



PHASE III ASSESSMENT

Brooks Brook Yukon Territory



Prepared For:



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1.0 INTRODUCTION

Hemmera Resource Consultants Ltd. (Hemmera) has completed a Phase III assessment of the former Alaskan Highway construction camp and relay station located at Brooks Brook, Yukon Territory. This Phase III assessment was initiated after a Phase II investigation by Lorimer and Associates Ltd. (Lorimer) and Hemmera completed in the summer of 1997, indicated the presence of concentrations of hydrocarbons in excess of the Yukon Contaminated Sites Regulations (YCSR) in the vicinity of Foundation "AB" near the junction of Brooks Brook and the Alaska Highway. Also indicated was the presence of hydrocarbons and organochlorine pesticides (OCP) in excess of the YCSR and equivalent standards from other jurisdictions for OCP in the vicinity of the new cook shack on-site. Subsequent work was initiated in order to delineate the vertical and horizontal extent of the contamination, to develop viable remedial strategies and to provide a cost framework for each remedial option.

1.1 Location

Brook's Brook is located in the Yukon Territory along the Alaska Highway at mile post 830 (Figure 1). The former construction camp is located along the northeastern shoreline of Lake Teslin, between the highway and the lake.

The camp has been partially converted to a meeting ground for the Tlingit Band (Figures 2 & 3). A wooden framed meeting hall and cook shack, along with numerous tent bases and outhouses have been constructed on the site. Numerous concrete foundations from the former buildings on the site are still visible. In addition, at least three former landfills are located on or near the site.

1.2 Historic Background

The complete historical background on the Brook's Brook site is documented in the Environmental Sciences Group report, *An Environmental Assessment of Brooks Brook, Yukon Territory*, January 1997. The following presents a brief summary of the history of the site.

Brooks Brook was originally commissioned in 1942 as a line camp, one of the relatively smaller camps spaced every 10 to 15 miles along the Alaska Highway which housed 6 to 12 engineers and 100 to 200 construction workers. The camp was also used as a telephone relay station for the U.S. Relay Stations network. These stations were manned 24 hours a day and were used to relay telephone, teletype and radio messages. The third use of the camp was as a base for the truck drivers, pipe-layers and construction workers involved in the construction of the part of the Canol (Canadian Oil) project oil pipeline in the vicinity of Brooks Brook. This project was abandoned in 1945.

In 1946, the camp was transferred to the Canadian Army, with the Royal Canadian Air Force (RCAF) being made responsible for the land communications. The relay line was transferred from the RCAF to Canadian National Telegraphs, which was responsible for the actual operation of the line, while the Canadian Army continued to supervise the maintenance and road improvements of the Alaska Highway until 1964. This task then became the responsibility of the Federal Department of Public Works. In 1965 the Brooks Brook road maintenance station was moved to near the Teslin Airport and the repeater station was shut down. The inhabitants of Brooks Brook gradually moved from the site, which has been largely abandoned in recent years.

Recently, as part of the Teslin Tlingit Council land claim agreement, the Brooks Brook site is now under the jurisdiction of the Teslin Tlingit Council.

During its peak period, there were 20 to 30 buildings located on the site (Figure 3). These buildings included barracks, married personnel living quarters, a school, a curling rink, at least two powerhouses, fuel storage tanks, at least two fuel dispensing locations, garages, storage sheds, a pumphouse and a relay station building. In addition, sewer lines ran from each building into Brooks Brook. During the ESG investigation and the Lorimer and Hemmera investigation, three landfills were identified: one at the northern end of the main site; one at the western edge of the site in the woods near Teslin Lake; and one approximately 2 km south of the main site along the Alaska Highway.

1.3 Previous Environmental Investigations

In January 1997, ESG completed an environmental assessment of the camp. This assessment comprised the collection of shallow soil samples, representative vegetation samples, surface water samples and background soil samples. The samples were collected on two separate occasions during the summer of 1996. The results of their investigation revealed the following:

- none of the soil samples contained concentrations of polychlorinated biphenyls (PCB's) in excess of the Canadian Council of the Ministers of the Environment (CCME) and/or proposed Yukon Contaminated Sites Regulations (YCSR) criteria;
- inorganic element contamination (cadmium, chromium, copper, lead and zinc) in excess of the CCME and/or YCSR criteria was extremely localized around three of the concrete foundations and two of the landfills;
- the concentration of polycyclic aromatic hydrocarbons (PAH's) did not exceed either the CCME or YCSR criteria in any of the soil samples;
- concentrations of total petroleum hydrocarbons were elevated in two soil samples, but this can probably be attributed to recent rather than historic activities;
- one soil sample was found to contain concentrations of dichlorodiphenyltrichloroethane (DDT) at levels exceeding the Netherlands Soil Guidelines (criteria adopted for this project);
- ESG estimated that no more than 12 m³ of contaminated soil requires remediation at the site; and
- ESG recommended that this soil be excavated and placed in an appropriate landfill.

In July, 1997, Lorimer and Hemmera personnel mobilized to the site and completed a limited Phase I assessment as well as a program of monitoring well installation, soil sampling, groundwater sampling and test pitting at areas identified in the ESG report or during the Lorimer and Hemmera Phase I investigation as being potential areas of concern. Test pits were advanced around many of the foundations identified as having concentrations of metals or other parameters in excess of the YCSR criteria. In addition, based on the results of the Phase I assessment, test pits were advanced in areas suspected to be contaminated with concentrations of hydrocarbons.

Select soil samples from these test pits were analyzed and it was determined that hydrocarbon contamination was present around the former location of the gas pumps, to the north of Foundation "K" and near Foundation "AB." A broken concrete sump was found buried to the east of Foundation "AB" during the test pitting program. This sump was connected to a drain that was located on the southern edge of Foundation "AB." Soils in the vicinity of this sump had a distinct hydrocarbon odour and staining. At other areas on-site, metals contamination that was indicated at surface during the ESG investigation was determined to be limited to surficial contamination, as samples collected and analyzed from depth did not indicate concentrations of metals in excess of the YCSR criteria.

A second round of drilling was initiated in the fall of 1997 in order to investigate the vertical extent of hydrocarbon contamination at both Foundation "AB" and "K." Boreholes with monitoring wells were installed and soil and groundwater samples were collected and submitted for analyses. The analysis of soil samples indicated that concentrations of volatile petroleum hydrocarbons (VPH) and light extractable petroleum hydrocarbons (LEPH) in excess of the YCSR criteria were found in soil samples collected from some of the boreholes in the vicinity of Foundation "AB." In addition, the results of the analysis of soil samples collected from one borehole advanced in the vicinity of Foundation "K" has indicated that the vertical extent of the LEPH and VPH contamination is limited to depths less than 3 metres. An estimated 300 m³ of soil contaminated with concentrations of VPH and LEPH in excess of the YCSR residential land use criteria is present in the vicinity of Foundation "K" (Figure 4)

While the test pitting and borehole drilling results were successful in determining the vertical and horizontal extent of the hydrocarbon contamination in the area around Foundation "K," Hemmera was unable to obtain horizontal closure on the hydrocarbon contamination around Foundation "AB." Hemmera felt that the hydrocarbon contamination was limited to the perched water table in the sand and gravel fill lying above the silt, however, Hemmera was uncertain of the horizontal extent of the contamination. As a result, this report presents the results of additional drilling around Foundation "AB" which was completed in order to obtain horizontal closure of the hydrocarbon contamination.

The analytical results of some of the grab samples collected by ESG in the vicinity of the new cook shack had elevated concentrations of OCP. During the Lorimer and Hemmera investigation, two test pits were advanced in the area of the new cook shack and samples were analyzed for concentrations of OCP and petroleum hydrocarbons. The results of this investigation indicated that elevated concentrations of OCP and petroleum hydrocarbons were detected at these two test pit locations. This report presents the results of further investigations in the vicinity of the new cook shack which were completed in order to delineate the extent of petroleum hydrocarbon and OCP contamination in this area.

This report also outlines remedial options and Level D costs for the areas around Foundation "AB," Foundation "K," the new cook shack, the landfills, and the other foundations on the site.

1.4 Objectives and Scope of Work

The scope of work for this project was to carry out a more detailed assessment of the presence and/or extent of groundwater and soil contamination around Foundation "AB" and the new cook shack at the Brooks Brook site.

The objectives of the project were the following:

- Complete step out boreholes and monitoring wells around existing borehole and monitoring wells in the vicinity of Foundation "AB" in order to obtain vertical and horizontal closure on the hydrocarbon contamination detected in this area during previous investigations;
- Complete hand dug test pits in the vicinity of the new cook shack in order to delineate the extent of OCP and hydrocarbon contamination in this area; and
- Develop remedial options for the contaminated sites at Brooks Brook.

Following the initial Phase III field investigation, it was determined that the extent of the OCP contamination was greater than originally estimated and a second phase of hand dug test pits along with some deeper test pits and field testing was initiated in order to delineate the extent of OCP and hydrocarbon contamination in the vicinity of the new cook shack.

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2.0 REGULATORY CRITERIA

2.1 CEPA Regulations

Under the *Canadian Environmental Protection Act, Storage of PCB Material Regulations*, materials (solid or liquid) containing concentrations of PCBs in excess of 50 ppm must be remediated (Canada Gazette Part I, June 9, 1992) (CEPA 1992). The regulations govern the amount of PCB containing material that can be in or on a property and describe the required containers or drums that must be used to contain the PCB contaminated material.

The regulations do not apply to the handling, offering for transport, or transporting of PCB material governed by the *Transportation of Dangerous Goods Act* (TDGA) (TDGA 1985).

2.2 CCME Criteria

In response to the growing public concern over the potential environmental and human health effects associated with contaminated sites, the Canadian Council of Ministers of the Environment (CCME) has developed *Interim Canadian Environmental Quality Criteria for Contaminated Sites* (CCME 1991). These interim criteria have been adopted from existing guidelines and criteria currently in use in various jurisdictions across Canada. They are continuing to be assessed and are intended to be modified as required to reflect the emerging body of scientific information relevant to contaminant effects on the environment and human health. Recently, these Interim Criteria have been superseded by new CCME 1997 criteria for twenty compounds. In terms of the CCME criteria, the new (1997) criteria are in effect for the twenty compounds covered by the legislation and the old (1991) criteria are in effect for any compounds not covered by the new criteria.

2.2.1 CCME 1991

The CCME 1991 criteria include two levels of concentrations for soil and water quality: assessment criteria; and remediation criteria. Assessment criteria are the approximate background

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concentrations or approximate analytical detection limits for contaminants in soil and water. Background concentration refers to a representative ambient concentration for a contaminant in soil or water. Analytical detection limits are the lowest concentration that can be routinely measured within an acceptable level of accuracy and reproducibility. Remediation criteria are generally considered to be those levels which are protective of human and environmental health for specific uses of soil or water at contaminated sites.

If concentrations of a substance in water or soil at a site do not exceed the assessment criteria, further action is not usually required. When concentrations exceed assessment criteria, further investigation is required to assess the nature and extent of any contamination at a site. If contaminant concentrations exceed the remediation criteria for a current or proposed future land use for a site, then remediation of the site to meet the current or proposed land use criteria is required.

Soil remediation criteria have been developed for three land uses: agricultural; residential or parklands; and commercial or industrial. Water remediation criteria are based on CCME *Water Quality Guidelines* (CCREM 1987) and Health and Welfare Canada's *Drinking Water Quality Guidelines* (Health and Welfare Canada 1993).

2.2.2 CCME 1997

The CCME 1997 soil guidelines are a result of scientific information collected since the CCME 1991 guidelines. The new guidelines are scientifically defensible and are derived specifically for the protection of ecological receptors in the environment and for the protection of human health associated with four land uses: agricultural, residential/parkland, commercial and industrial. There are three types of guideline: soil quality guidelines for environmental health (SQG_{EH}), soil quality guidelines for human health (SQG_{HH}), and the CCME 1997 recommended guidelines, which are the lower of the SQG_{EH} and SQG_{HH} guidelines for each land use.

The environmental soil quality guidelines are derived using toxicological data to determine the threshold level on key receptors. Exposure from direct soil contact is the primary derivation procedure for environmental quality guidelines for residential/parkland, commercial and industrial land uses. Another derivation procedure, also based on soil and food ingestion, is also applied in the case of agricultural land use, with the lowest of the two values considered as the environmental soil quality guideline for this land use.

The development of the human health soil quality guidelines is based on a different approach using steps similar to a site-specific risk assessment. Several basic assumptions were made about the sensitive receptor and the nature of the chemical exposure for each land use to establish these generic guidelines. Guidelines derived for non-carcinogens are based on the assumed threshold for toxic effects. Carcinogenic compounds presenting some risk at any level of exposure, guidelines are derived based on estimated lifetime incremental cancer risk from exposure to soil.

2.3 Yukon Territory Standards

The Yukon Territory Renewable Resource Office released the *Yukon Contaminated Sites Regulations* (YCSR) in 1996. The CSR standards classify land as either agricultural, urban park, residential, commercial or industrial. Compounds are regulated under either generic standards or standards that are specifically related to environmental health risks (such as toxicity to soil invertebrates and plants).

2.4 Other Criteria

2.4.1 Transportation of Dangerous Goods Act (TDGA)

The TDGA includes a category of wastes defined as environmentally hazardous substances (Class 9.2 - Dangerous Goods). A waste which contains an environmentally hazardous substance with a 9.2 classification is a Dangerous Good or Special Waste if the concentration of the substance is greater than 0.01% (100 ug/g, or 100 parts per million (ppm)). PCB containing materials are classified as a Class 9.2 substance. Pesticides are classified as a Class 6.1 -

Poisonous (toxic) and infectious substance. The TDGA contains specifications for placarding, handling and transporting dangerous goods.

2.4.2 *Quebec Criteria*

Remediation criteria for pesticides are not included in the CCME criteria. In order to develop remedial objectives for these compounds, acceptable criteria in other jurisdictions were reviewed. The Ministère de l'Environnement du Québec, *Contaminated Sites Rehabilitation Policy* 1988, criteria for residential or recreational land is 2.0 ppm for total pesticides (Ministère de l'Environnement du Québec 1988). The Netherlands' *Soil Protection Act, Soil Cleanup Criteria* recommends criteria of 0.5 ppm for each chlorinated pesticide, 1.0 ppm for each non-chlorinated pesticide and 3.0 ppm for total pesticides (Ministry of Housing, Physical Planning and Environment 1987).

2.4.3 *BC Special Waste Criteria*

In 1988, the *B.C. Waste Management Act* was amended to include the *Special Waste Regulation* (SWR), which identifies certain wastes as being particularly hazardous. These are identified as Special Wastes in the Regulation. In April 1992, the Special Waste Regulation was amended. Special Wastes are currently defined as:

- dangerous goods that are no longer used for their original purpose, including those that are recycled, treated, or disposed; intended for recycle, treatment or disposal; or in storage or transit before recycle, treatment or disposal;
- PCB wastes;
- wastes containing dioxin;
- waste oil;
- waste asbestos;
- waste pest control product containers and wastes containing pest control products, including wastes produced in the production of treated wood products using pest control products;

- leachable toxic waste;
- waste containing tetrachloroethylene; and
- waste containing polycyclic aromatic hydrocarbon.

Each of these terms is defined more fully in the SWR.

2.5 Remedial Objectives

Based on the anticipated future land use of the Brooks Brook site, the CCME and YCSR Residential and Parkland Land Use (RL/PL) criteria were used as remedial objectives for PAH's, benzene, toluene, ethylbenzene, xylene (BTEX), volatile petroleum hydrocarbons (VPH), light extractable petroleum hydrocarbons (LEPH), heavy extractable petroleum hydrocarbons (HEPH) and metals; CEPA and CCME criteria were used for PCB's; and, in the absence of CCME and territorial criteria for pesticides, the lowest criteria level in other jurisdictions was adopted as the remedial objective for Brooks Brook. Therefore a criteria of 0.5 ppm for individual pesticides and 2.0 ppm for total pesticides was used.

The groundwater samples were compared to the CCME Remediation Criteria for *drinking water* and the Yukon Territory Numerical Water Standards for *drinking water* and *aquatic life*.

3.0 WORK PROGRAM

3.1 Monitoring Well Installation

During the initial round of drilling at this location, elevated concentrations of total extractable hydrocarbons (TEH) were detected in groundwater and concentrations of LEPH and VPH in excess of the YCSR criteria were detected in soil samples. As a result, in order to develop remedial alternatives for this area, step-out boreholes were advanced around the original boreholes and monitoring wells installed in this area. Soil and groundwater samples were collected and analyzed.

On August 18, 1998, Midnight Sun Drilling mobilized to the site and advanced 10 boreholes in the vicinity of Foundation "AB." Boreholes were advanced using a 0.2 metre diameter hollow stem auger. Soil samples were collected using an Alconox washed and distilled water rinsed split spoon sampler. Soil samples were generally collected every 0.76 metres. The soil stratigraphy was logged in each split spoon and soil samples were collected for analysis using latex gloved hands. The soil samples were placed in laboratory prepared glass jars, packed in coolers and shipped to the project laboratory for analyses. A fresh pair of latex gloves were used for each sample.

Monitoring wells were installed in four of the boreholes. Monitoring wells were constructed with 50 mm diameter, Schedule 40, PVC riser pipe and 50 mm diameter, .010" slot, Schedule 40, PVC screen. All of the wells were installed with 1.52 m screens.. The wells were backfilled with 10-20 silica sand to a height of 0.3 m above the top of the screen, plugged with a 0.6 m thick plug of bentonite and backfilled to surface with cuttings. The wells had 0.3 to 0.6 m stickups, protected with a lockable upright metal pipe well protector which was cemented into place. A disposable teflon bailer was installed in each of the new wells.

The elevations of the top of the monitoring well (TOP) were surveyed relative to a local benchmark (well H97-12, assumed elevation of 100 m).

Figure 5 shows the location of the monitoring wells. The borehole and monitoring well logs are included in Appendix A.

3.2 Groundwater Sampling

Following the installation of the wells, groundwater samples were collected from each of wells in the vicinity of Foundation "AB." Prior to the collection of the groundwater samples, three of the new wells (H98-18, -20 and -23) were developed using the disposable bailers and allowed to recharge for 24 hours prior to sampling (the old wells had previously been developed during the 1997 program). The fourth well, H98-25, was bailed and sampled right away due to logistical constraints. Following development, all of the wells in the vicinity were bailed of at least three well volumes before sampling.

Groundwater samples were collected on August 20, 1998 from all of the wells located around Foundation "AB." The groundwater from each well was bailed into laboratory prepared glass bottles, packed in coolers and shipped to the project laboratory for analyses.

3.3 Surface and Test Pitting Around New Cook Shack

On August 20 and 21, 1998, a program of shallow surface sample collection was initiated over a 5 metre grid to the south, east and west of the new cook shack (Figure 6). A rough 35 x 40 m grid was established using the south east corner of the cook shack as a starting point. The grid was oriented towards 316° magnetic north. Shallow test pits approximately 30 to 40 cm deep were advanced using a shovel. Soil samples were collected at two horizons in each test pit: 0-10 cm and 20-30 cm. The soil samples were collected after the walls of the test pits had been cleaned using an Alconox washed and distilled water rinsed stainless steel trowel. The samples were placed in laboratory prepared glass jars, packed in coolers and shipped to the laboratory for analysis. A fresh pair of latex gloves and a freshly cleaned trowel were used for each sample. Representative soil samples were submitted to the project laboratory for analysis of concentrations of OCP and extractable petroleum hydrocarbons (EPH).

Following the results of the analyses of the soil samples, it was determined that the horizontal and vertical extent of the OCP and EPH were greater than initially indicated. On September 28, 1998, Hemmera and a technician from CanTest Laboratories mobilized to the site to complete further test pitting. The grid was expanded over a much wider area in the vicinity of the cook shack (Figure 6). In order to obtain some indication of closure on the OCP contamination, the CanTest technician operated a field test kit. The test kit was an immuno assay kit capable of discerning concentrations of DDT+DDD+DDE in excess or less than standards using a differential photometer. A complete description of the testing procedure is included in Appendix B. In order to provide a conservative estimate of OCP concentrations in the soil, two standards were chosen: 0.4 ppm and 2 ppm. The Quebec criteria for individual OCPs is 0.5 ppm and for total OCPs is 2 ppm. Any sample that was determined to have a field concentration of greater than 0.4 ppm was considered as a "hit" and further step out samples were collected. The field estimate of "closure" on the OCP contamination was determined when the results of the immuno assay testing indicated concentrations of DDT+DDD+DDE were less than 0.4 ppm. Representative samples analyzed using the field test kit were also sent to the laboratory and analyzed for OCP and EPH using conventional methodologies. In order to insure that the field sample was completely homogeneous and that the possibility of "nugget" effects in the sample would be reduced as much as possible, each sample was thoroughly homogenized in a clean zip lock bag prior to being placed in the laboratory prepared glass jars. The aliquots used for field testing were removed from the same jars as the aliquots used for laboratory testing.

In order to determine the vertical depth of OCP contamination around the cook shack area, a rubber tired backhoe was mobilized to the site on October 1, 1998 to advance test pits to depths of 1.5 metres at four locations within the grid (Figure 6). These locations were chosen to represent worst case scenarios and to give some idea of the spatial variability of the depth of OCP contamination. Test pits were advanced at grid locations 107, 301, 404 and 408. The analysis of soil samples collected at surface from these locations indicated the following concentrations of total OCP: 107 - 189.1 ppm, 301 - 111.9 ppm, 404 - 110.3 ppm and 408 - 500.8 ppm. Soil samples were collected every 0.25 metres using latex gloved hands and Alconox washed and distilled water rinsed stainless steel trowels. The samples were placed in clean ziplock bags,

thoroughly homogenized, and packed in laboratory prepared glass jars. The soil samples were tested in the field using the immuno assay field test kit. These samples were also tested in the lab. The aliquots used for field testing were removed from the same jars as the aliquots used for laboratory testing.

The presence of OCP contamination over a fairly wide area at which there was no historical evidence of a potential source indicated that there was a possibility that OCP contamination could be found at other areas on site. In order to determine if this was the case, surface soil samples were collected at widely spaced intervals over the entire site (Figure 7). These were collected and tested using the same methodology as indicated above. Only those samples that had concentrations of total OCP greater than 0.4 ppm when tested using the immuno assay field test kit were submitted to the laboratory for further testing.

A total of 153 soil samples were tested in the field using the immuno assay test kit.

Following the receipt of the analysis of the soil samples for OCPs and to facilitate the selection of remedial options for the OCP soil, three soil samples (408A, 301A and 204A) with some of the highest concentrations of OCP were submitted to the U.S. E.P.A. Toxicity Characteristic Leachate Procedure. This was done to ascertain if the OCP contaminated soil could safely be disposed in an industrial landfill, which uses a limit of 3 mg/L DDT in leachate as their criteria for acceptance.

4.0 RESULTS

4.1 Foundation "AB"

4.1.1 Soils

The results of the analysis of soil samples collected during the advancement of boreholes around Foundation "AB" are summarized in Table 1. In order to provide a complete picture of the area of contamination at Foundation "AB", the results from the analysis of soil samples and stratigraphic information collected during the advancement of boreholes from previous investigations are also included. The original laboratory results are included in Appendix C.

The stratigraphy in the vicinity of Foundation "AB" was characterized by 2 metres of sand and gravel overlaying silt and clayey silt in most of the boreholes. At one borehole location (H97-16), the thickness of the sand and gravel was approximately 3.5 metres. This may have been the former channel for Brooks Brook prior to it being rerouted for the upgrade of the Alaska Highway. A distinct hydrocarbon odour and sheen was observed in boreholes H97-13 (1.83 to 4.27 metres), H97-15 (1.52 to 3.04 metres), H97-16 (1.83 to 3.66 metres), H98-18 (1.22 to 1.98 metres), H98-19 (1.22 to 1.98 metres), H98-20 (1.28 to 2.13 metres), H98-23 (1.68 to 2.13 metres), and H98-24 (1.98 to 2.43 metres).

The results of the analysis of soil samples indicated that the following soil samples had concentrations of LEPH and VPH in excess of the YCSR Residential land use criteria: Sample H97-15-5' (i.e. borehole 15 drilled in 1997 with the sample at 1.52 metres (5')) had concentrations of LEPH of 1400 ppm and VPH of 730 ppm; sample H97-16-6' had concentrations of LEPH of 3400 ppm; sample H98-18-4' had concentrations of LEPH of 7400 ppm and VPH of 630 ppm; sample H98-19-5.5' had concentrations of LEPH of 1900 ppm; sample H98-20-5.5' had concentrations of LEPH of 1800 ppm and VPH of 370 ppm; and sample H98-24-6.5' had concentrations of LEPH of 2700 ppm and VPH of 550 ppm. It appears that the depth of contamination ranges from 1.22 to 1.98 metres. This was corroborated in the field, as soil samples collected from this interval (1.22 to 1.98 metres) had visible staining and a detectable hydrocarbon odour. Soil samples collected above and below this depth interval did not

have concentrations of BTEX, LEPH, HEPH of VPH in excess of the YCSR Residential land use criteria.

Figure 8 shows the spatial distribution of the soil samples with concentrations of LEPH and/or VPH in excess of the YCSR Residential land use standards. The interpreted contaminated horizon is also marked on this figure. The volume of soil contaminated with concentrations of LEPH and /or VPH in excess of the YCSR Residential Land use standard is less than 1500 m³ and is found at depths less than 3 metres. However, we were unable to obtain closure on the contamination towards Brooks Brook on the eastern and southern side of the contamination. It is unclear whether the contamination extends under Brooks Brook. However, the height of the bank above Brooks Brook is approximately 1.74 metres, which is the approximate depth below ground surface of the silt/sand and gravel interface. Thus, the hydrocarbon contamination may daylight into Brooks Brook. Brooks Brook should be considered as the eastern boundary for soil contaminated with hydrocarbons. A similar situation is likely on the southern edge of the contamination, in the vicinity of H98-24. The circle delineating the contaminated area in Figure 8 is not closed on the southern side of H98-24. However, for the purposes of calculating the volume of contaminated soil, it was assumed that this circle would be closed maintaining the radius indicated. Any remedial efforts for this area of contaminated soil would have to be flexible enough to accommodate an increased volume of contaminated soil in this area.

4.1.2 Groundwater

The results of the analysis of groundwater samples collected from the monitoring wells around Foundation "AB" are summarized in Table 2. In order to provide a complete picture of the area of groundwater contamination at Foundation "AB", all of the monitoring wells around Foundation "AB" were sampled during the last sampling event. The original laboratory results are included in Appendix C.

The results of the analysis of groundwater samples indicated that the following monitoring wells had concentrations of PAH compounds in excess of the YCSR Criteria for Groundwater flowing to surface water used by freshwater aquatic life: H97-16 had 15 ppb Naphthalene and H98-18 had 130 ppb Naphthalene. In addition, the analysis of groundwater samples collected from many

of the wells indicated that they had elevated concentrations of TEH: H97-15 had 2000 ppb TEH, H97-16 had 30,000 ppb TEH, H98-18 had 6100 ppb TEH and H98-20 had 6300 ppb TEH. There are no criteria for TEH in the YCSR. Figure 9 shows the distribution of hydrocarbons in groundwater samples collected from the monitoring wells near Foundation "AB."

Hydrogeological data indicated that there are no distinct hydrogeological patterns to groundwater flow in the vicinity of Foundation "AB", as the data indicates that gradients are sporadic in their orientation (Figure 10). At the time of the collection of hydrogeological data, the elevation of the water in Brooks Brook was also surveyed. It appears that the water surface in Brooks Brook is at a slightly higher elevation than the piezometric surface in wells H98-18, H98-23, H97-12, H97-14, H97-15 and H97-16, which would suggest that there may be a net flow from Brooks Brook into the highly permeable sand and gravel horizon.

4.2 New Cook Shack

4.2.1 Organochlorine Pesticides

There are currently no criteria for organochlorine pesticides (OCP) in soils in the YCSR. However, other jurisdictions have used either 0.5 ppm for individual OCPs (IOCP) or 2 ppm for total OCPs. At sites in BC, 10 ppm has been used as a remedial criteria for the removal of contaminated soil. Anything less than 10 ppm has been remediated using encapsulation and risk management. The results of the field and laboratory testing for OCPs will be discussed in the context of all three of these criteria.

Figure 11 shows the extent of OCP contamination in soil using the 0.5 ppm criteria for IOCPs. The areal extent of soil contaminated with OCP concentrations in excess of 0.5 ppm IOCP is approximately 2300 m². Figure 12 shows the extent of OCP contamination in soil using the 2 ppm criteria for total OCP. The areal extent of soil contaminated with OCP concentrations in excess of 2 ppm total OCP is approximately 1600 m². Figure 13 shows the extent of OCP contamination in soil using the 10 ppm criteria for total OCP. The areal extent of soil contaminated with OCP concentrations in excess of 10 ppm total OCP is approximately 900 m².

The results of analysis of soil samples collected during the advancement of test pits at four locations in the grid around the new cook shack have indicated that OCP contamination in excess of 0.5 ppm IOCPs is generally restricted to samples collected to a depth of 0.5 metres in 3 of the 4 test pits (301, 404 and 408). In test pit 107, OCPs in excess of 0.5 ppm IOCP were found at a depth of 1.25 m. Curiously, the concentration of total OCPs in the samples collected at surface (189 ppm) at test pit 107 was lower than at test pit 408, where the sample collected at 0.25 metres had a maximum concentration of 0.011 ppm in an individual OCP yet a concentration of total OCPs at surface of 500.759 ppm.

The results of analysis of soil samples collected during the advancement of test pits at four locations in the grid around the new cook shack have indicated that OCP contamination in excess of 2 ppm total OCPs is generally restricted to samples collected to a depth of 0.5 metres in 3 of the 4 test pits (301, 404 and 408). In test pit 107, OCPs in excess of 2 ppm total OCP were found at a depth of 1 m.

The results of analysis of soil samples collected during the advancement of test pits at four locations in the grid around the new cook shack have indicated that OCP contamination in excess of 10 ppm total OCPs is restricted to samples collected to a depth of 0.75 metres in all of the test pits.

The results of the leachate test has indicated that the concentration of individual OCPs in leachate is at least three orders of magnitude less than is required (industrial landfills will accept OCP contaminated soil with less than 3 mg/L DDT in leachate from these soils) for disposal of OCP contaminated soil in an industrial landfill. Sample 408A had concentrations of o,p-DDT of 0.0022 mg/L in leachate and p,p-DDT of 0.0039 mg/L in leachate; sample 301A had concentrations of o,p-DDT of 0.0016 mg/L in leachate and p,p-DDT of 0.0049 mg/L in leachate; and sample 204A had concentrations of o,p-DDT of 0.00035 mg/L in leachate and p,p-DDT of 0.0015 mg/L in leachate.

4.2.2 Hydrocarbons

The analysis of selected soil samples from the grid around the new cook shack for concentrations of LEPH and HEPH has indicated that 10 out of 40 samples had concentrations of HEPH in excess of the YCSR residential criteria for sites with groundwater flowing to surface water used by aquatic life (Figure 14). The areal extent of soil contaminated with HEPH concentrations in excess of the YCSR residential criteria for sites with groundwater flowing to surface water used by aquatic life is approximately 350 m². During previous investigations, test pits were advanced in the locations of these stained areas in order to determine the depth of the hydrocarbon contamination. It was determined that the hydrocarbon contamination as indicated by black staining was present to a depth of approximately 0.15 metres.

4.3 General Site

A total of 36 shallow soil samples were collected at various random locations across the site and analyzed for OCPs in the field using the immuno assay test kit. The results of these analysis are presented in Table 3 and Figure 7. All of these samples had concentrations of Total OCPs less than 0.4 ppm except for G2 and G9. Both of these samples were submitted to the laboratory for analysis of individual OCPs. Samples G2 had one individual OCP (DDT) in excess of 0.5 ppm while sample G9 had total OCPs of 27.626 ppm, with several individual OCPs in excess of 0.5 ppm. Step outs from G9 were included in the grid around the new cook shack and closure on the contamination around G9 was attained. Step out samples from G2 were tested in the field using the immuno assay kit or in the lab. All of the step out samples from G2 (G34, G35, G36, 207N, 407N and 906N) had concentrations of total OCPs less than 0.4 ppm or individual OCPs less than 0.5 ppm.

5.0 DISCUSSION AND RECOMMENDATIONS

5.1 Foundation "AB"

The results of the analysis of soil and groundwater samples has indicated the presence of hydrocarbon contamination over a fairly restricted area to the west of Brooks Brook. The observations made during the advancement of the boreholes and observations made during the advancement of boreholes at other areas on-site indicate that the regional groundwater table is at a depth of approximately 10 metres below surface at this distance from Teslin Lake. Although there are no deep monitoring wells at this location, the close proximity of Brooks Brook to the monitoring wells; the groundwater gradients which are, in places, opposite to the regional gradient directions; and the soil stratigraphy suggest that the piezometric surface observed in the monitoring wells in the vicinity of Foundation "AB" may represent a perched water table which is a result of water from Brooks Brook seeping into the sand and gravel layer over the silt and clayey silt. It would appear that the potential for the migration of hydrocarbon contaminated groundwater into Brooks Brook is high. In fact, seasonal fluctuations in the level of the water in Brooks Brook may create temporary gradients which may have acted to spread out the hydrocarbon from a more confined source.

It would be difficult to gauge the impacts that the hydrocarbon contamination has on Brooks Brook or the aquatic environment of Teslin Lake. Brooks Brook flows quite rapidly and it is likely that there is a significant dilution of the hydrocarbon inputs to the brook. ESG collected surface water samples in Brooks Brook but did not analyze these for hydrocarbons. Following the determination of the remedial approach for this area, it should be evaluated whether sampling of the surface water in Brooks Brook for concentrations of various hydrocarbons is warranted. For example, if source removal is the chosen remedial approach, then surface water sampling may not be required. However, if risk management is chosen, then surface water sampling should be completed.

The distribution of the monitoring wells in the vicinity of Foundation "AB" did not allow for closure on the groundwater plume at the southern edge of the plume, as no monitoring well was

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installed in borehole H98-17. However, it appears that elevated concentrations of PAH compounds in excess of YCSR criteria are associated with extremely elevated concentrations of LEPH, hydrocarbon staining and a strong hydrocarbon odour in soil samples. Observations made during the advancement of borehole H98-17 indicated no hydrocarbon odours or observed hydrocarbon staining. Thus, it would appear that it is unlikely that the groundwater plume extends to this location from H97-16.

Observations made during the advancement of H97-16 and H98-17 indicated that the thickness of the sand and gravel layer was much greater than at other holes in the vicinity of Foundation "AB." In addition, the drill was unable to advance past 4.27 metres in H98-17. Upon retraction of the augers, chunks of concrete and sand and gravel were observed in the bit. It is possible that borehole H98-17 was also advanced in the former stream bed of Brooks Brook prior to it being diverted for the enhancement of the Alaska Highway. The chunks of concrete may represent debris thrown into the creek during the operation or closure of the Brooks Brook camp. Borehole H98-17 is in line with a linear feature perpendicular to the eastern bank of Brooks Brook which has been interpreted as the former stream course of Brooks Brook. If this lineament continues to the west, it may act as high conductivity cut-off which prevents the further migration of hydrocarbon contaminated groundwater to the south. While this may act to limit the ultimate southern extent of hydrocarbon contaminated soil in the vicinity of Foundation "AB", the possibility that hydrocarbon contaminated groundwater is migrating in a westerly direction, parallel to the present day location of Brooks Brook, in the highly conductive former Brooks Brook stream bed, cannot be discounted.

The question as to whether a large area of soil contaminated with hydrocarbons impacted the groundwater or whether hydrocarbon contamination from what was initially a small source area was spread about in the soil horizon immediately overlying the silt and clayey silt by shifts in the groundwater gradient due to changes in the level of Brooks Brook or seasonal changes is difficult to answer. A large buried concrete sump that collected liquid from a small drainage sump in Foundation "AB" may have been the source of the hydrocarbon contamination, as Foundation "AB" was thought to be the location of a generator. However, the highest concentrations of hydrocarbons were found at some distance away from this sump. In fact, the analysis of soil

samples collected during previous test pitting and boreholes located close to Foundation "AB" and the buried sump indicated that the concentrations of LEPH, HEPH, VPH and PAH compounds in these samples were less than the YCSR criteria. These results suggest that there could be local hydraulic gradients that are directed towards Brooks Brook which caused the migration of hydrocarbon contamination from the concrete sump towards Brooks Brook or that there is another source for the hydrocarbon contamination in the area.

Whatever the source of the hydrocarbon contamination in the vicinity of Foundation "AB," the close proximity of the hydrocarbon contaminated soil to the edge of Brooks Brook limits the available remedial approaches.

5.1.1 Excavation

Excavation of hydrocarbon contaminated soil in this area would require the diversion of Brooks Brook, as a significant amount of seepage would result from the migration of surface water through the porous sand and gravel horizon into an excavation if Brooks Brook were not diverted. The diversion of Brooks Brook may have implications to the stability of the highway above and would be a significant undertaking.

Excavated soil could either be disposed off-site, landfarmed on-site or biopiled on-site. Disposal off-site would be a costly undertaking, with considerable costs for transportation. If approval and space could be found, land farming of hydrocarbon contaminated soil would be a cost effective approach to the treatment of this soil. A treatment cell consisting of a hydrocarbon resistant high density polyethylene membrane floor and cover in a bermed area would be constructed. The membrane would be covered with a layer of protective geotextile followed by a layer of clean sand or gravel. The hydrocarbon contaminated soil would be placed in the treatment cell in a single 0.3 metre thick lift. This would be tilled periodically during the summer when it was sunny and warm. The cell would have to be covered when it was raining in order to limit the production of hydrocarbon contaminated leachate. A sump would be installed in one end of the cell in order to pump out any leachate that would accumulate. The sand or gravel layer would serve as a marker to prevent tearing of the membrane during tilling. Following one summer of tilling, the soil would be sampled to determine if the concentration of hydrocarbons in soil were

reduced below YCSR residential criteria. The volatile nature of some of the contaminants would suggest that reduction in hydrocarbon concentration in the soil would likely be completed within one or two summers at which time the cell could be decommissioned and the soil spread out on site.

An alternative to landfarming would be the construction of a biopile. A biopile is made of contaminated soil mixed with fertilizer in order to promote the growth of hydrocarbon consuming bacteria. The pile is made with an impermeable membrane for a base and cover, and some kind of supports on the edges such as berms or concrete blocks. The soil is mixed with fertilizer, placed in the pile and covered to prevent the infiltration of moisture. The soil is sampled periodically to determine the concentration of hydrocarbon remaining. This method can take longer than land farming, however, the biopile takes up much less space and, since it is always covered, hydrocarbon contaminated leachate is not generally a problem.

5.1.2 Soil Vapour Extraction

The analysis of soil samples has indicated that VPH is a contaminant of concern along with LEPH. Soil vapour extraction may be effective for the VPH contamination in the porous soils. However, it is likely to be only partially effective at removing all of the components of LEPH. Also, the hydrocarbon contamination is found in the saturated thickness above and only slightly in the silt horizon in this area. As such, vapour extraction would have to be preceded by a lowering of the groundwater table such that the circulating air would have access to the pore spaces and absorbed hydrocarbon for volatilization to take place. Again, due to the close proximity of Brooks Brook to the contaminated area, a significant volume of water would have to be pumped in order to reduce the saturated thickness. Due to the presence of dissolved hydrocarbons in excess of the YCSR standards, this water would likely have to be treated before being released. It is unlikely that soil vapour extraction would be a viable option for the remediation of this site.

5.1.3 Pump and Treat

The "Pump and Treat Approach" may be an effective remedial approach for hydrocarbon contaminated groundwater. However, as mentioned above, the close proximity of Brooks Brook

to the contaminated area would result in a significant volume of pumped groundwater requiring treatment. The removal of contaminated groundwater may result in a lowering of the concentration of hydrocarbon contamination in the soil, as the flow of groundwater through the soil to the pumping wells may act to wash a certain percentage of the hydrocarbon contamination from soil particles. However, there is bound to be a residual amount of hydrocarbon contamination adsorbed to soil particles which will be unaffected by groundwater flushing. The treatment of hydrocarbon contaminated groundwater using pump and treat would have to be coordinated with some other approach for contaminated soil.

5.1.4 Enhanced In-Situ Chemical Oxidation

Enhanced chemical oxidation may be an effective treatment approach for this site. This technique uses a high pressure grouting lance to inject hydrogen peroxide into the contaminated horizon. The actual process utilized in the oxidation is known as Fenton's Reagent. Hydrogen peroxide, in the natural presence of transition element catalysts (e.g. iron salts or iron oxides) forms hydroxyl radicals. The hydroxyl radical reacts with organic compounds. The hydroxyl radical cleaves the petroleum hydrocarbon bonds, eventually reducing the contaminants of concern to carbon dioxide, oxygen, water and heat. This system can treat both the soil and groundwater over a very short period of time. It would be effective in the types of soil present at the site. It has no harmful byproducts and the hydroxyl radicals react within a very short period of time such that no hydrogen peroxide or hydroxyl radicals migrate off-site. The frequency of injection sites is dependant on the permeability of the soil in the area and is calculated beforehand and tested in the field such that the injection density can be optimized. This system cause minimal disturbance to the soil and surroundings and it is likely that none of the vegetation in the area would have to be removed. In addition, the hydrogen peroxide solution could be injected quite close to the brook

5.1.5 Risk Management

A final remedial approach would be to monitor the quality of surface water in Brooks Brook for the presence of elevated concentrations of hydrocarbons without remediating the hydrocarbons in the soil and groundwater. This approach, which is essentially a risk management approach,

would be the most cost effective approach and would have to be supported by a ecological and human health risk assessment.

5.2 Foundation "K"

The results of the investigations in this area have indicated that hydrocarbon contamination of soil in the vicinity of Foundation "K" is limited in areal and vertical extent. There does not appear to be any migration of hydrocarbon into the groundwater from this area. Apart from an absence of vegetation on the surface around the area contaminated with hydrocarbon, there is no evidence of surficial staining or other impacts. The following remedial approaches are possible.

