TE 031

Gartner Lee

TE 031/RR 040

1997 Environmental Investigations along the Canol Road

[redacted]

Prepared For:
Ross River Dena Council

Prepared By:
Gartner Lee Limited

GLL 97-751

May, 1998

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July 6, 1998

Contaminants/Waste Program
Department of Indian & Northern Affairs
345-300 Main St.
Whitehorse, Yukon
Y1A 2B5

Attention: Mark Palmer, Manager Contaminants/Waste Program

Dear Mr. ~~Palmer~~ Mark,

Re: 1997 Canol Road Environmental Site Assessments

Please find following the Draft report for the above work. When you have had opportunity to review this report, we would like to integrate your comments into the final report along with the project recommendations. Should you have any questions or comments, please do not hesitate to contact me at 633-6474.

Yours very truly,
GARTNER LEE LIMITED

for
Steve Morison
Manager/Senior Geoscientist

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1. Introduction

During the summer of 1996 Gartner Lee Limited (GLL)was retained by the Ross River Dena Council (RRDC) to conduct a series of environmental site investigations at former waste sites located within the Ross River Dena people's traditional territory. The RRDC were anxious to proceed with the finding and recommendations presented in *Environmental Site Investigations Along the Canol Road* (GLL File 96-769, 1997). **The 1997 program conducted detailed site investigations and preliminary clean-up at six of the site from the 1996 field season.** In addition, **five new sites were investigated and nine new reconnaissance sites were visited.** In conjunction with the investigations, GLL environmental professionals provided a training program for an exchange of information and knowledge for a number of students in Ross River in both a classroom and field setting. Following the training program, the students joined the GLL professionals in the field to "job shadow" the technical team and participate in the site assessments.

1.1 Objectives

The goal of this project as prepared in the Ross River Dena Council's 1996 request is as follows; "*to gain preliminary environmental information of waste sites in the Ross River Dena people's traditional territory and establish a technical understanding of the environmental issues for the Ross River Dena people.*" This goal was used to guide Gartner Lee Limited (GLL) in the design and implementation of the 1996 and 1997 projects. The following are the 1997 project objectives which were developed by the Ross River Dena Council and the Department of Indian Affairs and Northern Development's (DIAND) Arctic Environmental Strategy (AES) Action on Waste program to ensure that the above goal was achieved:

- To provide the Ross River Dena with additional scientific understanding of identified waste sites in their traditional territory.
- To continue a transfer of knowledge to all stages and aspects of this project for the benefit of the Ross River Dena.
- To prepare work plans for the recommended follow-up investigations and initial clean-ups of sites identified in the previous year's work.
- As part of the above work plan, implementation of a training program for a number of Ross River Dean community members which will build upon principals of environmental assessment introduced in 1996. Concepts presented in the training session included a brief review of the 1996 activities and field techniques, an introduction to the new Yukon Environmental Act, verification sampling and compliance with the new criteria.
- To conduct reconnaissance of potential new sites in the Ross River Dena's traditional territory. Additional information pertaining to the existence of additional sites was provided by members and elders of the Ross River community at the end of the 1996 program and during a 1997 community consultation program.

- Present a report which outlines the findings and interpretations of the detailed investigations and initial clean-up activity. The report will also provide recommendations for remediation to assist the Ross River Dena Council and the Department of Indian Affairs and Northern Development (DIAND) to make management decisions with respect to the sites on the North and South Canol Road.

2. Background

2.1 Canol Road History

When the United States became involved in World War II, especially on the Pacific front, fears arose that their oil supplies in Alaska may be threatened. In response to this, the Canol Road project was initiated to construct an oil pipeline and road that would carry oil and supplies from Norman Wells, N.W.T. to Whitehorse, Y.T (Figure 1). In Whitehorse, the oil was to be refined and transported to Alaska.

