations listed in the regulations essentially consist of EPH values, which are corrected for Polycyclic Aromatic Hydrocarbons (PAH). Since PAH concentrations were not expected to significantly affect the analytical results at these action levels, the EPH analyses have been used. For the site, five soil samples with the highest EPH concentrations were submitted for analysis of PAH concentrations to validate this assumption.

In the CSR, BTEX compounds have several numerical values associated with each land use. These "matrix numerical values" allow for site specific factors to be taken into consideration in the evaluation of concentrations of contaminants in soil. The site specific factors of human intake of contaminated soil and toxicity to soil invertebrates and plants are required to be considered for all sites. Groundwater was not encountered in the Phase 3 drilling program but the standard for groundwater used for drinking water was considered due to a well located on the adjacent property. This well is not currently used for drinking water (per. T. Echervogt). Where more than one CSR criteria is available, the most stringent applicable criteria has been listed.

Based on the proximity to the Dezadeash River, the CSR aquatic life criteria were also considered in the evaluation of concentrations of hydrocarbons at the site. In all cases the most stringent criteria related to the factors considered have been provided in Tables 1 to 3.

For the purposes of estimating the volume of soil that may be contaminated in excess of the selected criteria, laboratory analyses for all parameters were considered. Where any one parameter was in excess of the criteria that sample was considered to be within the contaminant plume. Contours were then established for the extent of the contaminant plume at the surface, 3.0 m depth and 11 m depth. Where adjacent boreholes showed concentrations of contaminants that bracketed the criteria, the contour was placed nearest the borehole with contaminant concentrations below criteria. The volume of contaminated soil was then calculated as the volume contained within the contours. This method of calculating the volume of soil assumes a consistent lateral migration between boreholes.

### 3.0 RESULTS

Tables #1 – 4 summarizing the chemical analysis are presented at the end of this report. This is preceded by Figures containing information on site and borehole locations. The raw data tables, results of soil grain size analyses and borehole logs are presented in Appendix A. The Enviro•Test Laboratory and Norwest Labs Chemical Analyses Reports and QA/QC data are presented in Appendix B.

Tables are broken down into data collected during the Limited Phase 2 ESA and the Phase 3 ESA. The identification number for each sample, borehole, hand auger hole or test pit is preceded by a five digit job number which is unique to each of the two phases of work. This combination of job number and identification number is consistent throughout the summary tables, raw data tables and analytical results sheets.

### 3.1 SOIL CHEMICAL ANALYSIS

Laboratory analyses of hydrocarbon concentrations in soil are provided in Tables 1 through 3 and Table 4 contains Polycyclic Aromatic Hydrocarbon results. The results are grouped by borehole location except for PAHs. The borehole numbers, sample numbers and sample depths are listed within each table. Borehole locations are shown on Figures 3 through 8. The CCME and CSR criteria for Commercial Land Use are provided in each Table for comparison to analytical results.

Polycyclic Aromatic Hydrocarbon laboratory analyses were performed on five samples with the highest EPH concentrations. The results presented in Table 4 show that all parameters analyzed are below the selected criteria.

#### Bulk Gasoline AST

The laboratory results (Table 1) indicate that contamination exceeding the criteria was found in the area of the Gasoline AST to a maximum depth of 10.9 m (Borehole 13537-BH25). The chromatogram for this sample is typical of a diesel type of product indicating the source to be from other than the Gasoline AST. The BTEX compounds exceed both the CCME and CSR criteria in Boreholes 13413-BH01 & 04, 13537-BH10, & 23 and in Test Pit 13537-TP01 as shown in Table 1. The CSR standards for Volatile Petroleum Hydrocarbons and/or Light Extractable Petroleum Hydrocarbons were exceeded in Boreholes 13413-BH01 & 04, 13537-BH10, 20, 23 and 25 and in Test Pit 13537-TP01.

Of the soil samples collected in this area only the sample from 1.7 to 1.9 m in Borehole 13413-BH04 has a chromatograph indicating only a gasoline product. All other samples analyzed show patterns that indicate light end hydrocarbons in the C8 to C12 range, typical of gasoline and kerosene products as well as the presence of a diesel type of product.

The analytical results suggest that the contamination in the vicinity of the Gasoline AST appears to merge with the contaminant plume originating from the vicinity of the Stove Oil AST. Figures 5 & 6 depict the area estimated to contain concentrations of hydrocarbons in excess of the criteria.

### Stove Oil AST

The laboratory results (Table 2) indicate that contamination exceeding the criteria was found in the area of the Stove Oil AST. Boreholes 13413-BH02 and 13537-BH23 had concentrations of some or all of the BTEX compounds which exceed the CCME criteria in the upper 3.3 m of the soil profile. Boreholes 13537-BH13 & 23 had benzene concentrations exceeding the CSR standard for groundwater flow to drinking water and Borehole 13537-BH23 and Test Pit 13537-TP05 had concentrations of light extractable petroleum hydrocarbons exceeding the CSR standards. Field screening results also indicate elevated hydrocarbon concentrations in the upper 2.7 m of soil in Borehole 13537-BH11. The chromatograms for these samples all show evidence of a diesel type of product, presumably stove oil.

Analytical results from Boreholes 13537-BH12, 13 & 22 located to the north and east of Boreholes 13537-BH02 (Figure 3) show concentrations of hydrocarbons below the selected criteria. Field screening results from these boreholes as well as hand auger holes and test pits generally indicate concentrations of hydrocarbons that are anticipated to be below the criteria. One notable exception is Test Pit 13537-TP05 (Figure 3) which have concentrations of hydrocarbons in excess of the criteria for Extractable Petroleum Hydrocarbons (C10 – C18) as shown in Table 2.

Figures 5 & 6 depict the area estimated to contain concentrations of hydrocarbons in excess of the criteria. The results suggest that contamination originating in the vicinity of the Stove Oil AST has combined with contamination in the vicinity of the Gasoline AST.

### Furnace Oil AST

Laboratory analytical results for soil samples in the vicinity of the Furnace Oil AST (Table 3) indicate three borehole locations that contain concentrations of hydrocarbon contamination exceeding the criteria. Analytical results from Borehole 13413-BH03 (1.3 to 1.5 m) show concentrations of toluene and xylenes which exceed CCME guidelines. This soil sample also has concentrations of benzene and EPH (C10 – C18) which exceed the CSR standards. Hand auger hole 13537-HA09 had concentrations of toluene exceeding the CCME guidelines and Borehole 13537-BH19 had concentrations of benzene exceeding the CSR standards.

Field screening results indicate that Borehole 13537-BH07 also had concentrations of contaminants expected to exceed the criteria.

Figures 7 & 8 depict the area estimated to contain concentrations of hydrocarbons in excess of the criteria.

### **3.2 SOIL GRAIN SIZE ANALYSES AND BOREHOLE LOGS**

Soil conditions encountered in the Phase 3 drilling program were similar to those encountered during the Limited Phase 2 ESA. Soil stratigraphy information for all boreholes is detailed in the borehole logs provided in Appendix B.

The grain size analysis reports from the Limited Phase 2 ESA are presented in Appendix A. The analysis shows that soils which generally ranged from 0.3 to 5.5 m were a mixture of silt and clay with only a trace of sand or gravel (Photograph #3).

Soil grain size analysis completed on borehole BH13413-1 (Limited Phase 2 ESA) indicated that the soil at the 3.0 m level was silt and clay with a trace of sand. This changed to silt with sand and a trace of gravel for the sample collected at approximately 6.2 m in this borehole.

## **4.0 INTERPRETATIONS**

### **4.1 GENERAL**

Significant hydrocarbon contamination exceeding both CCME and CSR criteria was encountered in two general areas. One area is located in the vicinity where the gasoline and stove oil ASTs were located and the second area is near the former furnace oil AST. The contaminant plumes appear to be contained within the property boundaries.

The contamination found near the gasoline and stove oil ASTs appears to be from two distinct sources. The contaminant plumes have combined at depth to form a single plume. Since the laboratory analytical results show three distinct types of contamination which correspond to the three ASTs, the discussion of results has been separated based on the contaminant source.

The transition to dense glacial till at depth is considered to be continuous throughout the site and is also considered to be a barrier to the vertical migration of hydrocarbons. It may also contribute to the lateral migration of contaminants along the top of this layer. It is further noted that organic materials were encountered intermittently at various locations and depths throughout the site (Photograph #2). These materials could also be providing pathways for the lateral migration of hydrocarbons within the site. Both these factors could increase the volume of affected soil.

The current land use is for the storage of materials related to the operation of the adjacent service station. Since the site was graded following the removal of the ASTs, a 200 mm layer of relatively uncontaminated soil has been placed over the contaminated material. This will limit direct contact with the contaminated soil on the site and reduce volatilization of hydrocarbons from this soil. Shallow excavations in the area of the contaminated soil will obviously expose this soil for direct contact. Currently there is unrestricted access to the site.

Remediation options based on the contaminants found at the site are presented in Appendix C.

#### 4.2 FIELD SCREENING

Field screening results were compared to laboratory analyses for the five soil samples selected during the preliminary field work stage. A graph of the logarithmic values of the PID readings, EnviroGard results and the laboratory analytical values are presented in Charts 1 & 2. While the field screening results were not considered to correlate well with the concentrations of BTEX compounds and VPH concentrations (Chart 1) they were considered adequate to provide an indication of the presence of the extractable petroleum hydrocarbons as shown in Chart 2.

Field screening results which were thought to indicate contamination were established, based on the results of the Limited Phase 2 ESA and the preliminary field work. By comparing results such as those illustrated in Chart 2 a PID reading of 100 ppm was considered to indicate concentrations of hydrocarbons which may exceed the selected criteria. For the immunoassay tests a result of greater than 625 ppm was considered to indicate concentrations of hydrocarbons in excess of the selected criteria.



### 4.3 GASOLINE AST

The Limited Phase 2 ESA found a gasoline type of contaminant, in the vicinity of the former Gasoline AST, to a depth of over 6.4 m. Boreholes drilled during the Phase 3 assessment found contamination in excess of the criteria to a depth of approximately 11 m (13537-BH25). The subsurface investigation determined that there was a sand layer or lens within the glacial till from 10.7 m to 12.0 m at Borehole 13537-BH25. The sand layer underlies dense, damp glacial till and overlies very dense, dry glacial till (hardpan). Hydrocarbon contamination above criteria was detected from the surface to a depth of approximately 9.0 m within the dense glacial till and at a depth of 10.7 m to 10.9 m within the sand. Analytical results for the soil sample collected from a depth of 11.2 m to 11.4 m within the sand confirmed very low concentrations of hydrocarbon contamination. Therefore, excessive hydrocarbon contamination was limited to the upper portion of the sand layer in this location, which suggests that this is the lower extent of the contaminant plume.

The lateral extent of contamination has been estimated from information obtained from boreholes around the perimeter of this plume. In particular Boreholes 13537-BH10 & 19 show that concentrations of contaminants which exceed the criteria were not found at these borehole locations to the south of the AST. Concentrations of EPH at 2100 ppm were detected in Borehole 13537-BH20 (3.0-3.3 m) to the southwest of the AST. This is marginally over the criteria of 2000 ppm and is anticipated to be indicative of the edge of the contaminant plume. Borehole 13537-BH21 had concentrations of hydrocarbons which are below the criteria and Borehole 13537-BH11 had field screening results which were interpreted as indicating concentrations of hydrocarbons below the criteria.

Boreholes 13537-BH06, 08 & 09 to the east of the Gasoline AST (west of the Furnace Oil AST) also had concentrations of hydrocarbons anticipated to be below the criteria for all samples analysed.

The northern edge of the gasoline contaminant plume is obscured by contamination originating from the area of the Stove Oil AST.

Based on the laboratory results and field screening, the soil thought to contain hydrocarbon contamination in excess of the criteria has been estimated to be 940 m<sup>3</sup>. The spatial extent of this contamination is illustrated in Figures 5 & 6.

#### 4.4 STOVE OIL AST

Contamination discovered during the Limited Phase 2 ESA in the area of the Stove Oil AST was thought to have migrated vertically and laterally to mix with contamination from the Gasoline AST. Knowing that the gasoline contaminant plume impacted an area generally to the southwest of the Stove Oil AST, the drilling program was focused on determining a northern and eastern limit to the plume.

Boreholes 13537-BH12, 13 & 22 all show concentrations of hydrocarbons below the criteria, indicating that there was limited migration of contaminants to the north and east of the former Stove Oil AST location.

Hydrocarbon concentrations (EPH C10-C18) well above the criteria were detected in Borehole 13537-BH23 located to the southeast of the Stove Oil AST. It appears from the chromatograph results that the product is similar to a Stove Oil type of product, suggesting that lateral migration has occurred in this direction.

The overlap of the stove oil and gasoline in the chromatographs suggests that both products are present to the southern edge of the contaminant plume shown in Figure 4.

#### 4.5 FURNACE OIL AST

The Limited Phase 2 ESA found hydrocarbon contamination in excess of CSR criteria at the Furnace Oil AST location. The contamination appeared to be confined to the upper two metres of soil. The gas chromatographs were consistent with a furnace oil type of contaminant.

During the Phase 3 ESA, soil samples from boreholes located on the northern, western and eastern side of the former AST location had concentrations of hydrocarbons at or near the lower detection limit of laboratory analytical equipment. These concentrations are well below the selected criteria. Boreholes to the south of the former AST location encountered evidence of hydrocarbon contamination although concentrations were generally below criteria. Soil samples from Boreholes 13537-BH09, 14 & 18 all had concentrations of contaminants below the criteria,

with the highest concentrations in each borehole generally being found in the upper two metres of soil.

Field screening results from Borehole 13537-BH07 indicated that concentrations of hydrocarbons which may exceed the criteria were found down to 2.2 m. The next soil sample at 3.7 – 3.9 m was submitted for laboratory analysis and shows concentrations below the applicable criteria.

Based on the laboratory results and the field screening the soil though to contain hydrocarbon contamination in excess of the criteria has been estimated to be 110 m<sup>3</sup>. The spatial extent of this contamination is illustrated in Figures 7 & 8.

## 5.0 CONCLUSIONS AND RECOMMENDATIONS

In conclusion, the laboratory program indicates that contamination in excess of the commercial land use standards in both the Canadian Council of Ministers of the Environment guidelines and the Contaminated Sites Regulations was found in the vicinity of all three former AST locations on the site. The total volume of soil contaminated in excess of the criteria is estimated at 1050 m<sup>3</sup>. The soil is contained within the property boundary and does not appear to have migrated laterally to the adjacent properties.

A dense glacial till layer was detected in various locations at depths below seven metres. Analytical results show that the hydrocarbon concentrations in this layer do not exceed the criteria. It is therefore concluded that this layer is forming a barrier to the vertical migration of the hydrocarbons.

The contaminants are not affecting the current use of the site for storage.

The following recommendations are made respecting future action at this site:

- Should a land use change be contemplated, the results of this study should be reviewed to determine the potential impacts of the contaminants on the proposed new land use.
- Periodic testing of the well should be conducted to determine existing water quality and allow for the monitoring of changes to this water quality.
- Should any site grading or excavation take place appropriate precautions should be taken to reduce direct contact with the soil and hydrocarbon vapours.

## 6.0 CLOSURE

This report has been prepared for the exclusive use of the Department of Indian and Northern Affairs Canada, for the purposes as described in Section 1 of this report. It has been prepared in accordance with generally accepted geo-environmental practices. Further information regarding the use of this report is presented in the attached Environmental Report – General Conditions, which forms part of this report.

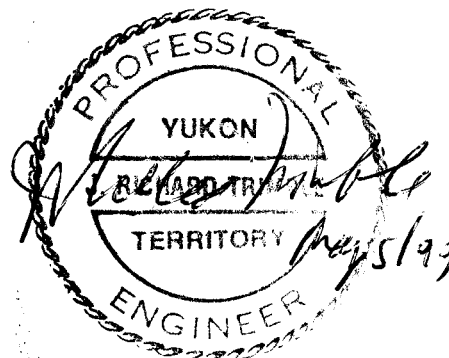
EBA trusts this report meets your requirements at this time. If you have any concerns or comments EBA would be pleased to discuss the report or any questions which you may have.

Respectfully submitted,  
EBA Engineering Consultants Ltd.

Reviewed by:



Donald J. Wilson  
Senior Environmental Scientist



J. Richard Trimble, P. Eng.  
Project Director  
Yukon Region

DJW/dw

Macintosh HD:0201 DJW:98 Projects:13537 DIAND Alcan:13537 Report Components:13537 report

## REFERENCES

- <sup>1</sup> EBA Engineering Consultants Ltd., 1998. Limited Phase II Environmental Site Assessment, Alcan Fuels Ltd., Haines Junction, YT. Unpublished contract report submitted to Source Motors Ltd.
- <sup>2</sup> Government of Yukon, 1996. Environment Act, Contaminated Sites Regulations, 1996/192
- <sup>3</sup> Canadian Council of Ministers of the Environment, 1997. Recommended Canadian Soil Quality Guidelines.

**EBA Engineering Consultants Ltd. (EBA)**  
**ENVIRONMENTAL REPORT – GENERAL CONDITIONS**

This report incorporates and is subject to these "General Conditions".

**A.1 USE OF REPORT**

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of EBA's client. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA's client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

**A.2 LIMITATIONS OF REPORT**

This report is based solely on the conditions which existed on site at the time of EBA's investigation. The client, and any other parties using this report with the express written consent of the client and EBA, acknowledge that conditions affecting the environmental assessment of the site can vary with time and that the conclusions and recommendations set out in this report are time sensitive.

The client, and any other party using this report with the express written consent of the client and EBA, also acknowledge that the conclusions and recommendations set out in this report are based on limited observations and testing on the subject site and that conditions may vary across the site which, in turn, could affect the conclusions and recommendations made.

The client acknowledges that EBA is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or

development of the property, the decisions on which are the sole responsibility of the client.

**A.2.1 Information Provided to EBA by Others**

During the performance of the work and the preparation of this report, EBA may have relied on information provided by persons other than the client. While EBA endeavours to verify the accuracy of such information when instructed to do so by the client, EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

**A.3 LIMITATION OF LIABILITY**

The client recognizes that property containing contaminants and hazardous wastes creates a high risk of claims brought by third parties arising out of the presence of those materials. In consideration of these risks, and in consideration of EBA providing the services requested, the client agrees that EBA's liability to the client, with respect to any issues relating to contaminants or other hazardous wastes located on the subject site shall be limited as follows:

- (1) With respect to any claims brought against EBA by the client arising out of the provision or failure to provide services hereunder shall be limited to the amount of fees paid by the client to EBA under this Agreement, whether the action is based on breach of contract or tort;
- (2) With respect to claims brought by third parties arising out of the presence of contaminants or hazardous wastes on the subject site, the client agrees to indemnify, defend and hold harmless EBA from and against any and all claim or claims, action or actions, demands, damages, penalties, fines, losses, costs and expenses of every nature and kind whatsoever, including solicitor-client costs, arising or alleged to arise either in whole or part out of services provided by EBA, whether the claim be brought against EBA for breach of contract or tort.

# ENVIRONMENTAL REPORT - GENERAL CONDITIONS

## A.4 JOB SITE SAFETY

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

## A.5 DISCLOSURE OF INFORMATION BY CLIENT

The client agrees to fully cooperate with EBA with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The client acknowledges that in order for EBA to properly provide the service, EBA is relying upon the full disclosure and accuracy of any such information.

## A.6 STANDARD OF CARE

Services performed by EBA for this report have been conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Engineering judgement has been applied in developing the conclusions and/or recommendations provided in this report. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of this report.

## A.7 EMERGENCY PROCEDURES

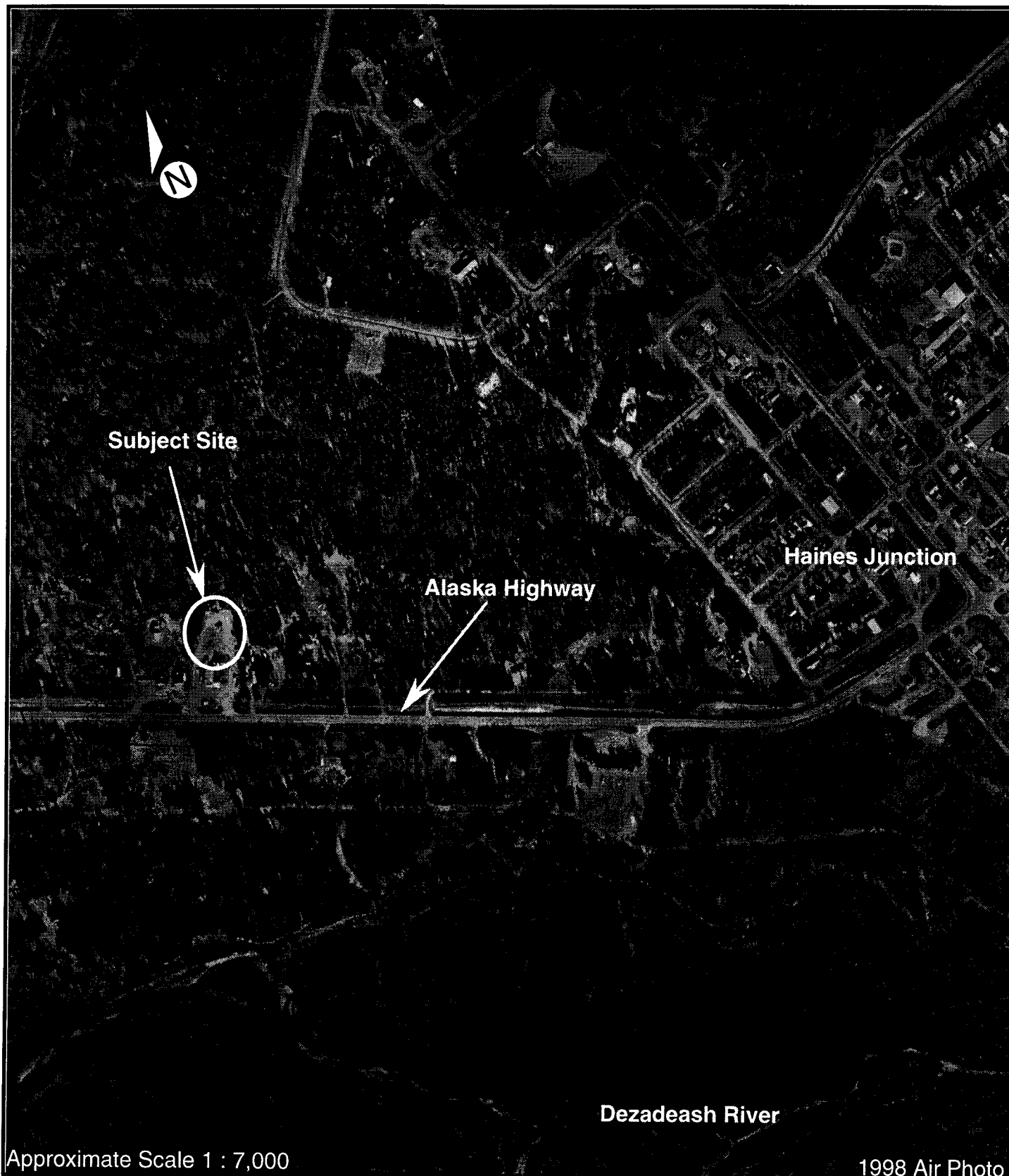
The client undertakes to inform EBA of all hazardous conditions, or possible hazardous conditions which are known to it. The client recognizes that the activities of EBA may uncover previously unknown hazardous materials or conditions and that such discovery may result in the necessity to undertake emergency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


## A.8 NOTIFICATION OF AUTHORITIES

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

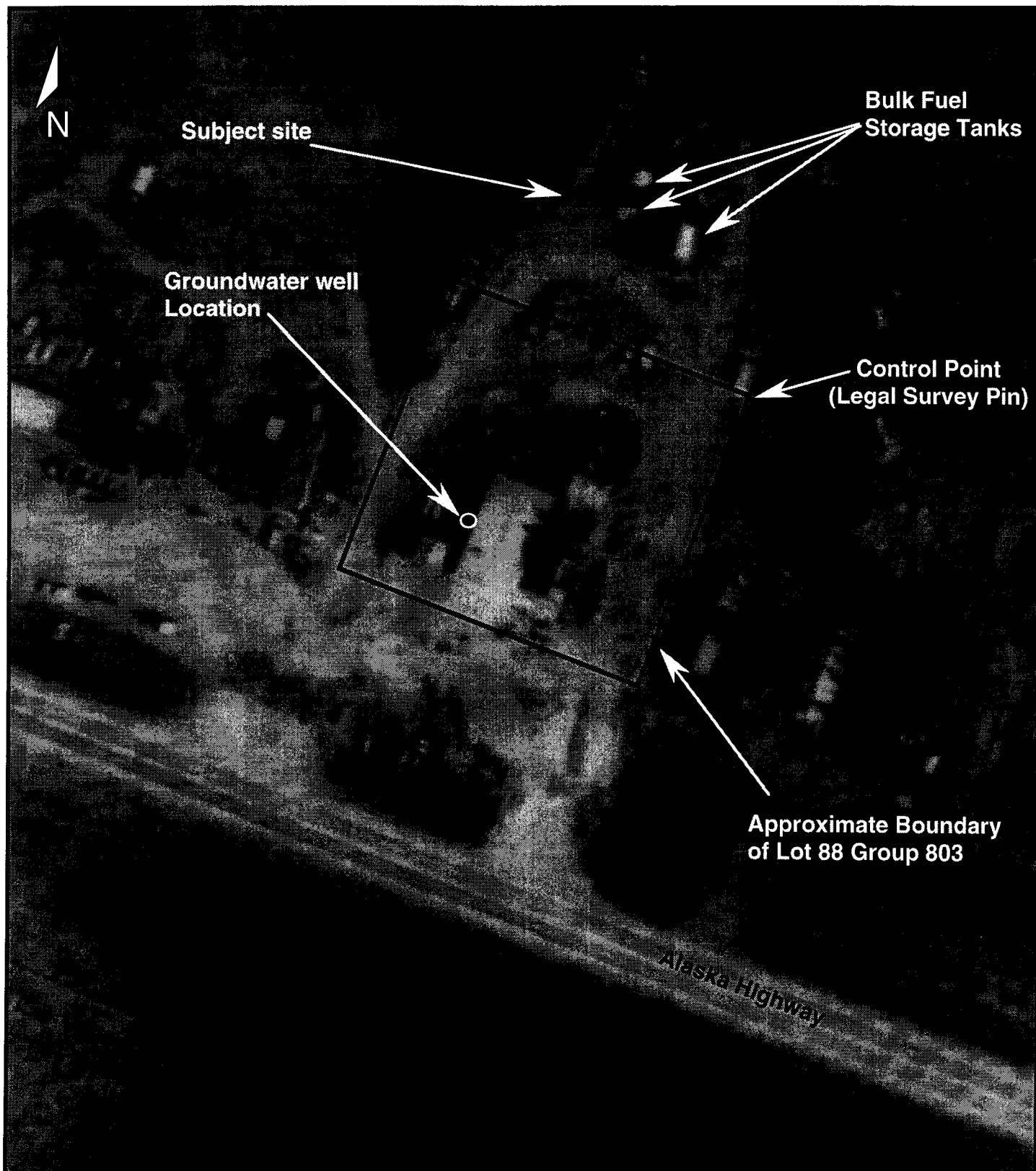
## A.9 OWNERSHIP OF INSTRUMENTS OF SERVICE

The client acknowledges that all reports, plans, and data generated by EBA during the performance of the work and other documents prepared by EBA are considered its professional work product and shall remain the copyright property of EBA.




 <b>EBA Engineering Consultants Ltd.</b>			PROJECT PHASE 3 E.S.A. ALCAN FUELS HAINES JUNCTION, YUKON		
CLIENT <b>INDIAN AND NORTHERN AFFAIRS ACTION ON WASTE PROGRAM</b>			TITLE <b>Site Location</b>		
DATE 99 02 16	DWN. DJW	CHKD.	FILE NO. 0201-98-13537	DWNG. 13413 Figure 1	REVISION 0

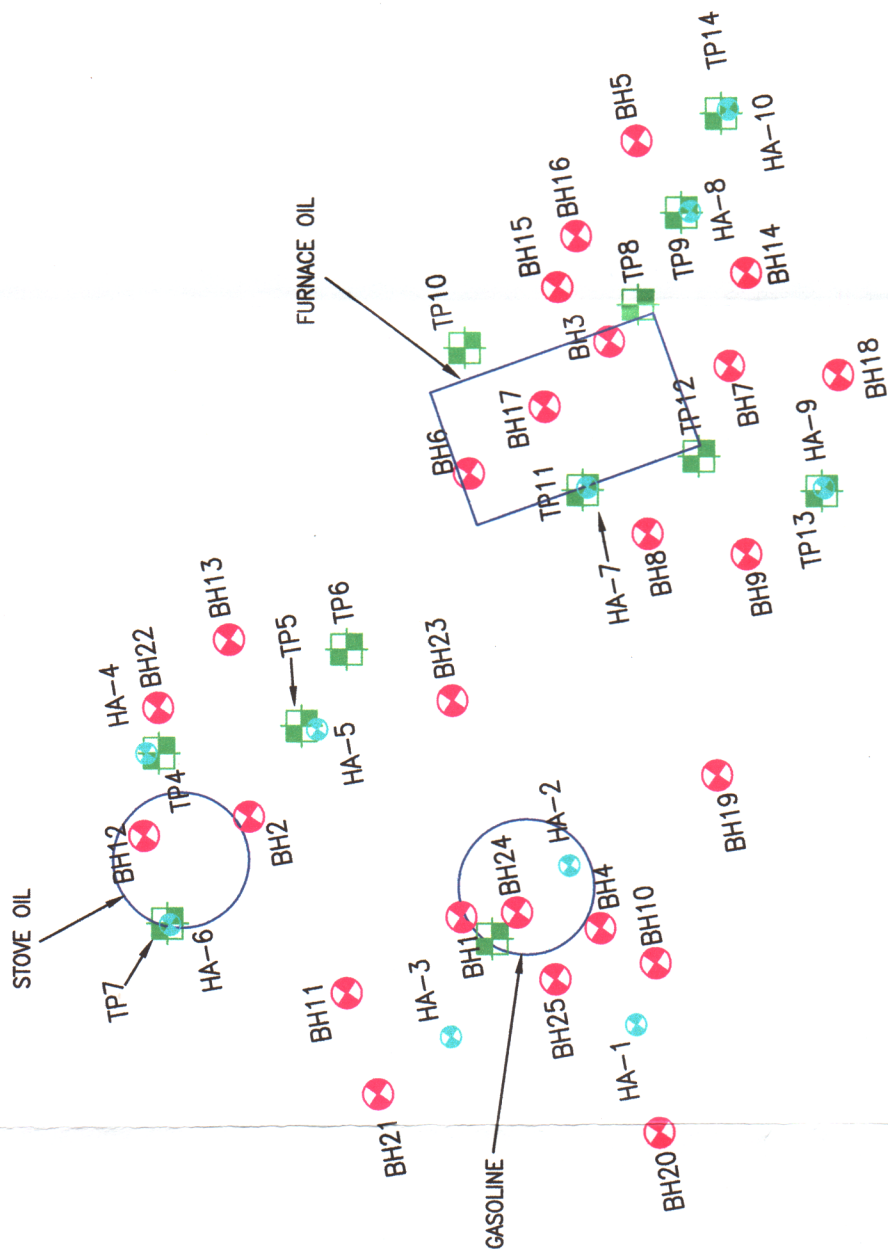
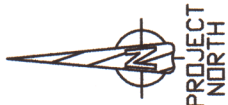




Approximate Scale 1 : 1,000

1992 Air Photo

 <b>EBA Engineering Consultants Ltd.</b>			<b>PROJECT</b> PHASE 3 E.S.A. ALCAN FUELS HAINES JUNCTION, YUKON		
<b>CLIENT</b>  INDIAN AND NORTHERN AFFAIRS ACTION ON WASTE PROGRAM			<b>TITLE</b>  Site Layout		
<b>DATE</b>	98 12 06	<b>DWN.</b>	DJW	<b>CHKD.</b>	
				<b>FILE NO.</b>	0201-98-13537
				<b>DWNG.</b>	13413 Figure 2
				<b>REVISION</b>	0



LEGEND

- BOREHOLE LOCATIONS
- TESTPIT LOCATIONS
- HAND AUGER HOLES



**EBA Engineering Consultants Ltd.**

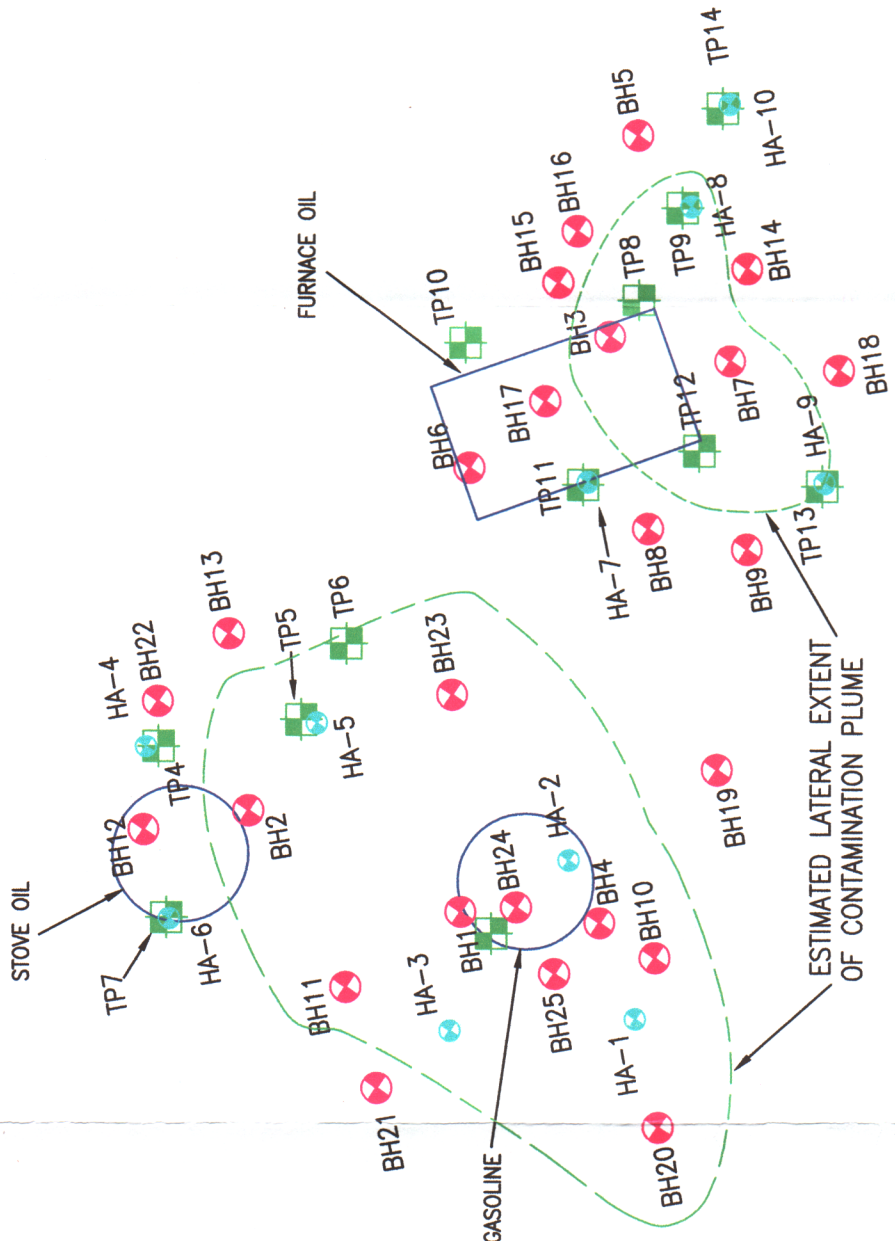
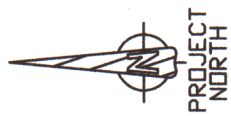
CLIENT