5.2.1 Excavation

Excavation of hydrocarbon contaminated soil in this area would be a very simple and straightforward approach. However, there are at present few disposal or treatment options for hydrocarbon contaminated soil, short of trucking it to an approved facility in Alberta. If approval and space could be found, land farming of hydrocarbon contaminated soil would be a cost effective approach to the treatment of this soil. A treatment cell consisting of a hydrocarbon resistant high density polyethylene membrane floor and cover in a bermed area would be constructed. The membrane would be covered with a layer of protective geotextile followed by a layer of clean sand or gravel. The hydrocarbon contaminated soil would be placed in the treatment cell in a single 0.3 meter thick lift. This would be tilled periodically during the summer when it was sunny and warm. The cell would have to be covered when it was raining in order to limit the production of hydrocarbon contaminated leachate. A sump would be installed in one end of the cell in order to pump out any leachate that would accumulate. The sand or gravel layer would serve as a marker to prevent tearing of the membrane during tilling. Following one summer of tilling, the soil would be sampled to determine if the concentration of hydrocarbons in soil were reduced below YCSR residential criteria. The volatile nature of the contaminants would suggest that reduction in hydrocarbon concentration in the soil would likely be completed within one or two summers at which time the cell could be decommissioned and the soil spread out on site.

An alternative to landfarming would be the construction of a biopile. A biopile is made of contaminated soil mixed with fertilizer in order to promote the growth of hydrocarbon consuming bacteria. The pile is made with an impermeable membrane for a base and cover, and some kind of supports on the edges such as berms or concrete blocks. The soil is mixed with fertilizer, placed in the pile and covered to prevent the infiltration of moisture. The soil is sampled periodically to determine the concentration of hydrocarbon remaining. This method can take longer than land farming, however, the biopile takes up much less space and, since it is always covered, hydrocarbon contaminated leachate is not generally a problem.

5.2.2 Enhanced In-Situ Chemical Oxidation

Enhanced chemical oxidation may be an effective treatment approach for this site. This technique uses a high pressure grouting lance to inject hydrogen peroxide into the contaminated horizon. The actual process utilized in the oxidation is known as Fenton's Reagent. Hydrogen peroxide, in the natural presence of transition element catalysts (e.g. iron salts or iron oxides) forms hydroxyl radicals. The hydroxyl radical reacts with organic compounds. The hydroxyl radical cleaves the petroleum hydrocarbon bonds, eventually reducing the contaminants of concern to carbon dioxide, oxygen, water and heat. This system can treat both the soil and groundwater over a very short period of time. It would be effective in the types of soil present at the site. It has no harmful byproducts and the hydroxyl radicals react within a very short period of time such that no hydrogen peroxide or hydroxyl radicals migrate off-site. The frequency of injection sites is dependant on the permeability of the soil in the area and is calculated beforehand and tested in the field such that the injection density can be optimized. This system cause minimal disturbance to the soil and surroundings and it is likely that none of the vegetation in the area would have to be removed.

5.2.3 Risk Management

A final remedial approach would be to monitor the quality of groundwater in the monitoring wells in the area for the presence of elevated concentrations of hydrocarbons without remediating the hydrocarbons in the soil. This approach, which is essentially a risk management approach, would be the most cost effective approach and would have to be supported by an ecological and human health risk assessment.

5.3 New Cook Shack

The remedial approach will be dependant on the remedial criteria adopted for OCPs in this area. The estimated volume of material contaminated with concentrations of OCP in excess of 0.5 ppm individual OCPs is approximately 3162 m³ if a contaminated depth of 1.375 metres is adopted. This depth of contamination was calculated based on one test pit with a sample at 1.25 metres having concentrations of individual OCPs in excess of 0.5 ppm and a sample at 1.5 metres having concentrations of individual OCPs less than 0.5 ppm. However, in three of the four test pits advanced to test the depth of OCP contamination, the maximum depth of contamination using the 0.5 ppm individual OCP criteria was 0.5 metres. Thus, assuming that, over the entire area contaminated with individual OCPs in excess of 0.5 ppm, the average depth of contamination is 0.625 metres (using the same calculation for depth of contamination as above), then the total volume of contaminated soil is approximately 1437 m³.

If the 2 ppm total OCP criteria is used, then the total volume of soil contaminated with concentrations of OCP in excess of 2 ppm total OCP is approximately 1800 m³ if a contaminated depth of 1.125 metres was adopted. However, in three of the four test pits advanced to test the depth of OCP contamination, the maximum depth of contamination using the 2 ppm total OCP criteria was 0.5 metres. Thus, assuming that, over the entire area contaminated with total OCP concentrations in excess of 2 ppm, the average depth of contamination is 0.625 metres, then the total volume of contaminated soil is approximately 1000 m³.

If the 10 ppm total OCP criteria is used, then the total volume of soil contaminated with concentrations of OCP in excess of 10 ppm total OCP is approximately 787 m³ if a contaminated depth of 0.875 metres was adopted.

There are three possible remedial options for the OCP contaminated soil: excavation and off-site disposal, risk management or risk management along with minimal excavation and off-site disposal. The area of hydrocarbon contaminated soil is included within the area of OCP contaminated soil using the 0.5 ppm individual OCP criteria. If the 2 ppm or 10 ppm total OCP

criteria is used, then an excavation for HEPH contaminated soil will also have to be completed to a depth of approximately 0.2 metres in areas to the west of the OCP contaminated soil. Unfortunately, this material will likely have to be disposed as OCP contaminated soil.

5.3.1 Excavation and Off-Site Disposal

Excavation of OCP contaminated soil would require strict health and safety precautions to limit exposure to remedial workers. The excavation would be proceeded by the removal of vegetation over the contaminated area. The vegetation would have to be tested for concentrations of OCP prior to disposal. The excavation would likely proceed in cells, with confirmation samples collected and tested in the field using the immunoassay field test kit. The excavated soil would be placed in the appropriate containers for shipment off-site. Due to the tremendous costs associated with the disposal of OCP contaminated soil at Swan Hills, field screening of samples and perhaps the mobilization of a portable laboratory for in field testing would be warranted. There is the possibility that the material could be transported to an industrial landfill in Alberta if the concentration of DDT and its metabolites is less than 3 mg/L in the leachate. This would have to be tested on existing samples.

5.3.2 Risk Assessment

In order to leave the contaminated soil in-place at this site, a human and ecological risk assessment would have to be completed. The concentration of OCPs in the surface soils is very high and it is unlikely that risk assessment and management without some form of OCP contaminated soil removal would be acceptable.

5.3.3 Partial Excavation and Off-Site Disposal with Risk Management

The partial removal of the most highly contaminated surficial soils to a depth of 0.25 metres accompanied by encapsulation of the remaining OCP contaminated soil with a layer of clean material may prove to be the most cost effective method of remediation for OCP contaminated soil at this site. The decision as to what constitutes the highly contaminated area will be based on the remedial criteria adopted for the site. One of the concerns with this approach would be the long term impact to Brooks Brook and Teslin Lake from the material that would be left on-site.

The solubility of DDT and DDT metabolites is low. This, in conjunction with a fairly deep

groundwater table would suggest that the mobilization of OCP contaminants into the groundwater table and ultimately into Brooks Brook and Teslin Lake is unlikely. The potential impact of OCP contaminated soil on Brooks Brook and Teslin Lake would have to be evaluated as part of a ecological risk assessment and the risks posed to humans using the site would have to be evaluated as part of a human health risk assessment.

5.4 Other Areas On Site

5.4.1 Foundation "Y" (ESG's Foundation 1)

ESG identified lead and zinc contamination at one sample location on the northwest corner of this foundation. Test pits advanced by Hemmera have shown very little evidence of anthropogenic debris at depth in the test pits. It is likely that lead and zinc contamination is limited in areal extent and depth and probably the result of metallic debris in the sample. The risks of exposure for this type of contamination are likely through inhalation or ingestion. Therefore, Hemmera recommends that the area around this foundation be cleared of any surface debris and the foundation and surrounding area be covered with a layer of at least 0.5 m of clean backfill.

5.4.2 Foundation "P" (ESG's Foundation 5)

ESG completed the delineation of metals contamination in this area. Hemmera advanced several test pits around this foundation and found that there is no evidence of anthropogenic debris at depth in the test pits. The risk of exposure for this type of contamination are likely through inhalation or ingestion. Therefore, Hemmera recommends that this foundation and surrounding area be covered with a layer of at least 0.5 m of clean backfill.

5.4.3 Main Landfill (ESG's North Landfill)

Hemmera did not collect any soil samples for analysis at this landfill. ESG indicated that a minor amount (1 m³) of arsenic contaminated soil is present at the north end of this landfill. The presence of various metallic debris scattered in the vicinity of the landfill would suggest that there is a possibility of other, highly localized zones of metallic contamination around this landfill.

The analysis of groundwater samples collected from monitoring wells installed around this landfill has indicated the presence of chlorinated phenols in groundwater. Chlorinated phenols are found in wood preservatives, pesticides and herbicides. It is possible that used containers for herbicides or pesticides may have had residues that leached into the groundwater. However, the piezometric surface is approximately 12 to 19 m below surface. It is unlikely that chlorinated phenols would be able to percolate to these depths without significant attenuation of concentrations due to adsorption in the silt and clayey silt soils. The project lab has indicated that there is a possibility that cross contamination of the samples has occurred. Samples from another project with high concentrations of chlorinated phenols were run in the same batch as the samples from this project. The possibility of cross-contamination cannot be discounted in this case.

Hemmera recommends that this landfill be properly closed, including: the collection and localization of any debris; coverage of the landfill and surrounding areas with clean backfill; and long term monitoring of groundwater quality. Piezometric elevations should be monitored and groundwater samples collected and analyzed for concentrations of chlorinated phenols in order to determine if the initial analytical results from the analysis of groundwater samples were accurate or reflected cross-contamination in the lab.

5.4.4 South Landfill

Hemmera did not collect any soil samples at this landfill. ESG's investigation indicated the presence of metals contaminated soil (2 m³) at three locations along the landfill. Again, the nature of landfills would suggest that there is the possibility of other highly localized zones of metallic contamination around this landfill.

The analysis of groundwater collected from monitoring wells installed around this landfill has indicated the presence of chlorinated phenols in groundwater. Hemmera recommends that the quality of the groundwater be re-evaluated along with the piezometric elevations as detailed above. The landfill should be properly closed as detailed above.

5.5 Summary Table

Table 5 below presents the contaminants, the surface area impacted and the volume of impacted soil for each area.

Table 5
Summary of Areas of Concern

Area	Contaminants	Criteria	Surface Area m ²	Volume m ³
Main Landfill	Arsenic(soil) Chlorinated Phenols (water)(but may be false positive result)	YCSR Residential (soil) YCSR Aquatic Life (water)	Soil contamination dispersed over landfill area of 6400 m ²	Surficial , likely less than 0.5 metres deep
South Landfill	Metals (soil) Chlorinated Phenols (water)(but may be false positive result)	YCSR Residential (soil) YCSR Aquatic Life (water)	Soil contamination dispersed over landfill area of 2800 m ²	Surficial , likely less than 0.5 metres deep
Foundation Y	Metals (soil)	YCSR Residential (soil)	2 m strip around edge of foundation	Surficial, likely less than 0.5 metres deep
Foundation P	Metals (soil)	YCSR Residential (soil)	2 m strip around edge of foundation	Surficial, likely less than 0.5 metres deep
Foundation K	VPH and LEPH (soil)	YCSR Residential (soil)	100 m ²	300 m ³
Foundation AB	VPH and LEPH (soil) Naphthalene (water)	YCSR Residential (soil) YCSR Aquatic Life (water)	450 m ²	1500 m ³
New Cook Shack	OCP (soil)	Individual OCP > 0.5 ppm	2230 m ²	1437 m ³
		Total OCP > 2 ppm	1600 m ²	1000 m ³
		Total OCP > 10 ppm	900 m ²	787 m ³

6.0 STANDARD LIMITATIONS

This report was prepared for the exclusive use of the Indian and Northern Affairs Canada and their representatives in accordance with the terms and conditions set forth in our proposal. The findings and conclusions documented in this report have been prepared for specific application to this project and have been developed in a manner consistent with the level of care and skill normally exercised by members of the environmental science profession currently practicing under similar conditions in the area.

This report is based on data and information collected during the review and investigation conducted by Hemmera Resource Consultants Ltd. personnel and is based solely on the site conditions at the time of the field investigations and the available reports on the site as described in this report. Any use which a Third Party makes of this report, or any reliance on the decisions to be made based on it, are the responsibility of such Third Parties. Hemmera Resource Consultants Ltd. accept no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

A potential remains for the presence of unknown, unidentified or unforeseen surface and subsurface contamination. Further evidence against such potential site contamination would require additional studies, surface and sub-surface exploration and testing.

If new information is developed in future work (which may include excavations, borings, or other studies), Hemmera Resource Consultants Ltd. should be requested to re-evaluate the conclusions of this report and to provide amendments as required.

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**Table 1 - Analytical Results for BTEX, LEPH, HEPH and VPH in Soil Around Foundation AB
Brooks Brook, Yukon
INAC
File: 316 - 003**

Parameter	Criteria*	Criteria**	Units	Sample ID Date Sampled Depth (m)	H97-10-8' Nov. '97 2.43	H97-11-6' Nov. '97 1.83	H97-12-7' Nov. '97 2.13	H97-12-12.5' Nov. '97 3.81	H97-13-5' Nov. '97 1.52	H97-13-7.5' Nov. '97 2.29	H97-13-10' Nov. '97 3.05	H97-13-12.5' Nov. '97 3.81
LEPH-uncorrected for PAH's	NC	1000	ug/g		< 250	< 250	< 250	< 250	400	< 250	< 250	< 250
HEPH-uncorrected for PAH's	NC	1000	ug/g		< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250
Benzene	8	1000	ug/g		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ethylbenzene	1000	3500	ug/g		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Toluene	300	6500	ug/g		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Xylenes	NC	65000	ug/g		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Volatile Pet. Hydrocarbons	NC	200	ug/g		< 10	< 10	< 10	< 10	170	66	< 10	19

Parameter	Criteria*	Criteria**	Units	Sample ID Date Sampled Depth (m)	H97-14-5' Nov. '97 1.52	H97-15-5' Nov. '97 1.52	H97-15-10' Nov. '97 3.05	H97-16-6' Nov. '97 1.83	H97-16-12' Nov. '97 3.66	Dup1 Nov. '97	Dup2 Nov. '97	H98-17-5' Aug. '98 1.52
LEPH-uncorrected for PAH's	NC	1000	ug/g		< 250	1400	< 250	3400	< 250	< 250	< 250	< 250
HEPH-uncorrected for PAH's	NC	1000	ug/g		< 250	< 250	< 250	300	< 250	< 250	< 250	< 250
Benzene	8	1000	ug/g		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ethylbenzene	1000	3500	ug/g		< 0.5	0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Toluene	300	6500	ug/g		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Xylenes	NC	65000	ug/g		< 0.5	2.3	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Volatile Pet. Hydrocarbons	NC	200	ug/g		43	730	100	140	59	< 10	< 10	< 10

* Yukon CSR Criteria - Groundwater flowing to surface water used by aquatic life for Residential or Park Land

**Yukon CSR Criteria - Generic criteria or human intake of contaminated soil criteria for Residential or Park Land

Exceeds Criteria

2700

NC = No criteria available for this parameter

NA = Not analyzed for this parameter

Dup 1 = 12-12.5, Dup 2 = 13-12.5

**Table 1 - Analytical Results for BTEX, LEPH, HEPH and VPH in Soil Around Foundation AB
Brooks Brook, Yukon
INAC
File: 316 - 003**

Parameter	Criteria*	Criteria**	Units	Sample ID Date Sampled Depth (m)	H98-18-2.5' Aug. '98 0.76	H98-18-4' Aug. '98 1.22	H98-18-7.5' Aug. '98 2.29	H98-19-5.5' Aug. '98 1.68	H98-19-7.5' Aug. '98 2.29	H98-20A-5.5' Aug. '98 1.68	H98-21-10' Aug. '98 3.05	H98-22-6.5' Aug. '98 1.98
LEPH-uncorrected for PAH's	NC	1000	ug/g		< 250	7400	< 250	1900	< 250	1800	< 250	< 250
HEPH-uncorrected for PAH's	NC	1000	ug/g		< 250	690	< 250	< 250	< 250	< 250	< 250	< 250
Benzene	8	1000	ug/g		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ethylbenzene	1000	3500	ug/g		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Toluene	300	6500	ug/g		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Xylenes	NC	65000	ug/g		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Volatile Pet. Hydrocarbons	NC	200	ug/g		< 10	630	< 10	180	< 10	370	< 10	< 10

Parameter	Criteria*	Criteria**	Units	Sample ID Date Sampled Depth (m)	H98-23-6' Aug. '98 1.83	H98-24-6.5' Aug. '98 1.98	H98-25-5.5' Aug. '98 1.68	H98-26-5.5' Aug. '98 1.68	Culvert Aug. '98 1.52
LEPH-uncorrected for PAH's	NC	1000	ug/g		< 250	2700	< 250	< 250	< 250
HEPH-uncorrected for PAH's	NC	1000	ug/g		< 250	810	< 250	< 250	420
Benzene	8	1000	ug/g		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Ethylbenzene	1000	3500	ug/g		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Toluene	300	6500	ug/g		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Xylenes	NC	65000	ug/g		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Volatile Pet. Hydrocarbons	NC	200	ug/g		< 10	550	< 10	< 10	< 10

* Yukon CSR Criteria - Groundwater flowing to surface water used by aquatic life for Residential or Park Land

**Yukon CSR Criteria - Generic criteria or human intake of contaminated soil criteria for Residential or Park Land

Exceeds Criteria 2700

NC = No criteria available for this parameter

NA = Not analyzed for this parameter

Dup 1 = 12-12.5, Dup 2 = 13-12.5

Table 2
Analytical Results for BTEX, PAHs, and TEH in GRoundwater Around Foundation AB
Brooks Brook, Yukon
INAC
File: 316 - 003

Parameter	Criteria*	Sample ID Date Sampled Units	H97-12 Aug,1998	H97-14 Aug,1998	H97-15 Aug,1998	H97-16 Aug,1998	Dup98-1 Aug,1998	H98-18 Aug,1998	H98-20 Aug,1998
Naphthalene	10	ug/L	< 0.3	< 0.3	< 0.3	15	16	130	1.7
Acenaphthylene		ug/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	60	ug/L	< 0.1	< 0.1	< 0.1	0.6	0.6	1.3	0.7
Fluorene	120	ug/L	< 0.05	< 0.05	< 0.05	2	2.1	3.7	1.7
Phenanthrene	3	ug/L	< 0.05	< 0.05	< 0.05	0.62	0.6	1	0.3
Anthracene	1	ug/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acridine	0.5	ug/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total LMW-PAH's		ug/L	-	-	-	18.2	19.3	136	4.4
Fluoranthene	2	ug/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Pyrene	0.2	ug/L	< 0.02	< 0.02	< 0.2	< 0.02	< 0.02	< 0.02	< 0.02
Benzo(a)anthracene	1	ug/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene		ug/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b)fluoranthene		ug/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene		ug/L	-	-	-	-	-	-	-
Benzo(a)pyrene	0.1	ug/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene		ug/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene		ug/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene		ug/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Total HMW-PAH's		ug/L	-	-	-	-	-	-	-
Total PAH's		ug/L	-	-	-	18.2	19.3	136	4.4
Total Extractable Hydrocarbons									
TEH		ug/L	< 100	1000	2000	30000	25000	6100	6300
Monocyclic Aromatic Hydrocarbons									
Benzene	3000	ug/L	< 0.1	< 0.1	0.3	< 0.1	< 0.1	< 2.5	< 2.5
Ethylbenzene	7000	ug/L	< 0.1	< 0.1	< 0.1	1.1	1.4	6.6	< 2.5
Toluene	3000	ug/L	< 0.1	< 0.1	< 0.1	0.2	0.2	< 2.5	< 2.5
Xylenes		ug/L	< 0.1	< 0.1	< 0.1	3.9	3.9	35	2.6
1,3,5-Trimethylbenzene		ug/L	< 0.1	0.3	0.2	3.3	3.1	61	< 2.5

Notes Dup98-1 = H97-16

*YCSR Generic Aquatic Life Criteria

Exceeds Criteria 567

Table 2
Analytical Results for BTEX, PAHs, and TEH in GRoundwater Around Foundation AB
Brooks Brook, Yukon
INAC
File: 316 - 003

Parameter	Criteria*	Units	Sample ID	H98-23	H98-25
			Date Sampled	Aug,1998	Aug,1998
Naphthalene	10	ug/L		< 0.3	< 0.3
Acenaphthylene		ug/L		< 0.1	< 0.1
Acenaphthene	60	ug/L		0.2	< 0.1
Fluorene	120	ug/L		0.32	< 0.05
Phenanthrene	3	ug/L		< 0.05	< 0.05
Anthracene	1	ug/L		< 0.05	< 0.05
Acridine	0.5	ug/L		< 0.05	< 0.05
Total LMW-PAH's		ug/L		0.52	-
Fluoranthene	2	ug/L		< 0.05	< 0.05
Pyrene	0.2	ug/L		< 0.02	< 0.02
Benzo(a)anthracene	1	ug/L		< 0.01	< 0.01
Chrysene		ug/L		< 0.01	< 0.01
Benzo(b)fluoranthene		ug/L		< 0.01	< 0.01
Benzo(k)fluoranthene		ug/L		-	-
Benzo(a)pyrene	0.1	ug/L		< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene		ug/L		< 0.01	< 0.01
Dibenz(a,h)anthracene		ug/L		< 0.01	< 0.01
Benzo(g,h,i)perylene		ug/L		< 0.01	< 0.01
Total HMW-PAH's		ug/L		-	-
Total PAH's		ug/L		0.52	-
Total Extractable Hydrocarbons					
TEH		ug/L		2000	< 100
Monocyclic Aromatic Hydrocarbons					
Benzene	3000	ug/L		< 0.1	< 0.1
Ethylbenzene	7000	ug/L		0.1	< 0.1
Toluene	3000	ug/L		< 0.1	< 0.1
Xylenes		ug/L		1.4	< 0.1
1,3,5-Trimethylbenzene		ug/L		6.5	< 0.1

Notes Dup98-1 = H97-16

*YCSR Generic Aquatic Life Criteria

Exceeds Criteria 567

Table 3 - Analytical Results for Organochlorine Pesticides in Soil
Brooks Brook, Yukon
INAC
File: 316 - 003

Parameter	Units	Sample ID	101A	102N	103A	105A	107A	107-0.25	107-0.5	107-0.75	107-1.0	107-1.25
		Date Sampled Depth	Aug, 1998 0-10cm	Oct, 1998 0-10cm	Aug, 1998 0-10cm	Aug, 1998 0-10cm	Aug, 1998 0-10cm	Oct, 1998 25cm	Oct, 1998 50cm	Oct, 1998 75cm	Oct, 1998 100cm	Oct, 1998 125cm
Aldrin	ug/g		< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.02	< 0.02	< 0.005	< 0.005	< 0.005
alpha-BHC	ug/g		< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.02	< 0.02	< 0.005	< 0.005	< 0.005
beta-BHC	ug/g		< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.02	< 0.02	< 0.005	< 0.005	< 0.005
delta-BHC	ug/g		< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.02	< 0.02	< 0.005	< 0.005	< 0.005
gamma-BHC (Lindane)	ug/g		< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.02	< 0.02	< 0.005	< 0.005	< 0.005
alpha-Chlordane	ug/g		< 0.005	< 0.025	< 0.005	< 0.005	0.037	0.19	0.2	< 0.025	< 0.025	< 0.025
gamma-Chlordane	ug/g		< 0.005	< 0.025	< 0.005	< 0.005	< 0.005	0.13	0.22	< 0.025	< 0.025	< 0.025
p,p-DDD	ug/g		0.98	0.15	0.073	0.37	27	26	32	0.03	0.38	0.24
o,p-DDE	ug/g		0.014	< 0.015	< 0.003	0.019	0.26	< 0.06	< 0.06	< 0.015	< 0.015	< 0.015
p,p-DDE	ug/g		1.2	0.08	< 0.003	0.29	4.8	1.2	1.4	< 0.015	0.06	0.02
o,p-DDT	ug/g		1.9	0.06	< 0.003	0.81	27	12	19	0.08	1.6	0.64
p,p-DDT	ug/g		10	0.91	0.037	2.4	130	30	50	0.2	0.21	0.08
Dieldrin	ug/g		0.003	< 0.015	< 0.003	< 0.003	0.008	< 0.06	< 0.06	< 0.015	< 0.015	< 0.015
Endosulfan I	ug/g		< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.2	< 0.2	< 0.05	< 0.05	< 0.05
Endosulfan II	ug/g		< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.2	< 0.2	< 0.05	< 0.05	< 0.05
Endosulfan Sulphate	ug/g		< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.2	< 0.2	< 0.05	< 0.05	< 0.05
Endrin	ug/g		< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.2	< 0.2	< 0.05	< 0.05	< 0.05
Endrin Aldehyde	ug/g		< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.2	< 0.2	< 0.05	< 0.05	< 0.05
Heptachlor	ug/g		< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.02	< 0.02	< 0.005	< 0.005	< 0.005
Heptachlor Epoxide	ug/g		< 0.001	< 0.005	< 0.001	< 0.001	0.002	< 0.02	< 0.02	< 0.005	< 0.005	< 0.005
Methoxychlor	ug/g		< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.2	< 0.2	< 0.05	< 0.05	< 0.05
Toxaphene	ug/g		< 0.3	< 1.5	< 0.3	< 0.3	< 0.3	< 6	< 6	< 1.5	< 1.5	< 1.5
Total Organochlorine Pesticides	ug/g		14.097	1.2	0.11	0.89	189.107	69.52	102.82	0.31	2.25	0.98

Exceeds Individual Organochlorine **0.91**

Pesticide Criteria of 0.5 ug/g

Exceeds Total Organochlorine **0.91**

Pesticide Criteria of 2 ug/g

Exceeds Total Organochlorine **189**

Pesticide Concentration of 10 ug/g

Table 3 - Analytical Results for Organochlorine Pesticides in Soil
Brooks Brook, Yukon
INAC
File: 316 - 003

Parameter	Units	Sample ID Date Sampled Depth	109 Oct, 1998 0-10cm	111 Sep, 1998 0-10cm	201N Oct, 1998 0-10cm	202A Aug, 1998 0-10cm	204A Aug, 1998 0-10cm	205N Oct, 1998 0-10cm	206A Aug, 1998 0-10cm	208A Aug, 1998 0-10cm	210 Oct, 1998 0-10cm	301A Aug, 1998 0-10cm
Aldrin	ug/g		< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.005	< 0.001
alpha-BHC	ug/g		< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.005	< 0.001
beta-BHC	ug/g		< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.005	0.008	0.009	< 0.005	< 0.001
delta-BHC	ug/g		< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.005	0.001	< 0.001	< 0.005	< 0.001
gamma-BHC (Lindane)	ug/g		< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.005	< 0.001
alpha-Chlordane	ug/g		< 0.005	< 0.005	< 0.025	< 0.005	0.042	< 0.025	< 0.005	< 0.005	< 0.025	0.1
gamma-Chlordane	ug/g		< 0.005	< 0.005	< 0.025	< 0.005	< 0.005	< 0.025	< 0.005	< 0.005	< 0.025	< 0.005
p,p-DDD	ug/g		0.16	0.11	0.13	0.015	6	0.07	1.6	1.9	0.48	< 0.005
o,p-DDE	ug/g		< 0.003	< 0.003	< 0.015	< 0.003	0.18	< 0.015	0.014	0.17	< 0.015	0.16
p,p-DDE	ug/g		0.08	0.14	0.24	< 0.003	1.3	0.03	0.11	0.51	0.09	6.2
o,p-DDT	ug/g		0.088	0.25	0.12	< 0.003	7	0.01	2	6.1	0.45	22
p,p-DDT	ug/g		37	1.2	6.8	0.008	31	0.2	9.6	23	0.66	83
Dieldrin	ug/g		< 0.003	< 0.003	< 0.015	< 0.003	0.03	< 0.015	< 0.003	0.006	< 0.015	0.082
Endosulfan I	ug/g		< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01
Endosulfan II	ug/g		< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	0.24
Endosulfan Sulphate	ug/g		< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01
Endrin	ug/g		< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01
Endrin Aldehyde	ug/g		< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	0.03
Heptachlor	ug/g		< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.005	0.002	0.002	< 0.005	0.037
Heptachlor Expoxide	ug/g		< 0.001	< 0.001	< 0.005	< 0.001	0.002	< 0.005	< 0.001	< 0.001	< 0.005	< 0.001
Methoxychlor	ug/g		< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	0.03	< 0.05	0.02
Toxaphene	ug/g		< 0.3	< 0.3	< 1.5	< 0.3	< 0.3	< 1.5	< 0.3	< 0.3	< 1.5	< 0.3
Total Organochlorine Pesticides	ug/g		37.328	1.7	7.29	0.023	45.554	0.31	13.335	31.727	1.68	111.869

Exceeds Individual Organochlorine **0.91**
Pesticide Criteria of 0.5 ug/g

Exceeds Total Organochlorine **189**
Pesticide Criteria of 2 ug/g

Exceeds Total Organochlorine **189**
Pesticide Concentration of 10 ug/g

Table 3 - Analytical Results for Organochlorine Pesticides in Soil
Brooks Brook, Yukon
INAC
File: 316 - 003

Parameter	Units	Sample ID	301-0.25	301-0.50	302N	303A	Dup 303A	303B	Dup 303B	305A	307A	309
		Date Sampled Depth	Oct, 1998 25cm	Oct, 1998 50cm	Oct, 1998 0-10cm	Aug, 1998 0-10cm	Aug, 1998 0-10cm	Aug, 1998 20-30cm	Aug, 1998 20-30cm	Aug, 1998 0-10cm	Aug, 1998 0-10cm	Sep, 1998 0-10cm
Aldrin	ug/g		< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.01
alpha-BHC	ug/g		< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	<0.01
beta-BHC	ug/g		< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	0.002	0.008	<0.01
delta-BHC	ug/g		< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	<0.01
gamma-BHC (Lindane)	ug/g		< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	0.004	< 0.001	<0.01
alpha-Chlordane	ug/g		< 0.005	< 0.005	< 0.025	0.093	0.091	0.01	0.012	< 0.005	0.059	12
gamma-Chlordane	ug/g		< 0.005	< 0.005	< 0.025	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	15
p,p-DDD	ug/g		0.005	< 0.005	0.28	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	1500
o,p-DDE	ug/g		< 0.003	< 0.003	< 0.015	0.022	0.026	0.004	0.004	0.004	0.2	1.4
p,p-DDE	ug/g		0.003	< 0.003	0.26	0.17	0.16	0.037	0.04	< 0.003	1.9	150
o,p-DDT	ug/g		0.004	< 0.003	0.35	0.29	0.27	0.31	0.25	1.8	0.48	21
p,p-DDT	ug/g		0.013	< 0.003	4.5	1	0.84	0.78	0.72	7.7	25	42
Dieldrin	ug/g		< 0.003	< 0.003	< 0.015	0.065	0.071	0.006	0.008	< 0.003	0.034	<0.03
Endosulfan I	ug/g		< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	<0.1
Endosulfan II	ug/g		< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	<0.1
Endosulfan Sulphate	ug/g		< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	<0.1
Endrin	ug/g		< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	<0.1
Endrin Aldehyde	ug/g		< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	<0.1
Heptachlor	ug/g		< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	0.006	0.013	<0.01
Heptachlor Expoxide	ug/g		< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	<0.01
Methoxychlor	ug/g		< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	<0.1
Toxaphene	ug/g		< 0.3	< 0.3	< 1.5	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	<3
Total Organochlorine Pesticides	ug/g		0.025	0		1.64	1.458	1.147	1.034		27.694	1741.4

Exceeds Individual Organochlorine **0.91**
Pesticide Criteria of 0.5 ug/g

Exceeds Total Organochlorine **3089**
Pesticide Criteria of 2 ug/g

Exceeds Total Organochlorine **189**
Pesticide Concentration of 10 ug/g

Table 3 - Analytical Results for Organochlorine Pesticides in Soil
Brooks Brook, Yukon
INAC
File: 316 - 003

Parameter	Units	Sample ID Date Sampled Depth	313 Oct, 1998 0-10cm	401N Sep, 1998 0-10cm	402A Aug, 1998 0-10cm	402B Aug, 1998 20-30cm	403A Aug, 1998 0-10cm	403B Aug, 1998 20-30cm	404-0.5 Oct, 1998 50cm	404-0.75 Oct, 1998 75cm	404-1.0 Oct, 1998 100cm	404A Aug, 1998 0-10cm	404B Aug, 1998 20-30cm
Aldrin	ug/g		< 0.001	< 0.01	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	0.001
alpha-BHC	ug/g		< 0.001	< 0.01	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	0.003	0.004
beta-BHC	ug/g		< 0.001	< 0.01	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	0.008	0.061
delta-BHC	ug/g		< 0.001	< 0.01	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001
gamma-BHC (Lindane)	ug/g		< 0.001	< 0.01	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001
alpha-Chlordane	ug/g		< 0.005	0.16	< 0.005	< 0.005	0.01	0.006	< 0.025	< 0.005	< 0.005	0.04	0.083
gamma-Chlordane	ug/g		< 0.005	0.4	< 0.005	< 0.005	< 0.005	< 0.005	< 0.025	< 0.005	< 0.005	< 0.005	< 0.005
p,p-DDD	ug/g		0.02	20	0.005	< 0.005	1	0.61	0.54	0.017	0.008	8.6	0.17
o,p-DDE	ug/g		< 0.003	< 0.03	< 0.003	< 0.003	0.044	0.012	< 0.015	< 0.003	< 0.003	0.31	1.8
p,p-DDE	ug/g		0.018	5.3	< 0.003	< 0.003	1.3	0.66	0.14	0.009	< 0.003	9.2	15
o,p-DDT	ug/g		0.01	15	< 0.003	< 0.003	1.8	0.93	0.65	0.013	0.007	15	49
p,p-DDT	ug/g		0.11	14	< 0.003	< 0.003	6.6	4.4	0.63	0.037	0.033	77	130
Dieldrin	ug/g		< 0.003	< 0.03	< 0.003	< 0.003	0.013	0.006	< 0.015	< 0.003	< 0.003	0.031	0.25
Endosulfan I	ug/g		< 0.01	< 0.1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	0.34
Endosulfan II	ug/g		< 0.01	< 0.1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01
Endosulfan Sulphate	ug/g		< 0.01	< 0.1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01
Endrin	ug/g		< 0.01	< 0.1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01
Endrin Aldehyde	ug/g		< 0.01	< 0.1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01
Heptachlor	ug/g		< 0.001	< 0.01	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001
Heptachlor Epoxide	ug/g		< 0.001	< 0.01	< 0.001	< 0.001	0.007	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001
Methoxychlor	ug/g		< 0.01	< 0.1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	0.06	< 0.01
Toxaphene	ug/g		< 0.3	< 3	< 0.3	< 0.3	< 0.3	< 0.3	< 1.5	< 0.3	< 0.3	< 0.3	< 0.3
Total Organochlorine Pesticides	ug/g		0.158	54.86	0.005	0	10.774	6.62	1.96	0.076	0.048	110.252	196.709

Exceeds Individual Organochlorine **0.91**
Pesticide Criteria of 0.5 ug/g

Exceeds Total Organochlorine **110.252**
Pesticide Criteria of 2 ug/g

Exceeds Total Organochlorine **189**
Pesticide Concentration of 10 ug/g

Table 3 - Analytical Results for Organochlorine Pesticides in Soil
Brooks Brook, Yukon
INAC
File: 316 - 003

Parameter	Units	Sample ID	404N	406A	Dup 406A	407A	407B	407N	408A	408-0.25	408-0.50	408-0.75	410
		Date Sampled Depth	Oct, 1998 0-10cm	Aug, 1998 0-10cm	Aug, 1998 0-10cm	Aug, 1998 0-10cm	Aug, 1998 20-30cm	Oct, 1998 0-10cm	Aug, 1998 0-10cm	Oct, 1998 25cm	Oct, 1998 50cm	Oct, 1998 75cm	Oct, 1998 0-10cm
Aldrin	ug/g		< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005
alpha-BHC	ug/g		< 0.005	< 0.001	< 0.001	0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005
beta-BHC	ug/g		< 0.005	< 0.001	< 0.001	0.006	0.001	< 0.005	0.002	< 0.001	< 0.001	< 0.001	< 0.005
delta-BHC	ug/g		< 0.005	< 0.001	< 0.001	0.002	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005
gamma-BHC (Lindane)	ug/g		< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005
alpha-Chlordane	ug/g		< 0.025	< 0.005	< 0.005	0.01	< 0.005	< 0.025	0.033	< 0.005	< 0.005	< 0.005	< 0.025
gamma-Chlordane	ug/g		< 0.025	< 0.005	< 0.005	< 0.005	< 0.005	< 0.025	< 0.005	< 0.005	< 0.005	< 0.005	< 0.025
p,p-DDD	ug/g		0.85	< 0.005	< 0.005	0.011	< 0.005	0.04	54	< 0.005	< 0.005	< 0.005	0.55
o,p-DDE	ug/g		< 0.015	0.006	0.007	0.041	0.004	< 0.015	1.7	< 0.003	< 0.003	< 0.003	< 0.015
p,p-DDE	ug/g		0.39	0.013	0.026	0.015	0.04	0.01	12	< 0.003	< 0.003	< 0.003	0.42
o,p-DDT	ug/g		0.09	0.029	0.043	0.61	0.16	0.028	53	< 0.003	< 0.003	< 0.003	0.26
p,p-DDT	ug/g		2.8	0.46	0.58	1	0.57	0.26	380	0.011	< 0.003	< 0.003	0.33
Dieldrin	ug/g		< 0.015	< 0.003	< 0.003	< 0.003	< 0.003	< 0.015	0.007	< 0.003	< 0.003	< 0.003	< 0.015
Endosulfan I	ug/g		< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Endosulfan II	ug/g		< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Endosulfan Sulphate	ug/g		< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Endrin	ug/g		< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Endrin Aldehyde	ug/g		< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	0.013	< 0.01	< 0.01	< 0.01	< 0.05
Heptachlor	ug/g		< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005
Heptachlor Expoxide	ug/g		< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005	0.004	< 0.001	< 0.001	< 0.001	< 0.005
Methoxychlor	ug/g		< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05
Toxaphene	ug/g		< 1.5	< 0.3	< 0.3	< 0.3	< 0.3	< 1.5	< 0.3	< 0.3	< 0.3	< 0.3	< 1.5
Total Organochlorine Pesticides	ug/g			0.508	0.656	1.696	0.775	0.338	500.759	0.011	0	0	1.56

Exceeds Individual Organochlorine **0.91**
Pesticide Criteria of 0.5 ug/g

Exceeds Total Organochlorine **189**
Pesticide Criteria of 2 ug/g

Exceeds Total Organochlorine **189**
Pesticide Concentration of 10 ug/g

Table 3 - Analytical Results for Organochlorine Pesticides in Soil

Brooks Brook, Yukon

INAC

File: 316 - 003

Parameter	Units	Sample ID	503A	503B	505A	505N	507A	509A	511	602A	604N	604A	606A
		Date Sampled Depth	Aug, 1998 0-10cm	Aug, 1998 20-30cm	Aug, 1998 0-10cm	Oct, 1998 0-10cm	Aug, 1998 0-10cm	Aug, 1998 0-10cm	Oct, 1998 0-10cm	Aug, 1998 0-10cm	Sep, 1998 0-10cm	Aug, 1998 0-10cm	Aug, 1998 0-10cm
Aldrin	ug/g		< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001
alpha-BHC	ug/g		< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001
beta-BHC	ug/g		< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	0.002
delta-BHC	ug/g		< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001
gamma-BHC (Lindane)	ug/g		< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001
alpha-Chlordane	ug/g		< 0.005	< 0.005	< 0.005	< 0.025	< 0.005	< 0.005	< 0.025	< 0.005	< 0.005	< 0.005	< 0.005
gamma-Chlordane	ug/g		< 0.005	< 0.005	< 0.005	< 0.025	< 0.005	< 0.005	< 0.025	< 0.005	< 0.005	< 0.005	< 0.005
p,p-DDD	ug/g		< 0.005	0.19	< 0.005	0.14	< 0.005	0.059	0.11	0.1	0.13	0.16	< 0.005
o,p-DDE	ug/g		0.078	0.013	< 0.003	< 0.015	< 0.003	< 0.003	< 0.015	< 0.003	< 0.003	0.006	< 0.003
p,p-DDE	ug/g		0.9	< 0.003	0.003	0.04	< 0.003	0.044	0.07	0.025	0.15	0.087	< 0.003
o,p-DDT	ug/g		3.1	0.84	0.081	0.11	0.009	0.071	0.18	< 0.003	0.049	< 0.003	< 0.003
p,p-DDT	ug/g		7.8	2.3	0.66	0.77	0.15	0.68	1.6	0.44	1.6	1.6	< 0.003
Dieldrin	ug/g		< 0.003	< 0.003	< 0.003	< 0.015	< 0.003	< 0.003	< 0.015	< 0.003	< 0.003	< 0.003	< 0.003
Endosulfan I	ug/g		< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01
Endosulfan II	ug/g		< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01
Endosulfan Sulphate	ug/g		< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01
Endrin	ug/g		< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01
Endrin Aldehyde	ug/g		< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01
Heptachlor	ug/g		< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001
Heptachlor Epoxide	ug/g		< 0.001	0.002	< 0.001	< 0.005	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	0.001	< 0.001
Methoxychlor	ug/g		0.03	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01
Toxaphene	ug/g		< 0.3	< 0.3	< 0.3	< 1.5	< 0.3	< 0.3	< 1.5	< 0.3	< 0.3	< 0.3	< 0.3
Total Organochlorine Pesticides	ug/g		11.908		0.744	1.06	0.159	0.854	1.96	0.565	1.929	1.854	0.002

Exceeds Individual Organochlorine 0.91

Pesticide Criteria of 0.5 ug/g

Exceeds Total Organochlorine

Pesticide Criteria of 2 ug/g

Exceeds Total Organochlorine 189

Pesticide Concentration of 10 ug/g

Table 3 - Analytical Results for Organochlorine Pesticides in Soil
Brooks Brook, Yukon
INAC
File: 316 - 003