The road and pipeline, which included work camps and oil pumping stations, were completed in 1944 and subsequently abandoned in 1945. When the Americans pulled out, the pipeline was left intact, vehicles and heavy equipment were winterized and left behind, and buildings were boarded up (K. Bissett and Ass., 1995). Also remaining behind were the numerous garbage dumps associated with the camps and pumping stations, oil drums, areas of oil spills and residue from pesticides used at the camps.

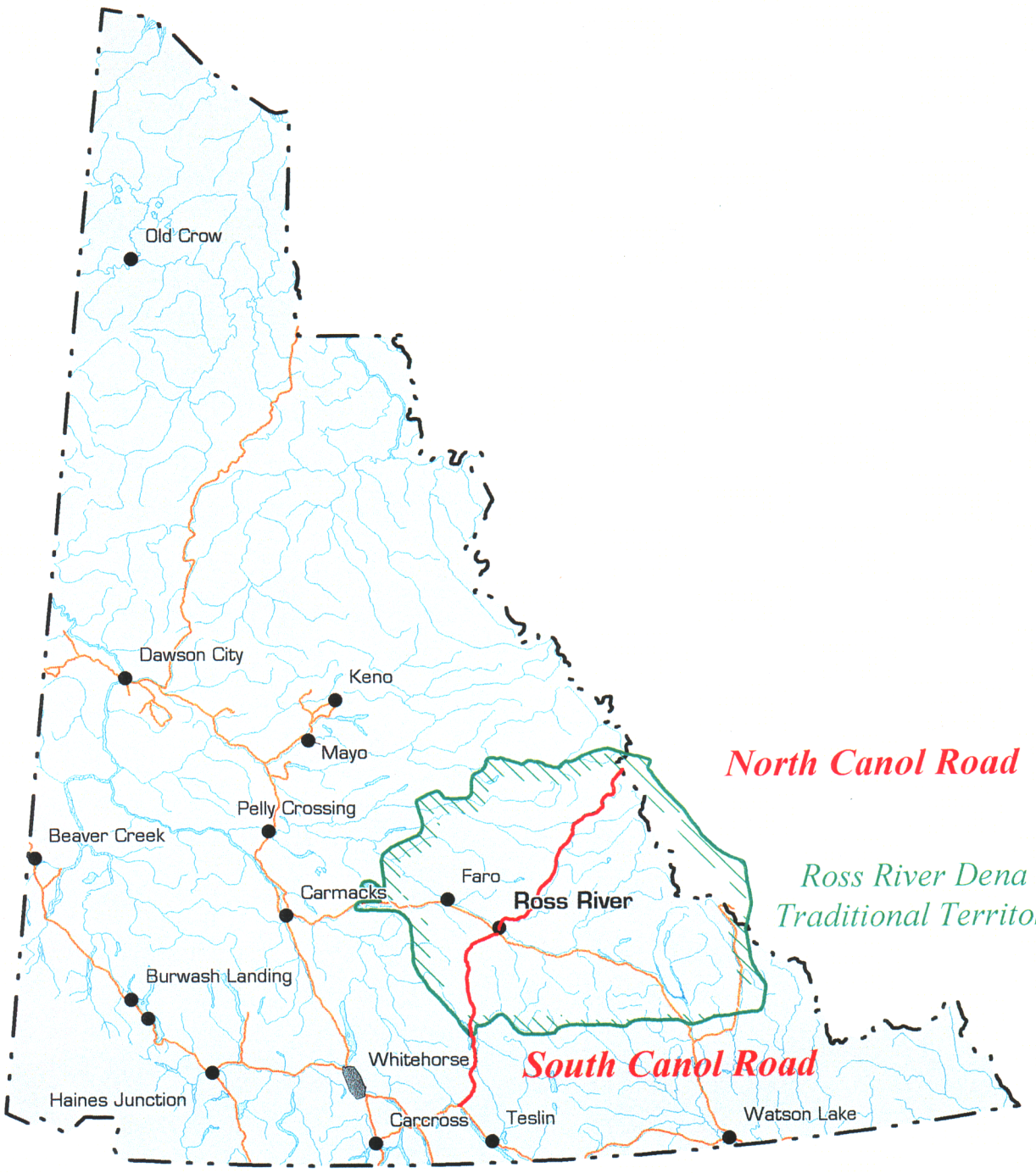
The Canadian Government was given the first option to purchase the salvage rights of the project; however, the government declined and the rights were sold to private salvage companies (Synergy West Ltd., 1975).

