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October 19, 2000

Reference No. 14048

Mr. Brett Hartshorne
Indian and Northern Affairs Canada
Waste Management Program
345 - 300 Main Street
Whitehorse, Yukon
Y1A 2B5

Dear Mr. Hartshorne:

Re: Conestoga-Rovers & Associates (CRA) Final Report
Million Dollar Falls, Haines Junction, Yukon

Please find attached ten copies of our Final Report entitled **"Phase I Environmental Site Assessment and Field Sampling Investigation, Million Dollar Falls".**

The Final Report includes minor corrections to the formatting of Table A2, as per your request to Frank Lebrero in your phone conversation on October 11, 2000, concerning our report issued April 17, 2000. As you noted during this conversation, all of your previous comments had been addressed satisfactorily in the April 17th report.

We hope that this report is to your satisfaction. Our objective on all projects is to meet or exceed the expectations of our clients by providing quality services in a responsive, safe, and cost-effective manner.

Should you have any questions regarding the attached report, please do not hesitate to contact us directly at (604) 214-0510. We will be pleased to provide any clarification where needed. You are our client and your satisfaction is our greatest priority.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

Daniel St-Gelais, P.Eng.
Vancouver Office Manager

Frank Lebrero, P.Eng.
Project Engineer

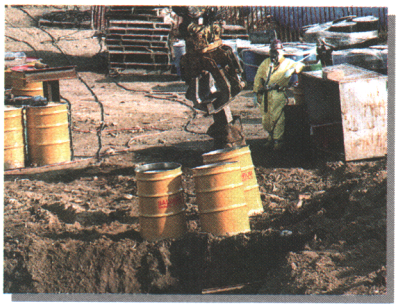
FAL/fal
Encl.

Phase I Environmental Site Assessment and Field Sampling Investigation

Million Dollar Falls

Prepared For:
Indian and Northern Affairs Canada

April 2000
14048 (2 - 2nd Issue)



Engineers & Environmental Specialists

CRA
Conestoga-Rovers & Associates

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EXECUTIVE SUMMARY

Conestoga-Rovers & Associates (CRA) was retained by Indian and Northern Affairs Canada (INAC) to conduct an Environmental Site Assessment (ESA) at Million Dollar Falls, located in the Yukon Territory (Site). The Site is currently a campground administered by the Yukon Territorial Government (YTG) but was formerly a construction camp for the U.S. military, and highway and pipeline construction. A preliminary assessment was conducted on the Site by UMA under INAC's direction in 1995. That study identified the presence of two debris areas below the former camp that may contain contaminants associated with former camp operations. Contaminants identified to be present included DDT, PCB's, select metals, and petroleum hydrocarbons. Possible low level PCB contamination of the campground water supply aquifer was also reported.

This study was requested by INAC to confirm the presence of the contaminants and to investigate the possibility of potentially buried materials left on the Site following decommissioning of the work camps. The scope of work included performing a historical study, including conducting interviews with individuals having knowledge of the Site; and performing a more detailed field investigation, including soil and water sampling and analysis. The fieldwork was conducted from September 17 to 22, 1999.

Results of the Site history interviews indicated that solid wastes and dynamite are alleged to have been buried on the Site. In addition, a nearby lake (Airplane Lake) used as a winter airstrip was alleged to have been used as a disposal area for solid and drummed wastes. However, air photos of the Site were not available prior to Site decommissioning to confirm these allegations. As the Site was regraded on decommissioning, no visual evidence of buried wastes was found during our site investigation.

The results of the soil and water quality analyses were assessed with respect to the Yukon Contaminated Sites Regulations (CSR) O.I.C 1996/192, dated December 16, 1996 and the Canadian Environmental Quality Guidelines by the Canadian Council of Ministers of the Environment (CEQG, 1999).

CRA's field and analytical investigation confirmed the presence of trace levels of petroleum hydrocarbon contamination in the soils at the toe of the debris areas and in one sediment sample taken from the old river bed downstream of the northern debris area. CRA also found that several inorganics, including: arsenic; chromium; and zinc are present in levels above the soil criteria in the soils at the toe of the debris areas. Sediment sampling confirmed the presence of chromium in the sediments adjacent to

the toe of the debris areas and in the sediments of the old river bed upstream and downstream of the debris areas. Arsenic concentrations just above the CEQG interim sediment quality guidelines were found in a sample taken upstream of the debris areas at the pond outlet. Elevated levels of sulphur were also noted in all of the soils sampled along the toe of the debris areas and at two of the sediment sampling locations upstream of the debris areas.

No PCB or pesticide/herbicide contamination was found in the soil or sediment samples and no surface water quality concerns were noted for petroleum hydrocarbons, PCBs or pesticides/herbicides in the samples analyzed.

Analysis of the campground well water sample showed that pH, colour, turbidity, and TDS exceeded CEQG criteria for drinking water quality. Aluminum levels exceeded the Yukon CSR drinking water quality criteria, and fluoride, iron, manganese, and sodium levels exceeded both the CEQG and Yukon CSR drinking water quality criteria. Confirmatory analysis for PCBs showed that no contamination was detected in two campground well water samples.

The extent of impact appears to be limited to trace petroleum hydrocarbon contamination and slightly elevated levels of inorganics (metals, sulphur) along the old river bed, concentrated at the debris areas. However, elevated levels of inorganics in the well water and slightly elevated levels of inorganics in sediments upstream of the debris areas suggests that potential buried sources of inorganic (principally metals) contamination may exist on the Site, as alleged by a witness interviewed during the historical review. Elevated levels of metals in the soil could also result from natural weathering, as all three metals (arsenic, chromium and zinc) occur naturally in the environment at a wide range of concentrations, depending on soil type and location. The elevated levels of inorganics in the groundwater sample may result from natural sources and/or turbidity of the sample.

Based on our findings during this investigation, we recommend the following tasks, summarized below and in the attached table. Scheduling of any Site work would be discussed with INAC at a meeting to be scheduled in early May 2000, and would be performed at times of low campground usage, if possible, to minimize disruption to the campers.

The recommended tasks have been grouped into three principal areas of work: the campground area; the debris area; and, off-Site (Airplane Lake) as follows:

Campground Area

Due to the potential hazard associated with unexploded dynamite alleged to have been buried in this location, an incremental approach is recommended for further investigation.

- We recommend performing a Site investigation with a witness from the Champagne and Aishihik First Nations (CAFN) and the RCMP Explosives Demolition Unit (EDU) to search identified areas for alleged buried dynamite, and to remove and dispose of any dynamite found. **Estimated cost: $5,500 - $8,000.**

- Once the risks associated with the alleged explosives are confirmed and removed, we recommend that a geophysical investigation (electromagnetic survey) of the campground area be performed to identify potential locations of buried solid wastes and sources of contaminants, concentrating on areas identified by the CAFN witness. **Estimated cost: $7,500 - $11,500.**

- *If required based on the above findings,* we recommend that additional field investigations of the soil and groundwater at the campground area be performed to confirm and delineate the extent of potential contamination. **Estimated cost (if required): $22,000 - $33,000.**

- *If required based on the above findings,* we recommend that a mitigation/remediation plan for the campground area be developed. **Estimated cost (if required): $10,000 - $15,000.** If required, local contractors would perform subsequent mitigation/remediation work when the campground is vacant. Estimated costs for this work cannot be provided at this time but would be developed and presented to INAC during the study.

Debris Area

Detailed soil and groundwater sampling may be considered to further delineate the extent of contamination in this area, however, difficult access for equipment could result in the costs of the study exceeding $30,000. Therefore, due to the nature and extent of contamination and the high costs associated with performing a detailed subsurface investigation, we do not consider this approach to be practical. Therefore, we recommend that this area be mitigated or remediated to control or remove potential sources of contaminants and to improve aesthetics. Three options are provided as follows, in order of increasing estimated costs:

- **Option 1:** Mitigate the debris area by constructing a cap to isolate the debris from runoff and streamflows, thereby reducing the leaching potential of contaminants within the pile. **Estimated Cost: $35,000 - $50,000.**

- **Option 2:** Remove the debris with an overhead crane and remediate the soils underneath. The feasibility of accessing debris with a locally-available overhead crane suitable for the work would have to be investigated by conducting a site visit with a local contractor. **Estimated cost: $50,000 - $70,000.**

- **Option 3:** As Option 2, using a helicopter to remove debris due to potential access problems or availability of a suitable crane in the area. **Estimated cost: $70,000 - $100,000.**

It is CRA's opinion that mitigation (Option 1) would be the most effective option to address the area, considering the age and condition of the debris. We feel that removal of the debris (as in Options 2 and 3) could result in increased environmental damage due to reduced stream bank stability, subsequent erosion and increased sediment loading to the stream. An additional concern for remediation work would include landfill sites in the area capable of accepting and treating contaminated soil.

The capping of the debris and stabilizing of the stream banks is a risk management approach that will likely require review by both YRR and DFO. To expedite the approval process, we suggest scheduling a meeting with these parties in early May 2000 to discuss the approach at a conceptual level. Following YRR/DFO approval of conceptual designs, CRA would provide detailed designs and costs for the preferred plan. These costs would be developed in coordination with experienced local excavation and landfill contractors.

Off-Site (Airplane Lake)

- We recommend that previous waste disposal practices at the winter airstrip be investigated to locate potential wastes at the bottom of the lake. We recommend performing a diving investigation, and conducting water quality and sediment sampling to provide information as to whether significant actual or potential contamination exists in the lake. **Estimated cost: $10,000 - $15,000.**

Please see the attached table for a summary of the recommendations, timing and duration of the tasks, and estimated costs.

SUMMARY OF RECOMMENDATIONS

Recommendation	Rationale	Tasks	Tentative Timing and Duration	Estimated Costs (1), (2)	Comments
Campground Area					
Perform Site investigation with Champagne and Aishihik First Nations (CAFN) witness and RCMP Explosives Demolition Unit to search areas of alleged buried dynamite and remove hazards	To confirm presence or absence of buried dynamite. If present, locate and remove hazards prior to further field investigation	Site investigation with RCMP using trained dogs and detection equipment.	May 2000, 2 days	**$5,500 - $8,000**	Cost includes time for excavator on site. Additional costs may result for neutralization or removal of dynamite, if required
Perform a geophysical survey	To indentify potential locations of buried solid waste/sources of contaminants	Ground penetrating radar or electromagnetic survey of the Site, analysis and reporting	May 2000, 3 days	**$7,500 - $11,500**	Cost includes crew and rental of electomagnetic survey equipment
If required based on the above findings, **perform additional field investigations of the soil and groundwater at the campground area**	To confirm and delineate the extent of potential contamination in the campground area due to buried wastes identified during the geophysical survey	Test pitting, drilling, installation of groundwater wells and soil and groundwater sampling	May or June 2000, 6 to 8 days	**$22,000 - $33,000**	Cost based on 3 test pits, 10 boreholes and 5 groundwater monitoring wells. Actual program would be based on site investigation findings
If required based on the above findings, **provide mitigation/remediation plan for the campground area**	To develop plan and estimate the cost of remediation of the campground area	Office study to summarize work performed on Site, results, and propose plan for cleanup	June 2000, 2 weeks	**$10,000 - $15,000**	Includes a comparative analysis of mitigation and remediation costs versus risks
Debris Area					
Option 1: **Isolate and contain debris area**	To control leaching of contaminants and to improve aesthetics	Develop detailed design for cover system (cap) for debris area. Construct erosion protection, cover area with sand and gravel, and plant vegetation. Monitor construction and perform sampling	During 2000 Fisheries Construction window (typically July 15 to September 15), approx. 2 weeks duration	**$35,000 - $50,000**	Cost includes an estimate for installation of 5 piezometers, and one round of water, soil and sediment sampling
Option 2: **Remove debris with crane and remediate debris area**	See Option 1	Break up pile with saws/torches, haul out pieces with crane, excavate local dump site and place liner, transport materials and cover. Monitor construction and perform sampling	See Option 1, duration approximately 3 weeks	**$50,000 - $70,000 (3)**	See Option 1
Option 3: **Remove debris with helicopter and remediate debris area**	See Option 1	As in Option 2, using helicopter to remove debris	See Option 1, duration approximately 3 weeks	**$70,000 - $100,000 (3)**	See Option 1
Off Site (Airplane Lake)					
Investigate and report on previous waste disposal practices at the winter airstrip on the lake	To investigate potential impacts to the lake due to claims of dumping	Perform a site investigation including a diving program, and water and sediment sampling	June 2000, 5 days	**$10,000 - $15,000**	Cost based on diving, video, 5 sediment and 5 water samples, travel and reporting

Notes:

(1) Estimated costs presented are based on limited information and have been provided for comparative purposes only.

(2) Costs were developed based on staging the CRA-staffed field work tasks in succession where possible, and therefore include savings resulting from reduced travel time and number of flights to the Yukon.

(3) Assumes contaminated soils or materials could be buried on-Site in an excavated and lined trench. Disposal of any waste would be discussed with INAC and YRR as part of the conceptual plans.

1.0 INTRODUCTION

Conestoga-Rovers & Associates (CRA) was retained by Indian and Northern Affairs Canada (INAC) to conduct an Environmental Site Assessment (ESA) at Million Dollar Falls, located in the Yukon Territory (Site). A Site location plan is included as Figure 1.

Million Dollar Falls is currently operated as a campground by Yukon Territorial Government (YTG), however the Site was formerly a construction camp for the U.S. military, and highway and pipeline construction that was investigated under INAC's direction in 1995. The Preliminary Environmental Assessment (UMA 1995) that was conducted identified the presence of two debris areas below the former camp that may contain contaminants associated with former camp operations. Contaminants identified to be present included DDT, PCB's, select metals, and petroleum hydrocarbons. PCB's were also reported in the campground supply well.

Based on its field investigation, sampling results and preliminary environmental risk assessment, UMA (1995) recommended the following:

- Remediate the debris areas to address the potential migration of DDT and zinc, and other constituents, to the stream and the Takhanne River; and
- Perform additional sampling and analysis to verify that the quality of the water from the campground supply well meets drinking water objectives for PCBs.

In 1999 INAC requested that CRA prepare a proposal to further investigate the Site conditions indicated by the findings in UMA (1995). In discussions with INAC, a secondary objective of the overall work program was to ascertain if other environmental issues associated with past military camp/construction camp operations may be present at the Site that were not identified previously by the preliminary assessment. In particular, INAC noted that a witness referred by the Champagne and Aishihik First Nations (CAFN) had identified that explosives may be buried at the Site.

This report summarizes the work program and presents all field and laboratory analytical data results. This report has been prepared for the use of INAC in assessing the environmental conditions at the Site and may not be relied upon by others without the written concurrence of CRA.

2.0 SCOPE OF WORK

Based on the discussions with the client, the scope of this study included:

- A brief historical review of relevant records and aerial photos, interviews with individuals having knowledge of the Site, contact with relevant regulatory agencies and a review of previous studies;
- Consultation with stakeholders to provide input to the study and to assist with the historical investigation of the Site;
- A Phase I field investigation, including a Site ground reconnaissance, and sampling and analysis of soil, sediment, surface water and drinking water;
- A control survey of sample locations and areas of environmental concern; and
- A summary report, including recommendations for further work to address previously identified and newly identified locations of contamination.

Activities were conducted in general accordance with CRA's proposal dated September 14, 1999.

3.0 BACKGROUND

Million Dollar Falls (Site) is located in the southwest corner of the Yukon Territory as shown on Figure 1. The Site was a former U.S. military and construction camp during the construction of the Haines Road and the Haines-Fairbanks pipeline during the 1940s and 1950s. Subsequent to its use as a military and construction camp, the Site was converted to a recreational campground and is presently administered by the Yukon Territorial Government (YTG).

The Site was initially investigated by UMA Engineering Ltd. (UMA) for INAC in 1995 pursuant to the Arctic Environmental Strategy – Action on Waste program and was one of five sites that were evaluated along the Haines-Fairbanks pipeline route. In 1995, UMA conducted a limited investigation of the Site. The findings of this investigation were documented in the report entitled "Preliminary Environmental Assessment, Haines-Fairbanks Pipeline" (UMA 1995).

3.1 SITE SETTING

The Site is located in the southwest corner of the Yukon Territory north of the Canada-United States border that separates the Yukon Territory from Alaska. The Site is situated within the Takhanne River valley at the location of Million Dollar Falls and is situated on the west side of the Haines Highway (at milepost 103) that connects Haines, Alaska to Haines Junction, Yukon. The Site features are shown in Figure 2.

The Site is located on an overburden plateau that overlooks the Takhanne River and is isolated by current and former channels of the river. The Site is bordered on the north by the present-day channel of the Takhanne River and on the south by an old channel of the Takhanne River. The old river channel has been cut off from the current river alignment by the access road to the recreational campground, which currently occupies the Site. A small stream flows through the old river channel to the Takhanne River. A lake is present in the old river channel alignment to the southeast of the existing campground.

The Site is relatively flat in the area of the campground. However, the topographic relief is severe where the slope falls steeply to the Takhanne River at the gorge and to the south towards the old river bed. Based on UMA (1995), vegetation in vicinity of the old river bed consists of late successional forest dominated by white spruce and occasional balsam poplar. Understorey vegetation in this area consists of willow, forbs, willow herb, grasses, and horsetail.

Present day features consist of campground sites, a day-use shelter and groundwater supply well situated near the center of the Site.

UMA (1995) reported that two historic debris areas are located below the campground at the toe of the slope in the old river bed. Materials reported to be observed in the larger debris area consist of wood scraps (some burned), metal straps and cans, rubber, barrels and car parts. The smaller debris area is reported to contain mostly domestic refuse such as cans. Partially buried drums were also reported in the old river bed near the debris areas. Other historic features include concrete pads situated at the locations of former buildings. Additional details are given in the following sections.

3.2 SITE HISTORY

According to UMA (1995), the Site was originally utilized as a U.S. military camp and as a communications relay station during the early 1940s. The Site was subsequently used in 1943 as a highway construction camp during construction of the Haines Road, then as a pipeline construction camp for construction of the Haines-Fairbanks pipeline during the period from 1954 to 1955. Subsequently, the Site has been utilized as a recreational campground by the YTG. The name Million Dollar Falls was derived from what was allegedly the value of US military equipment and buildings that was buried on Site.

The original construction camp at the Site was reportedly quite large and consisted of a number of barracks, mess halls, garage/gas station facilities and radio station buildings. In addition to the equipment and buildings buried on Site, a large amount of dumping was reported to have occurred on the west side of the Site in the old river bed during the 1943-1944 abandonment of the camp.

4.0 HISTORICAL RECORDS REVIEW

CRA's understanding of the historical operations at the Site was derived from previous reports, from personal interviews conducted with persons having direct experience with operations at the Site and through aerial photo interpretation. No property title search, request for fire insurance plans or search of environmental databases was conducted due to the nature of the Site, it's remote location and lack of records available.

4.1 PREVIOUS STUDIES

The preliminary assessment by UMA (1995) represents the only known investigation that has been conducted at the Site to date. Through incidental discussions with various persons knowledgeable of the Yukon and discussions with the Champagne and Aishihik First Nations, CRA is aware of other studies of the Haines-Fairbanks pipeline that have been commissioned by the CAFN. However senior CAFN representatives have stated that these reports contained only historical data assembly, and were not made available to CRA.

The field investigations conducted during UMA (1995) were limited in scope and focussed on assessing the quality of the groundwater in the campground drinking water supply well and investigating conditions in the vicinity of the debris areas. The scope was limited in part because the Site was occupied with campers at the time of the field investigation. The field investigations consisted of the following tasks:

- sampling of groundwater from the campground well;
- collection of three stream water samples from above, across from and below the debris areas at the toe of the slope to the old river channel (referred to as Upper Station, Middle Station, and Lower Station);
- collection of shallow soil samples and stream sediment samples at the stream water sample locations;
- vapour screening of three soil samples; and
- installation of two mini piezometers to depths of 0.6 and 1.5 meters adjacent to the stream in the old river channel.

The vapour screening of the three soil samples produced negative results for the presence of volatile organics. The piezometers were reportedly installed in soils of low permeability and did not yield adequate water for sample collection and analysis.

UMA's analytical program consisted of a field analytical program combined with a laboratory analytical program.

The field analytical program consisted of the screening of three soils samples for PCBs, TPH, PAH, and BTEX using immunoassay methods and for volatile organics using a PID container headspace procedure. The water sample from the campground well was also monitored for conductivity using a portable conductivity meter.

The laboratory analytical program consisted of the analysis of two soil samples for VOCs, BTEX, TEH, PCBs, pesticides, and herbicides. Four soil samples were analyzed for metals. For water samples, four were analyzed for VOCs and BTEX; three for TEH, metals, PCBs and pesticides; and two for herbicides.

The Preliminary Assessment assessed the analytical data to criteria and standards issued by the Canadian Council of Ministers of the Environment (CCME), the BC Ministry of Environment (BCMOE), the Dew Line Cleanup, the US Environmental Protection Agency (USEPA), and the Alaska Department of Environmental Conservation. Since 1995, the YTG has enacted contaminated sites legislation and environmental standards for the Yukon are promulgated in the Contaminated Sites Regulation (O.I.C 1996/192) (hereafter "CSR") administered by Yukon Renewable Resources (YRR). Photocopied sections from the preliminary assessment along with a compilation of laboratory analytical data are presented in Appendix A for reference. Relevant CSR standards and CCME criteria are also shown in the attached tables.

Based on the scope of work that was conducted, UMA (1995) identified two issues associated with the Site:

- possible low level PCB contamination of the campground water supply aquifer that posed possible human and ecosystem health risk implications; and
- elevated levels of zinc and DDT at the toe of the dump that could potentially migrate to the Takhanne River.

UMA (1995) recommended detailed confirmatory sampling and analysis and remediation of the dump to address these two issues, respectively.

4.2 INTERVIEWS

During interviews with CRA, representatives of Indian and Northern Affairs Canada (INAC) acknowledged the incomplete nature of official information available. Efforts by INAC staff to secure information beyond what had been incorporated into previous reports yielded little additional data. In recognition of the limited nature of either First Nation or agency records, INAC reiterated their statement that additional historical data was not a high priority for this report and that the focus of this study was to identify and address issues found on the Site.

As shown in the attached table, CRA also spoke with representatives at the Yukon Territorial Government (YTG) and Champagne Aishihuk First Nations (CAFN) to obtain additional information on the Site. YTG deferred us to INAC for available information. A senior representative of CAFN directed his staff to locate any historical information available regarding the Site. Subsequently, he related that no new data was available. Another representative of CAFN identified several potential witnesses to CRA, however, only one was able to provide any relevant information.

Mr. Chuck Hume, CAFN Band Councillor, said he had witnessed ongoing waste handling practices in the area from childhood to subsequent employment during Site decommissioning. Issues he noted included buried solid and drummed wastes on the Site including buried unexploded dynamite, and waste disposal practices at the winter airstrip on a nearby lake.

Wastes buried on the site apparently included: spent fuel drums; metal containers; drums of waste; pallets; unexploded dynamite; and domestic wastes from the Site and transported from various support facilities. Demolition materials from the Site decommissioning were also alleged to have been buried on site.

Wastes were also described as being left on a nearby ice covered lake referred to locally as Airplane Lake, because of its use as a winter airstrip. The reported practice was to leave solid and drummed wastes on the ice and await spring breakup. Since a typical complement of personnel could reach 300 persons or more, it was alleged that a significant quantity of wastes were disposed of in this manner, or buried on-site, as no wastes were ever transported off-Site for disposal.

On maps of the area, the lake nearest the Site is identified as Pringle Lake. It is alleged that this lake, being the one nearest the Site, is actually Airplane Lake. This lake is said to have once been very reedy and fish bearing but is now said to have a silty bottom and is no longer fish bearing.

Copies of CRA-generated Site figures and of aerial survey photographs were provided to the witness, and were returned with several of features and issues annotated. The records are included in Appendix B. Approximate locations of the buried wastes and buried dynamite were shown in relation to historic buildings and utilities. The location of these wastes appears to be concentrated in the northern half of the site, east of the campground, adjacent to a former access road.

An expert in Explosives Ordinance & Demolitions (EOD) with the Department of National Defense was contacted and asked, in general terms, about the risks associated with unexploded dynamite. He agreed to provide general information only and stated that since the situation described was a civilian one, that the RCMP was the correct agency to address this issue, if the allegations could be corroborated or the location determined to some accuracy. He related that he felt the corroboration would be important, as the RCMP might not conduct a wide area search as a result of a single allegation.

He related that danger arises as dynamite ages or is stored incorrectly, as the nitroglycerin begins to leach from the matrix and crystallizes on the exterior of the charge. In this state, the salts are extremely sensitive to impact. He cautioned that an unqualified person should not handle these materials in any manner. He further cautioned that no drilling or test pit excavations should be employed in searching for them.

RCMP Explosives Demolition Unit (EDU) can employ several methods to locate and manage the materials. These methods include a sniffer sensitive to ammonia nitrate and dogs trained to detect explosives. Other techniques would include utilizing ground penetrating radar (GPR) to search for differences in the density of soils including voids that may exist due to buried materials. Electromagnetic metal detection (EM) devices could also be used to search for metal materials that may have been buried in conjunction with explosives.

CONTACT NAME	AGENCY	COMMENTS
Brett Hartshorne	Indian & Northern Affairs Canada (INAC)	INAC had originally indicated that a staff member (K. Stromberg) would conduct a search for historical data and provide the results to CRA for incorporation into report. Subsequently, little additional data was located that had not been previously known. During a subsequent conversation, Mr. Hartshorne reiterated his earlier statement, acknowledging that the available data was scant and that he felt that it had been sufficiently represented in other reports and was not critical to the CRA report. He also stated that Environment Canada had no records of the Site.
Krista Stromberg	Indian & Northern Affairs Canada (INAC)	Related to CRA that she conducted a two day archival records search, searched any related INAC files and contacted the Heritage Branch of the YTG seeking information. No information other than UMAs Preliminary Assessment was provided to CRA.
Beinke Petterson	Yukon Territorial Government (YTG)	CRA contacted Mr. Petterson in an effort to secure any additional information regarding the Site, particularly any data relating to the campground supply well. Mr. Petterson stated that INAC held any relevant records.
Lawrence Joe, Director Heritage, Land, Resources, Employment and Training	Champagne & Aishihik First Nations	CRA contacted Lawrence Joe regarding the availability of data from any historical research previously undertaken or commissioned by the CAFN. Lawrence Joe subsequently related to CRA that no detailed records were found by either his staff members in Whitehorse or at Haines Junction.
Vera Owlchild Employment & Training	Champagne & Aishihik First Nations	Vera Owlchild provided several potential contacts to CRA for personal contact. They were identified as the following four individuals: Chuck Hume, Cathy Kushniruk, Marge Jackson and Pauline Fraser.
Chuck Hume Band Councillor	Champagne & Aishihik First Nations,	CRA conducted a lengthy telephone interview with Chuck Hume. During that interview, Mr. Hume related his observations and experiences covering a period of many years at the Site. Mr. Hume related observations ranging from his childhood to subsequent employment during the Site decommissioning. In addition to corroborating information previously related, he identified additional potential concerns. Site plans and copies of aerial survey photos were submitted to Mr.

		Hume and he agreed to annotate them to the best of his recollection and return them to CRA.
Cathy Kushniruk Band Counselor	Champagne & Aishihik First Nations	CRA conducted a brief telephone interview with Cathy Kushniruk. During that interview, Ms. Kushniruk related that she felt that she was too young to offer substantive first person observations of the Site operations. At her suggestion, CRA contacted Mr. Lawrence Joe of CAFN, to obtain any historical data they might have uncovered.
Marge Jackson	Champagne & Aishihik First Nations	Marge Jackson was unavailable.
Pauline Fraser	Champagne & Aishihik First Nations	Pauline Fraser was unavailable
Sgt. Banfield	Department of National Defence	Provided information on handling and disposal of potentially buried dynamite.

4.3 AERIAL PHOTOGRAPHS

To assess historical Site use, CRA obtained aerial photographs of the Site from the National Archives in Ottawa. Available aerial photographs only encompassed the years 1964, 1975, 1986 and 1992 (Appendix C). Aerial photos for the period of greatest interest (from the 1940s through the 1950s) were not available. Site use and features indicated by the aerial photographs are as follows.

July 17 and 21, 1964 Aerial Photographs

The features depicted on these aerial photographs resemble those indicated in UMA (1995). The buildings indicated in the report are no longer present, with the exception of the building that has been designated as a "root cellar" and a smaller building on the west side of the campsite situated close to the top of the slope. The locations of some of the other buildings are indicated by the presence of concrete pads, and the extent of previously disturbed areas from the camp operations are indicated in this photograph. The debris areas in the old river channel are not visible, as they are located in the shadow of the overlying slope. The alignment and position of roadways and buildings differ somewhat from those depicted in UMA (1995). Figure 2 shows the alignment and position of features digitally scanned and corrected using these aerial photographs.

August 26, 1975 Aerial Photograph

The Site features depicted on this aerial photograph indicate that the Site has not been significantly altered since 1964. The "root cellar" is no longer present. The other

building noted in 1964 and the debris areas are not visible as these features are situated beyond the edge of the aerial photograph. The entry area to the Site appears to have been regraded and indistinguishable materials are indicated in the area.

September 1986 Aerial Photograph

The small scale of this aerial photograph precludes the ability to distinguish individual features. However, the road network at the Site has been altered from that previously noted in 1964 and 1972. In this photo, the Site has been redeveloped as a recreational campground, and the campground loop road and campsites are evident.

August 30, 1992 Aerial Photographs

The Site features depicted on this aerial photograph indicate that the Site has not been altered significantly since 1986. The central shelter in the campground is visible. Former disturbed areas have revegetated since 1964. The debris areas adjacent to the old river channel are not distinguishable in the shadows and vegetation.

This sequence of aerial photographs indicate that buildings at the Site that were originally constructed for the camp in the 1940s were almost all removed by 1964 and are no longer present except for the concrete pads. The locations of former building pads were noted to fall within the alignments of reconstructed campground roadways in 1986.

5.0 SITE CHARACTERISTICS

5.1 SITE GEOLOGY

To assess regional geology, CRA obtained geologic maps pertinent to the Site from the Geological Survey of Canada for review. Available maps included map nos. 1019A, 1712A and Open File 831 (Geological Survey of Canada 1953, 1991 and undated, respectively).

According to the available geologic mapping, the local surficial geologic deposits are comprised of mainly till and stratified silts originating from the glacio-fluvial processes associated with the last glacial period. In addition, glacial outwash, alluvium and colluvium deposits are found within this area. Bedrock underlying the surficial geologic deposits is indicated as part of the Dezadeash Group of the Lower Cretaceous period. The Dezadeash Group is comprised of conglomerate, thin dark grey shale, interbedded light to dark buff grey lithic greywacke, sandstone, siltstone, tuff, argillite, chert, greywacke and coal.

UMA (1995) reported the Site to be located within a glaciofluvial deposit adjacent to the Takhanne River. Soils are described as being sands and gravels and the Site is reportedly well drained. Bedrock is exposed within the Takhanne River gorge downstream of the falls. Post glacial and recent sediments reportedly occupy the valley that borders the Site. The geologic conditions reported in UMA (1995) are consistent with the geologic mapping of the area.

Surficial sampling conducted by CRA during this study showed that surface soils on the banks of the old river bed consist primarily of organic clay and silt, and sediments in the creek beds consist of fine silty sand. Please see Appendix D for the overburden stratigraphy logs for additional details.

5.2 SITE HYDROGEOLOGY

UMA installed two shallow piezometers (less than 1.5 meters deep) near the old river channel during their Preliminary Assessment which did not provide any information regarding the hydrogeologic setting. CRA was not able to locate any existing piezometers during our field investigation. No other previous investigations are known to have been conducted at the Site to date to define the hydrogeologic setting.

The water table was measured at approximately 2.55 m below the riser of the campground supply well on September 21, 1999 (Appendix D). The elevation of the lake surface in the former Takhanne river channel (Oxbow, Figure 2) is indicative of the location of the groundwater table to the south side of the Site. Groundwater flow is expected to follow the general topography, dictated by the Takhanne River and the old river channel.

5.3 FISHERIES

Million Dollar Falls, situated on the north side of the Site on the Takhanne River, functions as a natural barrier to salmonid species migrating from the Pacific Ocean. The bottom of the falls forms the natural limit to the extent of migration and the extent of the spawning grounds for migratory salmonid species within the Takhanne River. The Federal Department of Fisheries and Oceans (DFO) and Environment Canada, in initial discussions, have indicated that the Takhanne River and its environs are considered to be important habitat for salmonid species. Fish in the Takhanne River represent a food source for both the First Nations and the native bear population.

UMA (1995) identified the presence of a small homemade fish hatchery located in the old river channel near the location of the Upper Station. The hatchery is constructed of lumber and coolers piped with water from the stream in the old river channel, however, during CRA's field investigation it was in a state of disrepair and no longer functional.

DFO has indicated to INAC that the old river channel has riparian value as spawning and rearing habitat.

6.0 FIELD ACTIVITIES

Investigation activities conducted by CRA at the Site during the period of September 17 to 22, 1999 included:

- Site ground reconnaissance;
- Debris area exploration;
- Debris area soil investigation;
- Stream sediment investigation;
- Stream water investigation;
- Shallow groundwater investigation;
- Campground well investigation; and,
- A control survey.

The following sections of this report summarize the procedures employed during each of these activities. Investigation and sampling locations are shown on Figures 2 and 3. Instrumentation and sampling logs are attached in Appendix D, representative photos of the Site are shown in Appendix E, and survey information is detailed in Appendix F.

6.1 SITE GROUND RECONNAISSANCE

A Site ground reconnaissance was conducted to:

- visually inspect all areas of the Site;
- confirm the locations of the debris areas;
- identify surficial features that represent potential environmental concerns; and,
- verify previous investigative findings and information noted from aerial photographs, archival research and interviews.

The information collected during the inspection was then used to finalize the scope of the field activities and to aid in defining the extent of the sampling program.

CRA staff conducted an overall ground reconnaissance of the Site on September 17 and 22, 1999 as part of the field investigation. During these two days the debris areas were located and the Site was investigated for other potential areas of environmental concern. However, other than building foundations and other building remains from the

decommissioned camps, no other signs of contamination or buried wastes were found. Representative photos of the Site are shown in Appendix E.

Areas of the Site that were obviously filled or showed signs of redeemed vegetative cover were noted in the field notes. Based on the above findings, field activities subsequently concentrated on assessing and sampling in the vicinity of the debris areas and sampling of the groundwater well.

6.2 DEBRIS AREA EXPLORATION

In accordance with the proposed work plan, CRA conducted an investigation of the debris areas described in UMA (1995) that resulted from initial decommissioning activities at the Site. These areas are shown in Figures 2 and 3.

The purpose of this investigation was to determine the presence of containers that might constitute a point source for DDT of which elevated levels were previously detected adjacent to or down gradient of the debris areas.

CRA delineated the approximate area of the debris in relation to a baseline placed as a reference for the sediment and surface water sampling program. Hand tools were subsequently used to carefully remove surface debris from selected locations throughout the debris areas. Due to the entanglement of the debris, it was difficult to observe the extent and condition of materials below the surface, however, as best as possible, underlying materials were examined for the presence of containers or other materials potentially responsible for any impacts.

The debris was thoroughly interbedded with native rock, thought to have been knocked into the area during the disposal of materials from initial decommissioning activities at the Site. Although two separate areas of debris were noted, they were in close proximity and conditions at both were similar. The total volume of the debris is estimated to be approximately 250 m^3. Additional debris was strewn along the streamside, adjacent to and between the main debris areas.

Materials typically encountered included: scrap lumber and wood; metal cans (food and beverage, paint, other); steel banding; crates; drums; steel cables; duct insulation; wiring; scrap metals; piping; wiring; (dry cell) battery; and native rock materials. Metal drums were present in the vicinity of the debris areas and in the stream. Several partially buried drums were also noted.

Though numerous metal containers were encountered, they were thoroughly rusted. Many were perforated by rust or by the native rock materials. Some of the drums were mostly intact, holding water but appeared to have been well flushed. No containers labeled for DDT or organic pesticides were found.

6.3 DEBRIS AREA SOIL INVESTIGATION

The soil in the debris area was investigated to attempt to locate sources of DDT from the debris as well as to assess the distribution of other debris-associated contaminants. Soil samples were collected along the toe of the debris areas and at select stream bank locations and were subjected to field screening using immunoassay methods and a Petro FLAG to determine the relative concentrations of DDT, PCBs and petroleum hydrocarbons. In addition, soil samples collected from the upper ten centimeters (cm) of the toe of the debris areas were field screened using photoionization detector (PID) methods to determine the relative concentrations of undifferentiated volatile organic compound vapours in the headspace of each respective soil sample.

Sample locations were initially selected longitudinally along the toe of the debris areas (Figures 2 and 3). As both of the debris areas showed no visual evidence of contamination, vegetative distress or surface drainage paths, sample locations began at the furthest extent of a debris area and were spaced no further than three meters (m) apart until the other extent of the debris area was reached.

During sampling, soil samples were observed for the presence of sheen, staining, or odors, which would indicate the presence of petroleum hydrocarbons.

Soil samples were collected from the upper 10 cm and field screened for DDT, PCBs, petroleum hydrocarbons and undifferentiated volatile organic compound vapours. If DDT was detected in any of the soil samples collected from the upper 10 cm, then the underlying 10 cm of the respective sample location was collected and screened for DDT using immunoassay methods. In addition, if DDT was detected in any of the soil samples collected from the upper or underlying 10 cm, then a soil sample was collected from the upper 10 cm at a location directly west and immediately adjacent to the stream.

All soil samples were collected using stainless steel sampling equipment. The equipment used for sampling was decontaminated between sample locations by washing the equipment in a solution of alconox and distilled water and then triple rinsing with distilled water.

Soil samples collected were placed into mason jars and put directly into an ice-filled cooler for subsequent chemical analysis by Norwest Soil Research. In addition, zip-lock bags were filled approximately 1/3 to 1/2 full with portions of each soil sample and allowed to warm up to ambient air temperatures of approximately 20 to 25 degrees Celsius for between 1 and 3 hours prior to conducting headspace screening analysis. A Rae Systems MiniRae photoionization detector (PID) was used to conduct the headspace screening on the samples collected. The headspace screening results are indicated on the logs of Appendix D under the heading "PID" and represent the concentrations of undifferentiated VOCs in parts per million (ppm) relative to isobutylene. The collected soil samples were described geologically according to the Unified Soil Classification System (USCS) with special note of any visual/olfactory evidence of impact. The stratigraphic and instrumentation Logs are presented in Appendix D.

The coolers containing jars of soil samples were delivered to Norwest Soil Research under Chain-of-Custody protocol. The laboratory was subsequently instructed by CRA as to which samples were to be analyzed, based on the headspace screening results, visual/olfactory evidence of contamination and immunoassay field investigation, to provide understanding of the chemical soil quality. Samples were subsequently tested for the presence of light and heavy extractable petroleum hydrocarbons (LEPH/HEPH), PCBs, pesticides and herbicides, metals, grain size and organic carbon.

A sample key showing a summary of sample location numbers, a description of each location and sample numbers is shown in Table 1.

6.4 STREAM SEDIMENT INVESTIGATION

Stream sediment samples were collected from a series of locations within the stream bed to assess the migration of contaminants from the debris areas. Sampling locations included upstream, opposite and downstream of the debris areas. The surveyed sample locations are described in Table 1 and shown in Figure 3. Location S1 was collected from the pond outlet, S3 from the hatchery and S14 from the stream outflow into the Takhanne River. Locations S16, S18 and S19 were collected from directly opposite of the debris areas whereas locations S15, S17 and S20 represent locations immediately upstream of, between and downstream of the two debris areas. Collected samples were subjected to field screening methods to determine the relative concentrations of DDT, PCBs and petroleum hydrocarbons as noted in Section 6.3 for soils.

Based on the screening results, select sediment samples were submitted to Norwest Soil Research for chemical analyses. As with the soil samples, sediment samples were tested

for the presence of light and heavy extractable petroleum hydrocarbons (LEPH/HEPH), PCBs, pesticides and herbicides, metals, grain size and organic carbon.

6.5 STREAM WATER INVESTIGATION

Surface water samples were collected from a series of locations within the stream water to assess the migration of contaminants from the debris areas to the Takhanne River. The surface water sample locations are the same as the stream bed sediment locations and are described in Table 1 and shown in Figures 2 and 3.

Collected samples were to be subjected to field screening using immunoassay methods to determine the relative concentrations of DDT, PCBs and petroleum hydrocarbons, however, the immunoassay kits supplied could not be used for water samples. CRA contacted Osprey Scientific Incorporated (Osprey), the supplier of the immunoassay kits, from the field to verify instructions for field screening the water samples. We were informed that previous correspondence from Osprey indicating that the rented kits could be used for water samples was incorrect and that there are no kits available from Osprey that can determine relative concentrations of DDT and PCBs in water samples. An immunoassay kit to test petroleum hydrocarbons in water was available, however, it could not be sent prior to the conclusion of the field program activities. CRA contacted Rick Seaman of INAC and it was agreed that in lieu of field testing of surface water samples, selected surface water samples would be sent to Norwest Soil Research for analysis.

A Horiba U-10 water quality sampler was used to measure pH, temperature, conductivity, salinity, dissolved oxygen and turbidity at each location prior to collection of samples. In accordance with CRA standard operating procedures, the instrument was field calibrated daily prior to use. All surface water samples were collected directly into laboratory-supplied sample containers, which were placed into an ice-filled cooler and sent for laboratory analysis to Norwest Soil Research.

6.6 SHALLOW GROUNDWATER INVESTIGATION

As discussed in Section 5.2, CRA attempted to locate the piezometers installed by UMA (1995) in order to conduct a shallow groundwater investigation, as described in CRA's scope of work document for this project. However, the piezometers could not be located and therefore the groundwater investigation could not be performed. CRA discussed the situation with the client, and it was mutually agreed that no groundwater sampling

would be performed as part of this environmental assessment, but that if surface water or well water showed contamination, further groundwater investigations may be performed.

6.7 CAMPGROUND WELL INVESTIGATION

Groundwater samples from the campground drinking water supply well were previously collected and submitted for laboratory analysis during the UMA's 1995 Preliminary Assessment. The results of the analytical report indicated the presence of PCBs, however, the detection of the PCBs was determined to be partially attributable to potential laboratory cross contamination. To confirm the presence of PCBs and also to investigate the general water chemistry, CRA purged and sampled the groundwater from the campground well, located in Figure 2.