Parameter	Units	Sample ID	608A	610	701N	701A	703N	703A	705A	707A	709A	801N	802
		Date Sampled Depth	Aug, 1998 0-10cm	Oct, 1998 0-10cm	Sep, 1998 0-10cm	Aug, 1998 0-10cm	Sep, 1998 0-10cm	Aug, 1998 0-10cm	Aug, 1998 0-10cm	Aug, 1998 0-10cm	Aug, 1998 0-10cm	Oct, 1998 0-10cm	Oct, 1998 0-10cm
Aldrin	ug/g		< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005	< 0.005
alpha-BHC	ug/g		< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005	< 0.005
beta-BHC	ug/g		< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	0.003	0.002	< 0.001	< 0.005	< 0.005
delta-BHC	ug/g		< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005	< 0.005
gamma-BHC (Lindane)	ug/g		< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.005	< 0.005
alpha-Chlordane	ug/g		< 0.005	< 0.025	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.025	< 0.025
gamma-Chlordane	ug/g		< 0.005	< 0.025	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.025	< 0.025
p,p-DDD	ug/g		< 0.005	< 0.025	0.017	0.009	0.12	0.26	< 0.005	0.061	< 0.005	0.091	0.079
o,p-DDE	ug/g		< 0.003	< 0.015	< 0.003	< 0.003	< 0.003	0.045	0.016	0.01	< 0.003	< 0.015	< 0.015
p,p-DDE	ug/g		< 0.003	< 0.015	0.088	0.008	0.23	0.37	0.049	0.019	< 0.003	0.78	0.31
o,p-DDT	ug/g		0.032	< 0.015	0.021	< 0.003	0.036	< 0.003	0.036	0.057	< 0.003	0.21	0.08
p,p-DDT	ug/g		0.08	< 0.018	0.19	0.033	0.9	1.6	0.93	0.13	0.031	3	0.92
Dieldrin	ug/g		< 0.003	< 0.015	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.015	< 0.015
Endosulfan I	ug/g		< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.05
Endosulfan II	ug/g		< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.05
Endosulfan Sulphate	ug/g		< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.05
Endrin	ug/g		< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.05
Endrin Aldehyde	ug/g		< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.05
Heptachlor	ug/g		< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005	< 0.005
Heptachlor Epoxide	ug/g		< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005	< 0.005
Methoxychlor	ug/g		< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.05
Toxaphene	ug/g		< 0.3	< 1.5	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 1.5	< 1.5
Total Organochlorine Pesticides	ug/g		0.112	0	0.316	0.05	1.286	2.275	1.035	0.279	0.031	0.91	1.389

Exceeds Individual Organochlorine **0.91**
Pesticide Criteria of 0.5 ug/g

Exceeds Total Organochlorine **1.389**
Pesticide Criteria of 2 ug/g

Exceeds Total Organochlorine **189**
Pesticide Concentration of 10 ug/g

Table 3 - Analytical Results for Organochlorine Pesticides in Soil
Brooks Brook, Yukon
INAC
File: 316 - 003

Parameter	Units	Sample ID	804	806	808	901	905	907	906N	912	1003	1006
		Date Sampled Depth	Oct, 1998 0-10cm	Oct, 1998 0-10cm	Oct, 1998 0-10cm	Sep, 1998 0-10cm	Oct, 1998 0-10cm	Oct, 1998 0-10cm	Oct, 1998 0-10cm	Oct, 1998 0-10cm	Oct, 1998 0-10cm	Oct, 1998 0-10cm
Aldrin	ug/g		< 0.001	< 0.01	< 0.005	< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001
alpha-BHC	ug/g		< 0.001	< 0.01	< 0.005	< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001
beta-BHC	ug/g		< 0.001	< 0.01	< 0.005	< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001
delta-BHC	ug/g		< 0.001	< 0.01	< 0.005	< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001
gamma-BHC (Lindane)	ug/g		< 0.001	< 0.01	< 0.005	< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001
alpha-Chlordane	ug/g		< 0.005	0.1	< 0.025	< 0.005	< 0.005	< 0.005	< 0.025	< 0.02	< 0.005	< 0.005
gamma-Chlordane	ug/g		< 0.005	< 0.05	< 0.025	< 0.005	< 0.005	0.006	< 0.025	< 0.005	< 0.005	< 0.005
p,p-DDD	ug/g		0.014	2.2	0.69	0.079	0.018	0.16	0.12	< 0.005	0.021	0.026
o,p-DDE	ug/g		< 0.003	< 0.03	< 0.015	< 0.003	< 0.003	< 0.003	< 0.015	< 0.003	< 0.003	< 0.003
p,p-DDE	ug/g		< 0.003	2.3	0.47	0.23	< 0.003	0.068	0.11	< 0.003	0.079	0.003
o,p-DDT	ug/g		< 0.003	2.6	0.77	0.029	0.005	0.044	0.042	< 0.003	< 0.003	0.005
p,p-DDT	ug/g		0.034	19	1.5	0.57	0.029	16	0.38	< 0.003	0.049	0.024
Dieldrin	ug/g		< 0.003	1.6	< 0.015	< 0.003	< 0.003	< 0.003	< 0.015	< 0.003	< 0.003	< 0.003
Endosulfan I	ug/g		< 0.01	< 0.1	< 0.05	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01
Endosulfan II	ug/g		< 0.01	< 0.1	< 0.05	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01
Endosulfan Sulphate	ug/g		< 0.01	< 0.1	< 0.05	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01
Endrin	ug/g		< 0.01	< 0.1	< 0.05	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01
Endrin Aldehyde	ug/g		< 0.01	< 0.1	< 0.05	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01
Heptachlor	ug/g		< 0.001	< 0.01	< 0.005	< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001
Heptachlor Epoxide	ug/g		< 0.001	< 0.01	< 0.005	< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001
Methoxychlor	ug/g		< 0.01	< 0.1	< 0.05	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01
Toxaphene	ug/g		< 0.3	< 3	< 1.5	< 0.3	< 0.3	< 0.3	< 1.5	< 0.3	< 0.3	< 0.3
Total Organochlorine Pesticides	ug/g			27.8		0.908	0.052	16.278	0.652	0	0.149	0.058

Exceeds Individual Organochlorine **0.91**
Pesticide Criteria of 0.5 ug/g

Exceeds Total Organochlorine **37.219**
Pesticide Criteria of 2 ug/g

Exceeds Total Organochlorine **189**
Pesticide Concentration of 10 ug/g

Table 3 - Analytical Results for Organochlorine Pesticides in Soil
Brooks Brook, Yukon
INAC
File: 316 - 003

Parameter	Units	Sample ID	1102	1102N	1104	1106	1108	1201	1205	1207	1209	1407
		Date Sampled Depth	Oct, 1998 0-10cm	Sep, 1998 0-10 cm	Oct, 1998 0-10cm	Sep, 1998 0-10cm	Sep, 1998 0-10cm	Oct, 1998 0-10cm	Oct, 1998 0-10cm	Oct, 1998 0-10cm	Oct, 1998 0-10cm	Oct, 1998 0-10cm
Aldrin	ug/g		< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.005
alpha-BHC	ug/g		< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.005
beta-BHC	ug/g		< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.005
delta-BHC	ug/g		< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.005
gamma-BHC (Lindane)	ug/g		< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.005
alpha-Chlordane	ug/g		< 0.005	< 0.005	< 0.025	< 0.005	< 0.005	< 0.005	< 0.005	< 0.025	< 0.005	< 0.025
gamma-Chlordane	ug/g		< 0.005	< 0.005	< 0.025	0.021	0.011	< 0.005	< 0.005	< 0.025	< 0.005	< 0.025
p,p-DDD	ug/g		< 0.005	0.1	0.26	0.15	0.12	0.012	< 0.005	0.09	< 0.005	< 0.025
o,p-DDE	ug/g		< 0.003	< 0.003	< 0.015	< 0.003	< 0.003	< 0.003	< 0.003	< 0.015	< 0.003	< 0.015
p,p-DDE	ug/g		0.008	0.12	< 0.015	0.051	0.049	< 0.003	< 0.003	< 0.015	0.016	< 0.015
o,p-DDT	ug/g		< 0.003	0.018	0.11	0.14	0.18	0.011	< 0.003	< 0.015	< 0.003	< 0.015
p,p-DDT	ug/g		0.029	0.66	0.36	0.92	0.58	0.024	< 0.003	0.09	0.019	< 0.015
Dieldrin	ug/g		< 0.003	< 0.003	< 0.015	< 0.003	< 0.003	< 0.003	< 0.003	< 0.015	< 0.003	< 0.015
Endosulfan I	ug/g		< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.05
Endosulfan II	ug/g		< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.05
Endosulfan Sulphate	ug/g		< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.05
Endrin	ug/g		< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.05
Endrin Aldehyde	ug/g		< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.05
Heptachlor	ug/g		< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.005
Heptachlor Expoxide	ug/g		< 0.001	< 0.001	< 0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005	< 0.001	< 0.005
Methoxychlor	ug/g		< 0.01	< 0.01	< 0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01	< 0.05
Toxaphene	ug/g		< 0.3	< 0.3	< 1.5	< 0.3	< 0.3	< 0.3	< 0.3	< 1.5	< 0.3	< 1.5
Total Organochlorine Pesticides	ug/g		0.037	0.898	0.73	1.282	0.94	0.047	0	0.18	0.035	0

Exceeds Individual Organochlorine **0.91**
Pesticide Criteria of 0.5 ug/g

Exceeds Total Organochlorine **189**
Pesticide Criteria of 2 ug/g

Exceeds Total Organochlorine **189**
Pesticide Concentration of 10 ug/g

Table 3 - Analytical Results for Organochlorine Pesticides in Soil
Brooks Brook, Yukon
INAC
File: 316 - 003

Parameter	Units	Sample ID	1508	1704	1002N	1104N	1203N	1205N	1302N	1502N	1504N	1701N
		Date Sampled Depth	Oct, 1998 0-10cm	Oct, 1998 0-10cm	Oct, 1998 0-10cm	Oct, 1998 0-10cm	Oct, 1998 0-10cm	Oct, 1998 0-10cm	Oct, 1998 0-10cm	Oct, 1998 0-10cm	Oct, 1998 0-10cm	Oct, 1998 0-10cm
Aldrin	ug/g		< 0.001	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.001
alpha-BHC	ug/g		< 0.001	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.001
beta-BHC	ug/g		< 0.001	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.001
delta-BHC	ug/g		< 0.001	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.001
gamma-BHC (Lindane)	ug/g		< 0.001	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.001
alpha-Chlordane	ug/g		< 0.005	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.005
gamma-Chlordane	ug/g		< 0.005	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.005
p,p-DDD	ug/g		0.07	0.081	0.12	0.15	0.14	0.09	0.049	0.14	0.066	0.033
o,p-DDE	ug/g		< 0.003	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.003
p,p-DDE	ug/g		0.034	0.092	0.41	0.34	0.34	< 0.015	0.06	0.065	0.11	0.042
o,p-DDT	ug/g		< 0.003	0.019	0.081	0.05	0.03	0.02	< 0.015	0.024	0.049	< 0.003
p,p-DDT	ug/g		0.004	0.28	0.61	0.41	0.07	0.05	< 0.015	0.085	0.46	0.051
Dieldrin	ug/g		< 0.003	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.015	< 0.003
Endosulfan I	ug/g		< 0.01	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01
Endosulfan II	ug/g		< 0.01	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01
Endosulfan Sulphate	ug/g		< 0.01	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01
Endrin	ug/g		< 0.01	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01
Endrin Aldehyde	ug/g		< 0.01	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01
Heptachlor	ug/g		< 0.001	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.001
Heptachlor Epoxide	ug/g		< 0.001	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.001
Methoxychlor	ug/g		< 0.01	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.01
Toxaphene	ug/g		< 0.3	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 0.3
Total Organochlorine Pesticides	ug/g		0.108	0.472	1.221	0.95	0.58	0.16	0.109	0.314	0.685	0.126

Exceeds Individual Organochlorine **0.91**
Pesticide Criteria of 0.5 ug/g

Exceeds Total Organochlorine **189**
Pesticide Criteria of 2 ug/g

Exceeds Total Organochlorine **189**
Pesticide Concentration of 10 ug/g

Table 3 - Analytical Results for Organochlorine Pesticides in Soil
Brooks Brook, Yukon
INAC
File: 316 - 003

Parameter	Units	Sample ID	G2	G9
		Date Sampled Depth	Oct, 1998 0-10cm	Oct, 1998 0-10cm
Aldrin	ug/g		< 0.005	< 0.01
alpha-BHC	ug/g		< 0.005	< 0.01
beta-BHC	ug/g		< 0.005	< 0.01
delta-BHC	ug/g		< 0.005	< 0.01
gamma-BHC (Lindane)	ug/g		< 0.005	< 0.01
alpha-Chlordane	ug/g		< 0.025	0.15
gamma-Chlordane	ug/g		< 0.025	0.076
p,p-DDD	ug/g		0.08	13
o,p-DDE	ug/g		< 0.015	< 0.03
p,p-DDE	ug/g		0.22	2.5
o,p-DDT	ug/g		0.2	2.6
p,p-DDT	ug/g		0.51	7.3
Dieldrin	ug/g		< 0.015	2
Endosulfan I	ug/g		< 0.05	< 0.1
Endosulfan II	ug/g		< 0.05	< 0.1
Endosulfan Sulphate	ug/g		< 0.05	< 0.1
Endrin	ug/g		< 0.05	< 0.1
Endrin Aldehyde	ug/g		< 0.05	< 0.1
Heptachlor	ug/g		< 0.005	< 0.01
Heptachlor Epoxide	ug/g		< 0.005	< 0.01
Methoxychlor	ug/g		< 0.05	< 0.1
Toxaphene	ug/g		< 1.5	< 3
Total Organochlorine Pesticides	ug/g		1.01	27.626

Exceeds Individual Organochlorine **0.91**
Pesticide Criteria of 0.5 ug/g

Exceeds Total Organochlorine **189**
Pesticide Criteria of 2 ug/g

Exceeds Total Organochlorine **189**
Pesticide Concentration of 10 ug/g

**Table 4- Analytical Results for EPH in Soil Around New Cook Shack
Brooks Brook, Yukon
INAC
File: 316 - 003**

			Sample ID	105A	107A	108A	204A	205A	208A	210	303A	DUP303A	304A	305A
			Date Sampled	Aug, 1998	Aug, 1998	Aug, 1998	Aug, 1998	Aug, 1998	Aug, 1998	Oct, 1998	Aug, 1998	Aug, 1998	Aug, 1998	Aug, 1998
			Depth (cm)	0-10		0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10	0-10
Parameter	Criteria *	Units												
LEPH-uncorrected for PAH's	1000	ug/g												
HEPH-uncorrected for PAH's	1000	ug/g												
				< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250
				< 250	490	< 250	< 250	1500	2000	490	< 250	< 250	< 250	2800

			Sample ID	306A	DUP306A	306B	307A	308A	309	403A	403B	404A	405A	406A
			Date Sampled	Aug, 1998	Aug, 1998	Aug, 1998	Aug, 1998	Aug, 1998	Oct, 1998	Aug, 1998	Aug, 1998	Aug, 1998	Aug, 1998	Aug, 1998
			Depth (cm)	0-10	0-10	20-30	0-10	0-10	0-10	0-10	20-30	0-10	0-10	0-10
Parameter	Criteria *	Units												
LEPH-uncorrected for PAH's	1000	ug/g												
HEPH-uncorrected for PAH's	1000	ug/g												
				310	330	380	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250
				2300	2500	2400	1500	4800	740	< 250	< 250	540	2400	< 250

			Sample ID	DUP406A	406B	408A	410	503A	504A	504B	505A	506A	507A	508A
			Date Sampled	Aug, 1998	Aug, 1998	Aug, 1998	Oct, 1998	Aug, 1998	Aug, 1998	Aug, 1998	Aug, 1998	Aug, 1998	Aug, 1998	Aug, 1998
			Depth (cm)	0-10	20-30	0-10	0-10	0-10	0-10	20-30	0-10	0-10	0-10	0-10
Parameter	Criteria *	Units												
LEPH-uncorrected for PAH's	1000	ug/g												
HEPH-uncorrected for PAH's	1000	ug/g												
				< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250
				< 250	< 250	270	320	< 250	< 250	< 250	< 250	< 250	900	< 250

			Sample ID	509A	605A	DUP605A	606A	607A	607B	608A	609A	707A	708A	709A
			Date Sampled	Aug, 1998	Aug, 1998	Aug, 1998	Aug, 1998	Aug, 1998	Aug, 1998	Aug, 1998	Aug, 1998	Aug, 1998	Aug, 1998	Aug, 1998
			Depth (cm)	0-10	0-10	0-10	0-10	0-10	20-30	0-10	0-10	0-10	0-10	0-10
Parameter	Criteria *	Units												
LEPH-uncorrected for PAH's	1000	ug/g												
HEPH-uncorrected for PAH's	1000	ug/g												
				< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250	< 250
				< 250	< 250	< 250	2000	< 250	< 250	< 250	< 250	1200	< 250	< 250

*YCSR Criteria - Matrix Criteria for Residential/Parkland Use

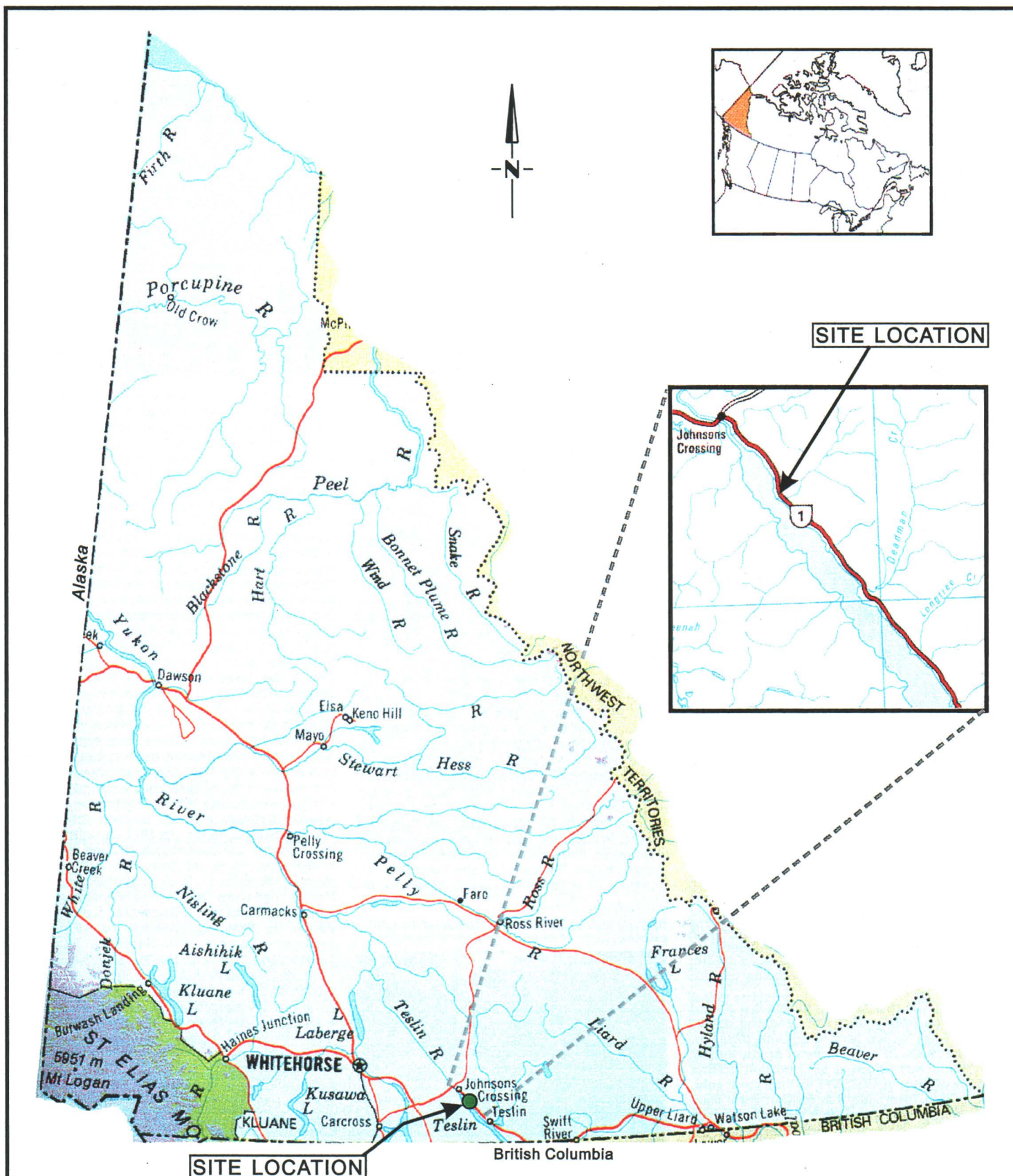
Exceeds Criteria

2000

**Table 4- Analytical Results for EPH in Soil Around New Cook Shack
Brooks Brook, Yukon
INAC
File: 316 - 003**

Parameter	Criteria *	Units	Sample ID Date Sampled Depth (cm)	808 Oct, 1998 0-10	811 Oct, 1998 0-10	1106 Oct, 1998 0-10	1108 Oct, 1998 0-10	1205 Oct, 1998 0-10	1207 Oct, 1998 0-10	1209 Oct, 1998 0-10
LEPH-uncorrected for PAH's	1000	ug/g		< 250	< 250	< 250	< 250	< 250	< 250	< 250
HEPH-uncorrected for PAH's	1000	ug/g		< 250	< 250	370	650	< 250	< 250	< 250

*YCSR Criteria - Matrix Criteria for Residential/Parkland Use
Exceeds Criteria **2000**



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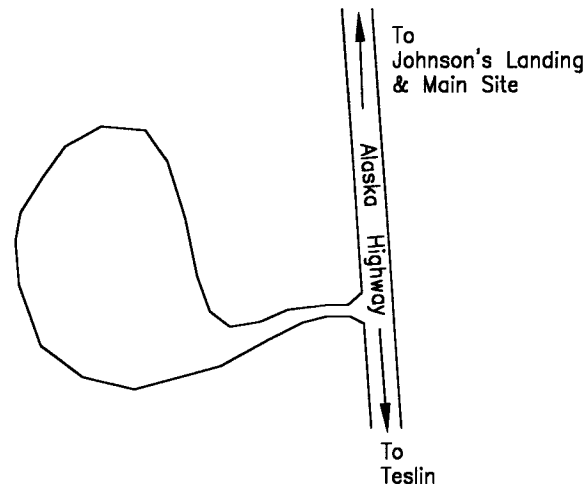
BROOKS BROOK
 Yukon Territory

**Location
 Map**

PROJECT No.
 316-003.01

March 1999

Figure 1

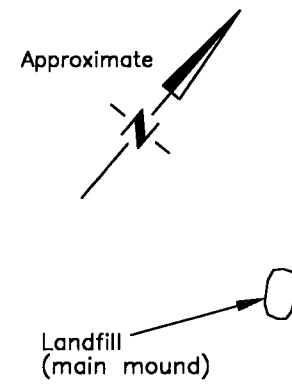


SOUTH LANDFILL

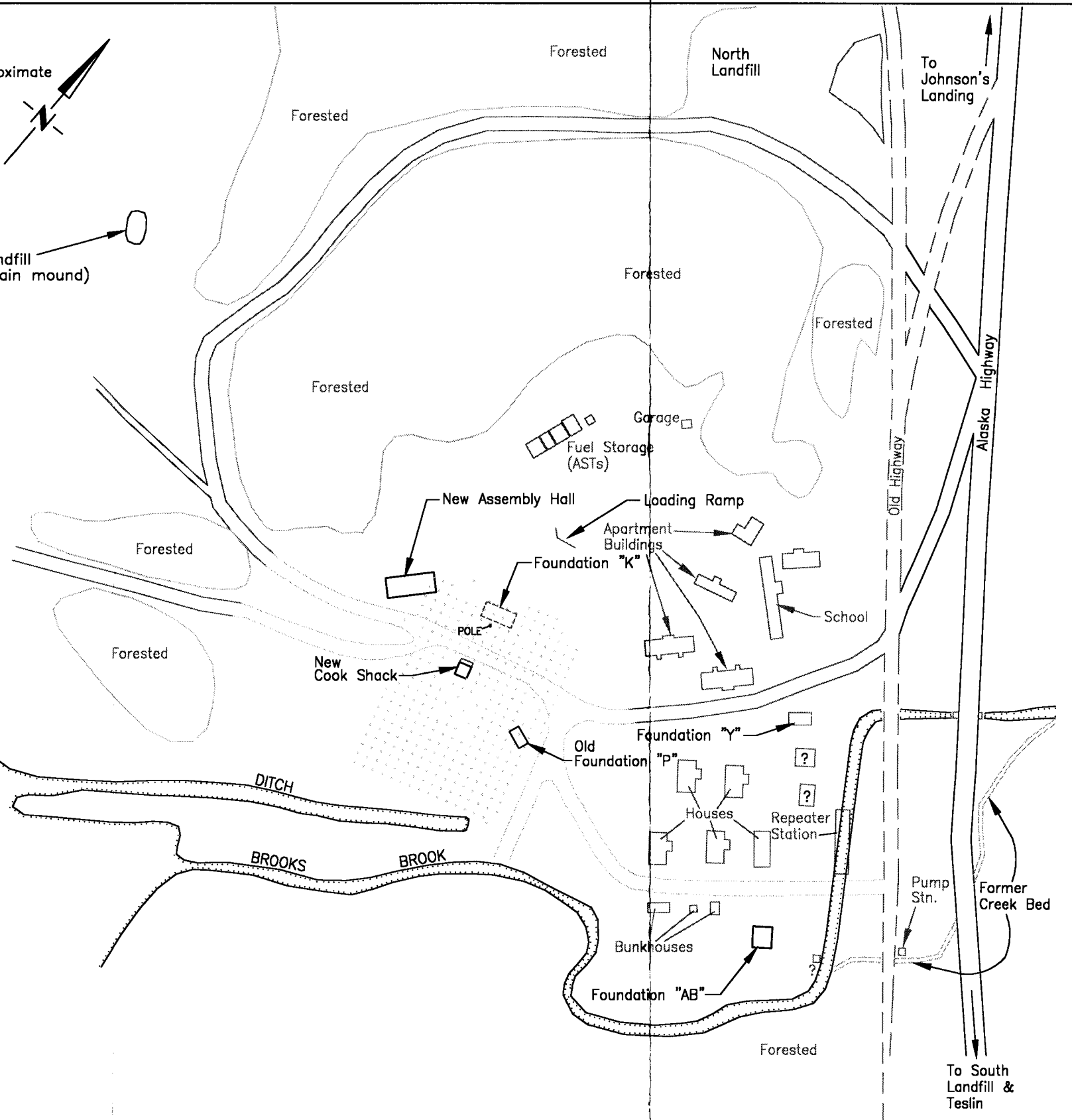
metres
0 50 100

Teslin

Lake



Landfill
(main mound)



SCALE 1:2500 (Approximate)

metres
0 50 100

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FIGURE 2

BROOKS BROOK

DETAILED LOCATION MAP



1964 AERIAL VIEW



1991 AERIAL VIEW

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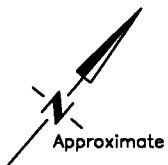
BROOKS BROOK
Yukon Territory

AERIAL VIEWS OF SITE
(1964 & 1991)

PROJECT No.
316-003.01

March 1999

Figure 3



New Assembly Hall

AREA OF CONTAMINATION

TP5

TP9

TP4

H97-7

TP6

TP8

TEST PIT WITH CONCENTRATION
of LEPH & VPH > CRITERIA
@ 2.5m
7700ppm LEPH
200ppm VPH

TP7

Old Foundation 'K'

POLE—○

LEGEND



HRC Monitoring Well (Installed 1997)



HRC Test Pit (1997)

SCALE 1:250 (Approximate)
metres

0 5 10



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BROOKS BROOK

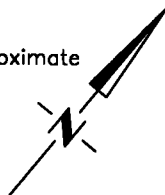
FOUNDATION 'K'
EXTENT of HYDROCARBON CONTAMINATION

PROJECT No.
316-003.01

March 1999

Figure 4

Approximate



⊕ H98-21

⊕ H98-22

● H98-25

● H98-20

⊕ H98-26

⊕ H97-11

⊕ H98-19

TP16

TP15

Generator
(Foundation AB)

TP18

T39

● H97-12

⊕ H97-13

T38

● H97-14

T37

⊕ H97-10

● H97-15

TP19

● H98-23

● H98-18

TP17

● H97-16

⊕ H98-24

⊕ H98-17

Brook

Brooks

LEGEND

H98-23 ● Monitoring Well

H98-24 ⊕ Borehole

NOTE: H97- indicates installation in 1997
H98- indicates installation in 1998

SCALE 1:250 Approximate
metres

0 5 10

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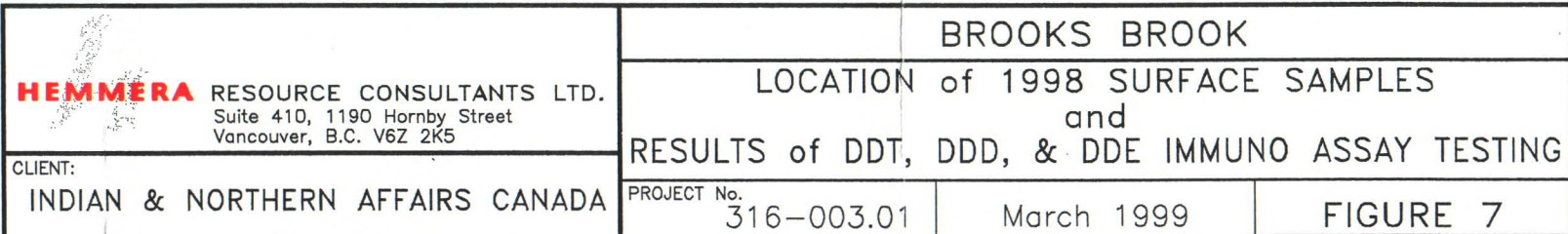
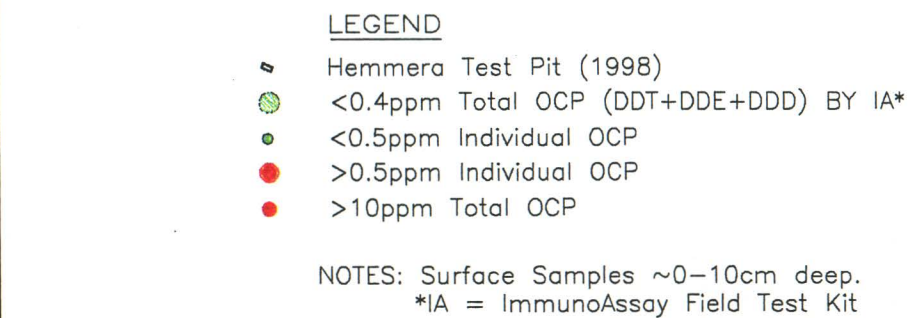
PROJECT No.
316-003.01

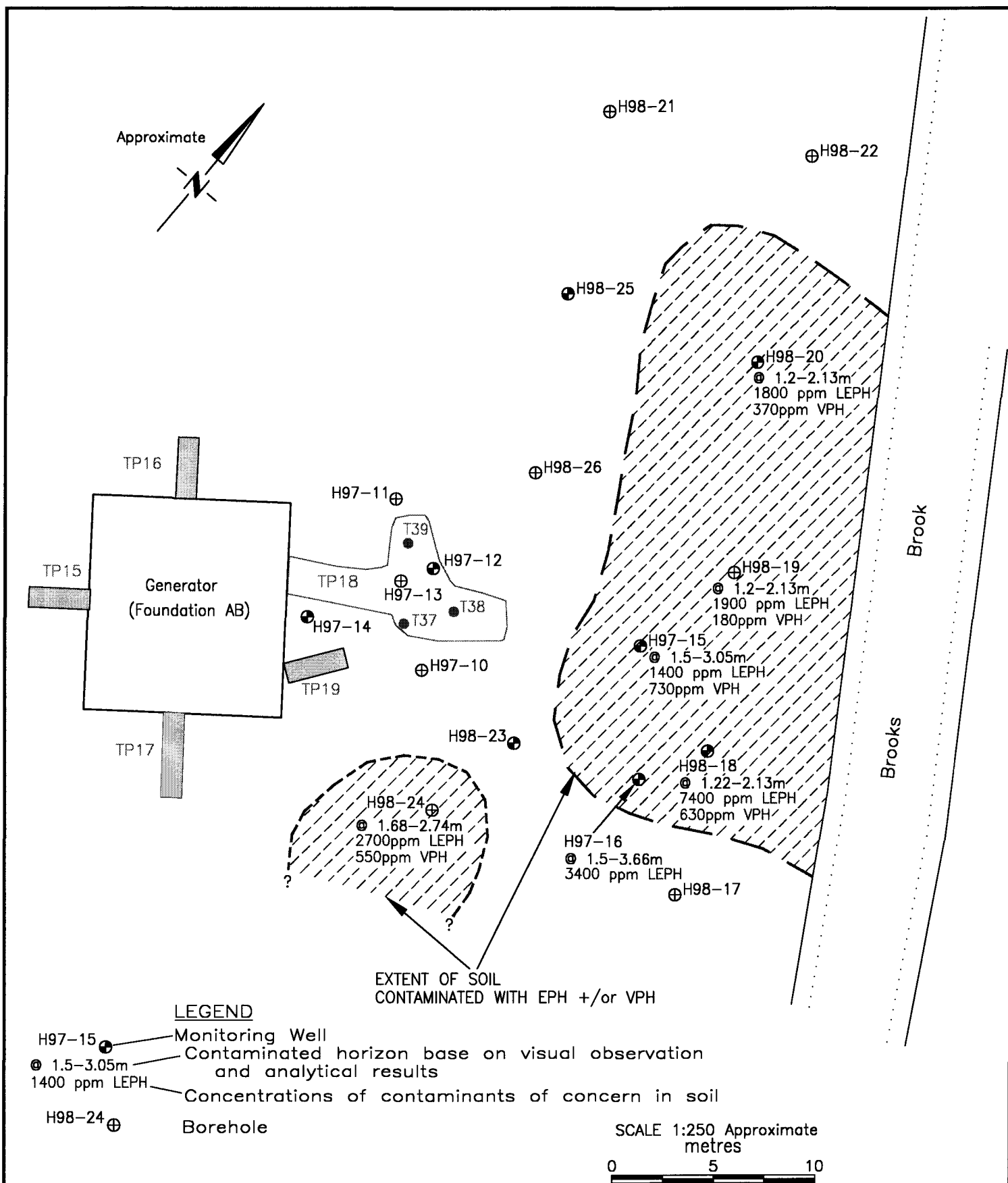
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FIGURE 5

BROOKS BROOK

FOUNDATION AB
LOCATION OF MONITORING WELLS
AND BOREHOLES





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CLIENT: INDIAN & NORTHERN AFFAIRS CANADA

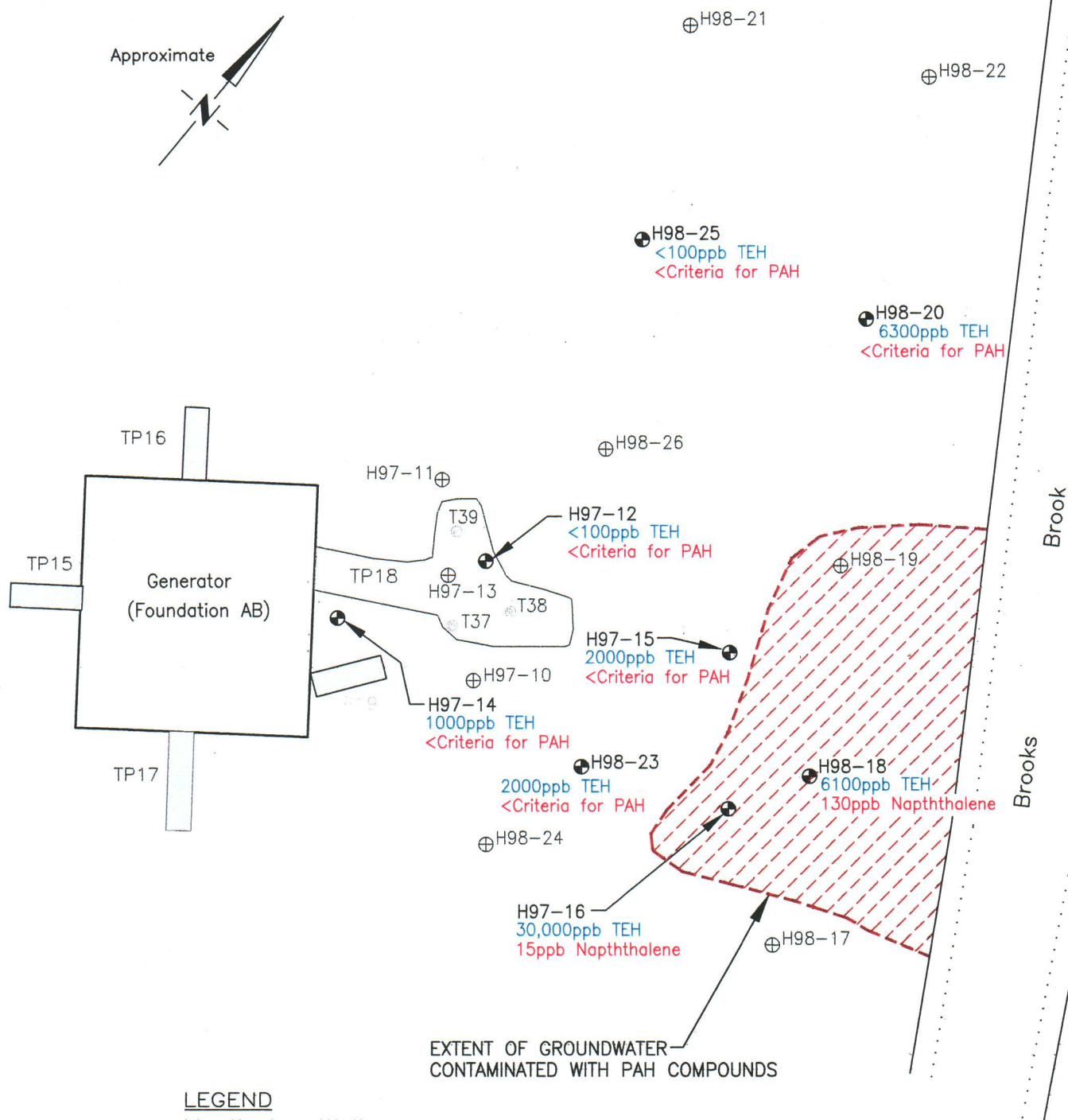
BROOKS BROOK
FOUNDATION AB
RESULTS of ANALYSIS of SOIL SAMPLES
(EPH & VPH Using YCSR Residential Criteria)

PROJECT No.
316-003.01

March 1999

FIGURE 8

Approximate



LEGEND

- H98-23 ● Monitoring Well
- 2000ppb TEH — Concentration of TEH in water
- <Criteria for PAH — Concentration of PAHs in water
- H98-24 ⊕ Borehole

SCALE 1:250 Approximate metres

0 5 10



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PROJECT No.