With the abandonment of the project, the roads and bridges fell into disrepair and soon became impassable. In the early 1950's, the first salvage crews began rebuilding the roads and bridges to reach the abandoned equipment. Since that time, salvage by both authorized and unauthorized parties has removed most of the materials left behind. Additionally, there has been clean-up efforts conducted by YTG in the 1970's, acting upon the findings in Synergy West Ltd.'s report. This work involved removal and crushing of drums, winding of telegraphy wire burial of debris, demolition and burning or burial of woody debris, and some removal of scrap iron. The alignment of vehicle hulks along the Canol Road today may have been completed as part of this work. (Bisset, 1995)

In the early 1970's exploration by mining companies in the MacMillan Pass area required that the road and bridges be maintained. Since that time, upkeep of the road has been supervised by the Yukon Territorial Government (YTG).

2.2 Previous Reports

Three reports in addition to GLL's 1997 report have been produced describing conditions along the Yukon portion of the Canol Road . Two of these, the "*Engineering StudyO-CEU-43, Pollution Canol Highway*" (Canadian Armed Forces, 1970), and "*Canol Road Clean-Up Assessment Study*" (Synergy West Ltd., 1975), concentrated on compiling an inventory and clean-up plan, including costs, for removal of abandoned materials remaining from military activities. The third report "*Research of Former*



Legend

0 30 60 120 180
kilometres

Scale 1:6,000,000

Drawn By: F. Pearson	Project No. 97-751
Site Name: Canol Road	Date: 04.02.98

Canol Road Study Area

1997 Environemental Investigations
Canol Road

Gartner Lee Limited

Figure No. 1

Military Sites and Activities in Yukon" (K. Bissett and Associates, 1995), reviewed activities at sites throughout the Yukon and identified potential contaminants of concern including petroleum hydrocarbons, metals and pesticides from past military operations.

Recently two reports describing environmental site investigations along the NWT side of the Canol Trail have been released. These reports, *"Environmental Assessment and Cleanup Options for Selected Sites Along the Canol Trail, N.W.T."* (DIAND, 1994) and "*An Environmental Study of the Canol Trail, NWT*" (Royal Roads Military College, 1994) provide preliminary analytical results from selective sampling and waste inventories of Canol Road sites in the NWT. There are preliminary clean-up options presented in each report.

2.3 1996 Environmental Site Investigation

In 1996, a total of 10 sites were investigated along the Canol Road by Gartner Lee Limited on behalf of the Ross River Dena Council (RRDC). The sites investigated had varying degrees of contamination, primarily from hydrocarbons. Areas of heavy surface oil staining were found at the majority of sites and concentrations of oil and grease at six of the ten sites would be classified as Special Waste (see section 3.5.3 Analytical Criteria. Several waste dumps were also found, including two with drums or containers that were still full or partially full of liquid products.

Environmental impacts on the physical environment, as well as the migration of contaminates beyond site boundaries were documented at five of the sites. Remedial actions were recommended for these five sites, as well another four sites had contamination and debris of a less serious nature. A table summarizing the site conditions as well as the conclusions and recommendations at all ten sites is provided as Table 2.3.1.