INDIAN AND NORTHERN AFFAIRS  
ACTION ON WASTE PROGRAM

PROJECT  
PHASE III E.S.A. ALCAN FUELS  
HAINEES JUNCTION, YUKON

TITLE  
SITE PLAN DEPICTING  
TESTHOLE LOCATIONS AND  
EXCAVATED AREAS


DATE 98/12/24 DWN. JSB CHKD. DJW FILE NO. 0201-98-13537 DRWG. FIGURE 3



LEGEND

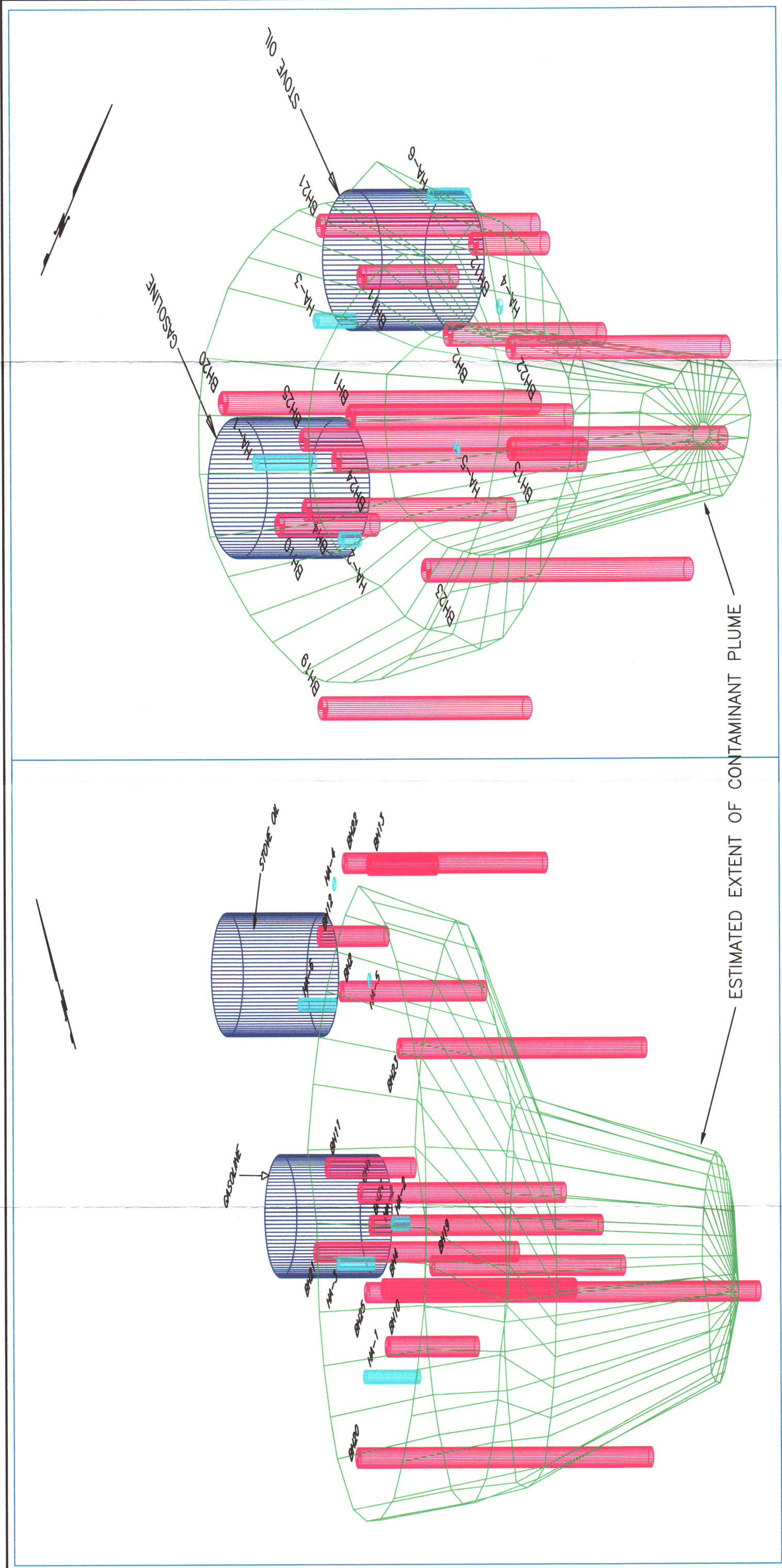
- BOREHOLE LOCATIONS
- TESTPIT LOCATIONS
- HAND AUGER HOLES



 CLIENT	INDIAN AND NORTHERN AFFAIRS ACTION ON WASTE PROGRAM			
	PHASE III E.S.A. ALCAN FUELS HAINES JUNCTION, YUKON			
DATE	98/12/24	DWN.	JSB	CHKD.
FILE NO.	0201-98-13537	DRWG.		FIGURE 4




SITE PLAN DEPICTING  
ESTIMATED EXTENT OF CONTAMINATION





3-D ELEVATED VIEW LOOKING NORTHWEST

3-D ELEVATED VIEW LOOKING SOUTHWEST

		PROJECT		PHASE III E.S.A. ALCAN FUELS HAINES JUNCTION, YUKON	
CLIENT		TITLE		3-D ELEVATED VIEW OF GASOLINE AND STOVE OIL AST'S AND ESTIMATED EXTENT OF CONTAMINANT PLUME	
DATE	99/01/12	DWN.	JSB	CHKD.	DJW
LEGEND		FILE NO.	0201-98-13537	DRWG.	FIGURE 5
 BOREHOLE LOCATIONS					
 HAND AUGER HOLES					
DRAWING PRODUCED IN COLOR					

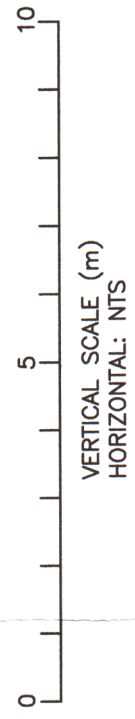
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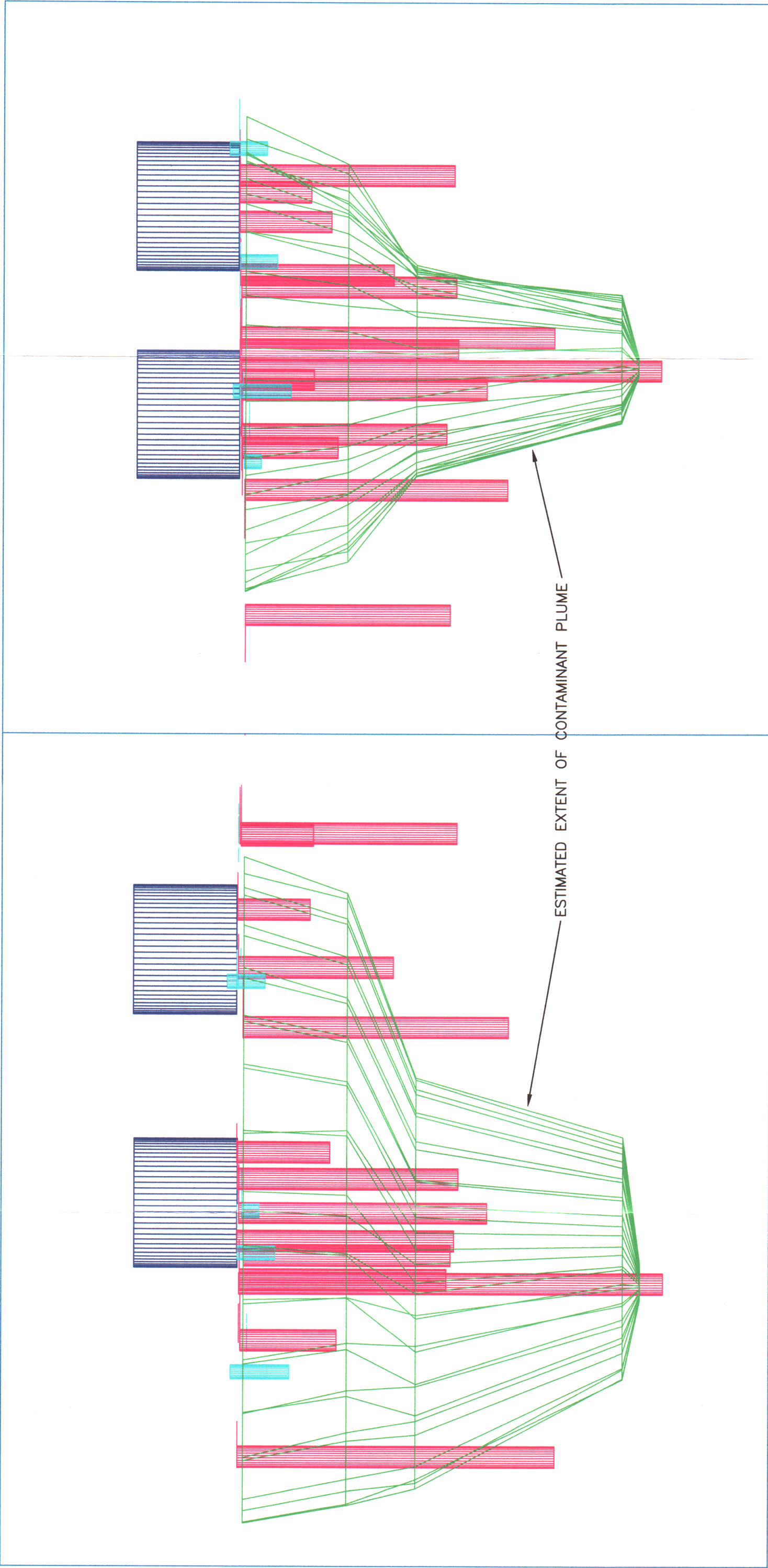
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VERTICAL SCALE (m)

HORIZONTAL: NTS

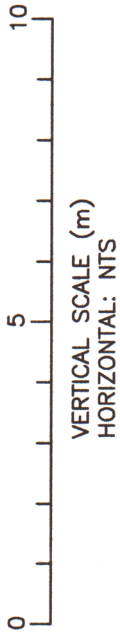






GROUND ELEVATION LOOKING NORTHWEST

GROUND ELEVATION VIEW LOOKING SOUTHWEST



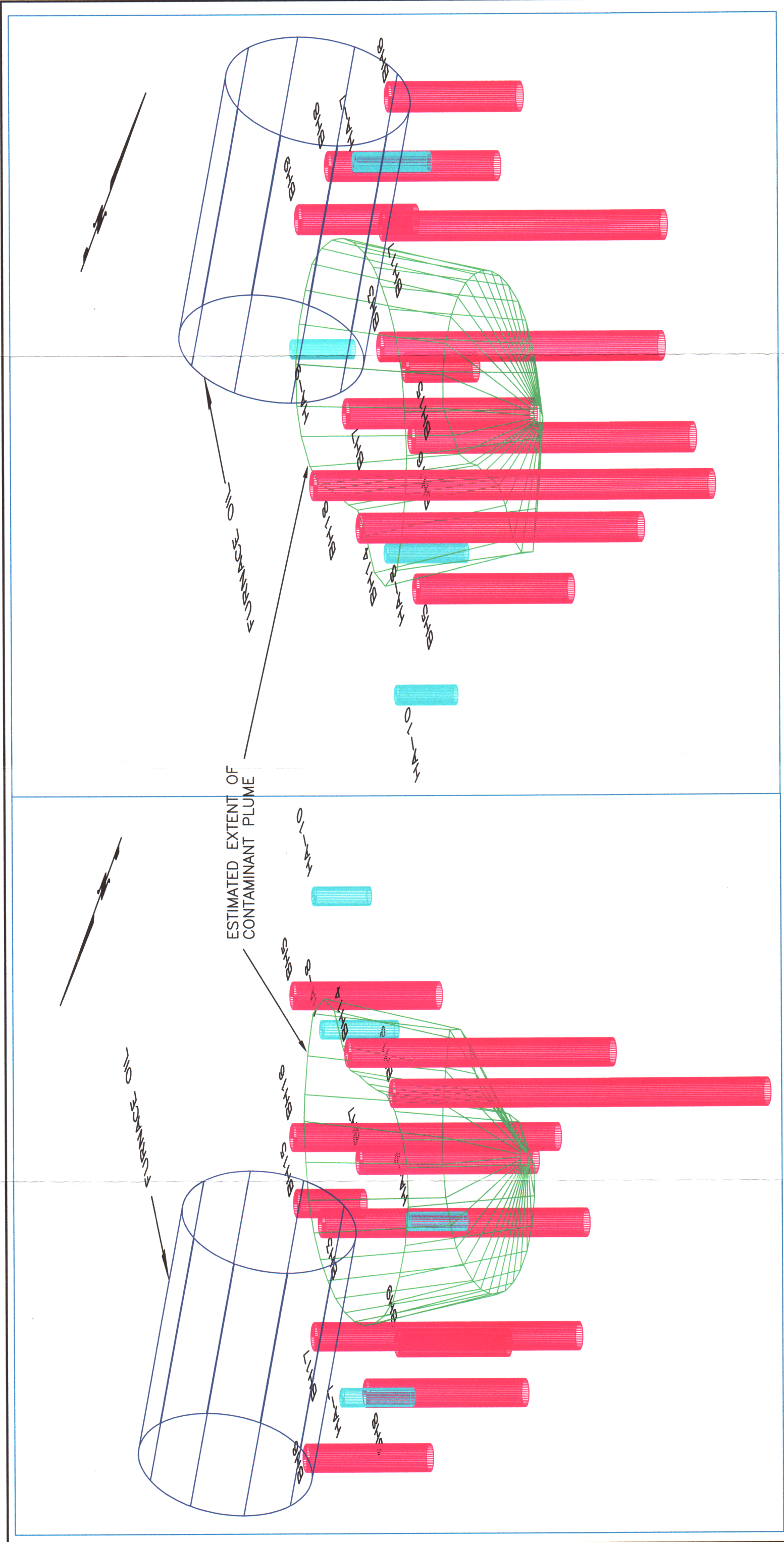
LEGEND

- BOREHOLE LOCATIONS
- HAND AUGER HOLES

DRAWING PRODUCED IN COLOR

		PROJECT		PHASE III E.S.A. ALCAN FUELS HAINES JUNCTION, YUKON	
CLIENT		TITLE		GROUND ELEVATION VIEW OF GASOLINE AND STOVE OIL AT'S AND ESTIMATED EXTENT OF CONTAMINANT PLUME	
DATE	99/01/12	DWN.	JSB	CHKD.	DJW
		FILE NO.		0201-98-13537	
				DRWG.	
				FIGURE 6	





3-D ELEVATED VIEW LOOKING NORTHEAST

3-D ELEVATED VIEW LOOKING SOUTHWEST

LEGEND

BOREHOLE LOCATIONS

HAND AUGER HOLES


DRAWING PRODUCED IN COLOR

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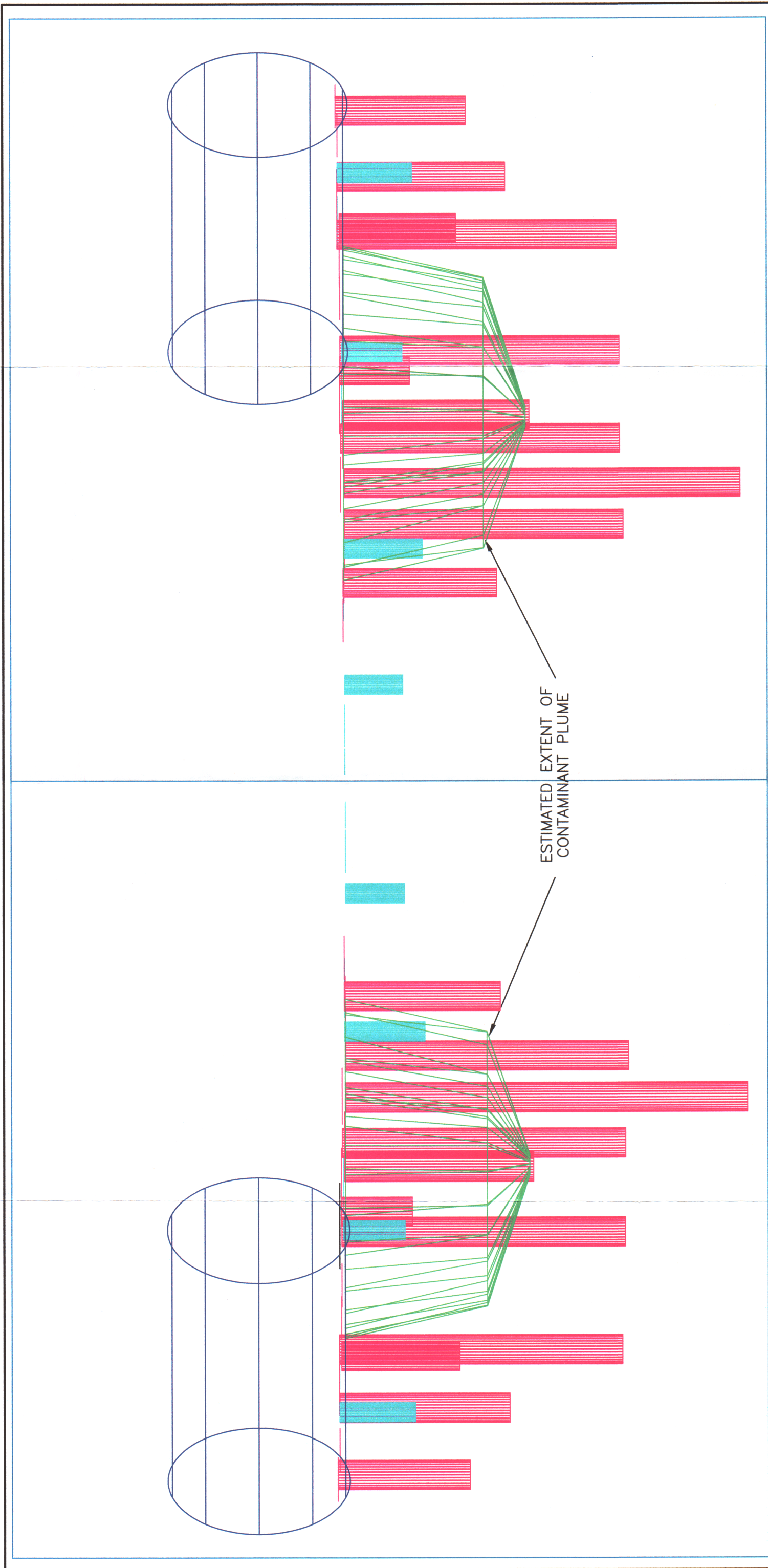
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VERTICAL SCALE (m)

HORIZONTAL: NTS

 <b>EBA Engineering Consultants Ltd.</b>					PROJECT		PHASE III E.S.A. ALCAN FUELS HAINES JUNCTION, YUKON		
CLIENT					TITLE		3-D ELEVATED VIEW OF FURNACE OIL AST AND ESTIMATED EXTENT OF CONTAMINANT PLUME		
DATE	99/01/12	DWN.	JSB	CHKD.	DJW	FILE NO.	0201-98-13537	DRWG.	FIGURE 7





GROUND ELEVATION LOOKING EAST BY NORTHEAST

GROUND ELEVATION LOOKING SOUTHWEST

LEGEND

- BOREHOLE LOCATIONS
- HAND AUGER HOLES

DRAWING PRODUCED IN COLOR

VERTICAL SCALE (m)  
HORIZONTAL: NTS



EBA Engineering Consultants Ltd.

CLIENT

INDIAN AND NORTHERN AFFAIRS  
ACTION ON WASTE PROGRAM

PROJECT

PHASE III E.S.A. ALCAN FUELS  
HAINES JUNCTION, YUKON

TITLE

GROUND ELEVATION VIEW OF FURNACE  
OIL AST AND ESTIMATED EXTENT  
OF CONTAMINANT PLUME

DATE

99/01/12

DWN.

JSB

CHKD.

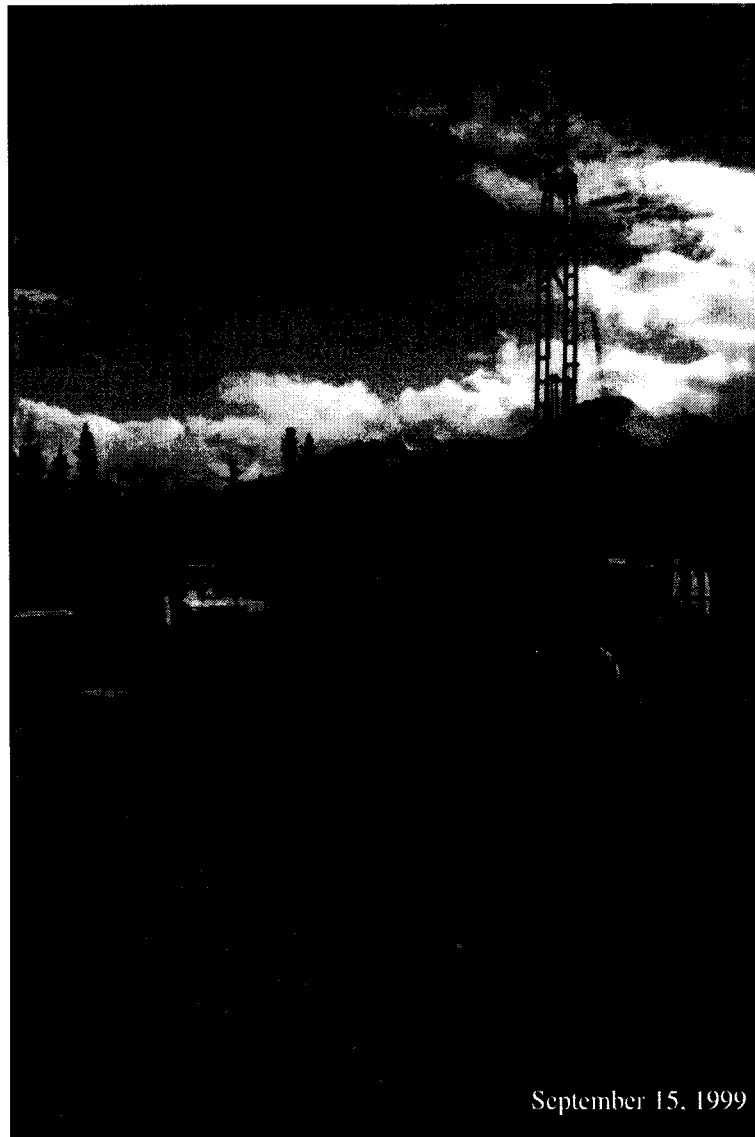
DJW

FILE NO.

0201-98-13537

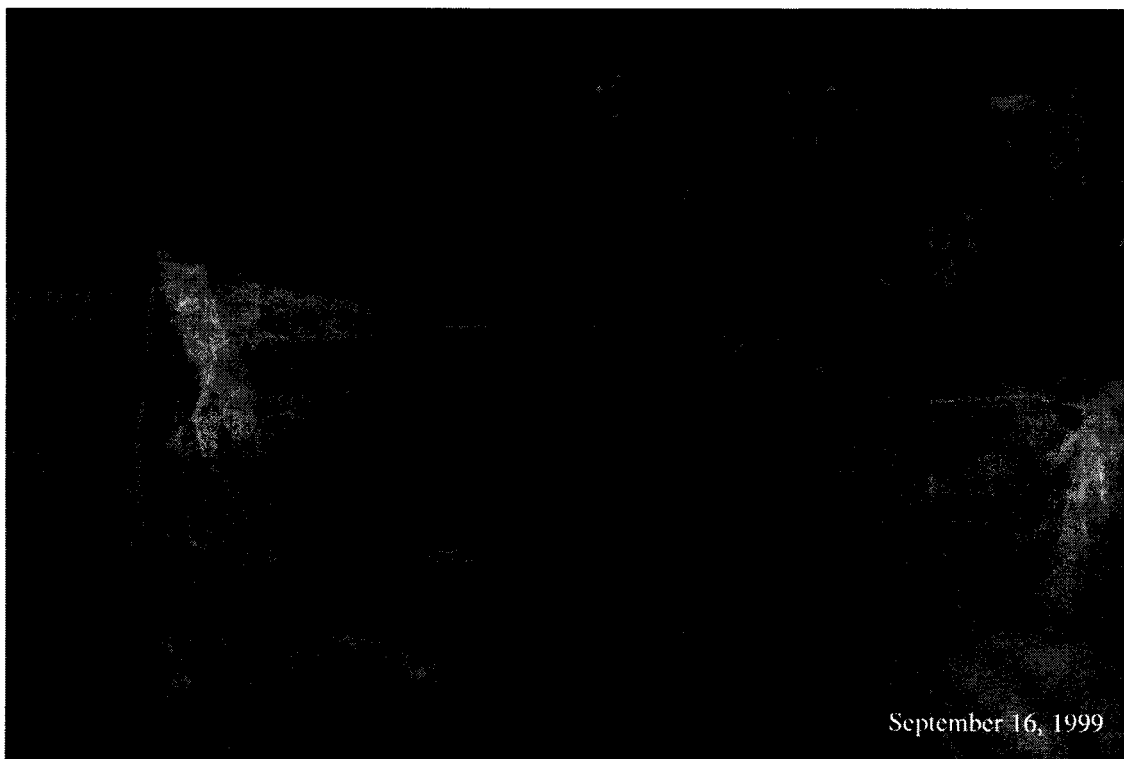
DRWG.

FIGURE 8

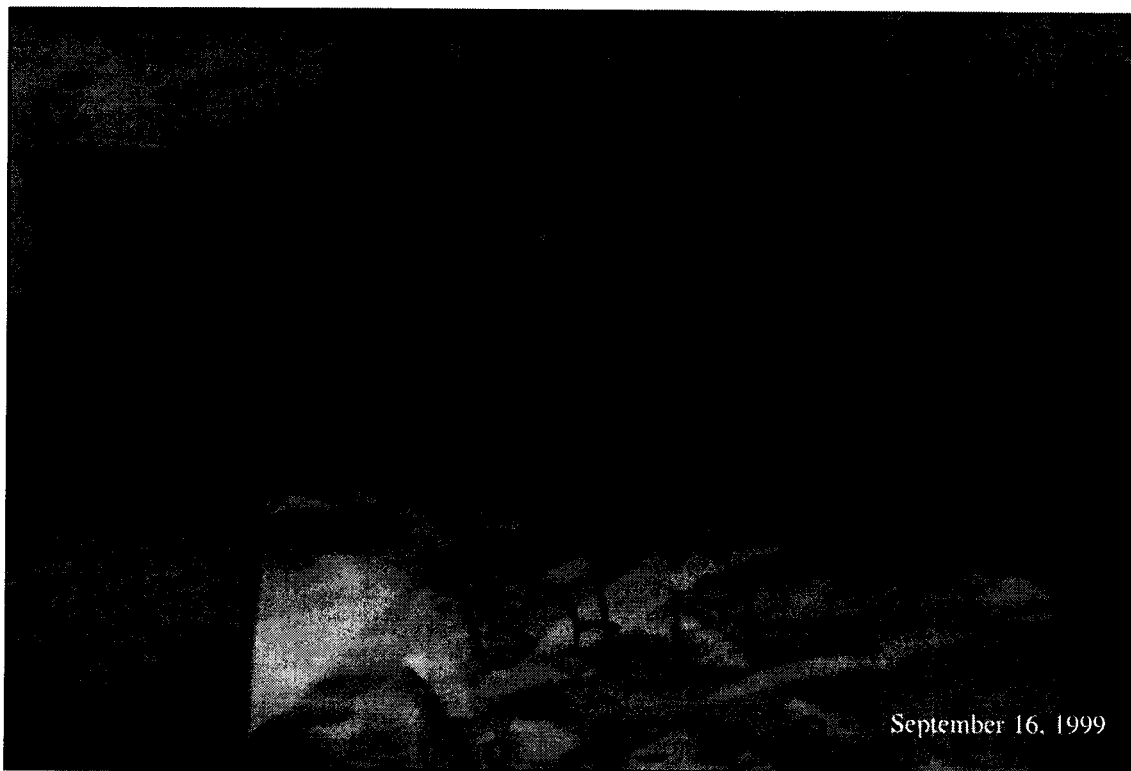


**Photograph 1:** Drill rig drilling near former Furnace Oil AST location.





**Photograph 2:** Split spoon sample showing silt and clay till and organic inclusions.



**Photograph 3:** Split spoon sample showing silt and clay till, note some gravel.

#### LEGEND FOR TABLES 1 TO 4

CCME	Canadian Council of Ministers of the Environment Recommended Guidelines 1997, Commercial Land Use
CSR	Contaminated Sites Regulations Standards, Commercial Land Use
PID	Photoionization Detector
ND	Not Detected
--	No Data Available
<div>130</div>	Concentrations which exceed the CCME guidelines
<div>130</div>	Concentrations which exceed the CSR standards
BH01	Borehole Number
HA01	Hand Auger Hole Number
TP01	Test Pit Number

Table 1:

## Analytical Results for Soil Samples Near Gasoline AST

All results presented in ppm unless otherwise stated

Borehole Number/Hand Auger	Sample Number	Depth (m)	PID Readings	EnviroGard	Benzene	Toluene	Ethylbenzene	Xylenes	Volatile Petroleum Hydrocarbons	Extractable Petroleum Hydrocarbons (C10-C18)	Extractable Petroleum Hydrocarbons (C19-C32)
COMB					5	0.8	20	17	--	--	--
CSR					0.04	2.5	7	20	200	2000	5000
Phase 2 ESA (13413)	BH01	1	1.3-1.5	176	--						
		2	2.0-2.2	537	--						
		3	2.8-3.0	715	--	33	130	59	210	390	1100 72
		4	3.8-4.0	355	--						
		5	5.3-5.5	610	--						
		6	6.2-6.4	700	--	21	150	43	220	440	5200 340
	BH02	16	1.0-1.2	380	--						
		17	1.7-1.9	955	--	32	230	88	380	610	1500 10
		18	2.5-2.7	676	--						
		19	3.4-3.6	953	--						
Phase 3 ESA (13537)		20	5.3-5.5	876	--	14	110	37	21	36	160 28
	BH10	12	1.0-1.2	150	>1250						
		13	2.5-2.8	395	>1250	45	190	38	246	ND	2200 220
	BH11	14	1.0-1.1	250	>250						
		15	2.5-2.7	251	>250						
	BH20	35	1.5-1.8	220	--						
		36	3.0-3.3	920	--	ND	ND	0.19	5.5	37	2100 ND
		37	4.5-4.8	200	--						
		38	6.0-6.4	390	--	ND	ND	0.12	0.94	9.5	340 ND
		39	6.7-7.2	190	--						
		40	7.5-7.7	550	>1250						
		41	8.2-8.5	300	--	ND	ND	ND	ND	1.6	32 ND
		42	9.0-9.2	30	<250	ND	ND	ND	ND	2.1	ND ND
	BH21	43	3.0-3.3	114	--	ND	ND	ND	0.07	2.9	450 44
		44	6.0-6.3	24	--	ND	ND	ND	ND	ND	ND ND
	BH22	45	3.0-3.3	45	250, <125	ND	ND	ND	0.06	1	75 ND
		46	4.5-4.8	24	--						
		47	6.0-6.3	16	<250						
	BH23	48	3.0-3.3	2000	--	23	120	27	150	ND	35000 3500
		49	6.0-6.3	320	--	0.25	0.52	0.11	0.45	ND	170 ND
		50	7.5-7.7	30	--	ND	ND	ND	0.05	ND	ND ND
	BH24	51	3.0-3.3	850	--						
		57	6.0-6.4	1650	--						
	BH25	52	9.0-9.3	178	--						
		53	9.7-10.1	116	<250						
		54	10.5-10.9	450	--	ND	ND	0.11	0.01	7.3	2800 380
		55	11.2-11.4	140	--	ND	ND	ND	0.03	ND	210 18
	HA01	1	1.6-1.7	160	125, <625						
	TP01	2	0.4-0.5	585	25, <62	43	190	96	750	380	1800 140
	HA02		0.5	0	--						
		3	1.0-1.1	51	<25						
			1.5	150	--						
		4	1.6-1.7	100	>625						
	VPH		0.5	810	--						
	HA03	5	1.0-1.1	470	<25						
		6	1.5-1.6	30	<25						

Table 2:

## Analytical Results for Soil Samples Near Stove Oil AST

All results presented in ppm unless otherwise stated

All results presented in ppm, unless otherwise stated													
	Borehole/Hand Auger/Test Pit Number	Sample Number	Depth (m)	PID Readings	EnviroGard	Benzene	Toluene	Ethylbenzene	Xylenes	Volatile Petroleum Hydrocarbons	Extractable Petroleum Hydrocarbons (C10-C18)	Extractable Petroleum Hydrocarbons (C19-C32)	
Phase 2	COME					5	0.8	20	17	--	--	--	
	CSR					0.04	2.5	7	20	200	2000	5000	
Phase 2	ESA (13413)	BH02	7	1.3-1.5	50	--							
		8	2.5-2.8	625	--	3.8	31	2.5	13	60	1500	130	
9		4.3-4.5	190	--									
Phase 3	ESA (13537)	BH01	14	1.0-1.1	250	<250							
		15	2.5-2.7	25	<250								
		BH12	16	1.2-1.3	160	<250							
		17	2.0-2.1	147	--	ND	0.07	ND	0.39	4.1	160	16	
		BH13	18	0.7-0.9	44	--							
		19	2.0-2.1	240	<250	0.31	0.74	0.09	0.51	ND	ND	ND	
		BH22	45	3.0-3.3	45	250,<125	ND	ND	ND	0.06	1	75	ND
		46	4.5-4.8	24	--								
		47	6.0-6.3	16	<250								
		BH23	48	5.0-5.3	2000		23	120	27	150	ND	35000	3500
		49	4.0-6.3	320		0.25	0.52	0.11	0.46	ND	3570	ND	
		50	1.3-1.7	30		ND	ND	ND	0.05	ND	11	ND	
		TP04	7	0.3	7.4	<25							
		TP05	8	0.3	125	<25	ND	0.16	0.51	0.77	13	3000	240
		TP06	9	0.3	2	--							
TP07	10	0.3	0.8	--									
HA04	--	--	--	--									
HA05	--	--	--	--									
HA06	11	1.0-1.1	65	<25									

Table 3:

## Analytical Results for Soil Samples Near Furnace Oil AST

All results presented in ppm unless otherwise stated

Borehole Number/Hand Auger	Sample Number	Depth (m)	PID Readings	EnviroGard	Benzene	Toluene	Ethylbenzene	Xylenes	Volatile Petroleum Hydrocarbons	Extractable Petroleum Hydrocarbons (C10-C18)	Extractable Petroleum Hydrocarbons (C19-C32)
CCME					5	0.8	20	17	--	--	--
CSR					0.04	2.5	7	20	200	2000	5000
Phase 2 ESA (13413)	BH03	10	0.5-0.7	399	--						
		11	1.3-1.5	433	--	2.6	9.5	4.2	31	47	100
		12	2.3-2.5	125	--	0.16	0.47	0.08	4.7	6.2	<5
		13	3.5-3.7	105	--						
		14	4.5-4.7	130	--						
		15	5.5-5.7	76	--						
Phase 3 ESA (13537)	BH05	1	1.0-1.3	16	<250	ND	0.19	ND	ND	ND	ND
		2	3.0-3.3	6.5	<250						
	BH06	3	1.0-1.3	46	--	ND	ND	ND	ND	3.7	150
		4	2.5-2.8	27.7	<250						
	BH07	5	1.0-1.3	975	--						
		6	2.0-2.2	595	<250						
		7	2.7-3.0	292	--	ND	ND	0.13	0.58	1.2	550
	BH08	8	2.2-2.4	85	<250						
		9	3.5-3.6	140	--	ND	ND	ND	0.1	1.6	ND
	BH09	10	0.7-1.0	34	--						
		11	1.0-1.3	103	--	ND	ND	ND	ND	ND	ND
	BH14	20	1.6-1.7	--	--	ND	ND	0.2	1.82	26	1000
		21	4.5-4.6	46	<250						
	BH15	22	1.7-1.8	51	<25	ND	ND	ND	0.06	1	ND
	BH16	23	5.8-5.9	14	--	ND	ND	ND	ND	ND	ND
	BH17	24	1.6-1.7	66	<25	ND	ND	ND	0.55	1.7	38
		25	3.1-3.2	30	<250						
		26	4.5-4.6	41	<250	ND	0.03	ND	0.23	ND	ND
		27	5.0-5.3	273	--	ND	ND	ND	ND	ND	ND
	BH18	28	3.0-3.3	46	--						
		29	4.5-4.8	49	<250						
		30	6.0-6.3	58	--	ND	ND	ND	ND	ND	ND
	BH19	31	1.5-1.8	1300	--	ND	0.13	0.09	0.87	7.8	ND
		32	3.0-3.3	298	<250	0.08	0.19	ND	0.39	ND	ND
		33	1.5-1.8	32	<250						
		33	3.0-3.3	35	--	0.06	ND	ND	ND	ND	ND
	HA07	0.5	21	--							
		12	1.0-1.1	15	<25	ND	ND	ND	0.47	13	150
		19	1.2-1.3	350	125,<625						
		13	1.5-1.6	15	>25,<125						
	HA08	20	0.5	157	125,<62	ND	0.04	0.06	0.81	15	3900
		14	1.0-1.1	150	--						
		15	1.6-1.7	185	125,<625						
	HA09	21	1.0-1.1	115	>625	ND	0.09	0.1	0.9	9.4	420
		--	1.2-1.3	120	--						
	TP08	--	0.5	355	--						
	TP09	--	0.5	13	--						
	TP10	--	0.5	150	--						
	13537-HA10	--	1.0-1.1	9	--						
		16	1.2-1.4	40	<25						

**Table 4: Analytical PAH Results for Soil Samples from Alcan Fuels, Haines Junction, Yukon.**

All units expressed in µg/g (ppm) unless stated otherwise.

PARAMETER	TESTPIT, SAMPLE NUMBER AND DEPTH						CCME**	CSR*
Borehole	13537-BH10	13537-BH14	13537-BH20	137537-BH23	13537-BH25			-
Sample #	13	20	36	48	54			-
Depth (m)	(2.5-2.8)	(1.6-1.7)	(3.0-3.3)	(3.0-3.3)	(10.5-10.9)			-
<u>Polycyclic Aromatic Hydrocarbon (PAH)</u>	-	-	-	-	-			-
Naphthalene	12	0.2	4.9	5.6	3.9		22	50
Acenaphthylene	0.1	ND	0.1	ND	0.1			-
Acenaphthene	0.1	ND	ND	0.1	0.1			-
Fluorene	0.5	ND	0.1	0.6	0.7			-
Phenanthrene	0.8	0.7	0.8	0.9	3.1			50
Anthraene	ND	ND	ND	0.1	0.1			-
Fluoranthene	ND	ND	ND	ND	ND			10
Pyrene	0.1	ND	ND	0.1	ND			100
Benzo(a)anthracene	ND	ND	ND	ND	ND			10
Chrysene	ND	ND	ND	ND	ND			-
Benzo(f)fluoranthene	ND	ND	ND	ND	ND			10
Benzo(a)pyrene	ND	ND	ND	ND	ND		0.7	10
Indeno(1,2,3-c,d)pyrene	ND	ND	ND	ND	ND			10
Dibenz(a,h)anthracene	ND	ND	ND	ND	ND			10
Benzo(g,h,i)perylene	ND	ND	ND	ND	ND			10

\* → Contaminated Sites Regulations (Yukon, 1996). Soil standards are for commercial/industrial land use.

\*\* → CCME Recommended Canadian Soil Quality Guidelines (1997).