316-003.01

March 1999

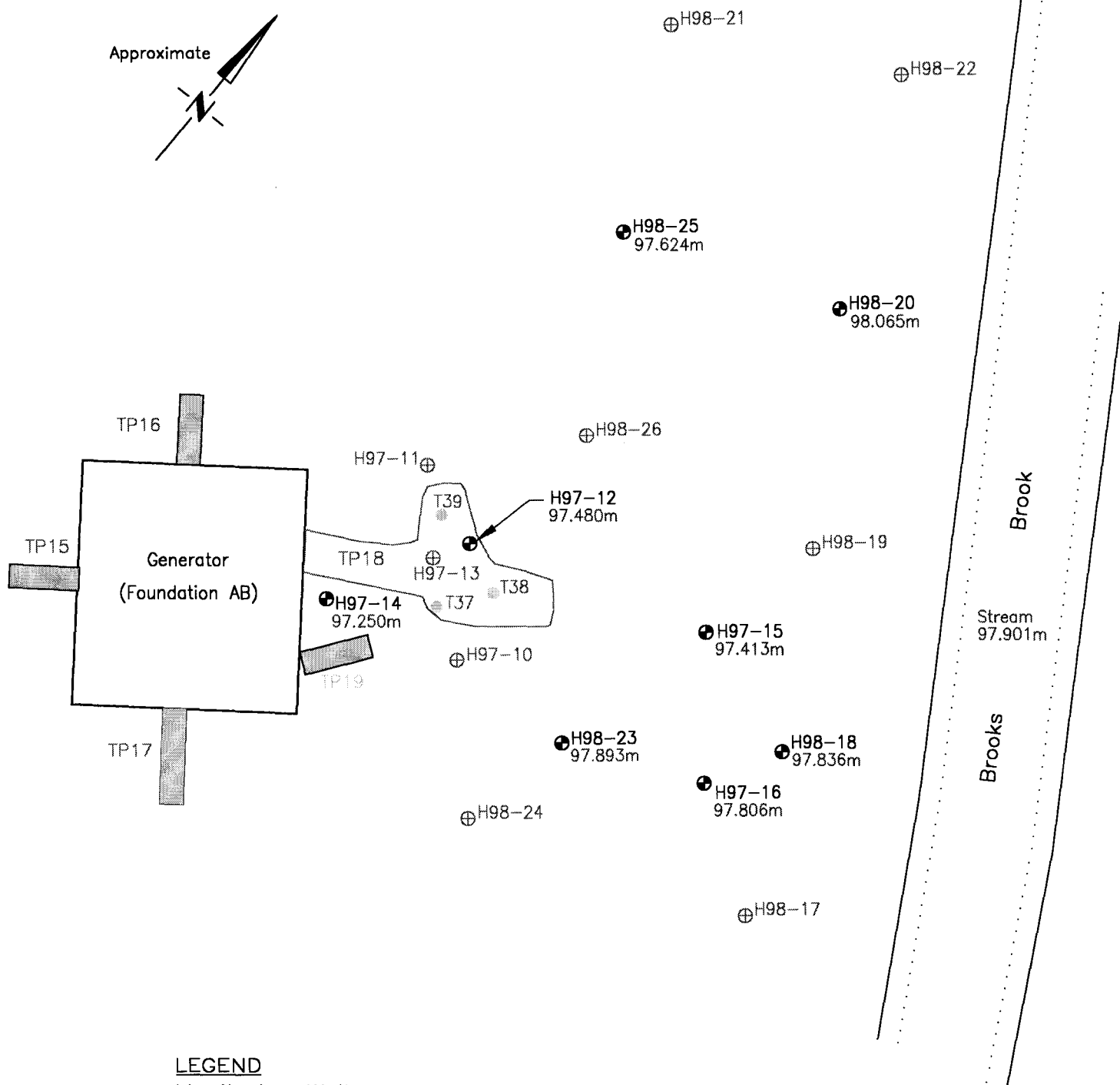
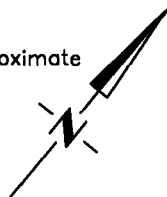
FIGURE 9

BROOKS BROOK

FOUNDATION AB

RESULTS of ANALYSIS of WATER SAMPLES
(TEH & PAHs Using YCSR Generic Criteria for Aquatic Life)

Approximate



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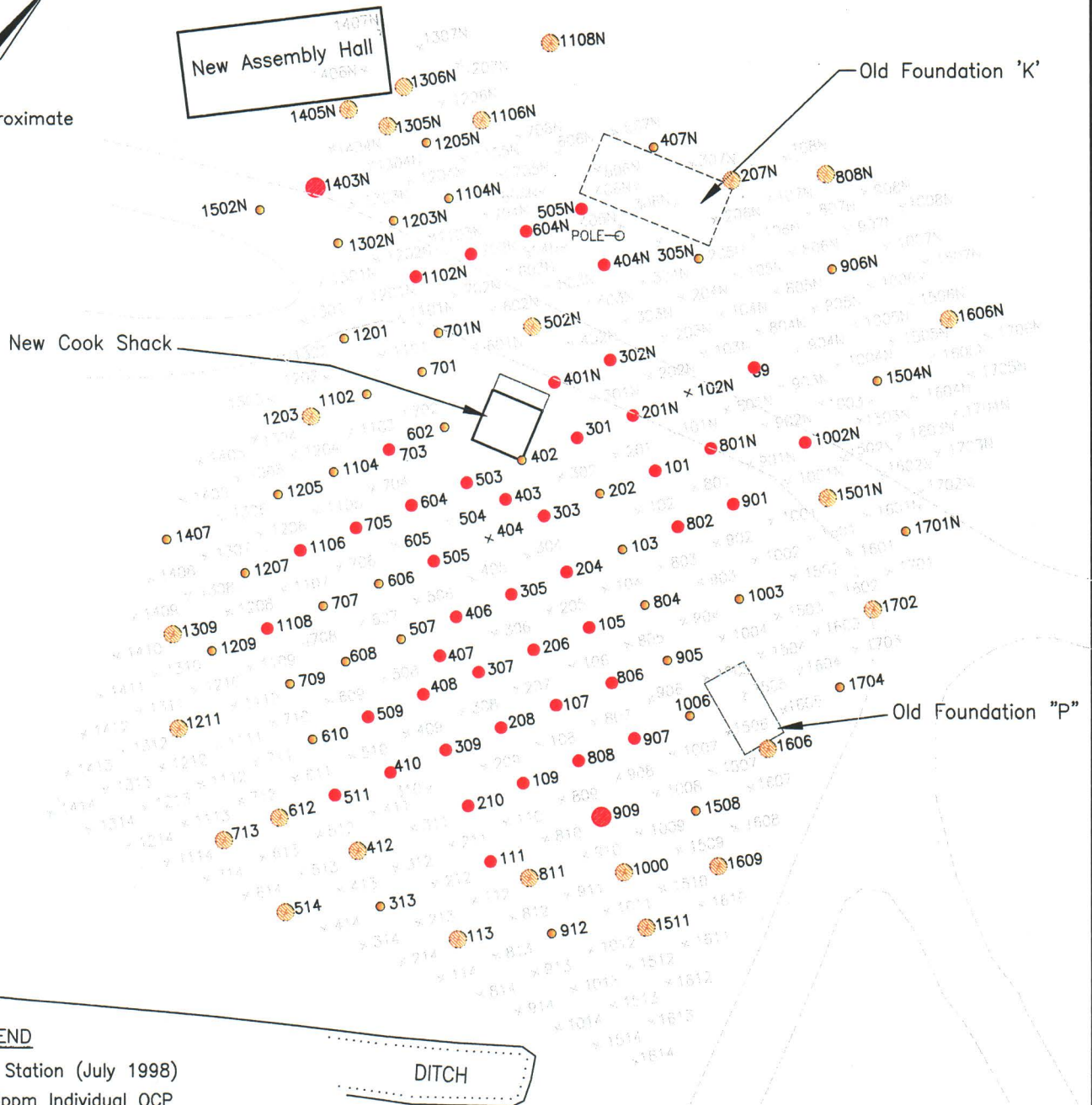
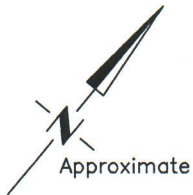
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**BROOKS BROOK
FOUNDATION AB
GROUNDWATER ELEVATIONS
(August 21, 1998)**

PROJECT No.
316-003.01

March 1999

FIGURE 10



LEGEND

- ×314 Grid Station (July 1998)
- >0.5ppm Individual OCP
- × >0.5ppm Total OCP (DDT+DDE+DDD) BY IA*
- <0.5ppm Individual OCP
- <0.5ppm Total OCP (DDT+DDE+DDD) BY IA*

*IA = ImmunoAssay Field Test Kit

NOTES: Surface Samples ~0-10cm deep.

SCALE 1:750 (Approximate)
metres

0 15 30



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CLIENT:

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PROJECT No.

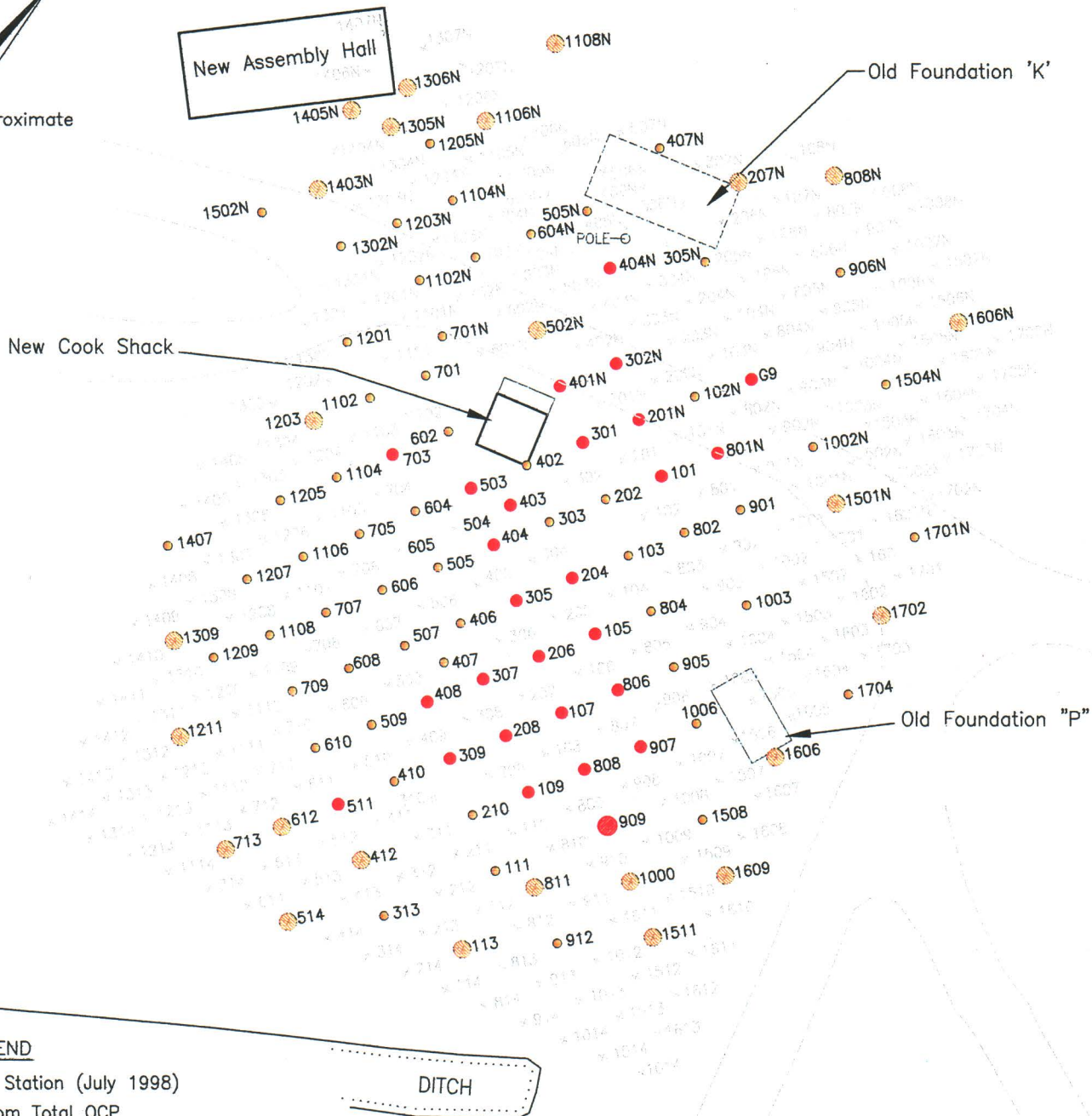
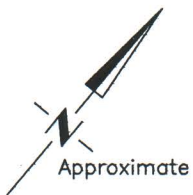
316-003.01

March 1999

FIGURE 11

BROOKS BROOK

RESULTS of ANALYSIS of SOIL SAMPLES
for INDIVIDUAL OCPs USING 0.5ppm CRITERIA



LEGEND

- x314 Grid Station (July 1998)
- >2ppm Total OCP
- ⊗ >2ppm Total OCP (DDT+DDE+DDD) BY IA*
- <2ppm Total OCP
- ⊙ <2ppm Total OCP (DDT+DDE+DDD) BY IA*

*IA = ImmunoAssay Field Test Kit

NOTES: Surface Samples ~0-10cm deep.

SCALE 1:750 (Approximate)
metres

0 15 30



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BROOKS BROOK

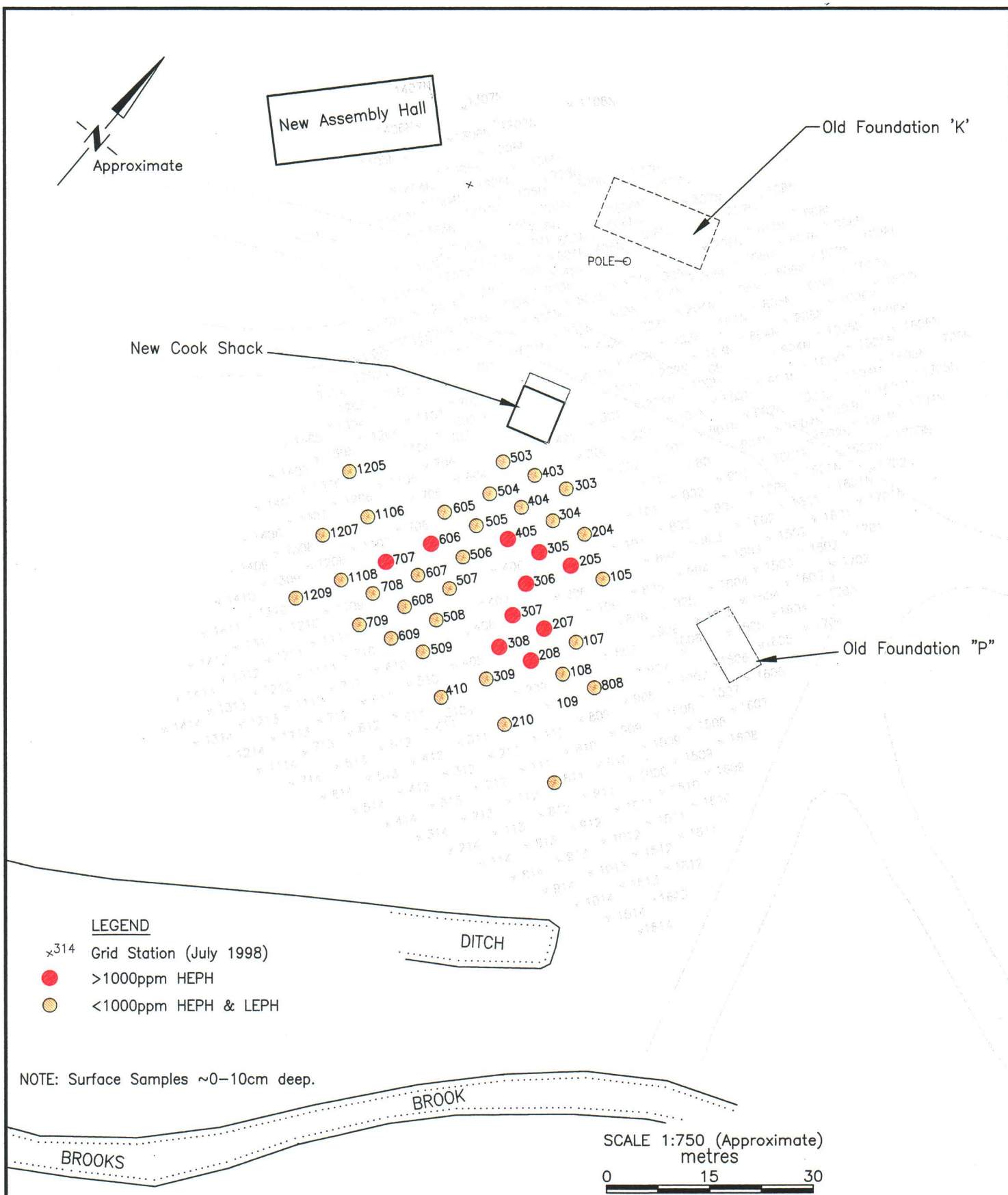
RESULTS of ANALYSIS of SOIL SAMPLES for TOTAL OCPs USING 2ppm CRITERIA

PROJECT No.

316-003.01

March 1999

FIGURE 12



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CLIENT:

INDIAN & NORTHERN AFFAIRS CANADA

PROJECT No.

316-003.01

March 1999

FIGURE 14

BROOKS BROOK

**RESULTS of ANALYSIS of SOIL SAMPLES
for HEPH**

Project: BROOK'S BROOK
 Project No.: 316-003.01
 Date: August 18, 1998
 Elevation: -

BOREHOLE H98-17

Location: Brook's Brook, Yukon Territory
 Contractor: Midnight Sun Drilling (CME Rig)
 Method: 8" Hollow Stem Auger
 - 3" Split Spoon Sampling
 Logged By: Phil Scallia

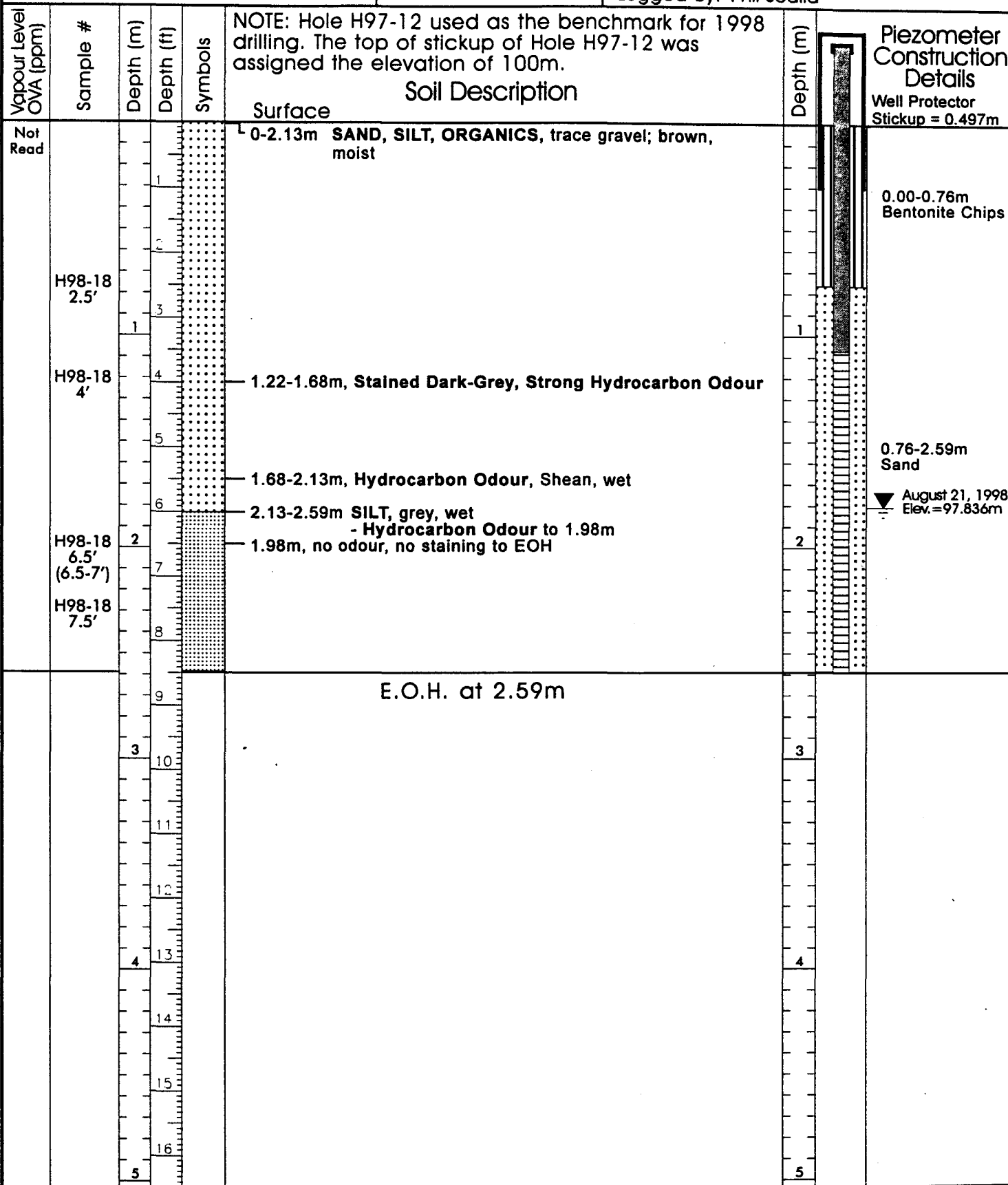
Vapour Level OVA (ppm)	Sample #	Depth (m)	Depth (ft)	Symbols	Surface	Soil Description	Depth (m)	Borehole Backfill
Not Read	H98-17 5'				0-3.05m	SAND & GRAVEL, medium grained sand, gravel <5cm diameter, rounded; brown, damp		0-0.30m Bentonite
		1	3				1	
		2	6		@1.83m,	no staining or odour, wet	2	
		3	9		1.98m,	no odour, no staining to EOH	3	
		4	12				4	
		5	15				5	
		6	18				6	
		7	21				7	
		8	24				8	
		9	27				9	
		10	30		3.05-3.81m	SAND, coarse grained, little gravel <2.5cm diameter wet	10	
		11	33				11	
		12	36				12	
		13	39		@3.81m,	refusal after 15cm, chunks of concrete, sand & gravel in bit	13	
		14	42				14	
		15	45				15	
		16	48				16	
		17	51				17	
		18	54				18	
		19	57				19	
		20	60				20	
		21	63				21	
		22	66				22	
		23	69				23	
		24	72				24	
		25	75				25	
		26	78				26	
		27	81				27	
		28	84				28	
		29	87				29	
		30	90				30	
		31	93				31	
		32	96				32	
		33	99				33	
		34	102				34	
		35	105				35	
		36	108				36	
		37	111				37	
		38	114				38	
		39	117				39	
		40	120				40	
		41	123				41	
		42	126				42	
		43	129				43	
		44	132				44	
		45	135				45	
		46	138				46	
		47	141				47	
		48	144				48	
		49	147				49	
		50	150				50	
		51	153				51	
		52	156				52	
		53	159				53	
		54	162				54	
		55	165				55	
		56	168				56	
		57	171				57	
		58	174				58	
		59	177				59	
		60	180				60	
		61	183				61	
		62	186				62	
		63	189				63	
		64	192				64	
		65	195				65	
		66	198				66	
		67	201				67	
		68	204				68	
		69	207				69	
		70	210				70	
		71	213				71	
		72	216				72	
		73	219				73	
		74	222				74	
		75	225				75	
		76	228				76	
		77	231				77	
		78	234				78	
		79	237				79	
		80	240				80	
		81	243				81	
		82	246				82	
		83	249				83	
		84	252				84	
		85	255				85	
		86	258				86	
		87	261				87	
		88	264				88	
		89	267				89	
		90	270				90	
		91	273				91	
		92	276				92	
		93	279				93	
		94	282				94	
		95	285				95	
		96	288				96	
		97	291				97	
		98	294				98	
		99	297				99	
		100	300				100	

Client:
INDIAN & NORTHERN AFFAIRS CANADA

Project: BROOK'S BROOK
 Project No.: 316-003.01
 Date: August 18, 1998
 Elevation: Gnd=99.639m, TOP=100.136m

MONITORING WELL H98-18

Location: Brook's Brook, Yukon Territory
 Contractor: Midnight Sun Drilling (CME Rig)
 Method: 8" Hollow Stem Auger
 - 3" Split Spoon Sampling
 Logged By: Phil Scalia



Client:
INDIAN & NORTHERN AFFAIRS CANADA

Location: Brook's Brook, Yukon Territory
Contractor: Midnight Sun Drilling (CME Rig)
Method: 8" Hollow Stem Auger
- 3" Split Spoon Sampling
Logged By: Phil Scallia

Client: **INDIAN & NORTHERN AFFAIRS CANADA**

Location: Brook's Brook, Yukon Territory
Contractor: Midnight Sun Drilling (CME Rig)
Method: 8" Hollow Stem Auger
- 3" Split Spoon Sampling
Logged By: Phil Scalla

Client:
INDIAN & NORTHERN AFFAIRS CANADA

Project: BROOK'S BROOK
 Project No.: 316-003.01
 Date: August 19, 1998
 Elevation: -

BOREHOLE H98-21

Location: Brook's Brook, Yukon Territory
 Contractor: Midnight Sun Drilling (CME Rig)
 Method: 8" Hollow Stem Auger
 - 3" Split Spoon Sampling
 Logged By: Phil Scallia

Vapour Level OVA (ppm)	Sample #	Depth (m)	Depth (ft)	Symbols	Surface	Soil Description	Depth (m)	Borehole Backfill
Not Read					Surface	0-3.20m SAND & GRAVEL, - no odour or staining		
		1	3				1	
		2	6				2	
		3	9				3	
		4	12				4	
		5	15				5	
		6	18				6	
		7	21				7	
		8	24				8	
		9	27				9	
		10	30				10	
		11	33				11	
		12	36				12	
		13	39				13	
		14	42				14	
		15	45				15	
		16	48				16	
		17	51				17	
		18	54				18	
		19	57				19	
		20	60				20	
		21	63				21	
		22	66				22	
		23	69				23	
		24	72				24	
		25	75				25	
		26	78				26	
		27	81				27	
		28	84				28	
		29	87				29	
		30	90				30	
		31	93				31	
		32	96				32	
		33	99				33	
		34	102				34	
		35	105				35	
		36	108				36	
		37	111				37	
		38	114				38	
		39	117				39	
		40	120				40	
		41	123				41	
		42	126				42	
		43	129				43	
		44	132				44	
		45	135				45	
		46	138				46	
		47	141				47	
		48	144				48	
		49	147				49	
		50	150				50	
		51	153				51	
		52	156				52	
		53	159				53	
		54	162				54	
		55	165				55	
		56	168				56	
		57	171				57	
		58	174				58	
		59	177				59	
		60	180				60	
		61	183				61	
		62	186				62	
		63	189				63	
		64	192				64	
		65	195				65	
		66	198				66	
		67	201				67	
		68	204				68	
		69	207				69	
		70	210				70	
		71	213				71	
		72	216				72	
		73	219				73	
		74	222				74	
		75	225				75	
		76	228				76	
		77	231				77	
		78	234				78	
		79	237				79	
		80	240				80	
		81	243				81	
		82	246				82	
		83	249				83	
		84	252				84	
		85	255				85	
		86	258				86	
		87	261				87	
		88	264				88	
		89	267				89	
		90	270				90	
		91	273				91	
		92	276				92	
		93	279				93	
		94	282				94	
		95	285				95	
		96	288				96	
		97	291				97	
		98	294				98	
		99	297				99	
		100	300				100	
		101	303				101	
		102	306				102	
		103	309				103	
		104	312				104	
		105	315				105	
		106	318				106	
		107	321				107	
		108	324				108	
		109	327				109	
		110	330				110	
		111	333				111	
		112	336				112	
		113	339				113	
		114	342				114	
		115	345				115	
		116	348				116	
		117	351				117	
		118	354				118	
		119	357				119	
		120	360				120	
		121	363				121	
		122	366				122	
		123	369				123	
		124	372				124	
		125	375				125	
		126	378				126	
		127	381				127	
		128	384				128	
		129	387				129	
		130	390				130	
		131	393				131	
		132	396				132	
		133	399				133	
		134	402				134	
		135	405				135	
		136	408				136	
		137	411				137	
		138	414				138	
		139	417				139	
		140	420				140	
		141	423				141	
		142	426				142	
		143	429				143	
		144	432				144	
		145	435				145	
		146	438				146	
		147	441				147	
		148	444				148	
		149	447				149	
		150	450				150	
		151	453				151	
		152	456				152	
		153	459				153	
		154	462				154	
		155	465				155	
		156	468				156	
		157	471				157	
		158	474				158	
		159	477				159	
		160	480				160	
		161	483				161	
		162	486				162	
		163	489				163	
		164	492				164	
		165	495				165	
		166	498				166	
		167	501				167	
		168	504				168	
		169	507				169	
		170	510				170	
		171	513				171	
		172	516				172	
		173	519				173	
		174	522				174	
		175	525				175	
		176	528				176	
		177	531				177	
		178	534				178	
		179	537				179	
		180	540				180	
		181	543				181	
		182	546				182	
		183	549				183	
		184	552				184	
		185	555				185	
		186	558				186	
		187	561				187	
		188	564				188	
		189	567				189	
		190	570				190	
		191	573				191	
		192	576				192	
		193	579				193	
		194	582				194	
		195	585				195	
		196	588				196	
		197	591				197	
		198	594				198	
		199	597				199	
		200	600				200	
		201	603				201	
		202	606				202	
		203	609				203	
		204	612				204	
		205	615				205	
		206	618				206	
		207	621				207	
		208	624				208	
		209	627				209	
		210	630				210	
		211	633				211	
		212	636				212	
		213	639				213	
		214	642				214	
		215	645				215	
		216	648				216	
		217	651				217	
		218	654				218	
		219	657				219	
		220	660				220	
		221	663				221	
		222	666				222	
		223	669				223	
		224	672				224	
		225	675				225	
		226	678				226	
		227	68					

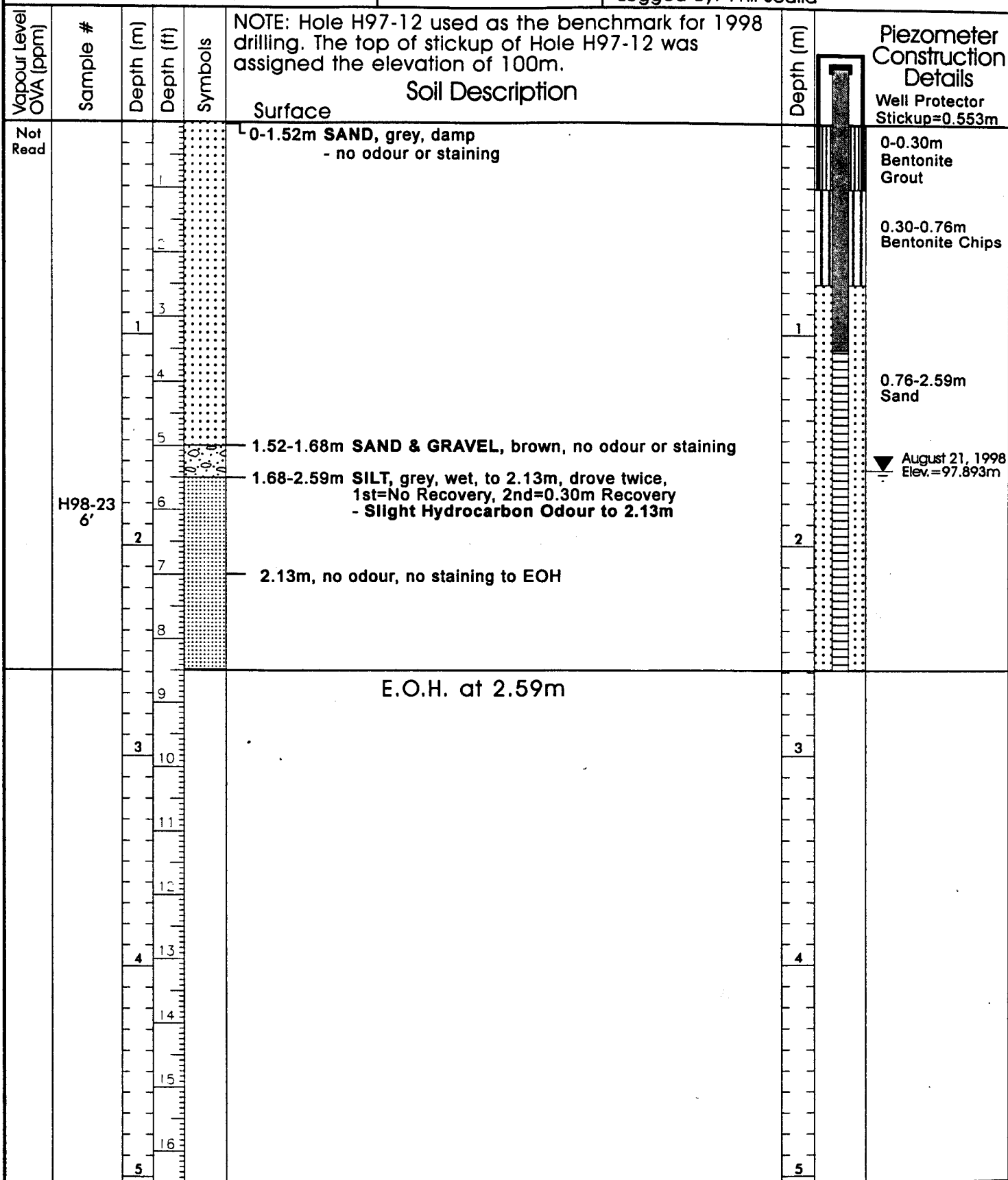
Location: Brook's Brook, Yukon Territory
Contractor: Midnight Sun Drilling (CME Rig)
Method: 8" Hollow Stem Auger
- 3" Split Spoon Sampling
Logged By: Phil Scaila

Client: **INDIAN & NORTHERN AFFAIRS CANADA**

Project: BROOK'S BROOK
 Project No.: 316-003.01
 Date: August 19, 1998
 Elevation: GND=99.53m, TOP=100.083m

MONITORING WELL H98-23

Location: Brook's Brook, Yukon Territory
 Contractor: Midnight Sun Drilling (CME Rig)
 Method: 8" Hollow Stem Auger
 - 3" Split Spoon Sampling
 Logged By: Phil Scalla



Client:
INDIAN & NORTHERN AFFAIRS CANADA

Project: BROOK'S BROOK
 Project No.: 316-003.01
 Date: August 19, 1998
 Elevation: -

BOREHOLE H98-24

Location: Brook's Brook, Yukon Territory
 Contractor: Midnight Sun Drilling (CME Rig)
 Method: 8" Hollow Stem Auger
 - 3" Split Spoon Sampling
 Logged By: Phil Scallia

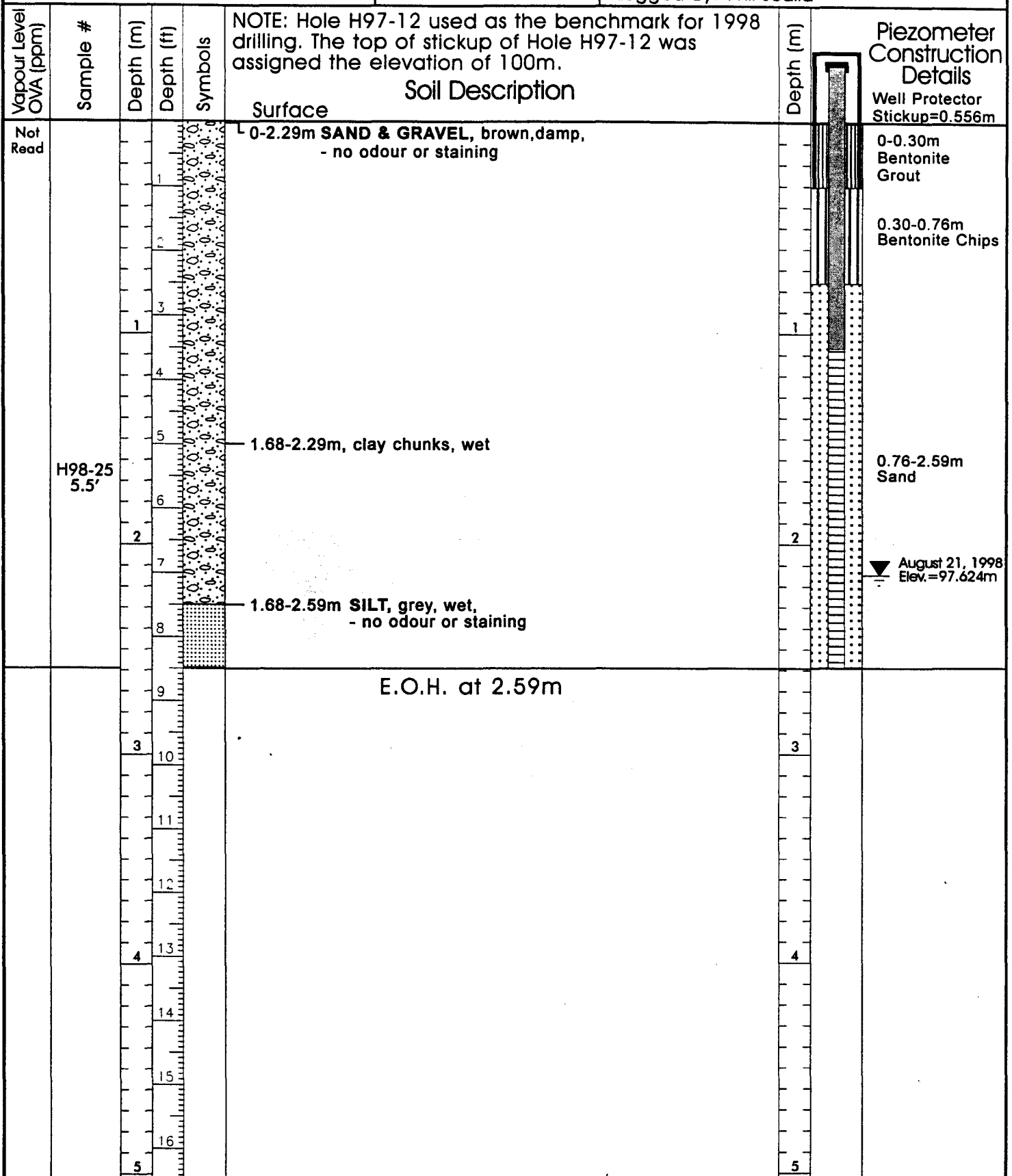
Vapour Level OVA (ppm)	sample #	Depth (m)	Depth (ft)	Symbols	Surface	Soil Description	Depth (m)	Borehole Backfill
Not Read					Surface	0-2.59m SAND & GRAVEL, brown, moist, - no staining - no odour to 1.98m		
	H98-24 6.5'	1	3				1	
		2	6			@ 1.98m, wet, - Strong Hydrocarbon Odour to 2.44m	2	
		3	9			2.44m, Hydrocarbon Odour		
		4	12			2.59-2.90m SILT, grey, wet - no odour or staining		
		5	15					
		6	18					
		7	21					
		8	24					
		9	27					
		10	30					
		11	33					
		12	36					
		13	39					
		14	42					
		15	45					
		16	48					
		17	51					
		18	54					
		19	57					
		20	60					
		21	63					
		22	66					
		23	69					
		24	72					
		25	75					
		26	78					
		27	81					
		28	84					
		29	87					
		30	90					
		31	93					
		32	96					
		33	99					
		34	102					
		35	105					
		36	108					
		37	111					
		38	114					
		39	117					
		40	120					
		41	123					
		42	126					
		43	129					
		44	132					
		45	135					
		46	138					
		47	141					
		48	144					
		49	147					
		50	150					
		51	153					
		52	156					
		53	159					
		54	162					
		55	165					
		56	168					
		57	171					
		58	174					
		59	177					
		60	180					
		61	183					
		62	186					
		63	189					
		64	192					
		65	195					
		66	198					
		67	201					
		68	204					
		69	207					
		70	210					
		71	213					
		72	216					
		73	219					
		74	222					
		75	225					
		76	228					
		77	231					
		78	234					
		79	237					
		80	240					
		81	243					
		82	246					
		83	249					
		84	252					
		85	255					
		86	258					
		87	261					
		88	264					
		89	267					
		90	270					
		91	273					
		92	276					
		93	279					
		94	282					
		95	285					
		96	288					
		97	291					
		98	294					
		99	297					
		100	300					

Client:
INDIAN & NORTHERN AFFAIRS CANADA

Project: BROOK'S BROOK
 Project No.: 316-003.01
 Date: August 20, 1998
 Elevation: GND=99.768m, TOP=100.324m

MONITORING WELL H98-25

Location: Brook's Brook, Yukon Territory
 Contractor: Midnight Sun Drilling (CME Rig)
 Method: 8" Hollow Stem Auger
 - 3" Split Spoon Sampling
 Logged By: Phil Scallia



Client:
INDIAN & NORTHERN AFFAIRS CANADA

Location: Brook's Brook, Yukon Territory
Contractor: Midnight Sun Drilling (CME Rig)
Method: 8" Hollow Stem Auger
- 3" Split Spoon Sampling
Logged By: Phil Scalia

Vapour Level OVA (ppm)	sample #	Depth (m)	Depth (ft)	Symbols	Soil Description	Depth (m)	Borehole Backfill
Not Read					Surface		
	H98-26 5.5'				0-1.83m SAND & GRAVEL , brown, moist, - no staining or staining @ 1.68m, wet 1.83-2.59m SILT , grey, wet - no odour or staining		0-2.59m Cuttings
					E.O.H. at 2.59m		

Client: **INDIAN & NORTHERN AFFAIRS CANADA**

Location: Brooks Brook, Yukon Territory
Contractor: Midnight Sun Drilling (CME Rig)
Method: Auger (Hollow Stem)
- Split Spoon Sampling
Logged By: Phil Scalia

& HEMERA RESOURCE CONSULTANTS LTD.

Project: BROOKS BROOK
 Project No.: 281-008-01
 Date Drilled: November 4, 1997
 Elevation: -

BOREHOLE H97-11

Location: Brooks Brook, Yukon Territory
 Contractor: Midnight Sun Drilling (CME Rig)
 Method: Auger (Hollow Stem)
 - Split Spoon Sampling
 Logged By: Phil Scalla

Vapour Level	Sample #	Depth (m)	Depth (ft)	Symbols	Soil Description	Depth (m)	Borehole Backfill
					SURFACE	Refill	
					0-2.29m SAND & GRAVEL - brown, moist, no staining, no odour		
		1				1	0-1.83m Cuttings
		5					
11-6'		2			1.83m = wet	2	
					2.29-4.42m SILT/clayey SILT - grey, wet, no staining, no odour		
		3	10			3	1.83-4.42m Bentonite
11-13'		4				4	
		15			E.O.H. at 4.42m		
		5				5	
		6	20			6	
		7				7	
		25					
		8				8	
		9	30			9	
		10				10	
		35					
		11				11	

Client:
 INDIAN & NORTHERN AFFAIRS CANADA

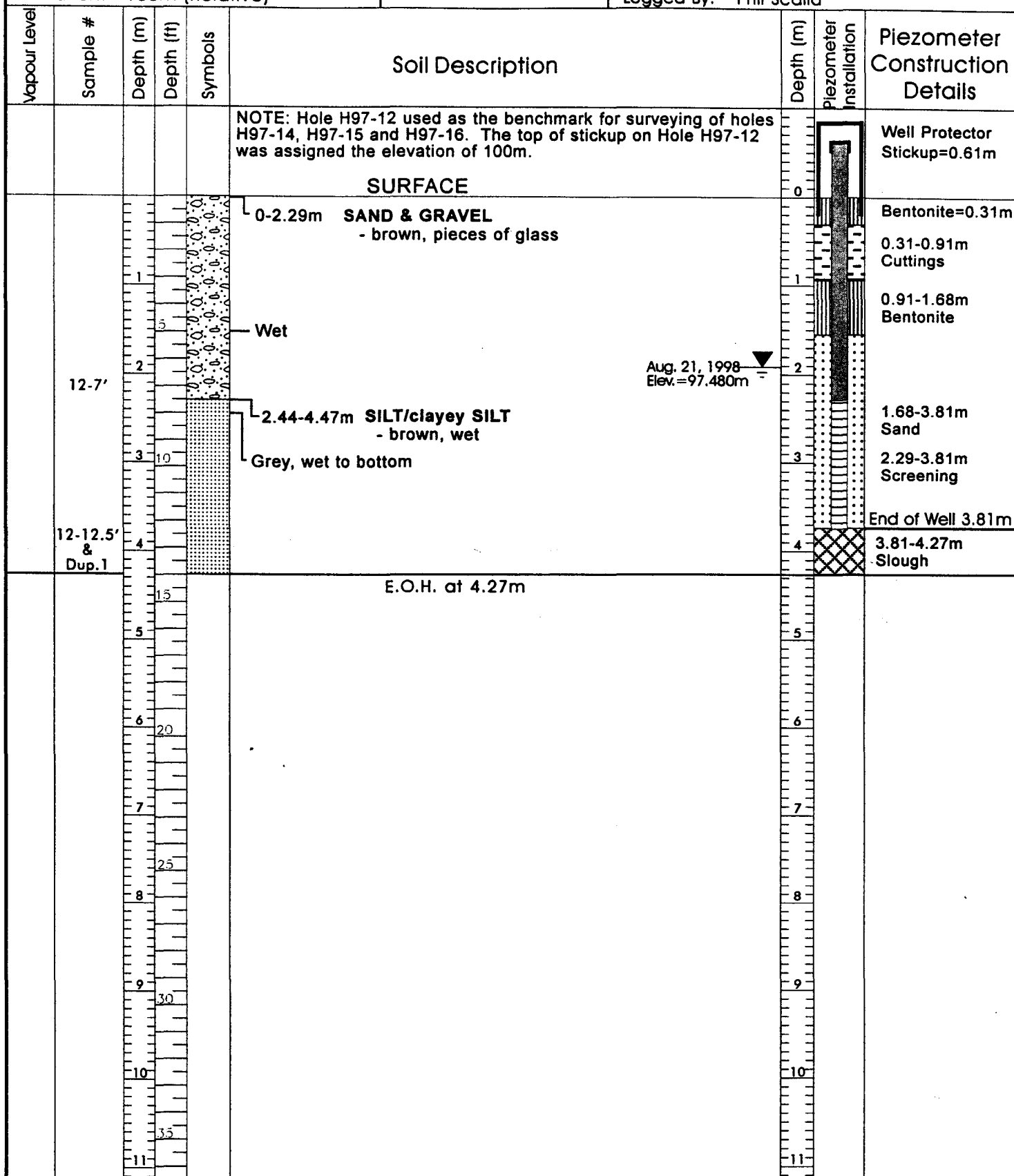
LORIMER
 & Associates
 Consulting Engineers

& HEMERA RESOURCE CONSULTANTS LTD.