Prior to purging, the wellhead couplings were temporarily removed to inspect the wellhead and measure the well depth and depth to water. The groundwater was purged to ensure that representative water quality samples were obtained from the well. Purging was conducted using the existing hand-pumping apparatus and purged water was discharged to the ground surface away from but in the proximity of the well. The well volume was calculated and water quality parameters of pH, temperature, conductivity, salinity, dissolved oxygen and turbidity were measured after each removed well-volume using the Horiba meter. Methods and results are presented in Appendix D.

As the initial well volume was purged, the pumping water level decreased. After one full well volume was removed, the pumping water level approached the measured well depth. The well was allowed to recharge before additional purging. The groundwater water quality was measured after the initial well volume was removed and at selected purging volumes until stabilization in the parameters of pH, temperature, conductivity, salinity and turbidity were achieved. Sampling occurred after stabilization of the groundwater.

Groundwater samples were collected using a sealed disposable bailer attached to clean nylon rope and transferred directly to the laboratory-supplied sample containers. A total of two groundwater samples were submitted under chain-of-custody protocol to Norwest Soil Research. Both of these samples were analyzed for the presence of PCBs and one of the samples analyzed for general water chemistry (potability).

6.8 CONTROL SURVEY

Upon completion of the field activities Yukon Engineering Services conducted a horizontal and vertical control survey of the Site. The control survey captured the extent of the debris areas, the locations and elevations of the sampling points including the location of the campground well and staked surficial features that may represent areas of potential environmental concern.

Raw survey data is presented in Appendix F. The survey data was used in the development of the sampling location plans shown in Figures 2 through 5.

7.0 SOIL QUALITY INVESTIGATIONS

7.1 SOIL AND SEDIMENT QUALITY ASSESSMENT CRITERIA

The results of the soil quality analyses were assessed with respect to the Yukon Contaminated Sites Regulations (CSR) O.I.C 1996/192, dated December 16, 1996 and the Canadian Environmental Quality Guidelines by the Canadian Council of Ministers of the Environment (CEQG, 1999). For the Yukon CSR, Generic Numerical Soil Standards for Park (PL, Schedule 1) were utilised as the criteria for most contaminants, however, if no criteria was available, the Matrix Numerical Soil Standards (Schedule 2) were substituted as required. For the CEQG, the Residential/Parkland uses criteria were used to compare to analytical soil data, and the interim sediment quality guideline (ISQG) values for freshwater sediments were used when comparing to stream sediments. These criteria are shown in the analytical data summary tables.

The above criteria was used as it is CRA's understanding that:

- the Site is currently under YTG jurisdiction and will continue to be used for recreational purposes;
- contaminated surface and groundwater from the soils and sediments on the Site could affect fish-bearing stream habitat.

7.2 FIELD OBSERVATIONS AND ANALYTICAL RESULTS

No visual observations were made, or odors noticed, that would indicate the presence of petroleum hydrocarbons in any of the soil or sediment samples.

Subsequent field investigative measures included the use of a Photoionization detector (PID) to detect organic vapours consistent with the presence of petroleum hydrocarbons. As noted in Section 6.3 and 6.4, a semi-quantitative field test kit (Petro FLAG) was also employed to test for petroleum hydrocarbons and immunoassay kits were used to test for DDT and PCB in the samples. These kits indicated positive results as shown in Table 2.

Subsequently, a total of 38 soil and sediment samples selected from the toe of the debris areas and the adjacent stream bank were placed into laboratory-supplied sample containers and submitted under chain-of-custody protocol to Norwest Soil Research for analysis. Seventeen of these samples were analyzed for light and heavy extractable

petroleum hydrocarbons (LEPH/HEPH), 15 for the presence of PCBs, 19 for pesticides and herbicides, 15 for metals, ten for grain size and eleven for organic carbon.

Analytical soil and sediment quality data is compared to field screening results in Table 2 and presented in detail in Tables 3 and 4. Results are also summarized on Figures 4 and 5. Physical parameters of the soil samples are shown in Table 5. Complete copies of the laboratory analytical reports are included in Appendix G.

Results of the analytical testing are as follows:

The measured concentration of PCBs and pesticides/herbicides were all below the laboratory detection limit for both soils and sediments.

Trace levels of light and heavy extractable petroleum hydrocarbons were noted in soil samples along the toe of the debris areas (S4, S5, S9, S10 and S12) and in one sediment sample located at S14, in the old river bed north (downstream) of the northern debris area. These results are summarized and compared to the applicable criteria below.

	Concentration µg/g	
Parameter	***EPH 10-19***	***EPH 19-32***
Yukon CSR (PL) Criteria	1000	1000
Soils		
S4	31	86
S5	19	28
S9	<10	13
S10	10	14
S12	<10/<10	15/10
Sediment		
S14	11	24

Notes:
All values shown as micrograms per gram (µg/g).
/ - Indicates multiple samples from each site (see analytical summary tables for details).
< - Indicates below applicable detection limit.
No criteria available in CEQG.
(1) Yukon CSR General Numerical Soil Standards for Parkland (PL), ug/g

Levels of inorganic parameters above the Yukon CSR parkland soil criteria and CEQG residential/parkland guideline were found in samples taken at the toe of the debris areas (S4, S10, and S12) as shown in the table below. Concentrations of arsenic were just above the CEQG residential/parkland guideline, but below the Yukon CSR parkland

criteria at location S4 (toe of southern debris area) and S10. Chromium levels were just above the Yukon CSR parkland criteria at S10, and above both criteria at S4 and S12. Zinc levels were above both criteria at S4.

Concentrations of arsenic just above the CEQG interim sediment quality guideline (ISQG) were found in a sediment sample taken upstream of the debris areas at the pond outlet (S1). Levels of chromium above the CEQG ISQG (but below the probable effect level (PEL) for biological toxicity) were also found at location S1, and at the old hatchery (S3), adjacent to the debris areas (S16) and downstream of the northern debris area (S14). These results are summarized and compared to applicable criteria in the table below.

Soils

Parameter	*Concentration μg/g*		
	Arsenic	*Chromium*	*Zinc*
Yukon CSR (PL) Criteria	60 (1)	60 (1)	150 (2)
CEQG (RP) Criteria (3)	12	64	200
S4	12/13/7	55.3/**64.8**/**64.2**	**219**/**173**/93.5
S10	13/<2	**60.1**/59.6	119/114
S12	8	**73.7**	119

Sediments

Parameter	*Concentration μg/g*		
	Arsenic	*Chromium*	*Zinc*
Yukon CSR (PL) Criteria	60 (1)	60 (1)	150 (2)
CEQG Sed. ISQG/PEL (4)	5.9/17.0	37.3/90	123/315
NGR database mean background (5)	10.7	81	107
S1	6	40.5	57.3
S3	4	38.3	53.8
S14	<2	47	58.2
S16	<2	46.8	59.2

Notes:
All values shown as micrograms per gram (μg/g).

/ Indicates multiple samples from each location (see analytical summary tables for details).
< Indicates below applicable detection limit.
60.1 Values shown in bold exceed the Yukon CSR Criteria.
12 Values underlined exceed the CEQG RP or ISQG Criteria.
64.8 Values shown in bold and underlined exceed both Yukon CSR and CEQG RP or ISQG Criteria.
(1) Matrix Numerical Soil Standards for Parkland, where groundwater flow to surface used by aquatic life.
(2) Matrix Numerical Soil Standards for Parkland, where groundwater flow to surface used by aquatic life. Dependent on pH level - most conservative value given.
(3) Canadian Environmental Quality Guidelines for Soil, Residential/Park.
(4) Canadian Environmental Quality Guidelines, interim sediment quality guideline (ISQG)/probable effect level (PEL). Original data in μg/kg, converted to μg/g for comparison purposes.
(5) National Geochemical Reconnaissance (NGR) program database by the Geological Survey of Canada (GSC) mean background concentration in Canadian stream sediments.

Elevated levels of sulphur were also noted in all of the soils sampled along the toe of the debris areas and in the sediments at location S1 and S3, upstream of the debris areas as shown in Table 4. However, no criteria or guideline in the Yukon CSR or CEQG are available for comparison.

8.0 SURFACE AND GROUNDWATER QUALITY INVESTIGATION

8.1 SURFACE AND GROUNDWATER QUALITY ASSESSMENT CRITERIA

The results of the water quality analyses were assessed with respect to the Yukon Contaminated Sites Regulations (CSR) O.I.C 1996/192, dated December 16, 1996 and the Canadian Environmental Quality Guidelines by the Canadian Council of Ministers of the Environment (CEQG, 1999). For the Yukon CSR, Generic Numerical Soil Standards for Aquatic Life (AW, Schedule 1) were utilised. For the CEQG, the freshwater aquatic life criteria were used for the surface water samples, and community criteria were used to compare to drinking water samples from the well. These criteria are shown in the analytical data summary tables.

The above criteria was used as it is CRA's understanding that:

- contaminated surface and groundwater from the soils and sediments on the Site could affect fish-bearing stream habitat;
- the campground well is currently used for drinking water.

The campground within the Site is served by the well for drinking water and therefore, the well water was also assessed for potability. It should be noted that a boil order sign is posted on the well.

8.2 FIELD OBSERVATIONS AND ANALYTICAL RESULTS

A total of 14 surface water samples were collected and submitted under chain-of-custody protocol to Norwest Soil Research for analysis. Nine of these samples were analyzed for light and heavy extractable petroleum hydrocarbons (LEPH/HEPH), 10 for PCBs, and 9 each for pesticides and herbicides, hardness, total dissolved solids (TDS) and total suspended solids (TSS).

Results of the surface and ground water (campground drinking water supply well) analyses results are shown in Table 6, 7 and 8 and presented in Figure 4. Copies of the laboratory analytical reports are included in Appendix G.

For surface water, the analytical results were compared to the applicable criteria for petroleum hydrocarbons, PCBs and pesticides/herbicides. The results show that no detectable concentrations for any of these parameters were measured.

Confirmatory analysis for PCBs showed that no contamination was detected in the two campground drinking water well samples. The potability results from the well are presented in Table 8 and summarised below. The results show that pH, colour, turbidity and TDS exceeded CEQG criteria for drinking water quality and that aluminum exceeded the Yukon CSR criteria for drinking water quality. In addition, fluoride, iron, manganese and sodium levels exceeded the identical CEQC and Yukon CSR drinking water quality criteria for these parameters.

Parameter	Yukon CSR Criteria (DW) (1)	CEQG Community Water Guideline (2)	Sample no. GS-44
pH		6.5 - 8.5 (AO)	8.72
Colour		15 TCU (AO)	50 TCU
Turbidity		5 NTU (AO)	75 NTU
TDS		500 mg/l (AO)	935 mg/l
Aluminum	0.2 mg/l	-	**11.6**
Fluoride	1.5 mg/l	1.5 mg/l	31 mg/l
Iron	0.3 mg/l	<0.3 mg/l (AO)	20.8 mg/l
Manganese	0.050 mg/l	<0.050 mg/l (AO)	0.175 mg/l
Sodium	200 mg/l	200 mg/l (AO)	**380** mg/l

Notes:
All values shown as micrograms per litre (mg/l) unless otherwise noted.

60.1 Values shown in bold exceed the Yukon CSR Criteria.

12 Values underlined exceed the CEQG Criteria.

64.8 Values shown in bold and underlined exceed both Yukon CSR and CEQG criteria.

(1) General Numerical Water Standards for Drinking Water (DW), (several original figures in µg/l, converted to mg/l for comparison purposes.)

(2) Canadian Environmental Quality Guidelines for Water: Community (original figures in µg/l, converted to mg/l for comparison purposes.) AO: aesthetic objective.

9.0 NATURE AND EXTENT OF ENVIRONMENTAL IMPACT

UMA (1995) results showed zinc, DDT and petroleum hydrocarbon contamination in soil samples taken at the toe of the debris areas. CRA's investigation has confirmed the presence of trace levels of petroleum hydrocarbon contamination in the soils at the toe of the debris areas and in one sediment sample taken from the old river bed downstream of the northern debris area. CRA also found that several inorganics, including: arsenic; chromium; and zinc are present in levels above the soil criteria in the soils at the toe of the debris areas. Sediment sampling confirmed the presence of chromium in the sediments adjacent to the toe of the debris areas and in the sediments of the old river bed upstream and downstream of the piles. Arsenic concentrations just above the CEQG criteria were found in a sample taken upstream of the debris areas at the pond outlet. Elevated levels of sulphur were also noted in all of the soils sampled along the toe of the debris areas and at two of the sediment sampling locations upstream of the debris areas. However, no DDT or PCB contamination was found in any of the analytical testing of soils or sediments.

UMA (1995) also concluded that the campground well water samples might have possible PCB contamination, although the report states that these results may be due to lab error. Our investigation showed that no PCB contamination was found in either of the well water samples or in any of the surface water samples. Groundwater (well) water quality potability results, however, showed that drinking water guidelines were exceeded for several inorganic parameters as described in Section 8.2.

The extent of impact appears to be limited to trace petroleum hydrocarbon contamination and slightly elevated levels of inorganics (metals, sulphur) along the old river bed, concentrated at the debris areas. However, elevated levels of inorganics in the well water and slightly elevated levels of inorganics in sediments upstream of the debris areas suggests that potential buried sources of inorganic (principally metals) contamination may exist on the Site, as alleged by a witness interviewed during the historical review.

The elevated levels of arsenic, chromium and zinc found in the soil and sediment samples may result from possible leaching from the debris areas found on the Site, or from leaching of potentially buried wastes. Elevated levels of these metals could also result from natural weathering, however, as all three metals occur naturally in the environment at a wide range of concentrations, depending on soil type and location.

For sediments, analytical results for arsenic and chromium shown in the table in Section 8.0 were below the CEQG probable effect level (PEL), which is the concentration above

which adverse biological effects, such as toxicity to aquatic organisms, are expected to occur frequently. As shown in the table, the analytical results were also below the levels noted by the Geological Survey of Canada (GSC) National Geochemical Reconnaissance (NGR) program database for mean background concentrations in Canadian stream sediments, indicating that elevated levels of both arsenic and chromium above the ISQG occur naturally in Canada, and may occur at the Site.

For drinking water, the parameters analyzed that exceeded the CEQG drinking water guidelines generally affect aesthetics and/or taste. These include pH, colour, turbidity, TDS, iron, manganese and sodium. High turbidity in drinking water may also have health effects. The Canadian Water Quality Guidelines states that natural ranges in Canadian drinking waters are: 0.1 to 4.5 mg/l for fluoride (31mg/l measured); generally less than 1 mg/l for iron (20.8 mg/l measured) and below 0.05 mg/l for manganese in drinking water, but as high as 4.6 mg/l found in supply waters (0.175 mg/l measured). The Guidelines state that levels of pH in US drinking waters range from 5 to 10.5 (8.72 measured), and levels of TDS in Canadian drinking waters range from 20 to 3800 mg/l (935 mg/l measured). There is no information on aluminum levels in the Guidelines. Treatment and filtration are common for most of the above parameters to achieve acceptable drinking water standards, with forms of desalination (reverse osmosis, distillation) used for TDS removal. Based on the above findings, the elevated levels of inorganics in the groundwater sample may result from natural sources and/or from the turbidity of the sample. Additional study is required to confirm that no other sources of contamination are present.

No detailed field investigation has been performed by CRA or in previous studies to determine if solid wastes were buried on the Site. Except for the remains of building footprints and filled areas noted, very little visual evidence exists to determine the presence or extent of buried wastes as the Site was regraded since camp operations ceased in the 1960's. It is the experience of CRA personnel, at similar sites in the Yukon, that subsurface investigation at such building footprints typically yields evidence of contamination. Buildings that previously housed warehousing and shop operations have shown impacts from previous spills, disposal or poor handling, usually at outdoor storage or loading areas. A witness to Site operations indicated that spent fuel drums; metal containers; drums of waste; pallets; unexploded dynamite; and domestic wastes have been buried on site. Additional study is required to confirm the presence of dynamite and to determine if the elevated levels of metal concentrations are due to naturally high background levels or due to potentially buried wastes.

Finally, no previous investigative reports examined by CRA make note of the alleged waste disposal practices at the winter airstrip on a nearby lake. Further investigation is required to determine if these practices have altered the character of the lake.

10.0 CONCLUSIONS

The following conclusions are based on the field and analytical data generated during the environmental site assessment:

- **Site Geology:** No detailed geological investigations have been performed on the Site. This information would be extremely helpful to assess potential contamination and migration of contaminants in light of the Site's history, as well as alleged presence of solid wastes buried on the Site.
- **Site Hydrogeology:** No boreholes or wells were installed during this program to provide groundwater levels or groundwater flowpath information. Groundwater flow is expected to follow the general topography, dictated by the Takhanne River, and the former Takhanne river channel. Specific information on groundwater gradients and potential for possible groundwater contaminant migration can only be determined through additional investigation, including a groundwater-monitoring program.
- **Soil Quality:** On the basis of the analytical data generated and CRA's field observations, trace levels of petroleum hydrocarbon contamination were found in the soils along the toe of the debris areas at locations S4, S5, S9, S10, and S12. In addition, levels of inorganic contaminants above CEQG soil guidelines were found, including arsenic (S4, S10), chromium (S4, S10 and S12) and zinc (S4). Yukon CSR criteria were also exceeded for chromium (S4 and S12) and zinc (S4). Elevated levels of sulphur were also noted in all of the soils sampled along the toe of the debris areas. No PCB or pesticide/herbicide contamination was found in the soil samples.
- **Sediment Quality:** Analytical data results show that trace petroleum hydrocarbon contamination was found in the sediments of the old river bed at location S14, north (downstream) of the northern debris area. Inorganic sediment quality concerns above the CEQG interim sediment quality guideline included chromium at S1 (at the pond outlet), S3 (at the old hatchery), S14 (downstream of the northern debris area) and S16 (adjacent to the northern debris area). Concentrations of arsenic just above the CEQG interim sediment quality guideline (ISQG) were found in a sediment sample taken upstream of the debris areas at the pond outlet (S1). Elevated levels of sulphur were also noted at S1 and S3. No PCB or pesticide/herbicide contamination was found in the sediment samples.

- **Surface Water Quality:** On the basis of the analytical data generated and CRA's field observations, no surface water quality concerns were noted for petroleum hydrocarbons, PCBs or pesticides/herbicides in the samples analyzed.
- **Groundwater Quality:** Campground well water sample analysis showed that pH, colour, turbidity, and TDS exceeded CEQG criteria for drinking water quality. Aluminum levels exceeded the Yukon CSR drinking water quality criteria, and fluoride, iron, manganese and sodium levels exceeded both the CEQC and Yukon CSR drinking water quality criteria. Confirmatory analysis for PCBs showed that no contamination was detected in the two campground well water samples.
- **Nature and Extent of Environmental Impact:** The nature and extent of impact appears to be limited to trace petroleum hydrocarbon contamination and slightly elevated levels of inorganics metals, sulphur) along the old river bed, concentrated at the debris areas. However, elevated levels of inorganics in the well water and slightly elevated levels of inorganics in sediments upstream of the debris areas suggests that potential buried sources of inorganic (principally metals) contamination may exist on the Site, as alleged by a witness interviewed during the historical review. Elevated levels of metals in the soil could also result from natural weathering, as all three metals (arsenic, chromium and zinc) occur naturally in the environment at a wide range of concentrations, depending on soil type and location. The elevated levels of inorganics in the groundwater sample may result from natural sources and/or turbidity of the sample. Additional study is required to confirm that no other sources of contamination are present.

  In addition, dynamite is alleged to have been buried on site and a nearby lake is alleged to have been used to dispose of solid wastes. Further study is required to fully investigate these issues.

11.0 RECOMMENDATIONS

Based on our findings during this investigation, we recommend the following tasks, described in detail below and summarized in Table 9. The tentative timing, anticipated duration and estimated costs of each of the tasks are provided. Scheduling of any Site work would be discussed with INAC at a meeting to be scheduled in early May 2000, and would be performed at times of low campground usage, if possible, to minimize disruption to the campers. The estimated costs presented are based on limited information and have been provided for comparative purposes only. The costs were developed based on staging the CRA-staffed fieldwork tasks in succession where possible, and therefore include savings resulting from reduced travel time and number of flights to the Yukon.

The recommended tasks have been grouped into three principal areas of work: the campground area; the debris area; and, off-Site (Airplane Lake). Work at the campground area is discussed first as groundwater from the campground most likely discharges to the old river bed and ultimately reaches the debris area. Due to the potential for buried sources of contaminants in the campground area that may leach through the groundwater, studies to confirm the presence or absence of buried wastes at the campground area should be performed first. Recommendations for the debris area are discussed second, and off-Site work is presented last.

Campground Area

Due to the potential hazard associated with unexploded dynamite alleged to have been buried in this location, an incremental approach is recommended for further investigation.

- We recommend performing a Site investigation with the Champagne and Aishihik First Nations (CAFN) witness and RCMP Explosives Demolition Unit (EDU) to search identified areas for alleged buried dynamite, and to remove and dispose of any dynamite found. The use of trained dogs and/or detection equipment would likely be the method(s) used. The EDU could then assess the situation and direct disposal or employ methods to neutralize the materials in place. The cost of this work is estimated to range from $5,500 to $8,000, including time for an excavator on-Site. The fieldwork could be performed in May 2000 and is estimated to take approximately 2 days. The deliverable for this task would be a report summarizing the results of the investigation and safety clearance from the RCMP regarding explosives on the Site.

- Once the risks associated with the alleged explosives are confirmed and removed, we recommend that a geophysical investigation (electromagnetic survey) of the campground area be performed, concentrating on areas identified by CAFN as being potential locations for buried solid wastes that may include sources of metal and petroleum hydrocarbons. The cost of this work is estimated to range from $7,500 to $11,500. The fieldwork could be performed in May 2000 and is estimated to take approximately 3 days. The deliverable would be a report including detailed mapping of the campground area indicating identified potential sources of buried waste.

- If the geophysical survey results show evidence of buried materials, further investigation may be required to confirm and delineate the extent of potential contamination due to these buried wastes. It may be required to excavate test pits and/or drill boreholes to further investigate the Site. To assess groundwater flow paths and the extent of potential contamination migration, piezometers would be installed and groundwater sampling would be performed. Analytical testing of these samples would be performed for petroleum hydrocarbons, PCBs, pesticides/herbicides, and metals.

  If required, this work is estimated to cost $22,000 to $33,000. The fieldwork could be performed in May or June (or during the shoulder seasons to reduce conflict with campground users) and is estimated to take approximately 6 to 8 days to complete. The deliverables would include a report detailing the results of the investigation. The report would include detailed mapping of the Site showing delineation of any identified subsurface soil and groundwater contamination at the campground area.

- Finally, if the field investigations provide evidence of contamination, a mitigation/remediation plan would be developed for the campground area. The deliverable would be a report that would: summarize the studies performed; provide a comparative analysis of the cost of mitigation/remediation options versus risk; and, propose a plan for the mitigation or remediation of contamination at the campground area. This study is estimated to cost $10,000 to $15,000 and would be performed in June following the subsurface investigations. This task would take approximately 2 weeks to complete.

  If required, local contractors would perform subsequent mitigation/remediation work when the campground is vacant. Estimated costs for this work cannot be provided at this time but would be developed and presented to INAC during the study.

Debris Area

Results of this study found trace levels of petroleum hydrocarbons and slightly elevated levels of inorganics in the soils and sediments near the debris area. The elevated levels of contaminants may be due to leaching from the debris piles, leaching from other buried wastes or, in the case of metals, due to high background levels. Detailed soil and groundwater sampling may be considered to further delineate the extent of contamination in this area, however, difficult access for equipment could result in the costs of the study exceeding $30,000. Therefore, due to the nature and extent of contamination and the high costs associated with performing a detailed subsurface investigation, we do not consider this approach to be practical.

Therefore, we recommend that this area be mitigated or remediated to control or remove potential sources of contaminants and to improve aesthetics. Three options are provided as follows, in order of increasing estimated costs:

- **Option 1:** Mitigate the debris area by constructing a cap to isolate it from runoff and streamflows, thereby reducing leaching potential of contaminants within the pile. Tasks would include designing a cover system, construction of erosion control measures, covering the pile with gravel and soil layers, and planting vegetation. Construction monitoring and annual sampling of surface and ground water, soil and sediments would also be performed. Costs associated with this work are estimated to range from $35,000 to $50,000 including one round of sampling, which is comparable to the cost of a detailed field investigation of the area. The fieldwork is estimated to take approximately 2 weeks to perform. The deliverables would include two reports, one providing design details, and one summarizing construction work, monitoring and sampling.

- **Option 2:** Remove the debris area with an overhead crane and remediate the soils underneath. The feasibility of accessing debris with a locally-available overhead crane suitable for the work would have to be investigated by conducting a site visit with a local contractor. If feasible, this option would involve breaking up the pile of metals with saws or torches, and removing the debris by crane. The debris could then be disposed. Soils underneath the debris piles would be revegetated. Costs for this option are estimated to range from $50,000 - $70,000, including construction monitoring and one round of sampling. This option would take approximately 3 weeks to complete. Deliverables would be as in Option 1.

- **Option 3:** As Option 2, using a helicopter to remove debris due to potential access problems or availability of a suitable crane in the area. Using a helicopter, costs for

this task are estimated to range from $70,000 - $100,000, including construction monitoring and one round of sampling. Option 3 would take approximately 3 weeks to complete. Deliverables would be as in Options 1 and 2.

It is CRA's opinion that mitigation (Option 1) would be the most effective option to address the area, considering that the debris has been in place in the old river bed since the 1950's, that it is entangled with native material and is imbedded into the old river bank. We feel that removal of the debris (Options 2 and 3) could result in increased environmental damage due to reduced stream bank stability, subsequent erosion and increased sediment loading to the stream. An additional concern for remediation work would include landfill sites in the area capable of accepting and treating contaminated soil. For costing purposes we have assumed that contaminated soils or materials could be buried on-Site in an excavated and lined trench, however, disposal of any waste would be discussed with INAC and YRR as part of the conceptual plans.

The capping of the debris and stabilizing of the stream banks is a risk management approach that will likely require review by both YRR and DFO. To expedite the approval process, we suggest scheduling a meeting with these parties in early May 2000 to discuss the approach at a conceptual level.

Following YRR/DFO approval of conceptual designs, CRA would provide detailed designs and costs for the preferred plan. These costs would be developed in coordination with experienced local excavation and landfill contractors.

As the each of the recommended options include work to be performed within the banks of a fish bearing stream, the timing for the work may be limited to the DFO construction window, typically July 15 to September 15.

Off-Site (Airplane Lake)

- We recommend that previous waste disposal practices at the winter airstrip should be investigated to locate potential wastes at the bottom of the lake. We recommend conducting water quality sampling and sampling of the lake bottom sediments to provide information as to whether significant actual or potential contamination exists in the lake. This investigation could be supplemented by a diving program with video to physically examine the lake bottom for evidence of contamination. The estimated cost for this study is expected to range from $10,000 to $15,000, and could be performed in June 2000. The study would take approximately 5 days to complete. Deliverables would consist of a report summarizing the results of the

investigation, maps showing GIS-referenced locations of identified contamination in the lake, and a video documenting observed contamination.

Please see Table 9 for a summary of our recommendations, timing and duration of the tasks, and estimated costs.

12.0 REFERENCES

Geological Survey of Canada. 1953. Map 1019A - Dezadeash Yukon Territory, Department of Mines and Technical Surveys.

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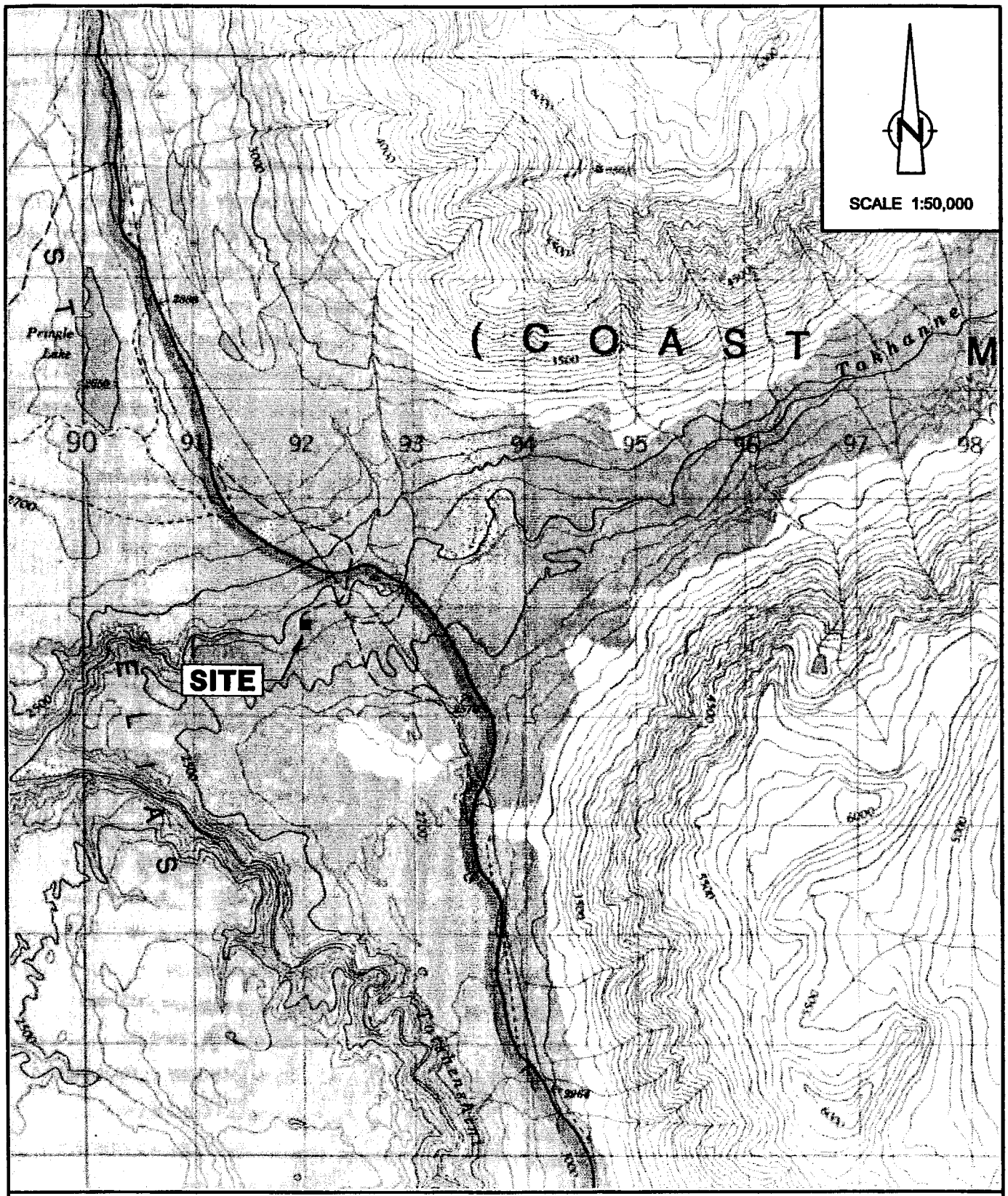
Geological Survey of Canada. Undated. Open File O.F. 831 - Geology S.W. Dezadeash Map Area (115A), Department of Energy, Mines and Resources.

UMA Engineering Ltd. 1995. Preliminary Environmental Assessment, Haines – Fairbanks Pipeline. Prepared for Indian and Northern Affairs Canada, Artic Environmental Strategy. Prepared by UMA Engineering Ltd. in association with AMBIO Research Associates Inc. August 1995.

FIGURES



SOURCE: TAKHANNE RIVER 115 A/2 (EDITION 2)
ENERGY, MINES AND RESOURCES CANADA

figure 1

SITE LOCATION PLAN
MILLION DOLLAR FALLS
INAC

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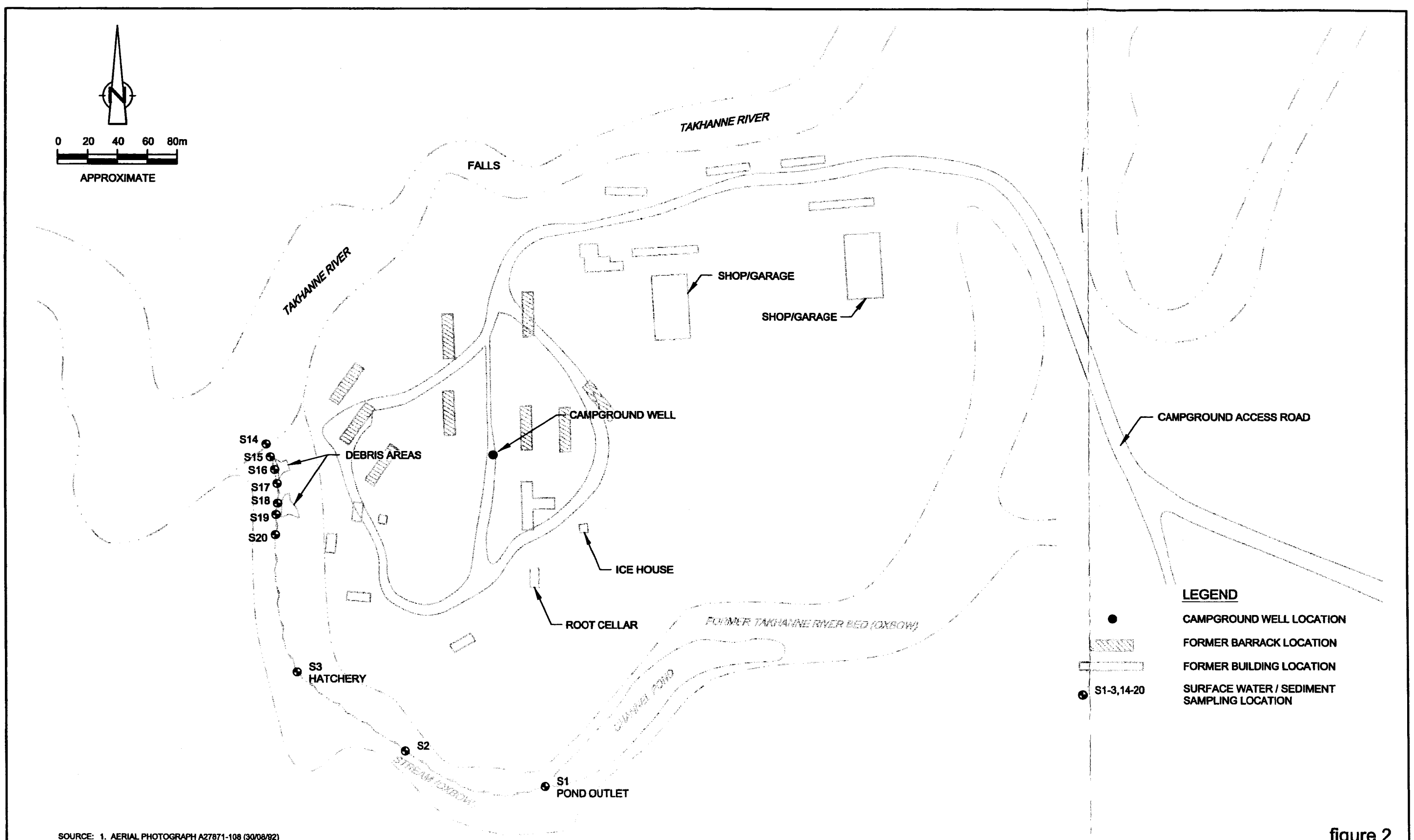

SOURCE: 1. AERIAL PHOTOGRAPH A27871-108 (30/08/92) NATIONAL AIR PHOTO LIBRARY NATURAL RESOURCES CANADA
2. UMA ENGINEERING LTD. AND AMBIO RESEARCH ASSOCIATES INC. MILLION DOLLAR FALLS LOCATION PLAN DATED AUGUST 1995
3. YUKON ENGINEERING SERVICES INC. ON-SITE FIELD SURVEY ON SEPTEMBER 1999

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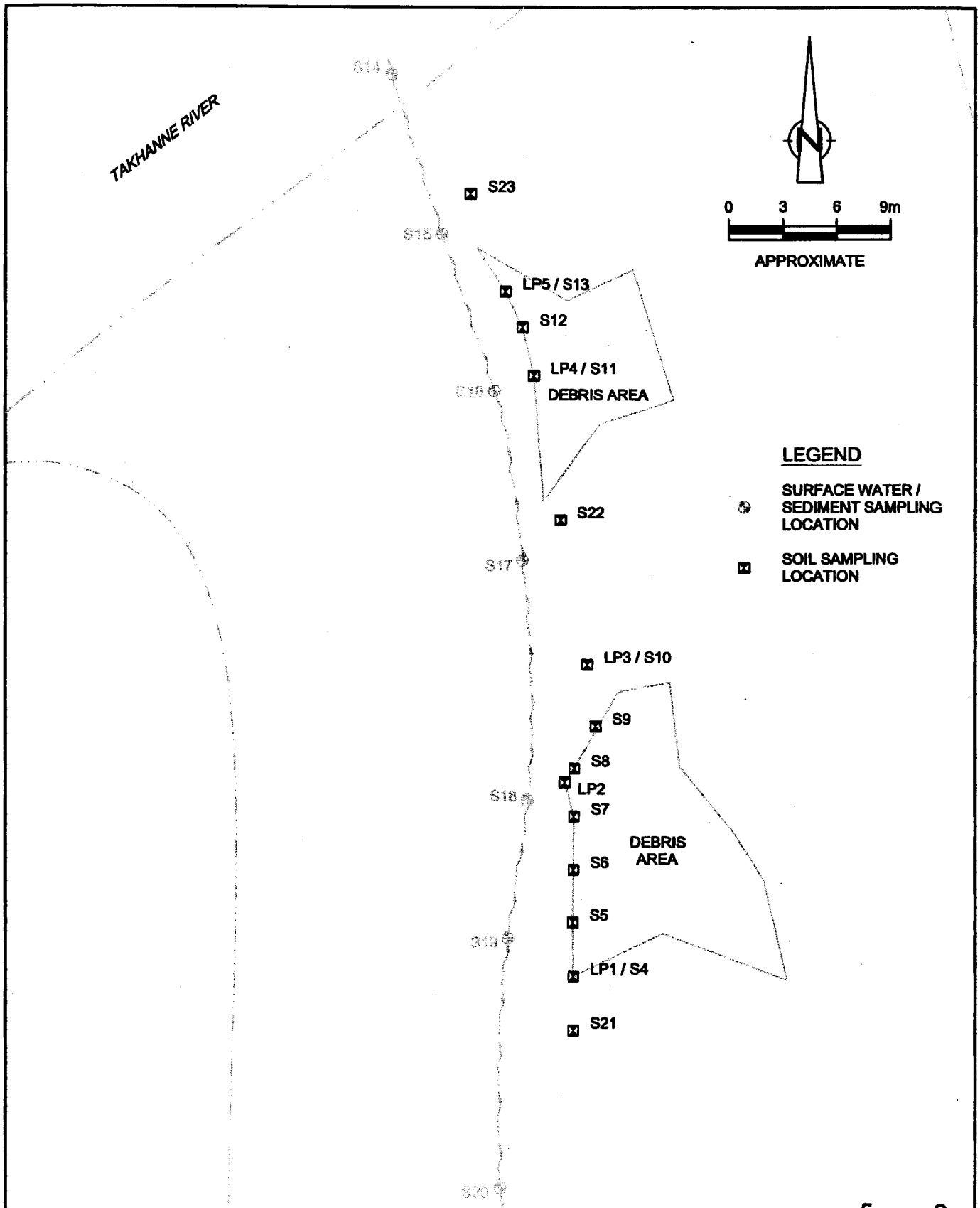
figure 2

SURFACE WATER / SEDIMENT SAMPLING LOCATIONS
MILLION DOLLAR FALLS
INAC

14048-00(002)GN-VA003 FEB 08/2000



SOURCE: 1. AERIAL PHOTOGRAPH A27871-108 (30/08/92)
NATIONAL AIR PHOTO LIBRARY
NATURAL RESOURCES CANADA
2. UMA ENGINEERING LTD. AND
AMBIO RESEARCH ASSOCIATES INC.
MILLION DOLLAR FALLS LOCATION PLAN
DATED AUGUST 1995
3. YUKON ENGINEERING SERVICES INC.
ON-SITE FIELD SURVEY ON SEPTEMBER 1999

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figure 3

SOIL SAMPLING LOCATIONS
MILLION DOLLAR FALLS
INAC

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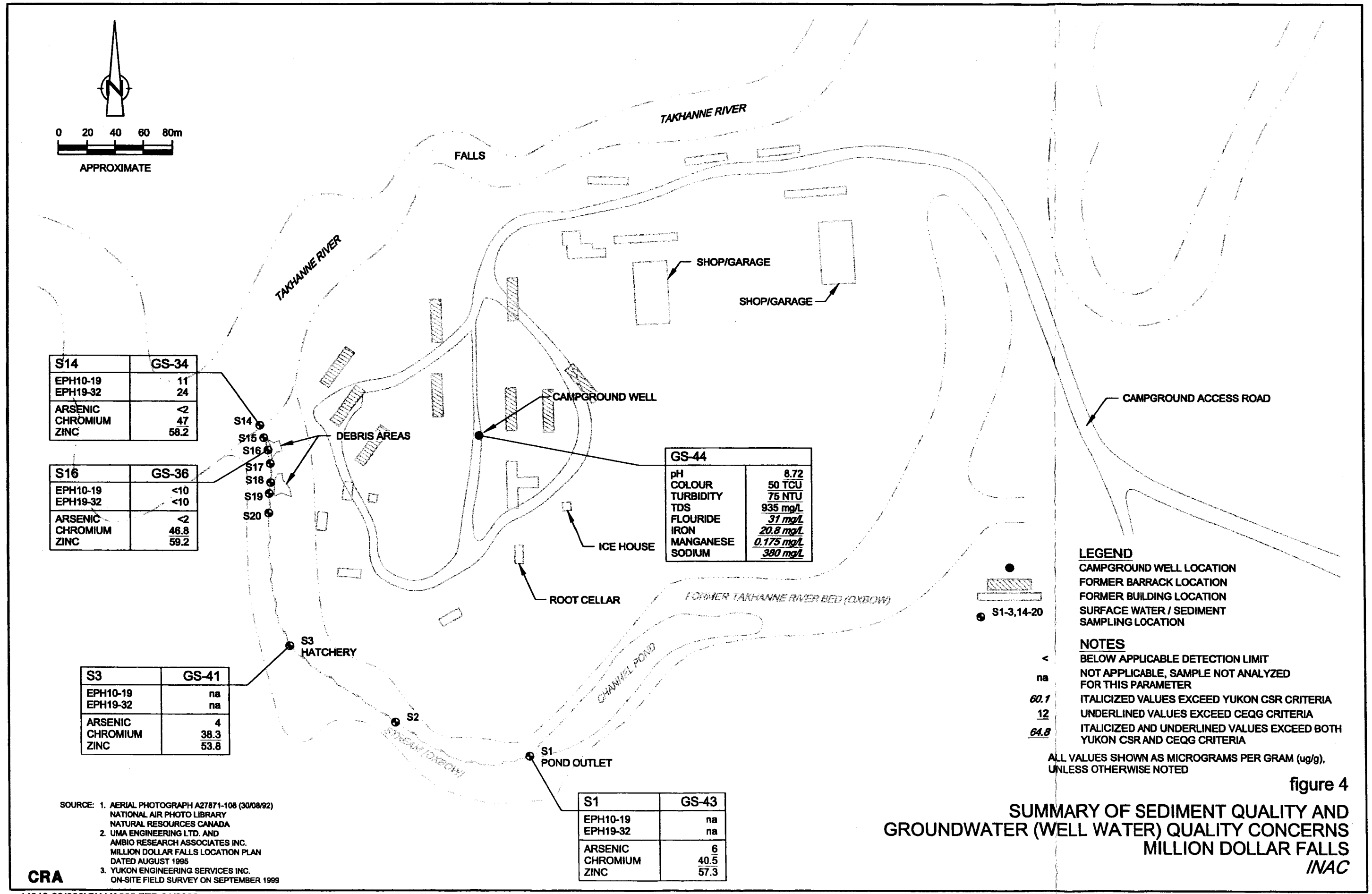