Chart 1: Comparison of Field Screening and Laboratory Analytical Results

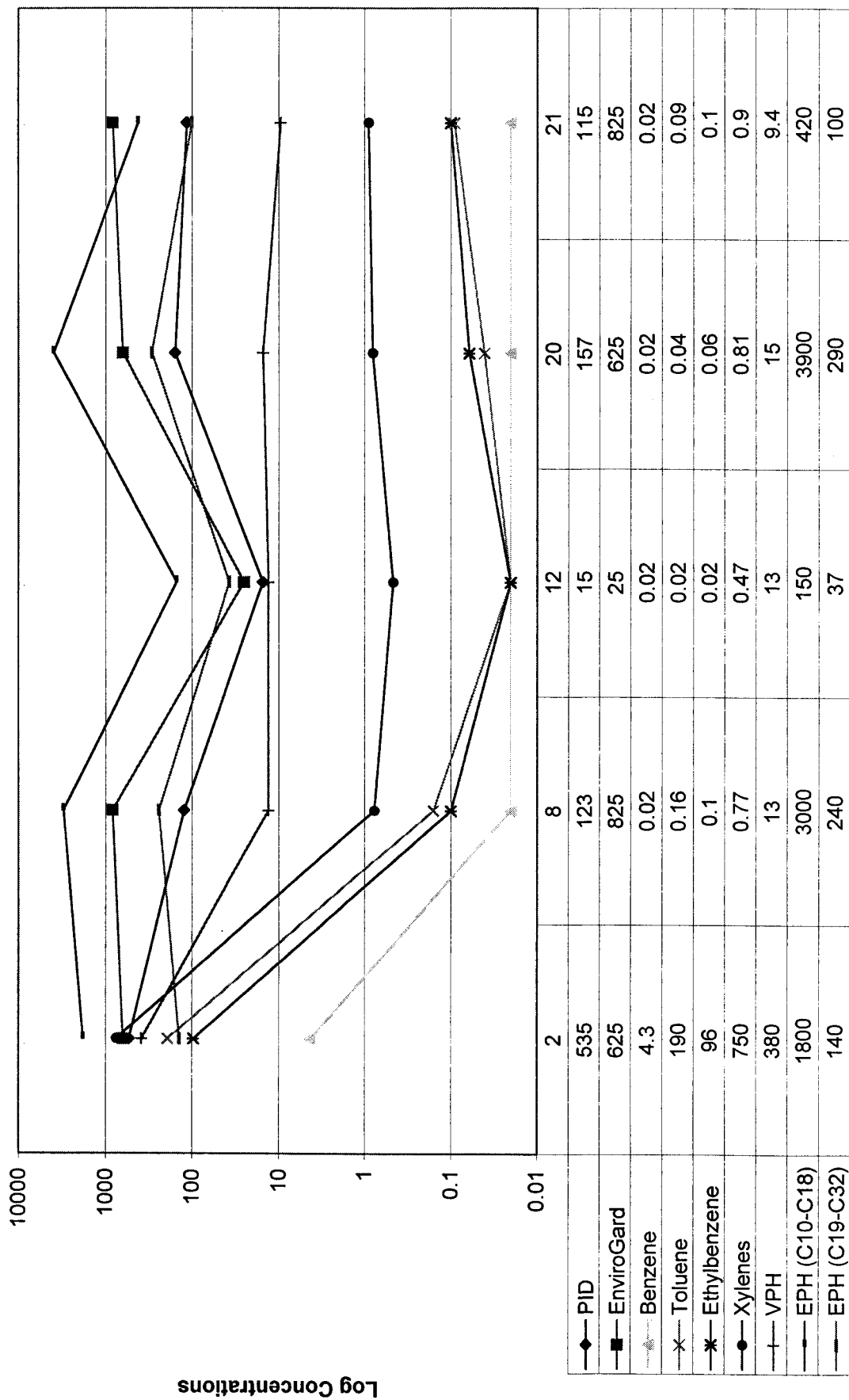
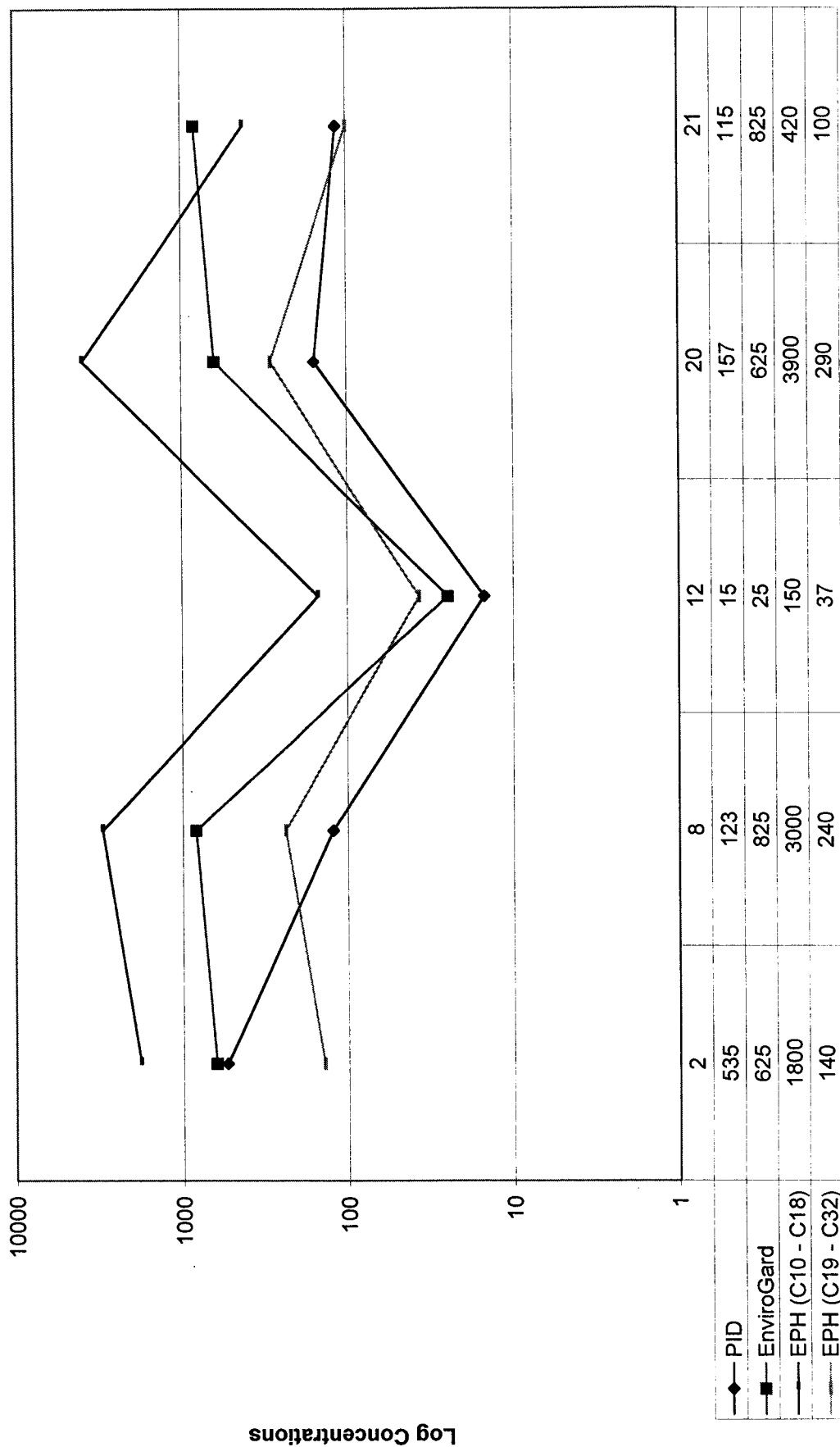


Chart 2: Comparison of Field Screening and Extractable Petroleum Hydrocarbon Concentrations





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## **APPENDIX A**

### **Borehole Logs and Grain Size Analyses**

HYDROCARBON INVESTIGATION				CLIENT: SOURCE MOTORS				BOREHOLE NO: 13413-BH1			
ALCAN STATION, MILE 1016 ALASKA HWY				DRILLING METHOD: SOLID SHAFT AUGERS				PROJECT NO: 0201-98-13413			
HAINES JUNCTION, YT				UTM ZONE: 8 N6738257 E362104				ELEVATION: 101.25 m			
SAMPLE TYPE		<input checked="" type="checkbox"/> GRAB SAMPLE		<input checked="" type="checkbox"/> NO RECOVERY		<input checked="" type="checkbox"/> STANDARD PEN.		<input checked="" type="checkbox"/> 75 mm SPOON		<input type="checkbox"/> CORREL BARREL	
BACKFILL TYPE		<input checked="" type="checkbox"/> BENTONITE		<input type="checkbox"/> PEA GRAVEL		<input type="checkbox"/> SLOUGH		<input checked="" type="checkbox"/> GROUT		<input checked="" type="checkbox"/> DRILL CUTTINGS	
										<input type="checkbox"/> SAND	

Depth(m)	SAMPLE TYPE	RUN NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	IONIZABLE VAPOURS			PERCENT GRAVEL			PERCENT SAND			PERCENT SILT OR FINES			PERCENT CLAY			INSTRUMENTATION DATA	ELEVATION(m)	
						120	240	360	480	20	40	60	80	20	40	60	80	20	40	60			80
0.0					GRAVEL & SAND (FILL) - some silt, well graded, dry, light brown, no odour																		101.0
					SILT & CLAY (FILL) - low plastic, moist, dark grey, slight hydrocarbon odour																		
1.0		1			SILT & CLAY (TILL) - moist, brownish grey, strong hydrocarbon odour																		100.0
2.0		2			- weaker hydrocarbon odour																		99.0
3.0		3			- trace of gravel, slight hydrocarbon odour																		98.0
4.0		4																					97.0
5.0		5																					96.0
6.0		6			SILT (TILL) - sandy, some clay, trace of gravel, soft, moist, dark grey, slight hydrocarbon odour																		95.0
7.0					END OF BOREHOLE @ 6.4 m																		94.0
8.0																							93.0

EBA Engineering Consultants Ltd. Whitehorse, Yukon		LOGGED BY: DJW	COMPLETION DEPTH: 6.4 m
		REVIEWED BY: JRT	COMPLETE: 06/10/98

HYDROCARBON INVESTIGATION				CLIENT: SOURCE MOTORS		BOREHOLE NO: 13413-BH2	
ALCAN STATION, MILE 1016 ALASKA HWY				DRILLING METHOD: SOLID SHAFT AUGERS		PROJECT NO: 0201-98-13413	
HAINES JUNCTION, YT				UTM ZONE: 8 N6738262 E362109		ELEVATION: 101.3 m	
SAMPLE TYPE		<input checked="" type="checkbox"/> GRAB SAMPLE <input type="checkbox"/> NO RECOVERY <input checked="" type="checkbox"/> STANDARD PEN. <input type="checkbox"/> 75 mm SPOON <input type="checkbox"/> CRREL BARREL					

Depth(m)	SAMPLE TYPE	RUN NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	VAPOUR EMISSIONS (ppm)		PERCENT GRAVEL		PERCENT SAND		PERCENT SILT OR FINES		PERCENT CLAY		Depth(m)	
						20	40	60	80	20	40	60	80	20	40		60
0.0					GRAVEL & SILT (FILL) - some sand, dry, medium brown, no hydrocarbon odour												0.0
1.0					SILT & CLAY (FILL) - low plastic, moist, dark grey, very slight hydrocarbon odour												1.0
2.0		7			SILT & CLAY (TILL) - damp, dark grey, slight hydrocarbon odour												2.0
3.0		8			- moist, slight hydrocarbon odour												3.0
4.0		9															4.0
5.0					END OF BOREHOLE @ 4.5 m												5.0

EBA Engineering Consultants Ltd. Whitehorse, Yukon		LOGGED BY: DJW	COMPLETION DEPTH: 4.5 m
		REVIEWED BY: JRT	COMPLETE: 06/10/98
		Page 1 of 1	

HYDROCARBON INVESTIGATION				CLIENT: SOURCE MOTORS				BOREHOLE NO: 13413-BH3			
ALCAN STATION, MILE 1016 ALASKA HWY				DRILLING METHOD: SOLID SHAFT AUGERS				PROJECT NO: 0201-98-13413			
HAINES JUNCTION, YT				UTM ZONE: 8 N6738248 E362118				ELEVATION: 101 m			
SAMPLE TYPE		<input checked="" type="checkbox"/> GRAB SAMPLE		<input checked="" type="checkbox"/> NO RECOVERY		<input checked="" type="checkbox"/> STANDARD PEN.		<input type="checkbox"/> 75 mm SPOON		<input type="checkbox"/> CRREL BARREL	
BACKFILL TYPE		<input checked="" type="checkbox"/> BENTONITE		<input type="checkbox"/> PEA GRAVEL		<input type="checkbox"/> SLOUGH		<input type="checkbox"/> GROUT		<input checked="" type="checkbox"/> DRILL CUTTINGS	
										<input type="checkbox"/> SAND	

Depth(m)	SAMPLE TYPE	RUN NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	IONIZABLE VAPOURS			PERCENT GRAVEL				PERCENT SAND				PERCENT SILT OR FINES				PERCENT CLAY				INSTRUMENTATION DATA	ELEVATION(m)
						120 240 360 480				20 40 60 80				20 40 60 80				20 40 60 80								
						PLASTIC M.C. LIQUID																				
						12 24 36 48																				
0.0					SILT & GRAVEL (FILL) - some sand, dry, medium grey, slight hydrocarbon odour																			101.0		
1.0		10			SAND (FILL) - fine grained, dry, grey, slight hydrocarbon odour																			100.0		
2.0		11			SILT & SAND (FILL) - fine grained sand, dry, grey, slight hydrocarbon odour																			99.0		
2.0					SILT (TILL) - moist, med. grey, slight hydrocarbon odour																			98.0		
3.0		12			SILT (TILL) - some gravel to 30 mm diameter, moist, grey, slight hydrocarbon odour																			97.0		
4.0		13			- low plastic, moist, medium grey, very slight hydrocarbon odour																			96.0		
5.0		14																						95.0		
6.0		15																						94.0		
6.0					END OF BOREHOLE @ 6.0 m																			93.0		

EBA Engineering Consultants Ltd. Whitehorse, Yukon		LOGGED BY: DJW	COMPLETION DEPTH: 6 m
		REVIEWED BY: JRT	COMPLETE: 06/10/98
		Page 1 of 1	

HYDROCARBON INVESTIGATION			CLIENT: SOURCE MOTORS			BOREHOLE NO: 13413-BH4		
ALCAN STATION, MILE 1016 ALASKA HWY			DRILLING METHOD: SOLID SHAFT AUGERS			PROJECT NO: 0201-98-13413		
HAINES JUNCTION, YT			UTM ZONE: 8 N6738254 E362103			ELEVATION: 101.23 m		
SAMPLE TYPE			<input checked="" type="checkbox"/> GRAB SAMPLE <input type="checkbox"/> NO RECOVERY <input checked="" type="checkbox"/> STANDARD PEN. <input type="checkbox"/> 75 mm SPOON <input type="checkbox"/> CRREL BARREL					
BACKFILL TYPE			<input checked="" type="checkbox"/> BENTONITE <input type="checkbox"/> PEA GRAVEL <input type="checkbox"/> SLOUGH <input type="checkbox"/> GROUT <input type="checkbox"/> DRILL CUTTINGS <input type="checkbox"/> SAND					

Depth(m)	SAMPLE TYPE	RUN NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	IONIZABLE VAPOURS			PERCENT GRAVEL				PERCENT SAND				PERCENT SILT OR FINES				PERCENT CLAY				INSTRUMENTATION DATA	ELEVATION(m)
						120	240	360	480	20	40	60	80	20	40	60	80	20	40	60	80	20	40	60		
0.0					SAND & GRAVEL (FILL) - medium grained sand, dry, no odour																		101.0			
					SILT & GRAVEL (FILL) - gravel to 20 mm, dry, grey, no odour																					
1.0		16			SILT (TILL) - low plastic, moist, dark grey, no odour																		100.0			
					- slight hydrocarbon odour @ 1.5 m																					
2.0		17			- some sand, dry, dark grey, slight hydrocarbon odour																		99.0			
3.0		18			SILT (TILL) - some gravel, trace of sand, dry, dark grey, slight hydrocarbon odour																		98.0			
4.0		19			- easier drilling, lost most of sample																		97.0			
5.0					- very slight hydrocarbon odour																		96.0			
6.0		20			END OF BOREHOLE @ 6.0 m																		95.0			
7.0																							94.0			
8.0																							93.0			

EBA Engineering Consultants Ltd. Whitehorse, Yukon		LOGGED BY: DJW	COMPLETION DEPTH: 6 m
		REVIEWED BY: JRT	COMPLETE: 06/10/98
		Page 1 of 1	

PHASE III ESA				CLIENT: DIAND				BOREHOLE NO: 13537-BH5			
ALCAN FUELS				DRILL: CME 750 c/w SOLID STEM				PROJECT NO: 0201-98-13537			
HAINES JUNCTION, YT				UTM ZONE: 8 N6738245 E362122				ELEVATION: 100.92 m			
SAMPLE TYPE		<input checked="" type="checkbox"/> GRAB SAMPLE		<input type="checkbox"/> NO RECOVERY		<input checked="" type="checkbox"/> STANDARD PEN.		<input type="checkbox"/> 75 mm SPOON		<input type="checkbox"/> CRREL BARREL	
BACKFILL TYPE		<input checked="" type="checkbox"/> BENTONITE		<input type="checkbox"/> PEA GRAVEL		<input type="checkbox"/> SLOUGH		<input checked="" type="checkbox"/> GROUT		<input checked="" type="checkbox"/> DRILL CUTTINGS	
Depth(m)	SAMPLE TYPE	RUN NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	<div style="display: flex; justify-content: space-between;"> <div> <b>◆ IONIZABLE VAPOURS ◆</b>  120   240   360   480 </div> <div> <b>■ PERCENT GRAVEL ■</b>  20   40   60   80 </div> </div>				INSTRUMENTATION DATA	ELEVATION(m)
						<div style="display: flex; justify-content: space-between;"> <div> <b>PLASTIC</b>   <b>M.C.</b>   <b>LIQUID</b>  12   24   36   48 </div> <div> <b>● PERCENT SAND ●</b>  20   40   60   80 </div> <div> <b>▲ PERCENT SILT OR FINES ▲</b>  20   40   60   80 </div> <div> <b>◆ PERCENT CLAY ◆</b>  20   40   60   80 </div> </div>					
0.0					GRAVEL (FILL) – sandy, some silt, sub-angular particles, dry, brown, no hydrocarbon odour						
					CLAY & SILT (FILL) – some gravel & sand, low plastic, sub-rounded particles, damp, greyish brown, no hydrocarbon odour						
1.0		1			CLAY & SILT (TILL) – some gravel & sand, low plastic, sub-rounded particles, damp, greyish brown, no hydrocarbon odour	◆					100.0
2.0						◆					99.0
					– moist, no hydrocarbon odour						
						◆					
3.0		2				◆					98.0
					END OF BOREHOLE @ 3.3 m Note: Elevation references to Control Point CP01 (Property pin) on Site Plan						
4.0											97.0
5.0											96.0

<b>EBA Engineering Consultants Ltd.</b> Whitehorse, Yukon		LOGGED BY: CPC	COMPLETION DEPTH: 3.3 m
		REVIEWED BY: DJW	COMPLETE: 98/09/14
		Page 1 of 1	

PHASE III ESA				CLIENT: DIAND				BOREHOLE NO: 13537-BH6			
ALCAN FUELS				DRILL: CME 750 c/w SOLID STEM				PROJECT NO: 0201-98-13537			
HAINES JUNCTION, YT				UTM ZONE: 8 N6738253 E362116				ELEVATION: 101.07 m			
SAMPLE TYPE		<input checked="" type="checkbox"/> GRAB SAMPLE		<input type="checkbox"/> NO RECOVERY		<input checked="" type="checkbox"/> STANDARD PEN.		<input type="checkbox"/> 75 mm SPOON		<input type="checkbox"/> CORREL BARREL	
BACKFILL TYPE		<input checked="" type="checkbox"/> BENTONITE		<input type="checkbox"/> PEA GRAVEL		<input type="checkbox"/> SLOUGH		<input type="checkbox"/> GROUT		<input checked="" type="checkbox"/> DRILL CUTTINGS	
										<input type="checkbox"/> SAND	

Depth(m)	SAMPLE TYPE	RUN NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	IONIZABLE VAPOURS			PERCENT GRAVEL			PERCENT SAND			PERCENT SILT OR FINES			PERCENT CLAY			INSTRUMENTATION DATA	ELEVATION(m)	
						120	240	360	480	20	40	60	80	20	40	60	80	20	40	60			80
0.0					SAND & GRAVEL (FILL) - some silt, sub-angular particles, dry, brown, slight hydrocarbon odour CLAY & SILT (TILL) - trace of sand & gravel, low-plastic, sub-rounded particles, damp, greyish brown																		101.0
1.0		3			- slight hydrocarbon odour																		100.0
2.0					- trace of hydrocarbon odour																		99.0
3.0		4			- slight hydrocarbon odour																		98.0
4.0					END OF BOREHOLE @ 2.8 m Note: Elevation referenced to Control point CP01 (Property pin) on site plan																		97.0
5.0																							

EBA Engineering Consultants Ltd. Whitehorse, Yukon		LOGGED BY: CPC	COMPLETION DEPTH: 2.8 m
		REVIEWED BY: DJW	COMPLETE: 98/09/14
		Page 1 of 1	

PHASE III ESA				CLIENT: DIAND				BOREHOLE NO: 13537-BH7			
ALCAN FUELS				DRILL: CME 750 c/w SOLID STEM				PROJECT NO: 0201-98-13537			
HAINES JUNCTION, YT				UTM ZONE: 8 N6738245 E362116				ELEVATION: 100.92 m			
SAMPLE TYPE		<input checked="" type="checkbox"/> GRAB SAMPLE		<input type="checkbox"/> NO RECOVERY		<input checked="" type="checkbox"/> STANDARD PEN.		<input type="checkbox"/> 75 mm SPOON		<input type="checkbox"/> CORREL BARREL	
BACKFILL TYPE		<input checked="" type="checkbox"/> BENTONITE		<input type="checkbox"/> PEA GRAVEL		<input type="checkbox"/> SLOUGH		<input checked="" type="checkbox"/> GROUT		<input type="checkbox"/> DRILL CUTTINGS	
										<input type="checkbox"/> SAND	

Depth(m)	SAMPLE TYPE	RUN NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	IONIZABLE VAPOURS				PERCENT GRAVEL				PERCENT SAND				PERCENT SILT OR FINES				PERCENT CLAY				INSTRUMENTATION DATA	ELEVATION(m)
						120	240	360	480	20	40	60	80	20	40	60	80	20	40	60	80	20	40	60	80		
0.0					SAND & GRAVEL (FILL) - some silt, sub-angular particles, dry, brown SILT (FILL) - some wood particles, dry, black, strong hydrocarbon odour																						
1.0		5			SILT (TILL) - no wood particles, damp, brown, moderate hydrocarbon odour																						
2.0		6			- some hydrocarbon odour																						
3.0					CLAY & SILT (TILL) - trace of sand & gravel, low plastic, damp, dark grey																						
4.0		7			- slight hydrocarbon odour																						
5.0					END OF BOREHOLE @ 4.0 m Note: Elevation referenced to Control point CP01 (Property pin) on Site plan																						

EBA Engineering Consultants Ltd. Whitehorse, Yukon				LOGGED BY: CPC		COMPLETION DEPTH: 4 m	
				REVIEWED BY: DJW		COMPLETE: 98/09/14	
				Page 1 of 1			



PHASE III ESA				CLIENT: DIAND				BOREHOLE NO: 13537-BH8			
ALCAN FUELS				DRILL: CME 750 c/w SOLID STEM				PROJECT NO: 0201-98-13537			
HAINES JUNCTION, YT				UTM ZONE: 8 N6738249 E362112				ELEVATION: 101.03 m			
SAMPLE TYPE		<input checked="" type="checkbox"/> GRAB SAMPLE	<input checked="" type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> STANDARD PEN.	<input checked="" type="checkbox"/> 75 mm SPOON	<input checked="" type="checkbox"/> CRREL BARREL					
BACKFILL TYPE		<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS		<input type="checkbox"/> SAND			

Depth(m)	SAMPLE TYPE	RUN NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	IONIZABLE VAPOURS			PERCENT GRAVEL				PERCENT SAND				PERCENT SILT OR FINES				PERCENT CLAY				INSTRUMENTATION DATA	ELEVATION(m)
						120	240	360	480	20	40	60	80	20	40	60	80	20	40	60	80	20	40	60		
0.0					GRAVEL & SAND (FILL) - some silt, sub-angular particles, dry, brown																		101.0			
					CLAY & SILT (FILL) - trace of sand & gravel, low plastic, dry, grey																					
1.0					CLAY & SILT (TILL) - trace of sand & gravel, damp, brownish grey																		100.0			
					- moist, strong hydrocarbon odour																					
2.0																							99.0			
		8			- slight hydrocarbon odour																					
3.0																							98.0			
					- strong hydrocarbon odour																					
		9			END OF BOREHOLE @ 3.6 m																					
4.0					Note: Elevation references to Control point CP01 (Property pin) on Site plan																		97.0			
5.0																										

EBA Engineering Consultants Ltd. Whitehorse, Yukon				LOGGED BY: CPC		COMPLETION DEPTH: 3.6 m	
				REVIEWED BY: DJW		COMPLETE: 98/09/14	
						Page 1 of 1	

PHASE III ESA				CLIENT: DIAND				BOREHOLE NO: 13537-BH9			
ALCAN FUELS				DRILL: CME 750 c/w SOLID STEM				PROJECT NO: 0201-98-13537			
HAINES JUNCTION, YT				UTM ZONE: 8 N6738246 E362111				ELEVATION: 100.99 m			
SAMPLE TYPE		<input checked="" type="checkbox"/> GRAB SAMPLE		<input type="checkbox"/> NO RECOVERY		<input checked="" type="checkbox"/> STANDARD PEN.		<input type="checkbox"/> 75 mm SPOON		<input type="checkbox"/> CRREL BARREL	
BACKFILL TYPE		<input checked="" type="checkbox"/> BENTONITE		<input type="checkbox"/> PEA GRAVEL		<input type="checkbox"/> SLOUGH		<input type="checkbox"/> GROUT		<input checked="" type="checkbox"/> DRILL CUTTINGS	
										<input type="checkbox"/> SAND	

Depth(m)	SAMPLE TYPE	RUN NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	IONIZABLE VAPOURS			PERCENT GRAVEL				PERCENT SAND				PERCENT SILT OR FINES				PERCENT CLAY				INSTRUMENTATION DATA	ELEVATION(m)
						120	240	360	480	20	40	60	80	20	40	60	80	20	40	60	80	20	40	60		
0.0					GRAVEL & SAND (FILL) - some silt, sub-angular particles, dry, brown																					
					SILT & ORGANICS (FILL) - some wood particles, dry, black																					
1.0		10			CLAY & SILT (TILL) - trace of sand & gravel, low plastic, dry, grey, slight hydrocarbon odour																					
2.0					- thin gravel layer, no hydrocarbon odour																					
3.0		11			END OF BOREHOLE @ 2.5 m Note: Elevation references to Control point CP01 (Property pin) on Site plan																					
4.0																										
5.0																										

EBA Engineering Consultants Ltd. Whitehorse, Yukon				LOGGED BY: CPC		COMPLETION DEPTH: 2.5 m	
				REVIEWED BY: DJW		COMPLETE: 98/09/14	
				Page 1 of 1			

PHASE III ESA				CLIENT: DIAND		BOREHOLE NO: 13537-BH10	
ALCAN FUELS				DRILL: CME 750 c/w SOLID STEM		PROJECT NO: 0201-98-13537	
HAINES JUNCTION, YT				UTM ZONE: 8 N6738253 E362101		ELEVATION: 101.21 m	
SAMPLE TYPE		GRAB SAMPLE		<input type="checkbox"/> NO RECOVERY		<input checked="" type="checkbox"/> STANDARD PEN.	
BACKFILL TYPE		BENTONITE		<input type="checkbox"/> PEA GRAVEL		<input type="checkbox"/> SLOUGH	
				<input type="checkbox"/> GROUT		<input type="checkbox"/> DRILL CUTTINGS	
						<input type="checkbox"/> SAND	
Depth(m)	SAMPLE TYPE	RUN NO	USC	SOIL SYMBOL	SOIL DESCRIPTION		INSTRUMENTATION DATA
0.0					GRAVEL & SILT (FILL) - some silt, sub angular particles, dry brown		
					CLAY & SILT (FILL) - some sand, dry, grey, some hydrocarbon odour		
					- less sand, strong hydrocarbon odour		
1.0		12			CLAY & SILT (FILL) - some sand, dry, grey, some hydrocarbon odour		
					- very dense		
					- moist		
2.0							
3.0		13			END OF BOREHOLE @ 2.8 m		
					Note: Elevation referenced to Control point CP01 (Property pin) on Site plan		
4.0							
5.0							

PHASE III ESA			CLIENT: DIAND			BOREHOLE NO: 13537-BH11		
ALCAN FUELS			DRILL: CME 750 c/w SOLID STEM			PROJECT NO: 0201-98-13537		
HAINES JUNCTION, YT			UTM ZONE: 8 N6738261 E362104			ELEVATION: 101.31 m		
SAMPLE TYPE			<input checked="" type="checkbox"/> GRAB SAMPLE	<input type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> STANDARD PEN.	<input type="checkbox"/> 75 mm SPOON	<input type="checkbox"/> CRREL BARREL	
BACKFILL TYPE			<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS	<input type="checkbox"/> SAND

Depth(m)	SAMPLE TYPE	RUN NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	IONIZABLE VAPOURS			PERCENT GRAVEL			PERCENT SAND			PERCENT SILT OR FINES			PERCENT CLAY			INSTRUMENTATION DATA	ELEVATION(m)	
						120	240	360	480	20	40	60	80	20	40	60	80	20	40	60			80
0.0					GRAVEL & SAND (FILL) - some silt, sub-angular particles, dry, brown																		101.0
					CLAY & SILT - some sand, low plastic, dry, grey, strong hydrocarbon odour																		
1.0		14			CLAY & SILT (TILL) - trace of sand, low plastic, dry, grey, strong hydrocarbon odour																		100.0
					- very dense																		
2.0					- some gravel																		
					- slight hydrocarbon odour																		
3.0		15			END OF BOREHOLE @ 2.7 m Note: Elevation references to Control point CP01 (Property pin) on Site plan																		98.0
4.0																							97.0
5.0																							

EBA Engineering Consultants Ltd. Whitehorse, Yukon		LOGGED BY: CPC	COMPLETION DEPTH: 2.7 m
		REVIEWED BY: DJW	COMPLETE: 98/09/14
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PHASE III ESA				CLIENT: DIAND				BOREHOLE NO: 13537-BH12			
ALCAN FUELS				DRILL: CME 750 c/w SOLID STEM				PROJECT NO: 0201-98-13537			
HAINES JUNCTION, YT				UTM ZONE: 8 N6738265 E362110				ELEVATION: 101.3 m			
SAMPLE TYPE		<input checked="" type="checkbox"/> GRAB SAMPLE		<input type="checkbox"/> NO RECOVERY		<input checked="" type="checkbox"/> STANDARD PEN.		<input type="checkbox"/> 75 mm SPOON		<input type="checkbox"/> CRREL BARREL	
BACKFILL TYPE		<input checked="" type="checkbox"/> BENTONITE		<input type="checkbox"/> PEA GRAVEL		<input type="checkbox"/> SLOUGH		<input type="checkbox"/> GROUT		<input checked="" type="checkbox"/> DRILL CUTTINGS	
										<input type="checkbox"/> SAND	

Depth(m)	SAMPLE TYPE	RUN NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	IONIZABLE VAPOURS			PERCENT GRAVEL			PERCENT SAND			PERCENT SILT OR FINES			PERCENT CLAY			INSTRUMENTATION DATA	ELEVATION(m)	
						120	240	360	480	20	40	60	80	20	40	60	80	20	40	60			80
0.0					GRAVEL & SAND (FILL) - some silt, sub-angular particles, dry, brown																		101.0
					CLAY & SILT (FILL) - some sand, low plastic, dry, grey																		
1.0		16			CLAY & SILT (TILL) - some sand, damp, brownish grey, very slight hydrocarbon odour																		100.0
					- some gravel, med. grained, sub-rounded particles																		
2.0		17			- very slight hydrocarbon odour																		99.0
					END OF BOREHOLE @ 2.1 m																		
					Note:																		
					- Elevation references to Control point CP01 (Property pin) on Site plan																		
					- Noticeable roots & rotting organics on auger @ 1.2 m in depth																		
3.0																							98.0
4.0																							97.0
5.0																							

EBA Engineering Consultants Ltd. Whitehorse, Yukon		LOGGED BY: CPC	COMPLETION DEPTH: 2.1 m
		REVIEWED BY: DJW	COMPLETE: 98/09/14
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PHASE III ESA				CLIENT: DIAND				BOREHOLE NO: 13537-BH13			
ALCAN FUELS				DRILL: CME 750 c/w SOLID STEM				PROJECT NO: 0201-98-13537			
HAINES JUNCTION, YT				UTM ZONE: 8 N6738261 E362114				ELEVATION: 101.21 m			
SAMPLE TYPE		<input checked="" type="checkbox"/> GRAB SAMPLE		<input type="checkbox"/> NO RECOVERY		<input checked="" type="checkbox"/> STANDARD PEN.		<input type="checkbox"/> 75 mm SPOON		<input type="checkbox"/> CRREL BARREL	
BACKFILL TYPE		<input checked="" type="checkbox"/> BENTONITE		<input type="checkbox"/> PEA GRAVEL		<input type="checkbox"/> SLOUGH		<input type="checkbox"/> GROUT		<input checked="" type="checkbox"/> DRILL CUTTINGS	
										<input type="checkbox"/> SAND	

Depth(m)	SAMPLE TYPE	RUN NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	IONIZABLE VAPOURS				PERCENT GRAVEL				PERCENT SAND				PERCENT SILT OR FINES				PERCENT CLAY				INSTRUMENTATION DATA	ELEVATION(m)
						120	240	360	480	20	40	60	80	20	40	60	80	20	40	60	80	20	40	60	80		
0.0					GRAVEL & SAND (FILL) - some silt, sub angular particles, dry, brown																			101.0			
					SILT (FILL) - sandy, fine grained, dry, greyish brown, no hydrocarbon odour																						
1.0		18																									
					CLAY & SILT (TILL) - trace of sand, low plastic, dry, dark grey, no hydrocarbon odour																			100.0			
2.0		19																									
					- slight hydrocarbon odour																						
					END OF BOREHOLE @ 2.1 m																			99.0			
					Note: Elevation referenced to Control point CP01 (Property pin) on Site plan																						
3.0																								98.0			
4.0																								97.0			
5.0																											

EBA Engineering Consultants Ltd.				LOGGED BY: CPC				COMPLETION DEPTH: 2.1 m			
Whitehorse, Yukon				REVIEWED BY: DJW				COMPLETE: 98/09/14			
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PHASE III ESA			CLIENT: DIAND			BOREHOLE NO: 13537-BH14		
ALCAN FUELS			DRILL: CME 750 c/w HOLLOW STEM			PROJECT NO: 0201-98-13537		
HAINES JUNCTION, YT			UTM ZONE: 8 N6738243 E362118			ELEVATION: 100.9 m		
SAMPLE TYPE			<input checked="" type="checkbox"/> GRAB SAMPLE	<input type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> STANDARD PEN.	<input type="checkbox"/> 75 mm SPOON	<input type="checkbox"/> CRREL BARREL	
BACKFILL TYPE			<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS	<input type="checkbox"/> SAND

Depth(m)	SAMPLE TYPE	RUN NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	IONIZABLE VAPOURS	PERCENT GRAVEL	PERCENT SAND	PERCENT SILT OR FINES	PERCENT CLAY	INSTRUMENTATION DATA	ELEVATION(m)
						120 240 360 480 PLASTIC M.C. LIQUID 12 24 36 48	20 40 60 80 20 40 60 80	20 40 60 80 20 40 60 80	20 40 60 80 20 40 60 80			
0.0					GRAVEL & SAND (FILL) - some silt, sub angular particles, dry, brown							
					SILT (FILL) - some sand, fine grained, dry, black							
1.0												100.0
2.0		20			- organic layer, spruce needles, strong hydrocarbon odour							99.0
					CLAY & SILT (TILL) - trace of sand, low plastic, dry, greyish brown, some hydrocarbon odour							
3.0					- moist, slight hydrocarbon odour							98.0
					- dense drilling							
4.0												97.0
5.0		21			- slight hydrocarbon odour, no odour after 4.6 m							96.0
6.0					END OF BOREHOLE @ 6.3 m							95.0
					Note: Elevation referenced to Control point CP01 (Property pin) on Site plan							94.0
7.0												93.0
8.0												

EBA Engineering Consultants Ltd. Whitehorse, Yukon		LOGGED BY: CPC	COMPLETION DEPTH: 6.3 m
		REVIEWED BY: DJW	COMPLETE: 98/09/15
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PHASE III ESA				CLIENT: DIAND				BOREHOLE NO: 13537-BH15			
ALCAN FUELS				DRILL: CME 750 c/w HOLLOW STEM				PROJECT NO: 0201-98-13537			
HAINES JUNCTION, YT				UTM ZONE: 8 N6738245 E362122				ELEVATION: 100.99 m			
SAMPLE TYPE		<input checked="" type="checkbox"/> GRAB SAMPLE		<input checked="" type="checkbox"/> NO RECOVERY		<input checked="" type="checkbox"/> STANDARD PEN.		<input type="checkbox"/> 75 mm SPOON		<input type="checkbox"/> CRREL BARREL	
BACKFILL TYPE		<input checked="" type="checkbox"/> BENTONITE		<input type="checkbox"/> PEA GRAVEL		<input type="checkbox"/> SLOUGH		<input checked="" type="checkbox"/> GROUT		<input checked="" type="checkbox"/> DRILL CUTTINGS	
										<input type="checkbox"/> SAND	