Project: BROOKS BROOK
 Project No.: 281-008-01
 Date Drilled: November 5, 1997
 Elevation: 100m (Relative)

GROUNDWATER WELL H97-12

Location: Brooks Brook, Yukon Territory
 Contractor: Midnight Sun Drilling (CME Rig)
 Method: Auger (Hollow Stem)
 - Split Spoon Sampling
 Logged By: Phil Scalla



Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER & Associates
 Consulting Engineers

HELMER RESOURCE CONSULTANTS LTD.

Location: Brooks Brook, Yukon Territory
Contractor: Midnight Sun Drilling (CME Rig)
Method: Auger (Hollow Stem)
- Split Spoon Sampling
Logged By: Phil Scala

Vapour Level	Sample #	Depth (m)	Depth (ft)	Symbols	Soil Description	Depth (m)	Borehole Backfill
					SURFACE	Refill	
	13-5'	0-2.29m			SAND & GRAVEL - brown, moist, no staining, no odour	0-1.37m	Cuttings
	13-7.5'	1.98m - Staining & hydrocarbon odour				2	
	13-10'	2.29-4.27m			SILT/clayey SILT - grey, staining, hydrocarbon odour - odour strong in top 10cm	1.37-4.27m	Bentonite
	13-12.5'	3.81m - slight hydrocarbon odour				4	
		E.O.H. at 4.27m					

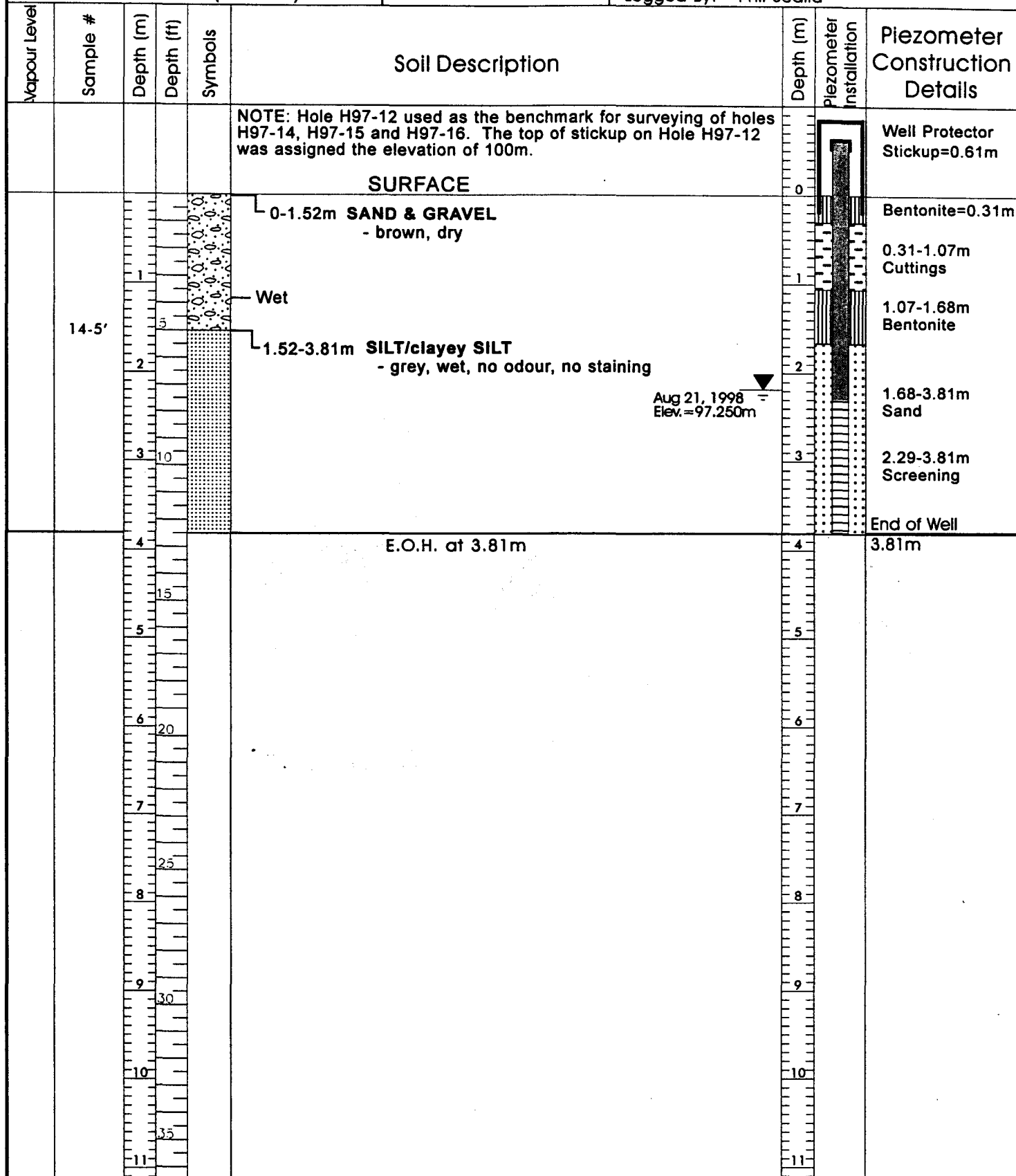
Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER &  **HERRERA RESOURCE CONSULTANTS LTD.**
& Associates
Consulting Engineers

Project: BROOKS BROOK
 Project No.: 281-008-01
 Date Drilled: November 5, 1997
 Elevation: 100.05m (Relative)

GROUNDWATER WELL H97-14

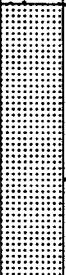
Location: Brooks Brook, Yukon Territory
 Contractor: Midnight Sun Drilling (CME Rig)
 Method: Auger (Hollow Stem)
 - Split Spoon Sampling
 Logged By: Phil Scalla



Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER
 & Associates
 Consulting Engineers

& HEMERA RESOURCE CONSULTANTS LTD.

Project: BROOKS BROOK Project No.: 281-008-01 Date Drilled: November 5, 1997 Elevation: 100.153m (Relative)					GROUNDWATER WELL H97-15		Location: Brooks Brook, Yukon Territory Contractor: Midnight Sun Drilling (CME Rig) Method: Auger (Hollow Stem) - Split Spoon Sampling Logged By: Phil Scalia	
Vapour Level	Sample #	Depth (m)	Depth (ft)	Symbols	Soil Description	Depth (m)	Piezometer Installation	Piezometer Construction Details
					NOTE: Hole H97-12 used as the benchmark for surveying of holes H97-14, H97-15 and H97-16. The top of stickup on Hole H97-12 was assigned the elevation of 100m. SURFACE	0		Well Protector Stickup=0.61m Bentonite=0.31m
	15-5'	1	5		0-1.68m SAND & GRAVEL - brown	1		0.31-1.37m Cuttings
	15-10'	2	10		1.68-3.81m SILT/clayey SILT - grey, wet - hydrocarbon odour & staining to 3.05m	2		1.37-1.98m Bentonite
		3	10		3.05m - no staining or hydrocarbon odour to bottom	3		1.98-3.81m Sand
		4	15		E.O.H. at 3.81m	4		2.29-3.81m Screening
		5	20			5		End of Well 3.81m
		6	25			6		
		7	30			7		
		8	35			8		
		9				9		
		10				10		
		11				11		

Client:
INDIAN & NORTHERN AFFAIRS CANADA

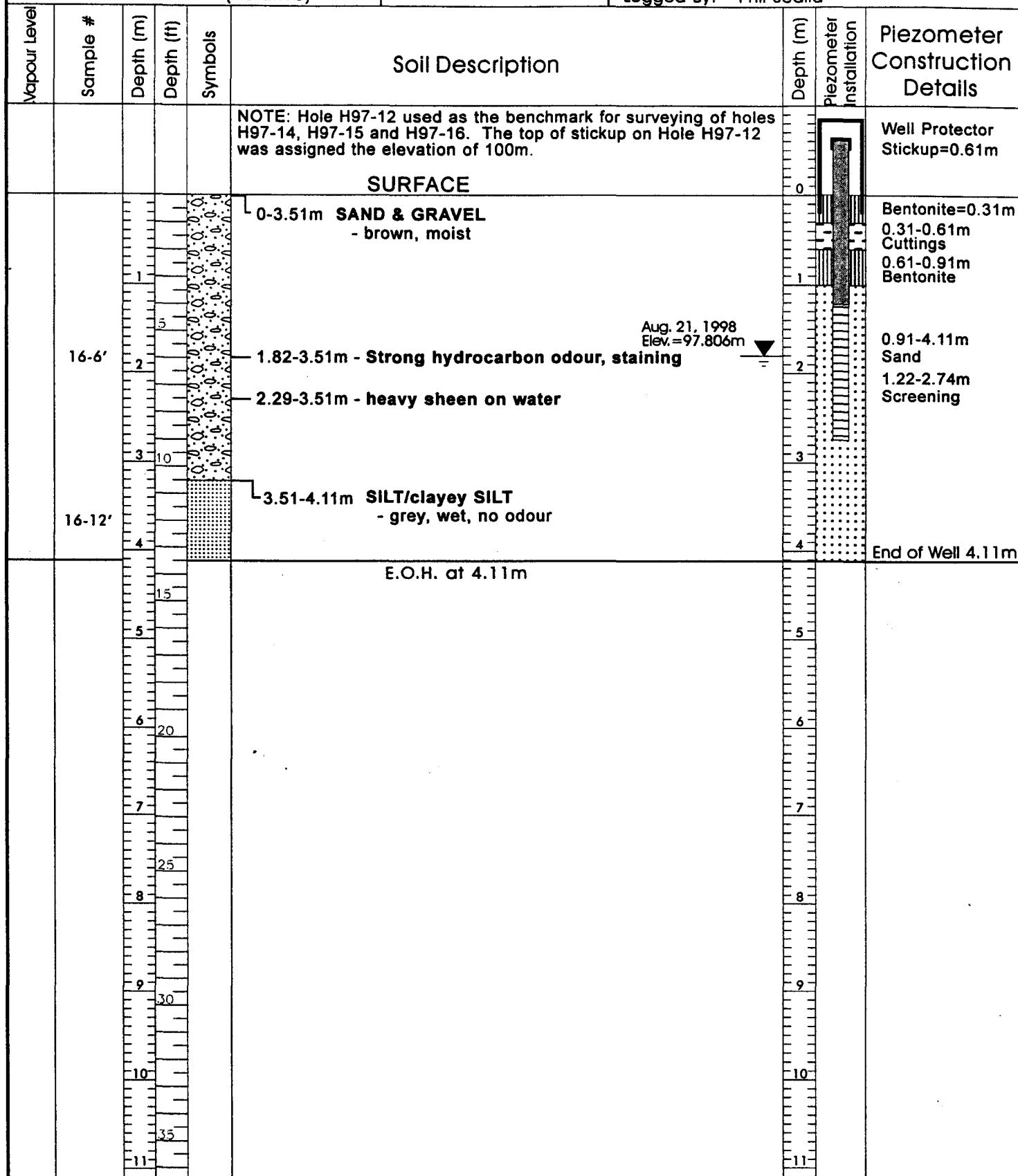
LORIMER
& Associates
Consulting Engineers

& HERMERA RESOURCE CONSULTANTS LTD.

Project: BROOKS BROOK
 Project No.: 281-008-01
 Date Drilled: November 5, 1997
 Elevation: 100.216m (Relative)

GROUNDWATER WELL H97-16

Location: Brooks Brook, Yukon Territory
 Contractor: Midnight Sun Drilling (CME Rig)
 Method: Auger (Hollow Stem)
 - Split Spoon Sampling
 Logged By: Phil Scalia



Client:
INDIAN & NORTHERN AFFAIRS CANADA

LORIMER
 & Associates
 Consulting Engineers

& HERRERA RESOURCE CONSULTANTS LTD.



400 Malheson Blvd. E., Suites 14 & 15
Mississauga, ON L4Z 1N8 Canada

Educational Purposes Only

CONSULT INSERT IN KIT **EnviroGard DDT in Soil Test Kit**

ENVR 000 31

Before Running Assay

Intended Use

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

Test Principles

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

A sample containing DDT is added to a test tube containing Assay Diluent. DDT-Enzyme Conjugate is then added to the test tube. The DDT-Enzyme Conjugate competes with the DDT for the antibody binding sites.

After the incubation, the unbound molecules are washed away.

A clear solution of chromogenic Substrate is then added to the test tube. In the presence of bound DDT-Enzyme Conjugate, the clear Substrate is converted to a blue color. One enzyme molecule can convert many Substrate molecules.

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

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

NOTE: Color is inversely proportional to DDT concentration.

Darker color = Lower concentration
Lighter color = Higher concentration

Performance Characteristics

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

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

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

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

Precautions

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

Materials Provided

EnviroGard DDT in Soil Test Kit

This test kit contains the following items.

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

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

Materials Required and Ordered Separately

See "Ordering Information" for the appropriate catalogue numbers.

EnviroGard Soil Extraction Bottle Kit

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

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

Methanol

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

Materials Required but Not Provided

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

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

Suggestions for Pipettor Use

Practice using both pipettors (positive displacement and Repeater pipettor) with water and extra tips before you analyze your samples.

Use a new tip each time you use the Repeater pipettor to avoid reagent cross-contamination. Label three 12.5 mL tips "Diluent", "Substrate" and "Stop," and one 5.0 mL tip "Conjugate".

Draw the desired reagent volume into the Repeater pipettor and dispense one portion of the reagent back into the container to properly engage the ratchet mechanism. If you do not do this, the first volume delivered may be inaccurate.

To add reagents using the Repeater pipettor, pipette down the side of the test tube just below the rim.

To add samples and calibrators using the positive displacement pipettor, pipette down the side of the test tube just above the liquid level.

The carryover volume of the positive displacement tips is minimal, but may affect results if you are going from a high to low DDT concentration. Use a new pipettor tip each time you pipette a new unknown.

Assay Procedure

Collect/Store the Sample

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

3. Store soil samples at 4°C (39°F).

Prepare the Sample/Extract the Soil

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

Perform the Test

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

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

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

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

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

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

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

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

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

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

Using a clean tip for each sample, add 25 μ L of each sample extract to the appropriately-labeled test tube.

Attach the 5.0 mL Combitip labeled "Conjugate" to the Repeater pipettor and adjust the dial to 1.

Add 100 μ L of DDT-Enzyme Conjugate to each test tube.

Shake the test tube rack to mix for 10 to 15 seconds. Leave the test tubes undisturbed for 15 minutes.

Vigorously shake out the test tube contents into a sink or suitable container. Fill the test tubes to overflowing with cool tap or distilled water, then decant and vigorously shake out the remaining water.

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

Attach the 12.5 mL Combitip labeled "Substrate" to the Repeater pipettor and set the dial to 2. Add 500 μ L of Substrate to each test tube. Leave the test tubes undisturbed for 10 minutes.

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

Interpret the Results

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

Visual Interpretation

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

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

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

Photometric Interpretation

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

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

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

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

Millipore Differential Photometer

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

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

Semi-quantitative Interpretation

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

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

If a sample OD is *equal* to the OD of a calibrator, the sample contains DDT at a concentration *approximately equal* to the calibrator.

If a sample OD is *greater* than a calibrator OD, the sample contains *less* DDT than the calibrator.

If a sample OD is *lower* than a calibrator OD, the sample may contain *more* DDT than that calibrator.

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

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

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

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

Example

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

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

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

Limitations of the Procedure

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

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

Analysis Report

CANTEST

CanTest Ltd

Professional
Analytical
Services

1523 West 3rd Ave
Vancouver, BC
V6J 1J8

Fax: 604 731 2386

Tel: 604 734 7276

1 800 665 8566

REPORT ON: Analysis of Leachate Samples
REPORTED TO: Hemmera Resource Consultants Ltd.
Suite 410
1190 Hornby Street
Vancouver, B.C.
V6Z 2K5

Att'n: Mr. Phil Scalia

PROJECT NAME: Brooks Brook
PROJECT NUMBER: 316-003

NUMBER OF SAMPLES: 3

REPORT DATE: January 19, 1999

DATE SUBMITTED: August 24, 1998

GROUP NUMBER: 9011235

SAMPLE TYPE: Soil

TEST METHODS:

Organochlorine Pesticides in Water, Soil and Leachate - analysis was performed using procedures based on U.S. EPA Method 608/8080, including extraction, clean-up steps, and analysis using GC/ECD.

Toxicity Characteristic Leaching Procedure - the samples were leached using procedures described in the U.S. E.P.A. "Code of Federal Regulations", Special Edition of the Federal Register, pages 783-797.

TEST RESULTS:

(See following pages)

CAN TEST LTD.

Zhenyong Gao, M.Sc.
Coordinator, Trace Organics

Page 1 of 5



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: January 19, 1999

GROUP NUMBER: 9011235

TCLP Extraction Procedure in Leachate

CLIENT SAMPLE IDENTIFICATION:	408A	301A	204A	DETECTION LIMIT	UNITS
CAN TEST ID:	901120144	901120145	901120146		
Initial pH of Sample	6.6	7.3	6.2	0.1	pH units
Final pH of Sample	5.0	5.0	5.0	0.1	pH units
Fluid Identification Number	1	1	1	-	
pH of Leaching Fluid	4.93	4.93	4.93	0.1	pH units

REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: January 19, 1999

GROUP NUMBER: 9011235

Organochlorine Pesticides in Leachate

CLIENT SAMPLE IDENTIFICATION:	408A	301A	204A	DETECTION LIMIT
CAN TEST ID:	901120144	901120145	901120146	
Aldrin	<	<	<	0.00004
alpha-BHC	<	<	<	0.00003
beta-BHC	<	<	<	0.00006
delta-BHC	<	<	<	0.0001
gamma-BHC (Lindane)	<	<	<	0.00004
alpha-Chlordane	<	<	<	0.0001
gamma-Chlordane	<	<	<	0.0001
p,p-DDD	<	<	<	0.0001
o,p-DDE	0.000046	<	<	0.00004
p,p-DDE	0.00029	0.00025	<	0.00004
o,p-DDT	0.0022	0.0016	0.00035	0.0001
p,p-DDT	0.0039	0.0049	0.0015	0.0001
Dieldrin	<	<	<	0.00002
Endosulfan I	<	<	<	0.0001
Endosulfan II	<	<	<	0.00004
Endosulfan Sulphate	<	<	<	0.0007
Endrin	<	<	<	0.00006
Endrin Aldehyde	<	<	<	0.0002
Heptachlor	<	<	<	0.0003
Heptachlor Epoxide	<	<	<	0.0008
Hexachlorobenzene	<	<	<	0.001
Methoxychlor	<	<	<	0.002
Toxaphene	<	<	<	0.003

Results expressed as milligrams per liter (mg/L)

< = Less than detection limit

REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: January 19, 1999

GROUP NUMBER: 9011235

Batch Quality Control for TCLP Extraction Procedure in Leachate (QC# 8628)

Parameter	Duplicate (R.P.D.)	Duplicate Limits
Initial pH of Sample	0	15
Final pH of Sample	0	15

R.P.D. = Relative Percent Difference

REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: January 19, 1999

GROUP NUMBER: 9011235

Batch Quality Control Frequency Summary

TCLP Leachate Extraction Prep (Batch# 8628)

QC Type	No. Samples
Duplicate	1
TCLP Blank	1
Batch Size	3

Analysis Report

CANTEST

CanTest Ltd

Professional
Analytical
Services

REPORT ON: Analysis of Soil Samples
REPORTED TO: Hemmera Resource Consultants Ltd.
Suite 410
1190 Hornby Street
Vancouver, B.C.
V6Z 2K5

1523 West 3rd Ave
Vancouver, BC
V6J 1J8

Fax: 604 731 2386

Tel: 604 734 7276

1 800 665 8566

Att'n: Mr. Phil Scalia

PROJECT NUMBER: 316-03

NUMBER OF SAMPLES: 56

REPORT DATE: October 19, 1998

DATE SUBMITTED: October 5, 1998

GROUP NUMBER: 8100642

SAMPLE TYPE: Soil

TEST METHODS:

Extractable Petroleum Hydrocarbons in Water/Soil (LEPH/HEPH-GNS) - analysis was performed using a draft DCM extraction-GC/FID procedure specified by the B.C. MOELP. Compounds eluting between n-decane (n-C10) and n-nonadecane (n-C19) are defined as Light Extractable Petroleum Hydrocarbons (LEPH). Compounds eluting between n-nonadecane and n-dotriacontane (n-C32) are defined as Heavy Extractable Petroleum Hydrocarbons (HEPH). The results can be compared to Generic Numerical Standard (GNS) criteria. The report states if results were corrected for specified PAH's, & if silica gel cleanup was used.

Organochlorine Pesticides in Water and Soil - analysis was performed using procedures based on U.S. EPA Method 608/8080, including extraction, clean-up steps, and analysis using GC/ECD.

TEST RESULTS:

(See following pages)

CAN TEST LTD.



Zhenyong Gao, M.Sc.
Coordinator, Trace Organics

Page 1 of 16



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: October 19, 1998

GROUP NUMBER: 8100642

Extractable Petroleum Hydrocarbons in Soil

CLIENT SAMPLE IDENTIFICATION:	SAMPLE DATE	CAN TEST ID	LEPH-uncorrected for PAH's	HEPH-uncorrected for PAH's
309	Sep 28/98	810060161	<	740
210	Sep 28/98	810060162	<	490
410	Sep 28/98	810060163	<	320
808	Sep 28/98	810060164	<	<
811	Sep 30/98	810060165	<	<
1108	Sep 28/98	810060166	<	370
1108	Sep 28/98	810060167	<	650
1207	Sep 28/98	810060168	<	<
1205	Sep 28/98	810060169	<	<
1209	Sep 30/98	810060170	<	<
DETECTION LIMIT			250	250
UNITS			$\mu\text{g/g}$	$\mu\text{g/g}$

$\mu\text{g/g}$ = micrograms per gram, on a dry weight basis.

< = Less than detection limit

Sample# 810060161, 810060162, 810060163, 810060166, 810060167

- The presence of hydrocarbon components with boiling points greater than that of C30 were detected.



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: October 19, 1998

GROUP NUMBER: 8100642

Organochlorine Pesticides in Soil

CLIENT SAMPLE IDENTIFICATION:	210	410	808	1207	
DATE SAMPLED:	Sep 28/98	Sep 28/98	Sep 28/98	Sep 28/98	
CAN TEST ID:	810060162	810060163	810060164	810060168	DETECTION LIMIT
Aldrin	<	<	<	<	0.005
alpha-BHC	<	<	<	<	0.005
beta-BHC	<	<	<	<	0.005
delta-BHC	<	<	<	<	0.005
gamma-BHC (Lindane)	<	<	<	<	0.005
alpha-Chlordane	<	<	<	<	0.025
gamma-Chlordane	<	<	<	<	0.025
p,p-DDD	0.48	0.55	0.69	0.09	0.025
o,p-DDE	<	<	<	<	0.015
p,p-DDE	0.09	0.42	0.47	<	0.015
o,p-DDT	0.45	0.26	0.77	<	0.015
p,p-DDT	0.66	0.33	1.5	0.09	0.015
Dieldrin	<	<	<	<	0.015
Endosulfan I	<	<	<	<	0.05
Endosulfan II	<	<	<	<	0.05
Endosulfan Sulphate	<	<	<	<	0.05
Endrin	<	<	<	<	0.05
Endrin Aldehyde	<	<	<	<	0.05
Heptachlor	<	<	<	<	0.005
Heptachlor Epoxide	<	<	<	<	0.005
Methoxychlor	<	<	<	<	0.05
Toxaphene	<	<	<	<	1.5

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

< = Less than detection limit

Sample# 810060162 , 810060163 , 810060164 , 810060168 - Detection limits adjusted: Dilution required



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: October 19, 1998

GROUP NUMBER: 8100642

Organochlorine Pesticides in Soil

CLIENT SAMPLE IDENTIFICATION:	1205	1209	1701N	1704	
DATE SAMPLED:	Sep 28/98	Sep 30/98			
CAN TEST ID:	810060169	810060170	810070132	810070133	DETECTION LIMIT
Aldrin	<	<	<	< 0.005	0.001
alpha-BHC	<	<	<	< 0.005	0.001
beta-BHC	<	<	<	< 0.005	0.001
delta-BHC	<	<	<	< 0.005	0.001
gamma-BHC (Lindane)	<	<	<	< 0.005	0.001
alpha-Chlordane	<	<	<	< 0.025	0.005
gamma-Chlordane	<	<	<	< 0.025	0.005
p,p-DDD	<	<	0.033	0.081	0.005
o,p-DDE	<	<	<	< 0.015	0.003
p,p-DDE	<	0.016	0.042	0.092	0.003
o,p-DDT	<	<	<	0.019	0.003
p,p-DDT	<	0.019	0.051	0.28	0.003
Dieldrin	<	<	<	< 0.015	0.003
Endosulfan I	<	<	<	< 0.05	0.01
Endosulfan II	<	<	<	< 0.05	0.01
Endosulfan Sulphate	<	<	<	< 0.05	0.01
Endrin	<	<	<	< 0.05	0.01
Endrin Aldehyde	<	<	<	< 0.05	0.01
Heptachlor	<	<	<	< 0.005	0.001
Heptachlor Epoxide	<	<	<	< 0.005	0.001
Methoxychlor	<	<	<	< 0.05	0.01
Toxaphene	<	<	<	< 1.5	0.3

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

< = Less than detection limit

Sample# 810070133 - Detection limits adjusted: Dilution required



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: October 19, 1998

GROUP NUMBER: 8100642

Organochlorine Pesticides in Soil

CLIENT SAMPLE IDENTIFICATION:	1504N	1508	1002N	1003	
CAN TEST ID:	810070134	810070135	810070136	810070137	DETECTION LIMIT
Aldrin	< 0.005	<	< 0.005	<	0.001
alpha-BHC	< 0.005	<	< 0.005	<	0.001
beta-BHC	< 0.005	<	< 0.005	<	0.001
delta-BHC	< 0.005	<	< 0.005	<	0.001
gamma-BHC (Lindane)	< 0.005	<	< 0.005	<	0.001
alpha-Chlordane	< 0.025	<	< 0.025	<	0.005
gamma-Chlordane	< 0.025	<	< 0.025	<	0.005
p,p-DDD	0.066	0.070	0.12	0.021	0.005
o,p-DDE	< 0.015	<	< 0.015	<	0.003
p,p-DDE	0.11	0.034	0.41	0.079	0.003
o,p-DDT	0.049	<	0.081	<	0.003
p,p-DDT	0.46	0.004	0.61	0.049	0.003
Dieldrin	< 0.015	<	< 0.015	<	0.003
Endosulfan I	< 0.05	<	< 0.05	<	0.01
Endosulfan II	< 0.05	<	< 0.05	<	0.01
Endosulfan Sulphate	< 0.05	<	< 0.05	<	0.01
Endrin	< 0.05	<	< 0.05	<	0.01
Endrin Aldehyde	< 0.05	<	< 0.05	<	0.01
Heptachlor	< 0.005	<	< 0.005	<	0.001
Heptachlor Epoxide	< 0.005	<	< 0.005	<	0.001
Methoxychlor	< 0.05	<	< 0.05	<	0.01
Toxaphene	< 1.5	<	< 1.5	<	0.3

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

< = Less than detection limit

Sample# 810070134 , 810070136 - Detection limits adjusted: Dilution required



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: October 19, 1998

GROUP NUMBER: 8100642

Organochlorine Pesticides in Soil

CLIENT SAMPLE IDENTIFICATION:	1006	906N	912	G9	
CAN TEST ID:	810070138	810070139	810070140	810070141	DETECTION LIMIT
Aldrin	<	< 0.005	<	< 0.01	0.001
alpha-BHC	<	< 0.005	<	< 0.01	0.001
beta-BHC	<	< 0.005	<	< 0.01	0.001
delta-BHC	<	< 0.005	<	< 0.01	0.001
gamma-BHC (Lindane)	<	< 0.005	<	< 0.01	0.001
alpha-Chlordane	<	< 0.025	< 0.02 (a)	0.15	0.005
gamma-Chlordane	<	< 0.025	<	0.076	0.005
p,p-DDD	0.026	0.12	<	13	0.005
o,p-DDE	<	< 0.015	<	< 0.03	0.003
p,p-DDE	0.003	0.11	<	2.5	0.003
o,p-DDT	0.005	0.042	<	2.6	0.003
p,p-DDT	0.024	0.38	<	7.3	0.003
Dieldrin	<	< 0.015	<	2.0	0.003
Endosulfan I	<	< 0.05	<	< 0.1	0.01
Endosulfan II	<	< 0.05	<	< 0.1	0.01
Endosulfan Sulphate	<	< 0.05	<	< 0.1	0.01
Endrin	<	< 0.05	<	< 0.1	0.01
Endrin Aldehyde	<	< 0.05	<	< 0.1	0.01
Heptachlor	<	< 0.005	<	< 0.01	0.001
Heptachlor Epoxide	<	< 0.005	<	< 0.01	0.001
Methoxychlor	<	< 0.05	<	< 0.1	0.01
Toxaphene	<	< 1.5	<	< 3	0.3

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

< = Less than detection limit

Sample# 810070139 , 810070141 - Detection limits adjusted: Dilution required

(a) = Detection limit adjusted: Interference present in sample



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: October 19, 1998

GROUP NUMBER: 8100642

Organochlorine Pesticides in Soil

CLIENT SAMPLE IDENTIFICATION:	801N	802	806	102N	DETECTION LIMIT
CAN TEST ID:	810070142	810070143	810070144	810070146	
Aldrin	<	<	< 0.01	<	0.005
alpha-BHC	<	<	< 0.01	<	0.005
beta-BHC	<	<	< 0.01	<	0.005
delta-BHC	<	<	< 0.01	<	0.005
gamma-BHC (Lindane)	<	<	< 0.01	<	0.005
alpha-Chlordane	<	<	0.10	<	0.025
gamma-Chlordane	<	<	< 0.05	<	0.025
p,p-DDD	0.091	0.079	2.2	0.15	0.025
o,p-DDE	<	<	< 0.03	<	0.015
p,p-DDE	0.78	0.31	2.3	0.08	0.015
o,p-DDT	0.21	0.08	2.6	0.06	0.015
p,p-DDT	3.0	0.92	19	0.91	0.015
Dieldrin	<	<	1.6	<	0.015
Endosulfan I	<	<	< 0.1	<	0.05
Endosulfan II	<	<	< 0.1	<	0.05
Endosulfan Sulphate	<	<	< 0.1	<	0.05
Endrin	<	<	< 0.1	<	0.05
Endrin Aldehyde	<	<	< 0.1	<	0.05
Heptachlor	<	<	< 0.01	<	0.005
Heptachlor Epoxide	<	<	< 0.01	<	0.005
Methoxychlor	<	<	< 0.1	<	0.05
Toxaphene	<	<	< 3	<	1.5

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

< = Less than detection limit

Sample# 810070142 , 810070143 , 810070144 , 810070146 - Detection limits adjusted: Dilution required



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: October 19, 1998

GROUP NUMBER: 8100642

Organochlorine Pesticides in Soil

CLIENT SAMPLE IDENTIFICATION:	205N	201N	302N	313	DETECTION LIMIT
CAN TEST ID:	810070147	810070148	810070150	810070151	
Aldrin	< 0.005	< 0.005	< 0.005	<	0.001
alpha-BHC	< 0.005	< 0.005	< 0.005	<	0.001
beta-BHC	< 0.005	< 0.005	< 0.005	<	0.001
delta-BHC	< 0.005	< 0.005	< 0.005	<	0.001
gamma-BHC (Lindane)	< 0.005	< 0.005	< 0.005	<	0.001
alpha-Chlordane	< 0.025	< 0.025	< 0.025	<	0.005
gamma-Chlordane	< 0.025	< 0.025	< 0.025	<	0.005
p,p-DDD	0.07	0.13	0.28	0.020	0.005
o,p-DDE	< 0.015	< 0.015	< 0.015	<	0.003
p,p-DDE	0.03	0.24	0.26	0.018	0.003
o,p-DDT	0.01	0.12	0.35	0.01	0.003
p,p-DDT	0.20	6.8	4.5	0.11	0.003
Dieldrin	< 0.015	< 0.015	< 0.015	<	0.003
Endosulfan I	< 0.05	< 0.05	< 0.05	<	0.01
Endosulfan II	< 0.05	< 0.05	< 0.05	<	0.01
Endosulfan Sulphate	< 0.05	< 0.05	< 0.05	<	0.01
Endrin	< 0.05	< 0.05	< 0.05	<	0.01
Endrin Aldehyde	< 0.05	< 0.05	< 0.05	<	0.01
Heptachlor	< 0.005	< 0.005	< 0.005	<	0.001
Heptachlor Epoxide	< 0.005	< 0.005	< 0.005	<	0.001
Methoxychlor	< 0.05	< 0.05	< 0.05	<	0.01
Toxaphene	< 1.5	< 1.5	< 1.5	<	0.3

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

< = Less than detection limit

Sample# 810070147 , 810070148 , 810070150 - Detection limits adjusted: Dilution required



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: October 19, 1998

GROUP NUMBER: 8100642

Organochlorine Pesticides in Soil

CLIENT SAMPLE IDENTIFICATION:	407N	404N	505N	511	DETECTION LIMIT
CAN TEST ID:	810070152	810070153	810070155	810070156	
Aldrin	<	<	<	<	0.005
alpha-BHC	<	<	<	<	0.005
beta-BHC	<	<	<	<	0.005
delta-BHC	<	<	<	<	0.005
gamma-BHC (Lindane)	<	<	<	<	0.005
alpha-Chlordane	<	<	<	<	0.025
gamma-Chlordane	<	<	<	<	0.025
p,p-DDD	0.04	0.85	0.14	0.11	0.025
o,p-DDE	<	<	<	<	0.015
p,p-DDE	0.01	0.39	0.04	0.07	0.009
o,p-DDT	0.028	0.09	0.11	0.18	0.015
p,p-DDT	0.26	2.8	0.77	1.6	0.015
Dieldrin	<	<	<	<	0.015
Endosulfan I	<	<	<	<	0.05
Endosulfan II	<	<	<	<	0.05
Endosulfan Sulphate	<	<	<	<	0.05
Endrin	<	<	<	<	0.05
Endrin Aldehyde	<	<	<	<	0.05
Heptachlor	<	<	<	<	0.005
Heptachlor Epoxide	<	<	<	<	0.005
Methoxychlor	<	<	<	<	0.05
Toxaphene	<	<	<	<	1.5

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

< = Less than detection limit

Sample# 810070152 , 810070153 , 810070155 , 810070156 - Detection limits adjusted: Dilution required



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: October 19, 1998

GROUP NUMBER: 8100642

Organochlorine Pesticides in Soil

CLIENT SAMPLE IDENTIFICATION:	610	1104	1102	1104N	DETECTION LIMIT
CAN TEST ID:	810070157	810070158	810070159	810070160	
Aldrin	< 0.005	< 0.005	<	< 0.005	0.001
alpha-BHC	< 0.005	< 0.005	<	< 0.005	0.001
beta-BHC	< 0.005	< 0.005	<	< 0.005	0.001
delta-BHC	< 0.005	< 0.005	<	< 0.005	0.001
gamma-BHC (Lindane)	< 0.005	< 0.005	<	< 0.005	0.001
alpha-Chlordane	< 0.025	< 0.025	<	< 0.025	0.005
gamma-Chlordane	< 0.025	< 0.025	<	< 0.025	0.005
p,p-DDD	< 0.025	0.26	<	0.15	0.005
o,p-DDE	< 0.015	< 0.015	<	< 0.015	0.003
p,p-DDE	< 0.015	< 0.015	0.008	0.34	0.003
o,p-DDT	< 0.015	0.11	<	0.05	0.003
p,p-DDT	< 0.018 (a)	0.36	0.029	0.41	0.003
Dieldrin	< 0.015	< 0.015	<	< 0.015	0.003
Endosulfan I	< 0.05	< 0.05	<	< 0.05	0.01
Endosulfan II	< 0.05	< 0.05	<	< 0.05	0.01
Endosulfan Sulphate	< 0.05	< 0.05	<	< 0.05	0.01
Endrin	< 0.05	< 0.05	<	< 0.05	0.01
Endrin Aldehyde	< 0.05	< 0.05	<	< 0.05	0.01
Heptachlor	< 0.005	< 0.005	<	< 0.005	0.001
Heptachlor Epoxide	< 0.005	< 0.005	<	< 0.005	0.001
Methoxychlor	< 0.05	< 0.05	<	< 0.05	0.01
Toxaphene	< 1.5	< 1.5	<	< 1.5	0.3

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

< = Less than detection limit

Sample# 810070157 - Detection limits adjusted: Interference present in sample

Sample# 810070158 , 810070160 - Detection limits adjusted: Dilution required

(a) = Detection limit adjusted: Interference present in sample



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: October 19, 1998

GROUP NUMBER: 8100642

Organochlorine Pesticides in Soil

CLIENT SAMPLE IDENTIFICATION:	1205N	1203N	1201	1302N	DETECTION LIMIT
CAN TEST ID:	810070161	810070162	810070163	810070167	
Aldrin	< 0.005	< 0.005	<	< 0.005	0.001
alpha-BHC	< 0.005	< 0.005	<	< 0.005	0.001
beta-BHC	< 0.005	< 0.005	<	< 0.005	0.001
delta-BHC	< 0.005	< 0.005	<	< 0.005	0.001
gamma-BHC (Lindane)	< 0.005	< 0.005	<	< 0.005	0.001
alpha-Chlordane	< 0.025	< 0.025	<	< 0.025	0.005
gamma-Chlordane	< 0.025	< 0.025	<	< 0.025	0.005
p,p-DDD	0.09	0.14	0.012	0.049	0.005
o,p-DDE	< 0.015	< 0.015	<	< 0.015	0.003
p,p-DDE	< 0.015	0.34	<	0.060	0.003
o,p-DDT	0.02	0.03	0.011	< 0.015	0.003
p,p-DDT	0.05	0.07	0.024	< 0.015	0.003
Dieldrin	< 0.015	< 0.015	<	< 0.015	0.003
Endosulfan I	< 0.05	< 0.05	<	< 0.05	0.01
Endosulfan II	< 0.05	< 0.05	<	< 0.05	0.01
Endosulfan Sulphate	< 0.05	< 0.05	<	< 0.05	0.01
Endrin	< 0.05	< 0.05	<	< 0.05	0.01
Endrin Aldehyde	< 0.05	< 0.05	<	< 0.05	0.01
Heptachlor	< 0.005	< 0.005	<	< 0.005	0.001
Heptachlor Epoxide	< 0.005	< 0.005	<	< 0.005	0.001
Methoxychlor	< 0.05	< 0.05	<	< 0.05	0.01
Toxaphene	< 1.5	< 1.5	<	< 1.5	0.3

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

< = Less than detection limit

Sample# 810070161 , 810070162 , 810070167 - Detection limits adjusted: Dilution required



REPORTED TO: Hemmera Resource Consultants Ltd.