S14	GS-34
EPH10-19	11
EPH19-32	24
ARSENIC	<2
CHROMIUM	47
ZINC	58.2

S16	GS-36
EPH10-19	<10
EPH19-32	<10
ARSENIC	<2
CHROMIUM	46.8
ZINC	59.2

GS-44	
pH	8.72
COLOUR	50 TCU
TURBIDITY	75 NTU
TDS	935 mg/L
FLOURIDE	*31 mg/L*
IRON	*20.8 mg/L*
MANGANESE	*0.175 mg/L*
SODIUM	*380 mg/L*

S3	GS-41
EPH10-19	na
EPH19-32	na
ARSENIC	4
CHROMIUM	38.3
ZINC	53.8

S1	GS-43
EPH10-19	na
EPH19-32	na
ARSENIC	6
CHROMIUM	40.5
ZINC	57.3

figure 4

SUMMARY OF SEDIMENT QUALITY AND GROUNDWATER (WELL WATER) QUALITY CONCERNS
MILLION DOLLAR FALLS
INAC

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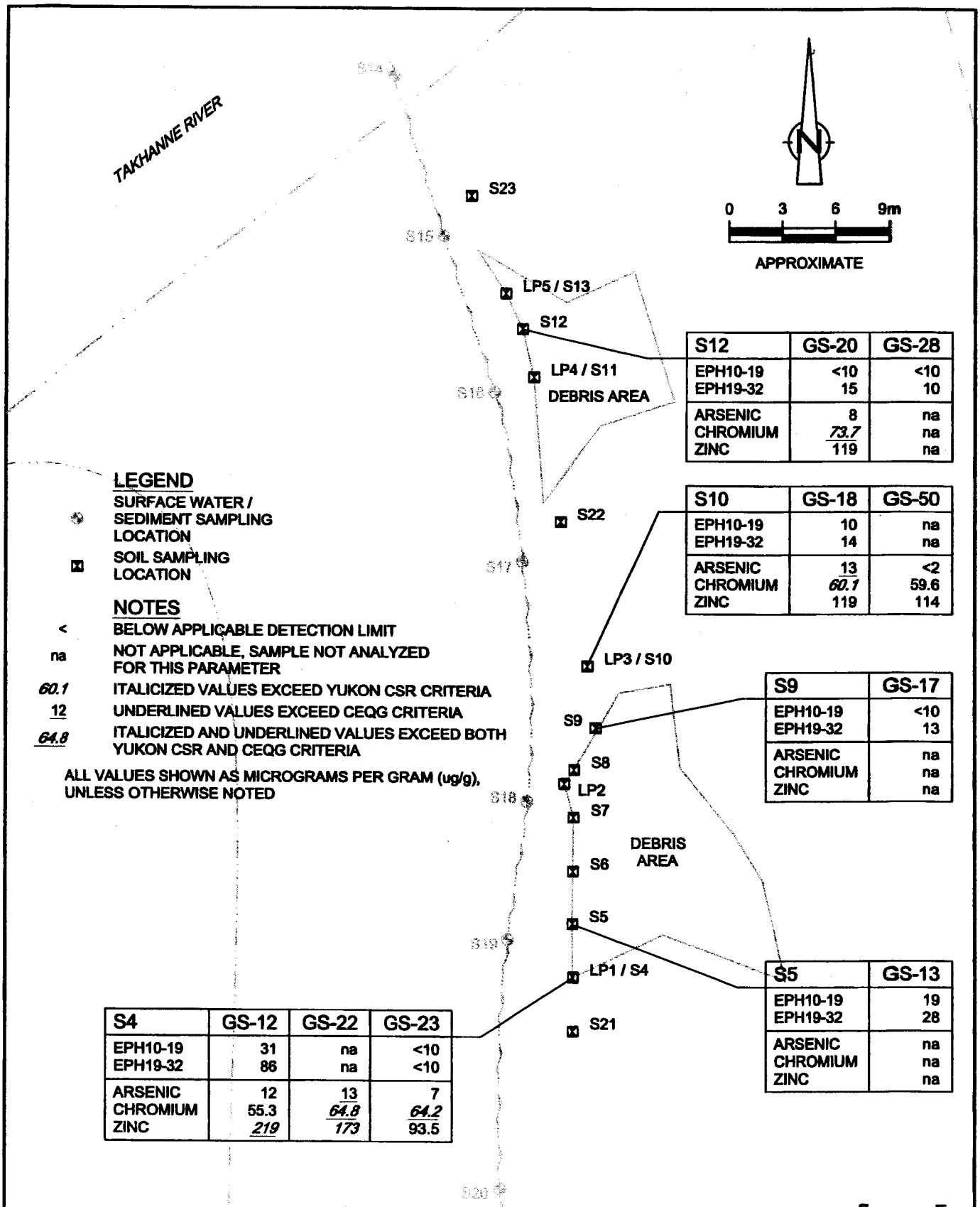

S12	GS-20	GS-28
EPH10-19	<10	<10
EPH19-32	15	10
ARSENIC	8	na
CHROMIUM	*73.7*	na
ZINC	119	na

S10	GS-18	GS-50
EPH10-19	10	na
EPH19-32	14	na
ARSENIC	13	<2
CHROMIUM	*60.1*	59.6
ZINC	119	114

S9	GS-17
EPH10-19	<10
EPH19-32	13
ARSENIC	na
CHROMIUM	na
ZINC	na

S5	GS-13
EPH10-19	19
EPH19-32	28
ARSENIC	na
CHROMIUM	na
ZINC	na

S4	GS-12	GS-22	GS-23
EPH10-19	31	na	<10
EPH19-32	86	na	<10
ARSENIC	12	13	7
CHROMIUM	55.3	*64.8*	*64.2*
ZINC	*219*	*173*	93.5

LEGEND

- SURFACE WATER / SEDIMENT SAMPLING LOCATION
- SOIL SAMPLING LOCATION

NOTES

- < BELOW APPLICABLE DETECTION LIMIT
- na NOT APPLICABLE, SAMPLE NOT ANALYZED FOR THIS PARAMETER
- *60.1* ITALICIZED VALUES EXCEED YUKON CSR CRITERIA
- 12 UNDERLINED VALUES EXCEED CEQG CRITERIA
- *64.8* ITALICIZED AND UNDERLINED VALUES EXCEED BOTH YUKON CSR AND CEQG CRITERIA

ALL VALUES SHOWN AS MICROGRAMS PER GRAM (ug/g), UNLESS OTHERWISE NOTED

SOURCE:
1. AERIAL PHOTOGRAPH A27871-108 (30/08/92) NATIONAL AIR PHOTO LIBRARY NATURAL RESOURCES CANADA
2. UMA ENGINEERING LTD. AND AMBIO RESEARCH ASSOCIATES INC. MILLION DOLLAR FALLS LOCATION PLAN DATED AUGUST 1995
3. YUKON ENGINEERING SERVICES INC. ON-SITE FIELD SURVEY ON SEPTEMBER 1999

CRA

figure 5

SUMMARY OF SOIL QUALITY CONCERNS
MILLION DOLLAR FALLS
INAC

14048-00(002)GN-VA006 FEB 21/2000

TABLES

TABLE 1

SAMPLE KEY

Loc. No.	Location	Sample No. Water	Sample No. Soil	Sample Description
S1	Pond outlet	W-GS-10		Stream water
		W-GS-11		Dupl. of W-GS-10
			S-GS-43	Stream sediment
S2	Stream (oxbow)	W-GS-9		Stream water
			S-GS-42	Stream sediment
S3	Hatchery	W-GS-8		Stream water
			S-GS-41	Stream sediment
S4	South debris area		S-GS-12	Soil (upper 10cm)
			S-GS-22	Soil (lower 10cm)
			S-GS-23	Stream bank soil
S5	South debris area		S-GS-13	Soil (upper 10cm)
			S-GS-46	Dupl. of S-GS-13
			S-GS-24	Stream bank soil
S6	South debris area		S-GS-14	Soil (upper 10cm)
S7	South debris area		S-GS-15	Soil (upper 10cm)
			S-GS-48	Dupl. Of S-GS-15
			S-GS-25	Stream bank soil
S8	South debris area		S-GS-16	Soil (upper 10cm)
S9	South debris area		S-GS-17	Soil (upper 10cm)
			S-GS-26	Stream bank soil
S10	Between debris areas		S-GS-18	Soil (upper 10cm)
			S-GS-50	Dupl. Of S-GS-18
S11	North debris area		S-GS-19	Soil (upper 10cm)
			S-GS-27	Stream bank soil
S12	North debris area		S-GS-20	Soil (upper 10cm)
			S-GS-52	Dupl. Of S-GS-20
			S-GS-28	Stream bank soil
S13	North debris area		S-GS-21	Soil (upper 10cm)
			S-GS-29	Stream bank soil
S14	Stream outlet to Takhanne River	W-GS-1		Stream water
			S-GS-34	Stream sediment
S15	Adjacent to North debris area	W-GS-2		Stream water
			S-GS-35	Stream sediment
S16	Adjacent to North debris area	W-GS-3		Stream water
			S-GS-36	Stream sediment
S17	Adjacent to North debris area	W-GS-4		Stream water
			S-GS-37	Stream sediment
S18	Adjacent to South debris area	W-GS-5		Stream water
			S-GS-38	Stream sediment
			S-GS-47	Dupl. Of S-GS-38
S19	Adjacent to South debris area	W-GS-6		Stream water
			S-GS-39	Stream sediment
			S-GS-49	Dupl. Of S-GS-39
S20	Adjacent to South debris area	W-GS-7		Stream water
			S-GS-40	Stream sediment
S21	3 m south of S4 debris line		S-GS-30	Soil (upper 10cm)
			S-GS-51	Dupl. Of S-GS-30
S22	Half way between S10 and S11		S-GS-31	Soil (upper 10cm)
S23	3 m north of S13 debris line		S-GS-32	Soil (upper 10cm)
-	Drum at debris area	W-GS-33		Drum water
-	Campground Well	W-GS-44		Well water
		W-GS-45		Dupl. Of W-GS-44
-	Blank	W-GS-53		Distilled water rinse

TABLE 2

SUMMARY OF SOIL IMMUOSSARY RESULTS

Sample No.	DDT					PCBs						Petroleum Hydrocarbons		
	I.A.			Lab Analytical		I.A.			Lab Analytical			I.A.	Lab Analytical	
	0.0 Index	0.2 Index	Result	2,4'-DDT	4,4'-DDT	0.0 Index	1.0 Index	Result	A-1242	A-1254	A-1260	(ppm)	EPH 10-19	EPH 19-32
GS-12	2.17	2.08	2.13	<0.05	<0.05	1.27	1.21	1.21	<0.1	<0.1	<0.1	147	31	86
GS-13	2.17	2.08	2.17	<0.05	<0.05	1.27	1.21	1.36	<0.1	<0.1	<0.1	73	19	28
GS-14	2.17	2.08	2.26	n/a	n/a	1.27	1.21	1.36	n/a	n/a	n/a	84	n/a	n/a
GS-15	2.17	2.08	2.23	n/a	n/a	1.27	1.21	1.36	n/a	n/a	n/a	89	<10	<10
GS-16	2.17	2.08	2.24	n/a	n/a	1.27	1.21	1.35	<0.1	<0.1	<0.1	75	n/a	n/a
GS-17	2.17	2.08	2.20	n/a	n/a	1.27	1.21	1.39	n/a	n/a	n/a	104	<10	13
GS-18	2.17	2.08	2.26	<0.05	<0.05	1.27	1.21	1.40	n/a	n/a	n/a	29	10	14
GS-19	2.17	2.08	2.20	n/a	n/a	1.27	1.21	1.48	<0.1	<0.1	<0.1	149	n/a	n/a
GS-20	2.17	2.08	2.27	<0.05	<0.05	1.27	1.21	1.37	n/a	n/a	n/a	173	<10	15
GS-21	2.17	2.08	2.18	<0.05	<0.05	1.27	1.21	1.35	<0.1	<0.1	<0.1	179	n/a	n/a
GS-22	1.72	1.36	1.58	<0.05	<0.05	1.25	1.03	1.33	<0.1	<0.1	<0.1	66	n/a	n/a
GS-23	1.72	1.36	1.67	<0.05	<0.05	1.25	1.03	1.26	<0.1	<0.1	<0.1	110	<10	<10
GS-24	1.72	1.36	1.72	<0.05	<0.05	1.25	1.03	n/a	n/a	n/a	n/a	72	n/a	n/a
GS-25	1.72	1.36	n/a	n/a	n/a	1.25	1.03	n/a	n/a	n/a	n/a	60	<10	<10
GS-26	1.72	1.36	1.72	<0.05	<0.05	1.25	1.03	n/a	n/a	n/a	n/a	52	n/a	n/a
GS-27	1.72	1.36	1.69	n/a	n/a	1.25	1.03	n/a	n/a	n/a	n/a	101	n/a	n/a
GS-28	1.72	1.36	n/a	n/a	n/a	1.25	1.03	n/a	n/a	n/a	n/a	100	<10	10
GS-29	1.72	1.36	1.68	<0.05	<0.05	1.25	1.03	n/a	n/a	n/a	n/a	113	<10	<10
GS-30	1.72	1.36	1.68	n/a	n/a	1.25	1.03	1.28	<0.1	<0.1	<0.1	73	n/a	n/a
GS-31	1.72	1.36	n/a	n/a	n/a	1.25	1.03	n/a	n/a	n/a	n/a	71	n/a	n/a
GS-32	1.72	1.36	1.58	<0.05	<0.05	1.25	1.03	n/a	n/a	n/a	n/a	105	n/a	n/a
GS-33	1.81	1.00	1.31	n/a	n/a	1.31	1.08	1.31	<0.1	<0.1	<0.1	n/a	n/a	n/a
GS-34	1.81	1.00	1.34	<0.05	<0.05	1.31	1.08	1.34	n/a	n/a	n/a	0	11	24
GS-35	1.81	1.00	1.32	n/a	n/a	1.31	1.08	1.32	n/a	n/a	n/a	9	n/a	n/a
GS-36	1.81	1.00	1.36	<0.05	<0.05	1.31	1.08	1.36	<0.1	<0.1	<0.1	22	<10	<10
GS-37	1.81	1.00	1.39	n/a	n/a	1.31	1.08	1.39	n/a	n/a	n/a	8	n/a	n/a
GS-38	1.81	1.00	1.31	<0.05	<0.05	1.31	1.08	1.31	<0.1	<0.1	<0.1	0	n/a	n/a
GS-39	1.81	1.00	1.34	n/a	n/a	1.31	1.08	1.34	n/a	n/a	n/a	8	<10	<10
GS-40	1.81	1.00	1.31	<0.05	<0.05	1.31	1.08	1.31	<0.1	<0.1	<0.1	24	<10	<10
GS-41	1.81	1.00	1.35	<0.05	<0.05	1.31	1.08	1.35	n/a	n/a	n/a	24	n/a	n/a
GS-42	1.81	1.00	1.33	n/a	n/a	1.31	1.08	1.33	n/a	n/a	n/a	13	<10	<10
GS-43	1.81	1.00	1.23	<0.05	<0.05	1.31	1.08	1.23	<0.1	<0.1	<0.1	0	<10	<10

Notes:

1. Immunoassay investigation for DDT employed test/reagent kits specific to 2,4D. Minimum detection limit is 0.2 ppm.
   0.0 Index is optical density for distilled water blank, 0.2 index is optical density for calibrator at 0.2 ppm or minimum detection limit. Result column is optical density of specific samp
2. Field investigation for PCBs employed test/reagent kits specific to Aroclor 1248 with a minimum detection limit of 1.0 ppm. 0.0 Index is optical density for distilled water blank, 1.0 Index is optical density for calibrator at 1.0 ppm or mdl. Result column shows optical density of specific sample.
3. Field investigation for petroleum hydrocarbons employed a Petro FLAG Test Kit (consistent with EPA SW 846, Method 9074). Values returned by this process reflect broad spectrum screening reported in ppm.
4. All methods are compared to available analytical lab results.

TABLE 3

ANALYTICAL DATA SUMMARY OF ORGANIC CONCENTRATIONS IN SOIL SAMPLES

Parameter	Detection Limit (ug/g)	Yukon CSR Criteria (PL) (ug/g)	CEQG Interim Sediment Guideline (4) (ug/kg)	CEQG Soil Guideline (RP) (5) (ug/g)	Location No. S1 Sample No. GS-43 (Sediment) (ug/g)	Location No. S2 Sample No. GS-42 (Sediment) (ug/g)	Location No. S3 Sample No. GS-41 (Sediment) (ug/g)	Location No. S4 Sample No. GS-12 (ug/g)	Location No. S4 Sample No. GS-22 (ug/g)	Location No. S4 Sample No. GS-23 (ug/g)	Location No. S5 Sample No. GS-13 (ug/g)	Location No. S5 Sample No. GS-24 (ug/g)
Extractable Hydrocarbons												
EPH 10-19	10	1000 (1)			na	<10	na	31	na	<10	19	na
EPH 19-32	10	1000 (1)			na	<10	na	86	na	<10	28	na
PCBs		5 (2,3)	34.1ug/kg (3)	1.3 (3)								
Aroclor 1242	0.1				<0.1	na	na	<0.1	<0.1	<0.1	<0.1	na
Aroclor 1254	0.1		60 ug/kg		<0.1	na	na	<0.1	<0.1	<0.1	<0.1	na
Aroclor 1260	0.1				<0.1	na	na	<0.1	<0.1	<0.1	<0.1	na
Organochlorine Pesticides												
Aldrin	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
alpha BCH	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
2,4'-DDT	0.05			0.7 (6)	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
4,4'-DDD	0.05		3.54 ug/kg		<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
4,4'-DDE	0.05		1.42 ug/kg		<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
4,4'-DDT	0.05		1.19 ug/kg	0.7 (6)	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
cis-Chlordane	0.05		4.5 ug/kg		<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
trans-Chlordane	0.05		4.5 ug/kg		<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chlorothalonil	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dieldrin	0.05		2.85 ug/kg		<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulphan I	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulphan II	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulphan sulfate	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin	0.05		2.67 ug/kg		<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Heptaclor	0.05		0.6 ug/kg		<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Heptaclor epoxide	0.05		0.6 ug/kg		<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Hexachlorobenzene	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Iprodione	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Lindane	0.05		0.94 ug/kg		<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Methoxychlor	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mirex	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Phenoxy / Acid Herbicides												
2,4- D	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
2,4-DB	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
2,4,5-T	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
2,4,5-TP	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Bromoxynil	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Clopyralid	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dicamba	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Diclofop-methyl	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

TABLE 3

ANALYTICAL DATA SUMMARY OF ORGANIC CONCENTRATIONS IN SOIL SAMPLES

Parameter	Detection Limit (ug/g)	Yukon CSR Criteria (PL) (ug/g)	CEQG Interim Sediment Guideline (4) (ug/kg)	CEQG Soil Guideline (RP) (5) (ug/g)	Location No. S1 Sample No. GS-43 (Sediment) (ug/g)	Location No. S2 Sample No. GS-42 (Sediment) (ug/g)	Location No. S3 Sample No. GS-41 (Sediment) (ug/g)	Location No. S4 Sample No. GS-12 (ug/g)	Location No. S4 Sample No. GS-22 (ug/g)	Location No. S4 Sample No. GS-23 (ug/g)	Location No. S5 Sample No. GS-13 (ug/g)	Location No. S5 Sample No. GS-24 (ug/g)
Fluazifop	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Imazapyr	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Imazethapyr	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
MCPA	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
MCPB	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mecoprop	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Picloram	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Triclopyr	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Fenoxaprop Ethyl	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Neutral Herbicides												
Ethalfluralin	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Triallate	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Trifluralin	0.05				<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

NOTES: Analytical results expressed in ug/g (ppm) unless otherwise expressed.
(1) General Numerical Soil Standards for Parkland, expressed in ug/g unless otherwise indicated.
(2) Matrix Numerical Soil Standards for Parkland, toxicity to soil invertebrates and plants, expressed in ug/g unless otherwise indicated.
(3) Total PCBs - includes arochlor mixtures 1242, 1248, 1245 and 1260.
(4) Canadian Environmental Quality Guidelines, Interim sediment quality guideline (ug/kg, equal to 1000 ug/g))
(5) Canadian Environmental Quality Guidelines for Soil, Residential/Park (mg/kg, equal to ug/g)
(6) DDT (2,2 -Bis (p-chlorophenyl)-1,1,1-trichloroethane; Dichloro diphenyl tricholorethane)
< = Less than analytical detection limit indicated

60.1	- Values shown in bold exceed the Yukon CSR Criteria.
12	- Values underlined exceed the applicable CEQG soil or sediment criteria.
64.8	- Values shown in bold and underlined exceed both Yukon CSR and applicable CEQG criteria.

TABLE 3

ANALYTICAL DATA SUMMARY OF ORGANIC CONCENTRATIONS IN SOIL SAMPLES

Parameter	Detection Limit (ug/g)	Yukon CSR Criteria (PL) (ug/g)	CEQG Interim Sediment Guideline (4) (ug/kg)	CEQG Soil Guideline (RP) (5) (ug/g)	Location No. S5 Sample No. GS-46 (ug/g)	Location No. S7 Sample No. GS-15 (ug/g)	Location No. S7 Sample No. GS-25 (ug/g)	Location No. S7 Sample No. GS-48 (ug/g)	Location No. S8 Sample No. GS-16 (ug/g)	Location No. S9 Sample No. GS-17 (ug/g)	Location No. S9 Sample No. GS-26 (ug/g)	Location No. S10 Sample No. GS-18 (ug/g)	Location No. S11 Sample No. GS-19 (ug/g)
Extractable Hydrocarbons													
EPH 10-19	10	1000 (1)			na	<10	<10	<10	na	<10	na	10	na
EPH 19-32	10	1000 (1)			na	<10	<10	<10	na	13	na	14	na
PCBs		5 (2,3)	34.1ug/kg (3)	1.3 (3)									
Aroclor 1242	0.1				<0.1	na	na	na	<0.1	na	na	na	<0.1
Aroclor 1254	0.1		60 ug/kg		<0.1	na	na	na	<0.1	na	na	na	<0.1
Aroclor 1260	0.1				<0.1	na	na	na	<0.1	na	na	na	<0.1
Organochlorine Pesticides													
Aldrin	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na
alpha BCH	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na
2,4'-DDT	0.05			0.7 (6)	<0.05	na	na	na	na	na	<0.05	<0.05	na
4,4'-DDD	0.05		3.54 ug/kg		<0.05	na	na	na	na	na	<0.05	<0.05	na
4,4'-DDE	0.05		1.42 ug/kg		<0.05	na	na	na	na	na	<0.05	<0.05	na
4,4'-DDT	0.05		1.19 ug/kg	0.7 (6)	<0.05	na	na	na	na	na	<0.05	<0.05	na
cis-Chlordane	0.05		4.5 ug/kg		<0.05	na	na	na	na	na	<0.05	<0.05	na
trans-Chlordane	0.05		4.5 ug/kg		<0.05	na	na	na	na	na	<0.05	<0.05	na
Chlorothalonil	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na
Dieldrin	0.05		2.85 ug/kg		<0.05	na	na	na	na	na	<0.05	<0.05	na
Endosulphan I	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na
Endosulphan II	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na
Endosulphan sulfate	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na
Endrin	0.05		2.67 ug/kg		<0.05	na	na	na	na	na	<0.05	<0.05	na
Heptaclor	0.05		0.6 ug/kg		<0.05	na	na	na	na	na	<0.05	<0.05	na
Heptaclor epoxide	0.05		0.6 ug/kg		<0.05	na	na	na	na	na	<0.05	<0.05	na
Hexachlorobenzene	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na
Iprodione	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na
Lindane	0.05		0.94 ug/kg		<0.05	na	na	na	na	na	<0.05	<0.05	na
Methoxychlor	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na
Mirex	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na
Phenoxy / Acid Herbicides													
2,4- D	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na
2,4-DB	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na
2,4,5-T	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na
2,4,5-TP	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na
Bromoxynil	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na
Clopyralid	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na
Dicamba	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na
Diclofop-methyl	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na

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ANALYTICAL DATA SUMMARY OF ORGANIC CONCENTRATIONS IN SOIL SAMPLES

Parameter	Detection Limit (ug/g)	Yukon CSR Criteria (PL) (ug/g)	CEQG Interim Sediment Guideline (4) (ug/kg)	CEQG Soil Guideline (RP) (5) (ug/g)	Location No. S5 Sample No. GS-46 (ug/g)	Location No. S7 Sample No. GS-15 (ug/g)	Location No. S7 Sample No. GS-25 (ug/g)	Location No. S7 Sample No. GS-48 (ug/g)	Location No. S8 Sample No. GS-16 (ug/g)	Location No. S9 Sample No. GS-17 (ug/g)	Location No. S9 Sample No. GS-26 (ug/g)	Location No. S10 Sample No. GS-18 (ug/g)	Location No. S11 Sample No. GS-19 (ug/g)
Fluazifop	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na
Imazapyr	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na
Imazethapyr	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na
MCPA	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na
MCPB	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na
Mecoprop	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na
Picloram	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na
Triclopyr	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na
Fenoxaprop Ethyl	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na
Neutral Herbicides													
Ethalfluralin	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na
Triallate	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na
Trifluralin	0.05				<0.05	na	na	na	na	na	<0.05	<0.05	na

NOTES: Analytical results expressed in ug/g (ppm) unless otherwise expressed.
(1) General Numerical Soil Standards for Parkland, expressed in ug/g unless otherwise indicated.
(2) Matrix Numerical Soil Standards for Parkland, toxicity to soil invertebrates and plants, expressed in ug/g unless otherwise indicated.
(3) Total PCBs - includes arochlor mixtures 1242, 1248, 1245 and 1260.
(4) Canadian Environmental Quality Guidelines, Interim sediment quality guideline (ug/kg, equal to 1000 ug/g))
(5) Canadian Environmental Quality Guidelines for Soil, Residential/Park (mg/kg, equal to ug/g)
(6) DDT (2,2 -Bis (p-chlorophenyl)-1,1,1-trichloroethane; Dichloro diphenyl tricholorethane)
< = Less than analytical detection limit indicated

60.1	- Values shown in bold exceed the Yukon CSR Criteria.
12	- Values underlined exceed the applicable CEQG soil or sediment criteria.
64.8	- Values shown in bold and underlined exceed both Yukon CSR and applicable CEQG criteria.

TABLE 3

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Parameter	Detection Limit (ug/g)	Yukon CSR Criteria (PL) (ug/g)	CEQG Interim Sediment Guideline (4) (ug/kg)	CEQG Soil Guideline (RP) (5) (ug/g)	Location No. S11 Sample No. GS-27 (ug/g)	Location No. S12 Sample No. GS-20 (ug/g)	Location No. S12 Sample No. GS-28 (ug/g)	Location No. S13 Sample No. GS-21 (ug/g)	Location No. S13 Sample No. GS-29 (ug/g)	Location No. S14 Sample No. GS-34 (Sediment) (ug/g)	Location No. S16 Sample No. GS-36 (Sediment) (ug/g)	Location No. S18 Sample No. GS-38 (Sediment) (ug/g)
Extractable Hydrocarbons												
EPH 10-19	10	1000 (1)			na	<10	<10	na	<10	11	<10	na
EPH 19-32	10	1000 (1)			na	15	10	na	<10	24	<10	na
PCBs		5 (2,3)	34.1ug/kg (3)	1.3 (3)								
Aroclor 1242	0.1				na	na	na	<0.1	na	<0.1	<0.1	<0.1
Aroclor 1254	0.1		60 ug/kg		na	na	na	<0.1	na	<0.1	<0.1	<0.1
Aroclor 1260	0.1				na	na	na	<0.1	na	<0.1	<0.1	<0.1
Organochlorine Pesticides												
Aldrin	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
alpha BCH	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
2,4'-DDT	0.05			0.7 (6)	na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
4,4'-DDD	0.05		3.54 ug/kg		na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
4,4'-DDE	0.05		1.42 ug/kg		na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
4,4'-DDT	0.05		1.19 ug/kg	0.7 (6)	na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
cis-Chlordane	0.05		4.5 ug/kg		na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
trans-Chlordane	0.05		4.5 ug/kg		na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
Chlorothalonil	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
Dieldrin	0.05		2.85 ug/kg		na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulphan I	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulphan II	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulphan sulfate	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin	0.05		2.67 ug/kg		na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
Heptaclor	0.05		0.6 ug/kg		na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
Heptaclor epoxide	0.05		0.6 ug/kg		na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
Hexachlorobenzene	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
Iprodione	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
Lindane	0.05		0.94 ug/kg		na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
Methoxychlor	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
Mirex	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
Phenoxy / Acid Herbicides												
2,4- D	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
2,4-DB	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
2,4,5-T	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
2,4,5-TP	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
Bromoxynil	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
Clopyralid	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
Dicamba	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
Diclofop-methyl	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05

TABLE 3

ANALYTICAL DATA SUMMARY OF ORGANIC CONCENTRATIONS IN SOIL SAMPLES

Parameter	Detection Limit (ug/g)	Yukon CSR Criteria (PL) (ug/g)	CEQG Interim Sediment Guideline (4) (ug/kg)	CEQG Soil Guideline (RP) (5) (ug/g)	Location No. S11 Sample No. GS-27 (ug/g)	Location No. S12 Sample No. GS-20 (ug/g)	Location No. S12 Sample No. GS-28 (ug/g)	Location No. S13 Sample No. GS-21 (ug/g)	Location No. S13 Sample No. GS-29 (ug/g)	Location No. S14 Sample No. GS-34 (Sediment) (ug/g)	Location No. S16 Sample No. GS-36 (Sediment) (ug/g)	Location No. S18 Sample No. GS-38 (Sediment) (ug/g)
Fluazifop	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
Imazapyr	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
Imazethapyr	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
MCPA	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
MCPB	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
Mecoprop	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
Picloram	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
Triclopyr	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
Fenoxaprop Ethyl	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
Neutral Herbicides												
Ethalfluralin	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
Triallate	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05
Trifluralin	0.05				na	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05

NOTES: Analytical results expressed in ug/g (ppm) unless otherwise expressed.
(1) General Numerical Soil Standards for Parkland, expressed in ug/g unless otherwise indicated.
(2) Matrix Numerical Soil Standards for Parkland, toxicity to soil invertebrates and plants, expressed in ug/g unless otherwise indicated.
(3) Total PCBs - includes arochlor mixtures 1242, 1248, 1245 and 1260.
(4) Canadian Environmental Quality Guidelines, Interim sediment quality guideline (ug/kg, equal to 1000 ug/g))
(5) Canadian Environmental Quality Guidelines for Soil, Residential/Park (mg/kg, equal to ug/g)
(6) DDT (2,2 -Bis (p-chlorophenyl)-1,1,1-trichloroethane; Dichloro diphenyl tricholorethane)
< = Less than analytical detection limit indicated

60.1	- Values shown in bold exceed the Yukon CSR Criteria.
12	- Values underlined exceed the applicable CEQG soil or sediment criteria.
64.8	- Values shown in bold and underlined exceed both Yukon CSR and applicable CEQG criteria.

TABLE 3

ANALYTICAL DATA SUMMARY OF ORGANIC CONCENTRATIONS IN SOIL SAMPLES

Parameter	Detection Limit (ug/g)	Yukon CSR Criteria (PL) (ug/g)	CEQG Interim Sediment Guideline (4) (ug/kg)	CEQG Soil Guideline (RP) (5) (ug/g)	Location No. S18 Sample No. GS-47 (Sediment) (ug/g)	Location No. S19 Sample No. GS-39 (Sediment) (ug/g)	Location No. S19 Sample No. GS-49 (Sediment) (ug/g)	Location No. S20 Sample No. GS-40 (Sediment) (ug/g)	Location No. S21 Sample No. GS-30 (ug/g)	Location No. S23 Sample No. GS-32 (ug/g)
Extractable Hydrocarbons										
EPH 10-19	10	1000 (1)			na	<10	<10	<10	na	na
EPH 19-32	10	1000 (1)			na	<10	<10	<10	na	na
PCBs		5 (2,3)	34.1ug/kg (3)	1.3 (3)						
Aroclor 1242	0.1				<0.1	na	na	<0.1	<0.1	na
Aroclor 1254	0.1		60 ug/kg		<0.1	na	na	<0.1	<0.1	na
Aroclor 1260	0.1				<0.1	na	na	<0.1	<0.1	na
Organochlorine Pesticides										
Aldrin	0.05				<0.05	na	na	<0.05	na	<0.05
alpha BCH	0.05				<0.05	na	na	<0.05	na	<0.05
2,4'-DDT	0.05			0.7 (6)	<0.05	na	na	<0.05	na	<0.05
4,4'-DDD	0.05		3.54 ug/kg		<0.05	na	na	<0.05	na	<0.05
4,4'-DDE	0.05		1.42 ug/kg		<0.05	na	na	<0.05	na	<0.05
4,4'-DDT	0.05		1.19 ug/kg	0.7 (6)	<0.05	na	na	<0.05	na	<0.05
cis-Chlordane	0.05		4.5 ug/kg		<0.05	na	na	<0.05	na	<0.05
trans-Chlordane	0.05		4.5 ug/kg		<0.05	na	na	<0.05	na	<0.05
Chlorothalonil	0.05				<0.05	na	na	<0.05	na	<0.05
Dieldrin	0.05		2.85 ug/kg		<0.05	na	na	<0.05	na	<0.05
Endosulphan I	0.05				<0.05	na	na	<0.05	na	<0.05
Endosulphan II	0.05				<0.05	na	na	<0.05	na	<0.05
Endosulphan sulfate	0.05				<0.05	na	na	<0.05	na	<0.05
Endrin	0.05		2.67 ug/kg		<0.05	na	na	<0.05	na	<0.05
Heptaclor	0.05		0.6 ug/kg		<0.05	na	na	<0.05	na	<0.05
Heptaclor epoxide	0.05		0.6 ug/kg		<0.05	na	na	<0.05	na	<0.05
Hexachlorobenzene	0.05				<0.05	na	na	<0.05	na	<0.05
Iprodione	0.05				<0.05	na	na	<0.05	na	<0.05
Lindane	0.05		0.94 ug/kg		<0.05	na	na	<0.05	na	<0.05
Methoxychlor	0.05				<0.05	na	na	<0.05	na	<0.05
Mirex	0.05				<0.05	na	na	<0.05	na	<0.05
Phenoxy / Acid Herbicides										
2,4- D	0.05				<0.05	na	na	<0.05	na	<0.05
2,4-DB	0.05				<0.05	na	na	<0.05	na	<0.05
2,4,5-T	0.05				<0.05	na	na	<0.05	na	<0.05
2,4,5-TP	0.05				<0.05	na	na	<0.05	na	<0.05
Bromoxynil	0.05				<0.05	na	na	<0.05	na	<0.05
Clopyralid	0.05				<0.05	na	na	<0.05	na	<0.05
Dicamba	0.05				<0.05	na	na	<0.05	na	<0.05
Diclofop-methyl	0.05				<0.05	na	na	<0.05	na	<0.05

TABLE 3

ANALYTICAL DATA SUMMARY OF ORGANIC CONCENTRATIONS IN SOIL SAMPLES

Parameter	Detection Limit (ug/g)	Yukon CSR Criteria (PL) (ug/g)	CEQG Interim Sediment Guideline (4) (ug/kg)	CEQG Soil Guideline (RP) (5) (ug/g)	Location No. S18 Sample No. GS-47 (Sediment) (ug/g)	Location No. S19 Sample No. GS-39 (Sediment) (ug/g)	Location No. S19 Sample No. GS-49 (Sediment) (ug/g)	Location No. S20 Sample No. GS-40 (Sediment) (ug/g)	Location No. S21 Sample No. GS-30 (ug/g)	Location No. S23 Sample No. GS-32 (ug/g)
Fluazifop	0.05				<0.05	na	na	<0.05	na	<0.05
Imazapyr	0.05				<0.05	na	na	<0.05	na	<0.05
Imazethapyr	0.05				<0.05	na	na	<0.05	na	<0.05
MCPA	0.05				<0.05	na	na	<0.05	na	<0.05
MCPB	0.05				<0.05	na	na	<0.05	na	<0.05
Mecoprop	0.05				<0.05	na	na	<0.05	na	<0.05
Picloram	0.05				<0.05	na	na	<0.05	na	<0.05
Triclopyr	0.05				<0.05	na	na	<0.05	na	<0.05
Fenoxaprop Ethyl	0.05				<0.05	na	na	<0.05	na	<0.05
Neutral Herbicides										
Ethalfluralin	0.05				<0.05	na	na	<0.05	na	<0.05
Triallate	0.05				<0.05	na	na	<0.05	na	<0.05
Trifluralin	0.05				<0.05	na	na	<0.05	na	<0.05

NOTES: Analytical results expressed in ug/g (ppm) unless otherwise expressed.
(1) General Numerical Soil Standards for Parkland, expressed in ug/g unless otherwise indicated.
(2) Matrix Numerical Soil Standards for Parkland, toxicity to soil invertebrates and plants, expressed in ug/g unless otherwise indicated.
(3) Total PCBs - includes arochlor mixtures 1242, 1248, 1245 and 1260.
(4) Canadian Environmental Quality Guidelines, Interim sediment quality guideline (ug/kg, equal to 1000 ug/g))
(5) Canadian Environmental Quality Guidelines for Soil, Residential/Park (mg/kg, equal to ug/g)
(6) DDT (2,2 -Bis (p-chlorophenyl)-1,1,1-trichloroethane; Dichloro diphenyl tricholorethane)
< = Less than analytical detection limit indicated

60.1	- Values shown in bold exceed the Yukon CSR Criteria.
12	- Values underlined exceed the applicable CEQG soil or sediment criteria.
64.8	- Values shown in bold and underlined exceed both Yukon CSR and applicable CEQG criteria.

TABLE 4

ANALYTICAL DATA SUMMARY OF METAL CONCENTRATIONS IN SOIL SAMPLES

Parameter	Detection Limit	Yukon CSR Standards (PL) (ug/g)	CEQG Interim Sediment Guideline (4) (ug/kg)	CEQG Soil Guideline (RP) (5) (ug/g)	S1 Sample No. GS-43 (Sediment) (ug/g)	S3 Sample No. GS-41 (Sediment) (ug/g)	S4 Sample No. GS-12 (ug/g)	S4 Sample No. GS-22 (ug/g)	S4 Sample No. GS-23 (ug/g)	S7 Sample No. GS-15 (ug/g)	S7 Sample No. GS-25 (ug/g)	S10 Sample No. GS-18 (ug/g)	S10 Sample No. GS-50 (ug/g)	S12 Sample No. GS-20 (ug/g)	S14 Sample No. GS-34 (Sediment) (ug/g)	S16 Sample No. GS-36 (Sediment) (ug/g)	S19 Sample No. GS-39 (Sediment) (ug/g)	S21 Sample No. GS-30 (ug/g)	S21 Sample No. GS-51 (ug/g)
Aluminum	5				18000	19200	25,300	28,500	28,400	25,200	22,600	25,200	27900	35,400	22100	22000	15400	22,500	24200
Antimony	2	20 (1)			<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Arsenic	2	60 (2)	5900	12	6	4	12	13	7	10	6	13	<2	8	<2	<2	2	<2	8
Barium	0.05	500 (1)		500	210	255	461	441	391	371	325	407	455	496	315	287	175	292	349
Beryllium	0.1	4 (1)			0.2	0.1	0.1	0.2	0.2	0.2	<0.1	0.3	<0.1	0.3	0.1	0.2	0.2	0.1	<0.1
Bismuth	5				<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Cadmium	0.1	1.5 (3)	600	10	0.4	0.3	0.5	0.6	0.5	0.6	0.4	0.7	0.6	0.7	0.2	0.2	0.2	0.3	0.5
Calcium	5				13600	16800	25,900	22,200	20,300	17,900	16,700	20,500	23200	24,400	17800	16500	12000	15,600	18500
Chromium	0.5	60 (2)	37300	64	40.5	38.3	55.3	64.8	64.2	58.7	49.6	60.1	59.6	73.7	47	46.8	33.4	48.7	54.7
Cobalt	0.1	50 (1)			11.2	10.5	15	17.9	15.5	14.2	13.7	16.2	15.6	17	11.2	11.5	9	12.6	13.4
Copper	0.5	90 (3)	35700	63	26.4	20	53.1	48.9	38.8	36.9	35.6	47.9	47.9	46.1	22.9	19.7	14.6	28.5	32.6
Iron	1				32000	31000	43,000	46,000	46,000	42,000	42,000	43,000	45000	50,000	33000	32000	23000	35,000	43000
Lead	1	150 (3)	35000	140	3	4	43	15	5	8	4	6	5	7	1	3	3	4	3
Lithium	0.5				11.4	12.3	20.3	19.1	17	15.8	14.5	17.2	16.3	19.1	11.5	12.4	9.7	12.8	15
Magnesium	1				10000	10900	13,900	15,600	15,500	13,100	13,300	14,000	14600	17,700	11500	11600	8490	11,900	13500
Manganese	0.5				375	613	1,460	1,480	1,110	1,030	1070	1,180	1270	1,050	1120	731	578	872	1370
Mercury	0.01	2 (1)	170	6.6	0.01	<0.01	0.07	0.06	0.04	0.03	<0.01	0.03	0.03	0.04	<0.01	<0.01	<0.01	<0.01	0.02
Molybdenum	1	10 (1)			<1	<1	2	2	<1	<1	<1	2	<1	1	<1	<1	<1	<1	<1
Nickel	1	100 (1)		50	22.5	21.9	31.8	38.2	33.1	29.9	29.2	35.3	34	36.5	23	23.1	18.5	25.4	28.1
Phosporus	5				813	732	1,120	1,100	1,050	949	945	1,120	1100	1,100	782	759	646	821	999
Potassium	20				2620	2540	4600	4910	4510	4210	3110	3840	4350	6100	3320	3360	2100	3280	3980
Selenium	2	3 (1)			<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Silicon	5				270	278	66	329	329	200	434	314	555	384	308	259	282	384	262
Silver	0.5	20 (1)			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sodium	5				984	1050	1050	1170	2630	967	1340	956	1020	3510	1790	1880	1130	2020	1050
Strontium	1				45	51	62	62	68	60	48	59	64	84	61	59	44	56	56
Sulphur	10				580	340	830	620	440	400	390	770	830	570	300	210	190	300	400
Thorium	1				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tin	1	50 (1)			1	<1	2	<1	2	1	1	1	1	3	<1	2	2	1	1
Titanium	0.2				1750	1680	2,030	2360	2380	2120	2,130	2170	2190	2670	1860	1930	1440	2,020	2140
Uranium	5				<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Vanadium	1	200 (1)		130	65	64	85	94	94	89	73	89	90	130	75	74	55	75	84
Zinc	0.5	150 (3)	123000	200	57.3	53.8	219	173	93.5	87.6	77.8	119	114	119	58.2	59.2	43.5	64	78.9
Zirconium	0.1				8.6	8.6	8.7	10.4	11.3	10.9	9.4	10.1	9.1	12.4	8.7	8.8	7.1	9.3	10

NOTES: Analytical results expressed in ug/g unless otherwise expressed.
(1) General Numerical Soil Standards for Parkland, expressed in ug/g unless otherwise indicated.
(2) Matrix Numerical Soil Standards for Parkland, where groundwater flow to surface used by aquatic life. Expressed in ug/g unless otherwise indicated.
(3) Matrix Numerical Soil Standards for Parkland, where groundwater flow to surface used by aquatic life. Dependent on pH level - most conservative value given. Expressed in ug/g unless otherwise indicated.
(4) Canadian Environmental Quality Guidelines, Interim sediment quality guideline (ug/kg, equal to 1000 ug/g)
(5) Canadian Environmental Quality Guidelines for Soil, Residential/Park (mg/kg equal to ug/g))
< = Less than analytical detection limit indicated

60.1	- Values shown in bold exceed the Yukon CSR Criteria.
12	- Values underlined exceed the applicable CEQG soil or sediment criteria.
64.8	- Values shown in bold and underlined exceed both Yukon CSR and applicable CEQG criteria.