Depth(m)	SAMPLE TYPE	RUN NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	IONIZABLE VAPOURS				PERCENT GRAVEL			PERCENT SAND			PERCENT SILT OR FINES			PERCENT CLAY			INSTRUMENTATION DATA	ELEVATION(m)
						120	240	360	480	20	40	60	80	20	40	60	80	20	40	60	80		
0.0					GRAVEL & SAND (FILL) - some silt, sub angular particles, dry, brown																		
					SILT (FILL) - some sand & gravel, sub angular particles, dry, brownish grey																		
1.0					CLAY & SILT (TILL) - trace of sand & gravel, low plastic, damp, grey, slight hydrocarbon odour																		100.0
2.0				22	END OF BOREHOLE @ 1.9 m																		99.0
					Note: - Elevation referenced to Control point CP01 (Property pin) on Site plan - A piece of scape metal was drilled up drilled of hole, depth undetermined.																		98.0
3.0																							97.0
4.0																							96.0
5.0																							

EBA Engineering Consultants Ltd. Whitehorse, Yukon		LOGGED BY: CPC	COMPLETION DEPTH: 1.9 m
		REVIEWED BY: DJW	COMPLETE: 98/09/15
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PHASE III ESA			CLIENT: DIAND			BOREHOLE NO: 13537-BH16		
ALCAN FUELS			DRILL: CME 750 c/w HOLLOW STEM			PROJECT NO: 0201-98-13537		
HAINES JUNCTION, YT			UTM ZONE: 8 N6738247 E362120			ELEVATION: 100.97 m		
SAMPLE TYPE		<input checked="" type="checkbox"/> GRAB SAMPLE	<input checked="" type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> STANDARD PEN.	<input checked="" type="checkbox"/> 75 mm SPOON	<input checked="" type="checkbox"/> CRREL BARREL		
BACKFILL TYPE		<input checked="" type="checkbox"/> BENTONITE	<input checked="" type="checkbox"/> PEA GRAVEL	<input checked="" type="checkbox"/> SLOUGH	<input checked="" type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS		<input checked="" type="checkbox"/> SAND

Depth(m)	SAMPLE TYPE	RUN NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	IONIZABLE VAPOURS			PERCENT GRAVEL				PERCENT SAND				PERCENT SILT OR FINES				PERCENT CLAY				INSTRUMENTATION DATA	ELEVATION(m)
						120	240	360	480	20	40	60	80	20	40	60	80	20	40	60	80	20	40	60		
0.0					GRAVEL & SAND - some silt, sub angular particles, dry, brown																					
1.0					SILT (FILL) - some sand & gravel, sub angular particles, dry, brownish grey																					
2.0					CLAY & SILT (TILL) - trace of sand & gravel, low plastic, damp, grey, slight hydrocarbon odour - dense, stiffer drilling																					
3.0					- easier drilling																					
4.0					- hard drilling - easier drilling - more gravel, no hydrocarbon odour																					
5.0																										
6.0		23			END OF BOREHOLE @ 6.0 m Note: Elevation referenced to Control point CP01 (Property pin) on Site plan																					
7.0																										
8.0																										

EBA Engineering Consultants Ltd. Whitehorse, Yukon		LOGGED BY: CPC	COMPLETION DEPTH: 6 m
		REVIEWED BY: DJW	COMPLETE: 98/09/15
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PHASE III ESA			CLIENT: DIAND			BOREHOLE NO: 13537-BH17		
ALCAN FUELS			DRILL: CME 750 c/w HOLLOW STEM			PROJECT NO: 0201-98-13537		
HAINES JUNCTION, YT			UTM ZONE: 8 N6738250 E362117			ELEVATION: 101.04 m		
SAMPLE TYPE			<input checked="" type="checkbox"/> GRAB SAMPLE	<input checked="" type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> STANDARD PEN.	<input checked="" type="checkbox"/> 75 mm SPOON	<input type="checkbox"/> COREL BARREL	
BACKFILL TYPE			<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS	<input type="checkbox"/> SAND

Depth(m)	SAMPLE TYPE	RUN NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	IONIZABLE VAPOURS			PERCENT GRAVEL				PERCENT SAND				PERCENT SILT OR FINES				PERCENT CLAY				INSTRUMENTATION DATA	ELEVATION(m)
						120	240	360	480	20	40	60	80	20	40	60	80	20	40	60	80	20	40	60		
0.0					GRAVEL & SAND (FILL) - some silt, sub angular particles, dry, greyish brown																		101.0			
0.5					CLAY & SILT (FILL) - some sand, fine grained, dry, greyish brown																					
1.0					CLAY & SILT (TILL) - some sand, damp, brownish grey																					
1.5		24			- very dense, very slight hydrocarbon odour																					
2.0																										
2.5																										
3.0		25			SAND & GRAVEL (TILL) - some silt, well graded, dry, grey, hydrocarbon odour																					
3.5																										
4.0					- grindy drilling, gravel layer																					
4.5																										
5.0		26																								
5.5																										
6.0					- very slight hydrocarbon odour																					
6.5		27																								
7.0					END OF BOREHOLE @ 6.3 m Note: Elevation referenced to Control point CP01 (Property pin) on Site plan																					
7.5																										
8.0																										

EBA Engineering Consultants Ltd. Whitehorse, Yukon		LOGGED BY: CPC	COMPLETION DEPTH: 6.3 m
		REVIEWED BY: DJW	COMPLETE: 98/09/15
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PHASE III ESA				CLIENT: DIAND				BOREHOLE NO: 13537-BH18			
ALCAN FUELS				DRILL: CME 750 c/w HOLLOW STEM				PROJECT NO: 0201-98-13537			
HAINES JUNCTION, YT				UTM ZONE: 8 N6738242 E362114				ELEVATION: 100.89 m			
SAMPLE TYPE		<input checked="" type="checkbox"/> GRAB SAMPLE		<input checked="" type="checkbox"/> NO RECOVERY		<input checked="" type="checkbox"/> STANDARD PEN.		<input checked="" type="checkbox"/> 75 mm SPOON		<input type="checkbox"/> CRREL BARREL	
BACKFILL TYPE		<input checked="" type="checkbox"/> BENTONITE		<input type="checkbox"/> PEA GRAVEL		<input type="checkbox"/> SLOUGH		<input type="checkbox"/> GROUT		<input checked="" type="checkbox"/> DRILL CUTTINGS	
										<input type="checkbox"/> SAND	

Depth(m)	SAMPLE TYPE	RUN NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	IONIZABLE VAPOURS			PERCENT GRAVEL				PERCENT SAND				PERCENT SILT OR FINES				PERCENT CLAY				INSTRUMENTATION DATA	ELEVATION(m)
						120	240	360	480	20	40	60	80	20	40	60	80	20	40	60	80	20	40	60		
0.0					GRAVEL (FILL) - sandy, some silt, sub-angular particles, dry, brown																					
1.0					CLAY & SILT (FILL) - some gravel & sand, damp, grey, some hydrocarbon odour - wood particles, black soil																					
2.0					CLAY & SILT (TILL) - some gravel & sand, damp, brownish grey, some hydrocarbon odour																					
3.0		28			- trace to some gravel & sand, damp to moist, slight hydrocarbon odour																					
4.0																										
5.0		29			- gravels, 40 mm in diameter, sub-angular particles - slow smooth drilling, some hydrocarbon odour																					
6.0		30																								
7.0																										
8.0					- organics, wood, fibres, possibly a tree, slight hydrocarbon odour - very slow hard drilling, no hydrocarbon odour																					
9.0					END OF BOREHOLE @ 8.5 m Note: Elevation referenced to Control point CP01 (Property pin) on Site plan																					
10.0																										
11.0																										

EBA Engineering Consultants Ltd.  
Whitehorse, Yukon

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COMPLETION DEPTH: 8.5 m

COMPLETE: 98/09/15

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PHASE III ESA				CLIENT: DIAND				BOREHOLE NO: 13537-BH19										
ALCAN FUELS				DRILL: CME 750 c/w HOLLOW STEM				PROJECT NO: 0201-98-13537										
HAINES JUNCTION, YT				UTM ZONE: 8 N6738250 E362105				ELEVATION: 101.11 m										
SAMPLE TYPE		<input checked="" type="checkbox"/> GRAB SAMPLE		<input type="checkbox"/> NO RECOVERY		<input checked="" type="checkbox"/> STANDARD PEN.		<input type="checkbox"/> 75 mm SPOON		<input type="checkbox"/> CRREL BARREL								
BACKFILL TYPE		<input checked="" type="checkbox"/> BENTONITE		<input type="checkbox"/> PEA GRAVEL		<input type="checkbox"/> SLOUGH		<input type="checkbox"/> GROUT		<input type="checkbox"/> DRILL CUTTINGS								
										<input type="checkbox"/> SAND								
Depth(m)	SAMPLE TYPE	RUN NO	USC	SOIL SYMBOL	SOIL DESCRIPTION				◆ IONIZABLE VAPOURS ◆ 120 240 360 480 PLASTIC M.C. LIQUID 12 24 36 48				■ PERCENT GRAVEL ■ 20 40 60 80 ● PERCENT SAND ● 20 40 60 80 ▲ PERCENT SILT OR FINES ▲ 20 40 60 80 ◆ PERCENT CLAY ◆ 20 40 60 80				INSTRUMENTATION DATA	ELEVATION(m)
0.0					GRAVEL (FILL) - sandy, some silt, sub-rounded particles, damp, brown									101.0				
1.0					SILT (FILL) - some gravel & sand, damp, brown									100.0				
2.0		31			CLAY & SILT (TILL) - trace of sand & gravel, dense, damp, grey, strong hydrocarbon odour									99.0				
3.0		32			- some gravel, trace of sand, moist, grey, slight hydrocarbon odour									98.0				
4.0														97.0				
5.0		34			- gravelly, moist, grey, no hydrocarbon odour - grindy drilling - smooth drilling									96.0				
6.0		33												95.0				
7.0					END OF BOREHOLE @ 6.3 m Note: Elevation referenced to Contol point CP01 (Property pin) on Site plan									94.0				
8.0														93.0				

EBA Engineering Consultants Ltd.  
Whitehorse, Yukon

LOGGED BY: CPC	COMPLETION DEPTH: 6.3 m
REVIEWED BY: DJW	COMPLETE: 98/09/16

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PHASE III ESA			CLIENT: DIAND			BOREHOLE NO: 13537-BH20		
ALCAN FUELS			DRILL: CME 750 c/w HOLLOW STEM			PROJECT NO: 0201-98-13537		
HAINES JUNCTION, YT			UTM ZONE: 8 N6738255 E362097			ELEVATION: 101.29 m		
SAMPLE TYPE			<input checked="" type="checkbox"/> GRAB SAMPLE	<input type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> STANDARD PEN.	<input type="checkbox"/> 75 mm SPOON	<input type="checkbox"/> CRREL BARREL	
BACKFILL TYPE			<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS	<input type="checkbox"/> SAND

Depth(m)	SAMPLE TYPE	RUN NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	IONIZABLE VAPOURS			PERCENT GRAVEL				PERCENT SAND				PERCENT SILT OR FINES				PERCENT CLAY				INSTRUMENTATION DATA	ELEVATION(m)
						120	240	360	480	20	40	60	80	20	40	60	80	20	40	60	80	20	40	60		
0.0					GRAVEL (FILL) - sandy, some silt, sub-rounded particles, dry, brown																			101.0		
1.0					SILT (FILL) - some sand & gravel, damp, brown																			100.0		
2.0		35			CLAY & SILT (TILL) - some gravel, trace of sand, dense, damp, grey, some hydrocarbon odour																			99.0		
3.0					- thin fine sand layers, moist, med-dense, strong hydrocarbon odour																			98.0		
4.0					- smooth drilling																			97.0		
5.0		36																						96.0		
6.0					- some hydrocarbon odour																			95.0		
7.0		37																						94.0		
8.0					- grindy drilling - cobble																			93.0		
9.0		38			- some sand, damp, brownish grey																			92.0		
10.0					- sand & gravelly, damp, brownish grey, slight hydrocarbon odour																			91.0		
11.0		39			- no hydrocarbon odour																					
		40			END OF BOREHOLE @ 9.2 m																					
		41			Note: Used 1 bag of bentonite to plug bottom of hole																					
		42			Elevation referenced to Control point CP01 (Property pin) on Site plan																					

EBA Engineering Consultants Ltd. Whitehorse, Yukon		LOGGED BY: CPC	COMPLETION DEPTH: 9.2 m
		REVIEWED BY: DJW	COMPLETE: 98/09/16

PHASE III ESA			CLIENT: DIAND			BOREHOLE NO: 13537-BH21		
ALCAN FUELS			DRILL: CME 750 c/w HOLLOW STEM			PROJECT NO: 0201-98-13537		
HAINES JUNCTION, YT			UTM ZONE: 8 N6738262 E362101			ELEVATION: 101.31 m		
SAMPLE TYPE		<input checked="" type="checkbox"/> GRAB SAMPLE	<input checked="" type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> STANDARD PEN.	<input type="checkbox"/> 75 mm SPOON	<input type="checkbox"/> CRREL BARREL		
BACKFILL TYPE		<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS		<input type="checkbox"/> SAND

Depth(m)	SAMPLE TYPE	RUN NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	IONIZABLE VAPOURS			PERCENT GRAVEL				PERCENT SAND				PERCENT SILT OR FINES				PERCENT CLAY				INSTRUMENTATION DATA	ELEVATION(m)
						120	240	360	480	20	40	60	80	20	40	60	80	20	40	60	80	20	40	60		
0.0					GRAVEL (FILL) - sandy, some silt, sub-rounded particles, dry, brown SILT (FILL) - some sand, fine grained, damp, greyish brown																		101.0			
1.0																							100.0			
2.0					CLAY & SILT (TILL) - some sand & gravel, med-dense, damp, grey, no hydrocarbon odour																		99.0			
3.0					- fine sand lenses 50 mm apart, some hydrocarbon odour																		98.0			
4.0																							97.0			
5.0					- no more sand lenses, no hydrocarbon odour																		96.0			
6.0																							95.0			
7.0					END OF BOREHOLE @ 6.3 m Note: Elevation referenced to Control point CP01 (Property pin) on Site plan																		94.0			
8.0																							93.0			

EBA Engineering Consultants Ltd. Whitehorse, Yukon		LOGGED BY: CPC	COMPLETION DEPTH: 6.3 m
		REVIEWED BY: DJW	COMPLETE: 98/09/16
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PHASE III ESA		CLIENT: DIAND		BOREHOLE NO: 13537-BH22	
ALCAN FUELS		DRILL: CME 750 c/w HOLLOW STEM		PROJECT NO: 0201-98-13537	
HAINES JUNCTION, YT		UTM ZONE: 8 N6738263 E362113		ELEVATION: 101.26 m	
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB SAMPLE	<input checked="" type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> STANDARD PEN.	<input checked="" type="checkbox"/> 75 mm SPOON	<input checked="" type="checkbox"/> CRREL BARREL
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input checked="" type="checkbox"/> PEA GRAVEL	<input checked="" type="checkbox"/> SLOUGH	<input checked="" type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS <input checked="" type="checkbox"/> SAND

Depth(m)	SAMPLE TYPE	RUN NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	IONIZABLE VAPOURS 120 240 360 480	PLASTIC	M.C.	LIQUID	PERCENT GRAVEL 20 40 60 80	PERCENT SAND 20 40 60 80	PERCENT SILT OR FINES 20 40 60 80	PERCENT CLAY 20 40 60 80	INSTRUMENTATION DATA	ELEVATION(m)
0.0					GRAVEL (FILL) - sandy, some silt, sub-rounded particles, dry, brown										101.0
1.0					SILT (FILL) - some sand & gravel, damp, greyish brown										100.0
2.0					CLAY & SILT (TILL) - some sand, trace of gravel, damp, grey, slight hydrocarbon odour										99.0
3.0					- some gravel, moist, med-dense, slight hydrocarbon odour										98.0
4.0															97.0
5.0															96.0
6.0															95.0
7.0															94.0
8.0															93.0

END OF BOREHOLE @ 6.3 m  
Note: Elevation referenced to Control point CP01 (Property pin) on Site plan

EBA Engineering Consultants Ltd.  
Whitehorse, Yukon

LOGGED BY: CPC  
REVIEWED BY: DJW

COMPLETION DEPTH: 6.3 m  
COMPLETE: 98/09/16

PHASE III ESA			CLIENT: DIAND			BOREHOLE NO: 13537-BH23		
ALCAN FUELS			DRILL: CME 750 c/w HOLLOW STEM			PROJECT NO: 0201-98-13537		
HAINES JUNCTION, YT			UTM ZONE: 8 N6738256 E362110			ELEVATION: 101.14 m		
SAMPLE TYPE			<input checked="" type="checkbox"/> GRAB SAMPLE	<input type="checkbox"/> NO RECOVERY	<input checked="" type="checkbox"/> STANDARD PEN.	<input type="checkbox"/> 75 mm SPOON	<input type="checkbox"/> CRREL BARREL	
BACKFILL TYPE			<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS	<input type="checkbox"/> SAND

Depth(m)	SAMPLE TYPE	RUN NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	IONIZABLE VAPOURS			PERCENT GRAVEL			PERCENT SAND			PERCENT SILT OR FINES			PERCENT CLAY			INSTRUMENTATION DATA	ELEVATION(m)	
						120	240	360	480	20	40	60	80	20	40	60	80	20	40	60			80
0.0					GRAVEL (FILL) - sandy, some silt, sub-rounded particles, dry, brown																		101.0
1.0					SILT (FILL) - some sand, damp, greyish brown																		100.0
2.0					- layer of organics, wood chips, black, some hydrocarbon odour																		99.0
3.0					SILT (TILL) - some sand, damp, greyish brown																		98.0
4.0					CLAY & SILT (TILL) - some sand & gravel, med-dense, wet, grey, strong hydrocarbon odour																		97.0
5.0					- moist, some hydrocarbon odour																		96.0
6.0					- slight hydrocarbon odour																		95.0
7.0																							94.0
8.0					SILT - some sand, dense, damp, brownish grey, no hydrocarbon odour																		93.0
9.0					END OF BOREHOLE @ 7.7 m Note: Used 1 bag of bentonite to plug bottom of hole Elevation referenced to Control point CP01 (Property pin) on Site plan																		92.0
10.0																							91.0
11.0																							

EBA Engineering Consultants Ltd. Whitehorse, Yukon		LOGGED BY: CPC	COMPLETION DEPTH: 7.7 m
		REVIEWED BY: DJW	COMPLETE: 98/09/17
		Page 1 of 1	



PHASE III ESA				CLIENT: DIAND				BOREHOLE NO: 13537-BH24			
ALCAN FUELS				DRILL: CME 750 c/w HOLLOW STEM				PROJECT NO: 0201-98-13537			
HAINES JUNCTION, YT				UTM ZONE: 8 N6738256 E362104				ELEVATION: 101.25 m			
SAMPLE TYPE		<input checked="" type="checkbox"/> GRAB SAMPLE		<input type="checkbox"/> NO RECOVERY		<input checked="" type="checkbox"/> STANDARD PEN.		<input type="checkbox"/> 75 mm SPOON		<input type="checkbox"/> CORREL BARREL	
BACKFILL TYPE		<input checked="" type="checkbox"/> BENTONITE		<input type="checkbox"/> PEA GRAVEL		<input type="checkbox"/> SLOUGH		<input type="checkbox"/> GROUT		<input type="checkbox"/> DRILL CUTTINGS	
										<input type="checkbox"/> SAND	

Depth(m)	SAMPLE TYPE	RUN NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	IONIZABLE VAPOURS			PERCENT GRAVEL				PERCENT SAND				PERCENT SILT OR FINES				PERCENT CLAY				INSTRUMENTATION DATA	ELEVATION(m)
						120	240	360	480	20	40	60	80	20	40	60	80	20	40	60	80	20	40	60		
0.0					GRAVEL (FILL) - sandy, some silt, dry, brown																		101.0			
1.0					SILT (FILL) - some sand, trace of gravel, damp, brownish grey																		100.0			
2.0					CLAY & SILT (TILL) - some gravel, trace of sand, damp, grey																		99.0			
3.0					- moist, dense, strong hydrocarbon odour - grindy drilling  - smooth drilling																		98.0			
4.0		51																					97.0			
5.0																							96.0			
6.0																							95.0			
7.0					- very hard grindy drilling - refusal, very large boulder END OF BOREHOLE @ 7.2 m Note: - Elevation referenced to Control point CP01 (Property pin) on Site plan - A plastic bottle was drilled up side of hole, depth undetermined																		94.0			
8.0		57																					93.0			

EBA Engineering Consultants Ltd. Whitehorse, Yukon		LOGGED BY: CPC	COMPLETION DEPTH: 7.2 m
		REVIEWED BY: DJW	COMPLETE: 98/09/17
		Page 1 of 1	

PHASE III ESA				CLIENT: DIAND				BOREHOLE NO: 13537-BH25			
ALCAN FUELS				DRILL: CME 750 c/w HOLLOW STEM				PROJECT NO: 0201-98-13537			
HAINES JUNCTION, YT				UTM ZONE: 8 N6738256 E362102				ELEVATION: 101.25 m			
SAMPLE TYPE		<input checked="" type="checkbox"/> GRAB SAMPLE		<input type="checkbox"/> NO RECOVERY		<input checked="" type="checkbox"/> STANDARD PEN.		<input type="checkbox"/> 75 mm SPOON		<input type="checkbox"/> CORREL BARREL	
BACKFILL TYPE		<input checked="" type="checkbox"/> BENTONITE		<input type="checkbox"/> PEA GRAVEL		<input type="checkbox"/> SLOUGH		<input type="checkbox"/> GROUT		<input type="checkbox"/> DRILL CUTTINGS <input type="checkbox"/> SAND	

Depth(m)	SAMPLE TYPE	RUN NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	IONIZABLE VAPOURS			PERCENT GRAVEL				PERCENT SAND				PERCENT SILT OR FINES				PERCENT CLAY				INSTRUMENTATION DATA	ELEVATION(m)
						120	240	360	480	20	40	60	80	20	40	60	80	20	40	60	80	20	40	60		
0.0					DRILLED DOWN TO 9.0 m STARTED SAMPLING THERE																				101.0	
1.0																									100.0	
2.0																									99.0	
3.0																									98.0	
4.0																									97.0	
5.0																									96.0	
6.0																									95.0	
7.0																									94.0	
8.0																									93.0	
9.0																									92.0	
10.0					SILT (TILL) - sand & gravelly, dense, damp, brownish grey, slight hydrocarbon odour																				91.0	
11.0					- sand lens, some gravel, trace of silt, fine to medium grained, very dense, brown, some hydrocarbon odour																				90.0	
12.0					- some sand & gravel, very dense, dry, brown, no hydrocarbon odour																				89.0	
13.0					END OF BOREHOLE @ 12.3 m Note: Used 3 bags of bentonite to plug bottom of hole Elevation referenced to Control point CP01 (Property pin) on Site plan																				88.0	
14.0																									87.0	

EBA Engineering Consultants Ltd. Whitehorse, Yukon		LOGGED BY: CPC	COMPLETION DEPTH: 12.3 m
		REVIEWED BY: DJW	COMPLETE: 98/09/17
		Page 1 of 1	



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## **APPENDIX B**

### **Raw Data Tables**

**Enviro•Test Chemical Analysis Report**

**Norwest Labs Chemical Analysis Reports**

Raw Data Table  
All results presented in ppm unless otherwise stated

Page 1

Borehole/Hand Auger Number		Sample Number	Depth (m)	northing (m)	easting (m)	PID Readings	EnvrioGard	Benzene	Toluene	Ethylbenzene	Xylenes	Volatile Petroleum Hydrocarbons	Extractable Petroleum Hydrocarbons (C10-C18)	Extractable Petroleum Hydrocarbons (C19-C32)
OCME CSR								5 0.04	0.8 2.5	20 7	17 20	-- 200	-- 2000	-- 5000
Phase 2 ESA (13413)	BH01	1	1.3-1.5	6738257	362104	176	--							
		2	2.0-2.2	6738257	362104	537	--							
		3	2.8-3.0	6738257	362104	715	--	33	130	59	210	390	1100	72
		4	3.8-4.0	6738257	362104	355	--							
		5	5.3-5.5	6738257	362104	610	--							
	BH02	6	6.2-6.4	6738257	362104	700	--	21	150	43	220	440	5200	340
		7	1.3-1.5	6738262	362109	50	--							
		8	2.5-2.8	6738262	362109	625	--	3.8	31	2.5	13	60	1500	130
	BH03	9	4.3-4.5	6738262	362109	190	--							
		10	0.5-0.7	6738248	362118	399	--							
		11	1.3-1.5	6738248	362118	433	--	2.6	9.5	4.2	31	47	20000	100
		12	2.3-2.5	6738248	362118	125	--	0.16	0.47	0.08	4.7	6.2	1700	<5
		13	3.5-3.7	6738248	362118	105	--							
	BH04	14	4.5-4.7	6738248	362118	130	--							
		15	5.5-5.7	6738248	362118	76	--							
		16	1.0-1.2	6738254	362103	330	--							
		17	1.7-1.9	6738254	362103	955	--	32	230	83	330	640	1500	10
		18	2.5-2.7	6738254	362103	676	--							
		19	3.4-3.6	6738254	362103	953	--							
		20	5.3-5.5	6738254	362103	876	--	1.4	10	3.7	21	36	160	28

Raw Data Table  
All results presented in ppm unless otherwise stated

Borehole/Hand Auger Number		Sample Number	Depth (m)	northing (m)	easting (m)	PID Readings	EnvrioGard	Benzene	Toluene	Ethylbenzene	Xylenes	Volatile Petroleum Hydrocarbons	Extractable Petroleum Hydrocarbons (C10-C18)	Extractable Petroleum Hydrocarbons (C19-C32)
CQME CSR								5 0.04	0.8 2.5	20 7	17 20	-- 200	-- 2000	-- 5000
Phase 3 ESA (13537)	BH05	1	1.0-1.3	6738245	362122	16	<250	ND	0.19	ND	ND	ND	ND	ND
		2	3.0-3.3	6738245	362122	6.5	<250							
	BH06	3	1.0-1.3	6738253	362116	46	--	ND	ND	ND	ND	3.7	150	ND
		4	2.5-2.8	6738253	362116	27.7	<250							
	BH07	5	1.0-1.3	6738245	362116	975	--							
		6	2.0-2.2	6738245	362116	595	>1250							
		7	3.7-3.9	6738245	362116	292	--	ND	ND	0.16	0.53	12	550	44
	BH08	8	2.2-2.4	6738249	362112	85	<250							
		9	3.5-3.6	6738249	362112	140	--	ND	ND	ND	0.1	1.6	ND	ND
	BH09	10	0.7-1.0	6738246	362111	34	--							
		11	1.0-1.3	6738246	362111	103	--	ND	ND	ND	ND	ND	ND	ND
	BH10	12	1.0-1.2	6738253	362101	150	>1250							
		13	2.5-2.8	6738253	362101	395	>1250	45	190	38	246	ND	2200	220
	BH11	14	1.0-1.1	6738261	362104	250	>1250							
		15	2.5-2.7	6738261	362104	251	>1250							
	BH12	16	1.2-1.3	6738265	362110	160	<250							
		17	2.0-2.1	6738265	362110	147	--	ND	0.07	ND	0.39	4.1	160	16
	BH13	18	0.7-0.9	6738261	362114	44	--							
		19	2.0-2.1	6738261	362114	240	<250	0.31	0.74	0.09	0.51	ND	ND	ND
	BH14	20	1.6-1.7	6738243	362118	--	--	ND	ND	0.2	1.82	26	1000	98
		21	4.5-4.6	6738243	362118	46	<250							
	BH15	22	1.7-1.8	6738245	362122	51	--	ND	ND	ND	0.06	1	ND	ND
	BH16	23	5.8-5.9	6738247	362120	14	--	ND	ND	ND	ND	ND	ND	ND
	BH17	24	1.6-1.7	6738250	362117	66	--	ND	ND	ND	0.55	1.7	38	ND
		25	3.1-3.2	6738250	362117	30	<250							
		26	4.5-4.6	6738250	362117	11	<250	ND	0.03	ND	0.22	ND	ND	ND
		27	6.0-6.3	6738250	362117	273	--	ND	ND	ND	ND	ND	28	ND
	BH18	28	3.0-3.3	6738242	362114	46	--							
		29	4.5-4.8	6738242	362114	49	<250							
		30	6.0-6.3	6738242	362114	58	--	ND	ND	ND	ND	ND	ND	ND
	BH19	31	1.5-1.8	6738250	362105	1300	--	ND	0.13	0.09	0.87	7.8	ND	ND
		32	3.0-3.3	6738250	362105	298	<250	0.08	0.19	ND	0.39	ND	ND	ND
		34	4.5-4.8	6738250	362105	82	<250							
		33	6.0-6.4	6738250	362105	35	--	0.06	ND	ND	ND	ND	ND	ND

Raw Data Table  
All results presented in ppm unless otherwise stated

Page 3

Borehole/Hand Auger Number		Sample Number	Depth (m)	northing (m)	easting (m)	PID Readings	EnviroGard	Benzene	Toluene	Ethylbenzene	Xylenes	Volatile Petroleum Hydrocarbons	Extractable Petroleum Hydrocarbons (C10-C18)	Extractable Petroleum Hydrocarbons (C19-C32)
OCME CSR								5 0.04	0.8 2.5	20 7	17 20	-- 200	-- 2000	-- 5000
Phase 3 ESA (13537)	BH20	35	1.5-1.8	6738255	362097	220	--							
		36	3.0-3.3	6738255	362097	920	--	ND	ND	0.19	5.5	37	2100	ND
		37	4.5-4.8	6738255	362097	200	--							
		38	6.0-6.4	6738255	362097	390	--	ND	ND	0.12	0.94	9.5	340	ND
		39	6.7-7.2	6738255	362097	190	--							
		40	7.5-7.7	6738255	362097	550	>1250							
	BH21	41	8.2-8.5	6738255	362097	300	--	ND	ND	ND	ND	1.6	32	ND
		42	9.0-9.2	6738255	362097	30	<250	ND	ND	ND	ND	2.1	ND	ND
		43	3.0-3.3	6738262	362101	114	--	ND	ND	ND	0.07	2.9	450	44
	BH22	44	6.0-6.3	6738262	362101	24	--	ND	ND	ND	ND	ND	ND	ND
		45	3.0-3.3	6738263	362113	45	>250,<1250	ND	ND	ND	0.06	1	75	ND
		46	4.5-4.8	6738263	362113	24	--							
	BH23	47	6.0-6.3	6738263	362113	16	<250							
		48	3.0-3.3	6738256	362110	2000	--	23	120	27	150	ND	35000	3500
		49	6.0-6.3	6738256	362110	320	--	0.25	0.52	0.11	0.46	ND	170	ND
	BH24	50	7.5-7.7	6738256	362110	30	--	ND	ND	ND	0.05	ND	11	ND
		51	3.0-3.3	6738256	362104	850	--							
	BH25	57	6.0-6.4	6738256	362104	1650	--							
		52	9.0-9.3	6738256	362102	178	--							
		53	9.7-10.1	6738256	362102	115	<250							
54		10.5-10.9	6738256	362102	450	--	ND	ND	0.11	0.91	7.3	4800	380	
	55	11.2-11.4	6738256	362102	140	--	ND	ND	ND	0.08	ND	210	18	

Raw Data Table  
All results presented in ppm unless otherwise stated

Page 4

Borehole/Hand Auger Number		Sample Number	Depth (m)	northing (m)	easting (m)	PID Readings	EnvrioGard	Benzene	Toluene	Ethylbenzene	Xylenes	Volatile Petroleum Hydrocarbons	Extractable Petroleum Hydrocarbons (C10-C18)	Extractable Petroleum Hydrocarbons (C19-C32)
CCME CSR								5 0.04	0.8 2.5	20 7	17 20	-- 200	-- 2000	-- 5000
Phase 3 ESA (13537)	HA01	1	1.6-1.7	6738254	362100	160	>125,<625							
	TP01	2	0.4-0.5	6738257	362104	535	>125,<625	4.3	190	96	750	380	1800	140
	HA02		0.5	6738254	362105	0	--							
		3	1.0-1.1	6738254	362105	51	<25							
		1.5	6738254	362105	150	--								
	4	1.6-1.7	6738254	362105	100	>625								
		0.5	--	--	810	--								
	VPH													
	HA03	5	1.0-1.1	6738259	362102	470	<25							
		6	1.5-1.6	6738259	362102	30	<25							
	TP04	7	0.3	6738263	362112	7.4	<25							
	TP05	8	0.3	6738259	362111	123	>625	ND	0.16	0.1	0.77	13	3000	240
	TP06	9	0.3	6738257	362112	2	--							
	TP07	10	0.3	6738265	362108	0.8	--							
	HA04	--	--	6738263	362112	--	--							
	HA05	--	--	6738259	362111	--	--							
	HA06	11	1.0-1.1	6738265	362108	65	<25							
	HA07		0.5	6738250	362114	21	--							
		12	1.0-1.1	6738250	362114	15	<25	ND	ND	ND	0.47	13	150	37
		19	1.2-1.3	6738250	362114	350	>125,<625							
		13	1.5-1.6	6738250	362114	15	>25,<125							
	HA08	20	0.5	6738244	362120	157	>125,<625	ND	0.04	0.06	0.81	15	3900	290
		14	1.0-1.1	6738244	362120	150	--							
		15	1.6-1.7	6738244	362120	185	>125,<625							
	HA09	21	1.0-1.1	6738244	362112	115	>625	ND	0.09	0.1	0.9	9.4	420	100
		--	1.2-1.3	6738244	362112	120	--							
	TP08	--	0.5	6738246	362118	355	--							
	TP09	--	0.5	6738244	362120	1.3	--							
TP10	--	0.5	6738251	362118	150	--								
HA10	--	1.0-1.1	6738242	362122	9	--								
	--	1.0-1.1	6738242	362122	9	--								
	16	1.3-1.4	6738242	362122	40	<25								
	17	1.25-1.3	6738242	362122	--	--								
	18	1.2-1.25	6738242	362122	--	--								



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Western Canada Fax:  
1-800-286-7319

**CHEMICAL ANALYSIS REPORT**

**FAS GAS OIL LTD  
236 4919 59 ST  
RED DEER AB T4N 6C9**

**DATE: June 24, 1998**

**ATTN: SIM KOOPMANS**

**Lab Work Order #: E806640**

**Sampled By: DJW**

**Project Reference: NOT SUBMITTED**

**Date Received: 06/15/98**

**Project P.O.#: 806650**

**Comments:**

**APPROVED BY:**

  
**Doug Johnson**  
Project Manager

THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL WITHOUT THE WRITTEN AUTHORITY OF THE LABORATORY.  
ALL SAMPLES WILL BE DISPOSED OF AFTER 30 DAYS FOLLOWING ANALYSIS. PLEASE CONTACT THE LAB IF YOU REQUIRE  
ADDITIONAL SAMPLE STORAGE TIME.