CAN-TEST

REPORT DATE: October 19, 1998

GROUP NUMBER: 8100642

Organochlorine Pesticides in Soil

CLIENT SAMPLE IDENTIFICATION:	1407	1502N	G2	107-0.25	DETECTION LIMIT
CAN TEST ID:	810070168	810070169	810070170	810070171	
Aldrin	<	<	<	< 0.02	0.005
alpha-BHC	<	<	<	< 0.02	0.005
beta-BHC	<	<	<	< 0.02	0.005
delta-BHC	<	<	<	< 0.02	0.005
gamma-BHC (Lindane)	<	<	<	< 0.02	0.005
alpha-Chlordane	<	<	<	0.19	0.025
gamma-Chlordane	<	<	<	0.13	0.025
p,p-DDD	<	0.14	0.08	26	0.025
o,p-DDE	<	<	<	< 0.06	0.015
p,p-DDE	<	0.065	0.22	1.2	0.015
o,p-DDT	<	0.024	0.20	12	0.015
p,p-DDT	<	0.085	0.51	30	0.015
Dieldrin	<	<	<	< 0.06	0.015
Endosulfan I	<	<	<	< 0.2	0.05
Endosulfan II	<	<	<	< 0.2	0.05
Endosulfan Sulphate	<	<	<	< 0.2	0.05
Endrin	<	<	<	< 0.2	0.05
Endrin Aldehyde	<	<	<	< 0.2	0.05
Heptachlor	<	<	<	< 0.02	0.005
Heptachlor Epoxide	<	<	<	< 0.02	0.005
Methoxychlor	<	<	<	< 0.2	0.05
Toxaphene	<	<	<	< 6	1.5

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

< = Less than detection limit

Sample# 810070168 - Detection limits adjusted: Interference present in sample

Sample# 810070169 , 810070170 , 810070171 - Detection limits adjusted: Dilution required



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: October 19, 1998

GROUP NUMBER: 8100642

Organochlorine Pesticides in Soil

CLIENT SAMPLE IDENTIFICATION:	107-0.5	107-0.75	107-1.0	107-1.25	DETECTION LIMIT
CAN TEST ID:	810070172	810070173	810070174	810070175	
Aldrin	< 0.02	<	<	<	0.005
alpha-BHC	< 0.02	<	<	<	0.005
beta-BHC	< 0.02	<	<	<	0.005
delta-BHC	< 0.02	<	<	<	0.005
gamma-BHC (Lindane)	< 0.02	<	<	<	0.005
alpha-Chlordane	0.20	<	<	<	0.025
gamma-Chlordane	0.22	<	<	<	0.025
p,p-DDD	32	0.03	0.38	0.24	0.025
o,p-DDE	< 0.06	<	<	<	0.015
p,p-DDE	1.4	<	0.06	0.02	0.015
o,p-DDT	19	0.08	1.6	0.64	0.015
p,p-DDT	50	0.20	0.21	0.08	0.015
Dieldrin	< 0.06	<	<	<	0.015
Endosulfan I	< 0.2	<	<	<	0.05
Endosulfan II	< 0.2	<	<	<	0.05
Endosulfan Sulphate	< 0.2	<	<	<	0.05
Endrin	< 0.2	<	<	<	0.05
Endrin Aldehyde	< 0.2	<	<	<	0.05
Heptachlor	< 0.02	<	<	<	0.005
Heptachlor Epoxide	< 0.02	<	<	<	0.005
Methoxychlor	< 0.2	<	<	<	0.05
Toxaphene	< 6	<	<	<	1.5

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

< = Less than detection limit

Sample# 810070172 , 810070173 , 810070174 , 810070175 - Detection limits adjusted: Dilution required



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: October 19, 1998

GROUP NUMBER: 8100642

Organochlorine Pesticides in Soil

CLIENT SAMPLE IDENTIFICATION:	404-0.5	404-0.75	404-1.0	408-0.25	DETECTION LIMIT
CAN TEST ID:	810070176	810070177	810070178	810070179	
Aldrin	< 0.005	<	<	<	0.001
alpha-BHC	< 0.005	<	<	<	0.001
beta-BHC	< 0.005	<	<	<	0.001
delta-BHC	< 0.005	<	<	<	0.001
gamma-BHC (Lindane)	< 0.005	<	<	<	0.001
alpha-Chlordane	< 0.025	<	<	<	0.005
gamma-Chlordane	< 0.025	<	<	<	0.005
p,p-DDD	0.54	0.017	0.008	<	0.005
o,p-DDE	< 0.015	<	<	<	0.003
p,p-DDE	0.14	0.009	<	<	0.003
o,p-DDT	0.65	0.013	0.007	<	0.003
p,p-DDT	0.63	0.037	0.033	0.011	0.003
Dieldrin	< 0.015	<	<	<	0.003
Endosulfan I	< 0.05	<	<	<	0.01
Endosulfan II	< 0.05	<	<	<	0.01
Endosulfan Sulphate	< 0.05	<	<	<	0.01
Endrin	< 0.05	<	<	<	0.01
Endrin Aldehyde	< 0.05	<	<	<	0.01
Heptachlor	< 0.005	<	<	<	0.001
Heptachlor Epoxide	< 0.005	<	<	<	0.001
Methoxychlor	< 0.05	<	<	<	0.01
Toxaphene	< 1.5	<	<	<	0.3

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

< = Less than detection limit

Sample# 810070176 - Detection limits adjusted: Dilution required



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: October 19, 1998

GROUP NUMBER: 8100642

Organochlorine Pesticides in Soil

CLIENT SAMPLE IDENTIFICATION:	408-0.50	408-0.75	301-0.25	301-0.50	DETECTION LIMIT
CAN TEST ID:	810070180	810070181	810070182	810070183	
Aldrin	<	<	<	<	0.001
alpha-BHC	<	<	<	<	0.001
beta-BHC	<	<	<	<	0.001
delta-BHC	<	<	<	<	0.001
gamma-BHC (Lindane)	<	<	<	<	0.001
alpha-Chlordane	<	<	<	<	0.005
gamma-Chlordane	<	<	<	<	0.005
p,p-DDD	<	<	0.005	<	0.005
o,p-DDE	<	<	<	<	0.003
p,p-DDE	<	<	0.003	<	0.003
o,p-DDT	<	<	0.004	<	0.003
p,p-DDT	<	<	0.013	<	0.003
Dieldrin	<	<	<	<	0.003
Endosulfan I	<	<	<	<	0.01
Endosulfan II	<	<	<	<	0.01
Endosulfan Sulphate	<	<	<	<	0.01
Endrin	<	<	<	<	0.01
Endrin Aldehyde	<	<	<	<	0.01
Heptachlor	<	<	<	<	0.001
Heptachlor Epoxide	<	<	<	<	0.001
Methoxychlor	<	<	<	<	0.01
Toxaphene	<	<	<	<	0.3

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

< = Less than detection limit



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: October 19, 1998

GROUP NUMBER: 8100642

Batch Quality Control for Extractable Petroleum Hydrocarbons in Soil (QC# 37844)

Parameter	Blank (ug/g)	Blank Limits	Duplicate (R.P.D.)	Duplicate Limits	Spike (% Recovery)	Spike Limits
LEPH-uncorrected for PAH's	< 250	250	NC	20	104	75 - 125
HEPH-uncorrected for PAH's	< 250	250	NC	20	-	-

ug/g = micrograms per gram

R.P.D. = Relative Percent Difference

NC = Not Calculated. Duplicate sample results were less than the detection limit. Relative Percent Difference calculation is not defined for analyte levels of less than detection limit.



CANTEST LTD. CHROMATOGRAM COVER SHEET

CanTest Ltd.

Professional
Analytical
Services

Date: Tuesday, October 20, 1998

1523 West 3rd Ave
Vancouver, BC
V6J 1J8

Fax: 604 731 2386

Tel: 604 734 7276

1 800 665 8566

Company Name: Hemmera Resource Consultants Ltd.

Fax Number: (604) 669-0430

Contact: Mr. Paul Scalia

of Pages: 6 (Including Cover)

Please find attached the chromatograms associated with:

Group Number: 8100642

Project Number: 316-03

Project Name:

Sample Matrix: Soil

The originals will follow with the report.

If you have any questions or concerns, please do not hesitate to contact one of our Technical Service Representatives at (604) 734-7276.

Printed: Tuesday, October 20, 1998

Injection Date : 10/9/98 11:56:58 PM Seq. Line : 13

Sample Name : 810060161 Vial : 37

Acq. Operator : kf Inj : 1

Inj Volume : 2 µl

Acq. Method : C:\HPCHEM\2\METHODS\TEHBAKE.M

Last changed : 9/17/98 4:53:45 PM by gr

Analysis Method : C:\HPCHEM\2\METHODS\TEH.M

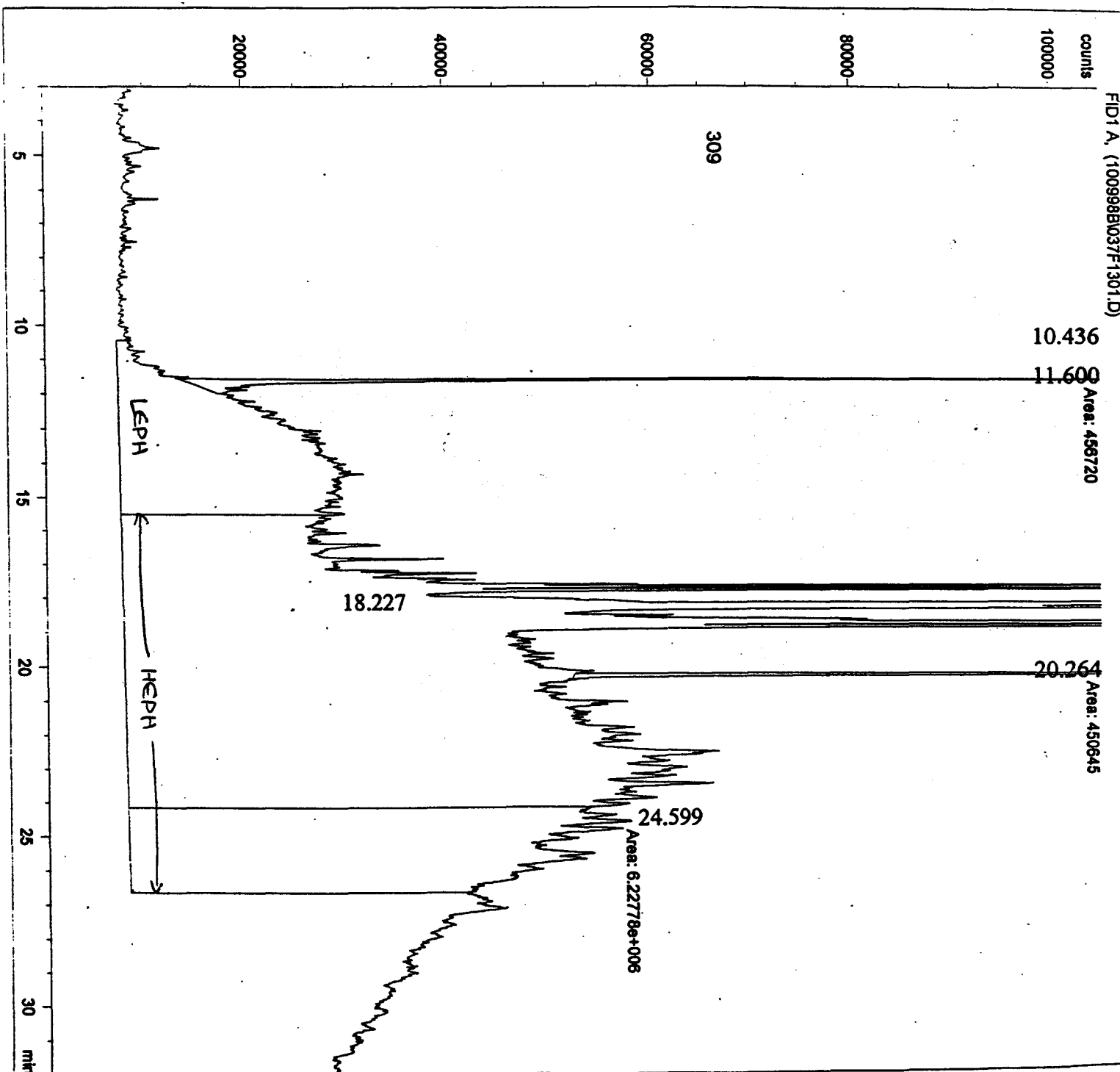
Last changed : 10/14/98 10:02:05 AM by gr

(modified after loading)

Total Extractable Hydrocarbons. Soils and Waters are extracted using methylene chloride and then analyzed using an HPGC-FID.
Calculations are based on an internal standard and reported in ug/L for waters and ug/g for soils.

8100642

HEMMERA



Injection Date : 10/10/98 12:41:22 AM Seq. Line : 14

Sample Name : 810060162 Vial : 38

Acq. Operator : kf Inj : 1

Inj Volume : 2 µl

Acq. Method : C:\HPCHEM\2\METHODS\TEHBAKE.M

Last changed : 9/17/98 4:53:45 PM by gr

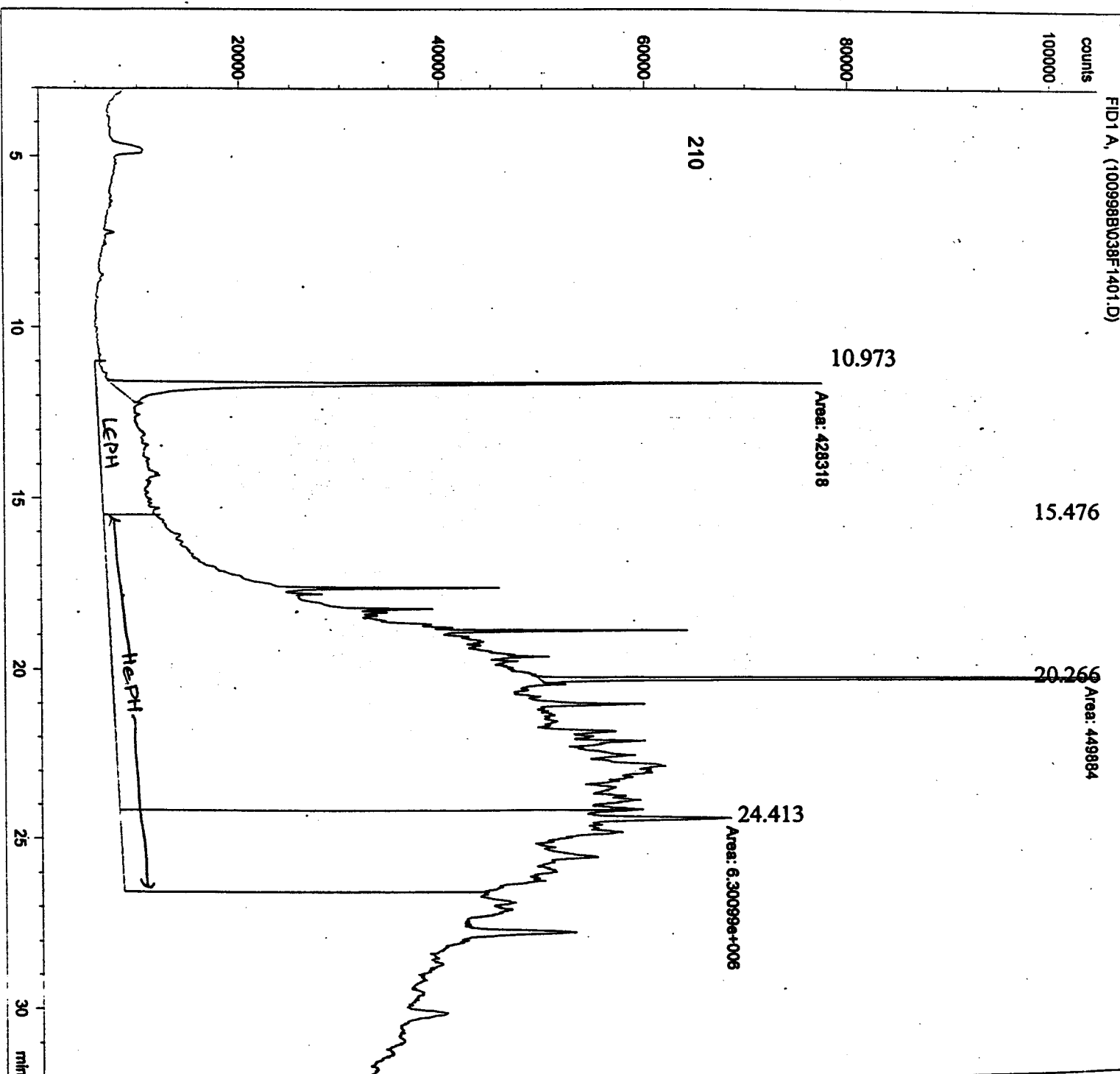
Analysis Method : C:\HPCHEM\2\METHODS\TEH.M

Last changed : 10/14/98 10:02:05 AM by gr

(modified after loading)

Total Extractable Hydrocarbons. Soils and Waters are extracted using methylene chloride and then analyzed using an HPGC-FID.

Calculations are based on an internal standard and reported in ug/L for waters and ug/g for soils.

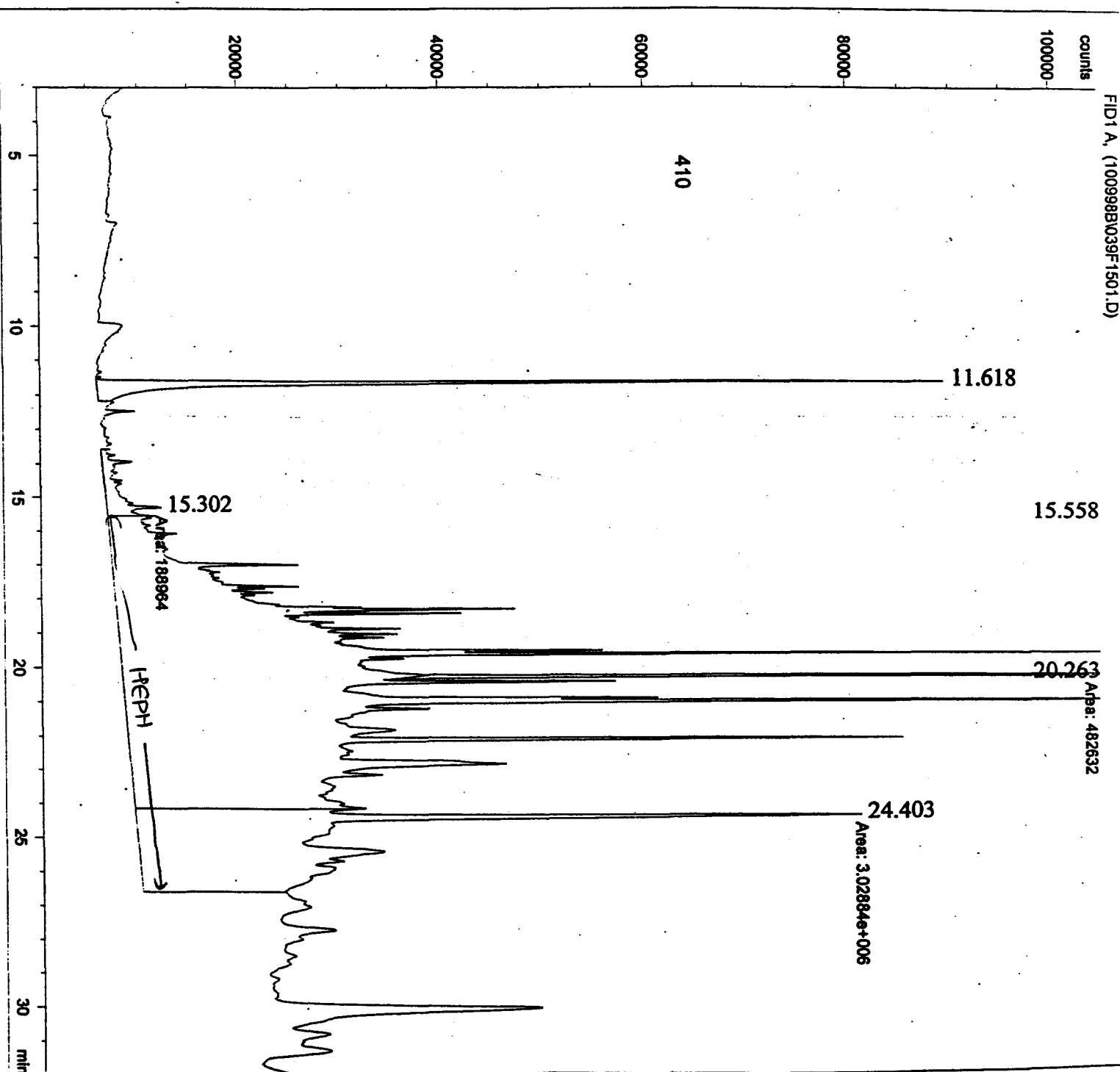


=====

Injection Date : 10/10/98 1:25:45 AM Seq. Line : 15
Sample Name : 810060163 Vial : 39
Acq. Operator : kf Inj : 1
Inj Volume : 2 µl
Acq. Method : C:\HPCHEM\2\METHODS\TEHBAKE.M
Last changed : 9/17/98 4:53:45 PM by gr
Analysis Method : C:\HPCHEM\2\METHODS\!TEH.M
Last changed : 10/14/98 10:02:05 AM by gr
(modified after loading)

Total Extractable Hydrocarbons. Soils and Waters are extracted using methylene chloride and then analyzed using an HPGC-FID.
Calculations are based on an internal standard and reported in ug/L for waters and ug/g for soils.

=====



Injection Date : 10/10/98 3:39:10 AM Seq. Line : 18
Sample Name : 810060166 Vial : 42
Acq. Operator : kf Inj : 1

Inj Volume : 2 µl

Acq. Method : C:\HPCHEM\2\METHODS\TEHBAKE.M

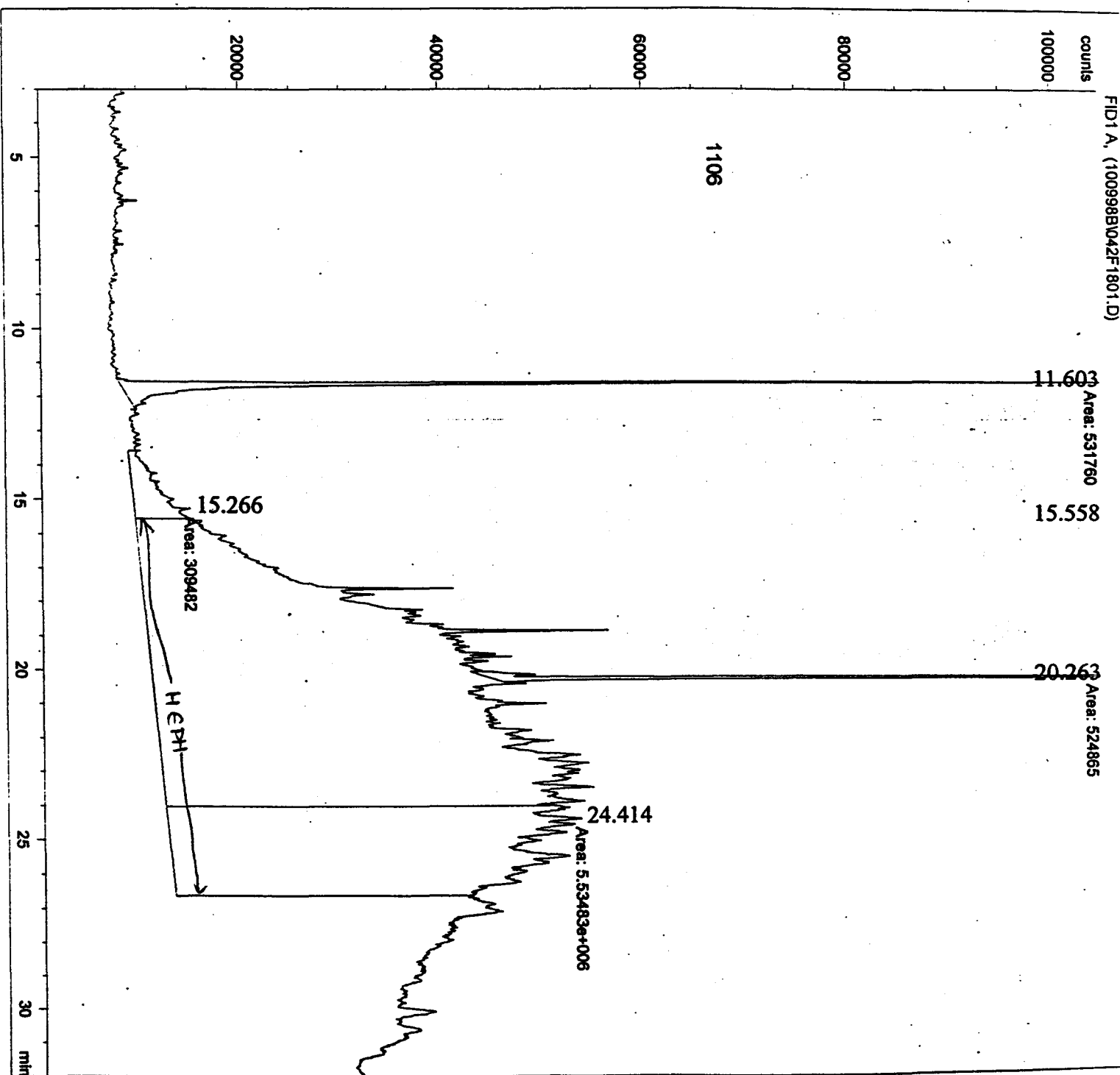
Last changed : 9/17/98 4:53:45 PM by gr

Analysis Method : C:\HPCHEM\2\METHODS\TEH.M

Last changed : 10/14/98 10:17:26 AM by gr

(modified after loading)

Total Extractable Hydrocarbons. Soils and Waters are extracted using methylene chloride and then analyzed using an HPGC-FID.
Calculations are based on an internal standard and reported in ug/L for waters and ug/g for soils.



Injection Date : 10/10/98 4:23:40 AM Seq. Line : 19

Sample Name : 810060167 Vial : 43

Acq. Operator : kjf Inj : 1

Inj Volume : 2 µl

Acq. Method : C:\HPCHEM\2\METHODS\TEHBAKE.M

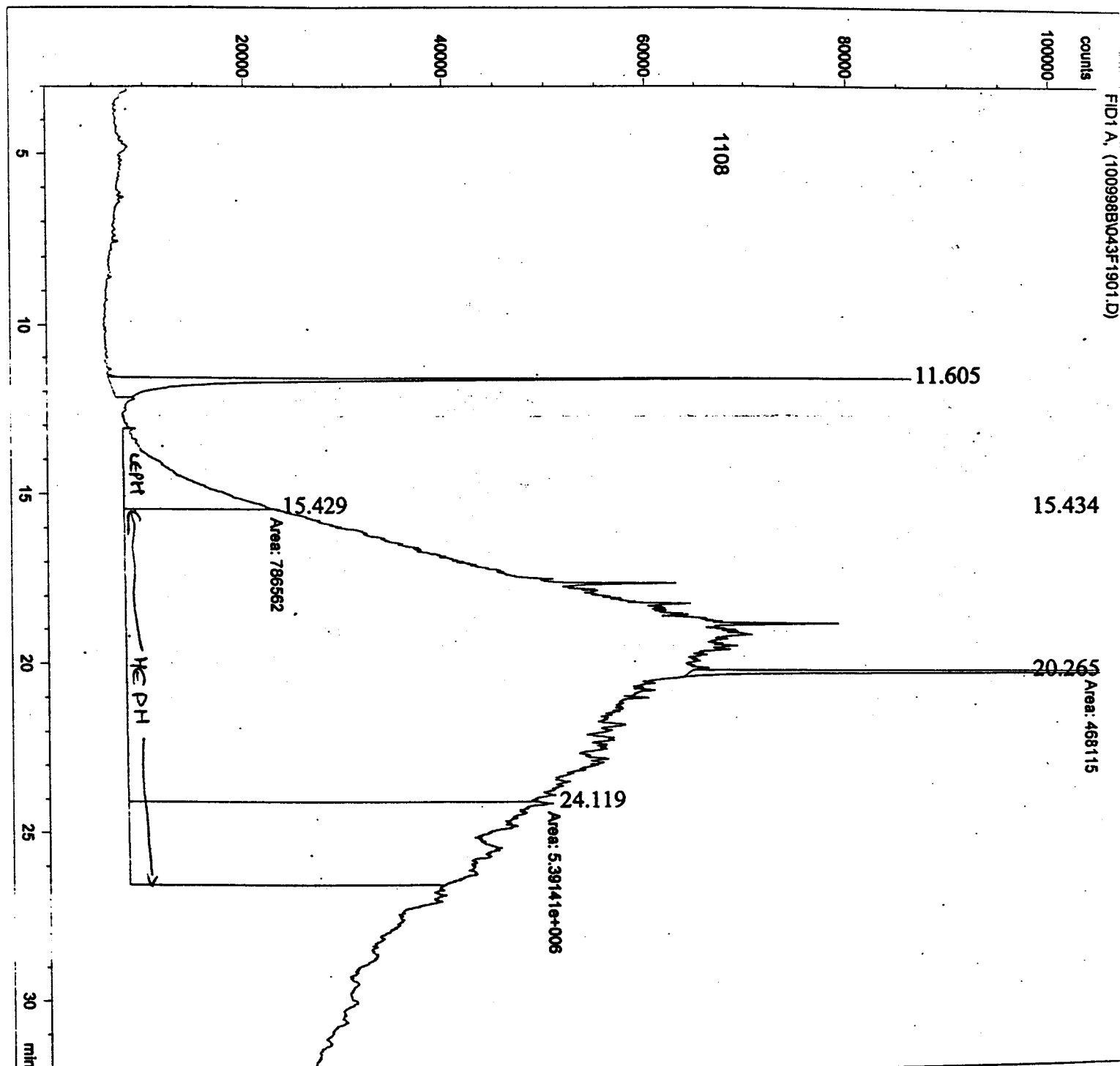
Last changed : 9/17/98 4:53:45 PM by gr

Analysis Method : C:\HPCHEM\2\METHODS\TEH.M

Last changed : 10/14/98 10:17:26 AM by gr

(modified after loading)

Total Extractable Hydrocarbons. Soils and Waters are extracted using methylene chloride and then analyzed using an HPGC-FID.
Calculations are based on an internal standard and reported in ug/L for waters and ug/g for soils.



SEP 11 1998

Analysis Report

CANTEST

CanTest Ltd

Professional
Analytical
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1523 West 3rd Ave
Vancouver, BC
V6J 1J8

Fax: 604 731 2386

Tel: 604 734 7276

1 800 665 8566

REPORT ON: Analysis of Soil, Water Samples

REPORTED TO: Hemmera Resource Consultants Ltd.
Suite 410
1190 Hornby Street
Vancouver, B.C.
V6Z 2K5

Att'n: Mr. Phil Scalia

CHAIN OF CUSTODY: 38401
PROJECT NAME: Brooks Brook
PROJECT NUMBER: 316-03

NUMBER OF SAMPLES: 64

REPORT DATE: September 3, 1998

DATE SUBMITTED: August 24, 1998

GROUP NUMBER: 8082535

SAMPLE TYPE: Soil

TEST METHODS:

Volatile Organic Compounds in Water and Soil - analysis was performed using procedures based on U.S. EPA Methods 624/8240/8260, involving sparging with a Purge and Trap apparatus and analysis using GC/MS.

Volatile Petroleum Hydrocarbons in Soil (VPH-GNS) - analysis was performed using a draft methanol extraction-purge and trap-GC/FID procedure specified by the B.C. MOELP. The VPH compounds elute between n-pentane (n-C5) and n-undecane (n-C11). BTEX compounds are not included in the VPH result. VPH results produced by this method can be compared to Generic Numerical Standard (GNS) criteria.

Volatile Organic Compounds in Soil - analysis was performed using procedures based on U.S. EPA Methods 624/8240, involving methanol extraction, sparging/collection with a Purge and Trap apparatus and analysis using GC/MS.

Extractable Petroleum Hydrocarbons in Water/Soil (LEPH/HEPH-GNS) - analysis was performed using a draft DCM extraction-GC/FID procedure specified by the B.C. MOELP. Compounds eluting between n-decane (n-C10) and n-nonadecane (n-C19) are defined as Light Extractable Petroleum Hydrocarbons (LEPH). Compounds eluting between n-nonadecane and n-dotriacontane (n-C32) are defined as Heavy Extractable Petroleum Hydrocarbons (HEPH). The results can be compared to Generic Numerical Standard (GNS) criteria. The report states if results were corrected for specified PAH's, & if silica gel cleanup was used.

Organochlorine Pesticides in Water and Soil - analysis was performed using procedures based on U.S. EPA Method 608/8080, including extraction, clean-up steps, and analysis using GC/ECD.

Polynuclear Aromatic Hydrocarbons - analysis was performed using procedures based on U.S. EPA Methods

(Continued)

CAN TEST LTD.


Zhenyong Gao, M.Sc.
Coordinator, Trace Organics

Page 1 of 30



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Polynuclear Aromatic Hydrocarbons

625/8270, involving extraction, clean-up steps, and analysis using GC/MS.

Total Extractable Hydrocarbons (TEH) - analysis was performed using procedures based on USEPA Method 8015 and BC MOELP Environmental Laboratory Manual (1994) Method X366, involving dichloromethane extraction and analysis using GC/FID. Components in the C10 to C30 range are included, using an alkane standard for quantitation. The report states if silica gel cleanup was used.

TEST RESULTS:

(See following pages)



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Polycyclic Aromatic Hydrocarbons in Water

CLIENT SAMPLE IDENTIFICATION:	H98-20	H97-15	H98-18	H97-16	
DATE SAMPLED:	Aug 20/98	Aug 20/98	Aug 20/98	Aug 20/98	
CAN TEST ID:	808250206	808250207	808250208	808250209	
ANALYSIS DATE:	Aug 31/98	Aug 31/98	Aug 31/98	Aug 31/98	DETECTION LIMIT
Naphthalene	1.7	<	130	15	0.3
Acenaphthylene	<	<	<	<	0.1
Acenaphthene	0.7	<	1.3	0.6	0.1
Fluorene	1.7	<	3.7	2.0	0.05
Phenanthrene	0.30	<	1.0	0.62	0.05
Anthracene	<	<	<	<	0.05
Acridine	<	<	<	<	0.05
Total LMW-PAH's	4.4		136	18.2	
Fluoranthene	<	<	<	<	0.05
Pyrene	<	< 0.2 (a)	<	<	0.02
Benzo(a)anthracene	<	<	<	<	0.01
Chrysene	<	<	<	<	0.01
Benzo(b)fluoranthene	<	<	<	<	0.01
Benzo(k)fluoranthene	<	<	<	<	0.01
Benzo(a)pyrene	<	<	<	<	0.01
Indeno(1,2,3-c,d)pyrene	<	<	<	<	0.01
Dibenz(a,h)anthracene	<	<	<	<	0.01
Benzo(g,h,i)perylene	<	<	<	<	0.01
Total HMW-PAH's					
Total PAH's	4.4		136	18.2	

Results expressed as micrograms per liter ($\mu\text{g/L}$)

< = Less than detection limit

(a) = Detection limit adjusted: Interference present in sample



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Polycyclic Aromatic Hydrocarbons in Water

CLIENT SAMPLE IDENTIFICATION:	H98-23	H97-12	H97-14	H98-25	
DATE SAMPLED:	Aug 20/98	Aug 20/98	Aug 20/98	Aug 20/98	
CAN TEST ID:	808250210	808250211	808250212	808250213	
ANALYSIS DATE:	Aug 31/98	Aug 31/98	Aug 31/98	Aug 31/98	DETECTION LIMIT
Naphthalene	<	<	<	<	0.3
Acenaphthylene	<	<	<	<	0.1
Acenaphthene	0.2	<	<	<	0.1
Fluorene	0.32	<	<	<	0.05
Phenanthrene	<	<	<	<	0.05
Anthracene	<	<	<	<	0.05
Acridine	<	<	<	<	0.05
Total LMW-PAH's	0.52				
Fluoranthene	<	<	<	<	0.05
Pyrene	<	<	<	<	0.02
Benzo(a)anthracene	<	<	<	<	0.01
Chrysene	<	<	<	<	0.01
Benzo(b)fluoranthene	<	<	<	<	0.01
Benzo(k)fluoranthene	<	<	<	<	0.01
Benzo(a)pyrene	<	<	<	<	0.01
Indeno(1,2,3-c,d)pyrene	<	<	<	<	0.01
Dibenz(a,h)anthracene	<	<	<	<	0.01
Benzo(g,h,i)perylene	<	<	<	<	0.01
Total HMW-PAH's					
Total PAH's	0.52				

Results expressed as micrograms per liter ($\mu\text{g/L}$)

< = Less than detection limit



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Polycyclic Aromatic Hydrocarbons in Water

CLIENT SAMPLE IDENTIFICATION:	Dup98-1	
DATE SAMPLED:	Aug 20/98	
CAN TEST ID:	808250214	
ANALYSIS DATE:	Aug 31/98	DETECTION LIMIT
Naphthalene	16	0.3
Acenaphthylene	<	0.1
Acenaphthene	0.6	0.1
Fluorene	2.1	0.05
Phenanthrene	0.6	0.05
Anthracene	<	0.05
Acridine	<	0.05
Total LMW-PAH's	19.3	
Fluoranthene	<	0.05
Pyrene	<	0.02
Benzo(a)anthracene	<	0.01
Chrysene	<	0.01
Benzo(b)fluoranthene	<	0.01
Benzo(k)fluoranthene	<	0.01
Benzo(a)pyrene	<	0.01
Indeno(1,2,3-c,d)pyrene	<	0.01
Dibenz(a,h)anthracene	<	0.01
Benzo(g,h,i)perylene	<	0.01
Total HMW-PAH's		
Total PAH's	19.3	

Results expressed as micrograms per liter ($\mu\text{g/L}$)

< = Less than detection limit



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Total Extractable Hydrocarbons in Water

CLIENT SAMPLE IDENTIFICATION:	SAMPLE DATE	CAN TEST ID	TEH
H98-20	Aug 20/98	808250206	6300
H97-15	Aug 20/98	808250207	2000
H98-18	Aug 20/98	808250208	6100
H97-16	Aug 20/98	808250209	30000
H98-23	Aug 20/98	808250210	2000
H97-12	Aug 20/98	808250211	<
H97-14	Aug 20/98	808250212	1000
H98-25	Aug 20/98	808250213	<
Dup98-1	Aug 20/98	808250214	25000
DETECTION LIMIT			100
UNITS			µg/L

µg/L = micrograms per liter

< = Less than detection limit

Sample# 808250206 , 808250207 , 808250208 , 808250209 , 808250210 , 808250212 , 808250214

- The presence of hydrocarbon components with boiling points below that of C10 were detected.



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Monocyclic Aromatic Hydrocarbons in Water

CLIENT SAMPLE IDENTIFICATION:	H98-20	H97-15	H98-18	H97-16	
DATE SAMPLED:	Aug 20/98	Aug 20/98	Aug 20/98	Aug 20/98	
CAN TEST ID:	808250206	808250207	808250208	808250209	
ANALYSIS DATE:	Aug 28/98	Aug 28/98	Aug 28/98	Aug 28/98	
Benzene	< 2.5	0.3	< 2.5	<	0.1
Ethylbenzene	< 2.5	<	6.6	1.1	0.1
Toluene	< 2.5	<	< 2.5	0.2	0.1
Xylenes	2.6	<	35	3.9	0.1
1,3,5-Trimethylbenzene	< 2.5	0.2	61	3.3	0.1
Surrogate Recovery					
Toluene-d8	124	97	116	119	-
Bromofluorobenzene	107	85	91	98	-

Results expressed as micrograms per liter ($\mu\text{g/L}$)

Surrogate recoveries expressed as percent (%)

< = Less than detection limit

Sample# 808250208, 808250206 - Detection limits adjusted: Interference present in sample



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Monocyclic Aromatic Hydrocarbons in Water

CLIENT SAMPLE IDENTIFICATION:	H98-23	H97-12	H97-14	H98-25	
DATE SAMPLED:	Aug 20/98	Aug 20/98	Aug 20/98	Aug 20/98	
CAN TEST ID:	808250210	808250211	808250212	808250213	
ANALYSIS DATE:	Aug 31/98	Aug 31/98	Aug 31/98	Aug 31/98	DETECTION LIMIT
Benzene	<	<	<	<	0.1
Ethylbenzene	0.1	<	<	<	0.1
Toluene	<	<	<	<	0.1
Xylenes	1.4	<	<	<	0.1
1,3,5-Trimethylbenzene	6.5	<	0.3	<	0.1
Surrogate Recovery					
Toluene-d8	108	116	92	100	-
Bromofluorobenzene	90	99	85	88	-

Results expressed as micrograms per liter ($\mu\text{g/L}$)

Surrogate recoveries expressed as percent (%)

< = Less than detection limit



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Monocyclic Aromatic Hydrocarbons in Water

CLIENT SAMPLE IDENTIFICATION:	Dup98-1	TB80811C	
DATE SAMPLED:	Aug 20/98	Aug 11/98	
CAN TEST ID:	808250214	808250215	
ANALYSIS DATE:	Aug 31/98	Aug 31/98	DETECTION LIMIT
Benzene	<	<	0.1
Ethylbenzene	1.4	<	0.1
Toluene	0.2	<	0.1
Xylenes	3.9	<	0.1
1,3,5-Trimethylbenzene	3.1	<	0.1
Surrogate Recovery			
Toluene-d8	103	98	-
Bromofluorobenzene	107	75	-

Results expressed as micrograms per liter ($\mu\text{g/L}$)

Surrogate recoveries expressed as percent (%)

< = Less than detection limit



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Extractable Petroleum Hydrocarbons in Soil

CLIENT SAMPLE IDENTIFICATION:	CAN TEST ID	LEPH-uncorrected for PAH's	HEPH-uncorrected for PAH's
H98-17-5'	808250192	<	<
H98-18-2.5'	808250193	<	<
H98-18-4'	808250194	7400	690
H98-18-7.5'	808250195	<	<
H98-19-5.5'	808250196	1900	<
H98-19-7.5'	808250197	<	<
H98-20A-5.5'	808250198	1800	<
H98-21-10'	808250199	<	<
H98-22-6.5'	808250200	<	<
H98-23-6'	808250201	<	<
H98-24-6.5'	808250202	2700	610
H98-25-5.5'	808250203	<	<
H98-26-5.5'	808250204	<	<
Culvert	808250205	<	420
DETECTION LIMIT UNITS		250 $\mu\text{g/g}$	250 $\mu\text{g/g}$

$\mu\text{g/g}$ = micrograms per gram, on a dry weight basis.