Table 2.3.1 – Summary of 1996 Recommendations

Site	Findings	Recommended Action
MP 234	A large area of surficial hydrocarbon staining as well as several buried drums full of oil were discovered.	Define burial area and remove affected soils
MP 73	Several areas of surficial soil staining and occurrences of contamination at depth were discovered at this site as was an old camp dump.	Remove affected soils and define dump area.
MP 124.5	Issues at this site include a UST with product and heavily contaminated shallow soils.	Pump out and remove UST, remove metal debris and affected soils
MP 233	Isolated areas of shallow hydrocarbon contamination as well as surface water metals contamination were found at this site.	Removal of affected soils and investigate possibility of dump site up slope
MP 174	Contamination with hydrocarbons has affected the surficial and shallow soils at this site.	Remove affected shallow soils.
OLD ROSS	Two areas of metal and wooden debris were found at this site. Concatenations of two metals were found to exceed the Parkland criteria and one of the elements, arsenic, appears to be associated with the refuse.	Remove refuse to Ross River Landfill.
MP 213	A large camp formerly occupied this site and two isolated areas of shallow hydrocarbon contamination were found to exceed the criteria. Immediate imparts are not predicted.	Remove affect shallow soils.
MP 212	A former dump site lettered with a large amount of metal debris was found at this site. There are no indications of contamination.	Bury or remove metal debris.
MP 99.5	Very little evidence remains of a small camp once located on this site. Concentrations of contaminates did not exceed the Parkland criteria and no remedial action is required	No action recommended.
MP 268	Several old vehicle hulks were found at this site. There appears to be no impacts on the site from past activities.	No action recommended.

3. Scope of Work and Technical Approach

The scope of the work completed by Gartner Lee Limited is summarized below:

- Review of 1996 results and research of previous reports for initial design of the 1997 field program;
- Conducted a two day training session with Ross River students to introduce desktop and field investigation techniques;
- Performed reconnaissance visits and inventories of new sites identified in consultation with the Ross River community;
- Removal of underground storage tanks (UST) and encapsulation of some contaminated soils;
- Conducted detailed investigations of follow-up sites including mapping, soil and water sampling, test pitting, installation of groundwater monitors, and geophysical surveys of dump sites;
- Conducted field testing of soils for potential sources of contaminants;
- Submitted selected samples to an accredited analytical laboratory for testing;
- Produce a report documenting site conditions, work completed and providing recommendations for preliminary remedial measures.

The field portion of the program commenced July 11, 1997, with site reconnaissance carried out by Terry Duffy, B.Sc. Hydrogeology, and Forest Pearson, Geological Engineer EIT of Gartner Lee Limited (GLL) along with Fran Etzel, the project coordinated appointed by the Band, and the five Ross River students with occasional accompanyment of elders from the community. The training of the students was conducted by Steve Morison, GLL's Whitehorse manager and Terry Duffy in late July, 1997.

Site investigations and preliminary clean-up were conducted from August 4th, through August 27th 1997 under the super vision of Terry Duffy, Forest Pearson and Fran Etzel.

3.1 Ross River Dena Council and Student Training

Student training and assistance in the field was an important component for the 1996 site assessment project on the North and South Canol Road. As follow up to this, a 1997 training program was also integrated into the overall field site assessment program. A total of 14 students were interviewed for the field assistant positions (see Appendix A) and 4 candidates were interviewed for the Community Coordinator position (see Appendix A). The interviews were conducted by Gartner Lee technical staff and recommendations were made to Mr. George Smith for the final selection of the successful candidates. It was originally planned to hire 4 student assistants but due to the enthusiasm and qualifications of the students, a total of 5 were hired to support the program.

The training session for the students and the Community Coordinator took place on July 10th and July 11th in Ross River. The following were the areas which were covered during the training program:

Day 1- Classroom Setting:

- Canol Road Project Overview
- Hands-On Demonstrations
  - Mapping Techniques (e.g. hip chain and compass)
  - Topographic Maps
  - Geological Maps
  - Air Photos
  - PID Demonstration
  - Soil Sampling
  - Water Sampling
- 1996 Results
- Overview of Yukon Contaminated Sites Regulations

Day 2- Field Setting:

- Visit sites at MP 124.5 and MP 73
- Review field techniques including soil sampling, use of the PID and map work
- Discussion on excavation protocols for Underground Storage Tanks (UST's) for fuel.