**ACCREDITATIONS: STANDARDS COUNCIL OF CANADA (SCC), IN COOPERATION WITH THE CANADIAN ASSOCIATION FOR  
ENVIRONMENTAL ANALYTICAL LABORATORIES (CAEAL): FOR SPECIFIC TESTS AS REGISTERED BY THE  
COUNCIL (EDMONTON, CALGARY)  
AMERICAN INDUSTRIAL HYGIENE ASSOCIATION (AIHA): FOR INDUSTRIAL HYGIENE ANALYSIS (EDMONTON)  
AGRICULTURE CANADA: UNDER THE CANADIAN FERTILIZER QUALITY ASSURANCE PROGRAM (SASKATOON)**

# ENVIRO-TEST CHEMICAL ANALYSIS REPORT

LAB ID	SAMPLE ID	TEST DESCRIPTION	RESULT	D.L.	UNITS	EXTRACTED	ANALYZED	BY
E806640-01	13413 BH-1 #3 Sample Type:SOIL Collected:06/10/98	BTEX/VPH/LEPH/HEPH In Soil						
		% Moisture	18.6	0	%		06/18/98	THT
		BTEX and VPH In Soil						
		Benzene	33	0.02	ug/g (ppm)	06/17/98	06/23/98	THT
		Toluene	130	0.02	ug/g (ppm)	06/17/98	06/23/98	THT
		Ethylbenzene	59	0.02	ug/g (ppm)	06/17/98	06/23/98	THT
		Xylenes	210	0.02	ug/g (ppm)	06/17/98	06/23/98	THT
		Volatile Petroleum Hydrocarbon	390	0.5	ug/g (ppm)	06/17/98	06/23/98	THT
		Heavy Extractables (Soil)	72	5	ug/g (ppm)	06/17/98	06/19/98	THT
		Light Extractables (Soil)	1100	5	ug/g (ppm)	06/17/98	06/19/98	THT
E806640-02	13413 BH-1 #6 Sample Type:SOIL Collected:06/10/98	BTEX/VPH/LEPH/HEPH In Soil						
		% Moisture	12.1	0	%		06/18/98	THT
		BTEX and VPH In Soil						
		Benzene	21	0.02	ug/g (ppm)	06/17/98	06/22/98	THT
		Toluene	150	0.02	ug/g (ppm)	06/17/98	06/22/98	THT
		Ethylbenzene	43	0.02	ug/g (ppm)	06/17/98	06/22/98	THT
		Xylenes	220	0.02	ug/g (ppm)	06/17/98	06/22/98	THT
		Volatile Petroleum Hydrocarbon	440	0.5	ug/g (ppm)	06/17/98	06/22/98	THT
		Heavy Extractables (Soil)	340	5	ug/g (ppm)	06/16/98	06/20/98	CAH
		Light Extractables (Soil)	5200	5	ug/g (ppm)	06/16/98	06/20/98	CAH
E806640-03	13413 BH-2 #2 Sample Type:SOIL Collected:06/10/98	BTEX/VPH/LEPH/HEPH In Soil						
		% Moisture	23.2	0	%		06/18/98	THT
		BTEX and VPH In Soil						
		Benzene	3.8	0.02	ug/g (ppm)	06/17/98	06/22/98	THT
		Toluene	31	0.02	ug/g (ppm)	06/17/98	06/22/98	THT
		Ethylbenzene	2.5	0.02	ug/g (ppm)	06/17/98	06/22/98	THT
		Xylenes	13	0.02	ug/g (ppm)	06/17/98	06/22/98	THT
		Volatile Petroleum Hydrocarbon	60	0.5	ug/g (ppm)	06/17/98	06/22/98	THT
		Heavy Extractables (Soil)	130	5	ug/g (ppm)	06/16/98	06/18/98	THT
		Light Extractables (Soil)	1500	5	ug/g (ppm)	06/16/98	06/18/98	THT
E806640-04	13413 BH-3 #2 Sample Type:SOIL Collected:06/10/98	BTEX/VPH/LEPH/HEPH In Soil						
		% Moisture	21.6	0	%		06/18/98	THT
		BTEX and VPH In Soil						
		Benzene	2.6	0.02	ug/g (ppm)	06/16/98	06/20/98	CAH
		Toluene	9.5	0.02	ug/g (ppm)	06/16/98	06/20/98	CAH
		Ethylbenzene	4.2	0.02	ug/g (ppm)	06/16/98	06/20/98	CAH
		Xylenes	31	0.02	ug/g (ppm)	06/16/98	06/20/98	CAH
		Volatile Petroleum Hydrocarbon	47	0.5	ug/g (ppm)	06/16/98	06/20/98	CAH
		Heavy Extractables (Soil)	100	5	ug/g (ppm)	06/16/98	06/18/98	THT
		Light Extractables (Soil)	20000	5	ug/g (ppm)	06/16/98	06/18/98	THT
E806640-05	13413 BH-3 #3 Sample Type:SOIL Collected:06/10/98	BTEX/VPH/LEPH/HEPH In Soil						
		% Moisture	21.1	0	%		06/18/98	THT
		BTEX and VPH In Soil						
		Benzene	0.16	0.02	ug/g (ppm)	06/16/98	06/20/98	CAH
		Toluene	0.47	0.02	ug/g (ppm)	06/16/98	06/20/98	CAH
		Ethylbenzene	0.08	0.02	ug/g (ppm)	06/16/98	06/20/98	CAH
		Xylenes	4.7	0.02	ug/g (ppm)	06/16/98	06/20/98	CAH
		Volatile Petroleum Hydrocarbon	6.2	0.5	ug/g (ppm)	06/16/98	06/20/98	CAH
		Heavy Extractables (Soil)	<5	5	ug/g (ppm)	06/16/98	06/18/98	THT
		Light Extractables (Soil)	1700	5	ug/g (ppm)	06/16/98	06/18/98	THT

**ENVIRO-TEST CHEMICAL ANALYSIS REPORT**

LAB ID	SAMPLE ID	TEST DESCRIPTION	RESULT	D.L.	UNITS	EXTRACTED	ANALYZED	BY		
E806640-06	13413 BH-4 #2 Sample Type:SOIL Collected:06/10/98	BTEX/VPH/LEPH/HEPH In Soil								
		% Moisture	22.2	0	%		06/18/98	THT		
		BTEX and VPH In Soil								
		Benzene	32	0.02	ug/g (ppm)	06/16/98	06/23/98	MTL		
		Toluene	230	0.02	ug/g (ppm)	06/16/98	06/23/98	MTL		
		Ethylbenzene	83	0.02	ug/g (ppm)	06/16/98	06/23/98	MTL		
		Xylenes	330	0.02	ug/g (ppm)	06/16/98	06/23/98	MTL		
		Volatile Petroleum Hydrocarbon	640	0.5	ug/g (ppm)	06/16/98	06/23/98	MTL		
		Heavy Extractables (Soil)	10	5	ug/g (ppm)	06/16/98	06/19/98	THT		
		Light Extractables (Soil)	1500	5	ug/g (ppm)	06/16/98	06/19/98	THT		
		E806640-07	13413 BH-4 #5 Sample Type:SOIL Collected:06/10/98	BTEX/VPH/LEPH/HEPH In Soil						
				% Moisture	13.1	0	%		06/18/98	THT
				BTEX and VPH In Soil						
Benzene	1.4			0.02	ug/g (ppm)	06/17/98	06/22/98	THT		
Toluene	10			0.02	ug/g (ppm)	06/17/98	06/22/98	THT		
Ethylbenzene	3.7			0.02	ug/g (ppm)	06/17/98	06/22/98	THT		
Xylenes	21			0.02	ug/g (ppm)	06/17/98	06/22/98	THT		
Volatile Petroleum Hydrocarbon	36			0.5	ug/g (ppm)	06/17/98	06/22/98	THT		
Heavy Extractables (Soil)	28			5	ug/g (ppm)	06/16/98	06/17/98	CAH		
Light Extractables (Soil)	160			5	ug/g (ppm)	06/16/98	06/17/98	CAH		
E806640-08	13413 BH-5 #2 Sample Type:SOIL Collected:06/10/98			BTEX/VPH/LEPH/HEPH In Soil						
				% Moisture	22.5	0	%		06/18/98	CMS
				BTEX and VPH In Soil						
		Benzene	< 0.02	0.02	ug/g (ppm)	06/16/98	06/20/98	CAH		
		Toluene	0.15	0.02	ug/g (ppm)	06/16/98	06/20/98	CAH		
		Ethylbenzene	0.08	0.02	ug/g (ppm)	06/16/98	06/20/98	CAH		
		Xylenes	0.86	0.02	ug/g (ppm)	06/16/98	06/20/98	CAH		
		Volatile Petroleum Hydrocarbon	0.8	0.5	ug/g (ppm)	06/16/98	06/20/98	CAH		
		Heavy Extractables (Soil)	12	5	ug/g (ppm)	06/16/98	06/17/98	CAH		
		Light Extractables (Soil)	53	5	ug/g (ppm)	06/16/98	06/17/98	CAH		
		E806640-09	13413 BH-6 #1 Sample Type:SOIL Collected:06/10/98	BTEX/VPH/LEPH/HEPH In Soil						
				% Moisture	22.7	0	%		06/18/98	CMS
				BTEX and VPH In Soil						
Benzene	< 0.02			0.02	ug/g (ppm)	06/16/98	06/20/98	CAH		
Toluene	0.05			0.02	ug/g (ppm)	06/16/98	06/20/98	CAH		
Ethylbenzene	< 0.02			0.02	ug/g (ppm)	06/16/98	06/20/98	CAH		
Xylenes	0.10			0.02	ug/g (ppm)	06/16/98	06/20/98	CAH		
Volatile Petroleum Hydrocarbon	< 0.5			0.5	ug/g (ppm)	06/16/98	06/20/98	CAH		
Heavy Extractables (Soil)	<5			5	ug/g (ppm)	06/16/98	06/17/98	CAH		
Light Extractables (Soil)	<5			5	ug/g (ppm)	06/16/98	06/17/98	CAH		
				N.D. - NOT DETECTED, LESS THAN THE DETECTION LIMIT						
				THIS IS THE FINAL PAGE OF THE REPORT						

## Appendix A Test Methodologies

### TEX and VPH in Soil

PREPARATION METHOD: Methanol extraction with purge and trap analysis.

INSTRUMENTAL METHOD: GC/PID for BTEX.  
GC/FID for VPH - summation of hydrocarbons from C5 to C9 carbon range and is calculated against m+p-Xylenes.  
NOTE: Results based upon dry weight.

METHOD REFERENCE: Modified SW-846 USEPA Method 5030 and 8015/8020.

BTEX QC SUMMARY:      Accuracy                      Precision  
                         97%                              +/- 22%  
NOTE: Accuracy is expressed as the average % recovery and Precision as the relative standard deviation (RSD) of fortifications made using certified standards (BTEX).

### Moisture

Preparation Method: Sample is oven dried at 105 degrees C  
Instrumental Method: Gravimetric analysis

### Light Extractables (Soil)

PREPARATION METHOD: Shake and sonication extraction with organic solvent

INSTRUMENTAL METHOD: GC/FID - summation of hydrocarbons from C10 to C18 carbon range (excluding benzene, toluene, ethylbenzene, and xylenes) and calculated against a calibrated n-decane standard. Result is not corrected for PAH concentration.  
NOTE: Results based upon dry weight.

METHOD REFERENCE: Modified SW-846 USEPA Method 3550/3580 and 8000

### Heavy Extractables (Soil)

PREPARATION METHOD: Shake and sonication extraction with organic solvent

INSTRUMENTAL METHOD: GC/FID - summation of hydrocarbons from C19 to C32 carbon range (excluding benzene, toluene, ethylbenzene, and xylenes) and calculated against a calibrated n-eicosane standard. Result is not corrected for PAH concentration.  
NOTE: Results based upon dry weight.

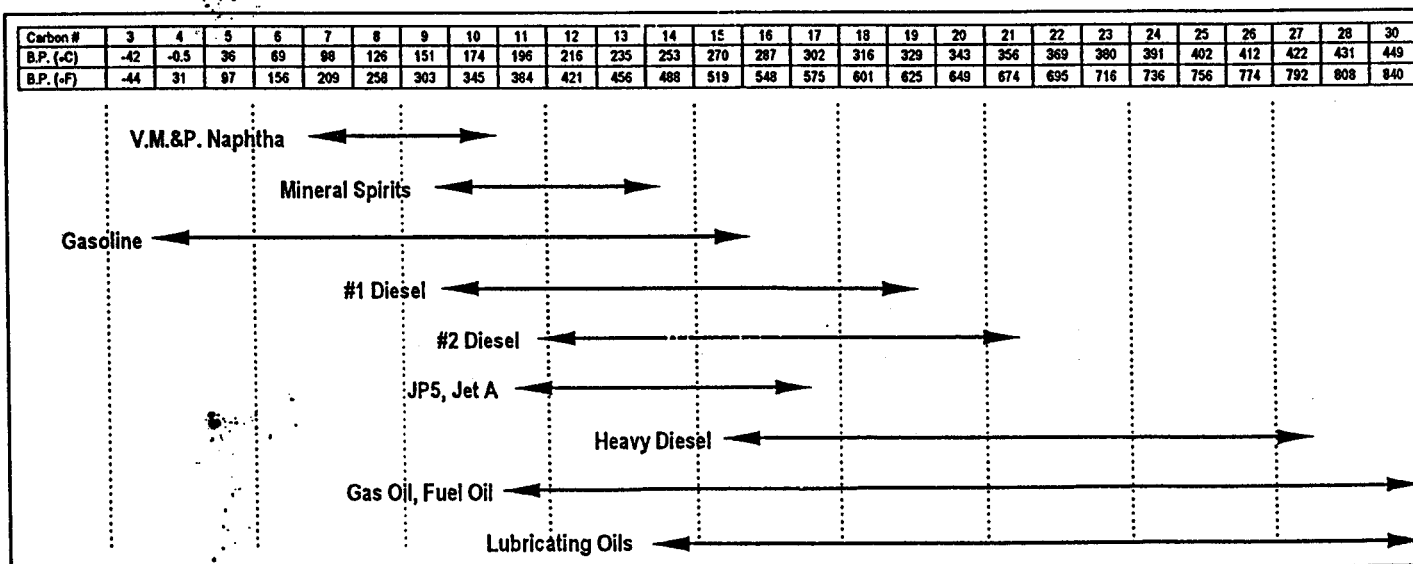
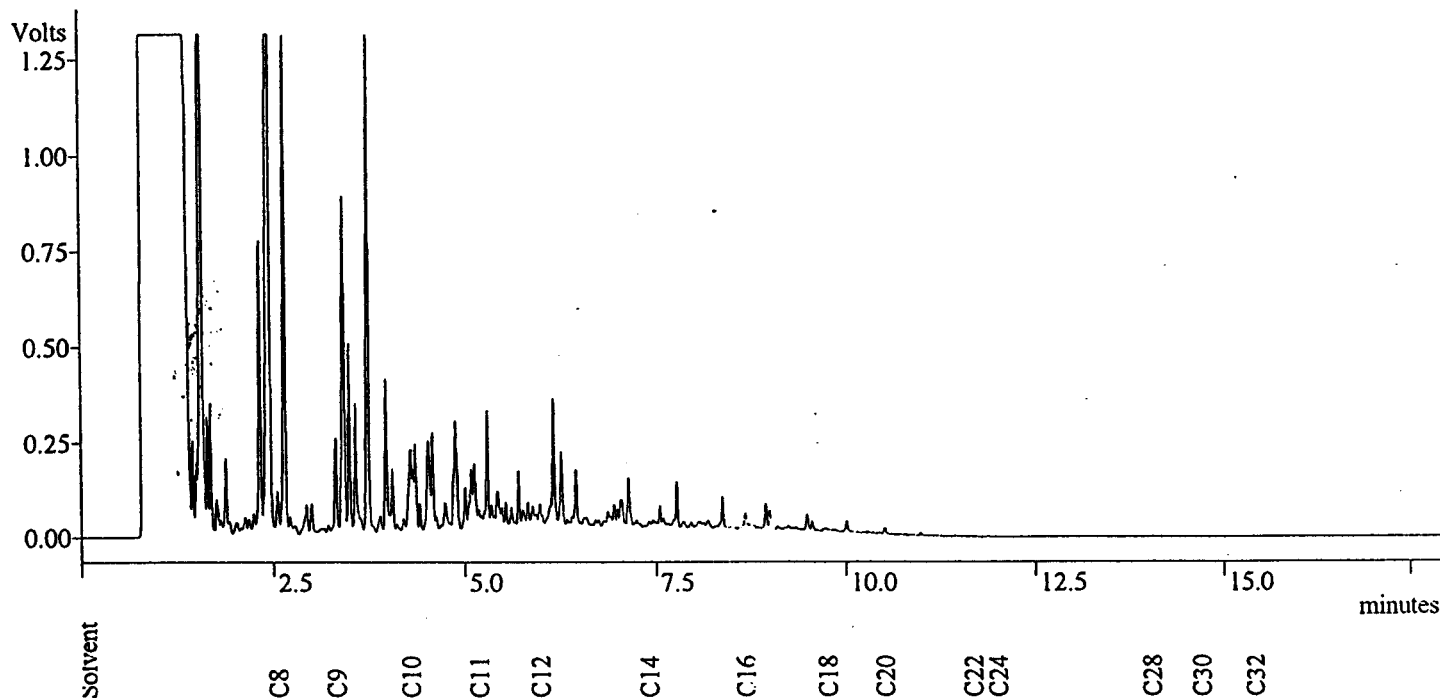
METHOD REFERENCE: Modified SW-846 USEPA Method 3550/3580 and 8000

THIS IS THE LAST PAGE OF THE METHODOLOGY APPENDIX.

CLIENT I.D.: 13413 BH-1 #3



Data File: c:\star\module16\maya1307.run  
Sample ID: E806640-01A-10  
Injection Date: 06/19/98 05:38:52 AM  
Instrument (Inj): GC 3600 SIDE A



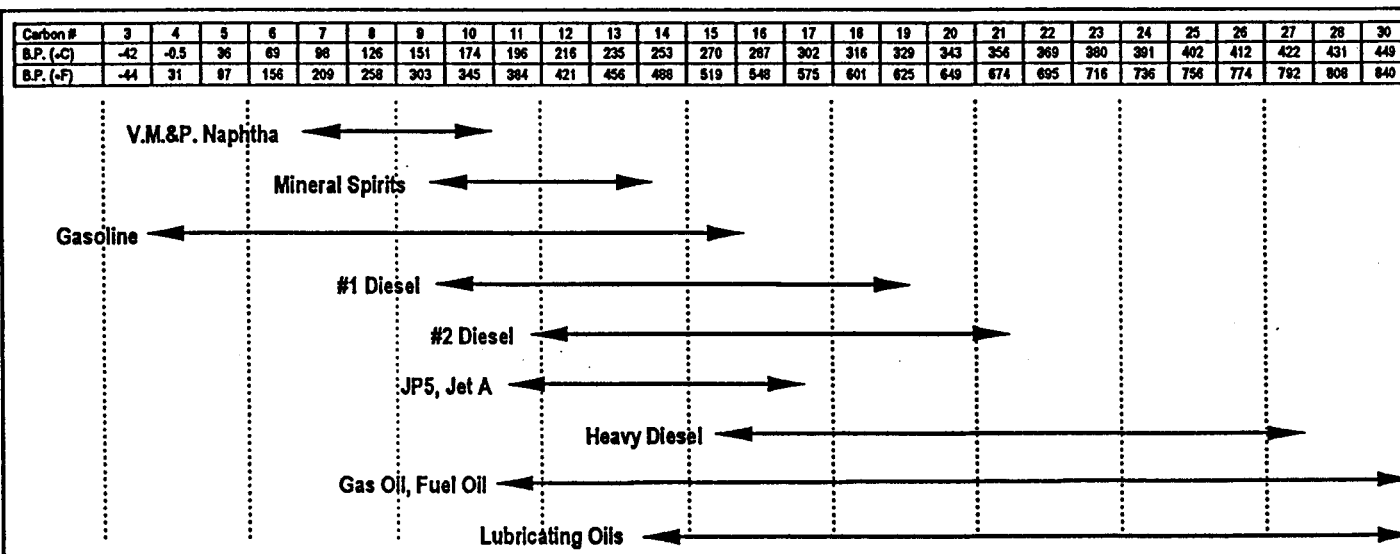
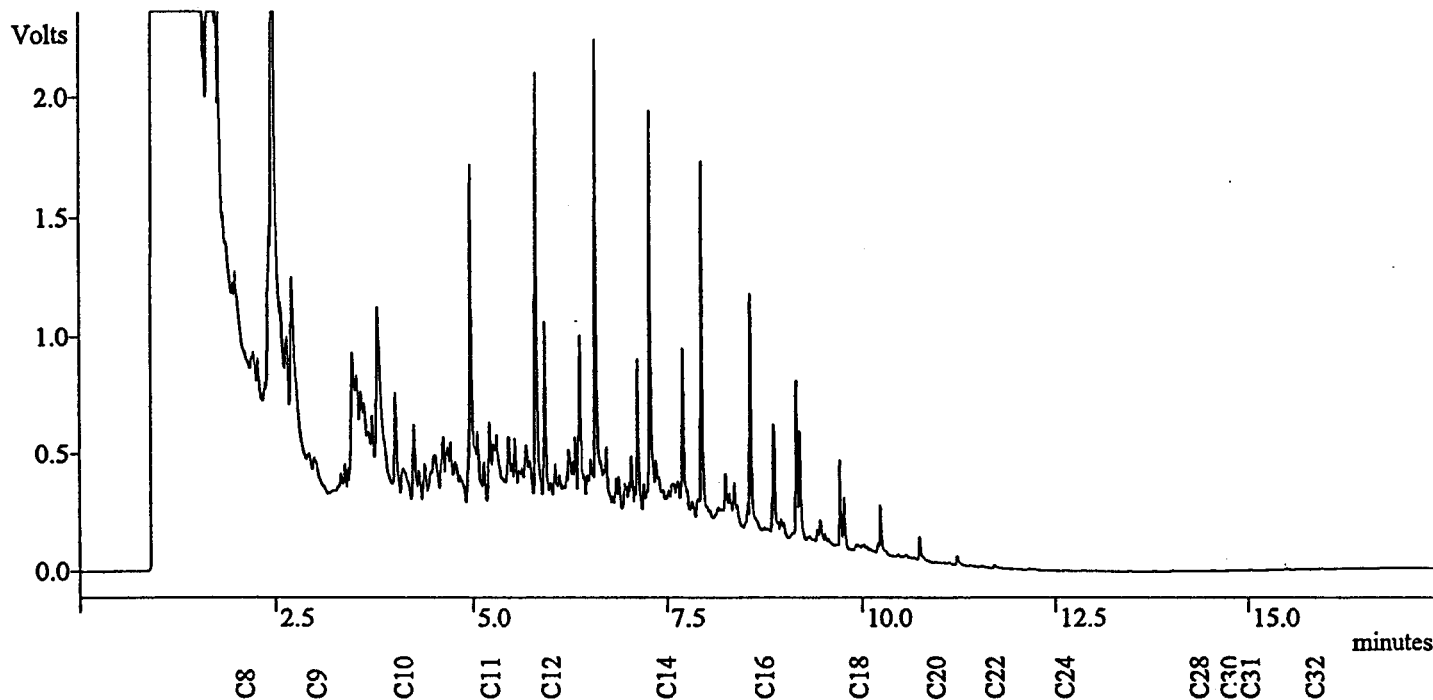
### Boiling Point Distribution Range for Petroleum Based Fuel Products

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

CLIENT I.D.: 13413 BH-1 #6



Data File: c:\star\module16\jun058.run  
 Sample ID: E806640-02A-100  
 Injection Date: 06/20/98 04:37:29 AM  
 Instrument (Inj): Varian Star 3400CX



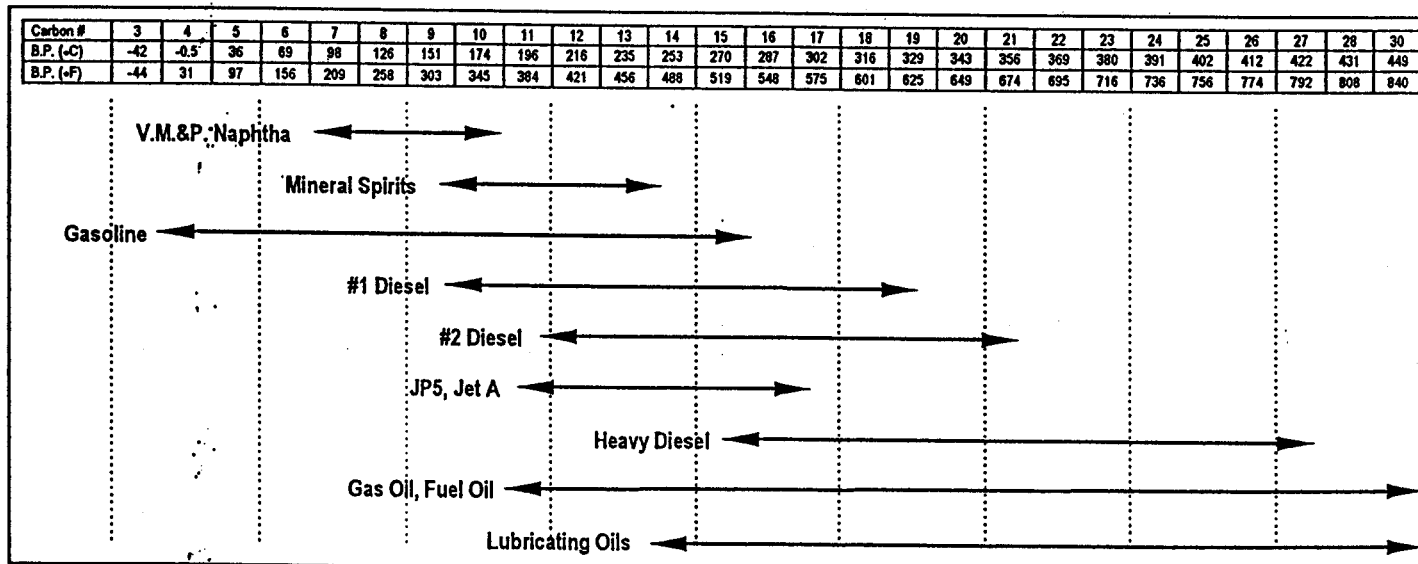
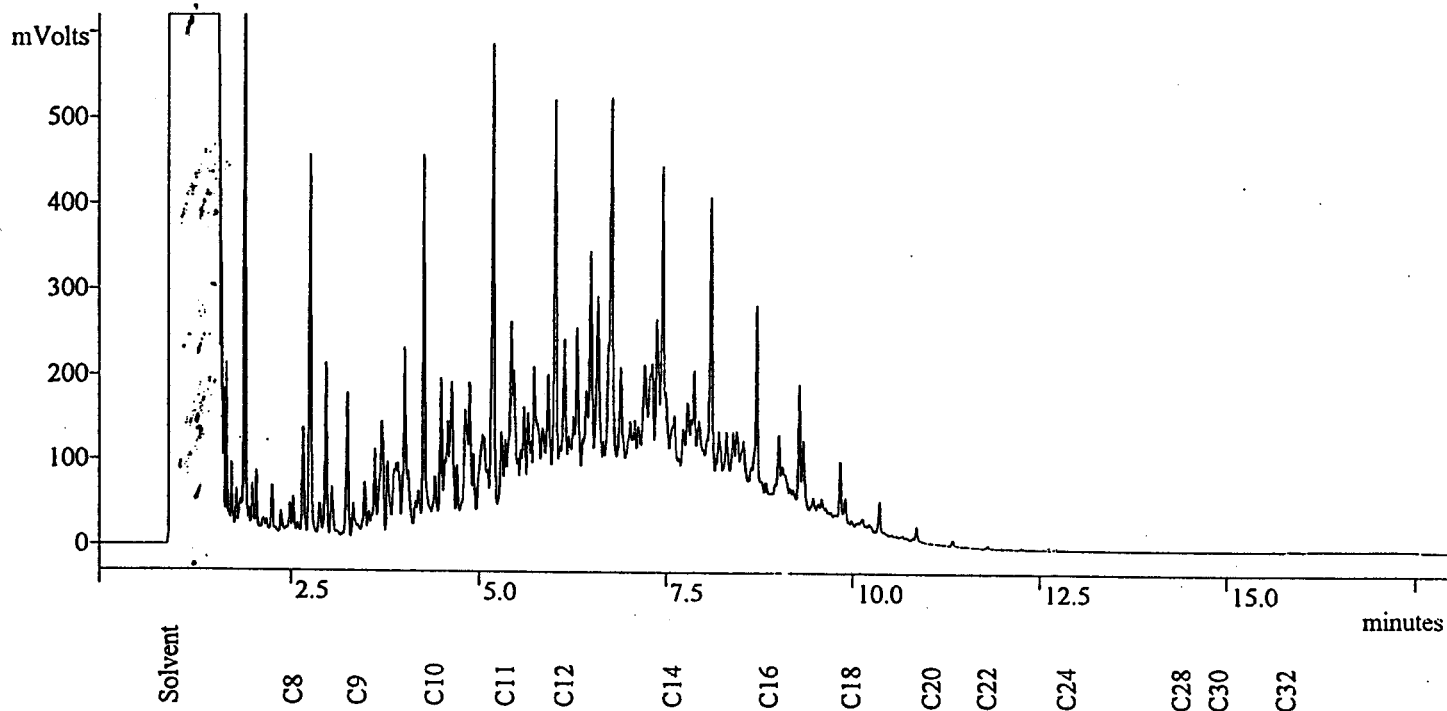
## Boiling Point Distribution Range for Petroleum Based Fuel Products

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

CLIENT I.D.: 13413 BH-2 #2



Data File: c:\star\module18\mayb1289.run  
 Sample ID: E806640-03A-10 RR  
 Injection Date: 06/18/98 09:57:19 PM  
 Instrument (Inj): GC 3600 SIDE B



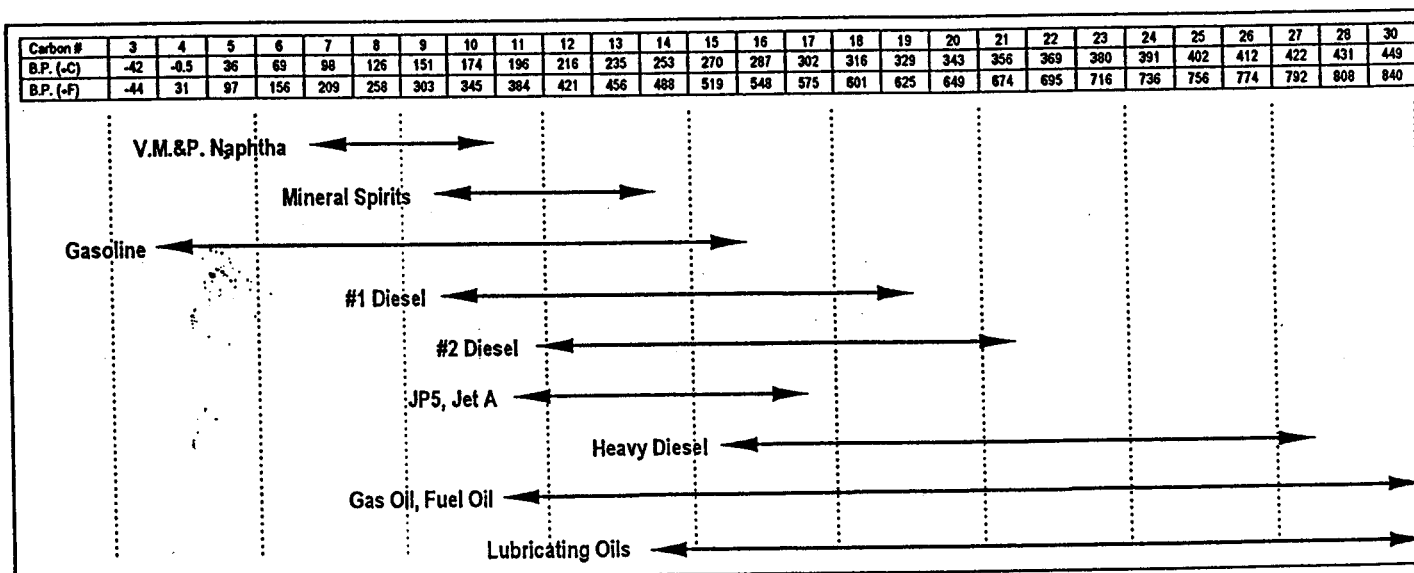
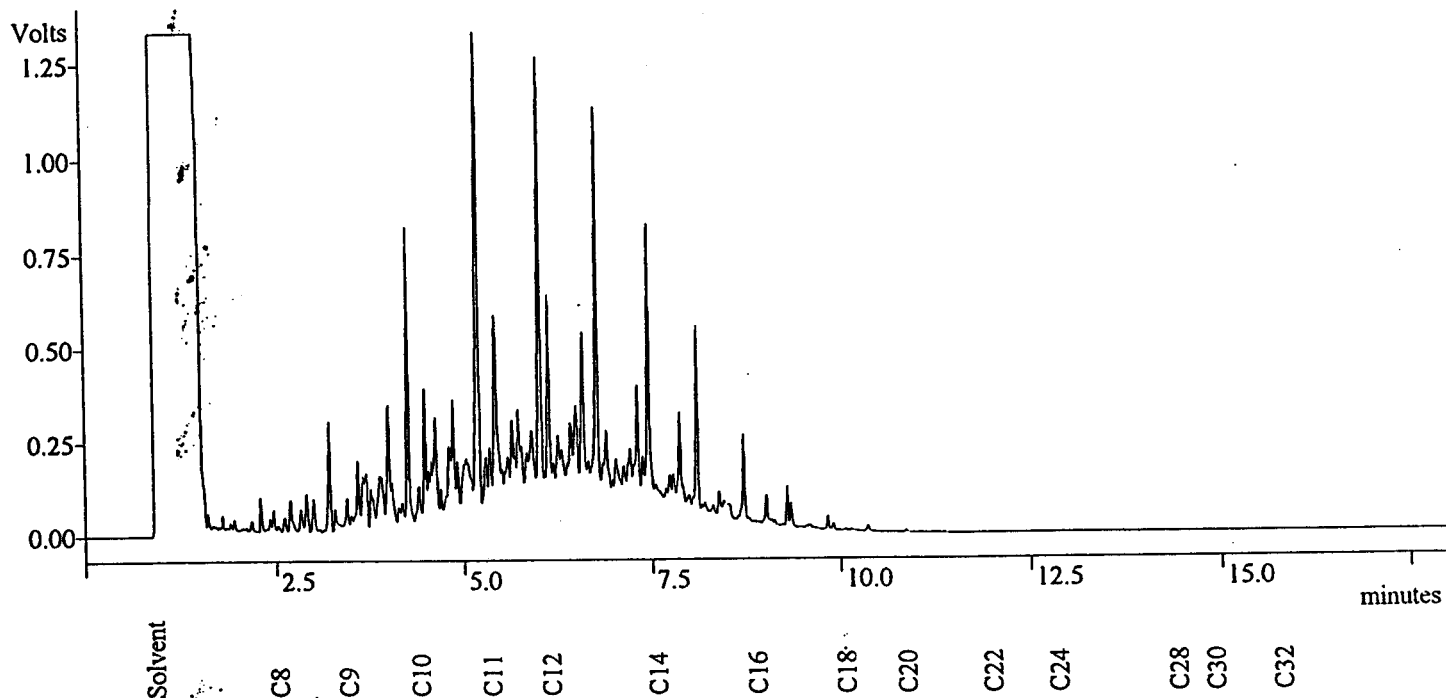
## Boiling Point Distribution Range for Petroleum Based Fuel Products

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

CLIENT I.D.: 13413 BH-3 #2



Data File: c:\star\module18\mayb1290.run  
 Sample ID: E806640-04A-100 D1  
 Injection Date: 06/18/98 10:30:44 PM  
 Instrument (Inj): GC 3600 SIDE B



### Boiling Point Distribution Range for Petroleum Based Fuel Products

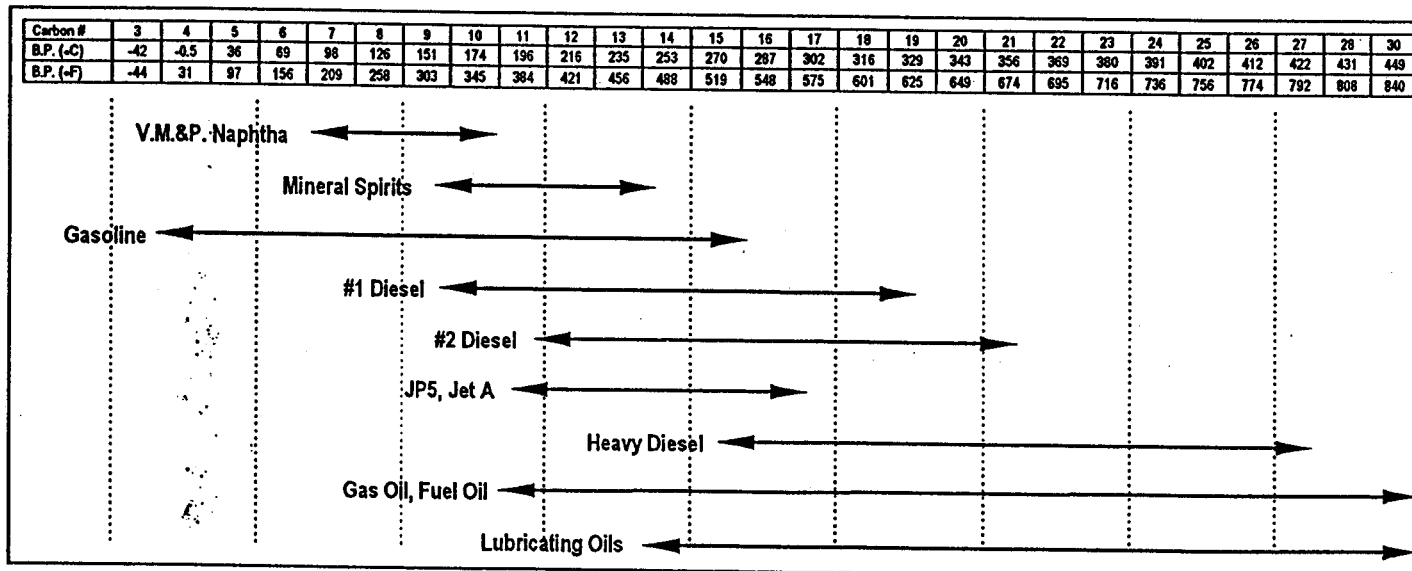
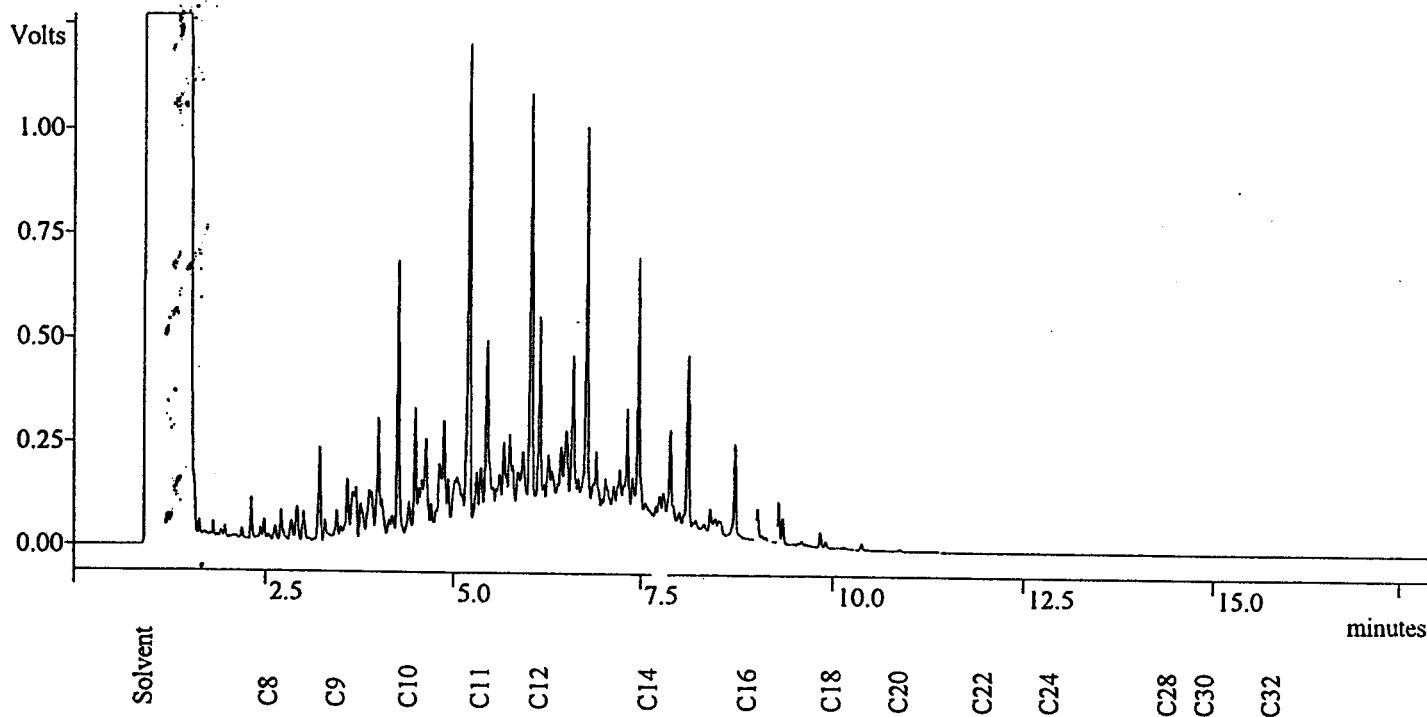
Adapted from: Drews, A.W., ED; Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA, 1989: p XVIII.