TABLE 5

ANALYTICAL DATA SUMMARY OF PHYSICAL PARAMETERS OF SOIL SAMPLES

Parameter	Detection Limit	Units	Location No. S4 Sample No. GS-12	Location No. S7 Sample No. GS-15	Location No. S12 Sample No. GS-20	Location No. S4 Sample No. GS-22	Location No. S4 Sample No. GS-23	Location No. S14 Sample No. GS-34 (Sediment)	Location No. S16 Sample No. GS-36 (Sediment)	Location No. S19 Sample No. GS-39 (Sediment)	Location No. S3 Sample No. GS-41 (Sediment)	Location No. S1 Sample No. GS-43 (Sediment)	Location No. S12 Sample No. GS-52
Partical Size Analysis													
% Sand	0.1	%	31.8	33.5	22.5	21.1	34.6	73.4	72.5	81.6	90.4	73.5	na
% Silt	0.1	%	48.7	49.4	63.9	58.8	52.9	21	20.9	10.9	4	19.9	na
% Clay	0.1	%	19.5	17	13.6	20.1	12.6	5.6	6.6	7.5	5.6	6.6	na
Texture			Loam	Loam	Silt Loam	Silt Loam	Silt Loam	Sandy Loam	Sandy Loam	Loamy Sand	Sand	Sandy Loam	na
Custome Seive Analysis													
4.76 mm Sieve	0.1	% Ret'd	<0.1	na	<0.1	<0.1	<0.1	<0.1	<0.1	na	<0.1	na	na
2.00 mm Sieve	0.1	% Ret'd	<0.1	na	<0.1	<0.1	<0.1	<0.1	<0.1	na	<0.1	na	na
0.42 mm Sieve	0.1	% Ret'd	27.8	na	21.3	27.8	11.4	11.6	4.37	na	13	na	na
0.25 mm Sieve	0.1	% Ret'd	16.5	na	11.4	15.6	8.13	17.9	10.3	na	33.2	na	na
0.106 mm Sieve	0.1	% Ret'd	20	na	13.6	19	22	35.4	45.9	na	44.1	na	na
0.074 mm Sieve	0.1	% Ret'd	6.91	na	12.6	12.9	18.7	16.9	19.5	na	6	na	na
Organic Matter													
% Organic Matter	0.05	%	39.1	5.5	15.4	24.8	7.7	2.2	0.45	0.47	0.42	2.3	9.3
Total Organic Carbon													
% Total Organic Carbon	0.05	%	22	3.11	8.64	14	4.31	1.26	0.252	0.264	0.236	1.28	5.2
pH	0.01	pH	7.4	7.9	8.1	7.7	7.8	7.9	8	8	8.2	7.2	na

TABLE 6

ANALYTICAL DATA SUMMARY
OF ORGANIC CONCENTRATIONS IN WATER

Parameter	Detection Limit	Yukon CSR Criteria (AW) (1)	CEQG Water Guideline (5)	Location No. S1 Sample No. GS-10	Location No. S1 Sample No. GS-11	Location No. S3 Sample No. GS-08	Location No. S14 Sample No. GS-01	Location No. S16 Sample No. GS-03	Location No. S18 Sample No. GS-05
Extractable Hydrocarbons									
EPH 10-19	50			<50	<50	<50	<50	<50	<50
EPH 19-32	50			<50	<50	<50	<50	<50	<50
PCBs (7)									
Aroclor 1242	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Aroclor 1254	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Aroclor 1260	0.5			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Organochlorine Pesticides									
Aldrin	0.5	0.04		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
alpha BCH	0.5			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
2,4'-DDT	0.5	0.01 (2)		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
4,4'-DDD	0.5			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
4,4'-DDE	0.5			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
4,4'-DDT	0.5	0.01 (2)		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
cis-Chlordane	0.5	0.06 (3)		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
trans-Chlordane	0.5	0.06 (3)		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chlorothalonil	0.5		0.18	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Dieldrin	0.5	0.04		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulphan I	0.5	0.2 (4)	0.2 (4)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulphan II	0.5	0.2 (4)	0.2 (4)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulphan sulfate	0.5	0.2 (4)	0.2 (4)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin	0.5	0.023		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Heptaclor	0.5	0.1		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Heptaclor epoxide	0.5	0.1		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Hexachlorobenzene	0.5	0.065		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Iprodione	0.5			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Lindane	0.5			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Methoxychlor	0.5			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mirex	0.5			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

TABLE 6

ANALYTICAL DATA SUMMARY
OF ORGANIC CONCENTRATIONS IN WATER

Parameter	Detection Limit	Yukon CSR Criteria (AW) (1)	CEQG Water Guideline (5)	Location No. S1 Sample No. GS-10	Location No. S1 Sample No. GS-11	Location No. S3 Sample No. GS-08	Location No. S14 Sample No. GS-01	Location No. S16 Sample No. GS-03	Location No. S18 Sample No. GS-05
Phenoxy Acid Herbicides									
2,4- D	0.1	40	4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2,4-DB	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2,4,5-T	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
2,4,5-TP	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bromoxynil	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Clopyralid	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dicamba	0.1		10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Diclofop-methyl	0.1		6.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fluazifop	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Imazapyr	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Imazethapyr	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MCPA	0.1		2.6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
MCPB	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Mecoprop	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Picloram	0.1	290	29	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Triclopyr	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Fenoxaprop Ethyl	0.1			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Neutral Herbicides									
Ethalfluralin	0.05			<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Triallate	0.05	2.4	0.24	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Trifluralin	0.05	0.1	0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

NOTES: Analytical results expressed in ug/l unless otherwise expressed.
(1) General Numerical Water Standards for Aquatic Life (AW), expressed in ug/l unless otherwise indicated
(2) DDT
(3) Chlordane
(4) Endosulfan
(5) Canadian Environmental Quality Guidelines for Water: Aquatic Life (Freshwater) (ug/l)
(6) PCB's - no standard exists for PCBs for CEQG Yukon CSR for aquatic life or drinking water
< = Less than analytical detection limit indicated

60.1	- Values shown in bold exceed the Yukon CSR Criteria.
12	- Values underlined exceed the CEQG criteria.
64.8	- Values shown in bold and underlined exceed both Yukon CSR and CEQG criteria.

TABLE 6

ANALYTICAL DATA SUMMARY
OF ORGANIC CONCENTRATIONS IN WATER

Parameter	Detection Limit	Yukon CSR Criteria (AW) (1)	CEQG Water Guideline (5)	Location No. S20 Sample No. GS-07	Drum Water Sample No. GS-33	Blank Sample No. GS-53
Extractable Hydrocarbons						
EPH 10-19	50			<50	<50	<50
EPH 19-32	50			<50	<50	<50
PCBs (7)						
Aroclor 1242	0.5			<0.5	<0.5	<0.5
Aroclor 1254	0.5			<0.5	<0.5	<0.5
Aroclor 1260	0.5			<0.5	<0.5	<0.5
Organochlorine Pesticides						
Aldrin	0.5	0.04		<0.05	<0.05	<0.05
alpha BCH	0.5			<0.05	<0.05	<0.05
2,4'-DDT	0.5	0.01 (2)		<0.05	<0.05	<0.05
4,4'-DDD	0.5			<0.05	<0.05	<0.05
4,4'-DDE	0.5			<0.05	<0.05	<0.05
4,4'-DDT	0.5	0.01 (2)		<0.05	<0.05	<0.05
cis-Chlordane	0.5	0.06 (3)		<0.05	<0.05	<0.05
trans-Chlordane	0.5	0.06 (3)		<0.05	<0.05	<0.05
Chlorothalonil	0.5		0.18	<0.05	<0.05	<0.05
Dieldrin	0.5	0.04		<0.05	<0.05	<0.05
Endosulphan I	0.5	0.2 (4)	0.2 (4)	<0.05	<0.05	<0.05
Endosulphan II	0.5	0.2 (4)	0.2 (4)	<0.05	<0.05	<0.05
Endosulphan sulfate	0.5	0.2 (4)	0.2 (4)	<0.05	<0.05	<0.05
Endrin	0.5	0.023		<0.05	<0.05	<0.05
Heptaclor	0.5	0.1		<0.05	<0.05	<0.05
Heptaclor epoxide	0.5	0.1		<0.05	<0.05	<0.05
Hexachlorobenzene	0.5	0.065		<0.05	<0.05	<0.05
Iprodione	0.5			<0.05	<0.05	<0.05
Lindane	0.5			<0.05	<0.05	<0.05
Methoxychlor	0.5			<0.05	<0.05	<0.05
Mirex	0.5			<0.05	<0.05	<0.05

TABLE 6

ANALYTICAL DATA SUMMARY
OF ORGANIC CONCENTRATIONS IN WATER

Parameter	Detection Limit	Yukon CSR Criteria (AW) (1)	CEQG Water Guideline (5)	Location No. S20 Sample No. GS-07	Drum Water Sample No. GS-33	Blank Sample No. GS-53
Phenoxy Acid Herbicides						
2,4- D	0.1	40	4	<0.1	<0.1	<0.1
2,4-DB	0.1			<0.1	<0.1	<0.1
2,4,5-T	0.1			<0.1	<0.1	<0.1
2,4,5-TP	0.1			<0.1	<0.1	<0.1
Bromoxynil	0.1			<0.1	<0.1	<0.1
Clopyralid	0.1			<0.1	<0.1	<0.1
Dicamba	0.1		10	<0.1	<0.1	<0.1
Diclofop-methyl	0.1		6.1	<0.1	<0.1	<0.1
Fluazifop	0.1			<0.1	<0.1	<0.1
Imazapyr	0.1			<0.1	<0.1	<0.1
Imazethapyr	0.1			<0.1	<0.1	<0.1
MCPA	0.1		2.6	<0.1	<0.1	<0.1
MCPB	0.1			<0.1	<0.1	<0.1
Mecoprop	0.1			<0.1	<0.1	<0.1
Picloram	0.1	290	29	<0.1	<0.1	<0.1
Triclopyr	0.1			<0.1	<0.1	<0.1
Fenoxaprop Ethyl	0.1			<0.1	<0.1	<0.1
Neutral Herbicides						
Ethalfluralin	0.05			<0.05	<0.05	<0.05
Triallate	0.05	2.4	0.24	<0.05	<0.05	<0.05
Trifluralin	0.05	0.1	0.2	<0.05	<0.05	<0.05

NOTES: Analytical results expressed in ug/l unless otherwise expressed.
(1) General Numerical Water Standards for Aquatic Life (AW), expressed in ug/l unless otherwise indicated
(2) DDT
(3) Chlordane
(4) Endosulfan
(5) Canadian Environmental Quality Guidelines for Water: Aquatic Life (Freshwater) (ug/l)
(6) PCB's - no standard exists for PCBs for CEQG Yukon CSR for aquatic life or drinking water
< = Less than analytical detection limit indicated

60.1	- Values shown in bold exceed the Yukon CSR Criteria.
12	- Values underlined exceed the CEQG criteria.
64.8	- Values shown in bold and underlined exceed both Yukon CSR and CEQG criteria.

TABLE 7

ANALYTICAL DATA SUMMARY OF
PHYSICAL PARAMETERS OF WATER SAMPLES

Parameter	Units	Location No. S1 Sample No. GS-10	Location No. S1 Sample No. GS-11	Location No. S3 Sample No. GS-08	Location No. S14 Sample No. GS-01	Location No. S16 Sample No. GS-03	Location No. S18 Sample No. GS-05	Location No. S20 Sample No. GS-07	Drum Water Sample No. GS-33	Blank Sample No. GS-53
Hardness										
Hardness (CaCO3 equiv.)	mg/l	138	139	157	167	169	168	164	45.8	0.04
Total Dissolved Solids										
Total Dissolved Solids	mg/l	180	174	268	191	194	191	191	80	<5
Total Suspended Solids										
Total Suspended Solids	mg/l	<5	<5	59	<5	<5	<5	<5	118	<5

TABLE 8

ANALYTICAL DATA SUMMARY
OF CAMPGROUND SUPPPLY WELL WATER POTABILITY RESULTS

Parameter	Detection Limit	Units	Yukon CSR Criteria (DW) (1)	CEQG Water Guideline (2)	Sample No. GS-44
pH				6.5-8.5(AO)	8.72
Colour	5	TCU		15(AO)	50
Turbidity	1	NTU		5(AO)	75
Total Dissolved Solids	1	mg/L		500(AO)	935
Hardness (CaCO3 equiv.)	1	mg CaCO3/L			30.3
Chloride	0.1	mg/L	250	250 (AO)	22.9
Flouride	0.04	mg/L	1.5	1.5	31
Nitrite - N	1	mg/L	3.2	3.2	<1
Nitrate - N	0.1	mg/L	10	45	<0.1
Sulfate	1	mg/L	500	500(AO)	<1
Aluminum	0.01	mg/L	0.2		11.6
Arsenic	0.02	mg/L	0.025	0.025 (IMAC)	<0.02
Barium	0.0005	mg/L	1	1	0.139
Cadmium	0.0005	mg/L	0.005	0.005	<0.0005
Chromium	0.001	mg/L	0.05	0.05	0.009
Copper	0.002	mg/L	1	1(AO)	0.011
Iron	0.003	mg/L	0.3	0.3(AO)	20.8
Lead	0.005	mg/L	0.01	0.01	<0.005
Manganese	0.0005	mg/L	0.05	0.05(AO)	0.175
Sodium	0.05	mg/L	200	200(AO)	380
Uranium	0.06	mg/L	0.1	0.1	<0.06
Zinc	0.001	mg/L	5	5(AO)	2.3
Total Alkalinity	5	mg CaCO3/L			696
PCBs	0.5	ug/l			<0.5 (3)

NOTES: Analytical results expressed mg/l unless otherwise expressed (see Detection Limit Units column)

(1) General Numerical Water Standards for Drinking Water (DW). Expressed in mg/l, unless otherwise indicated. Some values converted from ug/l (1000mg/l).

(2) Canadian Environmental Quality Guidelines for Water:Community. Expressed in mg/l, unless otherwise indicated.
Some values converted from ug/l (1000mg/l). Maximum acceptable concentration (MAC) listed unless otherwise noted.
IMAC: Interim maximum acceptable concentration. AO:aesthetic objective.

(3) Samples GS-44 and GS-45 analysed for PCBs, both had non-detectable results

60.1	- Values shown in bold exceed the Yukon CSR Criteria.
12	- Values underlined exceed the CEQG criteria.
64.8	- Values shown in bold and underlined exceed both Yukon CSR and CEQG criteria.

TABLE 9

SUMMARY OF RECOMMENDATIONS

Recommendation	Rationale	Tasks	Tentative Timing and Duration	Estimated Costs (1), (2)	Comments
Campground Area					
Perform Site investigation with Champagne and Aishihik First Nations (CAFN) witness and RCMP Explosives Demolition Unit to search areas of alleged buried dynamite and remove hazards	To confirm presence or absence of buried dynamite. If present, locate and remove hazards prior to further field investigation	Site investigation with RCMP using trained dogs and detection equipment.	May 2000, 2 days	**$5,500 - $8,000**	Cost includes time for excavator on site. Additional costs may result for neutralization or removal of dynamite, if required
Perform a geophysical survey	To indentify potential locations of buried solid waste/sources of contaminants	Ground penetrating radar or electromagnetic survey of the Site, analysis and reporting	May 2000, 3 days	**$7,500 - $11,500**	Cost includes crew and rental of electomagnetic survey equipment
If required based on the above findings, **perform additional field investigations of the soil and groundwater at the campground area**	To confirm and delineate the extent of potential contamination in the campground area due to buried wastes identified during the geophysical survey	Test pitting, drilling, installation of groundwater wells and soil and groundwater sampling	May or June 2000, 6 to 8 days	**$22,000 - $33,000**	Costs based on 3 test pits, 10 boreholes and 5 groundwater monitoring wells. Actual program would be based on site investigation findings
If required based on the above findings, **provide mitigation/remediation plan for the campground area**	To develop plan and estimate the cost of remediation of the campground area	Office study to summarize work performed on Site, results, and propose plan for cleanup	June 2000, 2 weeks	**$10,000 - $15,000**	Includes a comparative analysis of mitigation and remediation costs versus risks
Debris Area					
Option 1: Isolate and contain debris area	To control leaching of contaminants and to improve aesthetics	Develop detailed design for cover system (cap) for debris area. Construct erosion protection, cover area with sand and gravel, and plant vegetation. Monitor construction and perform sampling	During 2000 Fisheries Construction window (typically July 15 to September 15), approx. 2 weeks duration	**$35,000 - $50,000**	Cost includes an estimate for installation of 5 piezometers, and one round of water, soil and sediment sampling
Option 2: Remove debris with crane and remediate debris area	See Option 1	Break up pile with saws/torches, haul out pieces with crane, excavate local dump site and place liner, transport materials and cover. Monitor construction and perform sampling	See Option 1, duration approximately 3 weeks	**$50,000 - $70,000 (3)**	See Option 1
Option 3: Remove debris with helicopter and remediate debris area	See Option 1	As in Option 2, using helicopter to remove debris	See Option 1, duration approximately 3 weeks	**$70,000 - $100,000 (3)**	See Option 1
Off Site (Airplane Lake)					
Investigate and report on previous waste disposal practices at the winter airstrip on the lake	To investigate potential impacts to the lake due to claims of dumping	Perform a site investigation including a diving program, and water and sediment sampling	June 2000, 5 days	**$10,000 - $15,000**	Cost based on diving, video, 5 sediment and 5 water samples, travel and reporting

Notes:

(1) Estimated costs presented are based on limited information and have been provided for comparative purposes only.

(2) Costs were developed based on staging the CRA-staffed field work tasks in succession where possible, and therefore include savings resulting from reduced travel time and number of flights to the Yukon.

(3) Assumes contaminated soils or materials could be buried on-Site in an excavated and lined trench. Disposal of any waste would be discussed with INAC and YRR as part of the conceptual plans.

APPENDIX A

PRELIMINARY ENVIRONMENTAL ASSESSMENT SAMPLING RESULTS

EXECUTIVE SUMMARY

A preliminary environmental investigation was carried out at five sites along the decommissioned Haines-Fairbanks pipeline on behalf of Indian and Northern Affairs Canada, Arctic Environmental Strategy, Action On Waste. The program was designed to achieve the following major objectives:

- ascertain the impact of a 1956 fuel spill at Mile 207.6 of the pipeline;
- identify areas of waste disposal and contaminants at the Haines Junction Pump Station;
- evaluate drinking water quality and contaminant distribution at a historic dump site at Million Dollar Falls;
- identify areas of waste disposal and contaminants in surface and subsurface soil and water at the Blanchard River Pump Station and the Border Pump Station.

The overall objective was to assess the need for further action and to provide recommendations.

The methods employed included a historical review. Electromagnetic surveys were conducted to detect buried metallic debris. Intrusive soil and groundwater sampling using test pits and drill holes, as well as the installation of monitoring wells was conducted in order to detect subsurface contaminant sources and potential groundwater impacts. Surface soil and water samples were also collected and analyzed for a range of contaminants.

The analytical program consisted of two components. The field component utilized immunoassay test kits for PAHs, TPH, BTEX and PCBs; a photoionization detector was used to obtain gas-phase hydrocarbon concentrations. The laboratory component consisted of detailed analyses for a broad suite of inorganic and organic contaminants.

The five sites were visited in July 1995. Contaminant data from each site were interpreted relative to site-specific conditions and relevant soil and water assessment and remediation criteria (primarily CCME (1991) criteria). A preliminary risk assessment was carried out for each site.

Based on this methodology, the sites were ranked, in order of priority for remediation/action, as follows:

1) Blanchard River Pump Station
2) Million Dollar Falls
3) Border Pump Station
4) Haines Junction Pump Station
5) Mile 207.6 Spill Site

A summary of environmental problems and recommended actions is provided in Table 1.

Extensive hydrocarbon contamination was encountered at Mile 207.6 Spill Site, Blanchard River Pump Station, and Border Pump Station. This was confirmed by results obtained from the field analytical techniques. Laboratory analyses, however, did not confirm elevated levels of either PAHs or BTEX. Although not included in the laboratory analytical suite, the presence of alkylated aromatics is suspected.

Based on the substances analyzed, there was no evidence of direct risks to wildlife. The recommendations address situations where evidence suggests the potential for contaminants to migrate to fish-bearing waters. The investigation of impacts from this potential migration of contaminants was beyond the scope of this preliminary assessment. This investigation found no evidence for significant contamination by PCBs, chlorinated pesticides, PAHs, phenoxy acid herbicides, and volatile organohalogens.

TABLE 1 PROJECT SUMMARY - PRELIMINARY ENVIRONMENTAL ASSESSMENT HAINES-FAIRBANKS PIPELINE

Site	Problems Detected	Risk	Recommended Action
Blanchard River Pump Station	- Hydrocarbon and inorganic element contaminated leachate from unknown source. - Hydrocarbon contaminated groundwater plume.	- Evidence for input to fish-bearing waters. - Direct input into Blanchard River.	- Full site assessment to delineate source(s), composition, extent, and migration of contaminants.
Million Dollar Falls	- Possible low level PCB contamination of campground water supply aquifer. - Elevated levels of zinc and DDT at the toe of the dump.	- Possible human and ecosystem health risk implications. - Potential migration to Takhanne River.	- Detailed confirmatory sampling and analysis. - Remediation of dump under the supervision of an experienced hazardous waste professional.
Border Pump Station	- Soil and groundwater contaminated with hydrocarbons.	- Potential for downgradient migration to Klehini River via Rainy Hollow site.	- Collate all available contaminant and geotechnical information, and provide recommendations. - Resample monitoring wells MW-8a and 8b in TH-8.
Haines Junction Pump Station	- Buried drums containing hydrocarbon products.	- Probable future release of liquid contents.	- Excavation and removal of non-empty drums under the supervision of an experienced hazardous waste professional.
Mile 207.6 Spill Site	- Extensive hydrocarbon contamination of soils.	- Past impact to vegetation has occurred; however, recovery is evident. Little, if any, potential for future risks.	- None at this site; caution is recommended in extrapolation to other spill sites.

3.3 Million Dollar Falls

a) Site Description

Million Dollar Falls is located at milepost 103 (formerly milepost 99 along the old Haines Road prior to highway improvement) above the Takhanne River. This site was a communications relay station in the early 1940s. It was also used as a highway construction camp in 1943 for the Haines Road and later as a pipeline construction camp from 1954 to 1955. The name "Million Dollar Falls" is purportedly derived from the value of US military equipment and buildings that was buried on site. The site is presently used as a recreational area and campsite (Figure 4). The falls themselves are located to the northwest of the site (Photo 3.3.1)

The original construction camp was quite large and consisted of a number of barracks, mess halls, garage/gas station facilities, and radio station buildings. In addition to the burial of equipment mentioned above, it is reported that a large amount of dumping occurred in the ravine on the west side of the site during the 1943-44 abandonment of the camp (Figure 4). All that remains from the original buildings are cement pads presently found among the sites at the Million Dollar Falls campground. A large day-use shelter and a groundwater supply well situated near the centre of the site are also located at the campground.

Surface soils at the campsite consist principally of sand and gravel; organic clay in the ravine to the west; and fine sandy silt sediments in nearby creek beds.

Vegetation in the ravine surrounding the site consisted of late successional forest dominated by white spruce (*Picea* sp.) and the occasional balsam poplar (*Populus* sp.). Understory plants consisted of willow (*Salix* sp.), a few forbs [e.g., willow-herb (*Epilobium* sp.)], grasses, and horsetail (*Equisetum* sp.) in wetter areas.

b) Site Condition

The campsite area, where the original construction site was located, had no visible evidence of debris or surface staining aside from the remaining cement pads. Much of the original vegetation at the camp was undoubtedly destroyed during previous operations. Outside of the campsite areas vegetation is beginning to re-establish in less travelled areas as indicated by the small groupings (or woodlots) of balsam poplar and willow. Other early successional plants also abound, such as willow-herb and grasses.

There were two dump areas at the base of the ravine cliff on the west side of the site, along the edge of the surrounding forest. The largest of these, roughly 30 m by 20 m, consisted of wood scraps (some burned), metal straps and cans, rubber, barrels and car parts (Photo 3.3.2). A second smaller dump is situated further to the south near the Takhanne River and contained mostly domestic refuse such as cans. Both areas drain into a small creek approximately 3 m away, which subsequently flows north for 50 m to intersect with the Takhanne River just below the falls. The remains of a small homemade salmon hatchery constructed from coolers and piping were also found along this creek, 114 m upstream (south) of the larger dump (Photo 3.3.3). A few barrels were also strewn

in the forest along the creek; one barrel was found partially buried in the creek bed, 16 m upstream (south) of its confluence with the Takhanne River (Photo 3.3.4).

c) **Subsurface Soil Conditions**

The sand-clay soils at the base of the ravine dump on the west side of the site contained charred pieces of wood; no unusual odours such as hydrocarbons, however, were detected. Surface sediments in the creek near the toe of the dump appeared to be clean and also free of any unusual discolouration or odour. A field soil vapour probe survey was conducted of soils at the surface and depth (65 cm) at the toe of the dump and in sediments of the nearby creek. No volatile organic compounds (VOCs) were detected at any of these locations.

d) **Groundwater Conditions**

Mini-piezometers were set in the soft sediments adjacent to the stream as part of the investigations in the creek valley at the toe of the debris pile. The objective was to collect porewater samples at the base of the debris pile to see if leaching from the waste was impacting the groundwater. It was possible to drive the piezometers to a deep of 1.5 m; however the soils were too fine-grained to allow the collection by suctioning of a water sample. Groundwater impacts were inferred from the surface water chemistry. Any groundwater impacted by the waste pile will discharge into the creek as this is a local flow system and the severe topography creates strong upward gradients.

e) **Contaminant Considerations**

Selected soil and water samples from the campsite well and three stations along the creek of an old river bed to the west of the site were analyzed for various contaminants. The creek stations consisted of the Upper Station, near a homemade fish hatchery; Middle Station ,at the base of a dump; and Lower Station ,near the Takhanne River. Contaminants analyzed included inorganic elements, total extractable hydrocarbons (TEHs), volatile organic compounds (VOCs), organochlorine pesticides (OCs), phenoxyacid herbicides, polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs). These results are tabulated in Appendix G. The relative positions of these sample locations are indicated in Figure 4.

Inorganic elements were analyzed in sediment/soil samples from the Upper (MD1S010), Middle (MD1S004/5) and Lower Stations (MD1S008). Concentrations of most inorganic substances were comparable to or slightly higher than the CCME Assessment Criteria, and well below the CCME R/P Soil Remediation Criteria. The only exception were concentrations of zinc at MD1S004 (269 µg/g) and MD1S005 (497 µg/g) along the toe of the dump which exceeded the CCME Assessment Criteria; the larger value of these was also comparable to the R/P Soil Remediation Criterion.

Field duplicate soil samples at toe of landfill at the Middle Station (MD1S006/007 and MD1S004/005) were analyzed for phenoxyacid herbicides, VOCs (excluding BTEX), TEHs and OCs. Concentrations of most of these analytes were below detection with exception of TEHs which ranged from <20 to 180 µg/g between the field duplicates. These values were below US Federal/State Guidelines adopted by Alaska (200 µg/g). Concentrations of most OCs analyzed in field duplicate samples MD1S006/007 were below detection with the exception of DDT and its derivative compounds (50 and 62 ng/g, respectively). The total concentrations of these compounds however were below the BC MOE Level B Criterion. Low levels of PCB Aroclor 1254 were also detected in these samples (1.7 to 2.0 ng/g) which were well below the CCME Assessment Criterion.

Water samples from the campsite well (MD1GW001/2) and surface water sampled at the Middle Station (MD1W001) were tested for PCBs, OCs, TEHs and inorganic elements. Concentrations of most analytes, including OCs and TEHs were below detection in both sample locations. A number of analytes in the suite of inorganic elements were detectable, but these concentrations were well below CCME Assessment Criteria for water. A low level of PCB Aroclor 1254 (5.6 ng/L) was detected in the water sample duplicates obtained from the campsite well, but this value was well below the CCME Assessment Criteria for water (0.1 µg/L or 100 ng/L).

6.3 Million Dollar Falls

The site at Million Dollar Falls was rated second in priority. The discovery of low level PCB contamination in the Campground water supply raises some concerns and the presence of elevated levels of zinc and DDT at the foot of the dump in the gully represents an ecosystem risk.

It is recommended that the Campground water supply be carefully sampled and analyzed. The current pumping system should be temporarily removed and replaced with an environmental sampling system. The well should be sounded, thoroughly purged and large volume water samples obtained. These samples should be very carefully screened for hydrocarbons and PCBs using GC/MS techniques and congener fingerprinting. The fingerprint should give some information about potential sources. The cost of this should not exceed approximately $10,000 to $20,000. It would also be appropriate, given the historical information on buried debris in this area, to monitor the water quality of the well on an ongoing basis.

It is also recommended that the dump in the gully be removed. There is evidence that it may be acting as a source of zinc and DDT that could migrate into waters frequented by fish and thus constitute a violation of the Fisheries Act. The remediation of the dump could probably be best accomplished by a crane/platform or winch system from the top of the gully. The clean-up should be supervised by an experienced hazardous waste professional. The cost could be in the range of $100,000 to $150,000.

6.4 Blanchard River Pump Station

This site was rated as the highest priority. There is ample evidence that the rust coloured leachate on the north side of the site is carrying high levels of inorganic elements and hydrocarbons directly to the Blanchard River. On the other side of the site, a hydrocarbon contaminated groundwater plume surfaces right at the bank of the Blanchard River.

There is, unfortunately, insufficient information from this preliminary assessment to provide credible clean up recommendations. The contaminant plumes need to be fully characterized, in terms of extent, composition and source. The ecosystem impact, especially in the marsh area below the leachate spring, should be assessed. Following this, remedial options, if necessary, can be proposed. The current operation of the site, and its contribution, if any, to contaminants loading would also need to be assessed.

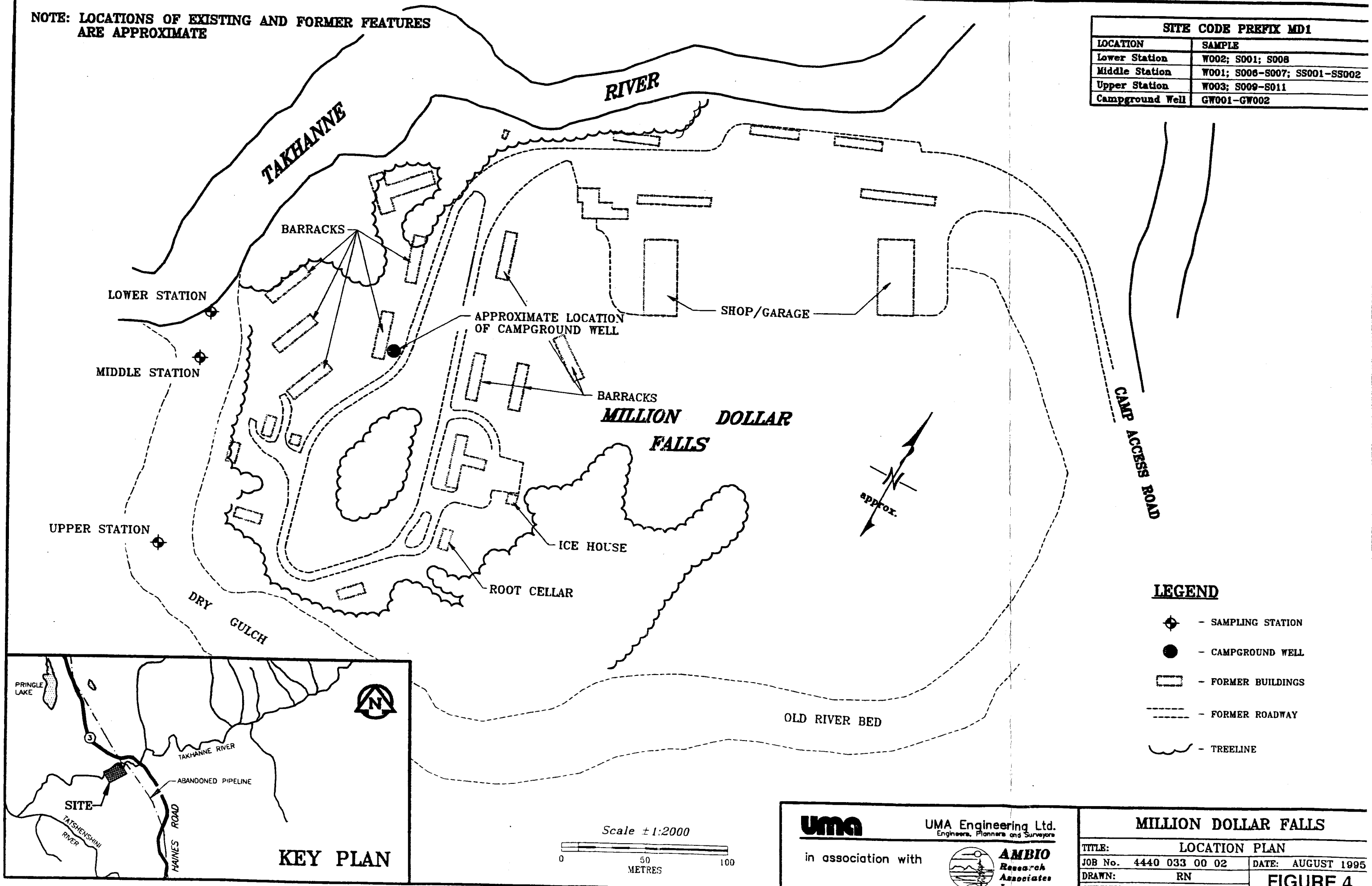
It is recommended that a full site assessment be carried out at the Blanchard River Station. A network of monitoring wells should be installed and sampled and additional test pitting should be carried out in the maintenance yard. The cost of this work including recommendations could be in the range of $100,000 - $200,000.

6.5 Border Pump Station

The Border Site was rated third in order of priority. There is evidence that a large volume of soil and groundwater is contaminated with hydrocarbons and that the contaminated groundwater may be moving towards the Klehini River under the Rainy Hollow site. It is unclear whether hydrocarbon contaminated groundwater is in fact reaching the Klehini River or whether hydrocarbons potentially reaching the river are at levels that could have an environmental impact.

NOTE: LOCATIONS OF EXISTING AND FORMER FEATURES ARE APPROXIMATE

SITE CODE PREFIX MD1	
LOCATION	SAMPLE
Lower Station	W002; S001; S008
Middle Station	W001; S006-S007; SS001-SS002
Upper Station	W003; S009-S011
Campground Well	GW001-GW002



UMA Engineering Ltd.
Engineers, Planners and Surveyors
in association with AMBIO Research Associates Inc.