3.2 Community Consultation

Extensive community consultation occurred throughout all phases of this project including the identification of additional sites for the 1997 fieldwork. The following summarizes the community consultation that was carried out:

- Interviews with community members and elders about potential contaminated sites that should be investigated.
- Distribution of pamphlets to every household in the Ross River Dena community by the students about potential sites which should be investigated (Appendix A).
- Distribution of a Project Update to the Ross River Dena Community (see Appendix A).
- Participation by elders and community members during the fieldwork.
- A community Open House at MP 234 on August 26th was organized to demonstrate field techniques, and to give tours at this site. Approximately 20 people from the community participated in the Open House including the new Chief and Council.

3.3 Site Selection

Potential sites were selected for investigation after the following process:

- Follow-up work based upon finding from 1996 field findings.
- Interviews with Ross River Dena elders.
- A reconnaissance field tour with the students and elders to follow up on interviews.
- Response from community consultation (see above).
- The identification of new sites which warranted detailed study

As result of this process, 6 follow-up sites were selected, 9 reconnaissance sites in Yukon and NWT, and 5 new sites. These sites are shown on Figure 2. The following sections provide a summary of the site investigated:

3.3.1 Follow-up Site Investigations

Table 3.3.1 lists the site that follow-up work was conducted based upon 1996 findings:

Table 3.3.1 – Follow-up Sites

Follow-up Site	Mile Post Number	Follow-up Issues
Pump Station 10	MP 73	• Define area extent of dump area. • Install monitor wells to determine if contaminate is migrating off-site. • Remove underground storage tank.
Pump Station 9 Lapie River	MP 124.5	• Remove underground storage tank.
Old Ross Townsite	MP 142	• Clean-up old dump site.
Pump Station 8 Flat Creek	MP 174	• Investigate reported new dump site area. • Test pit, map and sample new dump site.
Pump Station 7	MP 233	• Investigate possible dump up-slope of site. • Follow-up high metal content in 1996 water samples.
234 Military Camp	MP 234	• Define area extent of dump area. • Install monitor wells to determine if contaminate is migrating off-site.

Legend

- Full Site Investigations
- Reconnaissance Site Investigations

NOTE:
All Mile Post locations are referenced from Johnson's Crossing.

0 10 20 40 60
kilometres

Scale 1:2,000,000

Drawn By: F. Pearson	Project No. 97-751
Site Name: Canol Road	Date: 04.02.98

Canol Road & Priority Sites

1997 Environemental Investigations
Canol Road

Gartner Lee Limited

Figure No. 2

3.3.2 Reconnaissance Program Sites

In addition to the six follow-up sites, nine sites within the Ross River Traditional Territory were visited in the field for a preliminary assessment. These sites are summarized in Table 3.3.2.

Table 3.3.2 – Reconnaissance Site Investigations

Reconnaissance Site	Mile Post & Location	Description
Yukon Sites:		
Upper Sheep Creek	Top of Stormy Mt.	Mining Camp - Stormy (105F 011)
Boulder Creek	MP 119	Reported barrels off west side of road.
Ram Creek	MP 124	Reported camp site & debris across Lapie River from Pump Station 9.
Tenas Creek	MP 147	Reported sawmill with drums.
Sheldon Lake Sawmill	MP 220	Reported old sawmill site
Northwest Territories Sites:		
Site 20	MP 222	Vehicle bone yard.
Site 19B	MP 216	Barrel dump.
Site 19A	MP 215	Borrow pit & barrel dump.
Pumps Station 6	MP 222	Large contaminated site with POL tank, fuel & grease drums and debris.