CLIENT I.D.: 13413 BH-3 #2



Data File: c:\star\module18\mayb1291.run  
 Sample ID: E806640-04A-100 D2  
 Injection Date: 06/18/98 11:03:47 PM  
 Instrument (Inj): GC 3600 SIDE B



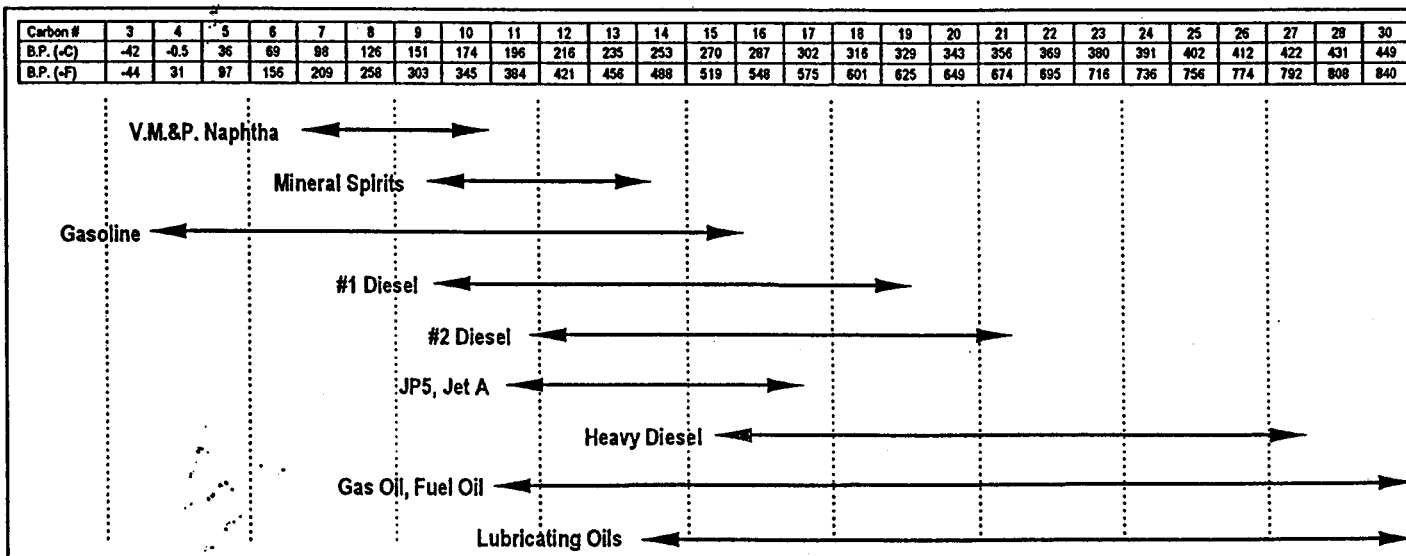
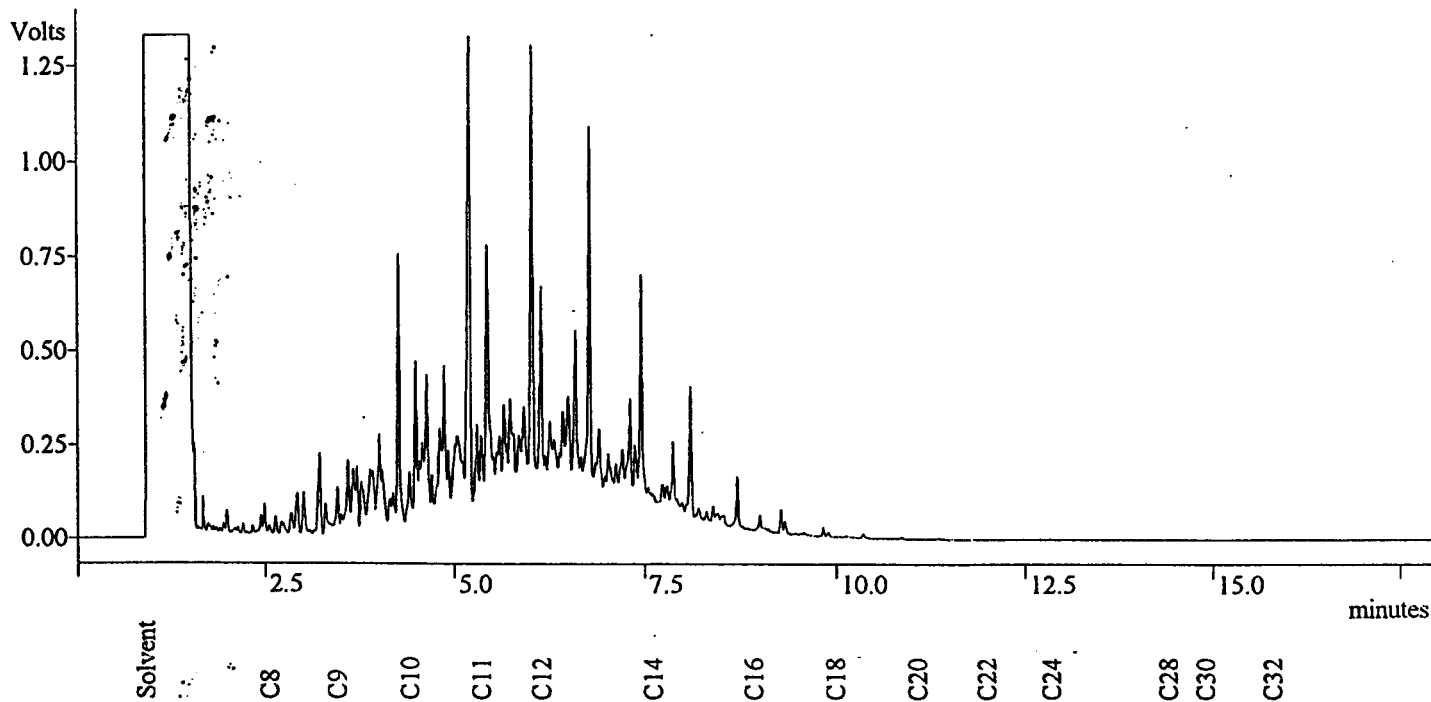
## Boiling Point Distribution Range for Petroleum Based Fuel Products

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

CLIENT I.D.: 13413 BH-3 #3



Data File: c:\star\module18\mayb1292.run  
 Sample ID: E806640-05A-10 RR  
 Injection Date: 06/18/98 11:36:46 PM  
 Instrument (Inj): GC 3600 SIDE B



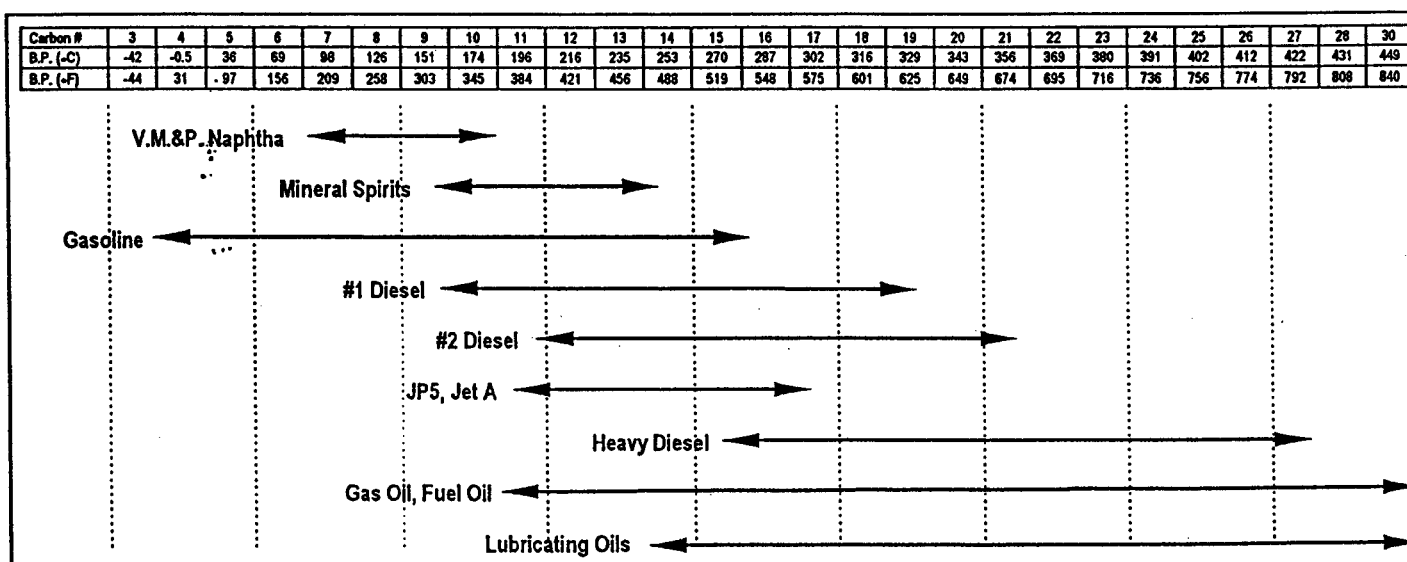
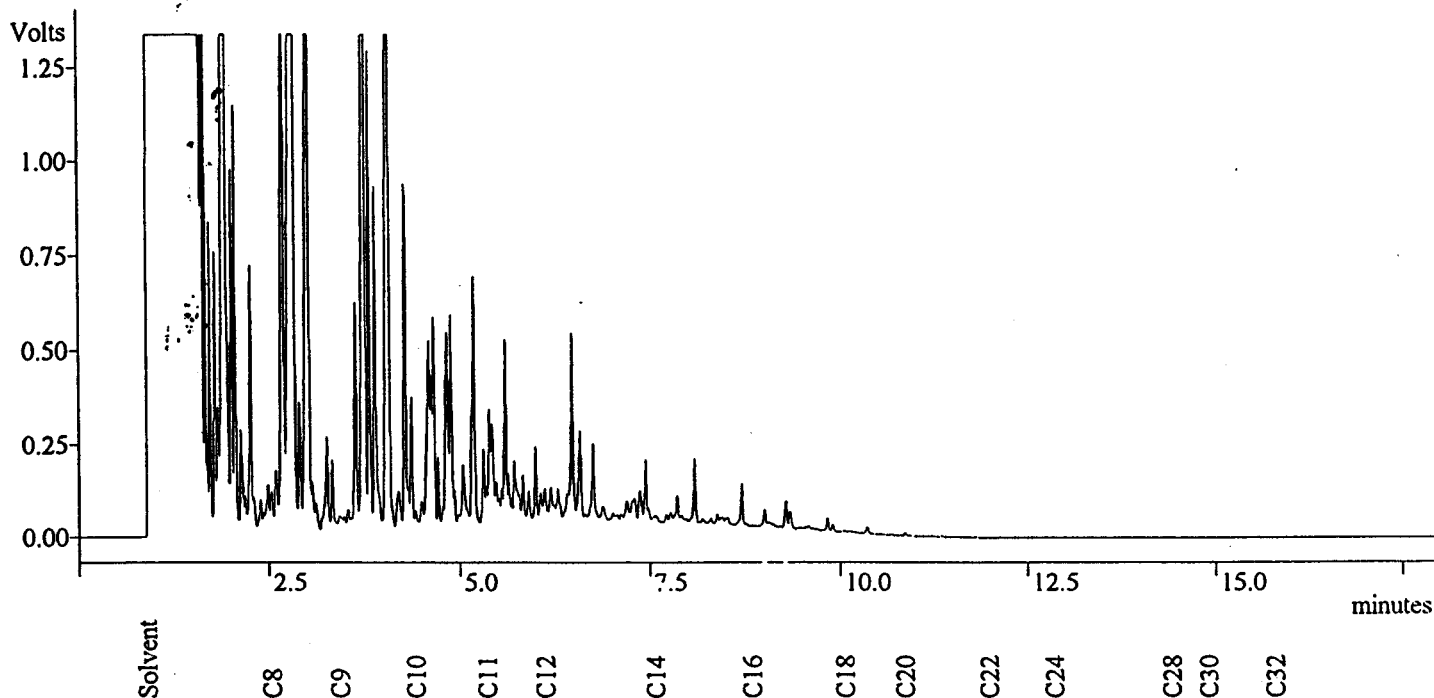
### Boiling Point Distribution Range for Petroleum Based Fuel Products

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

CLIENT I.D.: 13413 BH-4 #2



Data File: c:\star\module18\mayb1293.run  
 Sample ID: E806640-06A-10 RR  
 Injection Date: 06/19/98 12:09:48 AM  
 Instrument (Inj): GC 3600 SIDE B



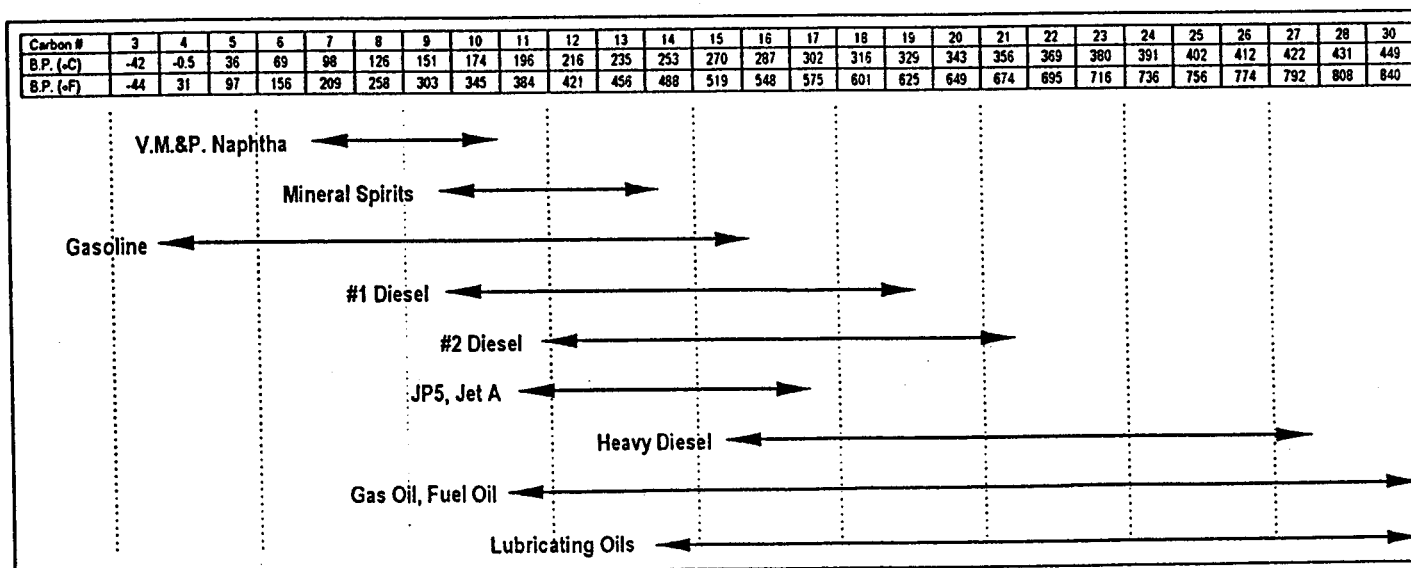
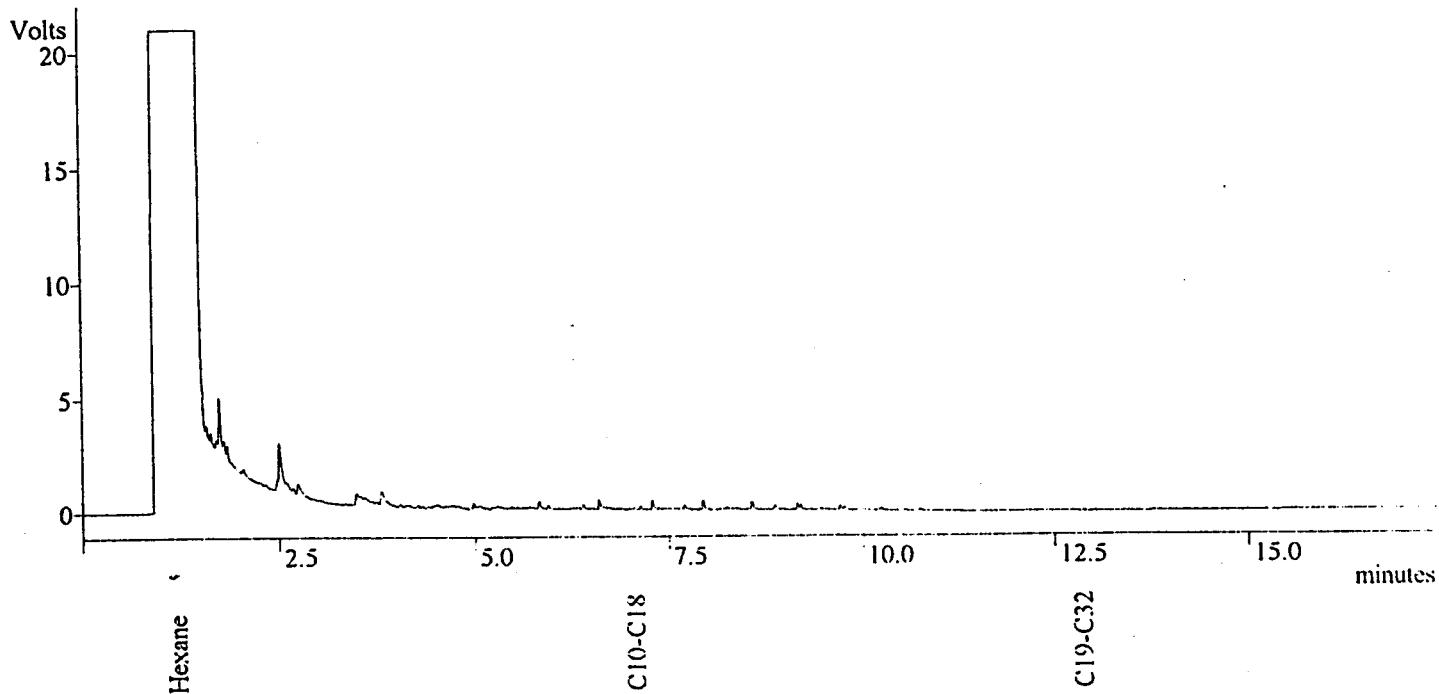
### Boiling Point Distribution Range for Petroleum Based Fuel Products

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

CLIENT I.D.: 13413 BH-4 #5



Data File: c:\star\module16\agu422.run  
 Sample ID: E806640-07A-10  
 Injection Date: 06/18/98 05:29:48 AM  
 Instrument (Inj): Varian Star 3400CX



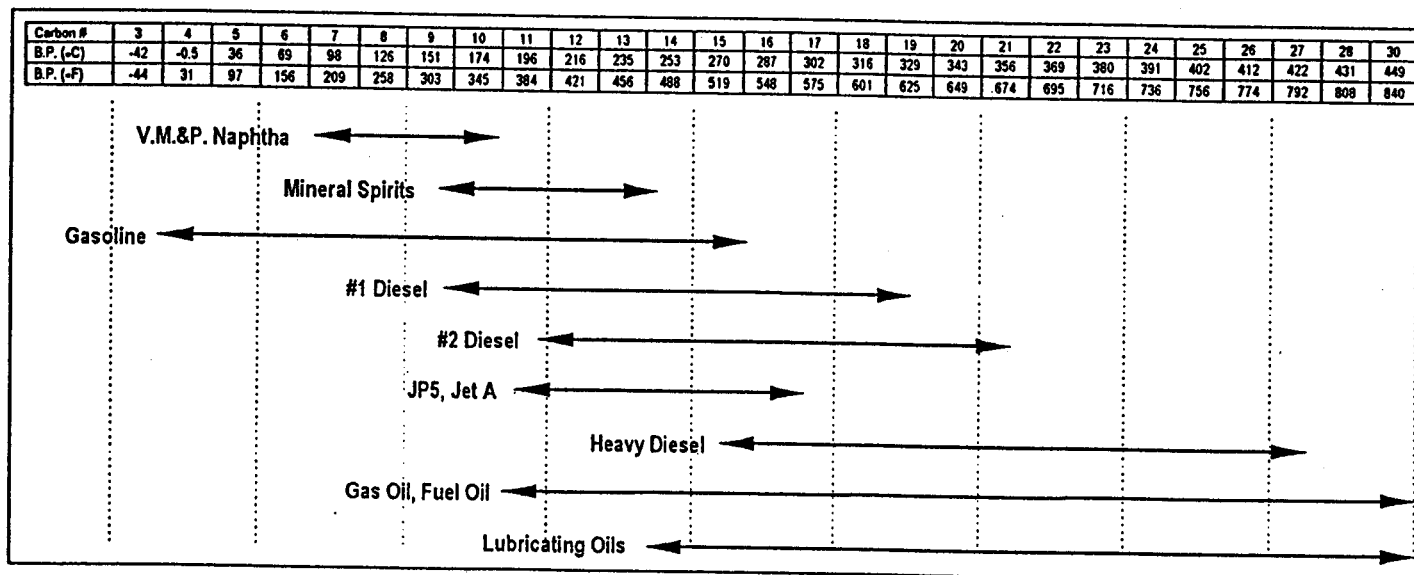
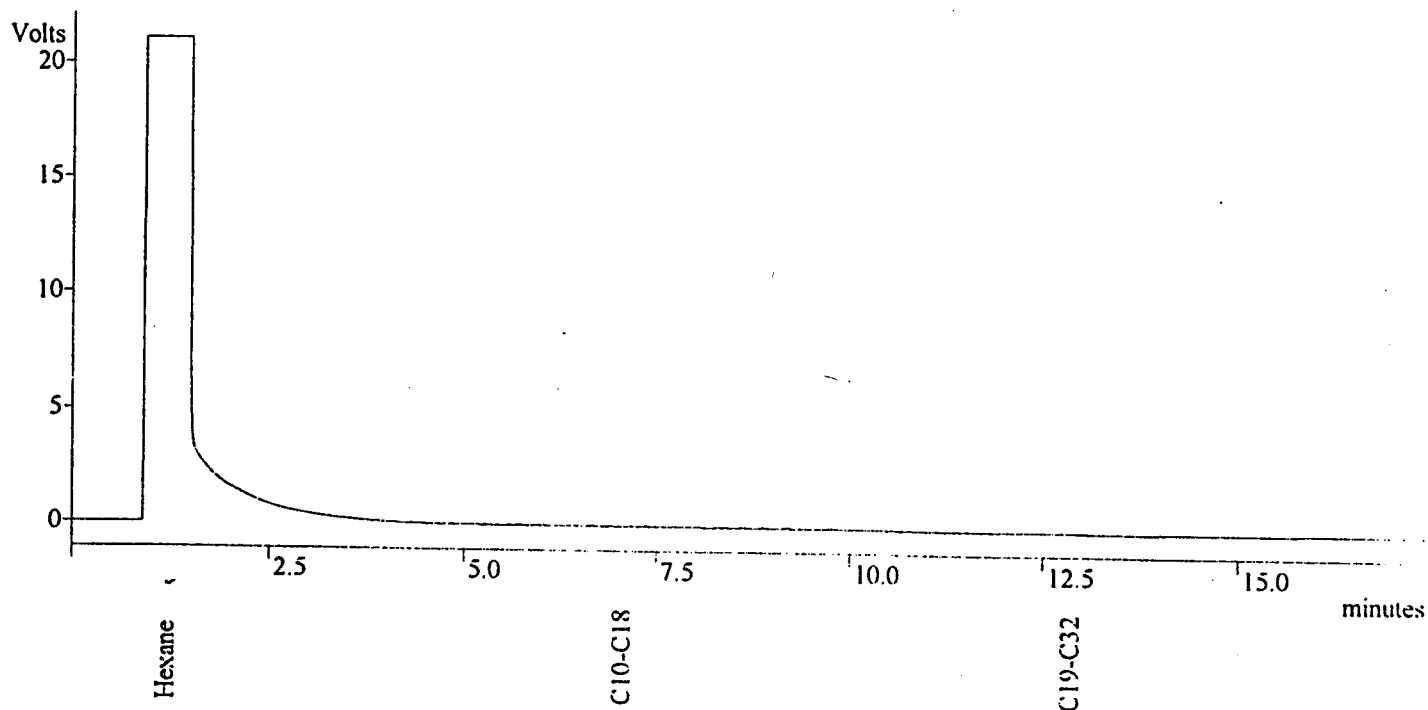
### Boiling Point Distribution Range for Petroleum Based Fuel Products

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

CLIENT I.D.: 13413 BH-5 #2



Data File: c:\star\module16\agu424.run  
Sample ID: E806640-08A-10  
Injection Date: 06/18/98 06:26:45 AM  
Instrument (Inj): Varian Star 3400CX



### Boiling Point Distribution Range for Petroleum Based Fuel Products

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

ANALYTICAL (LIMITS)  
Telephone: (403) 434-9509  
Fax: (403) 437-2311  
111 Research Drive, Saskatoon, Sask. S7N 3R2  
Telephone: (306) 668-8370  
Fax: (306) 668-8383

Telephone: (403) 434-9509  
Fax: (403) 437-2311  
111 Research Drive, Saskatoon, Sask. S7N 3R2  
Telephone: (306) 668-8370  
Fax: (306) 668-8383

06/19/98

ANALYSIS REQUESTED:

DATE SUBMITTED: 980611  
DATE REQUIRED: \_\_\_\_\_

SERVICE REQUESTED: ☒ REGULAR  
☐ PRIORITY (50% SURCHARGE)  
☐ EMERGENCY (100% SURCHARGE)

QUOTE #:

BTEX  
TOTAL PURGEABLES  
TOTAL EXTRACTABLES  
LEAD  
PHENOLS  
BTLEFS1 (Yukon Regs)  
(S)

SAMPLE RECEIVED (Y OR N)  
SAMPLE BROKEN (Y OR N)

LAB SAMPLE NO. E8060640

SAMPLE ID	SAMPLED BY	DATE / TIME SAMPLED	SAMPLE TYPE	LAB SAMPLE NO.
13413 BH-1 #1	DTW	980610	Soil	01
BH-1 #6				02
BH-2 #2				03
BH-3 #2				04
BH-3 #3				05
BH-4 #2				06
BH-4 #5				07
BH-5 #2				08
BH-6 #1				09

NOTES & CONDITIONS:

- Quote number must be provided to ensure proper pricing.
- Turnaround times will vary dependant on complexity of analysis & lab workload at time of submission. Please contact the lab to confirm turnaround times.
- All hazardous samples submitted must be labelled to comply with WHMIS regulations. This must include the nature of the hazard, as well as a contact name and phone number that the lab can contact for further information.

NOTE: Failure to properly complete all portions of this form may delay analysis.

CLIENT: Gas Gas NO. SAMPLES SUBMITTED: 9

CONTACT: Sim Kogmans NO. COOLERS / BOXES: 1

REPORT ADDRESS: PHONE: (403) 357-6447

RELINQUISHED BY:	DATE	RECEIVED BY:	DATE
	TIME		TIME
RELINQUISHED BY:	DATE	RECEIVED BY:	DATE
	TIME		TIME

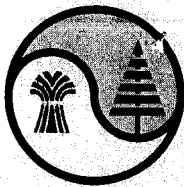
SAMPLE CONDITION UPON RECEIPT:

FROZEN: \_\_\_\_\_ COLD: \_\_\_\_\_ AMBIENT: \_\_\_\_\_

BILLING ADDRESS:

P.O.:

OTHER LEAKAGE PACKAGE:



# NORWEST LABS

Surrey Ph (604) 514-3322 FAX (604) 514-3323  
Edmonton Ph (403) 438-5522 FAX (403) 438-0396  
Calgary Ph (403) 291-2022 FAX (403) 291-2021  
Lethbridge Ph (403) 329-9266 FAX (403) 327-8527  
Winnipeg Ph (204) 982-8630 FAX (204) 275-6019

## Client

Name : EBA ENGINEERING CONSULTANTS  
Address : UNIT 6-151 INDUSTRIAL ROAD  
WHITEHORSE  
YT  
Y1A 2V3  
Att'n : DONALD WILSON  
Phone : 867 668-3068  
Fax : 867 668-4349

WO (Surrey) : 38034  
Quote No. :  
WO (Other) :  
PO Num : 0201-98-13537  
Project : ALCON FUELS  
Date Sampled : 27-Aug-98  
Date Received : 31-Aug-98  
Date Reported : 02-Sep-98

## Petroleum Hydrocarbons

38034-1 13537 #2

### BTEX in Soil

Analyte	Result	Detection	
		Limit	Units
Benzene	4.3	0.02	mg/kg
Toluene	190	0.02	mg/kg
Ethylbenzene	96	0.02	mg/kg
m,p-Xylene	520	0.05	mg/kg
o-Xylene	230	0.03	mg/kg

### EPH in Soil

Analyte	Result	Detection	
		Limit	Units
EPH (C10-C18)	1800	10	mg/kg
EPH (C19-C32)	140	10	mg/kg

### VPH in Soil

Analyte	Result	Detection	
		Limit	Units
VPH (C5-C10)	380	1	mg/kg

38034-2 13537 #8

### BTEX in Soil

Analyte	Result	Detection	
		Limit	Units
Benzene	Not Detected	0.02	mg/kg
Toluene	0.16	0.02	mg/kg
Ethylbenzene	0.1	0.02	mg/kg
m,p-Xylene	0.26	0.05	mg/kg
o-Xylene	0.51	0.03	mg/kg

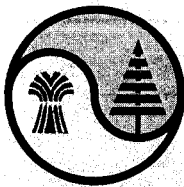
### EPH in Soil

Analyte	Result	Detection	
		Limit	Units
EPH (C10-C18)	3000	10	mg/kg
EPH (C19-C32)	240	10	mg/kg

### VPH in Soil

Analyte	Result	Detection	
		Limit	Units
VPH (C5-C10)	13	1	mg/kg

Initials: *RW*



# NORWEST LABS

Surrey Ph (604) 514-3322 FAX (604) 514-3323  
Edmonton Ph (403) 438-5522 FAX (403) 438-0396  
Calgary Ph (403) 291-2022 FAX (403) 291-2021  
Lethbridge Ph (403) 329-9266 FAX (403) 327-8527  
Winnipeg Ph (204) 982-8630 FAX (204) 275-6019

## Client

Name : EBA ENGINEERING CONSULTANTS  
Address : UNIT 6-151 INDUSTRIAL ROAD  
WHITEHORSE  
YT  
Y1A 2V3  
Att'n : DONALD WILSON  
Phone : 867 668-3068  
Fax : 867 668-4349

WO (Surrey) : 38034  
Quote No. :  
WO (Other) :  
PO Num : 0201-98-13537  
Project : ALCON FUELS  
Date Sampled : 27-Aug-98  
Date Received : 31-Aug-98  
Date Reported : 02-Sep-98

38034-3 13537 #19

### BTEX in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	0.25	0.05	mg/kg
o-Xylene	0.22	0.03	mg/kg

### EPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
EPH (C10-C18)	150	10	mg/kg
EPH (C19-C32)	37	10	mg/kg

### VPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
VPH (C5-C10)	13	1	mg/kg

38034-4 13537 #20

### BTEX in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	0.04	0.02	mg/kg
Ethylbenzene	0.06	0.02	mg/kg
m,p-Xylene	0.38	0.05	mg/kg
o-Xylene	0.43	0.03	mg/kg

### EPH in Soil

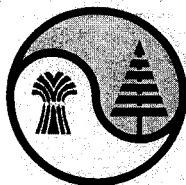
<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
EPH (C10-C18)	3900	10	mg/kg
EPH (C19-C32)	290	10	mg/kg

### VPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
VPH (C5-C10)	15	1	mg/kg

Initials: *RW*





# NORWEST LABS

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## Client

Name : EBA ENGINEERING CONSULTANTS  
Address : UNIT 6-151 INDUSTRIAL ROAD  
WHITEHORSE  
YT  
Y1A 2V3  
Att'n : DONALD WILSON  
Phone : 867 668-3068  
Fax : 867 668-4349

WO (Surrey) : 38034  
Quote No. :  
WO (Other) :  
PO Num : 0201-98-13537  
Project : ALCON FUELS  
Date Sampled : 27-Aug-98  
Date Received : 31-Aug-98  
Date Reported : 02-Sep-98

38034-5 13537 #21

### BTEX in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	0.09	0.02	mg/kg
Ethylbenzene	0.1	0.02	mg/kg
m,p-Xylene	0.5	0.05	mg/kg
o-Xylene	0.4	0.03	mg/kg

### EPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
EPH (C10-C18)	420	10	mg/kg
EPH (C19-C32)	100	10	mg/kg

### VPH in Soil

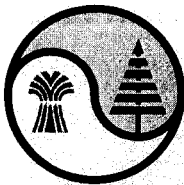
<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
VPH (C5-C10)	9.4	1	mg/kg

## QA/QC Results

<u>Method</u>	<u>Compound</u>	<u>Recovery</u>	<u>Date</u>	<u>Analyst</u>
BTEX in Soil	Benzene	91 %	02-Sep-98	M. Lakha
	Toluene	103 %		
	Ethylbenzene	96 %		
	m,p-Xylene	95 %		
	o-Xylene	98 %		
	Average:	97		
EPH in Soil	TEH (C10-C30)	103 %	01-Sep-98	D. Dykstra
	Average:	103		

Approved By:

Ralph Hindle, B.Sc.  
Supervisor, Organics Lab  
Page 3 of 3



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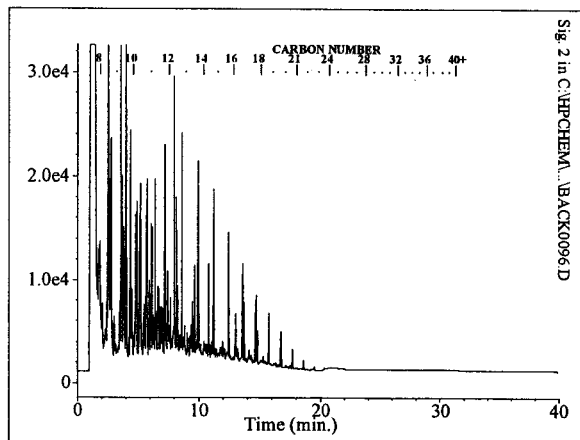
**Client**

Name : EBA ENGINEERING CONSULTANTS  
Address : UNIT 6-151 INDUSTRIAL ROAD  
WHITEHORSE  
YT  
Y1A 2V3  
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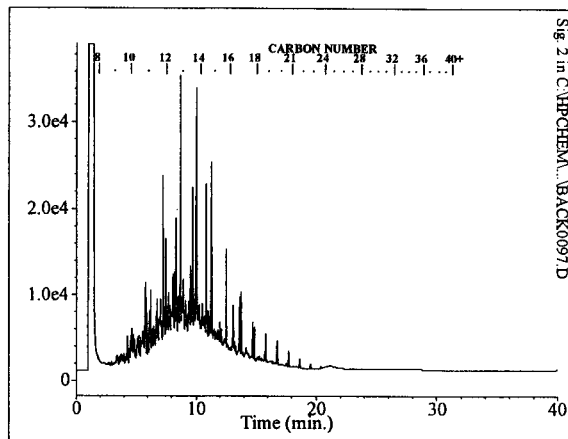
WO (Surrey) : **38034**  
Quote No. :  
WO (Other) :  
PO Num : 0201-98-13537  
Project : ALCON FUELS  
Date Sampled : 27-Aug-98  
Date Received : 31-Aug-98  
Date Reported : 02-Sep-98

**Qualitative Fuel Assessment Report**

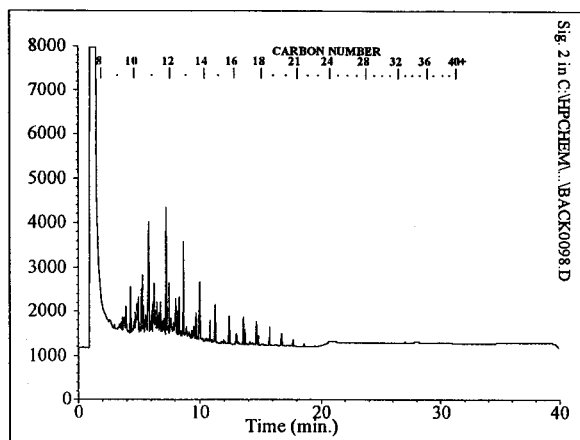
Method: EPH in Soil  
Sample No. 38034-1  
13537 #2