MILLION DOLLAR FALLS		
TITLE:	LOCATION PLAN	
JOB No. 4440 033 00 02		DATE: AUGUST 1995
DRAWN:	RN	FIGURE 4
CHECKED:	TRW	

TABLE A.1

UMA ANALYTICAL RESULTS - ORGANICS IN WATER
ANALYTICAL DATA SUMMARY
MILLION DOLLAR FALLS

Previous Sample No.	*Matrix*	*Parameter*	*Previous Result*	*Yukon CSR Criteria (DW)*	*CCME Criteria (DW)*
MD1GW001(1)	Water	Total Ext. HC	< 100 ppb	0.01 ppm (1)	ns
		VOCs	ND	2.4 ppm (2)	ns
		Aroclor 1242	<1.2 ng/L	ns	1 ng/L
		Aroclor 1254	3.5 ng/L	ns	1 ng/L
		Aroclor 1260	<1.9 ng/L	ns	1 ng/L
MD1GW001(2)	Water	Aroclor 1242	<1.3 ng/L	ns	1 ng/L
		Aroclor 1254	7.7 ng/L	ns	1 ng/L
		Aroclor 1260	<3.6 ng/L	ns	1 ng/L
MD1GW002	Water	Total Ext. HC	< 100 ppb	0.01 ppm (1)	ns
MD1W001	Water	Total Ext. HC	< 100 ppb	0.01 ppm (1)	ns
		VOCs	ND	2.4 ppm (2)	ns
		Aroclor 1242	<1.8 ng/L	ns	1 ng/L
		Aroclor 1254	<2.6 ng/L	ns	1 ng/L
		Aroclor 1260	<1.7 ng/L	ns	1 ng/L
MD1W002	Water	VOCs	ND	2.4 ppm (2)	ns
		Aroclor 1242	<2.6 ng/L	ns	1 ng/L
		Aroclor 1254	5.6 ng/L	ns	1 ng/L
		Aroclor 1260	<2.0 ng/L	ns	1 ng/L
MD1W003	Water	Not Analyzed			
MD1W004	Water	Not Analyzed			
MD1GW001(1)	Water	DDT	ND	30 ppm (1)	30 ppm
		Herbicides	ND		
MD1GW001(2)	Water	DDT	ND	30 ppm (1)	30 ppm
		Herbicides	ND		
MD1GW002	Water	DDT	ND	0.01 ppm (2)	ns
		Herbicides	ND		
MD1W001	Water	DDT	ND	0.01 ppm (2)	ns
		Herbicides	ND		
MD1W002	Water	DDT	ND	0.01 ppm (2)	ns
		Herbicides	ND		
MD1W003	Water	Not Analyzed			
MD1W004	Water	Not Analyzed			

Notes:
MD1GW001 (1) & (2) represent field duplicates of same sample
(1) Values for benzo[a]pyrene substituted
(2) Values for BTEX in drinking water (Ethylbenzene) substituted
ns = No standards listed
ND = Not Detected within laboratory parameters
Source: UMA (1995) - Preliminary Environmental Assessment, Hains-Fairbanks Pipeline, prepared by UMA Engineering Ltd. In association with AMBIO Research Associates Inc., August 1995

TABLE A.2

UMA ANALYTICAL RESULTS - INORGANICS IN WATER
ANALYTICAL DATA SUMMARY
MILLION DOLLAR FALLS

Parameter	*MD1GW001*	*MD1GW002*	*MD1W001*	*Yukon CSR Criteria (DW)*	*Yukon CSR Criteria (AW)*	*CCME Criteria (DW/AW)*
Aluminum	0.2	0.2	0.4	0.2	0.050 (1)	na
Antimony	< 0.15	< 0.15	< 0.15	na	0.3	0.6 (3)
Arsenic	< 0.001	< 0.001	< 0.001	0.025	0.5	0.05
Barium	0.031	0.037	0.1	1	10	1
Beryllium	< 0.003	< 0.003	< 0.003	ns	0.053	ns
Boron	13.3	12.9	0.16	5	ns	5
Cadmium	< 0.0002	< 0.0002	< 0.0002	0.005	0.002 (1)	0.005
Calcium	6.9	7.74	48.1	ns	ns	ns
Chromium	0.001	< 0.001	0.001	0.05	0.02	0.05
Cobalt	< 0.001	< 0.001	< 0.001	ns	0.5	na
Copper	0.004	0.001	0.004	1	0.020 (2)	1
Iron	0.82	1.04	0.82	0.3	3	0.3 (3)
Lead	0.001	0.001	< 0.001	0.01	0.040 (2)	0.05
Magnesium	1.92	2.09	9.12	ns	ns	ns
Manganese	0.19	0.22	0.045	0.05	1	0.15 (3)
Mercury	< 0.05	< 0.05	< 0.05	0.001	0.001	0.001
Molybdenum	< 0.001	< 0.001	< 0.001	0.25	10	ns
Nickel	< 0.001	< 0.001	0.002	ns	0.250 (2)	ns
Phosporus	< 0.4	< 0.4	< 0.4	na	na	na
Potassium	2.23	2.32	2.11	ns	ns	ns
Selenium	< 0.001	< 0.001	< 0.001	0.01	0.01	0.01
Silicon	12.6	11.4	10.7	ns	ns	ns
Silver	< 0.001	< 0.001	< 0.001	na	0.001	0.05
Sodium	439	380	5.1	200	ns	ns
Strontium	0.29	0.31	0.13	ns	ns	ns
Tin	< 0.001	< 0.001	< 0.001	ns	ns	ns
Titanium	< 0.006	< 0.006	0.025	ns	ns	ns
Vanadium	< 0.01	< 0.01	< 0.01	ns	ns	ns
Zinc	0.052	0.067	< 0.01	5.0	0.3	5.0 (3)
Zirconium	< 0.015	< 0.015	< 0.015	ns	ns	ns

NOTES:
All results and critieria reported in mg/L or ppm
ns = No standards listed
< = below laboratory detection limit listed
(1) pH dependent values
(2) Hardness dependent values
(3) Taste, Aesthetic criteria, no toxicology data available
Source: UMA (1995) - Preliminary Environmental Assessment, Hains-Fairbanks Pipeline, prepared by UMA Engineering Ltd. In association with AMBIO Research Associates Inc., August 1995

TABLE A.3

UMA ANALYTICAL RESULTS - ORGANICS IN SOIL
ANALYTICAL DATA SUMMARY
MILLION DOLLAR FALLS

Previous Sample No.	*Matrix*	*Parameter*	*Previous Result*	*Yukon CSR Criteria (Soil)*	*CCME Interim Remediation Criteria (RP)*
MD1S001	Sediment		Not Analyzed		
MD1S002	Soil		Not Analyzed		
MD1S003	Soil		Not Analyzed		
MD1S004	Soil		Not Analyzed		
MD1S005	Soil		Not Analyzed		
MD1S006	Soil	Total Ext. HC	< 20 ppb	1,000	1 ug/g
		VOCs	ND (1)	200	3 ug/g
		HCB	< 0.03 ng/g	0.05	2 ug/g
		alpha HCH	< 0.016 ng/g	ns	ns
		gamma HCH	< 0.02 ng/g	ns	ns
		cis-Chlordane	< 0.04 ng/g	ns	ns
		p,p DDE	1.1 ng/g	ns	ns
		o,p DDD	NDR (0.42)	ns	ns
		p,p DDD	0.81 ng/g	ns	ns
		p,p DDT	50 ng/g	ns	ns
		Aroclor 1242	<2.4 ng/g	5 ug/g	5 ug/g
		Aroclor 1254	2 ng/g	5 ug/g	5 ug/g
		Aroclor 1260	1.3 ng/g	5 ug/g	5 ug/g
MD1S007	Soil	Total Ext. HC	180 ug/g	ns	1 ug/g
		VOCs	ND (1)	ns	3 ug/g
		HCB	2.6 ng/g	ns	2 ug/g
		alpha HCH	2.4 ng/g	ns	ns
		gamma HCH	0.26 ng/g	ns	ns
		cis-Chlordane	0.07 ng/g	ns	ns
		p,p DDE	1.3 ng/g	ns	ns
		o,p DDD	1.2 ng/g	ns	ns
		p,p DDD	4.6 ng/g	ns	ns
		p,p DDT	62 ng/g	ns	ns
		Herbicides	ND	ns	ns
		Aroclor 1242	<0.2 ng/g	5 ug/g	5 ug/g
		Aroclor 1254	1.7 ng/g	5 ug/g	5 ug/g
		Aroclor 1260	< 0.8 ng/g	5 ug/g	5 ug/g
MD1S008	Soil		Not Analyzed		
MD1S009	Soil		Not Analyzed		
MD1S0010	Soil		Not Analyzed		
MD1S0011	Soil		Not Analyzed		
MD1SS001	Soil		Not Analyzed		
MD1SS002	Soil		Not Analyzed		

Notes:
All results and critieria reported in ng/g or ppb
ns = No standards listed
< = below laboratory detection limit listed
ND = Not Detected within laboratory parameters
(1) BTEX series not Analyzed within VOCs group, standard used
(2) LEPH / HEPH standards used
NDR - Peak detected but did not meet quanitifiation criteria
Source: UMA (1995) - Preliminary Environmental Assessment, Hains-Fairbanks Pipeline, prepared by UMA Engineering Ltd. In association with AMBIO Research Associates Inc., August 1995

TABLE A.4

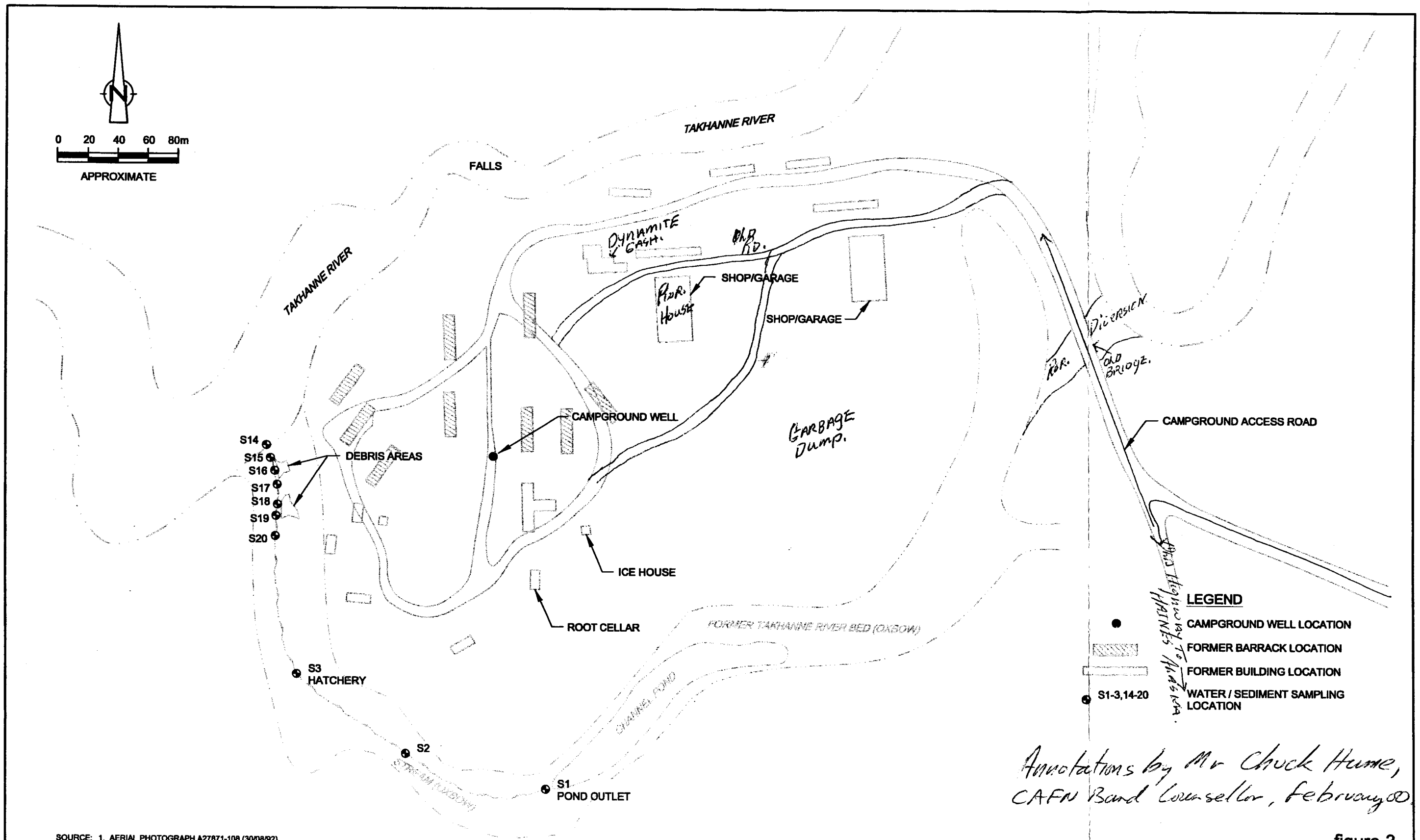
UMA ANALYTICAL RESULTS - INORGANICS IN SOIL
ANALYTICAL DATA SUMMARY
MILLION DOLLAR FALLS

Parameter	*MD1S004*	*MD1S005*	*MD1S008*	*MD1S010*	*Yukon CSR Standards (PL)*	*CCME Interim Remediation Criteria (RP)(4)*
Aluminum	18,400	16,900	15,100	20,800	ns	
Antimony	< 10	< 10	< 10	< 10	20 (1)	20
Arsenic	8.7	6.3	3.8	5.9	60 (2)	30
Barium	290	270	200	272	500 (1)	500
Beryllium	< 1	< 1	< 1	< 1	4 (1)	4
Boron	31	26	22	35	ns	ns
Cadmium	0.26	0.27	< 0.25	< 0.25	1.5 (3)	5
Calcium	15,200	84,700	11,900	20,500	ns	ns
Chromium	64	35	35	53	60 (2)	250
Cobalt	12	9	9	13	50 (1)	50
Copper	39	47	20	37	90 (3)	100
Iron	37,500	33,600	31,200	42,200	ns	ns
Lead	139	57	< 1	< 1	150 (3)	500
Magnesium	9,770	7,270	9,330	13,100	ns	ns
Manganese	1,010	1,870	856	869	ns	ns
Mercury	0.31	0.054	0.025	0.055	2 (1)	2
Molybdenum	< 4	< 4	< 4	< 4	10 (1)	10
Nickel	30	22	22	33	100 (1)	100
Phosporus	2,690	3,870	2,090	3,450	ns	ns
Potassium	ns	ns	ns	ns	ns	ns
Selenium	1.2	0.9	0.6	1.3	3 (1)	3
Silicon	ns	ns	ns	ns	ns	ns
Silver	< 2	< 2	< 2	< 2	20 (1)	20
Sodium	476	545	354	528	ns	ns
Strontium	68	120	45	69	ns	ns
Tin	< 5	6	< 5	< 5	50 (1)	50
Titanium	1,220	391	1,070	1,890	ns	ns
Vanadium	64	46	52	77	200 (1)	200
Zinc	269	497	52	73	150 (3)	500
Zirconium	ns	ns	ns	ns	ns	ns
Moisture as %	43.5	51.9	29.9	55.6	ns	ns

NOTES: Analytical results expressed in mg/g unless otherwise expressed.
(1) General Numerical Soil Standards for Parkland, expressed in mg/L unless otherwise expressed.
(2) Matrix Numerical Soil Standards for Parkland, where groundwater flow to surface used by aquatic life.
Expressed in ug/g unless otherwise indicated.
(3) Matrix Numerical Soil Standards for Parkland, where groundwater flow to surface used by aquatic life.
Standards are pH dependent beginning with value listed.
Expressed in ug/g unless otherwise indicated.
(4) Interim Environmental Quality Critieria for Contaminated Sites, Interim Remediation Criteria, March 1997
< = Less than analytical detection limit as stated by laboratory
Source: UMA (1995) - Preliminary Environmental Assessment, Hains-Fairbanks
Pipeline, prepared by UMA Engineering Ltd. In association with AMBIO Research
Associates Inc., August 1995

APPENDIX B

ANNOTATED FIGURE AND AIRPHOTO REGARDING HISTORICAL WASTE DISPOSAL PRACTICES



Annotations by Mr Chuck Hume, CAFN Band Counsellor, February 00.

SOURCE:
1. AERIAL PHOTOGRAPH A27871-108 (30/08/92) NATIONAL AIR PHOTO LIBRARY NATURAL RESOURCES CANADA
2. UMA ENGINEERING LTD. AND AMBIO RESEARCH ASSOCIATES INC. MILLION DOLLAR FALLS LOCATION PLAN DATED AUGUST 1995
3. YUKON ENGINEERING SERVICES INC. ON-SITE FIELD SURVEY ON SEPTEMBER 1999

CRA

figure 3

WATER / SEDIMENT SAMPLING LOCATIONS
MILLION DOLLAR FALLS
INAC

14048-00(002)GN-VA003 OCT 07/1999

Annotations by Mr Chuck Hume, CAFN Band counsellor
February 2020.

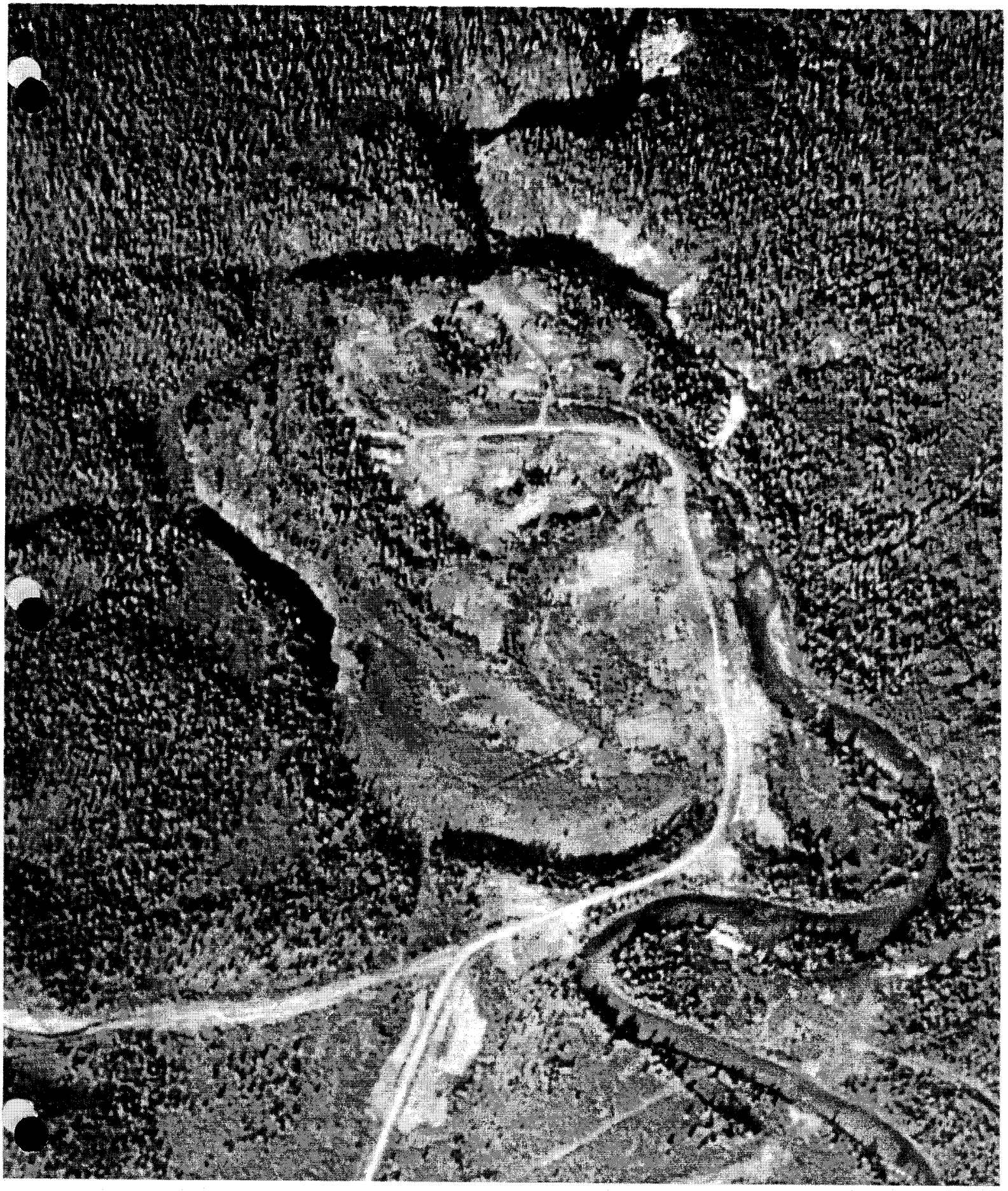
JULY 17, 1964

APPENDIX C

AIR PHOTOS

AUGUST 30, 1992

AUGUST 26, 1975



JULY 17, 1964

APPENDIX D

INSTRUMENTATION AND SAMPLING LOGS

14048
FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PAGE 1 OF 1

PROJECT NAME: Million # Falls
PROJECT NUMBER: 14048
CLIENT: INAC
LOCATION: Yukon

DRILLING CONTRACTOR:
DRILLER:
SURFACE ELEVATION:
WEATHER (A.M.): Sunny and Cloudy
(P.M.):

HOLE DESIGNATION: S4
DATE/TIME STARTED: 08/18/99
DATE/TIME COMPLETED: 08/18/99
DRILLING METHOD:
CRA SUPERVISOR:

STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION (ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) - MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS. NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).	SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
0		0.1	ML-SILT (TOPSOIL) WITH CLAY, TRACE SAND, LOW PLASTICITY, DARK BROWN, MOIST, WITH ROOTLETS AND ~~[illegible]~~ DECAYING WOOD.	GS-	12						0.9		

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING _____ DEPTH OF FIRST GROUNDWATER ENCOUNTER _____ TOPSOIL THICKNESS _____

WATER LEVEL IN OPEN BOREHOLE ON COMPLETION _____, AFTER ____ HOURS ____

COMPLETION DETAILS:

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

CRA

14048
FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PAGE 1 OF 1

PROJECT NAME: MILLION $ KAUS
PROJECT NUMBER: 14048
CLIENT: INAC
LOCATION: YUKON

DRILLING CONTRACTOR:
DRILLER:
SURFACE ELEVATION:
WEATHER (A.M.):
(P.M.): SUNNY AND CLOUDY

HOLE DESIGNATION: S-5
DATE/TIME STARTED: 9/18/99
DATE/TIME COMPLETED: 9/18/99
DRILLING METHOD:
CRA SUPERVISOR: GEOFF SINNETT

STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION (ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) - MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS. NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).	SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID/FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
0		0.1	ML - CLAYEY SILT (TOPSOIL), TRACE SAND, MEDIUM PLASTICITY, DARK BROWN, MOIST, WITH ROOTLETS AND SMALL TWIGS	GS-13							0.0		

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING: DEPTH OF FIRST GROUNDWATER ENCOUNTER: TOPSOIL THICKNESS:
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION: , AFTER HOURS
COMPLETION DETAILS:

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

CRA

14048
FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PROJECT NAME MILLION DOLLAR FALLS
PROJECT NUMBER 14048
CLIENT INAC
LOCATION YUKON

DRILLING CONTRACTOR
DRILLER
SURFACE ELEVATION
WEATHER (A.M.)
(P.M.) SUNNY, SOME CLOUDS, 10°C

HOLE DESIGNATION S6
DATE/TIME STARTED 09-18-99
DATE/TIME COMPLETED 09-18-99
DRILLING METHOD
CRA SUPERVISOR GEOFF SINNETT

STRATIGRAPHIC INTERVALS (DEPTHS IN ~~ft~~/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) – MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).	SAMPLE #	~~SAMPLING METHOD~~	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
0		0.1	ML SILT (TOPSOIL), ~~BOTH~~ PL CLAYEY, TRACE SAND, LOW PLASTICITY, DARK BROWN, MOIST, ROOTLETS, SOME DECAYING WOOD, NO DISTINCTIVE ODOURS.	GS-14							0.0		

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING _____ DEPTH OF FIRST GROUNDWATER ENCOUNTER _____ TOPSOIL THICKNESS _____
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION _____, AFTER ____ HOURS ____
COMPLETION DETAILS:

CRA

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

14048
FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PROJECT NAME: MILLION DOLLAR FALLS
PROJECT NUMBER: 14048
CLIENT: INAC
LOCATION: YUKON

DRILLING CONTRACTOR:
DRILLER:
SURFACE ELEVATION:
WEATHER (A.M.):
(P.M.):

HOLE DESIGNATION: S7
DATE/TIME STARTED: 09-18-99
DATE/TIME COMPLETED: 09-18-99
DRILLING METHOD:
CRA SUPERVISOR: GEOFF SINNETT

STRATIGRAPHIC INTERVALS (DEPTHS IN ~~ft~~/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) - MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).	SAMPLE #	~~SAMPLE LENGTH~~	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
0		0.1	ML - SILT (TOPSOIL), CLAYEY, TRACE SAND, LOW PLASTICITY, DARK BROWN, MOIST, ROOTLETS, SOME DECAYING WOOD, NO DISTINCTIVE ODOURS.	GS-15							0.0		

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING: DEPTH OF FIRST GROUNDWATER ENCOUNTER: TOPSOIL THICKNESS:
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION: , AFTER HOURS
COMPLETION DETAILS:

CRA

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

14048
FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PAGE ____ OF ____

PROJECT NAME: MILLION DOLLAR FALLS
PROJECT NUMBER: 14048
CLIENT: INAC
LOCATION: YUKON

DRILLING CONTRACTOR: ____
DRILLER: ____
SURFACE ELEVATION: ____
WEATHER (A.M.): ____
(P.M.): ____

HOLE DESIGNATION: S8
DATE/TIME STARTED: 09-18-99
DATE/TIME COMPLETED: 09-18-99
DRILLING METHOD: ____
CRA SUPERVISOR: GEORGE BINNETT

STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION (ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) - MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS. NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).	SAMPLE #	~~SAMPLE METHOD~~	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID/FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
0		0.1	ML-SILT (TOPSOIL) AND CLAY, TRACE SAND, LOW PLASTICITY, DARK BROWN, FEW ROOTLETS, V. LITTLE DECAYING WOOD, NO DISTINCTIVE ODOURS.	GS-16						0.0	0.0		

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING ____ DEPTH OF FIRST GROUNDWATER ENCOUNTER ____ TOPSOIL THICKNESS ____
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION ____, AFTER ____ HOURS ____
COMPLETION DETAILS: ____

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

CRA

14048
FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PAGE ____ OF ____

PROJECT NAME: MILLION DOLLAR FALLS
PROJECT NUMBER: 14048
CLIENT: INAC
LOCATION: YUKON

DRILLING CONTRACTOR: ____
DRILLER: ____
SURFACE ELEVATION: ____
WEATHER (A.M.): ____
(P.M.): SUNNY WITH CLOUDS

HOLE DESIGNATION: S9
DATE/TIME STARTED: ~~09~~ 09-18-99
DATE/TIME COMPLETED: 09-18-99
DRILLING METHOD: ____
CRA SUPERVISOR: GEOFF SINNETT

STRATIGRAPHIC INTERVALS (DEPTHS IN ~~mm~~ m BGS) FROM	AT	TO	SAMPLE DESCRIPTION (ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) - MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS. NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).	SAMPLE DETAILS: SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID/FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
0		0.1	ML SILT (TOPSOIL), CLAYEY, TRACE SAND, LOW PLASTICITY, DARK BROWN, MOIST, ROOTLETS AND DECAYING WOOD, NO DISTINCTIVE ODOURS.	GS-17							0.0		

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING ____ DEPTH OF FIRST GROUNDWATER ENCOUNTER ____ TOPSOIL THICKNESS ____
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION ____, AFTER ____ HOURS ____
COMPLETION DETAILS: ____

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

CRA

14048
FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PAGE ____ OF ____

PROJECT NAME: MILLION DOLLAR FALLS
PROJECT NUMBER: 14048
CLIENT: INAC
LOCATION: YUKON

DRILLING CONTRACTOR:
DRILLER:
SURFACE ELEVATION:
WEATHER (A.M.):
(P.M.): SUNNY WITH CLOUDS

HOLE DESIGNATION: S10
DATE/TIME STARTED: 09-18-99
DATE/TIME COMPLETED: 09-18-99
DRILLING METHOD:
CRA SUPERVISOR: GEDEE SINNETT

STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION (ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) – MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS. NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).)	SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
0		0.1	ML SILT (TOPSOIL) WITH CLAY, TRACE SAND, LOW PLASTICITY, DARK BROWN, MOIST, SOME ROOTLETS, V. LITTLE DECAYING WOOD, NO DISTINCTIVE ODOURS.	GS-18						0.2	0.2		

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING ____ DEPTH OF FIRST GROUNDWATER ENCOUNTER ____ TOPSOIL THICKNESS ____
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION ____, AFTER ____ HOURS ____
COMPLETION DETAILS:

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

CRA

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FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PAGE ____ OF ____

PROJECT NAME: MILLION DOLLAR FALLS
PROJECT NUMBER: 14048
CLIENT: INAC
LOCATION: YUKON

DRILLING CONTRACTOR: ____
DRILLER: ____
SURFACE ELEVATION: ____
WEATHER (A.M.): ____
(P.M.): SUNNY WITH CLOUDS

HOLE DESIGNATION: S 11
DATE/TIME STARTED: ____
DATE/TIME COMPLETED: ____
DRILLING METHOD: ____
CRA SUPERVISOR: GEOFF SINNETT

STRATIGRAPHIC INTERVALS (DEPTHS IN ~~ft~~ m BGS) FROM	AT	TO	SAMPLE DESCRIPTION (ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) – MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS. NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).	SAMPLE #	~~SAMPLING METHOD~~	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
0		0.1	ML SILT (TOPSOIL), TRACE CLAY, TRACE SAND, BLACK, MOIST, ROOTLETS, NO DISTINCTIVE ODOUR, LOAMY, LOW TO NONE PLASTICITY	GS-19							0.0		

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING ____ DEPTH OF FIRST GROUNDWATER ENCOUNTER ____ TOPSOIL THICKNESS ____
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION ____, AFTER ____ HOURS ____
COMPLETION DETAILS: ____

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

CRA

14048
FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PAGE ____ OF ____

PROJECT NAME: MILLION DOLLAR FALLS
PROJECT NUMBER: 14048
CLIENT: INAC
LOCATION: YUKON

DRILLING CONTRACTOR: ____
DRILLER: ____
SURFACE ELEVATION: ____
WEATHER (A.M.): ____
(P.M.): SUNNY WITH CLOUDS

HOLE DESIGNATION: S12
DATE/TIME STARTED: 09-18-99
DATE/TIME COMPLETED: 09-18-99
DRILLING METHOD: ____
CRA SUPERVISOR: GEOFF SINNETT

STRATIGRAPHIC INTERVALS (DEPTHS IN ~~ft~~ m BGS) FROM	AT	TO	SAMPLE DESCRIPTION: ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) – MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS. NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).	SAMPLE #	SAMPLE METHOD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
0		0.1	ML SILT (TOPSOIL), CLAYEY, DARK BROWN, MOIST, ROOTLETS, LOW PLASTICITY, NO DISTINCTIVE ODOURS	GS-20							0.0		

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING ____ DEPTH OF FIRST GROUNDWATER ENCOUNTER ____ TOPSOIL THICKNESS ____
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION ____, AFTER ____ HOURS ____
COMPLETION DETAILS: ____

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

CRA

14048
FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PAGE ____ OF ____

PROJECT NAME: MILLION DOLLAR FALLS
PROJECT NUMBER: 14048
CLIENT: INAC
LOCATION: YUKON

DRILLING CONTRACTOR:
DRILLER:
SURFACE ELEVATION:
WEATHER (A.M.):
(P.M.) SUNNY WITH CLOUDS

HOLE DESIGNATION: S 13
DATE/TIME STARTED: 09-18-99
DATE/TIME COMPLETED: 09-18-99
DRILLING METHOD:
CRA SUPERVISOR: GEOFF SINNETT

STRATIGRAPHIC INTERVALS (DEPTHS IN ~~ft~~ m BGS) FROM	AT	TO	SAMPLE DESCRIPTION (ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) – MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS. NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).	SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID/FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
0		0.1	ML SILT (TOPSOIL), WITH CLAY, TRACE SAND, LOW PLASTICITY, DARK BROWN, MOIST, ROOTLETS, V. LITTLE DECAYING WOOD MATERIAL, NO DISTINCTIVE ODOURS	GS-21						0.0			

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING ____ DEPTH OF FIRST GROUNDWATER ENCOUNTER ____ TOPSOIL THICKNESS ____
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION ____, AFTER ____ HOURS ____
COMPLETION DETAILS:

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

CRA

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FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PAGE ____ OF ____

PROJECT NAME Million Dollar Falls
PROJECT NUMBER 14048
CLIENT
LOCATION

DRILLING CONTRACTOR
DRILLER
SURFACE ELEVATION
WEATHER (A.M.)
(P.M.)

HOLE DESIGNATION S5
DATE/TIME STARTED
DATE/TIME COMPLETED
DRILLING METHOD
CRA SUPERVISOR

STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m) BGS FROM	AT	TO	SAMPLE DESCRIPTION ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) - MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).	SAMPLE DETAILS SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
0		0.1	ML Silt (Top Soil) CLAY trace Sand	GS	24										
			Low Plasticity Dark brown, moist No odour												

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING ____ DEPTH OF FIRST GROUNDWATER ENCOUNTER ____ TOPSOIL THICKNESS ____
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION ____, AFTER ____ HOURS ____
COMPLETION DETAILS:

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

CRA

14048
FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PAGE ____ OF ____

PROJECT NAME: Million Dollar Falls
PROJECT NUMBER: 14048
CLIENT:
LOCATION:

DRILLING CONTRACTOR:
DRILLER:
SURFACE ELEVATION:
WEATHER (A.M.):
(P.M.):

HOLE DESIGNATION: S7
DATE/TIME STARTED:
DATE/TIME COMPLETED:
DRILLING METHOD:
CRA SUPERVISOR:

STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION (ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) - MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS. NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).	SAMPLE #	SAMPLE LENGTH G/D	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
0		0.1	ML Silt (Top Soil) Some Clay Low plasticity Dark brown moist No Distinct colour.	G5	25										

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING ____ DEPTH OF FIRST GROUNDWATER ENCOUNTER ____ TOPSOIL THICKNESS ____
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION ____, AFTER ____ HOURS ____
COMPLETION DETAILS:

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

CRA

14048
FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PAGE ____ OF ____

PROJECT NAME Million Dollar Falls
PROJECT NUMBER 14045
CLIENT
LOCATION

DRILLING CONTRACTOR
DRILLER
SURFACE ELEVATION
WEATHER (A.M.)
(P.M.)

HOLE DESIGNATION S9
DATE/TIME STARTED
DATE/TIME COMPLETED
DRILLING METHOD
CRA SUPERVISOR

STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) - MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).	SAMPLE #	SAMPLE LENGTH	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
0		0.1	ML Silt with Clay Dark brown low plasticity	G5	26										
			oxidation noted at 7cm below surface												
			Heavy with Root letts No Odour.												

NOTES AND COMMENTS

CRA

DEPTH OF BOREHOLE CAVING ____ DEPTH OF FIRST GROUNDWATER ENCOUNTER ____ TOPSOIL THICKNESS ____
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION ____, AFTER ____ HOURS ____
COMPLETION DETAILS:

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

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FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PAGE ____ OF ____

PROJECT NAME Million Dollar Falls
PROJECT NUMBER 14048
CLIENT
LOCATION

DRILLING CONTRACTOR
DRILLER
SURFACE ELEVATION
WEATHER (A.M.)
(P.M.)

HOLE DESIGNATION S 11
DATE/TIME STARTED
DATE/TIME COMPLETED
DRILLING METHOD
CRA SUPERVISOR

STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) - MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).	SAMPLE DETAILS SAMPLE #	SAMPLE METHOD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
0		0.1	ML Silt with clay Dark brown Low Plasticity	GS	27										
			Heavy with Rootlettes No odour												

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING ____ DEPTH OF FIRST GROUNDWATER ENCOUNTER ____ TOPSOIL THICKNESS ____
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION ____, AFTER ____ HOURS ____
COMPLETION DETAILS:

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

CRA

14048
FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PAGE ___ OF ___

PROJECT NAME Million Dollar Falls
PROJECT NUMBER 14048
CLIENT
LOCATION

DRILLING CONTRACTOR
DRILLER
SURFACE ELEVATION
WEATHER (A.M.)
(P.M.)

HOLE DESIGNATION S12
DATE/TIME STARTED
DATE/TIME COMPLETED
DRILLING METHOD
CRA SUPERVISOR

STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) - MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).	SAMPLE DETAILS SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
0		0.1	ML Silt with Clay Dark brown Low Plasticity Heavy with Rootlettes No odour.	GS	28										

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING ___ DEPTH OF FIRST GROUNDWATER ENCOUNTER ___ TOPSOIL THICKNESS ___
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION ___, AFTER ___ HOURS ___
COMPLETION DETAILS:

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

CRA

14048
FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PAGE ____ OF ____

PROJECT NAME Million Dollar Falls
PROJECT NUMBER 14048
CLIENT
LOCATION

DRILLING CONTRACTOR
DRILLER
SURFACE ELEVATION
WEATHER (A.M.)
(P.M.)

HOLE DESIGNATION S13
DATE/TIME STARTED
DATE/TIME COMPLETED
DRILLING METHOD
CRA SUPERVISOR

STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) - MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).	SAMPLE #	SAMPLING	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
0		0.1	ML - Silt (Top Soil), with Clay, trace Sand Low Plasticity. Brown moist. with Rootlettes no odour	GS	29										

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING ____ DEPTH OF FIRST GROUNDWATER ENCOUNTER ____ TOPSOIL THICKNESS ____
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION ____, AFTER ____ HOURS ____
COMPLETION DETAILS:

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

CRA

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FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PAGE ____ OF ____

PROJECT NAME Million Dollar Falls
PROJECT NUMBER 14048.
CLIENT
LOCATION

DRILLING CONTRACTOR
DRILLER
SURFACE ELEVATION
WEATHER (A.M.)
(P.M.)

HOLE DESIGNATION S 21
DATE/TIME STARTED
DATE/TIME COMPLETED
DRILLING METHOD
CRA SUPERVISOR

STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) – MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).	SAMPLE DETAILS SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
0		0.1	CL - Sandy Clay with silt Low plasticity med. Brown, Moist with Rootlettes & wood chips.	GS	30										

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING ____ DEPTH OF FIRST GROUNDWATER ENCOUNTER ____ TOPSOIL THICKNESS ____
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION ____, AFTER ____ HOURS ____
COMPLETION DETAILS:

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

CRA

14048
FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PAGE ____ OF ____

PROJECT NAME Million Dollar Falls
PROJECT NUMBER 14048
CLIENT
LOCATION

DRILLING CONTRACTOR
DRILLER
SURFACE ELEVATION
WEATHER (A.M.)
(P.M.)

HOLE DESIGNATION S 22
DATE/TIME STARTED
DATE/TIME COMPLETED
DRILLING METHOD
CRA SUPERVISOR

STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) - MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).	SAMPLE DETAILS SAMPLE #	SAMPLE LENGTH/NO GD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
0		0.1	CL Clay (Top Soil) with silt, trace sand med. Plasticity Brown moist with Rootlettes.	GS	31									

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING ____ DEPTH OF FIRST GROUNDWATER ENCOUNTER ____ TOPSOIL THICKNESS ____
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION ____, AFTER ____ HOURS ____
COMPLETION DETAILS:

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

CRA

14048
FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PAGE ____ OF ____

PROJECT NAME Million Dollar Falls
PROJECT NUMBER 14048
CLIENT
LOCATION

DRILLING CONTRACTOR
DRILLER
SURFACE ELEVATION
WEATHER (A.M.)
(P.M.)

HOLE DESIGNATION S23
DATE/TIME STARTED
DATE/TIME COMPLETED
DRILLING METHOD
CRA SUPERVISOR

STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) - MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).	SAMPLE DETAILS SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
0		0.1		GS	32										

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING ____ DEPTH OF FIRST GROUNDWATER ENCOUNTER ____ TOPSOIL THICKNESS ____
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION ____, AFTER ____ HOURS ____
COMPLETION DETAILS:

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

CRA

14048
FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PAGE 1 OF 1

PROJECT NAME 14048
PROJECT NUMBER MILLION $ FALLS
CLIENT INAC
LOCATION Yukon

DRILLING CONTRACTOR
DRILLER
SURFACE ELEVATION
WEATHER (A.M.) Sunny w/ clouds
(P.M.)

HOLE DESIGNATION GS-34 (S14-Stream Sediment)
DATE/TIME STARTED
DATE/TIME COMPLETED
DRILLING METHOD
CRA SUPERVISOR

STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) - MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).	SAMPLE DETAILS SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
			SM - Sand (Stream bed) with silt, trace clay & Gravel Fine to course Grain poorly Graded brown very moist, with rootlettes & Leaves										

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING _____ DEPTH OF FIRST GROUNDWATER ENCOUNTER _____ TOPSOIL THICKNESS _____
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION _____, AFTER ____ HOURS ____
COMPLETION DETAILS:

CRA

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

14048
FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PAGE ___ OF ___

PROJECT NAME 14048
PROJECT NUMBER Million Dollar Falls
CLIENT INAC
LOCATION Yukon

DRILLING CONTRACTOR
DRILLER
SURFACE ELEVATION
WEATHER (A.M.) Sunny w. Clouds
(P.M.)

HOLE DESIGNATION GS-35 S15 stream bed
DATE/TIME STARTED
DATE/TIME COMPLETED
DRILLING METHOD
CRA SUPERVISOR

STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) - MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).	SAMPLE DETAILS SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
			SM- silty sand (stream bed deposit), with												
			Clay Fine to medium Grain, poorly Graded												
			brown very moist, with Rootlettes.												

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING ___ DEPTH OF FIRST GROUNDWATER ENCOUNTER ___ TOPSOIL THICKNESS ___
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION ___, AFTER ___ HOURS ___
COMPLETION DETAILS:

CRA

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

14048
FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PAGE ___ OF ___

PROJECT NAME 14048
PROJECT NUMBER Million Dollar Falls
CLIENT INAC
LOCATION Yukon

DRILLING CONTRACTOR
DRILLER
SURFACE ELEVATION
WEATHER (A.M.) Sunny w/ clouds
(P.M.)

HOLE DESIGNATION GS-36 S16 Streambed
DATE/TIME STARTED
DATE/TIME COMPLETED
DRILLING METHOD
CRA SUPERVISOR

STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) - MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).	SAMPLE DETAILS SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
			SM - Silty Sand (Streambed deposit), with clay, fine to medium grain, poorly graded, brown, very moist trace Rootlettes										

NOTES AND COMMENTS

CRA

DEPTH OF BOREHOLE CAVING ___ DEPTH OF FIRST GROUNDWATER ENCOUNTER ___ TOPSOIL THICKNESS ___
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION ___, AFTER ___ HOURS ___
COMPLETION DETAILS:

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

14048
FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PAGE ____ OF ____

PROJECT NAME 140418
PROJECT NUMBER Million Dollar Falls
CLIENT INAC
LOCATION Yukon

DRILLING CONTRACTOR
DRILLER
SURFACE ELEVATION
WEATHER (A.M.) Sunny with Clouds
(P.M.)

HOLE DESIGNATION GS-37 S17 stream bed
DATE/TIME STARTED
DATE/TIME COMPLETED
DRILLING METHOD
CRA SUPERVISOR

STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) - MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).	SAMPLE DETAILS SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
			SM- Sand (Streambed deposit) with silt trace												
			Clay fine to medium grained Poorly Graded												
			Brown, Very Moist trace Rootlettes												

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING ____ DEPTH OF FIRST GROUNDWATER ENCOUNTER ____ TOPSOIL THICKNESS ____
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION ____, AFTER ____ HOURS ____
COMPLETION DETAILS:

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

CRA

14048
FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PAGE ____ OF ____

PROJECT NAME 14048
PROJECT NUMBER Million Dollar Falls
CLIENT INAC
LOCATION Yukon

DRILLING CONTRACTOR
DRILLER
SURFACE ELEVATION
WEATHER (A.M.) Sunny w/ clouds.
(P.M.)

HOLE DESIGNATION GS-38 S18 Stream bed
DATE/TIME STARTED
DATE/TIME COMPLETED
DRILLING METHOD
CRA SUPERVISOR

STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) - MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).	SAMPLE DETAILS SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
			SM - Sand (stream bed deposit) with silt trace												
			clay, Fine Medium Grained, poorly Graded												
			Brown, Very moist trace twigs												

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING _____ DEPTH OF FIRST GROUNDWATER ENCOUNTER _____ TOPSOIL THICKNESS _____
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION _____, AFTER ____ HOURS ____
COMPLETION DETAILS:

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

CRA

14048
FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PAGE ____ OF ____

PROJECT NAME 14048
PROJECT NUMBER Million Dollar Falls
CLIENT INAC
LOCATION Yukon

DRILLING CONTRACTOR
DRILLER
SURFACE ELEVATION
WEATHER (A.M.) sunny with cloud
(P.M.)

HOLE DESIGNATION GS-39 S19
DATE/TIME STARTED
DATE/TIME COMPLETED
DRILLING METHOD
CRA SUPERVISOR

STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION	SAMPLE DETAILS: SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
			ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) - MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS. NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).										
			SM- Sand (Stream bed Deposit) with silt, trace clay, fine to Medium Grained Poorly Graded, brown, very moist, trace twigs										

NOTES AND COMMENTS

CRA

DEPTH OF BOREHOLE CAVING _____ DEPTH OF FIRST GROUNDWATER ENCOUNTER _____ TOPSOIL THICKNESS _____

WATER LEVEL IN OPEN BOREHOLE ON COMPLETION _____, AFTER ____ HOURS ____

COMPLETION DETAILS:

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

14048
FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PAGE ____ OF ____

PROJECT NAME 14048
PROJECT NUMBER Million Dollar Falls
CLIENT INAC
LOCATION Yukon

DRILLING CONTRACTOR
DRILLER
SURFACE ELEVATION
WEATHER (A.M.) Sunny w/ clouds
(P.M.)

HOLE DESIGNATION GS-40 S20
DATE/TIME STARTED
DATE/TIME COMPLETED
DRILLING METHOD
CRA SUPERVISOR

STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION	SAMPLE DETAILS SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
			ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) - MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS. NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).										
			SM- Sand (Streambed Deposit) with silt, trace clay, Fine to Medium Grained, Poorly Graded, brown, very moist, trace twigs Rootlettes										

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING _____ DEPTH OF FIRST GROUNDWATER ENCOUNTER _____ TOPSOIL THICKNESS _____
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION _____, AFTER ____ HOURS ____
COMPLETION DETAILS:

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

CRA

14048 FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PAGE ___ OF ___

PROJECT NAME 14048
PROJECT NUMBER Million Dollar Falls
CLIENT INAC
LOCATION Yukon

DRILLING CONTRACTOR
DRILLER
SURFACE ELEVATION
WEATHER (A.M.) Sunny w/ Clouds
(P.M.)

HOLE DESIGNATION GS-41 S 3 4m. south of Hatchery
DATE/TIME STARTED
DATE/TIME COMPLETED
DRILLING METHOD
CRA SUPERVISOR

STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) - MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).	SAMPLE DETAILS SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
			SM- Sand (Stream bed Deposit) with silt, trace clay, Fine to Medium Grained, poorly Graded, brown, very moist, trace twigs.												