< = Less than detection limit



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Monocyclic Aromatic Hydrocarbons-Methanol Extraction- in Soil

CLIENT SAMPLE IDENTIFICATION:	H98-17-5'	H98-18-2.5	H98-18-4'	H98-18-7.5	
CAN TEST ID:	808250192	808250193	808250194	808250195	
ANALYSIS DATE:	Aug 30/98	Aug 30/98	Aug 30/98	Aug 30/98	
Benzene	<	<	<	<	0.5
Ethylbenzene	<	<	<	<	0.5
Toluene	<	<	<	<	0.5
Xylenes	<	<	<	<	0.5
Volatile Pet. Hydrocarbons	<	<	630	<	10
Surrogate Recovery					
Toluene-d8	92	95	109	100	-
Bromofluorobenzene	75	77	117	81	-

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

Surrogate recoveries expressed as percent (%)

< = Less than detection limit



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Monocyclic Aromatic Hydrocarbons-Methanol Extraction- In Soil

CLIENT SAMPLE IDENTIFICATION:	H98-19-5.5	H98-19-7.5	H98-20A-5.5'	H98-21-10'	DETECTION LIMIT
CAN TEST ID:	808250196	808250197	808250198	808250199	
ANALYSIS DATE:	Aug 30/98	Aug 30/98	Aug 31/98	Aug 31/98	
Benzene	<	<	<	<	
Ethylbenzene	<	<	<	<	0.5
Toluene	<	<	<	<	0.5
Xylenes	<	<	<	<	0.5
Volatile Pet. Hydrocarbons	180	<	370	<	10
Surrogate Recovery					
Toluene-d8	106	97	93	80	-
Bromofluorobenzene	95	76	114	82	-

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

Surrogate recoveries expressed as percent (%)

< = Less than detection limit



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Monocyclic Aromatic Hydrocarbons-Methanol Extraction- in Soil

CLIENT SAMPLE IDENTIFICATION:	H98-22-6.5	H98-23-6'	H98-24-6.5	H98-25-5.5	
CAN TEST ID:	808250200	808250201	808250202	808250203	
ANALYSIS DATE:	Aug 31/98	Aug 31/98	Aug 31/98	Aug 31/98	DETECTION LIMIT
Benzene	<	<	<	<	0.5
Ethylbenzene	<	<	<	<	0.5
Toluene	<	<	<	<	0.5
Xylenes	<	<	<	<	0.5
Volatile Pet. Hydrocarbons	<	<	550	<	10
Surrogate Recovery					
Toluene-d8	103	107	115	121	-
Bromofluorobenzene	82	84	124	101	-

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

Surrogate recoveries expressed as percent (%)

< = Less than detection limit



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Monocyclic Aromatic Hydrocarbons-Methanol Extraction- in Soil

CLIENT SAMPLE IDENTIFICATION:	H98-26-5.5	Culvert	
CAN TEST ID:	808250204	808250205	
ANALYSIS DATE:	Aug 31/98	Aug 31/98	DETECTION LIMIT
Benzene	<	<	0.5
Ethylbenzene	<	<	0.5
Toluene	<	<	0.5
Xylenes	<	<	0.5
Volatile Pet. Hydrocarbons	<	<	10
Surrogate Recovery			
Toluene-d8	101	100	-
Bromofluorobenzene	87	80	-

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

Surrogate recoveries expressed as percent (%)

< = Less than detection limit



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Organochlorine Pesticides in Soil

CLIENT SAMPLE IDENTIFICATION:	403A	403B	303A	303B	DETECTION LIMIT
CAN TEST ID:	808250216	808250217	808250218	808250219	
Aldrin	<	<	<	<	0.001
alpha-BHC	<	<	<	<	0.001
beta-BHC	<	<	<	<	0.001
delta-BHC	<	<	<	<	0.001
gamma-BHC (Lindane)	<	<	<	<	0.001
alpha-Chlordane	0.010	0.006	0.093	0.010	0.005
gamma-Chlordane	<	<	<	<	0.005
p,p-DDD	1.0	0.61	<	<	0.005
o,p-DDE	0.044	0.012	0.022	0.004	0.003
p,p-DDE	1.3	0.66	0.17	0.037	0.003
o,p-DDT	1.8	0.93	0.29	0.31	0.003
p,p-DDT	6.6	4.4	1.0	0.78	0.003
Dieldrin	0.013	0.006	0.065	0.006	0.003
Endosulfan I	<	<	<	<	0.01
Endosulfan II	<	<	<	<	0.01
Endosulfan Sulphate	<	<	<	<	0.01
Endrin	<	<	<	<	0.01
Endrin Aldehyde	<	<	<	<	0.01
Heptachlor	<	<	<	<	0.001
Heptachlor Epoxide	0.007	<	<	<	0.001
Methoxychlor	<	<	<	<	0.01
Toxaphene	<	<	<	<	0.3

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

< = Less than detection limit



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Organochlorine Pesticides in Soil

CLIENT SAMPLE IDENTIFICATION:	Dup 303A	Dup 303B	404A	404B	DETECTION LIMIT
CAN TEST ID:	808250220	808250221	808250222	808250223	
Aldrin	<	<	<	0.001	0.001
alpha-BHC	<	<	0.003	0.004	0.001
beta-BHC	<	<	0.008	0.061	0.001
delta-BHC	<	<	<	<	0.001
gamma-BHC (Lindane)	<	<	<	<	0.001
alpha-Chlordane	0.091	0.012	0.040	0.083	0.005
gamma-Chlordane	<	<	<	<	0.005
p,p-DDD	<	<	8.6	0.17	0.005
o,p-DDE	0.026	0.004	0.31	1.8	0.003
p,p-DDE	0.16	0.040	9.2	15	0.003
o,p-DDT	0.27	0.25	15	49	0.003
p,p-DDT	0.84	0.72	77	130	0.003
Dieldrin	0.071	0.008	0.031	0.25	0.003
Endosulfan I	<	<	<	0.34	0.01
Endosulfan II	<	<	<	<	0.01
Endosulfan Sulphate	<	<	<	<	0.01
Endrin	<	<	<	<	0.01
Endrin Aldehyde	<	<	<	<	0.01
Heptachlor	<	<	<	<	0.001
Heptachlor Epoxide	<	<	<	<	0.001
Methoxychlor	<	<	0.06	<	0.01
Toxaphene	<	<	<	<	0.3

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

< = Less than detection limit



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Organochlorine Pesticides in Soil

CLIENT SAMPLE IDENTIFICATION:	503A	503B	402A	402B	DETECTION LIMIT
CAN TEST ID:	808250224	808250225	808250226	808250227	
Aldrin	<	<	<	<	0.001
alpha-BHC	<	<	<	<	0.001
beta-BHC	<	<	<	<	0.001
delta-BHC	<	<	<	<	0.001
gamma-BHC (Lindane)	<	<	<	<	0.001
alpha-Chlordane	<	<	<	<	0.005
gamma-Chlordane	<	<	<	<	0.005
p,p-DDD	<	0.19	0.005	<	0.005
o,p-DDE	0.078	0.013	<	<	0.003
p,p-DDE	0.90	<	<	<	0.003
o,p-DDT	3.1	0.84	<	<	0.003
p,p-DDT	7.8	2.3	<	<	0.003
Dieldrin	<	<	<	<	0.003
Endosulfan I	<	<	<	<	0.01
Endosulfan II	<	<	<	<	0.01
Endosulfan Sulphate	<	<	<	<	0.01
Endrin	<	<	<	<	0.01
Endrin Aldehyde	<	<	<	<	0.01
Heptachlor	<	<	<	<	0.001
Heptachlor Epoxide	<	0.002	<	<	0.001
Methoxychlor	0.03	<	<	<	0.01
Toxaphene	<	<	<	<	0.3

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

< = Less than detection limit



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Organochlorine Pesticides in Soil

CLIENT SAMPLE IDENTIFICATION:	301A	305A	307A	208A	DETECTION LIMIT
CAN TEST ID:	808250228	808250229	808250230	808250231	
Aldrin	<	<	<	<	0.001
alpha-BHC	<	0.001	<	<	0.001
beta-BHC	<	0.002	0.008	0.009	0.001
delta-BHC	<	0.001	<	<	0.001
gamma-BHC (Lindane)	<	0.004	<	<	0.001
alpha-Chlordane	0.10	<	0.059	<	0.005
gamma-Chlordane	<	<	<	<	0.005
p,p-DDD	<	<	<	1.9	0.005
o,p-DDE	0.16	0.004	0.20	0.17	0.003
p,p-DDE	6.2	<	1.9	0.51	0.003
o,p-DDT	22	1.8	0.48	6.1	0.003
p,p-DDT	83	7.7	25	23	0.003
Dieldrin	0.082	<	0.034	0.006	0.003
Endosulfan I	<	<	<	<	0.01
Endosulfan II	0.24	<	<	<	0.01
Endosulfan Sulphate	<	<	<	<	0.01
Endrin	<	<	<	<	0.01
Endrin Aldehyde	0.03	<	<	<	0.01
Heptachlor	0.037	0.006	0.013	0.002	0.001
Heptachlor Epoxide	<	<	<	<	0.001
Methoxychlor	0.02	<	<	0.03	0.01
Toxaphene	<	<	<	<	0.3

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

< = Less than detection limit



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Organochlorine Pesticides in Soil

CLIENT SAMPLE IDENTIFICATION:	206A	204A	202A	101A	
CAN TEST ID:	808250232	808250233	808250234	808250235	DETECTION LIMIT
Aldrin	<	<	<	<	0.001
alpha-BHC	<	<	<	<	0.001
beta-BHC	0.008	<	<	<	0.001
delta-BHC	0.001	<	<	<	0.001
gamma-BHC (Lindane)	<	<	<	<	0.001
alpha-Chlordane	<	0.042	<	<	0.005
gamma-Chlordane	<	<	<	<	0.005
p,p-DDD	1.6	6.0	0.015	0.98	0.005
o,p-DDE	0.014	0.18	<	0.014	0.003
p,p-DDE	0.11	1.3	<	1.2	0.003
o,p-DDT	2.0	7.0	<	1.9	0.003
p,p-DDT	9.6	31	0.008	10	0.003
Dieldrin	<	0.030	<	0.003	0.003
Endosulfan I	<	<	<	<	0.01
Endosulfan II	<	<	<	<	0.01
Endosulfan Sulphate	<	<	<	<	0.01
Endrin	<	<	<	<	0.01
Endrin Aldehyde	<	<	<	<	0.01
Heptachlor	0.002	<	<	<	0.001
Heptachlor Epoxide	<	0.002	<	<	0.001
Methoxychlor	<	<	<	<	0.01
Toxaphene	<	<	<	<	0.3

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

< = Less than detection limit



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Organochlorine Pesticides in Soil

CLIENT SAMPLE IDENTIFICATION:	103A	105A	107A	406A	DETECTION LIMIT
CAN TEST ID:	808250236	808250237	808250238	808250239	
Aldrin	<	<	<	<	0.001
alpha-BHC	<	<	<	<	0.001
beta-BHC	<	<	<	<	0.001
delta-BHC	<	<	<	<	0.001
gamma-BHC (Lindane)	<	<	<	<	0.001
alpha-Chlordane	<	<	0.037	<	0.005
gamma-Chlordane	<	<	<	<	0.005
p,p-DDD	0.073	0.37	27	<	0.005
o,p-DDE	<	0.019	0.26	0.006	0.003
p,p-DDE	<	0.29	4.8	0.013	0.003
o,p-DDT	<	0.81	27	0.029	0.003
p,p-DDT	0.037	2.4	130	0.46	0.003
Dieldrin	<	<	0.008	<	0.003
Endosulfan I	<	<	<	<	0.01
Endosulfan II	<	<	<	<	0.01
Endosulfan Sulphate	<	<	<	<	0.01
Endrin	<	<	<	<	0.01
Endrin Aldehyde	<	<	<	<	0.01
Heptachlor	<	<	<	<	0.001
Heptachlor Epoxide	<	<	0.002	<	0.001
Methoxychlor	<	<	<	<	0.01
Toxaphene	<	<	<	<	0.3

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

< = Less than detection limit



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Organochlorine Pesticides in Soil

CLIENT SAMPLE IDENTIFICATION:	408A	505A	507A	509A	DETECTION LIMIT
CAN TEST ID:	808250240	808250241	808250242	808250243	
Aldrin	<	<	<	<	0.001
alpha-BHC	<	<	<	<	0.001
beta-BHC	0.002	<	<	<	0.001
delta-BHC	<	<	<	<	0.001
gamma-BHC (Lindane)	<	<	<	<	0.001
alpha-Chlordane	0.033	<	<	<	0.005
gamma-Chlordane	<	<	<	<	0.005
p,p-DDD	54	<	<	0.059	0.005
o,p-DDE	1.7	<	<	<	0.003
p,p-DDE	12	0.003	<	0.044	0.003
o,p-DDT	53	0.081	0.009	0.071	0.003
p,p-DDT	380	0.66	0.15	0.68	0.003
Dieldrin	0.007	<	<	<	0.003
Endosulfan I	<	<	<	<	0.01
Endosulfan II	<	<	<	<	0.01
Endosulfan Sulphate	<	<	<	<	0.01
Endrin	<	<	<	<	0.01
Endrin Aldehyde	0.013	<	<	<	0.01
Heptachlor	<	<	<	<	0.001
Heptachlor Epoxide	0.004	<	<	<	0.001
Methoxychlor	<	<	<	<	0.01
Toxaphene	<	<	<	<	0.3

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

< = Less than detection limit



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Organochlorine Pesticides in Soil

CLIENT SAMPLE IDENTIFICATION:	608A	606A	604A	602A	
CAN TEST ID:	808250244	808250245	808250246	808250247	DETECTION LIMIT
Aldrin	<	<	<	<	0.001
alpha-BHC	<	<	<	<	0.001
beta-BHC	<	0.002	<	<	0.001
delta-BHC	<	<	<	<	0.001
gamma-BHC (Lindane)	<	<	<	<	0.001
alpha-Chlordane	<	<	<	<	0.005
gamma-Chlordane	<	<	<	<	0.005
p,p-DDD	<	<	0.16	0.10	0.005
o,p-DDE	<	<	0.006	<	0.003
p,p-DDE	<	<	0.087	0.025	0.003
o,p-DDT	0.032	<	<	<	0.003
p,p-DDT	0.080	<	1.6	0.44	0.003
Dieldrin	<	<	<	<	0.003
Endosulfan I	<	<	<	<	0.01
Endosulfan II	<	<	<	<	0.01
Endosulfan Sulphate	<	<	<	<	0.01
Endrin	<	<	<	<	0.01
Endrin Aldehyde	<	<	<	<	0.01
Heptachlor	<	<	<	<	0.001
Heptachlor Epoxide	<	<	0.001	<	0.001
Methoxychlor	<	<	<	<	0.01
Toxaphene	<	<	<	<	0.3

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

< = Less than detection limit



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Organochlorine Pesticides in Soil

CLIENT SAMPLE IDENTIFICATION:	701A	703A	705A	707A	
CAN TEST ID:	808250248	808250249	808250250	808250251	DETECTION LIMIT
Aldrin	<	<	<	<	0.001
alpha-BHC	<	<	<	<	0.001
beta-BHC	<	<	0.003	0.002	0.001
delta-BHC	<	<	<	<	0.001
gamma-BHC (Lindane)	<	<	0.001	<	0.001
alpha-Chlordane	<	<	<	<	0.005
gamma-Chlordane	<	<	<	<	0.005
p,p-DDD	0.009	0.26	<	0.061	0.005
o,p-DDE	<	0.045	0.016	0.010	0.003
p,p-DDE	0.008	0.37	0.049	0.019	0.003
o,p-DDT	<	<	0.036	0.057	0.003
p,p-DDT	0.033	1.6	0.93	0.13	0.003
Dieldrin	<	<	<	<	0.003
Endosulfan I	<	<	<	<	0.01
Endosulfan II	<	<	<	<	0.01
Endosulfan Sulphate	<	<	<	<	0.01
Endrin	<	<	<	<	0.01
Endrin Aldehyde	<	<	<	<	0.01
Heptachlor	<	<	<	<	0.001
Heptachlor Epoxide	<	<	<	<	0.001
Methoxychlor	<	<	<	<	0.01
Toxaphene	<	<	<	<	0.3

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

< = Less than detection limit



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Organochlorine Pesticides in Soil

CLIENT SAMPLE IDENTIFICATION:	709A	Dup 406A	407A	407B	
CAN TEST ID:	808250252	808250253	808250254	808250255	DETECTION LIMIT
Aldrin	<	<	<	<	0.001
alpha-BHC	<	<	0.001	<	0.001
beta-BHC	<	<	0.006	0.001	0.001
delta-BHC	<	<	0.002	<	0.001
gamma-BHC (Lindane)	<	<	<	<	0.001
alpha-Chlordane	<	<	0.010	<	0.005
gamma-Chlordane	<	<	<	<	0.005
p,p-DDD	<	<	0.011	<	0.005
o,p-DDE	<	0.007	0.041	0.004	0.003
p,p-DDE	<	0.026	0.015	0.040	0.003
o,p-DDT	<	0.043	0.61	0.16	0.003
p,p-DDT	0.031	0.58	1.0	0.57	0.003
Dieldrin	<	<	<	<	0.003
Endosulfan I	<	<	<	<	0.01
Endosulfan II	<	<	<	<	0.01
Endosulfan Sulphate	<	<	<	<	0.01
Endrin	<	<	<	<	0.01
Endrin Aldehyde	<	<	<	<	0.01
Heptachlor	<	<	<	<	0.001
Heptachlor Epoxide	<	<	<	<	0.001
Methoxychlor	<	<	<	<	0.01
Toxaphene	<	<	<	<	0.3

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

< = Less than detection limit



REPORTED TO: Hemmera Resource Consultants Ltd.

CAN-TEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Batch Quality Control for Extractable Petroleum Hydrocarbons in Soil (QC# 36647)

Parameter	Blank (ug/g)	Blank Limits	Duplicate (R.P.D.)	Duplicate Limits	Spike (% Recovery)	Spike Limits
LEPH-uncorrected for PAH's	< 250	250	NC	20	117	75 - 125
HEPH-uncorrected for PAH's	< 250	250	NC	20	-	-

ug/g = micrograms per gram

R.P.D. = Relative Percent Difference

NC = Not Calculated. Duplicate sample results were less than the detection limit. Relative Percent Difference calculation is not defined for analyte levels of less than detection limit.



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Batch Quality Control for Monocyclic Aromatic Hydrocarbons in Water (QC# 7070)

Parameter	Blank (ug/L)	Blank Limits	Duplicate (R.P.D.)	Duplicate Limits	Volatiles Water Spike (% Recovery)	Volatiles Water Spike Limits
Benzene	< 0.1	0.1	NC	20	117	79 - 117
Ethylbenzene	< 0.1	0.1	NC	20	108	76 - 124
Toluene	< 0.1	0.2	NC	20	104	83 - 118
Xylenes	< 0.1	0.1	NC	20	105	75 - 125

ug/L = micrograms per liter

R.P.D. = Relative Percent Difference

NC = Not Calculated. Duplicate sample results were less than the detection limit. Relative Percent Difference calculation is not defined for analyte levels of less than detection limit.



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Batch Quality Control for Monocyclic Aromatic Hydrocarbons in Water (QC# 7093)

Parameter	Blank (ug/L)	Blank Limits	Duplicate (R.P.D.)	Duplicate Limits	Volatiles Water Spike (% Recovery)	Volatiles Water Spike Limits
Benzene	< 0.1	0.1	NC	20	117	79 - 117
Ethylbenzene	< 0.1	0.1	NC	20	83	76 - 124
Toluene	< 0.1	0.2	NC	20	103	83 - 118
Xylenes	< 0.1	0.1	NC	20	86	75 - 125

ug/L = micrograms per liter

R.P.D. = Relative Percent Difference

NC = Not Calculated. Duplicate sample results were less than the detection limit. Relative Percent Difference calculation is not defined for analyte levels of less than detection limit.



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Batch Quality Control for Polycyclic Aromatic Hydrocarbons in Water (QC# 36652)

Parameter	Blank (ug/L)	Blank Limits	Spike (% Recovery)	Spike Limits
Naphthalene	< 0.3	0.3	92	38 - 115
Acenaphthylene	< 0.1	0.1	93	50 - 118
Acenaphthene	< 0.1	0.1	95	50 - 118
Fluorene	< 0.05	0.05	93	50 - 118
Phenanthrene	< 0.05	0.05	96	63 - 120
Anthracene	< 0.05	0.05	95	63 - 120
Fluoranthene	< 0.05	0.05	97	63 - 120
Pyrene	< 0.02	0.02	97	63 - 120
Benzo(a)anthracene	< 0.01	0.01	92	63 - 120
Chrysene	< 0.01	0.01	95	63 - 120
Benzo(b)fluoranthene	< 0.01	0.01	82	59 - 138
Benzo(k)fluoranthene	< 0.01	0.01	85	59 - 138
Benzo(a)pyrene	< 0.01	0.01	87	59 - 138
Indeno(1,2,3-c,d)pyrene	< 0.01	0.01	89	65 - 134
Dibenz(a,h)anthracene	< 0.01	0.01	95	65 - 134
Benzo(g,h,i)perylene	< 0.01	0.01	95	65 - 134

ug/L = micrograms per liter



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Batch Quality Control for Total Extractable Hydrocarbons in Water (QC# 36659)

Parameter	Blank (ug/L)	Blank Limits	Matrix Spike Duplicate (R.P.D.)	Matrix Spike Duplicate Limits	Spike (% Recovery)	Spike Limits
TEH	< 100	100	13	20	86	75 - 125

ug/L = micrograms per liter

R.P.D. = Relative Percent Difference



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: September 3, 1998

GROUP NUMBER: 8082535

Batch Quality Control Frequency Summary

Volatiles Analysis (Batch# 7070)

QC Type	No. Samples
Blank	1
Duplicate	1
Volatiles Water Spike	1
Batch Size	22

Volatiles Analysis (Batch# 7078)

QC Type	No. Samples
Duplicate	1
Volatiles Soil Spike	1
Batch Size	9

Volatiles Analysis (Batch# 7093)

QC Type	No. Samples
Blank	1
Duplicate	1
Volatiles Water Spike	1
Batch Size	14



CHROMATOGRAM COVER SHEET

Date: Sept 2, 1998

Company: Hemmera

Contact: Mr. Phil Scalia

FAX: 669-0430

of Pages: 15 (Including Cover Page)

Please find attached the chromatograms associated with:

CANTEST Group #: 808 2535

Your Project #: 316-03

Your Project Name: Brooks, Brook

Sample Matrix: Soil

The originals will follow with the report.

If you have any questions or concerns, please do not hesitate to contact one of our Technical Service Representatives at 604-734-7276.

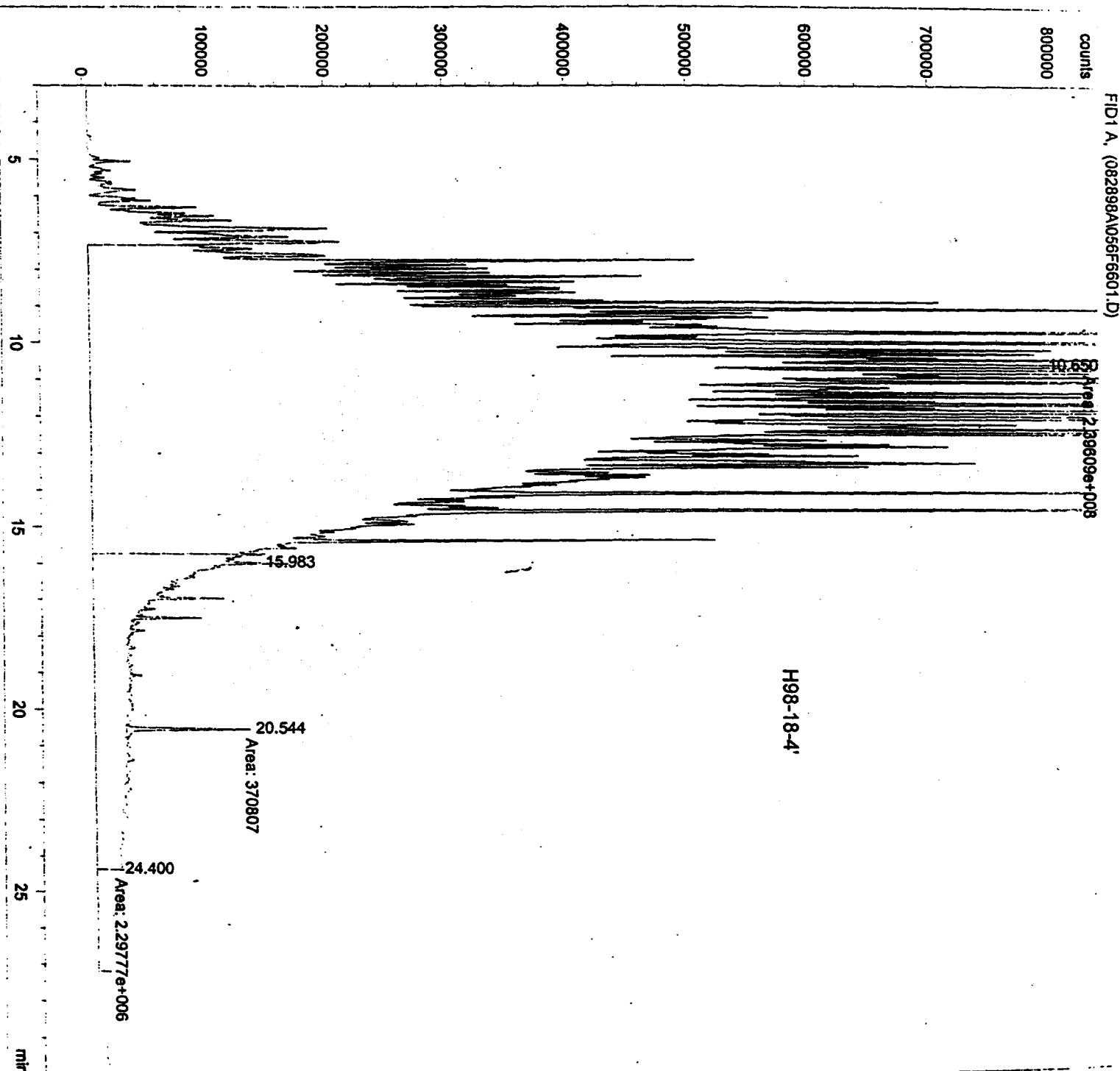


Injection Date : 8/30/98 9:55:42 AM Seq. Line : 66
Sample Name : 808250194 Vial : 56
Acq. Operator : kf Inj : 1

HEMMERA
8082535

Inj Volume : 2 µl
Acq. Method : C:\HPCHEM\1\METHODS\TEHBAKE.M
Last changed : 5/4/98 11:44:07 AM by kf
Analysis Method : C:\HPCHEM\1\METHODS\TEH.M
Last changed : 8/31/98 1:50:33 PM by kf
(modified after loading)

Total Extractable Hydrocarbons. Soils and Waters are extracted using methylene chloride and then analyzed using an HPGC-FID.
Calculations are based on an internal standard and reported in ug/L for waters and ug/g for soils.



Injection Date : 8/30/98 11:25:17 AM Seq. Line : 68
Sample Name : 808250196 Vial : 58
Acq. Operator : kf Inj : 1

Inj Volume : 2 µl

Acq. Method : C:\HPCHEM\1\METHODS\TEHBAKE.M

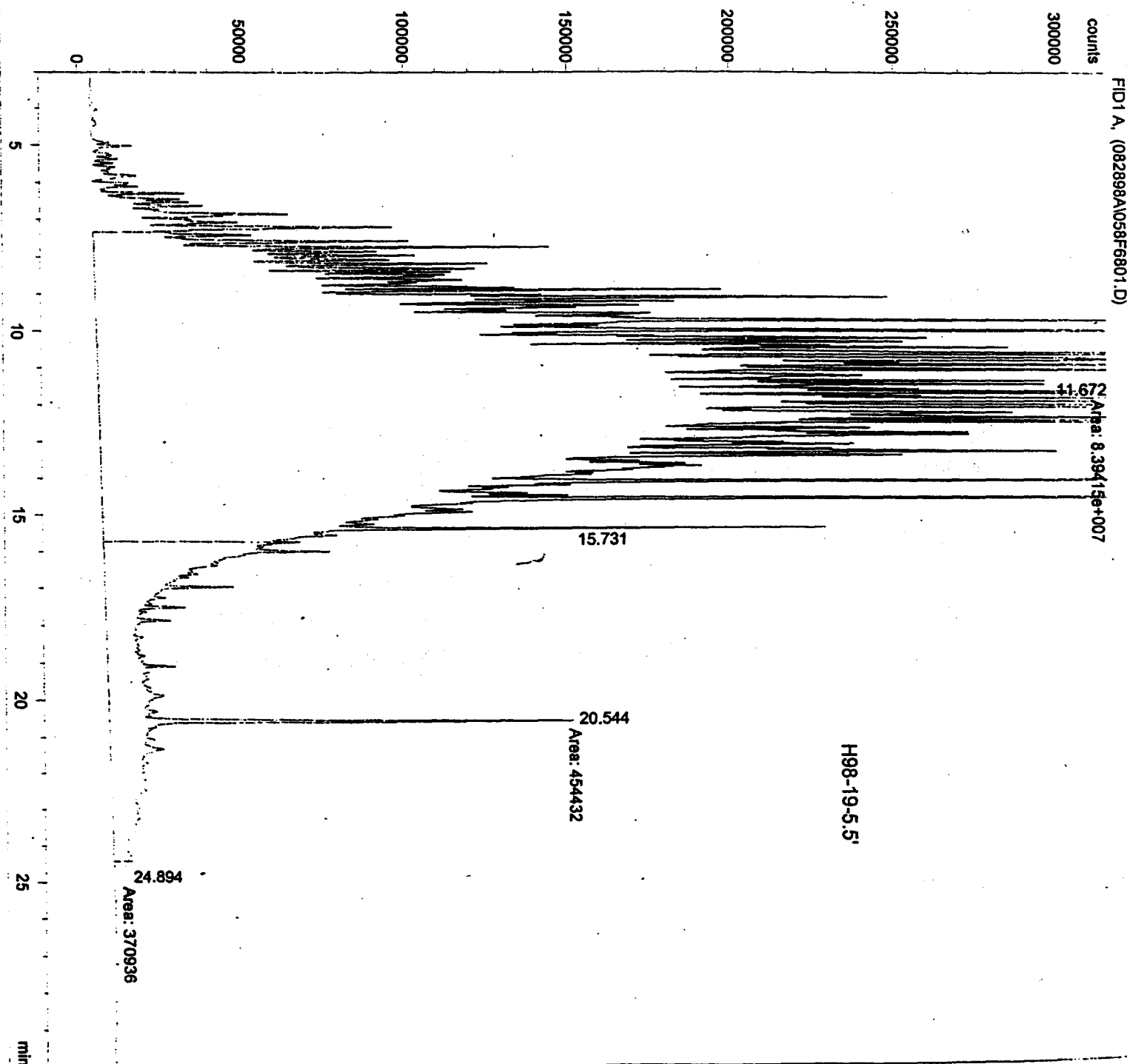
Last changed : 5/4/98 11:44:07 AM by kf

Analysis Method : C:\HPCHEM\1\METHODS\!TEH.M

Last changed : 8/31/98 1:52:15 PM by kf

(modified after loading)

Total Extractable Hydrocarbons. Soils and Waters are extracted using methylene chloride and then analyzed using an HPGC-FID.
Calculations are based on an internal standard and reported in ug/L for waters and ug/g for soils.



Injection Date : 8/30/98 12:55:01 PM Seq. Line : 70
Sample Name : 808250198 Vial : 60
Acq. Operator : kf Inj : 1

Inj Volume : 2 µl

Acq. Method : C:\HPCHEM\1\METHODS\TEHBAKE.M

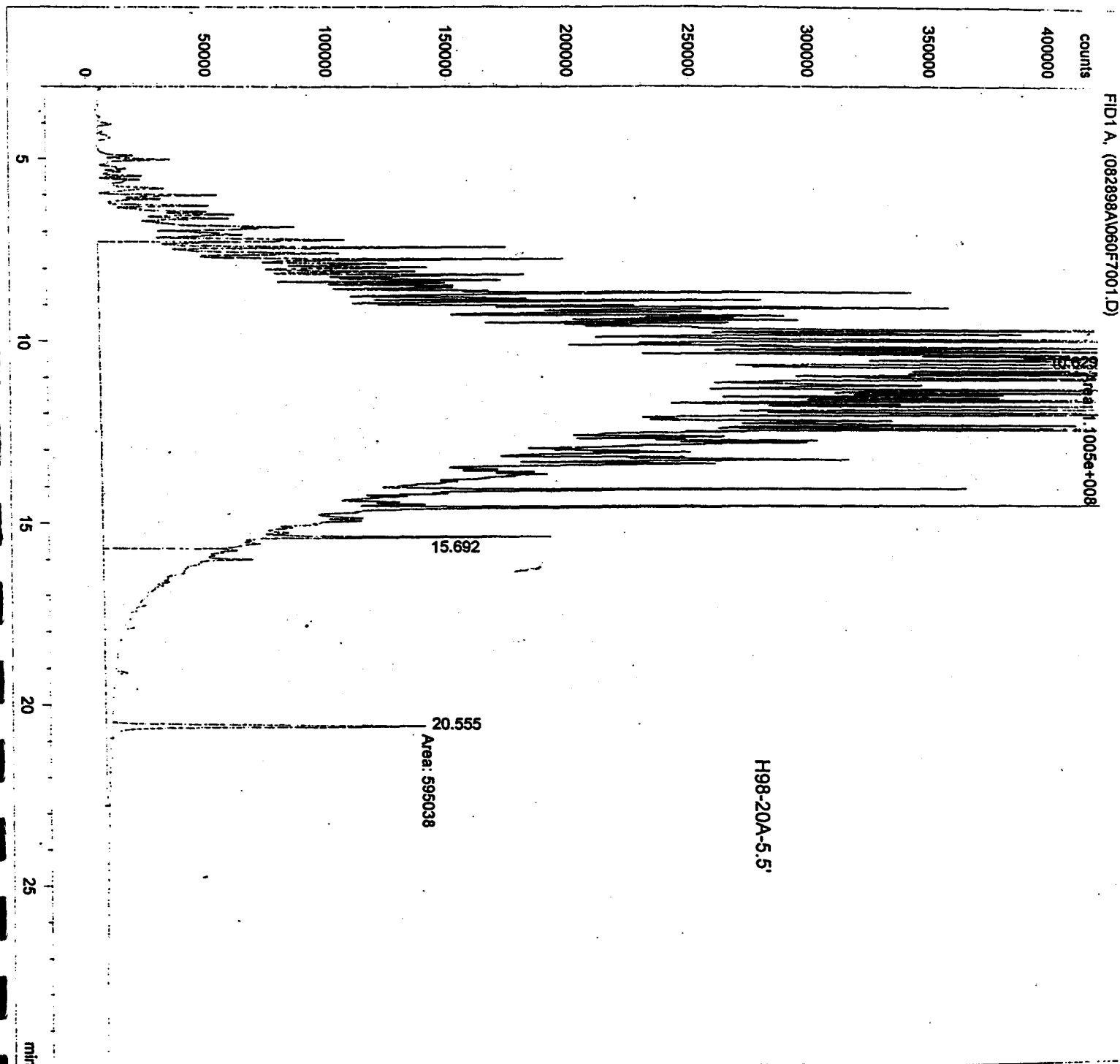
Last changed : 5/4/98 11:44:07 AM by kf

Analysis Method : C:\HPCHEM\1\METHODS\TEH.M

Last changed : 8/31/98 1:53:38 PM by kf

(modified after loading)

Total Extractable Hydrocarbons. Soils and Waters are extracted using methylene chloride and then analyzed using an HPGC-FID.
Calculations are based on an internal standard and reported in ug/L for waters and ug/g for soils.



Injection Date : 8/30/98 4:58:27 PM

Seq. Line : 76

Sample Name : 805250202

Vial : 64

Acq. Operator : kf

Inj : 1

Inj Volume : 2 µl

Acq. Method : C:\HPCHEM\1\METHODS\TEHBAKE.M

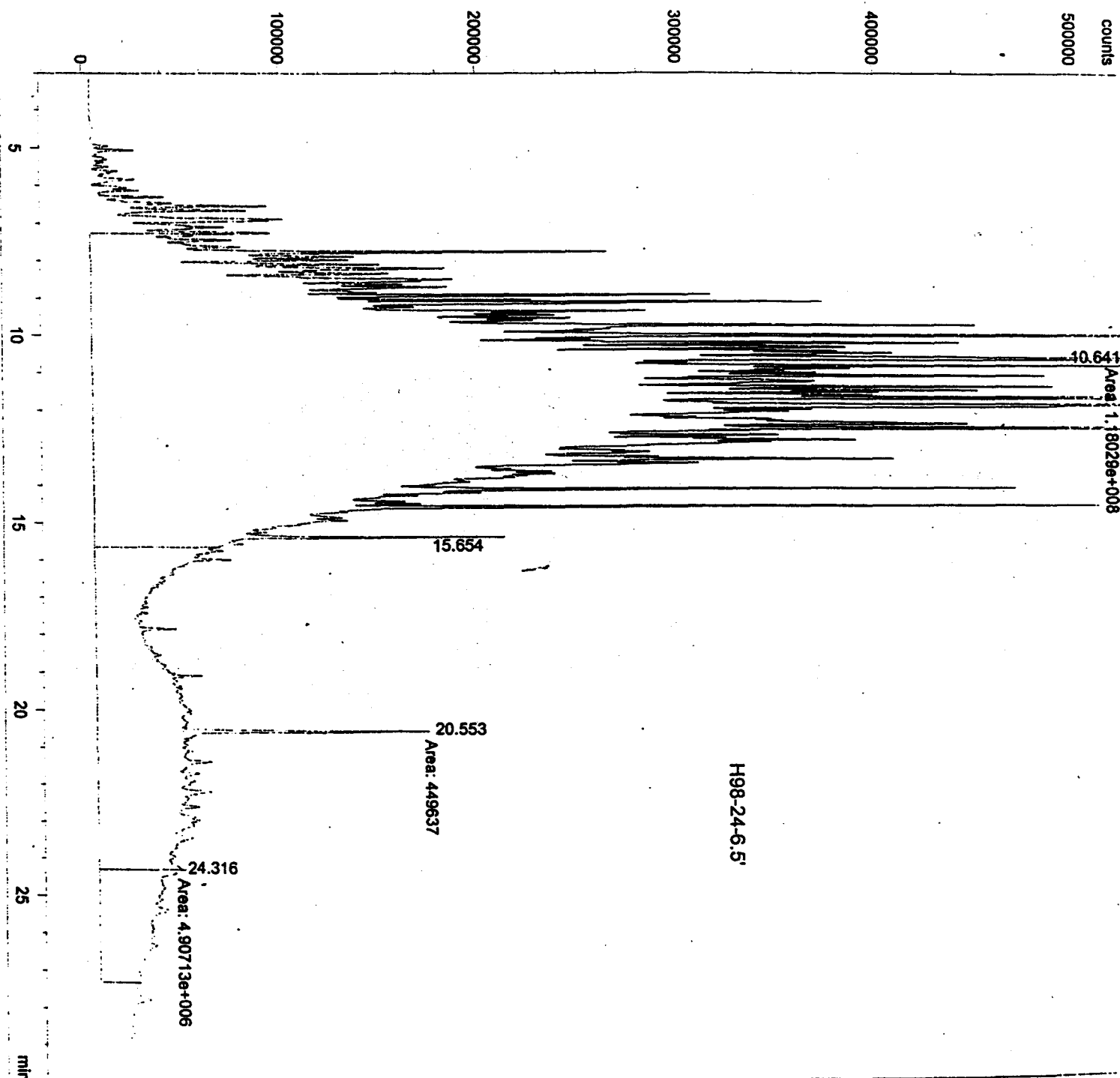
Last changed : 5/4/98 11:44:07 AM by kf

Analysis Method : C:\HPCHEM\1\METHODS\TEH.M

Last changed : 8/31/98 1:57:30 PM by kf

(modified after loading)

Total Extractable Hydrocarbons. Soils and Waters are extracted using methylene chloride and then analyzed using an HPGC-FID. Calculations are based on an internal standard and reported in ug/L for waters and ug/g for soils.

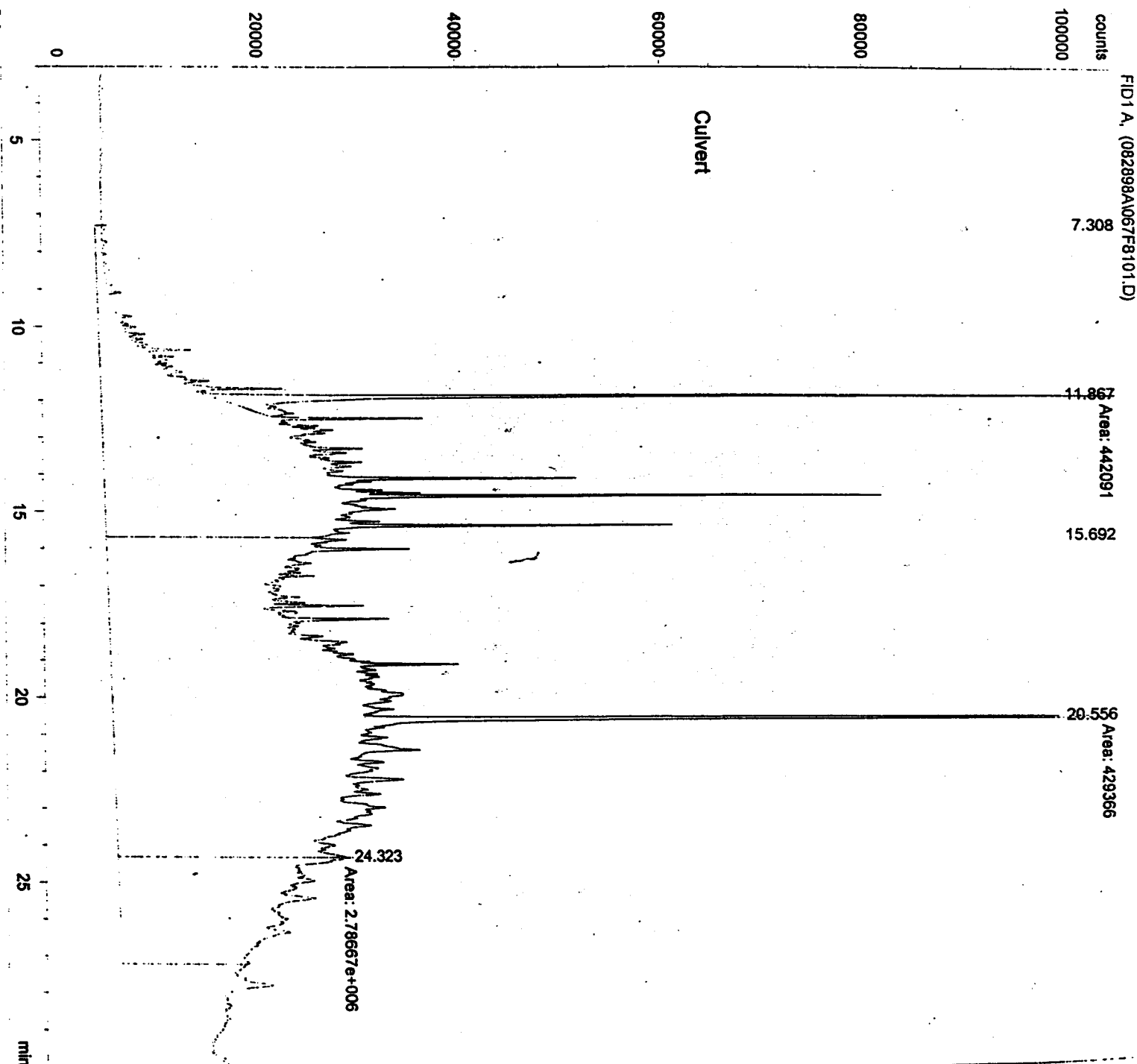


Injection Date : 8/30/98 7:59:48 PM Seq. Line : 81
Sample Name : 808250205 Vial : 67
Acq. Operator : kf Inj : 1

Inj Volume : 2 µl

Acq. Method : C:\HPCHEM\1\METHODS\TEHBAKE.M
Last changed : 5/4/98 11:44:07 AM by kf
Analysis Method : C:\HPCHEM\1\METHODS\TEH.M
Last changed : 8/31/98 1:58:20 PM by kf
(modified after loading)

Total Extractable Hydrocarbons. Soils and Waters are extracted using methylene chloride and then analyzed using an HPGC-FID.
Calculations are based on an internal standard and reported in ug/L for waters and ug/g for soils.