3.3.3 New Site Investigations

Five new sites were identified in 1996 and during the 1997 field season. Detailed site investigations were conducted at these sites. The following table provides a summary of these five sites.

Table 3.3.2 – Reconnaissance Site Investigations

New Site	Mile Post	Description
Sheldon Lake Pullouts	MP 220	Reports of burial sites on east side of Canol Road.
MP 234 Pump Station	MP 234	Newly discovered pump station & POL tank berms.
234.5 Waste Burial Site	MP 234.5	Burial site south of road.
MP 247	MP 247	Small dump and surficial staining.
MacMillan #2 Camp	MP 267.5	Old military camp site.

3.4 Site Investigations

3.4.1 Approach

Once the sites had been selected, the investigative phase of the project commenced. This was completed through the combination of both a preliminary desktop review and visits to each of the sites.

The desktop review was carried out to gather as much information about the sites prior to commencing the field program. This information was considered essential in order to gain an advanced understanding of the expected site conditions. Information was complied from the review of previous Canol Road reports, topographic and surficial geology maps, review of aerial photographs of the areas surround the sites. Additional information was provided by members of the Ross River Dena First Nation who were familiar with the sites, and other members of the Ross River community.

The site visits were conducted in two stages: the first being site reconnaissance and the second, mapping and sampling.

The reconnaissance visits were conducted between August 4th and August 15th 1996. This involved driving both the North and South Canol Roads with members and elders of the Ross River community to confirm the location the sites. Once the sites were located, a site walkover was conducted to inventory site features and conditions. Features such as drums, foundations, and areas of visible contamination were recorded in field notes.

The second state of the site investigations involved mapping the site, conducting preliminary clean-ups, invasive and non-invasive investigations and collecting soil and water samples were appropriate. Complete mapping and sampling methodologies are presented in the Methodologies section in Appendix A.

Site mapping was critical in order to produce a good quality reference plan of each site. Features identified during the site walkover were located, as were slopes, water courses and discernible boundaries.

Upon completion of mapping, samples were collected from the site. Based upon the site conditions observed, a "hot-spot" sampling strategy was used. This concentrated on sampling from areas which appeared visually contaminated, and from areas down-gradient of the "hot-spots". Soils samples were collected as surficial samples from the near surface area and as deeper samples from the sidewalls and base of test pits. The sampling methodology was sued to assess the maximum levels of contamination ion the site.

Selected samples were submitted for analytical testing and results compared to established criteria, as discussed in the next two sections. The results for each site were also assessed in the context of the site

setting. As part of that assessment, the project team considered Gartner Lee's standard "source-pathway-receptor" model. It is based on the integrated way in which contaminants disperse from the source and then impact on the natural environment. The focus of this project was to identify the sources of contamination, as well as the presence of the pathways for contaminants to move or migrate towards potential receptors.

3.4.2 Analytical Program

The analytical program concentrated on the potential contaminants of concern as identified in the 1996 Canol Road program. This program that identified hydrocarbons as the primary contaminate of concern. 1996 test showed that metals and pesticides were not a concern at the site investigated along the Canol Road. Soil and occasionally water samples were collected at most sites.

Soil samples were subjected to two levels of analytical testing:

1. field screening with portable meters; and
2. analytical testing by an accredited environmental laboratory using approved and standard procedures and quality assurance methods.

Soil samples were screened in the field using a Photoionization Detector (PID) to detect the presence of volatile organic vapours and thereby the potential for petroleum hydrocarbon contamination.

The specific laboratory tests preformed and the criteria against which the results were compared are outlined in Table 3.4.1.

Selected soil samples were analyzed for petroleum hydrocarbon content (eg. gasoline, diesel fuel and crude oil) using a number of different gross parameters or investigative scans, namely:

1. Total oil & grease
2. Light and heavy extractable petroleum hydrocarbons (LEPH/HEPH)
3. Polycyclic aromatic hydrocarbons (PAH's)

A description of the methodologies used fore each of these analyses is provided with the analytical reports from Phillip Environmental and reproduced in the Technical Appendix.