NOTES AND COMMENTS

CRA

DEPTH OF BOREHOLE CAVING ___ DEPTH OF FIRST GROUNDWATER ENCOUNTER ___ TOPSOIL THICKNESS ___
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION ___, AFTER ___ HOURS ___
COMPLETION DETAILS:

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

14048
FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PAGE ____ OF ____

PROJECT NAME 140418
PROJECT NUMBER Million Dollarfalls
CLIENT INAC
LOCATION Yukon

DRILLING CONTRACTOR
DRILLER
SURFACE ELEVATION
WEATHER (A.M.) Sunny w/ Clouds
(P.M.)

HOLE DESIGNATION GS-42 52
DATE/TIME STARTED
DATE/TIME COMPLETED
DRILLING METHOD
CRA SUPERVISOR

STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION	SAMPLE DETAILS SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
			ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) – MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS. NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).										
			SM-Sand (Stream bed deposit with silt, trace clay, Fine to Medium Grained, poorly Graded, ~~[illegible]~~, Very Moist, trace Rootlettes Grey										

NOTES AND COMMENTS

DEPTH OF BOREHOLE CAVING _____ DEPTH OF FIRST GROUNDWATER ENCOUNTER _____ TOPSOIL THICKNESS _____
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION _____, AFTER ____ HOURS ____
COMPLETION DETAILS:

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

CRA

14048
FIELD FILE

STRATIGRAPHY LOG (OVERBURDEN)

PAGE ____ OF ____

PROJECT NAME 14048
PROJECT NUMBER Million Dollar Falls
CLIENT INAC
LOCATION Yukon

DRILLING CONTRACTOR
DRILLER
SURFACE ELEVATION
WEATHER (A.M.)
(P.M.) Rain

HOLE DESIGNATION GS-43 S1
DATE/TIME STARTED
DATE/TIME COMPLETED
DRILLING METHOD
CRA SUPERVISOR

STRATIGRAPHIC INTERVALS (DEPTHS IN ft/m BGS) FROM	AT	TO	SAMPLE DESCRIPTION ORDER OF DESCRIPTORS: SOIL TYPE SYMBOL(S) - MAIN COMPONENT(S), (NATURE OF DEPOSIT), SECONDARY COMPONENTS, RELATIVE DENSITY/CONSISTENCY, GRAIN SIZE/PLASTICITY, GRADATION/STRUCTURE, COLOUR, MOISTURE CONTENT, SUPPLEMENTARY DESCRIPTORS NOTE: PLASTICITY DETERMINATION REQUIRES THE ADDITION OF MOISTURE IF THE SAMPLE IS TOO DRY TO ROLL (INDICATE IF MOISTURE WAS ADDED OR NOT).	SAMPLE DETAILS SAMPLE #	SAMPLING METHOD	PENETRATION RECORD SPLIT SPOON BLOWS (RECORD N-VALUES & RECOVERIES) 6"	6"	6"	6"	SAMPLE INTERVAL	PID / FID (ppm)	CHEMICAL ANALYSIS	GRAIN SIZE
			SM-Sand (streambed deposit) with silt, trace grain fine to medium Grained, Poorly Graded, Olive Green, very moist with twigs & leaves.												

NOTES AND COMMENTS

CRA

DEPTH OF BOREHOLE CAVING ____ DEPTH OF FIRST GROUNDWATER ENCOUNTER ____ TOPSOIL THICKNESS ____
WATER LEVEL IN OPEN BOREHOLE ON COMPLETION ____, AFTER ____ HOURS ____
COMPLETION DETAILS:

NOTE: FOR EACH SPLIT-SPOON SAMPLE, RECORD BLOW COUNTS, N-VALUE, SAMPLE RECOVERY LENGTH, AND SAMPLE INTERVAL.

14048
FIELD FILE

~~MONITORING WELL RECORD FOR LOW-FLOW PURGING~~ SURFACE WATER SAMPLING (2/28/00 FAL)

Project Data:

Project Name: MILLION $ FALLS
Ref. No.: 14048

Date: 09/21/99
Personnel: G. SINNETT
P. OLIVER
J. DOLSEN

Monitoring Well Data:

Well No.: S-1 (GS-10 & GS-11 (DW))
Measurement Point:
Constructed Well Depth (ft):
Measured Well Depth (ft):
Depth of Sediment (ft):

Screen Length (ft):
Depth to Pump Intake (ft)[1]:
Well Diameter, D (in):
Well Screen Volume, V_s (mL)[2]:
Initial Depth to Water (ft):

Time	Pumping Rate (mL/min)	Depth to Water (ft)	Drawdown from Initial Water Level[3] (ft)	pH	Temperature °C	Conductivity (mS/cm)	SAL ~~ORP (mV)~~ %	DO (mg/L)	Turbidity (NTU)	Volume Purged, Vp (mL)	No. of Well Screen Volumes Purged[4]
				7.55	6.9	0.286	0.01	7.38	3		

Notes:

(1) The pump intake will be placed at the well screen mid-point or at a minimum of 2 ft above any sediment accumulated at the well bottom.

(2) The well screen volume will be based on a 5-foot screen length, $V_s = p*(D/2)^2*(5*12)*(2.54)^3$

(3) The drawdown from the initial water level should not exceed 0.3 ft.

(4) Purging will continue until stabilization is achieved or until 20 well screen volumes have been purged (unless purge water remains visually turbid and appears to be clearing, or unless stabilization parameters are varying slightly outside of the stablization criteria and appear to be stablizing), No. of Well Screen Volumes Purged= Vp/Vs.

SURFACE WATER SAMPLING

~~MONITORING WELL RECORD FOR LOW-FLOW PURGING~~

14048
FIELD FILE

Project Data:

Project Name: MILLION $ FALLS

Ref. No.: 14048

Date: 09/18/99

Personnel: GEOFF SWEET
JIM DOLSEN

Monitoring Well Data:

Well No.: S-3 (GS-08)

Measurement Point:

Constructed Well Depth (ft):

Measured Well Depth (ft):

Depth of Sediment (ft):

Screen Length (ft):

Depth to Pump Intake (ft)[1]:

Well Diameter, D (in):

Well Screen Volume, V_s (mL)[2]:

Initial Depth to Water (ft):

Time	Pumping Rate (mL/min)	Depth to Water (ft)	Drawdown from Initial Water Level[3] (ft)	pH	Temperature °C	Conductivity (mS/cm)	~~ORP (mV)~~ SAL %	DO (mg/L)	Turbidity (NTU)	Volume Purged, V_p (mL)	No. of Well Screen Volumes Purged[4]
14:04				7.75	5.3	0.284	0.01	10.81	2		

Notes:

(1) The pump intake will be placed at the well screen mid-point or at a minimum of 2 ft above any sediment accumulated at the well bottom.

(2) The well screen volume will be based on a 5-foot screen length, $V_s = p*(D/2)^2*(5*12)*(2.54)^3$

(3) The drawdown from the initial water level should not exceed 0.3 ft.

(4) Purging will continue until stabilization is achieved or until 20 well screen volumes have been purged (unless purge water remains visually turbid and appears to be clearing, or unless stabilization parameters are varying slightly outside of the stablization criteria and appear to be stablizing), No. of Well Screen Volumes Purged= Vp/Vs.

SURFACE WATER SAMPLING

~~MONITORING WELL RECORD FOR LOW-FLOW PURGING~~

14048
FIELD FILE

Project Data:

Project Name: Millcan & Falls

Ref. No.: 14048

Date: 09/18/99

Personnel: G. Sinnett, J. Dolsen

Monitoring Well Data:

Well No.: S-2 (GS-09)

Measurement Point:

Constructed Well Depth (ft):

Measured Well Depth (ft):

Depth of Sediment (ft):

Screen Length (ft):

Depth to Pump Intake (ft)[1]:

Well Diameter, D (in):

Well Screen Volume, V_s (mL)[2]:

Initial Depth to Water (ft):

Time	Pumping Rate (mL/min)	Depth to Water (ft)	Drawdown from Initial Water Level[3] (ft)	pH	Temperature °C	Conductivity (mS/cm)	~~ORP (mV)~~ SAL %	DO (mg/L)	Turbidity (NTU)	Volume Purged, V_p (mL)	No. of Well Screen Volumes Purged[4]
14:23				7.55	5.7	0.288	0.01	10.34	0		

Notes:

(1) The pump intake will be placed at the well screen mid-point or at a minimum of 2 ft above any sediment accumulated at the well bottom.

(2) The well screen volume will be based on a 5-foot screen length, $V_s = p*(D/2)^2*(5*12)*(2.54)^3$

(3) The drawdown from the initial water level should not exceed 0.3 ft.

(4) Purging will continue until stabilization is achieved or until 20 well screen volumes have been purged (unless purge water remains visually turbid and appears to be clearing, or unless stabilization parameters are varying slightly outside of the stablization criteria and appear to be stablizing), No. of Well Screen Volumes Purged= Vp/Vs.

SURFACE WATER SAMPLING

~~MONITORING WELL RECORD FOR LOW-FLOW PURGING~~

14048
FIELD FILE

Project Data:

Project Name: MILLION $ FALLS

Ref. No.: 14048

Date: 09/18/99

Personnel:

Monitoring Well Data:

Well No.: S-14 (GS-01)

Measurement Point:

Constructed Well Depth (ft):

Measured Well Depth (ft):

Depth of Sediment (ft):

Screen Length (ft):

Depth to Pump Intake (ft)[1]:

Well Diameter, D (in):

Well Screen Volume, V_s (mL)[2]:

Initial Depth to Water (ft):

Time	Pumping Rate (mL/min)	Depth to Water (ft)	Drawdown from Initial Water Level [3] (ft)	pH	Temperature °C	Conductivity (mS/cm)	~~ORP (mV)~~ SAL %	DO (mg/L)	Turbidity (NTU)	Volume Purged, V_p (mL)	No. of Well Screen Volumes Purged [4]
13:01				7.90	5.3	0.284	0.01	12.50	1		

Notes:

(1) The pump intake will be placed at the well screen mid-point or at a minimum of 2 ft above any sediment accumulated at the well bottom.

(2) The well screen volume will be based on a 5-foot screen length, $V_s = p*(D/2)^2*(5*12)*(2.54)^3$

(3) The drawdown from the initial water level should not exceed 0.3 ft.

(4) Purging will continue until stabilization is achieved or until 20 well screen volumes have been purged (unless purge water remains visually turbid and appears to be clearing, or unless stabilization parameters are varying slightly outside of the stablization criteria and appear to be stablizing), No. of Well Screen Volumes Purged= Vp/Vs.

SURFACE WATER SAMPLING

~~MONITORING WELL RECORD FOR LOW-FLOW PURGING~~

14048 FIELD FILE

Project Data:

Project Name: Million Dollar Falls

Ref. No.: 14048

Date: 09/18/99

Personnel: Jim Dolsen, Geoff Sinnett

Monitoring Well Data:

Well No.: S-15 (GS-02)

Measurement Point:

Constructed Well Depth (ft):

Measured Well Depth (ft):

Depth of Sediment (ft):

Screen Length (ft):

Depth to Pump Intake (ft)[1]:

Well Diameter, D (in):

Well Screen Volume, V_s (mL)[2]:

Initial Depth to Water (ft):

Time	Pumping Rate (mL/min)	Depth to Water (ft)	Drawdown from Initial Water Level[3] (ft)	pH	Temperature °C	Conductivity (mS/cm)	~~ORP~~ Sal (mV)	DO (mg/L)	Turbidity (NTU)	Volume Purged, Vp (mL)	No. of Well Screen Volumes Purged[4]
				7.70	5.2	0.242	0.01	11.29	3		

Notes:

(1) The pump intake will be placed at the well screen mid-point or at a minimum of 2 ft above any sediment accumulated at the well bottom.

(2) The well screen volume will be based on a 5-foot screen length, $V_s = p*(D/2)^2*(5*12)*(2.54)^3$

(3) The drawdown from the initial water level should not exceed 0.3 ft.

(4) Purging will continue until stabilization is achieved or until 20 well screen volumes have been purged (unless purge water remains visually turbid and appears to be clearing, or unless stabilization parameters are varying slightly outside of the stablization criteria and appear to be stablizing), No. of Well Screen Volumes Purged= Vp/Vs.

SURFACE WATER SAMPLING.

~~MONITORING WELL RECORD FOR LOW FLOW PURGING~~

14048 FIELD FILE

Project Data:

Project Name: Million Dollar Falls

Ref. No.: 14048

Date: 09/15/99

Personnel: Jim Dolsen, Geoff Sinnett

Monitoring Well Data:

Well No.: S-16 (GS-03)

Measurement Point:

Constructed Well Depth (ft):

Measured Well Depth (ft):

Depth of Sediment (ft):

Screen Length (ft):

Depth to Pump Intake (ft)[1]:

Well Diameter, D (in):

Well Screen Volume, V_s (mL)[2]:

Initial Depth to Water (ft):

Time	Pumping Rate (mL/min)	Depth to Water (ft)	Drawdown from Initial Water Level[3] (ft)	pH	Temperature °C	Conductivity (mS/cm)	~~ORP~~ Sal (mV)	DO (mg/L)	Turbidity (NTU)	Volume Purged, V_p (mL)	No. of Well Screen Volumes Purged[4]
1:19				7.56	5.2	.280	0.01	11.97	2		

Notes:

(1) The pump intake will be placed at the well screen mid-point or at a minimum of 2 ft above any sediment accumulated at the well bottom.

(2) The well screen volume will be based on a 5-foot screen length, $V_s = p*(D/2)^2*(5*12)*(2.54)^3$

(3) The drawdown from the initial water level should not exceed 0.3 ft.

(4) Purging will continue until stabilization is achieved or until 20 well screen volumes have been purged (unless purge water remains visually turbid and appears to be clearing, or unless stabilization parameters are varying slightly outside of the stablization criteria and appear to be stablizing), No. of Well Screen Volumes Purged= Vp/Vs.

SURFACE WATER SAMPLING

~~MONITORING WELL RECORD FOR LOW-FLOW PURGING~~

Project Data:

Project Name: Million Dollar Falls

Ref. No.: 14044

Date: 09/19/99

Personnel: Jim Dolsen, Geoff Sinnett

14048 FIELD FILE

Monitoring Well Data:

Well No.: S-17 (GS-04)

Measurement Point:

Constructed Well Depth (ft):

Measured Well Depth (ft):

Depth of Sediment (ft):

Screen Length (ft):

Depth to Pump Intake (ft)[1]:

Well Diameter, D (in):

Well Screen Volume, V_s (mL)[2]:

Initial Depth to Water (ft):

Time	Pumping Rate (mL/min)	Depth to Water (ft)	Drawdown from Initial Water Level [3] (ft)	pH	Temperature °C	Conductivity (mS/cm)	Sal. ~~ORP~~ (mV)	DO (mg/L)	Turbidity (NTU)	Volume Purged, V_p (mL)	No. of Well Screen Volumes Purged [4]
1:29				7.57	5.3	.287	0.01	11.61	1		

Notes:

(1) The pump intake will be placed at the well screen mid-point or at a minimum of 2 ft above any sediment accumulated at the well bottom.

(2) The well screen volume will be based on a 5-foot screen length, $V_s = p*(D/2)^2*(5*12)*(2.54)^3$

(3) The drawdown from the initial water level should not exceed 0.3 ft.

(4) Purging will continue until stabilization is achieved or until 20 well screen volumes have been purged (unless purge water remains visually turbid and appears to be clearing, or unless stabilization parameters are varying slightly outside of the stablization criteria and appear to be stablizing), No. of Well Screen Volumes Purged= Vp/Vs.

SURFACE WATER SAMPLING.

~~MONITORING WELL RECORD FOR LOW-FLOW PURGING~~

Project Data:

Project Name: MILLION $ FALLS

Ref. No.: 14048

Date: 09/18/99

Personnel: G. SINNOTT, JIM DOLSEN

14048 FIELD FILE

Monitoring Well Data:

Well No.: S-18 (GS-05)

Measurement Point:

Constructed Well Depth (ft):

Measured Well Depth (ft):

Depth of Sediment (ft):

Screen Length (ft):

Depth to Pump Intake (ft)[1]:

Well Diameter, D (in):

Well Screen Volume, V_s (mL)[2]:

Initial Depth to Water (ft):

Time	Pumping Rate (mL/min)	Depth to Water (ft)	Drawdown from Initial Water Level[3] (ft)	pH	Temperature °C	Conductivity (mS/cm)	~~ORP (mV)~~ SAL %	DO (mg/L)	Turbidity (NTU)	Volume Purged, Vp (mL)	No. of Well Screen Volumes Purged[4]
13:37				7.56	5.2	0.282	0.01	11.73	2		

Notes:

(1) The pump intake will be placed at the well screen mid-point or at a minimum of 2 ft above any sediment accumulated at the well bottom.

(2) The well screen volume will be based on a 5-foot screen length, $V_s = p*(D/2)^2*(5*12)*(2.54)^3$

(3) The drawdown from the initial water level should not exceed 0.3 ft.

(4) Purging will continue until stabilization is achieved or until 20 well screen volumes have been purged (unless purge water remains visually turbid and appears to be clearing, or unless stabilization parameters are varying slightly outside of the stablization criteria and appear to be stablizing), No. of Well Screen Volumes Purged= Vp/Vs.

SURFACE WATER SAMPLING

MONITORING WELL RECORD FOR LOW-FLOW PURGING

Project Data:

Project Name: Million Dollar Falls

Ref. No.: 14048

Date: 09/14/99

Personnel: Jim Dolsen, Geoff Sinnett

14048 FIELD FILE

Monitoring Well Data:

Well No.: S-14 (GS-06)

Measurement Point:

Constructed Well Depth (ft):

Measured Well Depth (ft):

Depth of Sediment (ft):

Screen Length (ft):

Depth to Pump Intake (ft)[1]:

Well Diameter, D (in):

Well Screen Volume, V_s (mL)[2]:

Initial Depth to Water (ft):

Time	Pumping Rate (mL/min)	Depth to Water (ft)	Drawdown from Initial Water Level[3] (ft)	pH	Temperature °C	Conductivity (mS/cm)	~~ORP~~ Sal (mV)	DO (mg/L)	Turbidity (NTU)	Volume Purged, V_p (mL)	No. of Well Screen Volumes Purged[4]
1:46				7.62	5.2	.282	0.01	11.59	1		

Notes:

(1) The pump intake will be placed at the well screen mid-point or at a minimum of 2 ft above any sediment accumulated at the well bottom.

(2) The well screen volume will be based on a 5-foot screen length, $V_s = p*(D/2)^2*(5*12)*(2.54)^3$

(3) The drawdown from the initial water level should not exceed 0.3 ft.

(4) Purging will continue until stabilization is achieved or until 20 well screen volumes have been purged (unless purge water remains visually turbid and appears to be clearing, or unless stabilization parameters are varying slightly outside of the stablization criteria and appear to be stablizing), No. of Well Screen Volumes Purged= Vp/Vs.

SURFACE WATER SAMPLING
~~MONITORING WELL RECORD FOR LOW-FLOW PURGING~~

Project Data:

Project Name: MILLION $ FALLS
Ref. No.: 14048

Date: 9/18/99
Personnel: GEOFF SINNETT
TIM DOLSEN

14048 FILE

Monitoring Well Data:

Well No.: S-20
Measurement Point:
Constructed Well Depth (ft):
Measured Well Depth (ft):
Depth of Sediment (ft):

SAMPLE # : GS07
~~Screen Length~~ (ft):
Depth to Pump Intake (ft)[1]:
Well Diameter, D (in):
Well Screen Volume, V_s (mL)[2]:
Initial Depth to Water (ft):

Time	Pumping Rate (mL/min)	Depth to Water (ft)	Drawdown from Initial Water Level[3] (ft)	pH	Temperature °C	Conductivity (mS/cm)	SAL ~~ORP (mV)~~ %	DO (mg/L)	Turbidity (NTU)	Volume Purged, V_p (mL)	No. of Well Screen Volumes Purged[4]
12:47				7.03	5.2	0.279	0.01	11.68	1		
3:04				7.93	5.4	.283	0.01	11.37	1		

Notes:

(1) The pump intake will be placed at the well screen mid-point or at a minimum of 2 ft above any sediment accumulated at the well bottom.

(2) The well screen volume will be based on a 5-foot screen length, $V_s = p*(D/2)^2*(5*12)*(2.54)^3$

(3) The drawdown from the initial water level should not exceed 0.3 ft.

(4) Purging will continue until stabilization is achieved or until 20 well screen volumes have been purged (unless purge water remains visually turbid and appears to be clearing, or unless stabilization parameters are varying slightly outside of the stablization criteria and appear to be stablizing), No. of Well Screen Volumes Purged= Vp/Vs.

DRUM WATER SAMPLING.

~~MONITORING WELL RECORD FOR LOW-FLOW PURGING~~

14048

Project Data:

Project Name:

Ref. No.: 14048

Date: SEPT. 19/99

Personnel: GEOFF SINNETT

Monitoring Well Data:

Well No.: DRUM

Measurement Point: LABELLED OE-30

Constructed Well Depth (ft):

Measured Well Depth (ft):

Depth of Sediment (ft):

Screen Length (ft):

Depth to Pump Intake (ft)[1]:

Well Diameter, D (in):

Well Screen Volume, V_s (mL)[2]:

Initial Depth to Water (ft):

Time	*Pumping Rate (mL/min)*	*Depth to Water (ft)*	*Drawdown from Initial Water Level[3] (ft)*	*pH*	*Temperature °C*	*Conductivity (mS/cm)*	SAL ~~ORP (mV)~~ %	*DO (mg/L)*	*Turbidity (NTU)*	*Volume Purged, V_p (mL)*	*No. of Well Screen Volumes Purged[4]*
				7.76	7.4	0.142	0.00	4.26	478		

Notes:

(1) The pump intake will be placed at the well screen mid-point or at a minimum of 2 ft above any sediment accumulated at the well bottom.

(2) The well screen volume will be based on a 5-foot screen length, $V_s = p*(D/2)^2*(5*12)*(2.54)^3$

(3) The drawdown from the initial water level should not exceed 0.3 ft.

(4) Purging will continue until stabilization is achieved or until 20 well screen volumes have been purged (unless purge water remains visually turbid and appears to be clearing, or unless stabilization parameters are varying slightly outside of the stablization criteria and appear to be stablizing), No. of Well Screen Volumes Purged= Vp/Vs.

~~MONITORING WELL RECORD FOR LOW-FLOW PURGING~~

Project Data:

Project Name: _____

Ref. No.: _____

Date: 09/21/99

Personnel: _____

14048

Monitoring Well Data:

Well No.: Campground Well

Measurement Point: Top of Riser

Constructed Well Depth (ft): _____

Measured Well Depth (ft): 14.775m BTR (HIGH MOTTLE - Pump?)

Depth of Sediment (ft): _____

Screen Length (ft): _____

Depth to Pump Intake (ft)[1]: _____

Well Diameter, D (in): 6

Well Screen Volume, V_s (mL)[2]: _____

Initial Depth to Water (~~ft~~ m): 2.55

Time	Water Quality ~~Pumping Rate (mL/min)~~	Depth to Water ~~(ft)~~ m	Drawdown from Initial Water Level[3] ~~(ft)~~ m	pH	Temperature °C	Conductivity (mS/cm)	SAL ~~ORP (mV)~~ %	DO (mg/L)	Turbidity (NTU)	Volume Purged, Vp ~~(mL)~~	No. of Well ~~Screen~~ Volumes Purged[4]
10:19	Cloudy, no odor	9.80		8.97	4.1	1.60	0.07	3.36	332	65 US Gal	1
10:50	Cloudy, no odor	9.20		9.07	3.7	1.62	0.07	2.60	275	18L	
10:53	Cloudy, no odour	9.96		9.06	3.5	1.60	0.07	2.83	281	18L	
11:20	"	9.44	9.07	~~9.44~~	3.7	1.61	0.07	2.01	270	18L	
11:20	Collected	Sample	W-14048-	092199	-6544 &	6545					

Notes:

(1) The pump intake will be placed at the well screen mid-point or at a minimum of 2 ft above any sediment accumulated at the well bottom.

(2) The well screen volume will be based on a 5-foot screen length, $V_s = p*(D/2)^2*(5*12)*(2.54)^3$

(3) The drawdown from the initial water level should not exceed 0.3 ft.

(4) Purging will continue until stabilization is achieved or until 20 well screen volumes have been purged (unless purge water remains visually turbid and appears to be clearing, or unless stabilization parameters are varying slightly outside of the stablization criteria and appear to be stablizing), No. of Well Screen Volumes Purged= Vp/Vs.

FIELD DATA RECORD FORM
MONITOR, PID, MINIRAE

(QSF-259D)

Control No.: CRA-U-07
Date: 09/18/99
User: Gregoire Sauvet

Project No.: 14048
Project Name: Phase I Investigation Million $ Falls
Location: Yukon Territory

Additional Equipment Control Numbers and Descriptions:

FIELD PROCEDURE BEFORE USE:

	Check when completed
• Unscrew and remove the probe assembly.	
• Remove the dust filter (steel wool) from the cavity in the probe using a pair of tweezers.	
• Check to ensure the probe is clean.	☐ New, did not perform.
• Replace the filter back into the probe cavity and replace the probe assembly.	
• Turn on the instrument and allow to warm up and stabilize.	
• Check battery voltage by pressing the down arrow 4 times, until display reads reads bAt X.X.	
• Check battery level and record on the space provided, recharge if below 6.0 V.	N/A V
• Check pump inlet flow using your finger to detect suction.	☑
• Perform zero gas calibration. If calibrating in unclean air attach the charcoal filter (to exclude any organic gas) to the gas inlet tube.	☑
• Press [Menu] key until "CO 0.0" is displayed on LCD.	
• Press [Enter] key to zero the instrument.	☑
• Indicate the use of the charcoal filter by filling in a check box on the side of the filter (if used).	
• Remove the zero gas charcoal filter (if used).	
• Press the [Menu] key until the display reads "Clu 100.0" (or 107.0 depending on the concentration of isobutylene used to previously calibrate the instrument).	
• If the concentration of the calibration gas to be used is the same as the displayed value, press the [Enter] key 4 times to accept the value otherwise use the arrow keys to change the digit value and [Enter] key to confirm the digit. The flashing digit will move to the next digit to its right. Repeat the process until all 4 digits are entered.	☑
• "Gas On" will be displayed on the LCD. Connect the instrument to the calibration gas cylinder.	
• Turn the cylinder on.	
• Press [Enter] key to continue the calibration procedure.	
• Press [Menu] until the instrument is in real time measurement mode.	
• Expose the instrument to calibration gas and record reading on the space provided. The reading must be within ±2 ppm of the cal gas otherwise the instrument must be recalibrated.	
• Turn the instrument off by pressing the [ON] button and then confirming by pressing [Enter].	

Filing: Field File

Signature: [signature]

FIELD DATA:

(QSF-259D)

Sample No.	Time	Location	Reading	Comments
GS-12		S4	0.9	
GS-13		S5	0.0	
GS-14		S6	0.0	
GS-15		S7	0.0	
GS-16		S8	0.0	
GS-17		S9	0.0	
GS-18		S10	0.2	
GS-19		S11	0.0	
GS-20		S12	0.0	
GS-21		S13	0.0	

Filing: Field File

Project No: 14048

Date: 09/18/99

Name (please print): Geoff Sinnott

Signature: [signature]

14048
FIELD FILE

FIELD DATA RECORD FORM
METER, PH/COND./TURB./TEMP./DO/SALINITY, HORIBA

(QSF-242D)

Control No.: CRA-V-05
Date: 09/18/99, 09/19/99 & 09/21/99
User: GEOFF SINNETT

Project No.: 14048
Project Name: PHASE I INVESTIGATION - MILLION $ FALLS
Location: YUKON TERRITORY

Additional Equipment Control Numbers and Descriptions:

FIELD PROCEDURE BEFORE USE:

	Check when completed
• Fill calibration beaker to line with the standard solution.	
• Fit the probe over the beaker, turn power on.	
• Press the MODE key to put the unit into the MAINT mode.	☑
• Use the MODE key to put the lower cursor to AUTO.	
• Press the ENT key; the readout will show CAL.	
• When the calibration is complete the readout will briefly show End and then will switch to the MEAS mode.	☑
• The instrument is ready for use.	

Note: Conductivity measured in mS/cm not µS/cm as commonly measured by pocket meters. Multiply value by 1,000 to convert to µS/cm.

Filing: Field File

Signature:

1 548
FIELD FILE

FIELD DATA:

(QSF-242D)

Test No.	Sample Location	pH	Conductivity (in mS/cm or µS/cm)	Temperature (in °C)	Turbidity (in NTU)	DO (in mg/L)	Salinity (in %)	Comments
GS-08	S-3	7.75	0.284	5.3	2	10.81	0.01	SURFACE WTR
GS-09	S-2	7.55	0.288	5.7	0	10.34	0.01	
GS-01	S-14	7.90	0.284	5.3	1	12.50	0.01	
GS-02	S-15	7.70	0.282	5.2	3	11.29	0.01	
GS-03	S-16	7.56	0.280	5.2	2	11.87	0.01	
GS-04	S-17	7.57	0.287	5.3	1	11.61	0.01	
GS-05	S-18	7.56	0.282	5.2	2	11.73	0.01	
GS-06	S-19	7.62	0.282	5.2	1	11.59	0.01	
GS-07	S-20	7.03	0.279	5.2	1	11.68	0.01	
GS-07	S-20	7.83	0.283	5.4	1	11.37	0.01	
	DRUM	7.76	0.142	7.4	478	4.26	0.00	DRUM WATER
CAMPGROUND	WELL	8.97	1.60	4.1	332	3.36	0.07	GROUNDWTR
		9.07	1.62	3.7	275	2.60	0.07	
		9.06	1.60	3.5	281	2.83	0.07	
		9.07	1.61	3.7	270	2.01	0.07	

Filing: Field File

Project No: 14048

Date: 09/18/99 – 09/21/99

Name (please print): GEOFF SINNETT

Signature:

THIS COMPLETED FORM IS A QUALITY RECORD

APPENDIX E

PHOTOGRAPHS

PHOTO No. 1: CRA conducting inspection of primary debris area

PHOTO No. 2: Drums typical of those found in debris area(s)

SITE PHOTOGRAPHS
MILLION DOLLAR FALLS INVESTIGATION
Yukon Territory

CRA

Project No 14048 (2)

PHOTO No. 3: CRA conducting visual inspection during site reconnaissance

SITE PHOTOGRAPHS
MILLION DOLLAR FALLS INVESTIGATION
Yukon Territory

CRA

PHOTO No. 4: Campground supply well is dissembled prior to inspection and sampling

SITE PHOTOGRAPHS
MILLION DOLLAR FALLS INVESTIGATION
Yukon Territory

CRA

PHOTO No. 5: Teflon bailer showing sample from campground supply well

SITE PHOTOGRAPHS
MILLION DOLLAR FALLS INVESTIGATION
Yukon Territory

CRA

APPENDIX F

SURVEY RESULTS

This file contains point coordinates extracted from new-14048-00(001)GN-VA005.dwg.
Northing, Easting and Elevation values are based on the coordinate system used in this drawing.
Original survey data was NOT tied to any meaningful coordinate system such as U.T.M. NAD27 or NAD83.
Instead, the data was rotated to match the WCS as closely as possible in 14048-00(001)GN-VA005.dwg, received from Conestoga-Rovers.
Feb. 4, 2000, Fred VanDelft, Yukon Engineering Services Inc.

Pt.#	Northing	Easting	Elevation	Descriptor
50	1049.31	958.26	502.98	SH
51	1061.84	940.12	502.63	SH
54	1095.83	934.11	502.25	SH
56	1128.55	917.15	503.83	SH
58	1158.35	907.60	504.49	SH
59	1171.43	899.03	504.30	SH
60	1191.16	920.17	504.67	SH
61	1187.29	932.62	504.53	SH
65	1203.02	960.73	504.14	SH
67	1222.78	988.91	502.33	SH
81	1241.23	1006.05	502.13	SH
82	1272.85	1013.40	502.18	SH
91	1289.17	1019.30	502.12	SH
92	1306.64	1032.31	502.09	SH
95	1314.39	1047.93	501.99	SH
98	1316.39	1078.96	501.80	SH
99	1324.41	1111.50	501.68	SH
102	1338.57	1153.36	501.72	SH
103	1332.93	1155.47	501.75	SH
100	1318.45	1113.11	501.78	SH
97	1311.26	1078.04	501.82	SH
96	1306.57	1050.46	501.85	SH
93	1296.45	1032.88	502.05	SH
90	1283.56	1025.72	502.08	SH
89	1271.04	1024.66	502.22	SH
87	1261.53	1029.01	502.54	SH
86	1250.96	1038.72	502.93	SH
85	1243.16	1046.50	503.38	SH
84	1240.49	1040.28	503.11	SH
83	1250.87	1028.15	502.58	SH
88	1253.85	1022.75	502.35	SH
80	1254.95	1017.55	502.24	SH
78	1237.72	1011.50	502.20	SH
76	1210.48	1011.95	502.24	SH
75	1187.44	1012.35	502.25	SH
71	1145.50	1013.52	502.38	SH
72	1145.63	1011.93	502.36	SH
73	1157.25	1011.05	502.29	SH
74	1187.25	1009.55	502.18	SH
77	1211.06	1009.40	502.21	SH
79	1232.09	1008.70	502.18	SH
66	1217.76	993.68	502.15	SH
64	1194.16	959.05	504.16	SH
62	1177.66	931.78	504.33	SH
63	1168.45	923.66	504.50	SH
57	1154.41	918.37	504.34	SH
55	1126.85	924.67	503.80	SH
53	1097.35	939.14	502.29	SH
52	1065.57	945.88	502.51	SH
49	1055.43	961.97	502.82	SH
48	1061.40	985.72	503.14	SH
47	1061.93	997.40	503.34	SH
70	1134.75	1012.37	502.51	SH
12	1008.68	881.26	477.82	S3
13	955.62	954.13	481.00	S2
14	932.23	1047.83	488.01	S1
15	1102.41	867.24	475.32	S20

16	1116.20	867.67	475.12	S19
17	1114.08	871.35	475.71	LP1
18	1117.07	871.32	475.57	S5
19	1120.03	871.37	475.50	S6
20	1123.05	871.41	475.38	S7
21	1124.95	870.87	475.12	LP2
22	1125.73	871.43	475.01	S8
23	1123.96	868.78	474.91	S18
24	1128.08	872.62	475.13	S9
25	1131.55	872.16	475.10	LP3
26	1130.05	873.93	475.15	TRASHP
27	1130.55	876.78	476.63	TRASHP
28	1125.84	877.31	477.50	TRASHP
29	1122.14	880.33	480.36	TRASHP
30	1119.50	881.99	483.51	TRASHP
31	1113.92	883.25	483.31	TRASHP
32	1116.47	876.36	477.77	TRASHP
33	1137.44	868.51	474.64	S17
34	1147.83	869.14	475.15	LP4S11
35	1147.96	866.12	473.82	S16
36	1150.51	868.51	475.03	S12
37	1152.49	867.56	474.93	LP5S13
38	1155.67	864.04	473.85	S15
39	1164.46	861.28	471.53	S14
40	1169.94	858.70	468.55	EDGERIV
41	1154.91	865.97	474.52	TRASHP
42	1152.00	870.97	476.28	TRASHP
43	1153.71	874.72	479.66	TRASHP
44	1146.48	876.99	479.52	TRASHP
45	1145.12	872.86	475.94	TRASHP
46	1140.77	869.68	475.03	TRASHP
68	1157.19	1013.69	502.58	WELL
69	1123.67	1013.86	502.60	DOOR
94	1343.71	1062.68	497.87	EDGERIV
101	1241.75	1125.96	501.64	A1
104	1295.99	1234.38	500.19	A2
1	1030.95	894.59	500.00	Y7973
2	1059.73	928.52	502.92	Y7974
3	996.56	966.81	498.86	Y7975
4	1048.96	949.77	502.84	Y7992
5	949.25	1048.62	497.42	Y7977
6	1025.88	1005.11	502.02	Y7976
7	1128.66	889.55	498.45	Y7969
8	1165.84	907.20	504.55	Y7963
9	1233.51	1009.53	502.19	Y5783
10	1302.44	1034.97	502.13	Y7987
11	1349.34	1213.04	501.95	Y5782

APPENDIX G

LABORATORY ANALYTICAL REPORTS

CHAIN OF CUSTODY RECORD

CRA
3011 VIKING WAY, SUITE 150
RICHMOND, BRITISH COLUMBIA V6V 1W1
(604) 214-0510

SHIPPED TO (Laboratory Name): NORWEST LABS

REFERENCE NUMBER: PD90 - PCB2 - CTEX15 - ST32 - PS1 - CLSX 8

SAMPLER'S SIGNATURE: [signature] PRINTED NAME: GEOFF SINNETT

SEQ. No.	DATE	TIME	SAMPLE No.	SAMPLE TYPE	No. OF CONTAINERS	PESTICIDES - PP1	HERBICIDES	PCBS	LEPH/HEPH	METALS - ST32	GRAIN SIZE - PS1	ORGANIC CARBON - CLSX	MS/MSD			REMARKS
✓	09/18		S-14048-091899-GS-12	SOIL	3	✓	✓	✓	✓	✓	✓	✓				
	09/18		S-14048-091899-GS-13	"	2	✓	✓	✓	✓							
	09/18		S-14048-091899-GS-14	"	1											
	09/18		S-14048-091899-GS-15	"	2				✓	✓	✓	✓				
	09/18		S-14048-091899-GS-16	"	2			✓								
	09/18		S-14048-091899-GS-17	"	2				✓							
	09/18		S-14048-091899-GS-18	"	3	✓	✓		✓	✓						
	09/18		S-14048-091899-GS-19	"	2			✓								
	09/18		S-14048-091899-GS-20	"	3	✓	✓		✓	✓	✓	✓				
	09/18		S-14048-091899-GS-21	"	2	✓	✓	✓					✓			MS/MSD ON PEST/HERB/PCBS
	09/19		S-14048-091999-GS-22	"	3	✓	✓	✓		✓	✓	✓				
	09/19		S-14048-091999-GS-23	"	3	✓	✓	✓	✓	✓	✓	✓				
	09/19		S-14048-091999-GS-24	"	2	✓	✓									
	09/19		S-14048-091999-GS-25	"	2				✓	✓						
	09/19		S-14048-091999-GS-26	"	2	✓	✓									
	09/19		S-14048-091999-GS-27	"	1											
	09/19		S-14048-091999-GS-28	"	2				✓							

TOTAL NUMBER OF CONTAINERS 37 [redacted] HEALTH/CHEMICAL HAZARDS

RELINQUISHED BY: ① [signature]	DATE: 09/22/99 TIME: 13:30	RECEIVED BY: ② J. Smith NWL-SUR. Sept 24/99	DATE: Sept 24/99 TIME: 3:30 pm.
RELINQUISHED BY: ②	DATE: TIME:	RECEIVED BY: ③	DATE: TIME:
RELINQUISHED BY: ③	DATE: TIME:	RECEIVED BY: ④	DATE: TIME:

METHOD OF SHIPMENT: WAY BILL No.

White – Fully Executed Copy
Yellow – Receiving Laboratory Copy
Pink – Shipper Copy
Goldenrod – Sampler Copy

SAMPLE TEAM: G. SINNETT, P. OLIVER

RECEIVED FOR LABORATORY BY: DATE: TIME:

1001(F)JAN.30/96(W)REV.0(F-82)

CHAIN OF CUSTODY RECORD

CRA
3011 VIKING WAY, SUITE 150
RICHMOND, BRITISH COLUMBIA V6V 1W1
(604) 214-0510

SHIPPED TO (Laboratory Name): NORWEST LABS

REFERENCE NUMBER:

SAMPLER'S SIGNATURE: G. Sinnett PRINTED NAME: GEOFF SINNETT

SEQ. No.	DATE	TIME	SAMPLE No.	SAMPLE TYPE	No. OF CONTAINERS	Pesticides OP1	Herbicides PD20	PCBs - PCB2	Lept/Hepth - GTEH5	Metals - S103	Grain Size - PSA	Organic Carbon - OL31				REMARKS
	09/19		S-14048-091999-GS-29	SOIL	2	✓	✓		✓							
	09/19		S-14048-091999-GS-30	"	2			✓		✓						
	09/19		S-14048-091999-GS-31	"	1											
	09/19		S-14048-091999-GS-32	"	2	✓	✓									
	09/20		S-14048-092099-GS-34	"	3	✓	✓	✓	✓	✓	✓	✓				
	09/20		S-14048-092099-GS-35	"	1											
	09/20		S-14048-092099-GS-36	"	3	✓	✓	✓	✓	✓	✓	✓				
	09/20		S-14048-092099-GS-37	"	1											
	09/20		S-14048-092099-GS-38	"	1	✓	✓	✓								
	09/20		S-14048-092099-GS-39	"	2				✓	✓	✓	✓				
	09/20		S-14048-092099-GS-40	"	2	✓	✓	✓	✓							
	09/20		S-14048-092099-GS-41	"	3	✓	✓			✓	✓	✓				
	09/20		S-14048-092099-GS-42	"	2				✓							
	09/20		S-14048-092099-GS-43	"	3	✓	✓	✓		✓	✓	✓				
	09/18		S-14048-091899-GS-46	"	1	✓	✓	✓								
	09/20		S-14048-092099-GS-47	"	1	✓	✓	✓								
	09/18		S-14048-091899-GS-48	"	1				✓							
			TOTAL NUMBER OF CONTAINERS		31	HEALTH/CHEMICAL HAZARDS										

RELINQUISHED BY: ① G. Sinnett	DATE: 09/22/99 TIME: 13:30	RECEIVED BY: ② J. Smith NWL-SUR	DATE: Sept 24/99 TIME: 3:30pm
RELINQUISHED BY: ②	DATE: TIME:	RECEIVED BY: ③	DATE: TIME:
RELINQUISHED BY: ③	DATE: TIME:	RECEIVED BY: ④	DATE: TIME:

METHOD OF SHIPMENT: WAY BILL No.

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Yellow —Receiving Laboratory Copy
Pink —Shipper Copy
Goldenrod —Sampler Copy

SAMPLE TEAM: G. SINNETT, P. OLIVER

RECEIVED FOR LABORATORY BY:

DATE: TIME:

1001(F)JAN.30/96(W)REV.0(F-82)

CHAIN OF CUSTODY RECORD

CRA
3011 VIKING WAY, SUITE 150
RICHMOND, BRITISH COLUMBIA V6V 1W1
(604) 214-0510

SHIPPED TO (Laboratory Name): NORWEST LABS

REFERENCE NUMBER: 14048

SAMPLER'S SIGNATURE: [signature] PRINTED NAME: GEOFF SINNETT

SEQ. No.	DATE	TIME	SAMPLE No.	SAMPLE TYPE	No. OF CONTAINERS	PESTICIDES	HERBICIDES	PCBs	LEPH/HEPH	METALS	GRAIN SIZE	ORGANIC CARBON				REMARKS
	09/20		S-14048-092099-GS-49	SOIL	1				✓							
	09/18		S-14048-091899-GS-50	"	1					✓						
	09/19		S-14048-091999-GS-51	"	1					✓						
	09/18		S-14048-091899-GS-52	"	1							✓				

TOTAL NUMBER OF CONTAINERS | HEALTH/CHEMICAL HAZARDS

RELINQUISHED BY: ① [signature]	DATE: 09/22/99 TIME: 13:30	RECEIVED BY: ② L. Smith NWL-SUR	DATE: Sept 24/99 TIME: ~~4:00~~ 3:30pm
RELINQUISHED BY: ②	DATE: TIME:	RECEIVED BY: ③	DATE: TIME:
RELINQUISHED BY: ③	DATE: TIME:	RECEIVED BY: ④	DATE: TIME:

METHOD OF SHIPMENT: WAY BILL No.