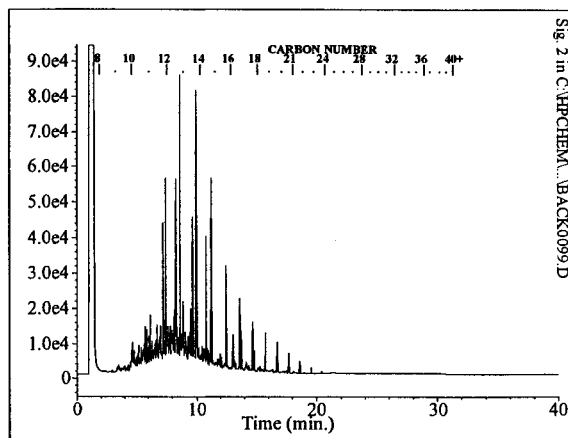
Method: EPH in Soil  
Sample No. 38034-2  
13537 #8



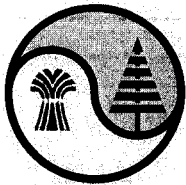
Method: EPH in Soil  
Sample No. 38034-3  
13537 #19



Method: EPH in Soil  
Sample No. 38034-4  
13537 #20



Initials: *RA*



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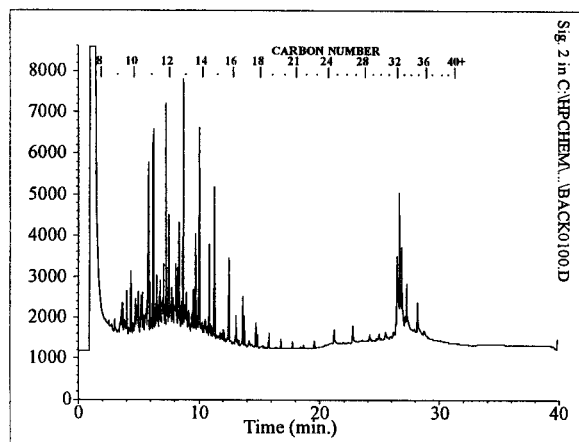
**Client**

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Y1A 2V3  
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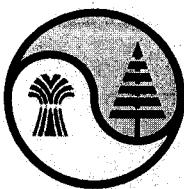
WO (Surrey) : **38034**  
Quote No. :  
WO (Other) :  
PO Num : 0201-98-13537  
Project : ALCON FUELS  
Date Sampled : 27-Aug-98  
Date Received : 31-Aug-98  
Date Reported : 02-Sep-98

**Qualitative Fuel Assessment Report**

Method: EPH in Soil  
Sample No. 38034-5  
13537 #21



Initials: *RH*



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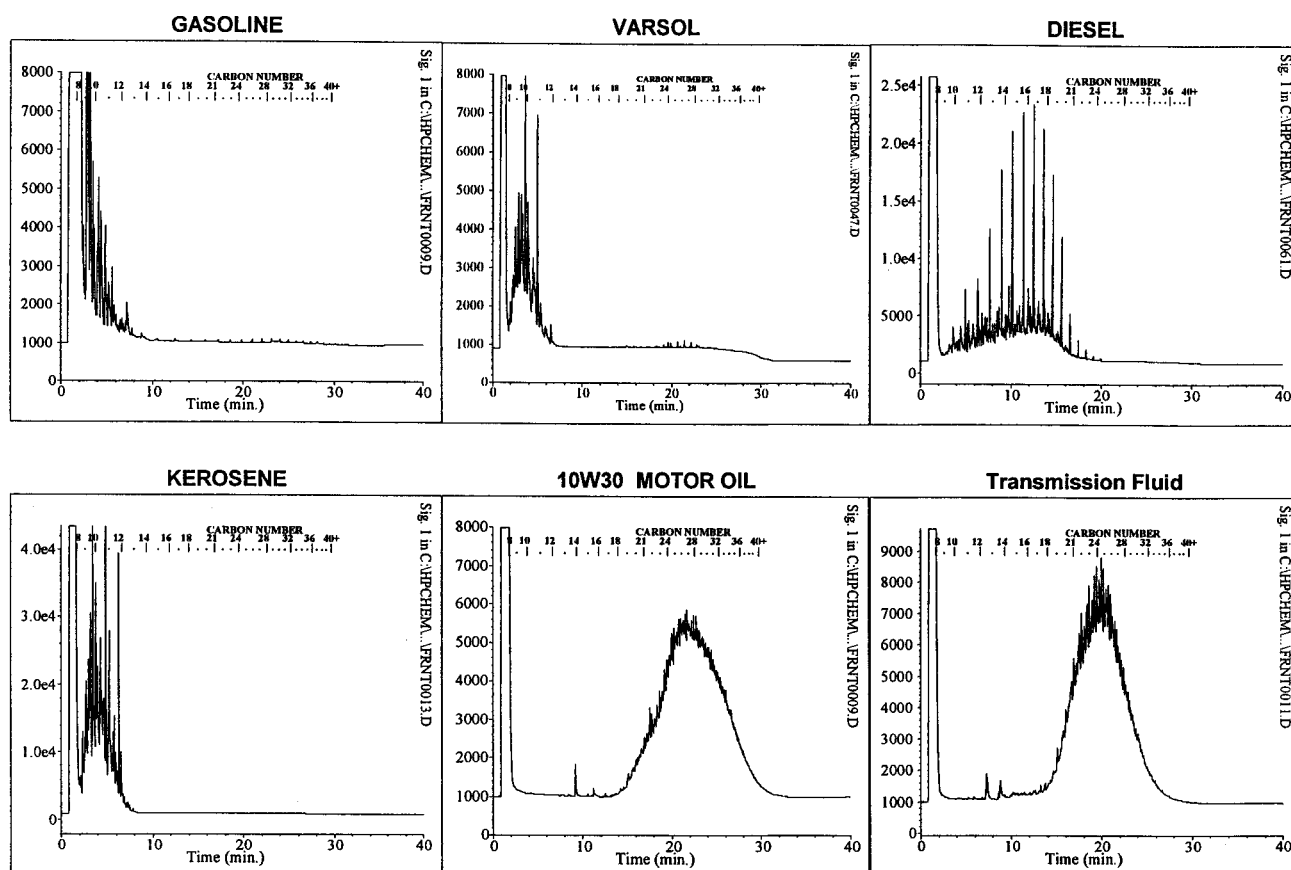
## Client

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## Qualitative Fuel Assessment Report

### TYPICAL PRODUCT CHROMATOGRAMS



### Product Carbon Number Ranges

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Approved By:

Ralph Hindle, B.Sc.  
Supervisor, Organics Lab  
Page 3 of 3



# NORWEST LABS

Control Number **E 01004**

## Environmental Sample Information Sheet

NOTE Proper completion of this form is required in order to proceed with analysis  
See reverse for your nearest Norwest location and proper sampling protocol

<b>Billing Address:</b> Company: <i>RBA Engineering Consultants Ltd.</i> Address: <i>Unit 6 151 Industrial</i> <i>Whitehorse, YT.</i> <i>Y1A 2U3</i> Attention: <i>Don Wilson</i> Phone: <i>867-668-3065</i> Fax: <i>867-668-4349</i> Cell: e-mail:	<b>Report To:</b> <input checked="" type="checkbox"/> <b>QA/QC Report</b> <input type="checkbox"/> <b>Report Result:</b> Fax <input checked="" type="checkbox"/> Mail <input checked="" type="checkbox"/> Courier <input type="checkbox"/> e-mail <input type="checkbox"/>	<b>Copy of Report To:</b> Company: Address: Attention: Phone: Fax: Cell: e-mail:	<b>Copy of invoice:</b> <input type="checkbox"/> <b>Mail invoice to this address for approval</b> <input type="checkbox"/> <b>Report Result:</b> Fax <input type="checkbox"/> Mail <input type="checkbox"/> Courier <input type="checkbox"/> e-mail <input type="checkbox"/>
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<b>Information to be included on Report and Invoice</b> Project ID: <i>0201-98-13537</i> Project Name: <i>Alcan Fuels</i> Project Location: <i>Haines Jct.</i> Legal Location: PO#: Proj. Acct. Code: Agreement ID:	<b>RUSH</b> Please contact the laboratory to confirm rush dates and times before submitting samples. Upon filling out this section, client accepts that surcharges will be attached to this analysis Required on: all analyses <b>or</b> as indicated <input type="checkbox"/> <b>or</b> <input type="checkbox"/> Date Required: _____ Signature: _____ Norwest Authorization: _____	<b>Sample Custody (Please Print)</b> Sampled by: <i>DJW</i> Date <i>980827</i> Company <i>RBA</i> Signature <i>Don Wilson</i> Relinquished by: Company _____ Date _____ Waybill number: Received by: <i>Mike</i> Company <i>Surrey</i> Date <i>August 31</i> Processed by: Norwest Labs _____ Date _____
--	--	---

**Special Instructions / Comments**

*Results by Fri. Sept 4 as per discussions with Nicole + Quote*

Sample Identification	Location	Depth	Date / Time Sampled	Matrix	Sampling Method	Number of Containers	Enter tests above (✓ relevant samples below)
1 <i>13537 # 2</i>	<i>H. J.</i>	<i>—</i>	<i>980827</i>	<i>Soil</i>	<i>Hand auger</i>	<i>1</i>	<i>1</i>
2 <i>13537 # 8</i>	<i>H. J.</i>	<i>—</i>	<i>↓</i>	<i>↓</i>	<i>↓</i>	<i>1</i>	<i>1</i>
3 <i>13537 # 19</i>	<i>H. J.</i>	<i>—</i>	<i>↓</i>	<i>↓</i>	<i>↓</i>	<i>1</i>	<i>1</i>
4 <i>13537 # 20</i>	<i>H. J.</i>	<i>—</i>	<i>↓</i>	<i>↓</i>	<i>↓</i>	<i>1</i>	<i>1</i>
5 <i>13537 # 21</i>	<i>H. J.</i>	<i>—</i>	<i>↓</i>	<i>↓</i>	<i>↓</i>	<i>1</i>	<i>1</i>
6		—					
7		—					
8		—					
9		—					
10		—					
11		—					
12		—					
13		—					
14		—					

NOTE: All hazardous samples must be labelled according to WHMIS guidelines.  
Accredited by the Standards Council of Canada for specific tests

Page \_\_\_\_\_ of \_\_\_\_\_  
##



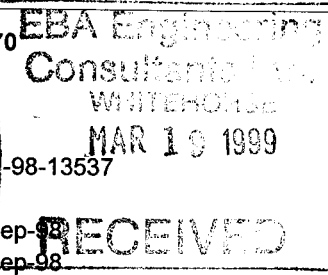
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## Client

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WHITEHORSE  
YT  
Y1A 2V3  
Att'n : DONALD WILSON  
Phone : 867 668-3068  
Fax : 867 668-4349

WO (Surrey) : 38570  
Quote No. :  
WO (Other) :  
PO Num :  
Project : 0201-98-13537  
Date Sampled :  
Date Received : 21-Sep-98  
Date Reported : 28-Sep-98



## Petroleum Hydrocarbons

38570-1 ALCAN FUELS, HAINES JUNCTION, YT 13537#1 980914

### BTEX in Soil

Analyte	Result	Detection Limit	Units
Benzene	Not Detected	0.02	mg/kg
Toluene	0.19	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	Not Detected	0.05	mg/kg
o-Xylene	Not Detected	0.03	mg/kg

### EPH in Soil

Analyte	Result	Detection Limit	Units
EPH (C10-C18)	Not Detected	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg

### VPH in Soil

Analyte	Result	Detection Limit	Units
VPH (C5-C10)	Not Detected	1	mg/kg

38570-2 ALCAN FUELS, HAINES JUNCTION, YT 13537#3 980914

### BTEX in Soil

Analyte	Result	Detection Limit	Units
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	Not Detected	0.05	mg/kg
o-Xylene	Not Detected	0.03	mg/kg

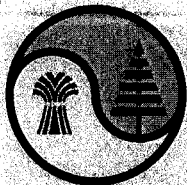
### EPH in Soil

Analyte	Result	Detection Limit	Units
EPH (C10-C18)	150	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg

### VPH in Soil

Analyte	Result	Detection Limit	Units
VPH (C5-C10)	3.7	1	mg/kg

Initials: RL



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## Client

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WHITEHORSE  
YT  
Y1A 2V3  
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Fax : 867 668-4349

WO (Surrey) : **38570**  
Quote No. :  
WO (Other) :  
PO Num :  
Project : 0201-98-13537  
Date Sampled :  
Date Received : 21-Sep-98  
Date Reported : 28-Sep-98

### 38570-3 ALCAN FUELS, HAINES JUNCTION, YT 13537#7 981914

#### BTEX in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	0.16	0.02	mg/kg
m,p-Xylene	0.26	0.05	mg/kg
o-Xylene	0.27	0.03	mg/kg

#### EPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
EPH (C10-C18)	550	10	mg/kg
EPH (C19-C32)	44	10	mg/kg

#### VPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
VPH (C5-C10)	12	1	mg/kg

### 38570-4 ALCAN FUELS, HAINES JUNCTION, YT 13537#9 980914

#### BTEX in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	Not Detected	0.05	mg/kg
o-Xylene	0.1	0.03	mg/kg

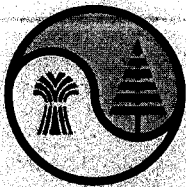
#### EPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
EPH (C10-C18)	Not Detected	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg

#### VPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
VPH (C5-C10)	1.6	1	mg/kg

Initials: RA



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Y1A 2V3  
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Fax : 867 668-4349

WO (Surrey) : 38570  
Quote No. :  
WO (Other) :  
PO Num :  
Project : 0201-98-13537  
Date Sampled :  
Date Received : 21-Sep-98  
Date Reported : 28-Sep-98

### 88570-5 ALCAN FUELS, HAINES JUNCTION, YT 13537#11 980914

#### BTEX in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	Not Detected	0.05	mg/kg
o-Xylene	Not Detected	0.03	mg/kg

#### EPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
EPH (C10-C18)	Not Detected	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg

#### VPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
VPH (C5-C10)	Not Detected	1	mg/kg

### 88570-6 ALCAN FUELS, HAINES JUNCTION, YT 13537#13 980914

#### BTEX in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
Benzene	45	0.02	mg/kg
Toluene	190	0.02	mg/kg
Ethylbenzene	38	0.02	mg/kg
m,p-Xylene	180	0.05	mg/kg
o-Xylene	66	0.03	mg/kg

#### EPH in Soil

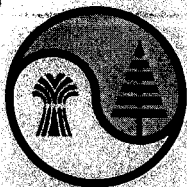
<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
EPH (C10-C18)	2200	10	mg/kg
EPH (C19-C32)	230	10	mg/kg

#### VPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
VPH (C5-C10)	Not Detected	1	mg/kg

Initials: RA





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Date Sampled :  
Date Received : 21-Sep-98  
Date Reported : 28-Sep-98

### 38570-7 ALCAN FUELS, HAINES JUNCTION, YT 13537#17 980914

#### BTEX in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection</u>	
		<u>Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	0.07	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	0.25	0.05	mg/kg
o-Xylene	0.14	0.03	mg/kg

#### EPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection</u>	
		<u>Limit</u>	<u>Units</u>
EPH (C10-C18)	160	10	mg/kg
EPH (C19-C32)	16	10	mg/kg

#### VPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection</u>	
		<u>Limit</u>	<u>Units</u>
VPH (C5-C10)	4.1	1	mg/kg

### 38570-8 ALCAN FUELS, HAINES JUNCTION, YT 13537#19 980914

#### BTEX in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection</u>	
		<u>Limit</u>	<u>Units</u>
Benzene	0.31	0.02	mg/kg
Toluene	0.74	0.02	mg/kg
Ethylbenzene	0.09	0.02	mg/kg
m,p-Xylene	0.37	0.05	mg/kg
o-Xylene	0.14	0.03	mg/kg

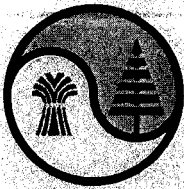
#### EPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection</u>	
		<u>Limit</u>	<u>Units</u>
EPH (C10-C18)	Not Detected	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg

#### VPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection</u>	
		<u>Limit</u>	<u>Units</u>
VPH (C5-C10)	Not Detected	1	mg/kg

Initials: *AW*



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## Client

Name : EBA ENGINEERING CONSULTANTS  
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WHITEHORSE  
YT  
Y1A 2V3  
Att'n : DONALD WILSON  
Phone : 867 668-3068  
Fax : 867 668-4349

WO (Surrey) : **38570**  
Quote No. :  
WO (Other) :  
PO Num :  
Project : 0201-98-13537  
Date Sampled :  
Date Received : 21-Sep-98  
Date Reported : 28-Sep-98

### 38570-9 ALCAN FUELS, HAINES JUNCTION, YT 13537#20 980915

#### BTEX in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	0.2	0.02	mg/kg
m,p-Xylene	0.72	0.05	mg/kg
o-Xylene	1.1	0.03	mg/kg

#### EPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
EPH (C10-C18)	1000	10	mg/kg
EPH (C19-C32)	98	10	mg/kg

#### VPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
VPH (C5-C10)	26	1	mg/kg

### 38570-10 ALCAN FUELS, HAINES JUNCTION, YT 13537#22 980915

#### BTEX in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	0.06	0.05	mg/kg
o-Xylene	Not Detected	0.03	mg/kg

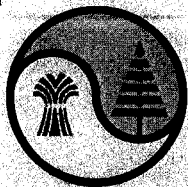
#### EPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
EPH (C10-C18)	Not Detected	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg

#### VPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
VPH (C5-C10)	1	1	mg/kg

Initials: RA



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## Client

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WO (Surrey) : **38570**  
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### 38570-11 ALCAN FUELS, HAINES JUNCTION, YT 13537#23 980915

#### BTEX in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	Not Detected	0.05	mg/kg
o-Xylene	Not Detected	0.03	mg/kg

#### EPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
EPH (C10-C18)	Not Detected	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg

#### VPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
VPH (C5-C10)	Not Detected	1	mg/kg

### 38570-12 ALCAN FUELS, HAINES JUNCTION, YT 13537#24 980915

#### BTEX in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	0.34	0.05	mg/kg
o-Xylene	0.21	0.03	mg/kg

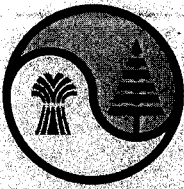
#### EPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
EPH (C10-C18)	38	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg

#### VPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
VPH (C5-C10)	1.7	1	mg/kg

Initials: RL



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## Client

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WO (Surrey) : 38570  
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38570-13

ALCAN FUELS, HAINES JUNCTION, YT 13537#26 980915

### BTEX in Soil

Analyte	Result	Detection Limit	Units
Benzene	Not Detected	0.02	mg/kg
Toluene	0.03	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	0.14	0.05	mg/kg
o-Xylene	0.08	0.03	mg/kg

### EPH in Soil

Analyte	Result	Detection Limit	Units
EPH (C10-C18)	Not Detected	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg

### VPH in Soil

Analyte	Result	Detection Limit	Units
VPH (C5-C10)	Not Detected	1	mg/kg

38570-14

ALCAN FUELS, HAINES JUNCTION, YT 13537#27 980915

### BTEX in Soil

Analyte	Result	Detection Limit	Units
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	Not Detected	0.05	mg/kg
o-Xylene	Not Detected	0.03	mg/kg

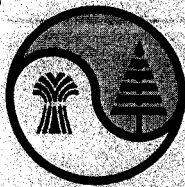
### EPH in Soil

Analyte	Result	Detection Limit	Units
EPH (C10-C18)	28	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg

### VPH in Soil

Analyte	Result	Detection Limit	Units
VPH (C5-C10)	Not Detected	1	mg/kg

Initials: B



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38570-15

### ALCAN FUELS, HAINES JUNCTION, YT 13537#30 980915

#### BTEX in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	Not Detected	0.05	mg/kg
o-Xylene	Not Detected	0.03	mg/kg

#### EPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
EPH (C10-C18)	Not Detected	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg

#### VPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
VPH (C5-C10)	Not Detected	1	mg/kg

38570-16

### ALCAN FUELS, HAINES JUNCTION, YT 13537#31 980916

#### BTEX in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	0.13	0.02	mg/kg
Ethylbenzene	0.09	0.02	mg/kg
m,p-Xylene	0.53	0.05	mg/kg
o-Xylene	0.34	0.03	mg/kg

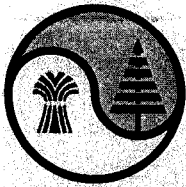
#### EPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
EPH (C10-C18)	Not Detected	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg

#### VPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
VPH (C5-C10)	7.8	1	mg/kg

Initials: TD



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## Client

Name : EBA ENGINEERING CONSULTANTS  
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Fax : 867 668-4349

WO (Surrey) : 38570  
Quote No. :  
WO (Other) :  
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Project : 0201-98-13537  
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Date Reported : 28-Sep-98

38570-17

### ALCAN FUELS, HAINES JUNCTION, YT 13537#32 980916

#### BTEX in Soil

Analyte	Result	Detection	
		Limit	Units
Benzene	0.08	0.02	mg/kg
Toluene	0.19	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	0.27	0.05	mg/kg
o-Xylene	0.12	0.03	mg/kg

#### EPH in Soil

Analyte	Result	Detection	
		Limit	Units
EPH (C10-C18)	Not Detected	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg

#### VPH in Soil

Analyte	Result	Detection	
		Limit	Units
VPH (C5-C10)	Not Detected	1	mg/kg

38570-18

### ALCAN FUELS, HAINES JUNCTION, YT 13537#34 980916

#### BTEX in Soil

Analyte	Result	Detection	
		Limit	Units
Benzene	0.06	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	Not Detected	0.05	mg/kg
o-Xylene	Not Detected	0.03	mg/kg

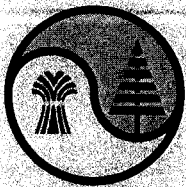
#### EPH in Soil

Analyte	Result	Detection	
		Limit	Units
EPH (C10-C18)	Not Detected	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg

#### VPH in Soil

Analyte	Result	Detection	
		Limit	Units
VPH (C5-C10)	Not Detected	1	mg/kg

Initials: RA



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## Client

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WHITEHORSE  
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Y1A 2V3  
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Fax : 867 668-4349

WO (Surrey) : 38570  
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### 38570-19 ALCAN FUELS, HAINES JUNCTION, YT 13537#36 980916

#### BTEX in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	0.19	0.02	mg/kg
m,p-Xylene	3	0.05	mg/kg
o-Xylene	2.5	0.03	mg/kg

#### EPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
EPH (C10-C18)	2100	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg

#### VPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
VPH (C5-C10)	37	1	mg/kg

### 38570-20 ALCAN FUELS, HAINES JUNCTION, YT 13537#38 980916

#### BTEX in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	0.12	0.02	mg/kg
m,p-Xylene	0.53	0.05	mg/kg
o-Xylene	0.41	0.03	mg/kg

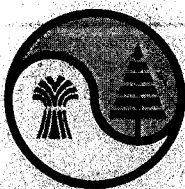
#### EPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
EPH (C10-C18)	340	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg

#### VPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
VPH (C5-C10)	9.5	1	mg/kg

Initials: *BL*



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38570-21

### ALCAN FUELS, HAINES JUNCTION, YT 13537#41 980916

#### BTEX in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	Not Detected	0.05	mg/kg
o-Xylene	Not Detected	0.03	mg/kg

#### EPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
EPH (C10-C18)	32	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg

#### VPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
VPH (C5-C10)	1.6	1	mg/kg

38570-22

### ALCAN FUELS, HAINES JUNCTION, YT 13537#42 980916

#### BTEX in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	Not Detected	0.05	mg/kg
o-Xylene	Not Detected	0.03	mg/kg

#### EPH in Soil

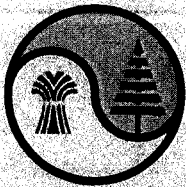
<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
EPH (C10-C18)	Not Detected	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg

#### VPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
VPH (C5-C10)	2.1	1	mg/kg

Initials: RT





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## Client

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WO (Surrey) : 38570  
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Date Reported : 28-Sep-98

38570-23

ALCAN FUELS, HAINES JUNCTION, YT 13537#43 980916

### BTEX in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	0.07	0.05	mg/kg
o-Xylene	Not Detected	0.03	mg/kg

### EPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
EPH (C10-C18)	450	10	mg/kg
EPH (C19-C32)	44	10	mg/kg

### VPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
VPH (C5-C10)	2.9	1	mg/kg

38570-24

ALCAN FUELS, HAINES JUNCTION, YT 13537#44

### BTEX in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	Not Detected	0.05	mg/kg
o-Xylene	Not Detected	0.03	mg/kg

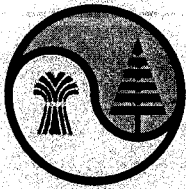
### EPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
EPH (C10-C18)	Not Detected	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg

### VPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
VPH (C5-C10)	Not Detected	1	mg/kg

Initials:



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## Client

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Y1A 2V3  
Att'n : DONALD WILSON  
Phone : 867 668-3068  
Fax : 867 668-4349

WO (Surrey) : 38570  
Quote No. :  
WO (Other) :  
PO Num :  
Project : 0201-98-13537  
Date Sampled :  
Date Received : 21-Sep-98  
Date Reported : 28-Sep-98

### 38570-25 ALCAN FUELS, HAINES JUNCTION, YT 13537#45 980916

#### BTEX in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	0.06	0.05	mg/kg
o-Xylene	Not Detected	0.03	mg/kg

#### EPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
EPH (C10-C18)	75	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg

#### VPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
VPH (C5-C10)	1	1	mg/kg

### 38570-26 ALCAN FUELS, HAINES JUNCTION, YT 13537#48 980917

#### BTEX in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
Benzene	23	0.02	mg/kg
Toluene	120	0.02	mg/kg
Ethylbenzene	27	0.02	mg/kg
m,p-Xylene	110	0.05	mg/kg
o-Xylene	40	0.03	mg/kg

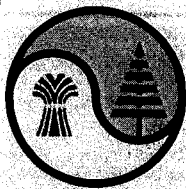
#### EPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
EPH (C10-C18)	35000	10	mg/kg
EPH (C19-C32)	3500	10	mg/kg

#### VPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
VPH (C5-C10)	Not Detected	1	mg/kg

Initials: RA



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### 38570-27 ALCAN FUELS, HAINES JUNCTION, YT 13537#49 980917

#### BTEX in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection</u>	
		<u>Limit</u>	<u>Units</u>
Benzene	0.25	0.02	mg/kg
Toluene	0.52	0.02	mg/kg
Ethylbenzene	0.11	0.02	mg/kg
m,p-Xylene	0.36	0.05	mg/kg
o-Xylene	0.1	0.03	mg/kg

#### EPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection</u>	
		<u>Limit</u>	<u>Units</u>
EPH (C10-C18)	170	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg

#### VPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection</u>	
		<u>Limit</u>	<u>Units</u>
VPH (C5-C10)	Not Detected	1	mg/kg

### 38570-28 ALCAN FUELS, HAINES JUNCTION, YT 13537#50 980917

#### BTEX in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection</u>	
		<u>Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	0.05	0.05	mg/kg
o-Xylene	Not Detected	0.03	mg/kg

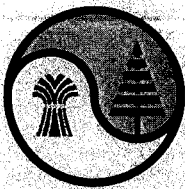
#### EPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection</u>	
		<u>Limit</u>	<u>Units</u>
EPH (C10-C18)	11	10	mg/kg
EPH (C19-C32)	Not Detected	10	mg/kg

#### VPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection</u>	
		<u>Limit</u>	<u>Units</u>
VPH (C5-C10)	Not Detected	1	mg/kg

Initials: *AB*



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38570-29

### ALCAN FUELS, HAINES JUNCTION, YT 13537#54 980917

#### BTEX in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	0.11	0.02	mg/kg
m,p-Xylene	0.53	0.05	mg/kg
o-Xylene	0.38	0.03	mg/kg

#### EPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
EPH (C10-C18)	4800	10	mg/kg
EPH (C19-C32)	390	10	mg/kg

#### VPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
VPH (C5-C10)	7.3	1	mg/kg

38570-30

### ALCAN FUELS, HAINES JUNCTION, YT 13537#55 980717

#### BTEX in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
Benzene	Not Detected	0.02	mg/kg
Toluene	Not Detected	0.02	mg/kg
Ethylbenzene	Not Detected	0.02	mg/kg
m,p-Xylene	0.08	0.05	mg/kg
o-Xylene	Not Detected	0.03	mg/kg


#### EPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
EPH (C10-C18)	210	10	mg/kg
EPH (C19-C32)	18	10	mg/kg

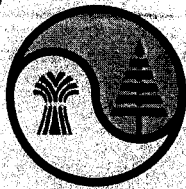
#### VPH in Soil

<u>Analyte</u>	<u>Result</u>	<u>Detection Limit</u>	<u>Units</u>
VPH (C5-C10)	Not Detected	1	mg/kg

Approved By:

  
Ralph Hindle, B.Sc.

Supervisor, Organics Lab  
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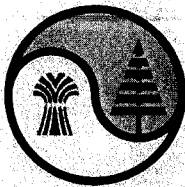
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Quote No. :  
WO (Other) :  
PO Num :  
Project : 0201-98-13537  
Date Sampled :  
Date Received : 21-Sep-98  
Date Reported : 28-Sep-98

## QA/QC Results

<u>Method</u>	<u>Compound</u>	<u>Recovery</u>	<u>Date</u>	<u>Analyst</u>
BTEX in Soil	Benzene	88 %	27-Sep-98	S. Ho
	Toluene	96 %		
	Ethylbenzene	90 %		
	m,p-Xylene	88 %		
	o-Xylene	87 %		
	<b>Average:</b>	<b>90</b>		

Approved By:

*Ralph Hindle*  
Ralph Hindle, B.Sc.  
Supervisor, Organics Lab  
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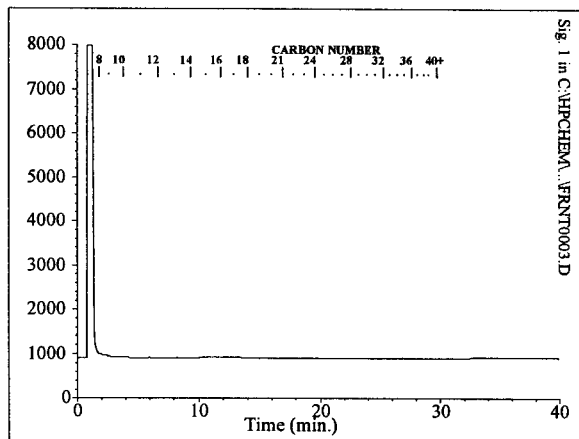
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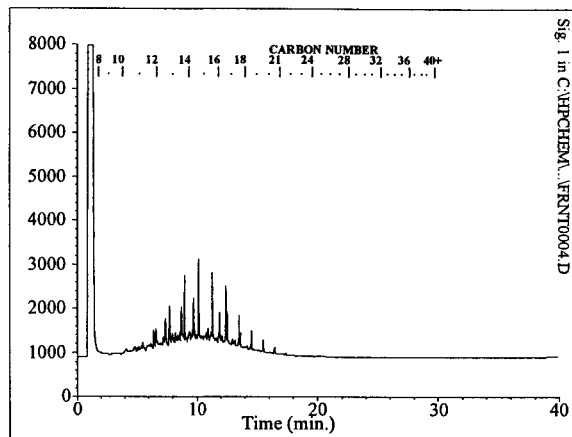
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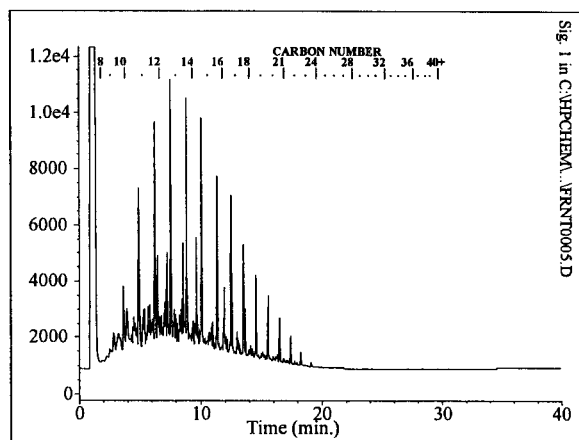
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ALCAN FUELS, HAINES JUNCTION, YT 13537#1 980914



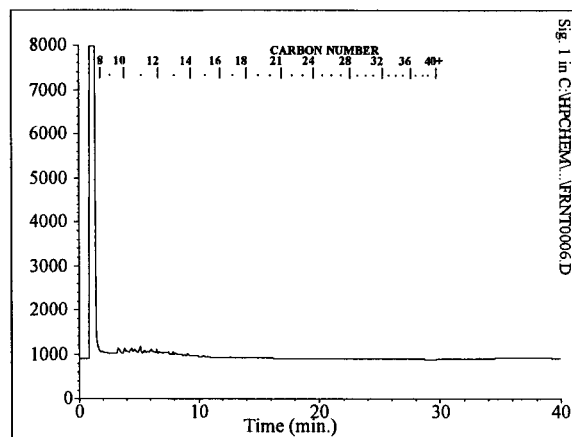
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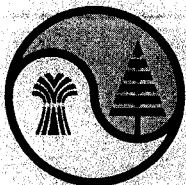
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Sample No. 38570-3  
ALCAN FUELS, HAINES JUNCTION, YT 13537#7 981914



Method: EPH in Soil  
Sample No. 38570-4  
ALCAN FUELS, HAINES JUNCTION, YT 13537#9 980914



Initials: RA



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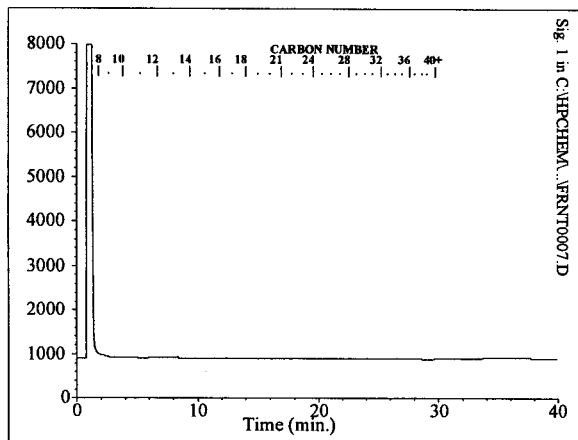
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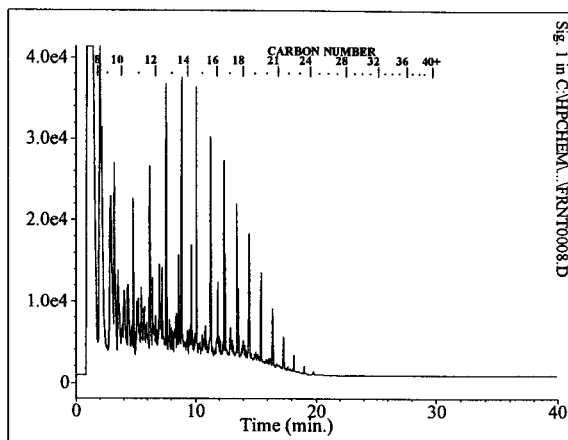
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Date Sampled :  
Date Received : 21-Sep-98  
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**Qualitative Fuel Assessment Report**

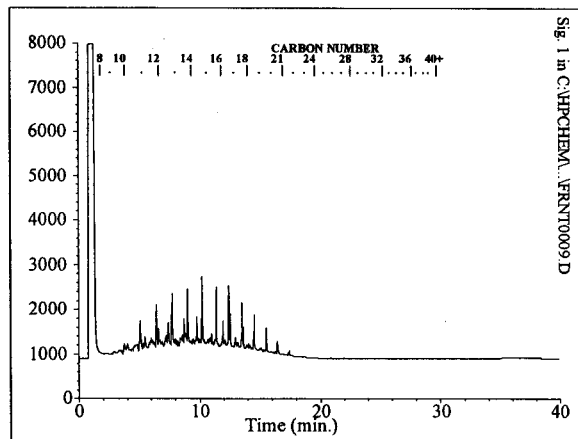
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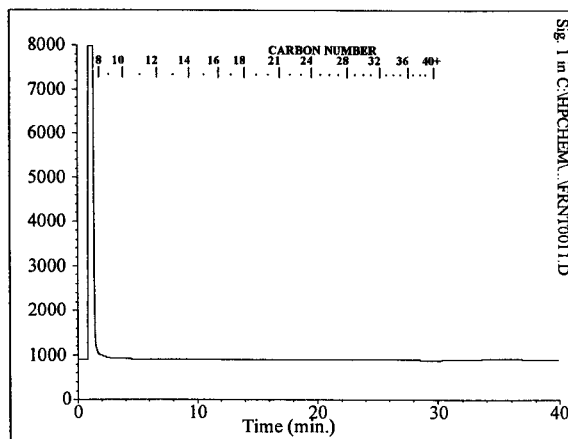
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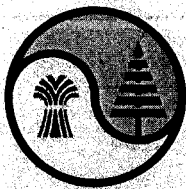
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ALCAN FUELS, HAINES JUNCTION, YT 13537#17  
980914



Method: EPH in Soil  
Sample No. 38570-8  
ALCAN FUELS, HAINES JUNCTION, YT 13537#19  
980914