Injection Date : 8/29/98 6:26:33 AM Seq. Line : 25

Sample Name : 808250206 Vial : 23

Acq. Operator : kf Inj : 1

Inj Volume : 2 µl

Acq. Method : C:\HPCHEM\1\METHODS\TEHBAKE.M

Last changed : 5/4/98 11:44:07 AM by kf

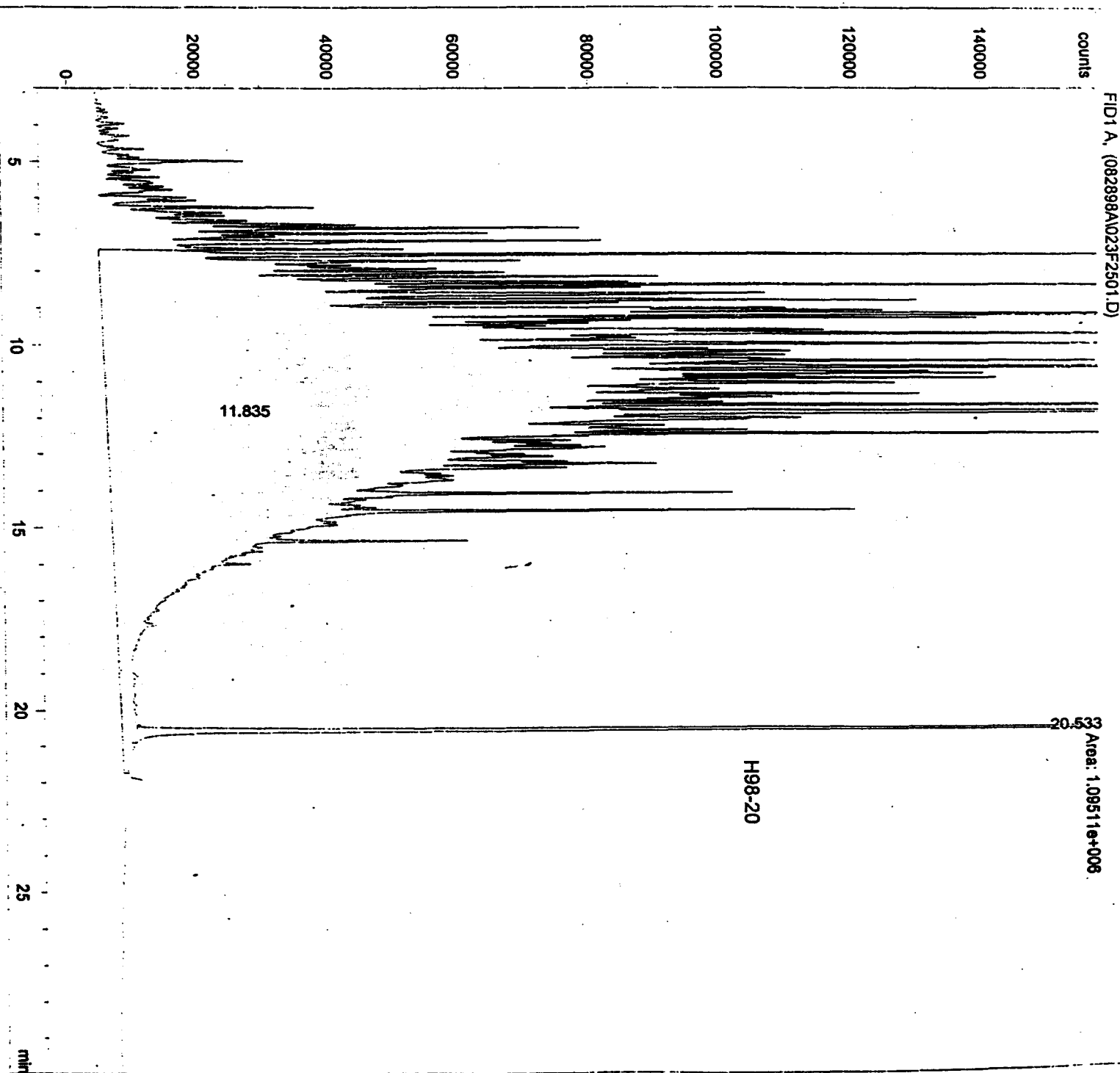
Analysis Method : C:\HPCHEM\1\METHODS\TEH.M

Last changed : 8/31/98 11:59:57 AM by kf

(modified after loading)

Total Extractable Hydrocarbons. Soils and Waters are extracted using methylene chloride and then analyzed using an HPGC-FID.
Calculations are based on an internal standard and reported in ug/L for waters and ug/g for soils.

8082535

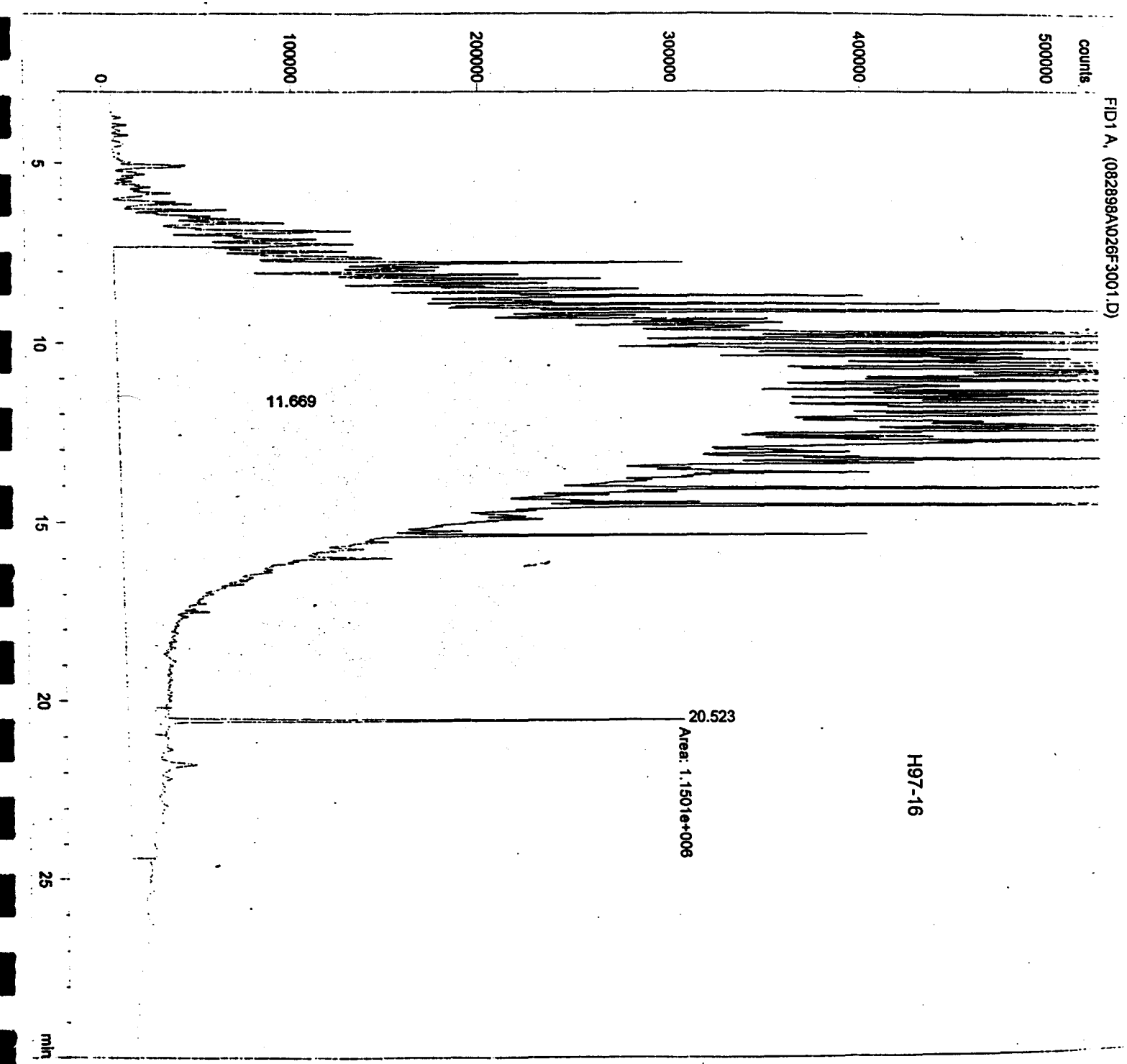
HEMMERA

Injection Date : 8/29/98 9:27:21 AM Seq. Line : 30
Sample Name : 808250209 Vial : 26
Acq. Operator : kf Inj : 1

Inj Volume : 2 µl

Acq. Method : C:\HPCHEM\1\METHODS\TEHBAKE.M
Last changed : 5/4/98 11:44:07 AM by kf
Analysis Method : C:\HPCHEM\1\METHODS\TEH.M
Last changed : 8/31/98 1:19:00 PM by kf
(modified after loading)

Total Extractable Hydrocarbons. Soils and Waters are extracted using methylene chloride and then analyzed using an HPGC-FID.
Calculations are based on an internal standard and reported in ug/L for waters and ug/g for soils.



Injection Date : 8/29/98 10:35:34 AM Seq. Line : 32

Sample Name : 808250210 Vial : 27

Acq. Operator : kf Inj : 1

Inj Volume : 2 µl

Acq. Method : C:\HPCHEM\1\METHODS\TEHBAKE.M

Last changed : 5/4/98 11:44:07 AM by kf

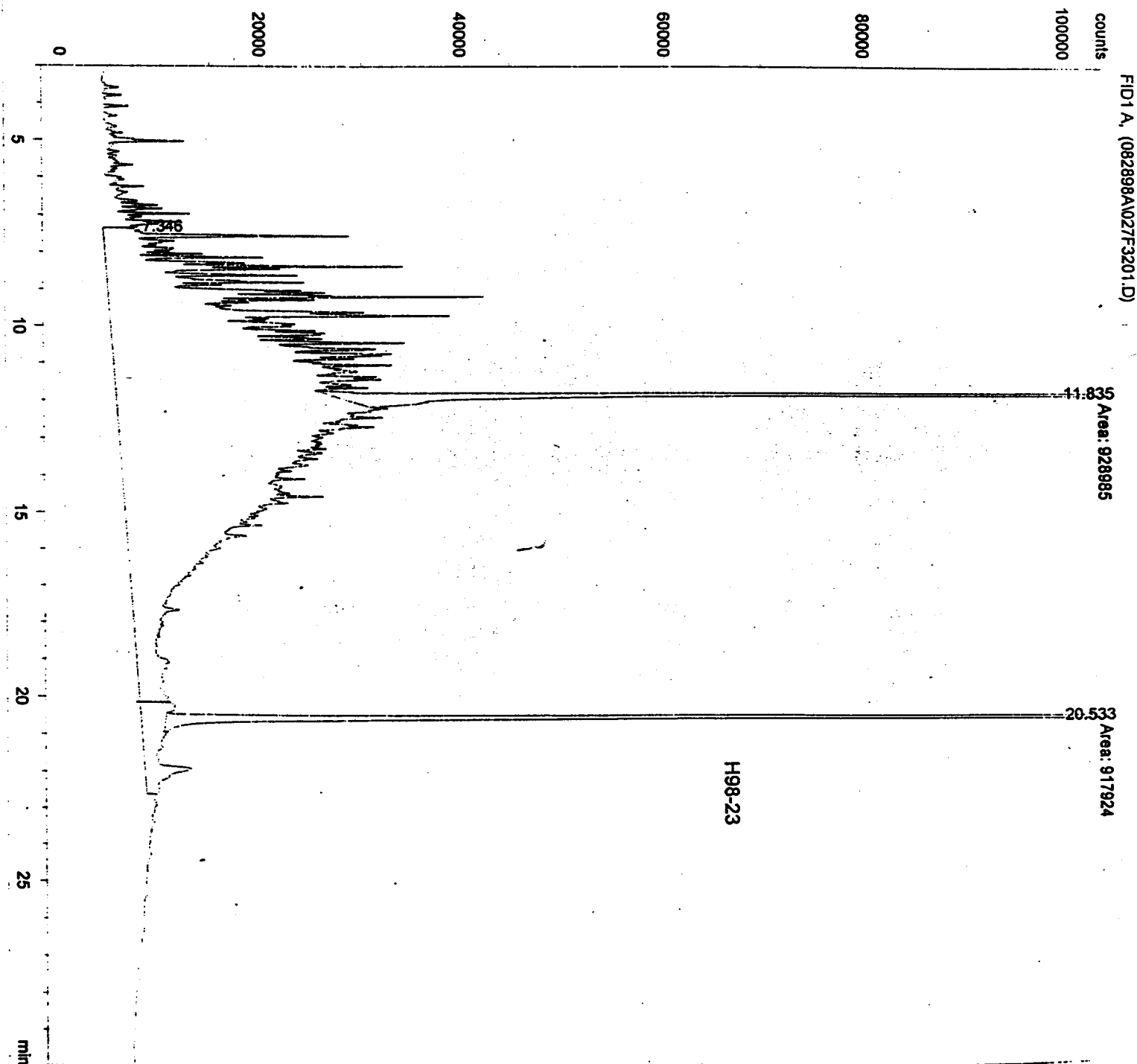
Analysis Method : C:\HPCHEM\1\METHODS\TEH.M

Last changed : 8/31/98 1:10:35 PM by kf

(modified after loading)

Total Extractable Hydrocarbons. Soils and Waters are extracted using methylene chloride and then analyzed using an HPGC-FID.

Calculations are based on an internal standard and reported in ug/L for waters and ug/g for soils.

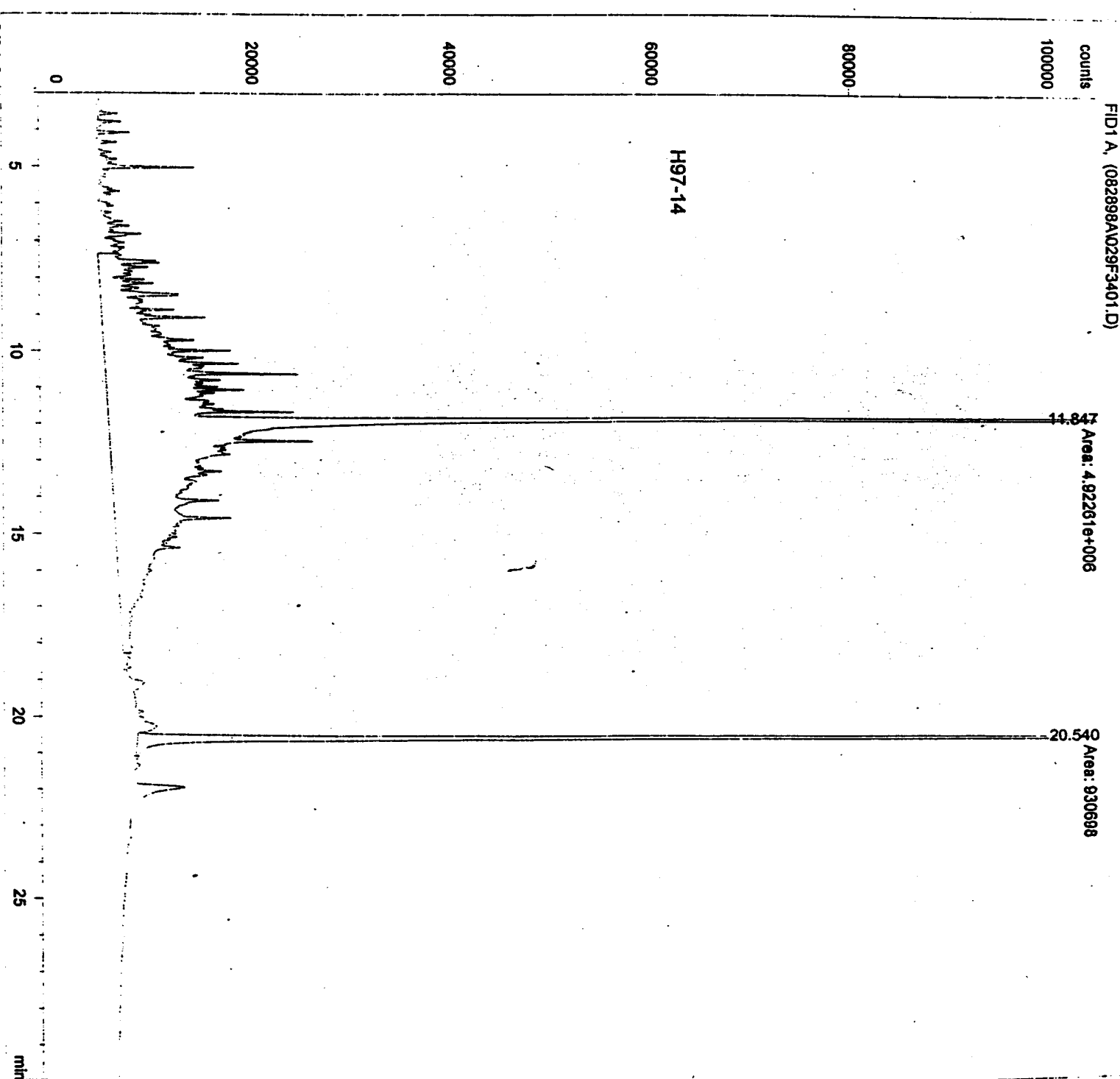


=====

Injection Date : 8/29/98 12:04:52 PM Seq. Line : 34
Sample Name : 808250212 Vial : 29
Acq. Operator : kf Inj : 1
Inj Volume : 2 µl
Acq. Method : C:\HPCHEM\1\METHODS\TEHBAKE.M
Last changed : 5/4/98 11:44:07 AM by kf
Analysis Method : C:\HPCHEM\1\METHODS\TEH.M
Last changed : 8/31/98 1:10:35 PM by kf
(modified after loading)

Total Extractable Hydrocarbons. Soils and Waters are extracted using methylene chloride and then analyzed using an HPGC-FID.
Calculations are based on an internal standard and reported in ug/L for waters and ug/g for soils.

=====



Injection Date : 8/29/98 1:34:25 PM Seq. Line : 36
 Sample Name : 808250214 Vial : 31
 Acq. Operator : kf Inj : 1

Inj Volume : 2 µl

Acq. Method : C:\HPCHEM\1\METHODS\TEHBAKE.M

Last changed : 5/4/98 11:44:07 AM by kf

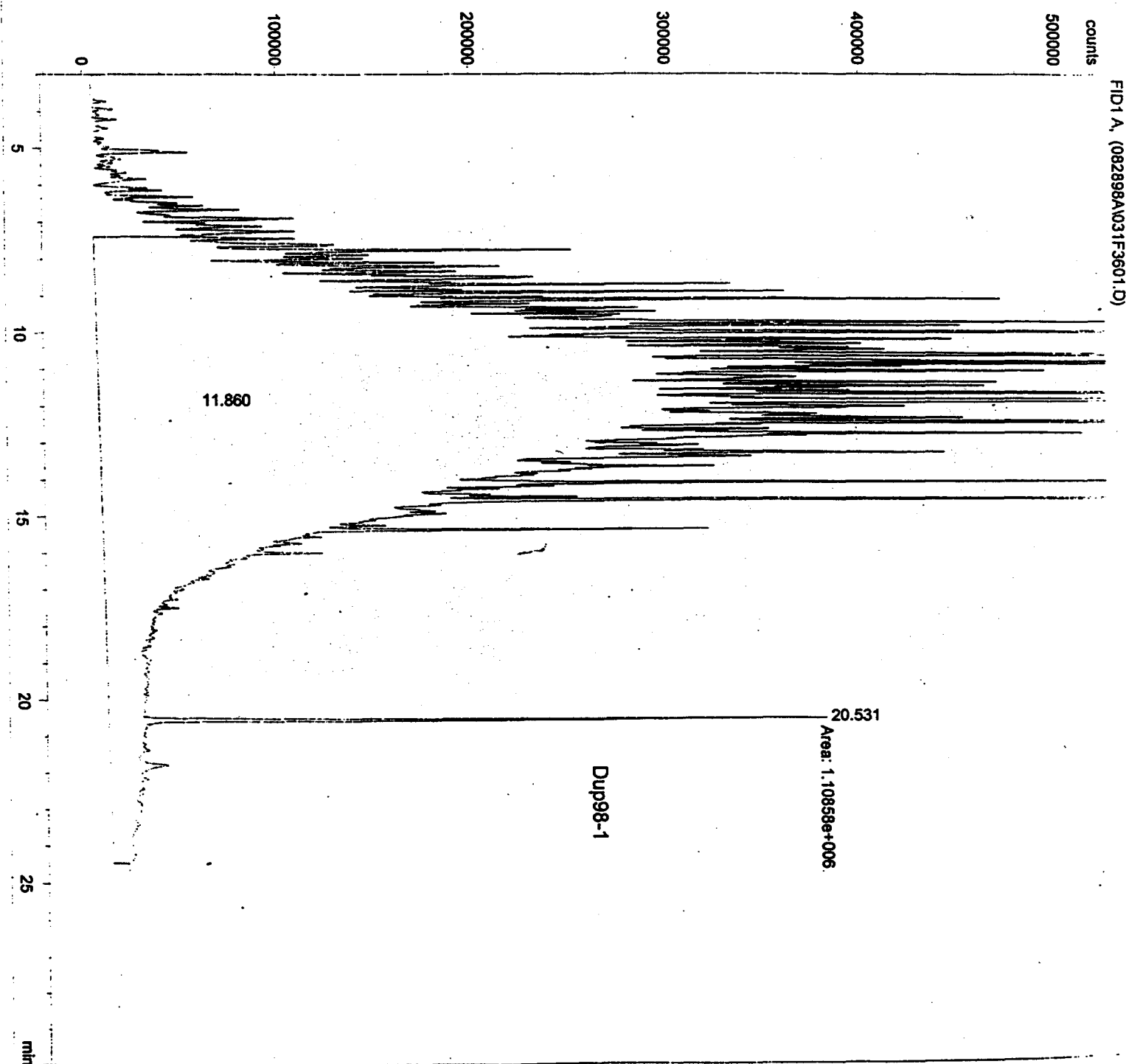
Analysis Method : C:\HPCHEM\1\METHODS\TEH.M

Last changed : 8/31/98 1:13:37 PM by kf

(modified after loading)

Total Extractable Hydrocarbons. Soils and Waters are extracted using methylene chloride and then analyzed using an HPGC-FID.

Calculations are based on an internal standard and reported in ug/L for waters and ug/g for soils.

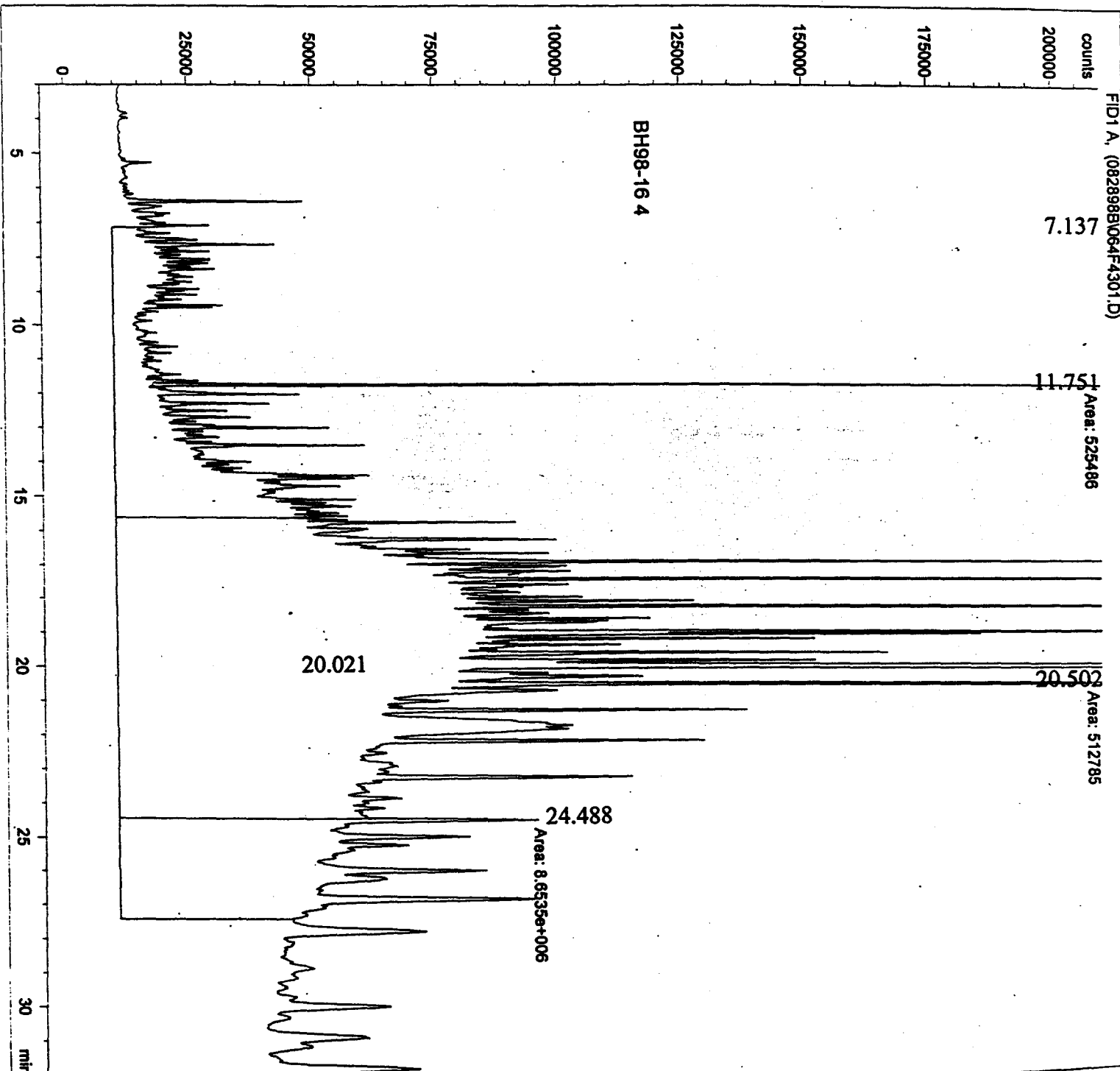


Injection Date : 8/29/98 6:50:52 PM Seq. Line : 43
Sample Name : 808260064 Vial : 64
Acq. Operator : kf Inj : 1

8082618
AGRA EARTH

Inj Volume : 2 µl
Acq. Method : C:\HPCHEM\2\METHODS\TEHBAKE.M
Last changed : 6/26/98 7:13:31 PM by ks
Analysis Method : C:\HPCHEM\2\METHODS\TEH.M
Last changed : 8/31/98 2:55:44 PM by kf
(modified after loading)

Total Extractable Hydrocarbons. Soils and Waters are extracted using methylene chloride and then analyzed using an HPGC-FID.
Calculations are based on an internal standard and reported in ug/L for waters and ug/g for soils.



Analysis Report

CANTEST

NOV 26 1998
CanTest Ltd

Professional
Analytical
Services

1523 West 3rd Ave
Vancouver, BC
V6J 1J8

Fax: 604 731 2386

Tel: 604 734 7276

1 800 665 8566

REPORT ON: Analysis of Soil Samples

REPORTED TO: Hemmera Resource Consultants
#410 - 1190 Hornby Street
Vancouver, BC
V6Z 2K5

Attention: Mr. Phil Scalia

PROJECT NAME: Brooks Brook Project

PROJECT NUMBER: #316-003

NUMBER OF SAMPLES: One Hundred Fifty-One (151) **REPORT DATE:** November 13, 1998

DATE SUBMITTED: September 22, 1998 **FILE NUMBER:** 10711K

SAMPLE TYPE: Soil

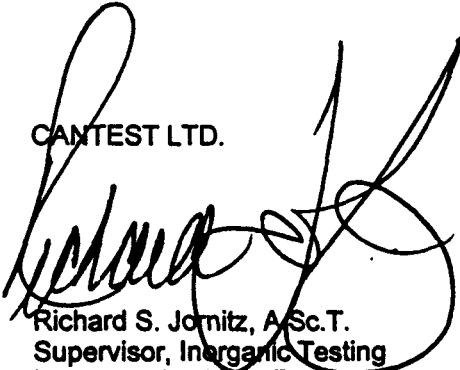
METHODS OF TESTING:

DDT - was determined by using immunoassay test kit, based on the use of polyclonal antibodies that bind either DDT or DDT-Enzyme Conjugate. These antibodies are immobilized to the walls of the test tubes included in the kit. When DDT is present in the sample, it competes with the DDT-Enzyme Conjugate for a limited number of antibody binding sites. Photometric interpretation was performed using a portable spectrophotometer.

RESULTS OF TESTING:

(See the following pages)

CANTEST LTD.


Richard S. Jomitz, A.Sc.T.
Supervisor, Inorganic Testing



REPORTED TO: Hemmera Resource Consultants

REPORT DATE: November 13, 1998

FILE NUMBER: 10711K

CANTEST

CANTEST ID:	CLIENT ID:	DDT
10711K-48	907	4.6
10711K-49	909	3.4
10711K-50	912	<0.4
10711K-51	1003	<0.4
10711K-52	1006	<0.4
10711K-53	1010	<0.4
10711K-54	1102	<0.4
10711K-55	1104	20
10711K-56	1106	4.6
10711K-57	1108	4.6
10711K-58	1201	0.4
10711K-59	1203	<0.4
10711K-60	1205	0.42
10711K-61	1207	1.7
10711K-62	1209	<0.4
10711K-63	1211	<0.4
10711K-64	1309	0.4
10711K-65	1407	<0.4
10711K-66	1508	0.4
10711K-67	1511	0.4
10711K-68	1601	0.5
10711K-69	1603	2.6
10711K-70	1606	<0.4
10711K-71	1609	<0.4
10711K-72	1702	0.4
10711K-73	1704	0.4
10711K-74	G1	<0.4
10711K-75	G2	2.0
10711K-76	G2 Duplicate	1.8
10711K-77	G3	<0.4
10711K-78	G4	<0.4
10711K-79	G5	<0.4
10711K-80	G6	<0.4
10711K-81	G7	<0.4
10711K-82	G8	<0.4
10711K-83	G9	<0.4
10711K-84	G10	<0.4
10711K-85	G11	<0.4
10711K-86	G12	<0.4
10711K-87	G13	<0.4
10711K-88	G14	<0.4
10711K-89	G15	<0.4
10711K-90	G16	<0.4
10711K-91	G17	<0.4
10711K-92	G18	<0.4
10711K-93	G19	<0.4
10711K-94	G20	<0.4
10711K-95	G21	<0.4

*



REPORTED TO: Hemmera Resource Consultants

REPORT DATE: November 13, 1998

FILE NUMBER: 10711K

CANTEST

CANTEST ID:	CLIENT ID:	DDT
10711K-96	G22	0.3
10711K-97	G23	<0.4
10711K-98	G24	<0.4
10711K-99	G25	<0.4
10711K-100	G26	<0.4
10711K-101	G27	<0.4
10711K-102	G28	<0.4
10711K-103	G29	<0.4
10711K-104	G30	<0.4
10711K-105	G31	<0.4
10711K-106	G32	<0.4
10711K-107	G33	<0.4
10711K-108	G34	<0.4
10711K-109	G35	0.4
10711K-110	G36	<0.4
10711K-111	102N	2.0
10711K-112	201N	2.1
10711K-113	205N	0.6
10711K-114	207N	<0.4
10711K-115	302N	2.5
10711K-116	401N	2.0
10711K-117	404N	3.4
10711K-118	407N	<0.4
10711K-119	502N	0.4
10711K-120	505N	<0.4
10711K-121	601N	2.0
10711K-122	604N	2.2
10711K-123	701N	1.4
10711K-124	703N	3.1
10711K-125	705N	<0.4
10711K-126	801N	2.5
10711K-127	808N	<0.4
10711K-128	901N	2.1
10711K-129	906N	0.7
10711K-130	1102N	1.4
10711K-131	1104N	1.4
10711K-132	1106N	<0.4
10711K-133	1108N	<0.4
10711K-134	1203N	1.9
10711K-135	1205N	2.0
10711K-136	1302N	<0.4
10711K-137	1304N	1.1
10711K-138	1305N	<0.4
10711K-139	1403N	2.0
10711K-140	1405N	<0.4
10711K-141	1501N	<0.4
10711K-142	1502N	0.9
10711K-143	1504N	0.7



REPORTED TO: Hemmera Resource Consultants

REPORT DATE: November 13, 1998

FILE NUMBER: 10711K

CANTEST

CANTEST ID:	CLIENT ID:	DDT
10711K-144	1606N	<0.4
10711K-145	1701N	<0.4
10711K-146	ML1	<0.4
10711K-147	ML2	<0.4
10711K-148	ML3	<0.4
10711K-149	SL1	<0.4
10711K-150	SL2	<0.4
10711K-151	SL3	<0.4
	CLEAN	<0.4

Results are expressed as micrograms per gram (ug/g).



Analysis Report

CANTEST

NOV 10 1998
CanTest Ltd

Professional
Analytical
Services

1523 West 3rd Ave
Vancouver, BC
V6J 1J8

Fax: 604 731 2386

Tel: 604 734 7276

1 800 665 8566

REPORT ON: Analysis of Soil Samples
REPORTED TO: Hemmera Resource Consultants Ltd.
Suite 410
1190 Hornby Street
Vancouver, B.C.
V6Z 2K5

Att'n: Mr. Phil Scalla

PROJECT NUMBER: 316-03

NUMBER OF SAMPLES: 14

REPORT DATE: October 29, 1998

DATE SUBMITTED: October 5, 1998

GROUP NUMBER: 8102201

SAMPLE TYPE: Soil

TEST METHODS:

Organochlorine Pesticides in Water and Soil - analysis was performed using procedures based on U.S. EPA Method 608/8080, including extraction, clean-up steps, and analysis using GC/ECD.

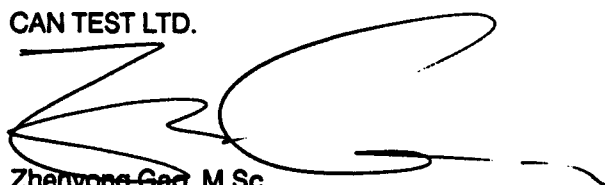
COMMENTS:

Please note that all samples under Group # 8102201 for OC analysis were submitted after the two weeks holding time.

TEST RESULTS:

(See following pages)

CAN TEST LTD.


Zhenyong Gao, M.Sc.
Coordinator, Trace Organics

Page 1 of 5



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: October 29, 1998

GROUP NUMBER: 8102201

Organochlorine Pesticides in Soil

CLIENT SAMPLE IDENTIFICATION:	804	905	907	109	
DATE SAMPLED:	Sep 28/98	Sep 28/98	Sep 28/98	Sep 28/98	
CAN TEST ID:	810220002	810220006	810220007	810220008	DETECTION LIMIT
Aldrin	<	<	<	<	0.001
alpha-BHC	<	<	<	<	0.001
beta-BHC	<	<	<	<	0.001
delta-BHC	<	<	<	<	0.001
gamma-BHC (Lindane)	<	<	<	<	0.001
alpha-Chlordane	<	<	<	<	0.005
gamma-Chlordane	<	<	0.006	<	0.005
p,p-DDD	0.014	0.018	0.16	0.16	0.005
o,p-DDE	<	<	<	<	0.003
p,p-DDE	<	<	0.068	0.080	0.003
o,p-DDT	<	0.005	0.044	0.088	0.003
p,p-DDT	0.034	0.029	16	37	0.003
Dieldrin	<	<	<	<	0.003
Endosulfan I	<	<	<	<	0.01
Endosulfan II	<	<	<	<	0.01
Endosulfan Sulphate	<	<	<	<	0.01
Endrin	<	<	<	<	0.01
Endrin Aldehyde	<	<	<	<	0.01
Heptachlor	<	<	<	<	0.001
Heptachlor Epoxide	<	<	<	<	0.001
Methoxychlor	<	<	<	<	0.01
Toxaphene	<	<	<	<	0.3

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

< = Less than detection limit



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: October 29, 1998

GROUP NUMBER: 8102201

Organochlorine Pesticides in Soil

CLIENT SAMPLE IDENTIFICATION:	604N	703N	1102N	701N	
DATE SAMPLED:	Sep 28/98	Sep 28/98	Sep 28/98	Sep 28/98	
CAN TEST ID:	810220009	810220010	810220011	810220012	DETECTION LIMIT
Aldrin	<	<	<	<	0.001
alpha-BHC	<	<	<	<	0.001
beta-BHC	<	<	<	<	0.001
delta-BHC	<	<	<	<	0.001
gamma-BHC (Lindane)	<	<	<	<	0.001
alpha-Chlordane	<	<	<	<	0.005
gamma-Chlordane	<	<	<	<	0.005
p,p-DDD	0.13	0.12	0.10	0.017	0.005
o,p-DDE	<	<	<	<	0.003
p,p-DDE	0.15	0.23	0.12	0.088	0.003
o,p-DDT	0.049	0.036	0.018	0.021	0.003
p,p-DDT	1.6	0.90	0.66	0.19	0.003
Dieldrin	<	<	<	<	0.003
Endosulfan I	<	<	<	<	0.01
Endosulfan II	<	<	<	<	0.01
Endosulfan Sulphate	<	<	<	<	0.01
Endrin	<	<	<	<	0.01
Endrin Aldehyde	<	<	<	<	0.01
Heptachlor	<	<	<	<	0.001
Heptachlor Epoxide	<	<	<	<	0.001
Methoxychlor	<	<	<	<	0.01
Toxaphene	<	<	<	<	0.3

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

< = Less than detection limit



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: October 29, 1998

GROUP NUMBER: 8102201

Organochlorine Pesticides in Soil

CLIENT SAMPLE IDENTIFICATION:	111	1108	1106	901	
DATE SAMPLED:	Sep 28/98	Sep 28/98	Sep 28/98	Sep 28/98	
CAN TEST ID:	810220013	810220014	810220015	810220016	DETECTION LIMIT
Aldrin	<	<	<	<	0.001
alpha-BHC	<	<	<	<	0.001
beta-BHC	<	<	<	<	0.001
delta-BHC	<	<	<	<	0.001
gamma-BHC (Lindane)	<	<	<	<	0.001
alpha-Chlordane	<	<	<	<	0.005
gamma-Chlordane	<	0.011	0.021	<	0.005
p,p-DDD	0.11	0.12	0.15	0.079	0.005
o,p-DDE	<	<	<	<	0.003
p,p-DDE	0.14	0.049	0.051	0.23	0.003
o,p-DDT	0.25	0.18	0.14	0.029	0.003
p,p-DDT	1.2	0.58	0.92	0.57	0.003
Dieldrin	<	<	<	<	0.003
Endosulfan I	<	<	<	<	0.01
Endosulfan II	<	<	<	<	0.01
Endosulfan Sulphate	<	<	<	<	0.01
Endrin	<	<	<	<	0.01
Endrin Aldehyde	<	<	<	<	0.01
Heptachlor	<	<	<	<	0.001
Heptachlor Epoxide	<	<	<	<	0.001
Methoxychlor	<	<	<	<	0.01
Toxaphene	<	<	<	<	0.3

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

< = Less than detection limit



REPORTED TO: Hemmera Resource Consultants Ltd.

CANTEST

REPORT DATE: October 29, 1998

GROUP NUMBER: 8102201

Organochlorine Pesticides in Soil

CLIENT SAMPLE IDENTIFICATION:	309	401N	
DATE SAMPLED:	Sep 28/98	Sep 28/98	
CAN TEST ID:	810220017	810220019	DETECTION LIMIT
Aldrin	<	<	0.01
alpha-BHC	<	<	0.01
beta-BHC	<	<	0.01
delta-BHC	<	<	0.01
gamma-BHC (Lindane)	<	<	0.01
alpha-Chlordane	12	0.16	0.05
gamma-Chlordane	15	0.40	0.05
p,p-DDD	1500	20	0.05
o,p-DDE	1.4	<	0.03
p,p-DDE	150	5.3	0.03
o,p-DDT	21	15	0.03
p,p-DDT	42	14	0.03
Dieldrin	<	<	0.03
Endosulfan I	<	<	0.1
Endosulfan II	<	<	0.1
Endosulfan Sulphate	<	<	0.1
Endrin	<	<	0.1
Endrin Aldehyde	<	<	0.1
Heptachlor	<	<	0.01
Heptachlor Epoxide	<	<	0.01
Methoxychlor	<	<	0.1
Toxaphene	<	<	3

Results expressed as micrograms per gram, on a dry weight basis. ($\mu\text{g/g}$)

< = Less than detection limit

Sample# 810220017, 810220019 - Detection limits adjusted: Dilution required