White –Fully Executed Copy
Yellow –Receiving Laboratory Copy
Pink –Shipper Copy
Goldenrod –Sampler Copy

SAMPLE TEAM: G. SINNETT, P. OLIVER

RECEIVED FOR LABORATORY BY:

DATE: TIME:

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NORWEST LABS

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

Client Code: CONERO

Name: CONESTOGA-ROVERS	Workorder: **47879**
Address: Suite 150-3011 Viking Way	WO (Other):
	PO Num:
Richmond	Project: 14048 - Soils
BC V6V 1W1	Date Sampled: Sep 18, 1999
Attn: GEOFF SINNETT	Date Received: Sep 24, 1999
Phone: (604) 214-0510	Date Reported: Oct 15, 1999
Fax: (604) 214-0525	

Rec'd CRA
OCT 21 1999

Metal Analysis

	Detection Limit	Units	47879-1 S-14048-091899-12	47879-4 S-14048-091899-GS-15	47879-7 S-14048-091899-GS-18	47879-9 S-14048-091899-GS-20
ICP Semi-Trace Scan - Metals in Soil						
Aluminum	5	µg/g	25300	25200	25200	35400
Antimony	2	µg/g	<2	<2	<2	<2
Arsenic	2	µg/g	12	10	13	8
Barium	0.05	µg/g	461	371	407	496
Beryllium	0.1	µg/g	0.1	0.2	0.3	0.3
Bismuth	5	µg/g	<5	<5	<5	<5
Cadmium	0.1	µg/g	0.5	0.6	0.7	0.7
Calcium	5	µg/g	25900	17900	20500	24400
Chromium	0.5	µg/g	55.3	58.7	60.1	73.7
Cobalt	0.1	µg/g	15	14.2	16.2	17
Copper	0.5	µg/g	53.1	36.9	47.9	46.1
Iron	1	µg/g	43000	42000	43000	50000
Lead	1	µg/g	43	8	6	7
Lithium	0.5	µg/g	20.3	15.8	17.2	19.1
Magnesium	1	µg/g	13900	13100	14000	17700
Manganese	0.5	µg/g	1460	1030	1180	1050
Mercury	0.01	µg/g	0.07	0.03	0.03	0.04
Molybdenum	1	µg/g	2	<1	2	1
Nickel	1	µg/g	31.8	29.9	35.3	36.5
Phosphorus	5	µg/g	1120	949	1120	1100
Potassium	20	µg/g	4600	4210	3840	6100
Selenium	2	µg/g	<2	<2	<2	<2
Silicon	5	µg/g	66	200	314	384
Silver	0.5	µg/g	<0.5	<0.5	<0.5	<0.5
Sodium	5	µg/g	1050	967	956	3510
Strontium	1	µg/g	62	60	59	84
Sulphur	10	µg/g	830	400	770	570
Thorium	1	µg/g	<1	<1	<1	<1
Tin	1	µg/g	2	1	1	3
Titanium	0.2	µg/g	2030	2120	2170	2670
Uranium	5	µg/g	<5	<5	<5	<5
Vanadium	1	µg/g	85	89	89	130
Zinc	0.5	µg/g	219	87.6	119	119
Zirconium	0.1	µg/g	8.7	10.9	10.1	12.4

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NORWEST LABS

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Winnipeg Ph (204) 982-8630 FAX (204) 275-6019

Client Code: CONERO

Name: CONESTOGA-ROVERS	Workorder: **47879**
Address: Suite 150-3011 Viking Way	WO (Other):
	PO Num:
Richmond	Project: 14048 - Soils
BC V6V 1W1	Date Sampled: Sep 18, 1999
Attn: GEOFF SINNETT	Date Received: Sep 24, 1999
Phone: (604) 214-0510	Date Reported: Oct 15, 1999
Fax: (604) 214-0525	

Metal Analysis (con't.)

	Detection Limit	Units	47879-11 S-14048-091899-GS-22	47879-12 S-14048-091899-GS-23	47879-14 S-14048-091899-GS-25	47879-19 S-14048-091899-GS-30
ICP Semi-Trace Scan - Metals in Soil						
Aluminum	5	µg/g	28500	28400	22600	22500
Antimony	2	µg/g	<2	<2	<2	<2
Arsenic	2	µg/g	13	7	6	<2
Barium	0.05	µg/g	441	391	325	292
Beryllium	0.1	µg/g	0.2	0.2	<0.1	0.1
Bismuth	5	µg/g	<5	<5	<5	<5
Cadmium	0.1	µg/g	0.6	0.5	0.4	0.3
Calcium	5	µg/g	22200	20300	16700	15600
Chromium	0.5	µg/g	64.8	64.2	49.6	48.7
Cobalt	0.1	µg/g	17.9	15.5	13.7	12.6
Copper	0.5	µg/g	48.9	38.8	35.6	28.5
Iron	1	µg/g	46000	46000	42000	35000
Lead	1	µg/g	15	5	4	4
Lithium	0.5	µg/g	19.1	17	14.5	12.8
Magnesium	1	µg/g	15600	15500	13300	11900
Manganese	0.5	µg/g	1480	1110	1070	872
Mercury	0.01	µg/g	0.06	0.04	<0.01	<0.01
Molybdenum	1	µg/g	2	<1	<1	<1
Nickel	1	µg/g	38.2	33.1	29.2	25.4
Phosphorus	5	µg/g	1100	1050	945	821
Potassium	20	µg/g	4910	4510	3110	3280
Selenium	2	µg/g	<2	<2	<2	<2
Silicon	5	µg/g	329	329	434	384
Silver	0.5	µg/g	<0.5	<0.5	<0.5	<0.5
Sodium	5	µg/g	1170	2630	1340	2020
Strontium	1	µg/g	62	68	48	56
Sulphur	10	µg/g	620	440	390	300
Thorium	1	µg/g	<1	<1	<1	<1
Tin	1	µg/g	<1	2	1	1
Titanium	0.2	µg/g	2360	2380	2130	2020
Uranium	5	µg/g	<5	<5	<5	<5
Vanadium	1	µg/g	94	94	73	75
Zinc	0.5	µg/g	173	93.5	77.8	64
Zirconium	0.1	µg/g	10.4	11.3	9.4	9.3

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Winnipeg Ph (204) 982-8630 FAX (204) 275-6019

Client Code: CONERO

Name: CONESTOGA-ROVERS	Workorder: **47879**
Address: Suite 150-3011 Viking Way	WO (Other):
	PO Num:
Richmond	Project: 14048 - Soils
BC V6V 1W1	Date Sampled: Sep 18, 1999
Attn: GEOFF SINNETT	Date Received: Sep 24, 1999
Phone: (604) 214-0510	Date Reported: Oct 15, 1999
Fax: (604) 214-0525	

Metal Analysis (con't.)

	Detection Limit	Units	47879-22 S-14048-091899-GS-34	47879-24 S-14048-091899-GS-36	47879-27 S-14048-091899-GS-39	47879-29 S-14048-091899-GS-41
ICP Semi-Trace Scan - Metals in Soil						
Aluminum	5	µg/g	22100	22000	15400	19200
Antimony	2	µg/g	<2	<2	<2	<2
Arsenic	2	µg/g	<2	<2	2	4
Barium	0.05	µg/g	315	287	175	255
Beryllium	0.1	µg/g	0.1	0.2	0.2	0.1
Bismuth	5	µg/g	<5	<5	<5	<5
Cadmium	0.1	µg/g	0.2	0.2	0.2	0.3
Calcium	5	µg/g	17800	16500	12000	16800
Chromium	0.5	µg/g	47	46.8	33.4	38.3
Cobalt	0.1	µg/g	11.2	11.5	9	10.5
Copper	0.5	µg/g	22.9	19.7	14.6	20
Iron	1	µg/g	33000	32000	23000	31000
Lead	1	µg/g	1	3	3	4
Lithium	0.5	µg/g	11.5	12.4	9.7	12.3
Magnesium	1	µg/g	11500	11600	8490	10900
Manganese	0.5	µg/g	1120	731	578	613
Mercury	0.01	µg/g	<0.01	<0.01	<0.01	<0.01
Molybdenum	1	µg/g	<1	<1	<1	<1
Nickel	1	µg/g	23	23.1	18.5	21.9
Phosphorus	5	µg/g	782	759	646	732
Potassium	20	µg/g	3320	3360	2100	2540
Selenium	2	µg/g	<2	<2	<2	<2
Silicon	5	µg/g	308	259	282	278
Silver	0.5	µg/g	<0.5	<0.5	<0.5	<0.5
Sodium	5	µg/g	1790	1880	1130	1050
Strontium	1	µg/g	61	59	44	51
Sulphur	10	µg/g	300	210	190	340
Thorium	1	µg/g	<1	<1	<1	<1
Tin	1	µg/g	<1	2	2	<1
Titanium	0.2	µg/g	1860	1930	1440	1680
Uranium	5	µg/g	<5	<5	<5	<5
Vanadium	1	µg/g	75	74	55	64
Zinc	0.5	µg/g	58.2	59.2	43.5	53.8
Zirconium	0.1	µg/g	8.7	8.8	7.1	8.6

na = not available

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Client Code: CONERO

Name: CONESTOGA-ROVERS	Workorder: **47879**
Address: Suite 150-3011 Viking Way	WO (Other):
	PO Num:
Richmond	Project: 14048 - Soils
BC V6V 1W1	Date Sampled: Sep 18, 1999
Attn: GEOFF SINNETT	Date Received: Sep 24, 1999
Phone: (604) 214-0510	Date Reported: Oct 15, 1999
Fax: (604) 214-0525	

Metal Analysis (con't.)

	Detection Limit	Units	47879-31 S-14048-091899-GS-43	47879-36 S-14048-091899-GS-50	47879-37 S-14048-091899-GS-51
ICP Semi-Trace Scan - Metals in Soil					
Aluminum	5	µg/g	18000	27900	24200
Antimony	2	µg/g	<2	<2	<2
Arsenic	2	µg/g	6	<2	8
Barium	0.05	µg/g	210	455	349
Beryllium	0.1	µg/g	0.2	<0.1	<0.1
Bismuth	5	µg/g	<5	<5	<5
Cadmium	0.1	µg/g	0.4	0.6	0.5
Calcium	5	µg/g	13600	23200	18500
Chromium	0.5	µg/g	40.5	59.6	54.7
Cobalt	0.1	µg/g	11.2	15.6	13.4
Copper	0.5	µg/g	26.4	47.9	32.6
Iron	1	µg/g	32000	45000	43000
Lead	1	µg/g	3	5	3
Lithium	0.5	µg/g	11.4	16.3	15
Magnesium	1	µg/g	10000	14600	13500
Manganese	0.5	µg/g	375	1270	1370
Mercury	0.01	µg/g	0.01	0.03	0.02
Molybdenum	1	µg/g	<1	<1	<1
Nickel	1	µg/g	22.5	34	28.1
Phosphorus	5	µg/g	813	1100	999
Potassium	20	µg/g	2620	4350	3980
Selenium	2	µg/g	<2	<2	<2
Silicon	5	µg/g	270	555	262
Silver	0.5	µg/g	<0.5	<0.5	<0.5
Sodium	5	µg/g	984	1020	1050
Strontium	1	µg/g	45	64	56
Sulphur	10	µg/g	580	830	400
Thorium	1	µg/g	<1	<1	<1
Tin	1	µg/g	1	1	1
Titanium	0.2	µg/g	1750	2190	2140
Uranium	5	µg/g	<5	<5	<5
Vanadium	1	µg/g	65	90	84
Zinc	0.5	µg/g	57.3	114	78.9
Zirconium	0.1	µg/g	8.6	9.1	10

Approved By: _____

John Davidson, Dipl. T., C.P.H.I. (C)
Supervisor, Inorganics Lab

Accredited By: CANADIAN ASSOCIATION FOR ENVIRONMENTALANALYTICAL LABORATORIES (CAEAL)
For specific tests registered with the Association

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NORWEST LABS

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

Client Code: CONERO

Name: CONESTOGA-ROVERS	Workorder: **47879**
Address: Suite 150-3011 Viking Way	WO (Other):
	PO Num:
Richmond	Project: 14048 - Soils
BC V6V 1W1	Date Sampled: Sep 18, 1999
Attn: GEOFF SINNETT	Date Received: Sep 24, 1999
Phone: (604) 214-0510	Date Reported: Oct 15, 1999
Fax: (604) 214-0525	

Pesticides

	Detection Limit	Units	47879-1 S-14048-091899-12	47879-2 S-14048-091899-13	47879-7 S-14048-091899-GS-18	47879-9 S-14048-091899-GS-20
Neutral Herbicides in Soil						
Ethalfluralin	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Triallate	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Trifluralin	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Organochlorine Pesticides in Soil						
Aldrin	0.05	ppm	<0.05	<0.05	<0.05	<0.05
BHC (alpha isomer)	0.05	ppm	<0.05	<0.05	<0.05	<0.05
2,4'-DDT	0.05	ppm	<0.05	<0.05	<0.05	<0.05
4,4'-DDD	0.05	ppm	<0.05	<0.05	<0.05	<0.05
4,4'-DDE	0.05	ppm	<0.05	<0.05	<0.05	<0.05
4,4'-DDT	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Chlordane-cis	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Chlordane-trans	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Chlorothalonil	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Dieldrin	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Endosulfan I	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Endosulfan II	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Endosulfan sulfate	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Endrin	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Heptachlor	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Hexachlorobenzene	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Iprodione	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Lindane	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Methoxychlor	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Mirex	0.05	ppm	<0.05	<0.05	<0.05	<0.05

na = not available

NORWEST LABS

Surrey Ph (604) 514-3322 FAX (604) 514-3323
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Lethbridge Ph (403) 329-9266 FAX (403) 327-8527
Winnipeg Ph (204) 982-8630 FAX (204) 275-6019

Client Code: CONERO

Name: CONESTOGA-ROVERS	Workorder: **47879**
Address: Suite 150-3011 Viking Way	WO (Other):
	PO Num:
Richmond	Project: 14048 - Soils
BC V6V 1W1	Date Sampled: Sep 18, 1999
Attn: GEOFF SINNETT	Date Received: Sep 24, 1999
Phone: (604) 214-0510	Date Reported: Oct 15, 1999
Fax: (604) 214-0525	

Pesticides (con't.)

	Detection Limit	Units	47879-1 S-14048-091899-12	47879-2 S-14048-091899-13	47879-7 S-14048-091899-GS-18	47879-9 S-14048-091899-GS-20
Phenoxy/Acid Herbicides in Soil						
2,4-D	0.05	ppm	<0.05	<0.05	<0.05	<0.05
2,4-DB	0.05	ppm	<0.05	<0.05	<0.05	<0.05
2,4,5-T	0.05	ppm	<0.05	<0.05	<0.05	<0.05
2,4,5-TP	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Bromoxynil	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Clopyralid	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Dicamba	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Diclofop-methyl	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Fluazifop	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Imazapyr	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Imazethapyr	0.05	ppm	<0.05	<0.05	<0.05	<0.05
MCPA	0.05	ppm	<0.05	<0.05	<0.05	<0.05
MCPB	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Mecoprop	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Picloram	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Triclopyr	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Fenoxaprop Ethyl	0.05	ppm	<0.05	<0.05	<0.05	<0.05

na = not available

NORWEST LABS

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Winnipeg Ph (204) 982-8630 FAX (204) 275-6019

Client Code: CONERO

Name: CONESTOGA-ROVERS	Workorder: **47879**
Address: Suite 150-3011 Viking Way	WO (Other):
	PO Num:
Richmond	Project: 14048 - Soils
BC V6V 1W1	Date Sampled: Sep 18, 1999
Attn: GEOFF SINNETT	Date Received: Sep 24, 1999
Phone: (604) 214-0510	Date Reported: Oct 15, 1999
Fax: (604) 214-0525	

Pesticides (con't.)

	Detection Limit	Units	47879-10 S-14048-091899-GS-21	47879-11 S-14048-091899-GS-22	47879-12 S-14048-091899-GS-23	47879-13 S-14048-091899-GS-24
Neutral Herbicides in Soil						
Ethalfluralin	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Triallate	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Trifluralin	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Organochlorine Pesticides in Soil						
Aldrin	0.05	ppm	<0.05	<0.05	<0.05	<0.05
BHC (alpha isomer)	0.05	ppm	<0.05	<0.05	<0.05	<0.05
2,4'-DDT	0.05	ppm	<0.05	<0.05	<0.05	<0.05
4,4'-DDD	0.05	ppm	<0.05	<0.05	<0.05	<0.05
4,4'-DDE	0.05	ppm	<0.05	<0.05	<0.05	<0.05
4,4'-DDT	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Chlordane-cis	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Chlordane-trans	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Chlorothalonil	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Dieldrin	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Endosulfan I	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Endosulfan II	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Endosulfan sulfate	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Endrin	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Heptachlor	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Hexachlorobenzene	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Iprodione	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Lindane	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Methoxychlor	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Mirex	0.05	ppm	<0.05	<0.05	<0.05	<0.05

na = not available

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Client Code: CONERO

Name: CONESTOGA-ROVERS	Workorder: **47879**
Address: Suite 150-3011 Viking Way	WO (Other):
	PO Num:
Richmond	Project: 14048 - Soils
BC V6V 1W1	Date Sampled: Sep 18, 1999
Attn: GEOFF SINNETT	Date Received: Sep 24, 1999
Phone: (604) 214-0510	Date Reported: Oct 15, 1999
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Pesticides (con't.)

	Detection Limit	Units	47879-10 S-14048-091899-GS-21	47879-11 S-14048-091899-GS-22	47879-12 S-14048-091899-GS-23	47879-13 S-14048-091899-GS-24
Phenoxy/Acid Herbicides in Soil						
2,4-D	0.05	ppm	<0.05	<0.05	<0.05	<0.05
2,4-DB	0.05	ppm	<0.05	<0.05	<0.05	<0.05
2,4,5-T	0.05	ppm	<0.05	<0.05	<0.05	<0.05
2,4,5-TP	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Bromoxynil	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Clopyralid	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Dicamba	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Diclofop-methyl	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Fluazifop	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Imazapyr	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Imazethapyr	0.05	ppm	<0.05	<0.05	<0.05	<0.05
MCPA	0.05	ppm	<0.05	<0.05	<0.05	<0.05
MCPB	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Mecoprop	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Picloram	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Triclopyr	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Fenoxaprop Ethyl	0.05	ppm	<0.05	<0.05	<0.05	<0.05

na = not available

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Client Code: CONERO

Name: CONESTOGA-ROVERS	Workorder: **47879**
Address: Suite 150-3011 Viking Way	WO (Other):
	PO Num:
Richmond	Project: 14048 - Soils
BC V6V 1W1	Date Sampled: Sep 18, 1999
Attn: GEOFF SINNETT	Date Received: Sep 24, 1999
Phone: (604) 214-0510	Date Reported: Oct 15, 1999
Fax: (604) 214-0525	

Pesticides (con't.)

	Detection Limit	Units	47879-15 S-14048-091899-GS-26	47879-18 S-14048-091899-GS-29	47879-21 S-14048-091899-GS-32	47879-22 S-14048-091899-GS-34
Neutral Herbicides in Soil						
Ethalfluralin	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Triallate	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Trifluralin	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Organochlorine Pesticides in Soil						
Aldrin	0.05	ppm	<0.05	<0.05	<0.05	<0.05
BHC (alpha isomer)	0.05	ppm	<0.05	<0.05	<0.05	<0.05
2,4'-DDT	0.05	ppm	<0.05	<0.05	<0.05	<0.05
4,4'-DDD	0.05	ppm	<0.05	<0.05	<0.05	<0.05
4,4'-DDE	0.05	ppm	<0.05	<0.05	<0.05	<0.05
4,4'-DDT	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Chlordane-cis	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Chlordane-trans	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Chlorothalonil	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Dieldrin	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Endosulfan I	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Endosulfan II	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Endosulfan sulfate	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Endrin	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Heptachlor	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Hexachlorobenzene	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Iprodione	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Lindane	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Methoxychlor	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Mirex	0.05	ppm	<0.05	<0.05	<0.05	<0.05

na = not available

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Client Code: CONERO

Name: CONESTOGA-ROVERS	Workorder: **47879**
Address: Suite 150-3011 Viking Way	WO (Other):
	PO Num:
Richmond	Project: 14048 - Soils
BC V6V 1W1	Date Sampled: Sep 18, 1999
Attn: GEOFF SINNETT	Date Received: Sep 24, 1999
Phone: (604) 214-0510	Date Reported: Oct 15, 1999
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Pesticides (con't.)

	Detection Limit	Units	47879-15 S-14048-091899-GS-26	47879-18 S-14048-091899-GS-29	47879-21 S-14048-091899-GS-32	47879-22 S-14048-091899-GS-34
Phenoxy/Acid Herbicides in Soil						
2,4-D	0.05	ppm	<0.05	<0.05	<0.05	<0.05
2,4-DB	0.05	ppm	<0.05	<0.05	<0.05	<0.05
2,4,5-T	0.05	ppm	<0.05	<0.05	<0.05	<0.05
2,4,5-TP	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Bromoxynil	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Clopyralid	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Dicamba	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Diclofop-methyl	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Fluazifop	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Imazapyr	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Imazethapyr	0.05	ppm	<0.05	<0.05	<0.05	<0.05
MCPA	0.05	ppm	<0.05	<0.05	<0.05	<0.05
MCPB	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Mecoprop	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Picloram	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Triclopyr	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Fenoxaprop Ethyl	0.05	ppm	<0.05	<0.05	<0.05	<0.05

Accredited By: CANADIAN ASSOCIATION FOR ENVIRONMENTALANALYTICAL LABORATORIES (CAEAL)
For specific tests registered with the Association

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Client Code: CONERO

Name: CONESTOGA-ROVERS	Workorder: **47879**
Address: Suite 150-3011 Viking Way	WO (Other):
	PO Num:
Richmond	Project: 14048 - Soils
BC V6V 1W1	Date Sampled: Sep 18, 1999
Attn: GEOFF SINNETT	Date Received: Sep 24, 1999
Phone: (604) 214-0510	Date Reported: Oct 15, 1999
Fax: (604) 214-0525	

Pesticides (con't.)

	Detection Limit	Units	47879-24 S-14048-091899-GS-36	47879-26 S-14048-091899-GS-38	47879-28 S-14048-091899-GS-40	47879-29 S-14048-091899-GS-41
Neutral Herbicides in Soil						
Ethalfluralin	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Triallate	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Trifluralin	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Organochlorine Pesticides in Soil						
Aldrin	0.05	ppm	<0.05	<0.05	<0.05	<0.05
BHC (alpha isomer)	0.05	ppm	<0.05	<0.05	<0.05	<0.05
2,4'-DDT	0.05	ppm	<0.05	<0.05	<0.05	<0.05
4,4'-DDD	0.05	ppm	<0.05	<0.05	<0.05	<0.05
4,4'-DDE	0.05	ppm	<0.05	<0.05	<0.05	<0.05
4,4'-DDT	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Chlordane-cis	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Chlordane-trans	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Chlorothalonil	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Dieldrin	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Endosulfan I	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Endosulfan II	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Endosulfan sulfate	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Endrin	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Heptachlor	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Hexachlorobenzene	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Iprodione	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Lindane	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Methoxychlor	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Mirex	0.05	ppm	<0.05	<0.05	<0.05	<0.05

na = not available

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Client Code: CONERO

Name: CONESTOGA-ROVERS	Workorder: **47879**
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Pesticides (con't.)

	Detection Limit	Units	47879-24 S-14048-091899-GS-36	47879-26 S-14048-091899-GS-38	47879-28 S-14048-091899-GS-40	47879-29 S-14048-091899-GS-41
Phenoxy/Acid Herbicides in Soil						
2,4-D	0.05	ppm	<0.05	<0.05	<0.05	<0.05
2,4-DB	0.05	ppm	<0.05	<0.05	<0.05	<0.05
2,4,5-T	0.05	ppm	<0.05	<0.05	<0.05	<0.05
2,4,5-TP	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Bromoxynil	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Clopyralid	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Dicamba	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Diclofop-methyl	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Fluazifop	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Imazapyr	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Imazethapyr	0.05	ppm	<0.05	<0.05	<0.05	<0.05
MCPA	0.05	ppm	<0.05	<0.05	<0.05	<0.05
MCPB	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Mecoprop	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Picloram	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Triclopyr	0.05	ppm	<0.05	<0.05	<0.05	<0.05
Fenoxaprop Ethyl	0.05	ppm	<0.05	<0.05	<0.05	<0.05

na = not available

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Client Code: CONERO

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Pesticides (con't.)

	Detection Limit	Units	47879-31 S-14048-091899-GS-43	47879-32 S-14048-091899-GS-46	47879-33 S-14048-091899-GS-47
Neutral Herbicides in Soil					
Ethalfluralin	0.05	ppm	<0.05	<0.05	<0.05
Triallate	0.05	ppm	<0.05	<0.05	<0.05
Trifluralin	0.05	ppm	<0.05	<0.05	<0.05
Organochlorine Pesticides in Soil					
Aldrin	0.05	ppm	<0.05	<0.05	<0.05
BHC (alpha isomer)	0.05	ppm	<0.05	<0.05	<0.05
2,4'-DDT	0.05	ppm	<0.05	<0.05	<0.05
4,4'-DDD	0.05	ppm	<0.05	<0.05	<0.05
4,4'-DDE	0.05	ppm	<0.05	<0.05	<0.05
4,4'-DDT	0.05	ppm	<0.05	<0.05	<0.05
Chlordane-cis	0.05	ppm	<0.05	<0.05	<0.05
Chlordane-trans	0.05	ppm	<0.05	<0.05	<0.05
Chlorothalonil	0.05	ppm	<0.05	<0.05	<0.05
Dieldrin	0.05	ppm	<0.05	<0.05	<0.05
Endosulfan I	0.05	ppm	<0.05	<0.05	<0.05
Endosulfan II	0.05	ppm	<0.05	<0.05	<0.05
Endosulfan sulfate	0.05	ppm	<0.05	<0.05	<0.05
Endrin	0.05	ppm	<0.05	<0.05	<0.05
Heptachlor	0.05	ppm	<0.05	<0.05	<0.05
Heptachlor epoxide	0.05	ppm	<0.05	<0.05	<0.05
Hexachlorobenzene	0.05	ppm	<0.05	<0.05	<0.05
Iprodione	0.05	ppm	<0.05	<0.05	<0.05
Lindane	0.05	ppm	<0.05	<0.05	<0.05
Methoxychlor	0.05	ppm	<0.05	<0.05	<0.05
Mirex	0.05	ppm	<0.05	<0.05	<0.05

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Client Code: CONERO

Name: CONESTOGA-ROVERS	Workorder: **47879**
Address: Suite 150-3011 Viking Way	WO (Other):
	PO Num:
Richmond	Project: 14048 - Soils
BC V6V 1W1	Date Sampled: Sep 18, 1999
Attn: GEOFF SINNETT	Date Received: Sep 24, 1999
Phone: (604) 214-0510	Date Reported: Oct 15, 1999
Fax: (604) 214-0525	

Pesticides (con't.)

	Detection Limit	Units	47879-31 S-14048-091899-GS-43	47879-32 S-14048-091899-GS-46	47879-33 S-14048-091899-GS-47
Phenoxy/Acid Herbicides in Soil					
2,4-D	0.05	ppm	<0.05	<0.05	<0.05
2,4-DB	0.05	ppm	<0.05	<0.05	<0.05
2,4,5-T	0.05	ppm	<0.05	<0.05	<0.05
2,4,5-TP	0.05	ppm	<0.05	<0.05	<0.05
Bromoxynil	0.05	ppm	<0.05	<0.05	<0.05
Clopyralid	0.05	ppm	<0.05	<0.05	<0.05
Dicamba	0.05	ppm	<0.05	<0.05	<0.05
Diclofop-methyl	0.05	ppm	<0.05	<0.05	<0.05
Fluazifop	0.05	ppm	<0.05	<0.05	<0.05
Imazapyr	0.05	ppm	<0.05	<0.05	<0.05
Imazethapyr	0.05	ppm	<0.05	<0.05	<0.05
MCPA	0.05	ppm	<0.05	<0.05	<0.05
MCPB	0.05	ppm	<0.05	<0.05	<0.05
Mecoprop	0.05	ppm	<0.05	<0.05	<0.05
Picloram	0.05	ppm	<0.05	<0.05	<0.05
Triclopyr	0.05	ppm	<0.05	<0.05	<0.05
Fenoxaprop Ethyl	0.05	ppm	<0.05	<0.05	<0.05

Approved By: _____

Ralph Hindle, B.Sc.
Supervisor, Organics Lab

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Petroleum Hydrocarbons

	Detection Limit	Units	47879-1 S-14048-091899-12	47879-2 S-14048-091899-13	47879-4 S-14048-091899-GS-15	47879-5 S-14048-091899-GS-16
EPH in Soil						
EPHs10-19	10	mg/kg	31	19	<10	na
EPHs19-32	10	mg/kg	86	28	<10	na
Moisture						
% Moisture		%	66	56	40	na
PCBs in Soil						
Total PCBs	0.1	mg/kg	<0.1	<0.1	na	<0.1

	Detection Limit	Units	47879-6 S-14048-091899-GS-17	47879-7 S-14048-091899-GS-18	47879-8 S-14048-091899-GS-19	47879-9 S-14048-091899-GS-20
EPH in Soil						
EPHs10-19	10	mg/kg	<10	10	na	<10
EPHs19-32	10	mg/kg	13	14	na	15
Moisture						
% Moisture		%	43	54	na	41
PCBs in Soil						
Total PCBs	0.1	mg/kg	na	na	<0.1	na

	Detection Limit	Units	47879-10 S-14048-091899-GS-21	47879-11 S-14048-091899-GS-22	47879-12 S-14048-091899-GS-23	47879-13 S-14048-091899-GS-24
EPH in Soil						
EPHs10-19	10	mg/kg	na	na	<10	na
EPHs19-32	10	mg/kg	na	na	<10	na
Moisture						
% Moisture		%	na	na	38	na
PCBs in Soil						
Total PCBs	0.1	mg/kg	<0.1	<0.1	<0.1	na

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Petroleum Hydrocarbons (con't.)

	Detection Limit	Units	47879-14 S-14048-091899-GS-25	47879-15 S-14048-091899-GS-26	47879-17 S-14048-091899-GS-28	47879-18 S-14048-091899-GS-29
EPH in Soil						
EPHs10-19	10	mg/kg	<10	na	<10	<10
EPHs19-32	10	mg/kg	<10	na	10	<10
Moisture						
% Moisture		%	41	na	39	43
PCBs in Soil						
Total PCBs	0.1	mg/kg	na	na	na	na

	Detection Limit	Units	47879-19 S-14048-091899-GS-30	47879-21 S-14048-091899-GS-32	47879-22 S-14048-091899-GS-34	47879-24 S-14048-091899-GS-36
EPH in Soil						
EPHs10-19	10	mg/kg	na	na	11	<10
EPHs19-32	10	mg/kg	na	na	24	<10
Moisture						
% Moisture		%	na	na	47	35
PCBs in Soil						
Total PCBs	0.1	mg/kg	<0.1	na	<0.1	<0.1

	Detection Limit	Units	47879-26 S-14048-091899-GS-38	47879-27 S-14048-091899-GS-39	47879-28 S-14048-091899-GS-40	47879-29 S-14048-091899-GS-41
EPH in Soil						
EPHs10-19	10	mg/kg	na	<10	<10	na
EPHs19-32	10	mg/kg	na	<10	<10	na
Moisture						
% Moisture		%	na	25	29	na
PCBs in Soil						
Total PCBs	0.1	mg/kg	<0.1	na	<0.1	na

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Petroleum Hydrocarbons (con't.)

	Detection Limit	Units	47879-30 S-14048-091899-GS-42	47879-31 S-14048-091899-GS-43	47879-32 S-14048-091899-GS-46	47879-33 S-14048-091899-GS-47
EPH in Soil						
EPHs10-19	10	mg/kg	<10	na	na	na
EPHs19-32	10	mg/kg	<10	na	na	na
Moisture						
% Moisture		%	26	na	na	na
PCBs in Soil						
Total PCBs	0.1	mg/kg	na	<0.1	<0.1	<0.1

	Detection Limit	Units	47879-34 S-14048-091899-GS-48	47879-35 S-14048-091899-GS-49	47879-36 S-14048-091899-GS-50	47879-37 S-14048-091899-GS-51
EPH in Soil						
EPHs10-19	10	mg/kg	<10	<10	na	na
EPHs19-32	10	mg/kg	<10	<10	na	na
Moisture						
% Moisture		%	37	30	na	na
PCBs in Soil						
Total PCBs	0.1	mg/kg	na	na	na	na

Approved By: _____
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Supervisor, Organics Lab

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Soil Analysis

	Detection Limit	Units	47879-1 S-14048-091899-12	47879-2 S-14048-091899-13	47879-4 S-14048-091899-GS-15	47879-5 S-14048-091899-GS-16
Organic Matter						
% Organic Matter	0.05	%	39.1	na	5.5	na
Particle Size Analysis by Hydrometer						
% Sand	0.1	%	31.8	na	33.5	na
% Silt	0.1	%	48.7	na	49.4	na
% Clay	0.1	%	19.5	na	17	na
Texture			Loam	na	Loam	na
pH in Soil (1:2 water)						
pH	0.01	pH	7.4	na	7.9	na
Total Organic Carbon in Soil						
Total Organic Carbon	0.05	%	22	na	3.11	na

	Detection Limit	Units	47879-6 S-14048-091899-GS-17	47879-7 S-14048-091899-GS-18	47879-8 S-14048-091899-GS-19	47879-9 S-14048-091899-GS-20
Organic Matter						
% Organic Matter	0.05	%	na	na	na	15.4
Particle Size Analysis by Hydrometer						
% Sand	0.1	%	na	na	na	22.5
% Silt	0.1	%	na	na	na	63.9
% Clay	0.1	%	na	na	na	13.6
Texture			na	na	na	Silt Loam
pH in Soil (1:2 water)						
pH	0.01	pH	na	8	na	8.1
Total Organic Carbon in Soil						
Total Organic Carbon	0.05	%	na	na	na	8.64

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Soil Analysis (con't.)

	Detection Limit	Units	47879-10 S-14048-091899-GS-21	47879-11 S-14048-091899-GS-22	47879-12 S-14048-091899-GS-23	47879-13 S-14048-091899-GS-24
Organic Matter						
% Organic Matter	0.05	%	na	24.8	7.7	na
Particle Size Analysis by Hydrometer						
% Sand	0.1	%	na	21.1	34.6	na
% Silt	0.1	%	na	58.8	52.9	na
% Clay	0.1	%	na	20.1	12.6	na
Texture			na	Silt Loam	Silt Loam	na
pH in Soil (1:2 water)						
pH	0.01	pH	na	7.7	7.8	na
Total Organic Carbon in Soil						
Total Organic Carbon	0.05	%	na	14	4.31	na

	Detection Limit	Units	47879-14 S-14048-091899-GS-25	47879-15 S-14048-091899-GS-26	47879-17 S-14048-091899-GS-28	47879-18 S-14048-091899-GS-29
Organic Matter						
% Organic Matter	0.05	%	na	na	na	na
Particle Size Analysis by Hydrometer						
% Sand	0.1	%	na	na	na	na
% Silt	0.1	%	na	na	na	na
% Clay	0.1	%	na	na	na	na
Texture			na	na	na	na
pH in Soil (1:2 water)						
pH	0.01	pH	8	na	na	na
Total Organic Carbon in Soil						
Total Organic Carbon	0.05	%	na	na	na	na

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Soil Analysis (con't.)

	Detection Limit	Units	47879-19 S-14048-091899-GS-30	47879-21 S-14048-091899-GS-32	47879-22 S-14048-091899-GS-34	47879-24 S-14048-091899-GS-36
Organic Matter						
% Organic Matter	0.05	%	na	na	2.2	0.45
Particle Size Analysis by Hydrometer						
% Sand	0.1	%	na	na	73.4	72.5
% Silt	0.1	%	na	na	21	20.9
% Clay	0.1	%	na	na	5.6	6.6
Texture			na	na	Sandy Loam	Sandy Loam
pH in Soil (1:2 water)						
pH	0.01	pH	7.8	na	7.9	8
Total Organic Carbon in Soil						
Total Organic Carbon	0.05	%	na	na	1.26	0.252

	Detection Limit	Units	47879-26 S-14048-091899-GS-38	47879-27 S-14048-091899-GS-39	47879-28 S-14048-091899-GS-40	47879-29 S-14048-091899-GS-41
Organic Matter						
% Organic Matter	0.05	%	na	0.47	na	0.42
Particle Size Analysis by Hydrometer						
% Sand	0.1	%	na	81.6	na	90.4
% Silt	0.1	%	na	10.9	na	4
% Clay	0.1	%	na	7.5	na	5.6
Texture			na	Loamy Sand	na	Sand
pH in Soil (1:2 water)						
pH	0.01	pH	na	8	na	8.2
Total Organic Carbon in Soil						
Total Organic Carbon	0.05	%	na	0.264	na	0.236

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Soil Analysis (con't.)

	Detection Limit	Units	47879-30 S-14048-091899-GS-42	47879-31 S-14048-091899-GS-43	47879-32 S-14048-091899-GS-46	47879-33 S-14048-091899-GS-47
Organic Matter						
% Organic Matter	0.05	%	na	2.3	na	na
Particle Size Analysis by Hydrometer						
% Sand	0.1	%	na	73.5	na	na
% Silt	0.1	%	na	19.9	na	na
% Clay	0.1	%	na	6.6	na	na
Texture			na	Sandy Loam	na	na
pH in Soil (1:2 water)						
pH	0.01	pH	na	7.2	na	na
Total Organic Carbon in Soil						
Total Organic Carbon	0.05	%	na	1.28	na	na

	Detection Limit	Units	47879-34 S-14048-091899-GS-48	47879-35 S-14048-091899-GS-49	47879-36 S-14048-091899-GS-50	47879-37 S-14048-091899-GS-51
Organic Matter						
% Organic Matter	0.05	%	na	na	na	na
Particle Size Analysis by Hydrometer						
% Sand	0.1	%	na	na	na	na
% Silt	0.1	%	na	na	na	na
% Clay	0.1	%	na	na	na	na
Texture			na	na	na	na
pH in Soil (1:2 water)						
pH	0.01	pH	na	na	7.2	7.9
Total Organic Carbon in Soil						
Total Organic Carbon	0.05	%	na	na	na	na

na = not available

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Soil Analysis (con't.)

	Detection Limit	Units	47879-38 S-14048-091899-GS-52
Organic Matter			
% Organic Matter	0.05	%	9.3
Particle Size Analysis by Hydrometer			
% Sand	0.1	%	na
% Silt	0.1	%	na
% Clay	0.1	%	na
Texture			na
pH in Soil (1:2 water)			
pH	0.01	pH	na
Total Organic Carbon in Soil			
Total Organic Carbon	0.05	%	5.2

Approved By: _____

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Supervisor, Inorganics Lab

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Soil Analysis (con't.)

	Detection Limit	Units	47879-1 S-14048-091899-12	47879-9 S-14048-091899-GS-20	47879-11 S-14048-091899-GS-22	47879-12 S-14048-091899-GS-23
Custom Sieve						
4.76 mm Sieve	0.1	% RET'D	<0.1	<0.1	<0.1	<0.1
2.00 mm Sieve	0.1	% RET'D	<0.1	<0.1	<0.1	<0.1
0.42 mm Sieve	0.1	% RET'D	27.8	21.3	27.8	11.4
0.25 mm Sieve	0.1	% RET'D	16.5	11.4	15.6	8.13
0.106 mm Sieve	0.1	% RET'D	20	13.6	19	22
0.074 mm Sieve	0.1	% RET'D	6.91	12.6	12.9	18.7

	Detection Limit	Units	47879-22 S-14048-091899-GS-34	47879-24 S-14048-091899-GS-36	47879-29 S-14048-091899-GS-41
Custom Sieve					
4.76 mm Sieve	0.1	% RET'D	<0.1	<0.1	<0.1
2.00 mm Sieve	0.1	% RET'D	<0.1	<0.1	<0.1
0.42 mm Sieve	0.1	% RET'D	11.6	4.37	13
0.25 mm Sieve	0.1	% RET'D	17.9	10.3	33.2
0.106 mm Sieve	0.1	% RET'D	35.4	45.9	44.1
0.074 mm Sieve	0.1	% RET'D	16.9	19.5	6

Approved By: _____

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CHAIN OF CUSTODY RECORD

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3011 VIKING WAY, SUITE 150
RICHMOND, BRITISH COLUMBIA V6V 1W1
(604) 214-0510

SHIPPED TO (Laboratory Name): NORWEST LABS

REFERENCE NUMBER: 14048

SAMPLER'S SIGNATURE: [signature] PRINTED NAME: GEOFF SINNETT

SEQ. No.	DATE	TIME	SAMPLE No.	SAMPLE TYPE	No. OF CONTAINERS	PESTICIDES (PP2)	HERBICIDES (0030)	PCBS (PCB33)	LEPH/HEPH (CTEH4)	HARDNESS	TSS	TDS	MS/MSD			REMARKS
✓	09/18		W-14048-091899-GS01	WATER	5	✓	✓	✓	✓	✓	✓	✓				
	09/18		W-14048-091899-GS-02	"	5	—	—	—	HOLD				—	—	—	
✓	09/18		W-14048-091899-GS-03	"	5	✓	✓	✓	✓	✓	✓	✓				
	09/18		W-14048-091899-GS-04	"	5	—	—	—	HOLD				—	—	—	
✓	09/18		W-14048-091899-GS-05	"	5	✓	✓	✓	✓	✓	✓	✓				
	09/18		W-14048-091899-GS-06	"	5	—	—	—	HOLD				—	—	—	
✓	09/18		W-14048-091899-GS-07	"	5	✓	✓	✓	✓	✓	✓	✓	✓			
✓	09/18		W-14048-091899-GS-08	"	5	✓	✓	✓	✓	✓	✓	✓				
	09/18		W-14048-091899-GS-09	"	5	—	—	—	HOLD				—	—	—	
																PP2/PCB
			MS/MSD = MATRIX SPIKE/ MATRIX SPIKE DUPLICATE													

TOTAL NUMBER OF CONTAINERS: 45 HEALTH/CHEMICAL HAZARDS:

RELINQUISHED BY: ① [signature]	DATE: 092099 TIME: 20:00	RECEIVED BY: ② Laura Smith	DATE: Sept 22/99 TIME:
RELINQUISHED BY: ②	DATE: TIME:	RECEIVED BY: ③	DATE: TIME:
RELINQUISHED BY: ③	DATE: TIME:	RECEIVED BY: ④	DATE: TIME:

METHOD OF SHIPMENT: WAY BILL No.