Initials: RA



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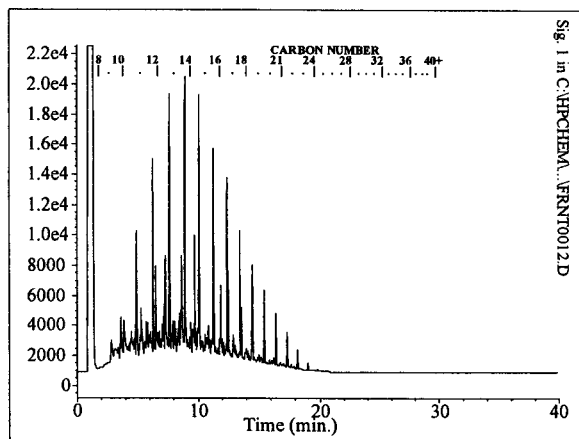
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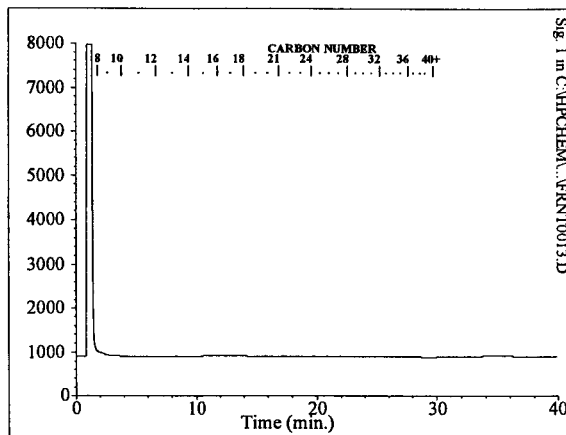
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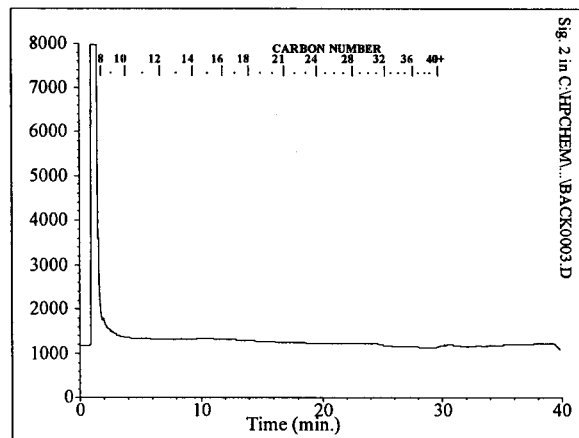
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980915



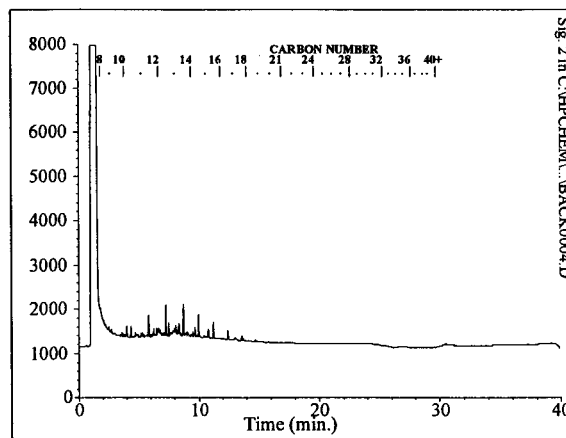
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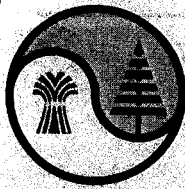


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Sample No. 38570-12  
ALCAN FUELS, HAINES JUNCTION, YT 13537#24  
980915



Initials: RA





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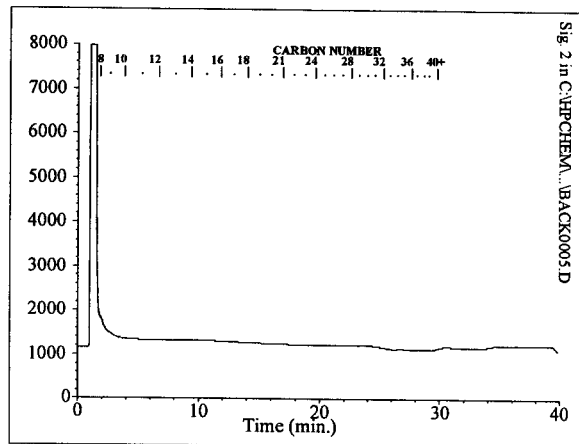
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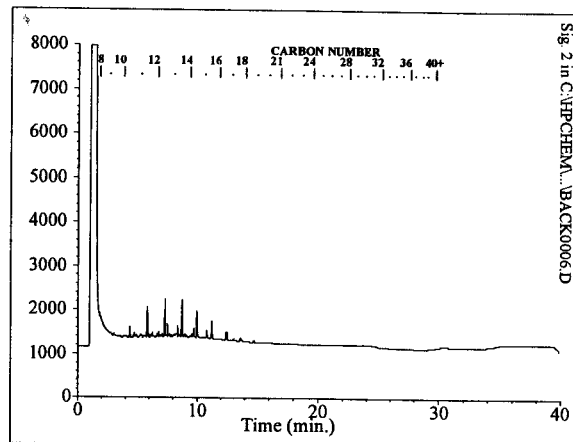
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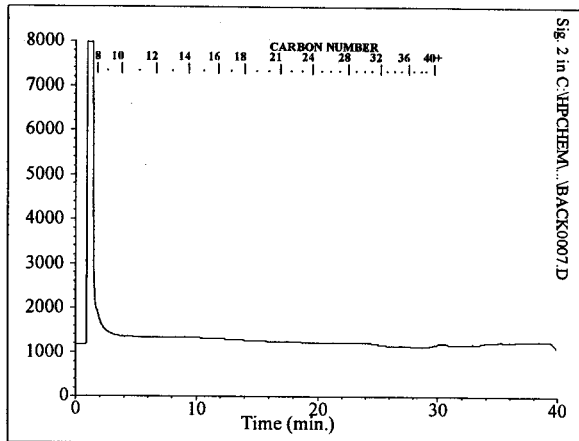
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980915



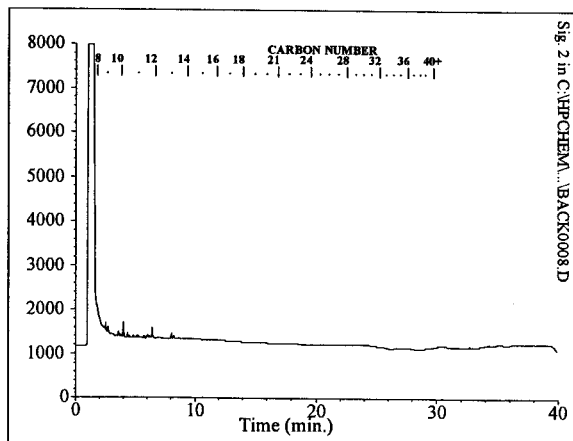
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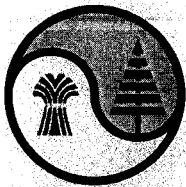
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980915



Method: EPH in Soil  
Sample No. 38570-16  
ALCAN FUELS, HAINES JUNCTION, YT 13537#31  
980916



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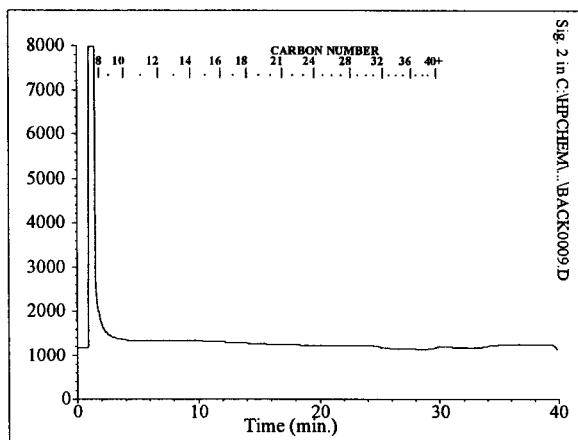
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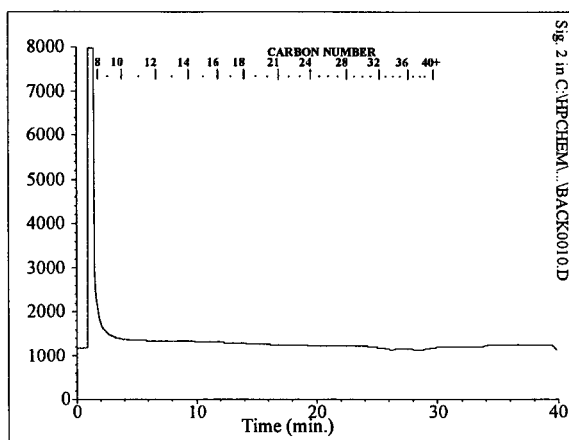
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Date Received : 21-Sep-98  
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## Qualitative Fuel Assessment Report

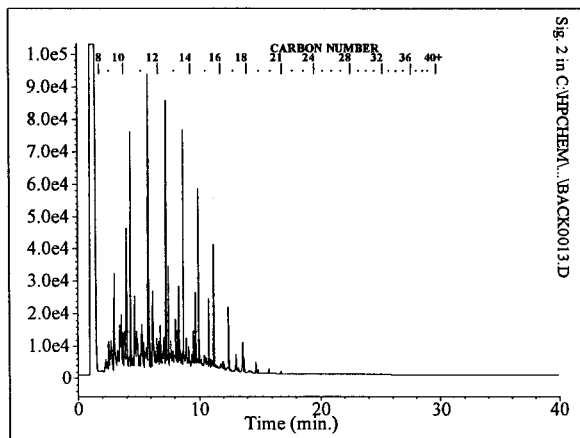
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980916



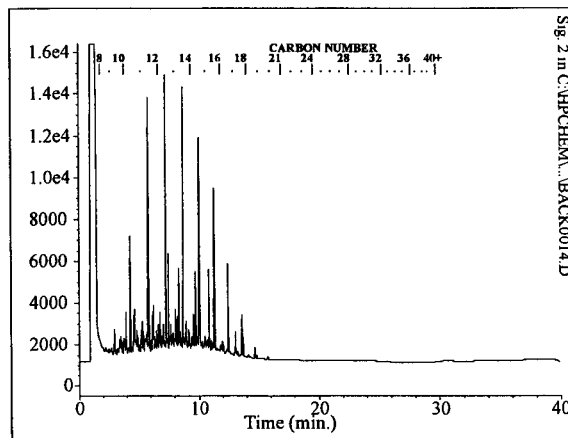
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980916



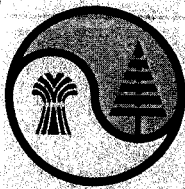
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980916



Method: EPH in Soil  
Sample No. 38570-20  
ALCAN FUELS, HAINES JUNCTION, YT 13537#38  
980916



Initials: *RA*



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Edmonton Ph (403) 438-5522 FAX (403) 438-0396  
Calgary Ph (403) 291-2022 FAX (403) 291-2021  
Lethbridge Ph (403) 329-9266 FAX (403) 327-8527  
Winnipeg Ph (204) 982-8630 FAX (204) 275-6019

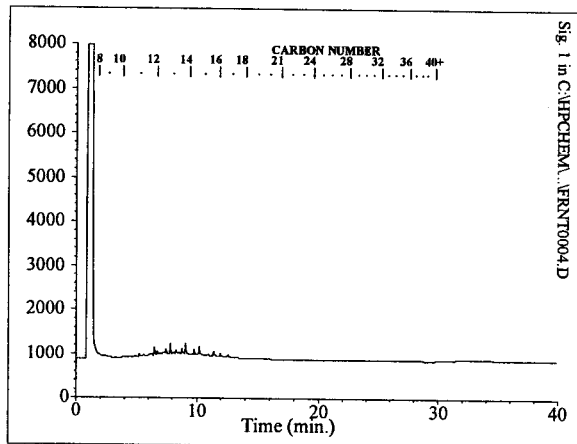
## Client

Name : EBA ENGINEERING CONSULTANTS  
Address : UNIT 6-151 INDUSTRIAL ROAD  
WHITEHORSE  
YT  
Y1A 2V3  
Att'n : DONALD WILSON  
Phone : 867 668-3068  
Fax : 867 668-4349

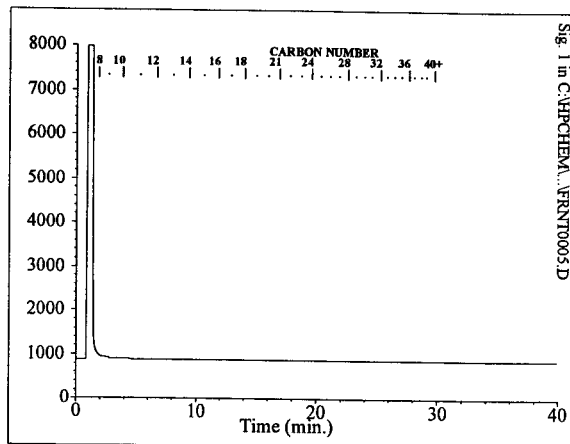
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Quote No. :  
WO (Other) :  
PO Num :  
Project : 0201-98-13537  
Date Sampled :  
Date Received : 21-Sep-98  
Date Reported : 28-Sep-98

## Qualitative Fuel Assessment Report

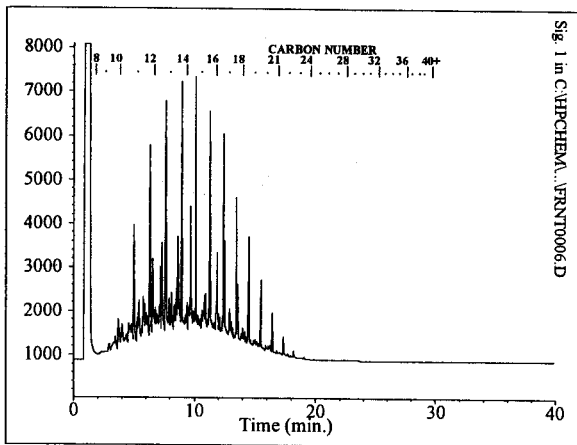
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980916



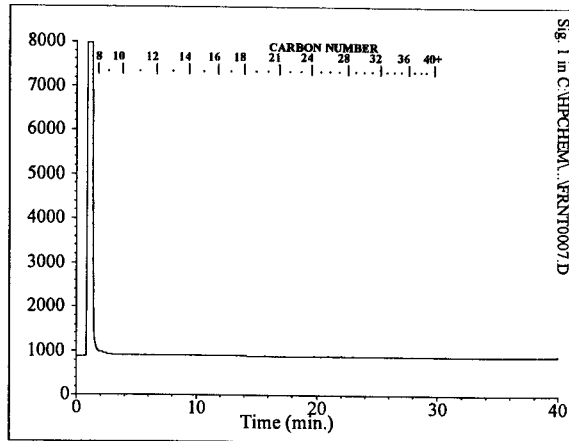
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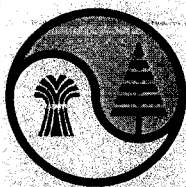
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980916



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Sample No. 38570-24  
ALCAN FUELS, HAINES JUNCTION, YT 13537#44



Initials: *RH*



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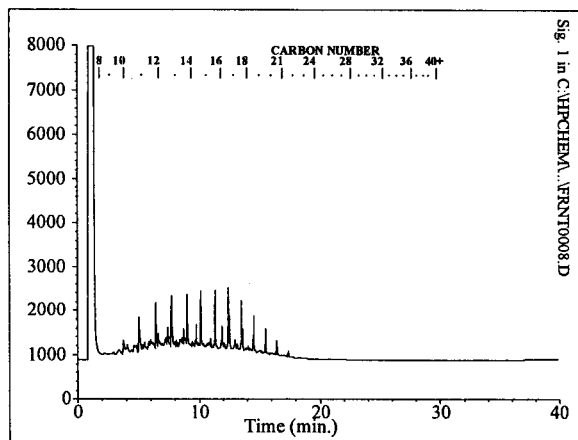
## Client

Name : EBA ENGINEERING CONSULTANTS  
Address : UNIT 6-151 INDUSTRIAL ROAD  
WHITEHORSE  
YT  
Y1A 2V3  
Att'n : DONALD WILSON  
Phone : 867 668-3068  
Fax : 867 668-4349

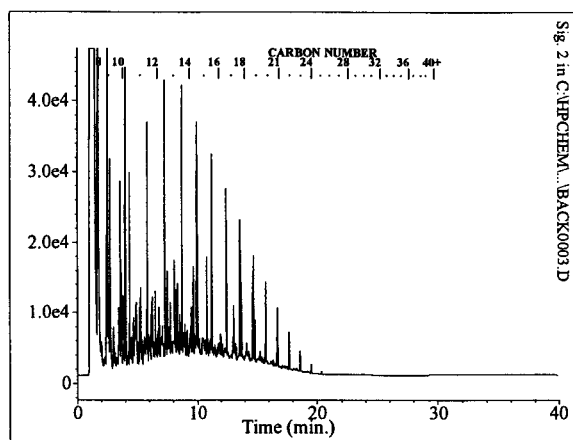
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Quote No. :  
WO (Other) :  
PO Num :  
Project : 0201-98-13537  
Date Sampled :  
Date Received : 21-Sep-98  
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## Qualitative Fuel Assessment Report

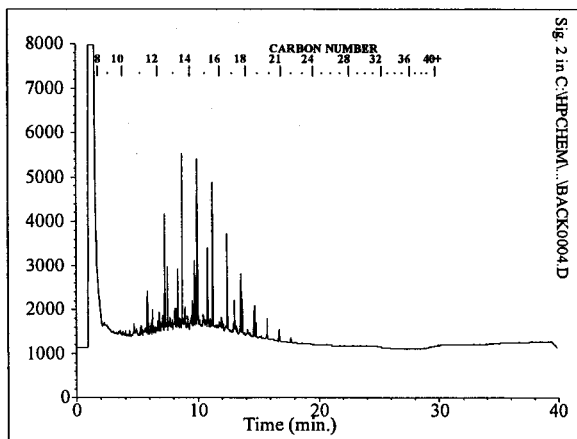
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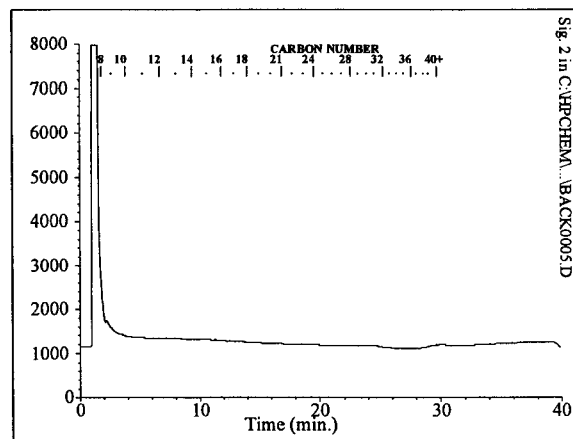
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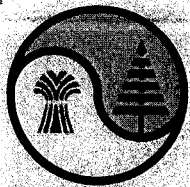
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Sample No. 38570-27  
ALCAN FUELS, HAINES JUNCTION, YT 13537#49  
980917



Method: EPH in Soil  
Sample No. 38570-28  
ALCAN FUELS, HAINES JUNCTION, YT 13537#50  
980917



Initials: AK



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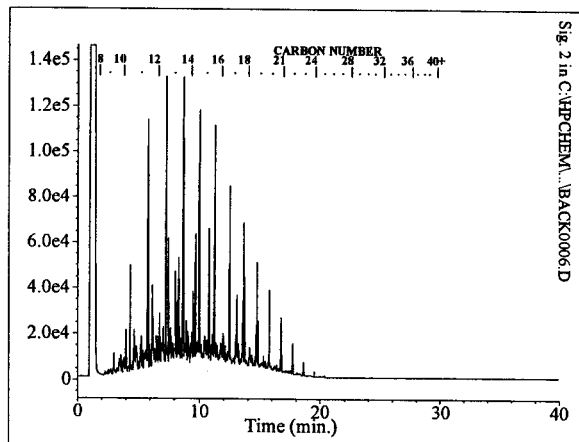
## Client

Name : EBA ENGINEERING CONSULTANTS  
Address : UNIT 6-151 INDUSTRIAL ROAD  
WHITEHORSE  
YT  
Y1A 2V3  
Att'n : DONALD WILSON  
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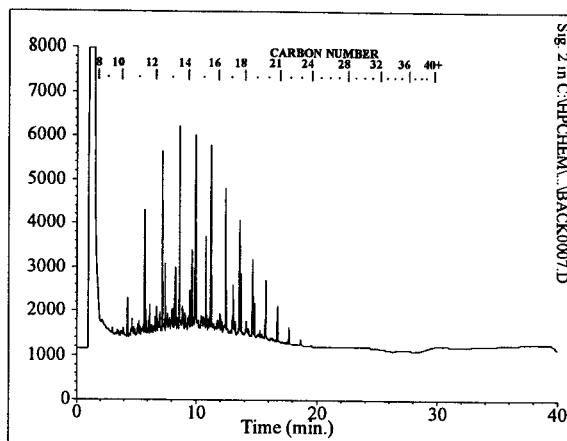
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Quote No. :  
WO (Other) :  
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Project : 0201-98-13537  
Date Sampled :  
Date Received : 21-Sep-98  
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## Qualitative Fuel Assessment Report

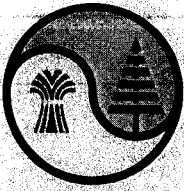
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980917



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Sample No. 38570-30  
ALCAN FUELS, HAINES JUNCTION, YT 13537#55  
980717



Initials: *RA*



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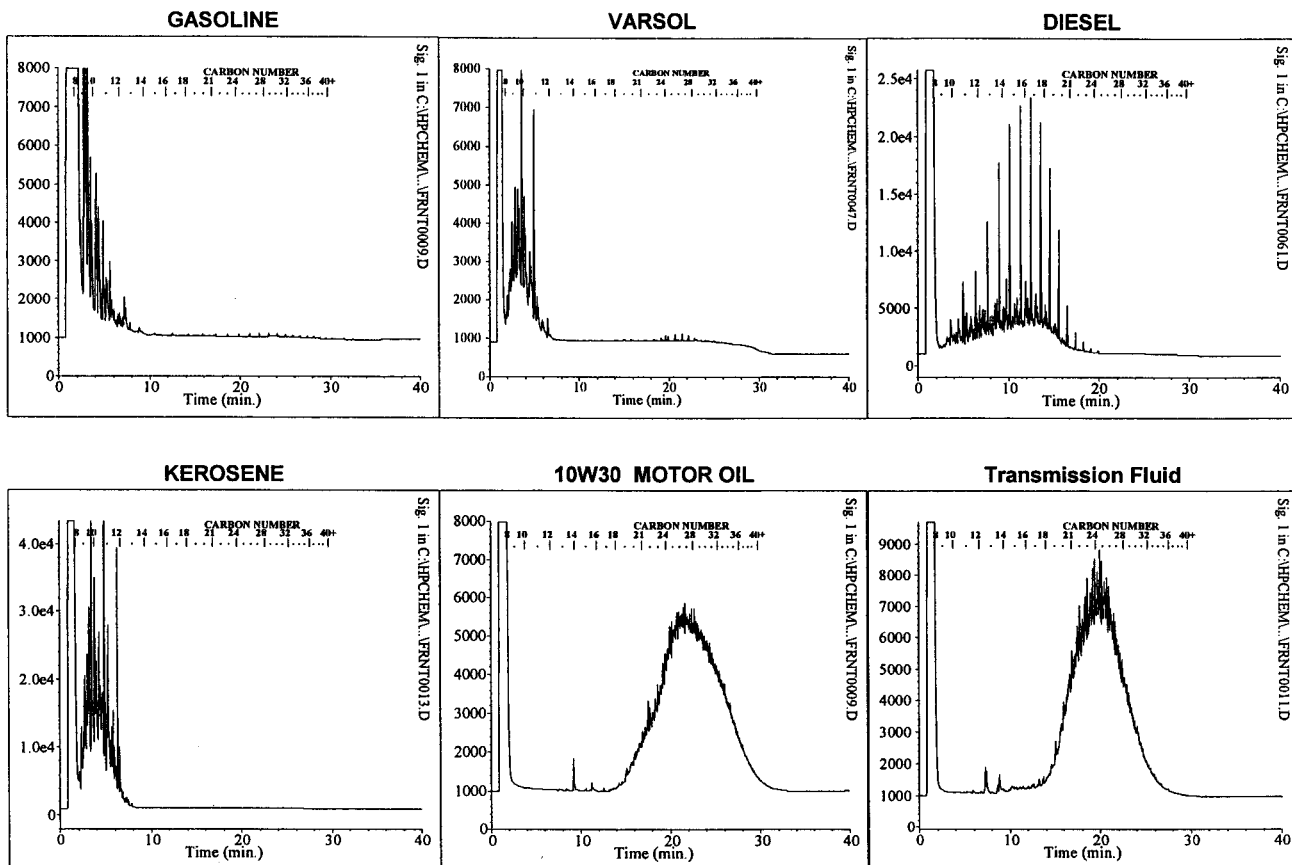
## Client

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## Qualitative Fuel Assessment Report

### TYPICAL PRODUCT CHROMATOGRAMS



### Product Carbon Number Ranges

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Approved By:

Ralph Hindle, B.Sc.  
Supervisor, Organics Lab  
Page 9 of 9



# NORWEST LABS

Control Number **E 01020**

## Environmental Sample Information Sheet

NOTE Proper completion of this form is required in order to proceed with analysis  
See reverse for your nearest Norwest location and proper sampling protocol

<b>Billing Address:</b> Company: <i>EBA Engineering Consultants Ltd.</i> Address: <i>Unit 6</i> <i>151 Industrial Rd</i> <i>Whitehorse YT</i> <i>Y1A 2V3</i> Attention: <i>Don Wilson</i> Phone: <i>867 668-3068</i> Fax: <i>867 668-4344</i> Cell: e-mail: <i>dwilson@eba.ca</i>	<b>Report To:</b> <input checked="" type="checkbox"/> <b>QA/QC Report</b> <input type="checkbox"/> <b>Report Result:</b> Fax <input checked="" type="checkbox"/> Mail <input checked="" type="checkbox"/> Courier <input type="checkbox"/> e-mail <input checked="" type="checkbox"/>	<b>Copy of Report To:</b> Company: Address: Attention: Phone: Fax: Cell: e-mail:	<b>Copy of invoice:</b> <input type="checkbox"/> Mail invoice to this address for approval <input type="checkbox"/> <b>Report Result:</b> Fax <input type="checkbox"/> Mail <input type="checkbox"/> Courier <input type="checkbox"/> e-mail <input type="checkbox"/>
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<b>Information to be included on Report and Invoice</b>  Project ID: <i>0201-99-13537</i> Project Name: <i>Alcan Fuels</i> Project Location: <i>Haines Junction, YT</i> Legal Location: PO#: Proj. Acct. Code: Agreement ID:	<b>RUSH</b> Please contact the laboratory to confirm rush dates and times before submitting samples.  Upon filling out this section, client accepts that surcharges will be attached to this analysis Required on: all analyses or as indicated <input type="checkbox"/> or <input type="checkbox"/>  Date Required: _____ Signature: _____ Norwest Authorization: _____	<b>Sample Custody (Please Print)</b>  Sampled by: <i>DSW/CPC</i> Date <i>980914-15</i> Company <i>EBA</i> Signature <i>Don Wilson</i>  Relinquished by: Company _____ Date _____ Waybill number: _____ Received by: <i>Sept 21/98</i> Company <i>McLellan</i> Date _____ Processed by: Norwest Labs _____ Date _____
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**Special Instructions / Comments**

*As per quote for Nade*  
*PAHs on 5 highest EPH samples*

	Sample Identification	Location	Depth	Date / Time Sampled	Matrix	Sampling Method	Number of Containers	Enter tests above (✓ relevant samples below)									
1	<i>13537 #1</i>	<i>1</i>	<i>—</i>	<i>980914</i>	<i>Soil</i>	<i>grab</i>	<i>1</i>	<i>1</i>									
2		<i>3</i>	<i>—</i>				<i>1</i>	<i>1</i>									
3		<i>7</i>	<i>—</i>				<i>1</i>	<i>1</i>									
4		<i>9</i>	<i>—</i>				<i>1</i>	<i>1</i>									
5		<i>11</i>	<i>—</i>				<i>1</i>	<i>1</i>									
6		<i>13</i>	<i>—</i>				<i>1</i>	<i>1</i>									
7		<i>17</i>	<i>—</i>				<i>1</i>	<i>1</i>									
8		<i>19</i>	<i>—</i>				<i>1</i>	<i>1</i>									
9		<i>20</i>	<i>—</i>	<i>980915</i>		<i>SPT</i>	<i>1</i>	<i>1</i>									
10		<i>22</i>	<i>—</i>				<i>1</i>	<i>1</i>									
11		<i>23</i>	<i>—</i>				<i>1</i>	<i>1</i>									
12		<i>24</i>	<i>—</i>				<i>1</i>	<i>1</i>									
13		<i>26</i>	<i>—</i>				<i>1</i>	<i>1</i>									
14		<i>27</i>	<i>—</i>				<i>1</i>	<i>1</i>									

NOTE: All hazardous samples must be labelled according to WHMIS guidelines.  
Accredited by the Standards Council of Canada for specific tests



# NORWEST LABS

Control Number E 01021

## Environmental Sample Information Sheet

NOTE Proper completion of this form is required in order to proceed with analysis  
See reverse for your nearest Norwest location and proper sampling protocol

<b>Billing Address:</b> Company: Address:  Attention: Phone: Fax: Cell: e-mail:	<b>Report To:</b> <input type="checkbox"/>  QA/QC Report <input type="checkbox"/>  <b>Report Result:</b> Fax <input type="checkbox"/> Mail <input type="checkbox"/> Courier <input type="checkbox"/> e-mail <input type="checkbox"/>	<b>Copy of Report To:</b> Company: Address:  Attention: Phone: Fax: Cell: e-mail:	<b>Copy of invoice:</b> <input type="checkbox"/> Mail invoice to this address for approval <input type="checkbox"/>  <b>Report Result:</b> Fax <input type="checkbox"/> Mail <input type="checkbox"/> Courier <input type="checkbox"/> e-mail <input type="checkbox"/>
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### Information to be included on Report and Invoice

Project ID:  
Project Name:  
Project Location:  
Legal Location:  
PO#:  
Proj. Acct. Code:  
Agreement ID:

### RUSH

Please contact the laboratory to  
confirm rush dates and times before submitting  
samples.

Upon filling out this section, client accepts that  
surcharges will be attached to this analysis  
Required on: all analyses **or** as indicated  
☐ **or** ☐

Date Required: \_\_\_\_\_  
Signature: \_\_\_\_\_  
Norwest Authorization: \_\_\_\_\_

### Sample Custody (Please Print)

Sampled by: CPC Date 980916-17  
Company EISA Signature [Signature]  
Relinquished by:  
Company \_\_\_\_\_ Date \_\_\_\_\_  
Waybill number: \_\_\_\_\_  
Received by: [Signature] Date Sept  
Company \_\_\_\_\_  
Processed by:  
Norwest Labs \_\_\_\_\_ Date \_\_\_\_\_

### Special Instructions / Comments

							Number of Containers												
Sample Identification	Location	Depth	Date / Time Sampled	Matrix	Sampling Method			Enter tests above (✓ relevant samples below)											
1 13537 ± 30		—	980915	Soil	SPT	1	1	✓											
2 31		—	980916			1	1	✓											
3 32		—				1	1	✓											
4 34		—				1	1	✓											
5 36		—				1	1	✓											
6 38		—				1	1	✓											
7 41		—				1	1	✓											
8 42		—				1	1	✓											
9 43		—				1	1	✓											
10 44		—				1	1	✓											
11 45		—				1	1	✓											
12 48		—	980917			1	1	✓											
13 49		—				1	1	✓											
14 50		—				1	1	✓											

NOTE: All hazardous samples must be labelled according to WHMIS guidelines.  
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Page 2 of 3  
##





## Environmental Sample Information Sheet

**NOTE Proper completion of this form is required in order to proceed with analysis**  
See reverse for your nearest Norwest location and proper sampling protocol

<b>Billing Address:</b>		<b>Report To:</b>	<input type="checkbox"/>	<b>Copy of Report To:</b>		<b>Copy of invoice:</b>	<input type="checkbox"/>
Company:				Company:		Mail invoice to this	
Address:		QA/QC Report <input type="checkbox"/>		Address:		address for approval <input type="checkbox"/>	
Attention:		<b>Report Result:</b>		Attention:		<b>Report Result:</b>	
Phone:		Fax <input type="checkbox"/>		Phone:		Fax <input type="checkbox"/>	
Fax:		Mail <input type="checkbox"/>		Fax:		Mail <input type="checkbox"/>	
Cell:		Courier <input type="checkbox"/>		Cell:		Courier <input type="checkbox"/>	
e-mail:		e-mail <input type="checkbox"/>		e-mail:		e-mail <input type="checkbox"/>	

<b>Information to be included on Report and Invoice</b>  Project ID: _____ Project Name: _____ Project Location: _____ Legal Location: _____ PO#: _____ Proj. Acct. Code: _____ Agreement ID: _____	<b>RUSH</b> Please contact the laboratory to confirm rush dates and times before submitting samples.  Upon filling out this section, client accepts that surcharges will be attached to this analysis  Required on: all analyses <b>or</b> as indicated <div style="display: flex; justify-content: center; align-items: center; gap: 20px;"> <input type="checkbox"/> <b>or</b> <input type="checkbox"/> </div> Date Required: _____ Signature: _____ Norwest Authorization: _____	<b>Sample Custody (Please Print)</b>  Sampled by: <u>CPC</u> Date <u>9/30/17</u> Company <u>LEA</u> Signature <u>[Signature]</u> <hr/> Relinquished by: _____ Date _____ Company _____ Waybill number: _____ <hr/> Received by: <u>[Signature]</u> Date <u>Sept 1</u> Company <u>[Signature]</u> <hr/> Processed by: _____ Norwest Labs _____ Date _____
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[illegible]

**NOTE:** All hazardous samples must be labelled according to WHMIS guidelines.

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Page 3 of 3  
##

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## **APPENDIX C**

### **Remediation Options**

## POTENTIAL SITE RESTORATION

### SELECTION OF TREATMENT OPTIONS

It is understood that should the site become property titled to other than the Government of Canada the Contaminated Sites Regulations would apply. This would mean that the eventual development of the property might be contingent upon a successful site restoration program such that the site would no longer be considered as contaminated under the Contaminated Sites Regulations. The remediation options have, therefore, been evaluated with consideration to restoring the site to standards established in these regulations.

Since the major sources of contamination are considered to be surface releases from the ASTs formerly on the site, these sources are no longer present. By treating the contaminated soil the potential for contaminant migration will also be removed. Information obtained in the Phase 2 and Phase 3 environmental site assessment is considered to reflect current site conditions. Over time the site conditions may change such that the assumptions which have been made, are no longer valid.

The discussions of treatment options are based on the following assumptions:

1. Two separate areas of hydrocarbon contamination are present on the site. One being the former location of the Furnace Oil AST the second being the area formerly occupied by the Gasoline and Stove Oil ASTs.
2. The hydrocarbon contamination is contained within the property boundaries.
3. The hydrocarbon contamination has not penetrated below 11.4 m.
4. The volume of soil contaminated in excess of the selected criteria is approximately 1050 m<sup>3</sup>.

In considering how to achieve restoration of the site *in situ* methods (treating the contamination in place) were excluded following consideration of the applicability of these types of treatments to the clay and silt matrix found through the site. The remaining restoration methods are generally referred to as *ex situ* treatments, which involve removing the contaminated soil for treatment. Within this category treatment can take place on-site or offsite. Given the location of the property and the limited space available, on-site methods are not considered viable. This leaves off-site treatment of the contaminated material.

## SUGGESTED TREATMENT OPTION

Off-site treatment would restore the property in a timely fashion since contaminated material would be removed from the site and replaced with clean fill. Soil, which was removed, could be treated using either a landfarming system or a more aggressive approach such as bioremediation. A more intensive bioremediation approach (such as a static pile bioremediation system) is considered less economically feasible. This is due to the costs to provide water on-site, to develop a treatment cell, and for power requirements.

Given the nature of the contaminant being a combination of gasoline type product and heavier diesel type products both of which volatilize readily, a landfarming system is thought to be the most cost effective treatment method for the soils encountered on the site. It is assumed that some bulking agents would be required to reduce clumping and provide additional vapour space within the soil matrix.

A landfarming treatment system allows natural processes such as volatilization and microbial biodegradation to reduce the hydrocarbon contamination in the soil. The volatilization mechanism for hydrocarbon removal involves the contaminant leaving the soil in the vapour form. The biodegradation mechanism involves natural soil bacteria consuming the hydrocarbon as its carbon and energy source for growth. Although natural biodegradation will occur within the contaminated soil, the rate of hydrocarbon removal will be proportional to the extent to which treatments or additives are employed. The particular remediation system envisaged would involve a passive landfarming program, which does not include providing additives to promote accelerated rates of biodegradation. As such, volatilization is assumed to be the primary process for hydrocarbon removal.

The suitability for the landfarming type of remediation system is directly related to the soil and contaminant types. With respect to soil type, landfarming is most suitable for a soil with a high intrinsic permeability since there is an increased opportunity for air transmission through the soil pore volume. Air transmission is the most critical requirement to effect both volatilization and aerobic respiration of the contaminant. As discussed, the clay and silt matrix would require bulking agents to enhance the permeability of the soil, depending on the material selected this could also provide additional nutrients to the soil. The gravel and sand soils encountered below the clays and silts are suitable for the adoption of a landfarming operation due to the moderate intrinsic permeability which could be expected.

In relation to contaminant type, landfarming is suitable for those hydrocarbons with a relatively high vapour pressure since volatilization is dependent on the extent to which the contaminant will partition to the vapour phase. In this particular case, the gasoline and to a lesser extent the fuel oil contaminants consists of mixtures of organic chemicals with a range of relatively high vapour pressures. In general, these constituents will readily volatilize at normal (summer) temperatures and thus landfarming would be an appropriate configuration to effect volatilization. These hydrocarbons are also readily biodegradable by naturally occurring soil bacteria. Therefore, it can be expected that a small amount of microbial degradation will occur throughout the remediation program.