White —Fully Executed Copy
Yellow —Receiving Laboratory Copy
Pink —Shipper Copy
Goldenrod —Sampler Copy

SAMPLE TEAM: G. SINNETT

RECEIVED FOR LABORATORY BY:

DATE: TIME:

1001(F)JAN.30/96(W)REV.0(F-82)

NORWEST LABS

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Edmc Ph (403) 438-5522 FAX (403) 438-0396
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Lethbridge Ph (403) 329-9266 FAX (403) 327-8527
Winnipeg Ph (204) 982-8630 FAX (204) 275-6019

Client Code: CONERO

Name: CONESTOGA-ROVERS	Workorder: **47833**
Address: Suite 150-3011 Viking Way	WO (Other):
	PO Num:
Richmond	Project: 14048
BC V6V 1W1	Date Sampled: Sep 18, 1999
Attn: Paul Oliver	Date Received: Sep 23, 1999
Phone: (604) 214-0510	Date Reported: Oct 04, 1999
Fax: (604) 214-0525	

Pesticides

	Detection Limit	Units	47833-1 W-14048-091899-GS01	47833-3 W-14048-091899-GS-03	47833-5 W-14048-091899-GS-05	47833-7 W-14048-091899-GS-07
Neutral Herbicides in Water						
Ethalfluralin	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Triallate	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Trifluralin	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Organochlorine Pesticides in Water						
Aldrin	0.05	ppb	<0.05	<0.05	<0.05	<0.05
BHC (alpha isomer)	0.05	ppb	<0.05	<0.05	<0.05	<0.05
2,4'-DDT	0.05	ppb	<0.05	<0.05	<0.05	<0.05
4,4'-DDD	0.05	ppb	<0.05	<0.05	<0.05	<0.05
4,4'-DDE	0.05	ppb	<0.05	<0.05	<0.05	<0.05
4,4'-DDT	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Chlordane-cis	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Chlordane-trans	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Chlorothalonil	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Dieldrin	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Endosulfan I	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Endosulfan II	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Endosulfan sulfate	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Endrin	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Heptachlor	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Hexachlorobenzene	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Iprodione	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Lindane	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Methoxychlor	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Mirex	0.05	ppb	<0.05	<0.05	<0.05	<0.05

na = not available

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	Detection Limit	Units	47833-1 W-14048-091899-GS01	47833-3 W-14048-091899-GS-03	47833-5 W-14048-091899-GS-05	47833-7 W-14048-091899-GS-07
Phenoxy/Acid Herbicides in Water						
2,4-D	0.1	ppb	<0.1	<0.1	<0.1	<0.1
2,4-DB	0.1	ppb	<0.1	<0.1	<0.1	<0.1
2,4,5-T	0.1	ppb	<0.1	<0.1	<0.1	<0.1
2,4,5-TP	0.1	ppb	<0.1	<0.1	<0.1	<0.1
Bromoxynil	0.1	ppb	<0.1	<0.1	<0.1	<0.1
Clopyralid	0.1	ppb	<0.1	<0.1	<0.1	<0.1
Dicamba	0.1	ppb	<0.1	<0.1	<0.1	<0.1
Diclofop-methyl	0.1	ppb	<0.1	<0.1	<0.1	<0.1
Fluazifop	0.1	ppb	<0.1	<0.1	<0.1	<0.1
Imazapyr	0.1	ppb	<0.1	<0.1	<0.1	<0.1
Imazethapyr	0.1	ppb	<0.1	<0.1	<0.1	<0.1
MCPA	0.1	ppb	<0.1	<0.1	<0.1	<0.1
MCPB	0.1	ppb	<0.1	<0.1	<0.1	<0.1
Mecoprop	0.1	ppb	<0.1	<0.1	<0.1	<0.1
Picloram	0.1	ppb	<0.1	<0.1	<0.1	<0.1
Triclopyr	0.1	ppb	<0.1	<0.1	<0.1	<0.1
Fenoxaprop Ethyl	0.1	ppb	<0.1	<0.1	<0.1	<0.1

na = not available

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Pesticides (con't.)

	Detection Limit	Units	47833-8 W-14048-091899-GS-08
Neutral Herbicides in Water			
Ethalfluralin	0.05	ppb	<0.05
Triallate	0.05	ppb	<0.05
Trifluralin	0.05	ppb	<0.05
Organochlorine Pesticides in Water			
Aldrin	0.05	ppb	<0.05
BHC (alpha isomer)	0.05	ppb	<0.05
2,4'-DDT	0.05	ppb	<0.05
4,4'-DDD	0.05	ppb	<0.05
4,4'-DDE	0.05	ppb	<0.05
4,4'-DDT	0.05	ppb	<0.05
Chlordane-cis	0.05	ppb	<0.05
Chlordane-trans	0.05	ppb	<0.05
Chlorothalonil	0.05	ppb	<0.05
Dieldrin	0.05	ppb	<0.05
Endosulfan I	0.05	ppb	<0.05
Endosulfan II	0.05	ppb	<0.05
Endosulfan sulfate	0.05	ppb	<0.05
Endrin	0.05	ppb	<0.05
Heptachlor	0.05	ppb	<0.05
Heptachlor epoxide	0.05	ppb	<0.05
Hexachlorobenzene	0.05	ppb	<0.05
Iprodione	0.05	ppb	<0.05
Lindane	0.05	ppb	<0.05
Methoxychlor	0.05	ppb	<0.05
Mirex	0.05	ppb	<0.05

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	Detection Limit	Units	47833-8 W-14048-091899-GS-08
Phenoxy/Acid Herbicides in Water			
2,4-D	0.1	ppb	<0.1
2,4-DB	0.1	ppb	<0.1
2,4,5-T	0.1	ppb	<0.1
2,4,5-TP	0.1	ppb	<0.1
Bromoxynil	0.1	ppb	<0.1
Clopyralid	0.1	ppb	<0.1
Dicamba	0.1	ppb	<0.1
Diclofop-methyl	0.1	ppb	<0.1
Fluazifop	0.1	ppb	<0.1
Imazapyr	0.1	ppb	<0.1
Imazethapyr	0.1	ppb	<0.1
MCPA	0.1	ppb	<0.1
MCPB	0.1	ppb	<0.1
Mecoprop	0.1	ppb	<0.1
Picloram	0.1	ppb	<0.1
Triclopyr	0.1	ppb	<0.1
Fenoxaprop Ethyl	0.1	ppb	<0.1

Approved By: Ralph Hindle

Ralph Hindle, B.Sc.
Supervisor, Organics Lab

na = not available

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Petroleum Hydrocarbons

	Detection Limit	Units	47833-1 W-14048-091899-GS01	47833-3 W-14048-091899-GS-03	47833-5 W-14048-091899-GS-05	47833-7 W-14048-091899-GS-07
EPH in Water						
EPHw10-19	50	µg/L	<50	<50	<50	<50
EPHw19-32	50	µg/L	<50	<50	<50	<50
PCBs in Water						
Total PCBs	0.5	µg/L	<0.5	<0.5	<0.5	<0.5

Petroleum Hydrocarbons (con't.)

	Detection Limit	Units	47833-8 W-14048-091899-GS-08
EPH in Water			
EPHw10-19	50	µg/L	<50
EPHw19-32	50	µg/L	<50
PCBs in Water			
Total PCBs	0.5	µg/L	<0.5

Approved By: Ralph Hindle

Ralph Hindle, B.Sc.
Supervisor, Organics Lab

Accredited By: CANADIAN ASSOCIATION FOR ENVIRONMENTALANALYTICAL LABORATORIES (CAEAL)
For specific tests registered with the Association

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Water Analysis

	Detection Limit	Units	47833-1 W-14048-091899-GS01	47833-3 W-14048-091899-GS-03	47833-5 W-14048-091899-GS-05	47833-7 W-14048-091899-GS-07
Hardness						
Hardness (CaCO3 equiv)	5	mg/L	167	169	168	164
Total Dissolved Solids						
Total Dissolved Solids	5	mg/L	191	194	191	191
Total Suspended Solids						
Total Suspended Solids	5	mg/L	<5	<5	<5	<5

Water Analysis (con't.)

	Detection Limit	Units	47833-8 W-14048-091899-GS-08
Hardness			
Hardness (CaCO3 equiv)	5	mg/L	157
Total Dissolved Solids			
Total Dissolved Solids	5	mg/L	268
Total Suspended Solids			
Total Suspended Solids	5	mg/L	59

Approved By:

John Davidson, Dipl. T., C.P.H.I. (C)
Supervisor, Inorganics Lab

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Attention: Paul Oliver
Phone : 604 214-0510
Fax : 604 214-0525

WO (Surrey) : **47833**
Quote No. :
WO (Other) :
PO Num :
Project : 14048
Date Sampled : Sep 18, 1999
Date Received : Sep 23, 1999
Date Reported : Oct 04, 1999

QA / QC REPORT

QA/QC Report

Method	Compound	Recovery	Date	Analyst
Neutral Herbicides in Water	Ethalfluralin	64 %	23-Jul-99	M. Lakha
	Triallate	88 %		
	Trifluralin	59 %		
	Average:	**70**		
Organochlorine Pesticides in Water	4,4'-DDE	122 %	30-Sep-99	J. Morawski
	Endosulfan I	109 %		
	Endosulfan II	125 %		
	Endosulfan sulfate	129 %		
	Average:	**121**		
PCBs in Water	Total PCBs	107 %	01-Oct-99	M. Lakha
	Average:	**107**		
Phenoxy/Acid Herbicides in Water	2,4-D	68 %	03-Jun-99	D. Dykstra
	2,4,5-T	62 %		
	2,4,5-TP	67 %		
	Bromoxynil	49 %		
	Clopyralid	67 %		
	Dicamba	70 %		
	Diclofop-methyl	77 %		
	Imazapyr	67 %		
	Imazethapyr	98 %		
	MCPA	54 %		
	Mecoprop	56 %		
	Picloram	71 %		
	Triclopyr	70 %		
	Average:	**67**		
EPH in Water	TEH (C10-C32)	88 %	01-Oct-99	J. Morawski
	Average:	**88**		

Approved By: Ralph Hindle, B.Sc.
Supervisor, Organics Lab

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Date Sampled : Sep 18, 1999
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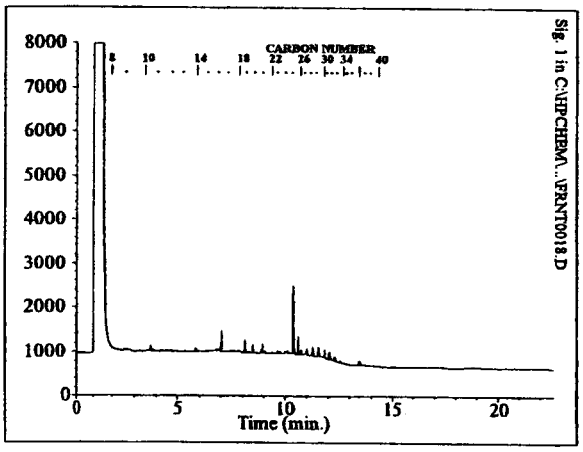
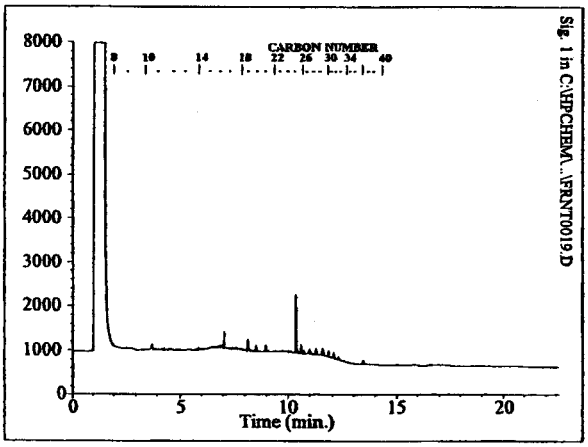
Date Reported : Oct 04, 1999

Qualitative Fuel Assessment Report

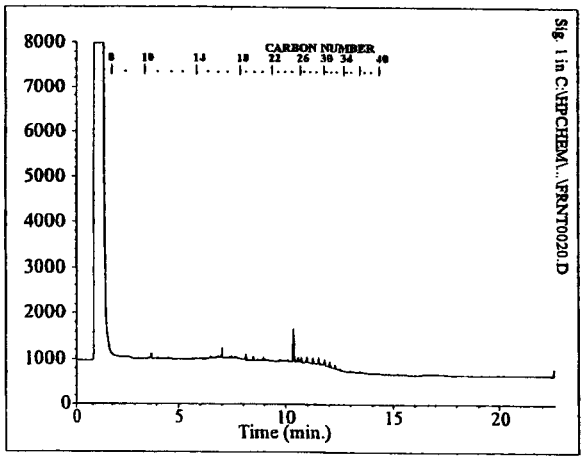
Method: EPH in Water
Sample No. 47833-1
W-14048-091899-GS01



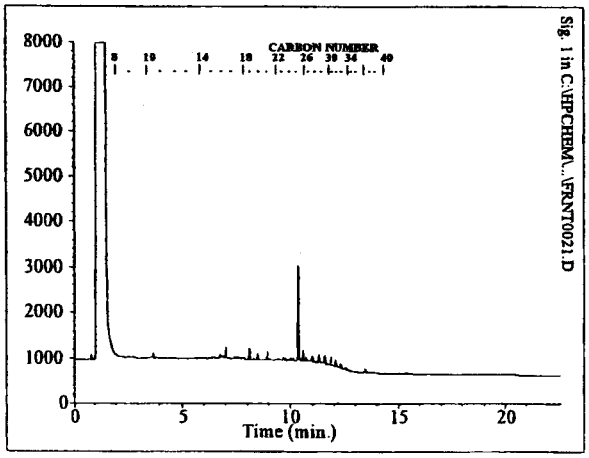
Method: EPH in Water
Sample No. 47833-3
W-14048-091899-GS-03



Method: EPH in Water
Sample No. 47833-5
W-14048-091899-GS-05



Method: EPH in Water
Sample No. 47833-7
W-14048-091899-GS-07



Initials: RH

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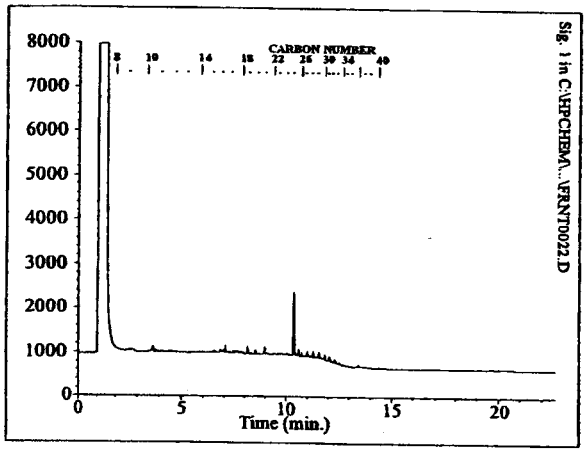
Qualitative Fuel Assessment Report

Method: EPH in Water
Sample No. 47833-8
W-14048-091899-GS-08



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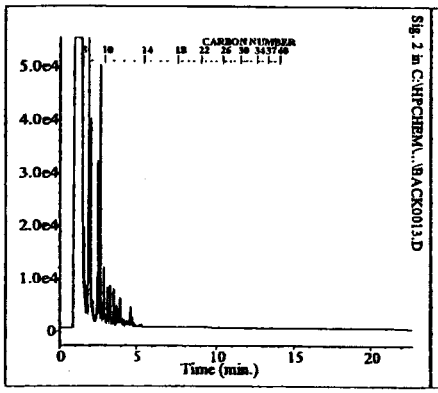
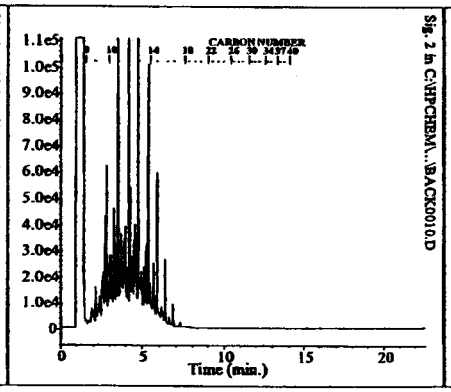
Qualitative Fuel Assessment Report

TYPICAL PRODUCT CHROMATOGRAMS

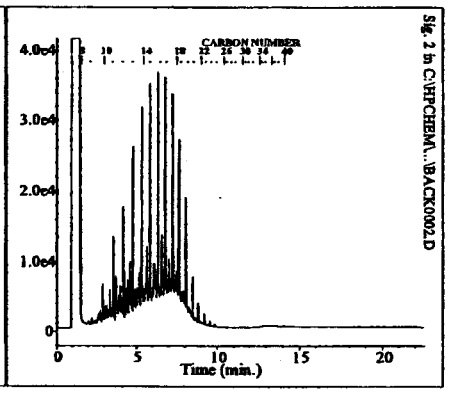
GASOLINE



JET FUEL A



DIESEL



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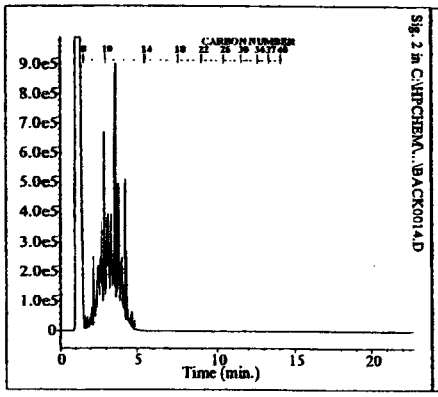
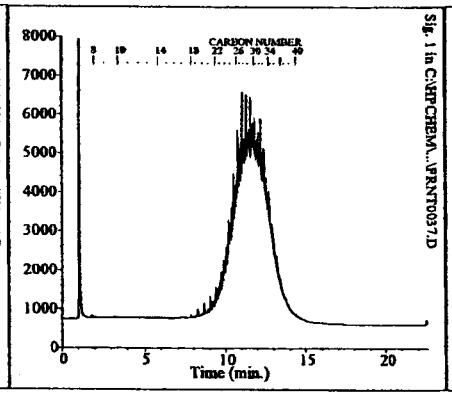
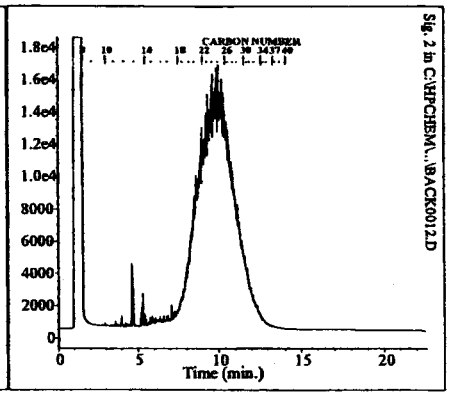


10W30 MOTOR OIL



Transmission Fluid



Product Carbon Number Ranges

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

Approved By:

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Supervisor, Organics Lab

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Winnipeg	Ph (204) 982-8630	FAX (204) 275-6019

Name : CONESTOGA-ROVERS
Address : Suite 150-3011 Viking Way
Richmond
BC
V6V 1W1
Attention: Paul Oliver
Phone : 604 214-0510
Fax : 604 214-0525

WO (Surrey) : **47833**
Quote No. :
WO (Other) :
PO Num :
Project : 14048
Date Sampled : Sep 18, 1999
Date Received : Sep 23, 1999
Date Reported : Oct 04, 1999

Method References

Organochlorine Pesticides in Water
This analysis is carried out in accordance with US EPA Method 8080, which involves extraction with an organic solvent (EPA 3540) followed by analysis by capillary gas chromatography using an electron capture detector.

Phenoxy/Acid Herbicides in Water
This analysis is carried out in accordance with US EPA Method 8151 which involves extraction of the components with an organic solvent followed by hydrolysis, derivatization and then analysis by gas chromatography using an electron capture detector.

EPH in Water
Summation of the C10-C19 and C19-C32 carbon range, using the BC Contaminated Sites Method, October 15, 1999, "Extractable Petroleum Hydrocarbons in Water by GC/FID." No corrections for PAHs.

PCBs in Water
Analysis by GC/ECD. Extraction y EPA 3510 , analysis by EPA 8080/8015. Equivalent to BC Environmental Laboratory Methods, March 1997.

Hardness
APHA Standard Methods # 2340:B , calculation from dissolved Ca and Mg.

Total Dissolved Solids
APHA Standard Methods # 2540 : B.

Total Suspended Solids
APHA Standard Method 2540:D, filtration GFC, dried at 105C. Gravimetric Analysis.

CHAIN OF CUSTODY RECORD

CRA
3011 VIKING WAY, SUITE 150
RICHMOND, BRITISH COLUMBIA V6V 1W1
(604) 214-0510

SHIPPED TO (Laboratory Name): NORWEST LABS

REFERENCE NUMBER: 14048

Rec'd CRA SEP 30 1999

SAMPLER'S SIGNATURE: GMS PRINTED NAME: GEOFF SINNETT

SEQ. No.	DATE	TIME	SAMPLE No.	SAMPLE TYPE	No. OF CONTAINERS	PESTICIDES	HERBICIDES	PCBs	LEPH/HEPH	HARDNESS	TSS	TDS	POTASSIUM			REMARKS
	09/21		W-14048-092199-GS-10	WATER	5	✓	✓	✓	✓	✓	✓	✓				
	09/21		W-14048-092199-GS-11	"	5	✓	✓	✓	✓	✓	✓	✓				
	09/19		W-14048-091999-GS-33	"	5	✓	✓	✓	✓	✓	✓	✓				
	09/21	11:25	W-14048-092199-GS-44	"	3			✓					✓			
	09/21		W-14048-092199-GS-45	"	1			✓								
	09/21		W-14048-092199-GS-53	"	5	✓	✓	✓	✓	✓	✓	✓				

TOTAL NUMBER OF CONTAINERS: 24

HEALTH/CHEMICAL HAZARDS:

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
①	09/21/99	13:30	②		
②			③		
③			④		

METHOD OF SHIPMENT:

WAY BILL No.

White – Fully Executed Copy
Yellow – Receiving Laboratory Copy
Pink – Shipper Copy
Goldenrod – Sampler Copy

SAMPLE TEAM: G. SINNETT, P. OLDER

RECEIVED FOR LABORATORY BY:

DATE: TIME:

14048
MONITORING DATA

1001(F)JAN.30/96(W)REV.0(F-82)

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Lethbridge Ph (403) 329-9266 FAX (403) 327-8527
Winnipeg Ph (204) 982-8630 FAX (204) 275-6019

Client Code: CONERO

Name: CONESTOGA-ROVERS	Workorder: **47884**
Address: Suite 150-3011 Viking Way	WO (Other):
	PO Num:
Richmond	Project: 14048 - Waters
BC V6V 1W1	Date Sampled: Sep 21, 1999
Attn: GEOFF SINNETT	Date Received: Sep 24, 1999
Phone: (604) 214-0510	Date Reported: Oct 07, 1999
Fax: (604) 214-0525	

Pesticides

	Detection Limit	Units	47884-1 W-14048-092199-GS-10	47884-2 W-14048-092199-GS-11	47884-3 W-14048-091999-GS-33	47884-6 W-14048-092199-GS-53
Neutral Herbicides in Water						
Ethalfluralin	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Triallate	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Trifluralin	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Organochlorine Pesticides in Water						
Aldrin	0.05	ppb	<0.05	<0.05	<0.05	<0.05
BHC (alpha isomer)	0.05	ppb	<0.05	<0.05	<0.05	<0.05
2,4'-DDT	0.05	ppb	<0.05	<0.05	<0.05	<0.05
4,4'-DDD	0.05	ppb	<0.05	<0.05	<0.05	<0.05
4,4'-DDE	0.05	ppb	<0.05	<0.05	<0.05	<0.05
4,4'-DDT	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Chlordane-cis	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Chlordane-trans	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Chlorothalonil	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Dieldrin	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Endosulfan I	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Endosulfan II	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Endosulfan sulfate	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Endrin	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Heptachlor	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Hexachlorobenzene	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Iprodione	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Lindane	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Methoxychlor	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Mirex	0.05	ppb	<0.05	<0.05	<0.05	<0.05
Phenoxy/Acid Herbicides in Water						
2,4-D	0.1	ppb	<0.1	<0.1	<0.1	<0.1
2,4-DB	0.1	ppb	<0.1	<0.1	<0.1	<0.1
2,4,5-T	0.1	ppb	<0.1	<0.1	<0.1	<0.1
2,4,5-TP	0.1	ppb	<0.1	<0.1	<0.1	<0.1
Bromoxynil	0.1	ppb	<0.1	<0.1	<0.1	<0.1
Clopyralid	0.1	ppb	<0.1	<0.1	<0.1	<0.1
Dicamba	0.1	ppb	<0.1	<0.1	<0.1	<0.1
Diclofop-methyl	0.1	ppb	<0.1	<0.1	<0.1	<0.1
Fluazifop	0.1	ppb	<0.1	<0.1	<0.1	<0.1

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For specific tests registered with the Association

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Winnipeg Ph (204) 982-8630 FAX (204) 275-6019

Client Code: CONERO

Name: CONESTOGA-ROVERS	Workorder: **47884**
Address: Suite 150-3011 Viking Way	WO (Other):
	PO Num:
Richmond	Project: 14048 - Waters
BC V6V 1W1	Date Sampled: Sep 21, 1999
Attn: GEOFF SINNETT	Date Received: Sep 24, 1999
Phone: (604) 214-0510	Date Reported: Oct 07, 1999
Fax: (604) 214-0525	

Pesticides con't

	Detection Limit	Units	47884-1 W-14048-092199-GS-10	47884-2 W-14048-092199-GS-11	47884-3 W-14048-091999-GS-33	47884-6 W-14048-092199-GS-53
Imazapyr	0.1	ppb	<0.1	<0.1	<0.1	<0.1
Imazethapyr	0.1	ppb	<0.1	<0.1	<0.1	<0.1
MCPA	0.1	ppb	<0.1	<0.1	<0.1	<0.1
MCPB	0.1	ppb	<0.1	<0.1	<0.1	<0.1
Mecoprop	0.1	ppb	<0.1	<0.1	<0.1	<0.1
Picloram	0.1	ppb	<0.1	<0.1	<0.1	<0.1
Triclopyr	0.1	ppb	<0.1	<0.1	<0.1	<0.1
Fenoxaprop Ethyl	0.1	ppb	<0.1	<0.1	<0.1	<0.1

Approved By: _____

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Supervisor, Organics Lab

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Petroleum Hydrocarbons

	Detection Limit	Units	47884-1 W-14048-092199-GS-10	47884-2 W-14048-092199-GS-11	47884-3 W-14048-091999-GS-33	47884-4 W-14048-092199-GS-44
EPH in Water						
EPHw10-19	50	µg/L	<50	<50	<50	na
EPHw19-32	50	µg/L	<50	<50	<50	na
PCBs in Water						
Total PCBs	0.5	µg/L	<0.5	<0.5	<0.5	<0.5

	Detection Limit	Units	47884-5 W-14048-092199-GS-45	47884-6 W-14048-092199-GS-53
EPH in Water				
EPHw10-19	50	µg/L	na	<50
EPHw19-32	50	µg/L	na	<50
PCBs in Water				
Total PCBs	0.5	µg/L	<0.5	<0.5

Approved By: _____

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	PO Num:
Richmond	Project: 14048 - Waters
BC V6V 1W1	Date Sampled: Sep 21, 1999
Attn: GEOFF SINNETT	Date Received: Sep 24, 1999
Phone: (604) 214-0510	Date Reported: Oct 07, 1999
Fax: (604) 214-0525	

Water Analysis

	Detection Limit	Units	47884-1 W-14048-092199-GS-10	47884-2 W-14048-092199-GS-11	47884-3 W-14048-091999-GS-33	47884-6 W-14048-092199-GS-53
Hardness						
Hardness (CaCO3 equiv)	0.01	mg/L	138	139	45.8	0.04
Total Dissolved Solids						
Total Dissolved Solids	5	mg/L	180	174	80	<5
Total Suspended Solids						
Total Suspended Solids	5	mg/L	<5	<5	118	<5

Approved By: _____

John Davidson, Dipl. T., C.P.H.I. (C)
Supervisor, Inorganics Lab

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Name : CONESTOGA-ROVERS
Address : Suite 150-3011 Viking Way
Richmond
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V6V 1W1
Attention: GEOFF SINNETT
Phone : 604 214-0510
Fax : 604 214-0525

WO (Surrey) : **47884**
Quote No. :
WO (Other) :
PO Num :
Project : 14048 - Waters
Date Sampled : Sep 21, 1999
Date Received : Sep 24, 1999
Date Reported : Oct 07, 1999

ANALYTICAL REPORT

47884-4 **W-14048-092199-GS-44**

W99-Water Potability

Analyte	Result	Detection Limit	Units	Guidelines / Recommendations Drinking Water Drinking Water
pH	8.72			pH values between 6.5 & 8.5 considered acceptable
Colour	50	5	TCU	Aesthetic limit 15 TCU
Turbidity	75	1	NTU	Below 5 NTU acceptable at point of use.
Total Dissolved Solids	935	1	mg/L	Objective level 500 mg/L; higher values indicate high salts
Hardness (CaCO3 equiv)	30.3	1	mg CaCO3/L	Soft waters are less than 75 mg/L; hard waters are above 150
Chloride	22.9	0.1	mg/L	Aesthetic limit 250 mg/L
Fluoride	31	0.04	mg/L	Values up to 1.2 mg/L desirable; under 1.5 mg/L acceptable
Nitrite-N	<1	1	mg/L	
Nitrate-N	<0.1	0.1	mg/L	Below 10 mg/L acceptable; objective level below 1.0 mg/L
Sulfate	<1	1	mg/L	
Aluminum	11.6	0.01	mg/L	
Arsenic	<0.02	0.02	mg/L	Below 0.025 mg/L acceptable
Barium	0.139	0.0005	mg/L	Below 1 mg/L acceptable
Cadmium	<0.0005	0.0005	mg/L	Below 0.005 mg/L acceptable
Chromium	0.009	0.001	mg/L	Below 0.05 mg/L acceptable
Copper	0.011	0.002	mg/L	Aesthetic limit 1.0 mg/L; objective below 0.01 mg/L
Iron	20.8	0.003	mg/L	>0.3 mg/L may cause staining; objective level below 0.05 mg/L
Lead	<0.005	0.005	mg/L	Below 0.01 mg/L acceptable
Manganese	0.175	0.0005	mg/L	Aesthetic limit 0.05 mg/L; objective below 0.01 mg/L
Sodium	380	0.05	mg/L	Aesthetic limit 200 mg/L; below 20 mg/L for low sodium diets
Uranium	<0.06	0.06	mg/L	Below 0.1 mg/L acceptable
Zinc	2.3	0.001	mg/L	Aesthetic limit 5.0 mg/L; objective below 1.0 mg/L
Total Alkalinity	696	5	mg CaCO3/L	

Approved by:

John Davidson, Dipl. T., C.P.H.I. (C)
Supervisor, Inorganics Lab

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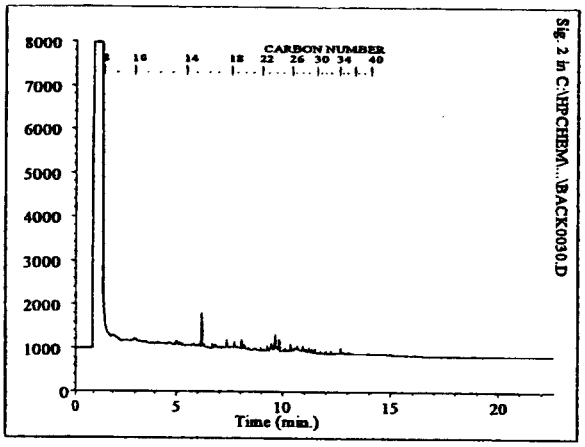
BC
V6V 1W1
Att'n : GEOFF SINNETT
Phone : 604 214-0510
Fax : 604 214-0525

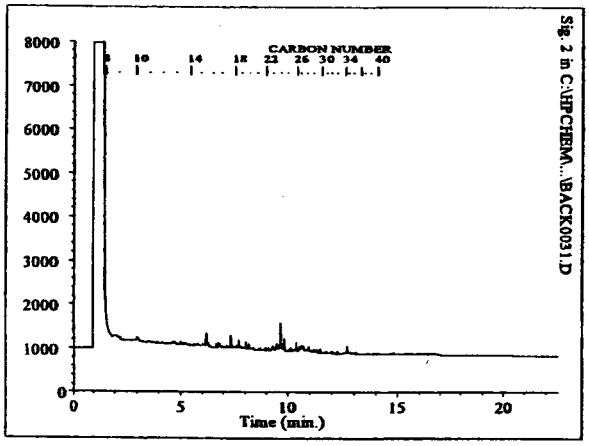
WO (Surrey) : 47884
Quote No. :
WO (Other) :
PO Num :
Project : 14048 - Waters
Date Sampled : Sep 21, 1999
Date Received : Sep 24, 1999
Date Reported : Oct 07, 1999

Qualitative Fuel Assessment Report

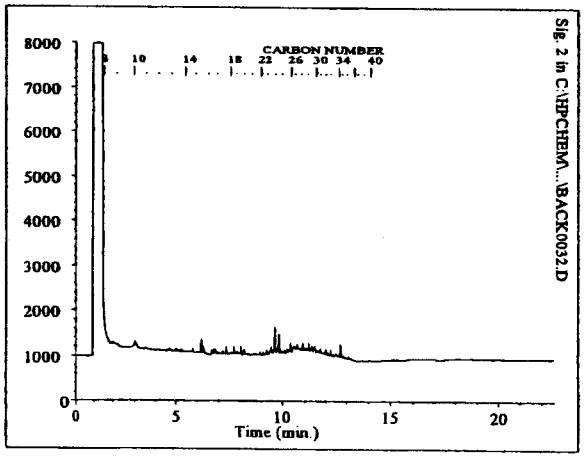
Method: EPH in Water
Sample No. 47884-1
W-14048-092199-GS-10



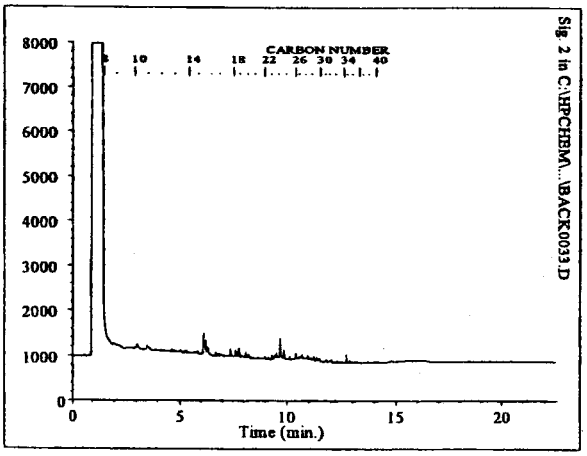
Method: EPH in Water
Sample No. 47884-2
W-14048-092199-GS-11



Method: EPH in Water
Sample No. 47884-3
W-14048-091999-GS-33



Method: EPH in Water
Sample No. 47884-6
W-14048-092199-GS-53



Initials: KLJ

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Date Sampled : Sep 21, 1999
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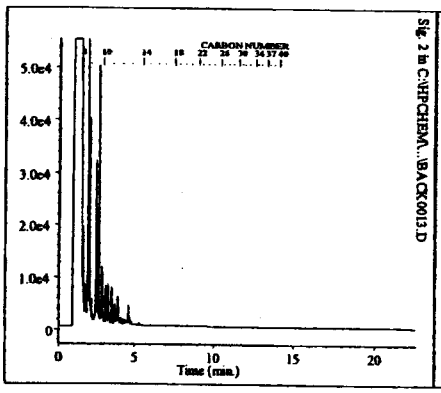
Qualitative Fuel Assessment Report

TYPICAL PRODUCT CHROMATOGRAMS

GASOLINE



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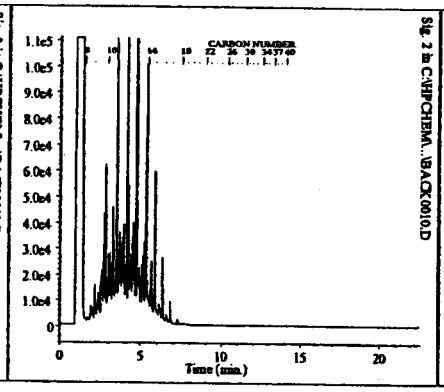

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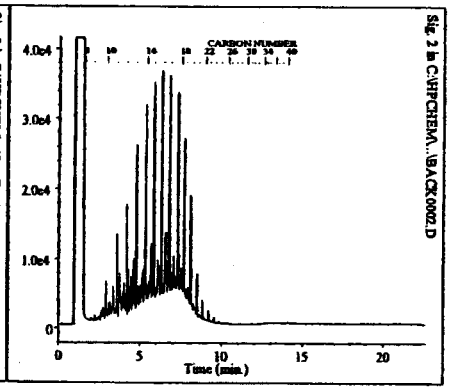
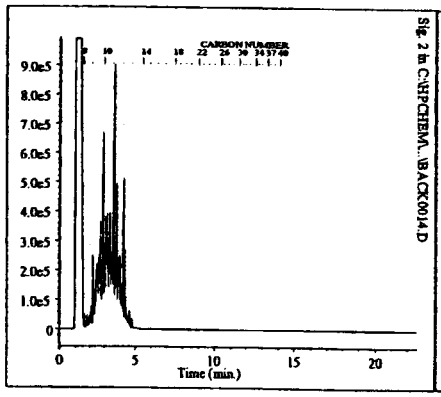
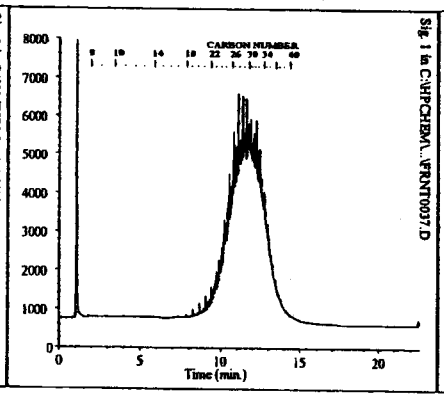


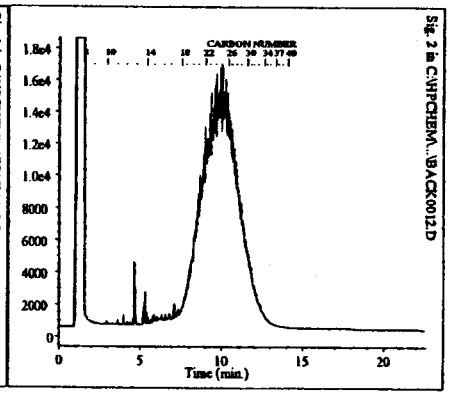
KEROSENE



10W30 MOTOR OIL



Transmission Fluid



Product Carbon Number Ranges

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

Approved By:

Ralph Hindle, B.Sc.
Supervisor, Organics Lab

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Calgary	Ph (403) 291-2022	FAX (403) 291-2021
Lethbridge	Ph (403) 329-9266	FAX (403) 327-8527
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WO (Surrey) : **47884**
Quote No. :
WO (Other) :
PO Num :
Project : 14048 - Waters
Date Sampled : Sep 21, 1999
Date Received : Sep 24, 1999
Date Reported : Oct 07, 1999

QA / QC REPORT

QA/QC Report

Method	Compound	Recovery		Date	Analyst
Neutral Herbicides in Water	Ethalfluralin	64	%	23-Jul-99	M. Lakha
	Triallate	88	%		
	Trifluralin	59	%		
	Average:	**70**			
Organochlorine Pesticides in Water	4,4'-DDE	122	%	30-Sep-99	J. Morawski
	Endosulfan I	109	%		
	Endosulfan II	125	%		
	Endosulfan sulfate	129	%		
	Average:	**121**			
PCBs in Water	Total PCBs	107	%	01-Oct-99	M. Lakha
	Average:	**107**			
Phenoxy/Acid Herbicides in Water	2,4-D	62	%	01-Oct-99	M. Lakha
	2,4-DB	54	%		
	2,4,5-T	76	%		
	2,4,5-TP	93	%		
	Bromoxynil	67	%		
	Clopyralid	45	%		
	Dicamba	59	%		
	Diclofop-methyl	105	%		
	Imazapyr	80	%		
	Imazethapyr	51	%		
	MCPA	104	%		
	MCPB	47	%		
	Mecoprop	108	%		
	Picloram	43	%		
	Triclopyr	80	%		
	Average:	**72**			
EPH in Water	TEH (C10-C32)	88	%	01-Oct-99	J. Morawski
	Average:	**88**			

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Method References

Organochlorine Pesticides in Water

This analysis is carried out in accordance with US EPA Method 8080, which involves extraction with an organic solvent (EPA 3540) followed by analysis by capillary gas chromatography using an electron capture detector.

Phenoxy/Acid Herbicides in Water

This analysis is carried out in accordance with US EPA Method 8151 which involves extraction of the components with an organic solvent followed by hydrolysis, derivatization and then analysis by gas chromatography using an electron capture detector.

EPH in Water

Summation of the C10-C19 and C19-C32 carbon range, using the BC Contaminated Sites Method, October 15, 1999, "Extractable Petroleum Hydrocarbons in Water by GC/FID." No corrections for PAHs.

PCBs in Water

Analysis by GC/ECD. Extraction y EPA 3510 , analysis by EPA 8080/8015. Equivalent to BC Environmental Laboratory Methods, March 1997.

Hardness

APHA Standard Methods # 2340:B , calculation from dissolved Ca and Mg.

Total Dissolved Solids

APHA Standard Methods # 2540 : B.

Total Suspended Solids

APHA Standard Method 2540:D, filtration GFC, dried at 105C. Gravimetric Analysis.