Surface samples were collected at sites were a body of water was identified in close proximity to the site and was considered potential receptors. Groundwater samples were collected where groundwater monitor wells were installed. Samples were analyzed for total metals, oil & grease and LEPH & HPEH.

3.4.3 Analytical Criteria

Interpretation on analytical data was based on a comparison against published federal and territorial guidelines and criteria, as well as on professional experience and judgement.

For the most part, the results were compared to the Yukon Contaminated Sites Regulations (January, 1997). Where no Yukon criteria exists, the results were compared to several guidelines and investigative criteria developed by B.C. Environment.

The issue of which criteria are appropriate for Fist Nations in terms of maintaining the traditional lifestyle of utilizing the land is beyond the scope of this report. The important point here is that these criteria might not be appropriate from a First Nation perspective. Gartner Lee Limited has used the existing criteria for contaminated sites as a guide. The final decision on whether the recommendations are appropriate rests with the Ross River Dena Council.

Table 3.4.1: Summary of Regulatory Criteria Used for Soil and Water Samples

Parameters	Regulatory Criteria for Soil						...For Water	
	Parkland / Residential (ug/g = ppm)		*Industrial / Commercial* (ug/g = ppm)		*Special Waste* (ug/g = ppm)		*Aquatic Life* (ug/L = ppb)	
Mineral Oil & Grease	1000	(2)	5000	(2)	30000	(5)	5000	(6)
Total Extractable Hydrocarbons (TEH)	400	(3)	2000	(3)			100	(3)
Light Extactable Hydrocarbons (LEPH)	1000	(1)	2000	(1)			NA	
Heavy Extractable Hydrocarbons (HEPH)	1000	(1)	5000				NA	
Polycyclic Aromatic Hydrocarbons (PAHs)								
benzo(a)pyrene	1	(4)	10	(4)			0.1	(1)
napthalene	5	(1)	50	(1)			10	(1)
pyrene	10	(1)	100	(1)			0.2	(1)

Notes:

1 Yukon Contaminated Site Regulations, Environment Act, December, 1996

2 Criteria for Managing Contaminated Sites in British Columbia, B.C. Envionment, November 1989 (Draft 6)

3 Memorandum - Measuring Petroluem Hydrocarbon Concentrations in Soil and Water, B.C. Environment, Contaminated Sites Unit, Oct 1991

4 Interim Canadian Environmental Quality Criteria for Conaminated Sites, Canadian Council of Ministers of the Environement (CCME), July 1991

5 Waste Management Act, Special Waste Regulation, Province of British Columbia, consilidated April, 1992

6 Yukon Territorial Water Board Water Licence to the City of Whitehorse, Licence Number: MN93-001

4. 1996 Follow-up Site Findings

This section provides a summary of the new field observations for each follow-up site as well as work conducted, analytical results, a discussion of the findings, conclusions and recommendations. Detailed site descriptions (including geology, hydrogeology, vegetation and surface water) are not included for these six follow-up sites since these sections are addressed in the 1996 report. All six follow-up sites are included in this section of the report, with each site represented as a separate subsection from 4.1 to 4.6.

4.1 Pump Station 10 - Mile Post 73

4.1.1 General Description

Pump Station 10 is located 97 km south of Ross River, and 0.5 km south of Gravel Creek on the South Canol Road (Figure 3). The site is located on a local topographic high which is bounded by low-lying wetlands areas to the north, south and west, and by Gravel Creek down a steep embankment to the east. The site is found an a relatively gentle, northwest facing slope. There are no visible surface drainage coursed through the site, likely owing to the permeable nature of the site soils.

The site is found on both sides of the road (see Figure 4) with the east site formerly occupied by a pumping station and the west side being and abandoned camp dump. A gravel access road provides access while the west side of the site is partially cleared.

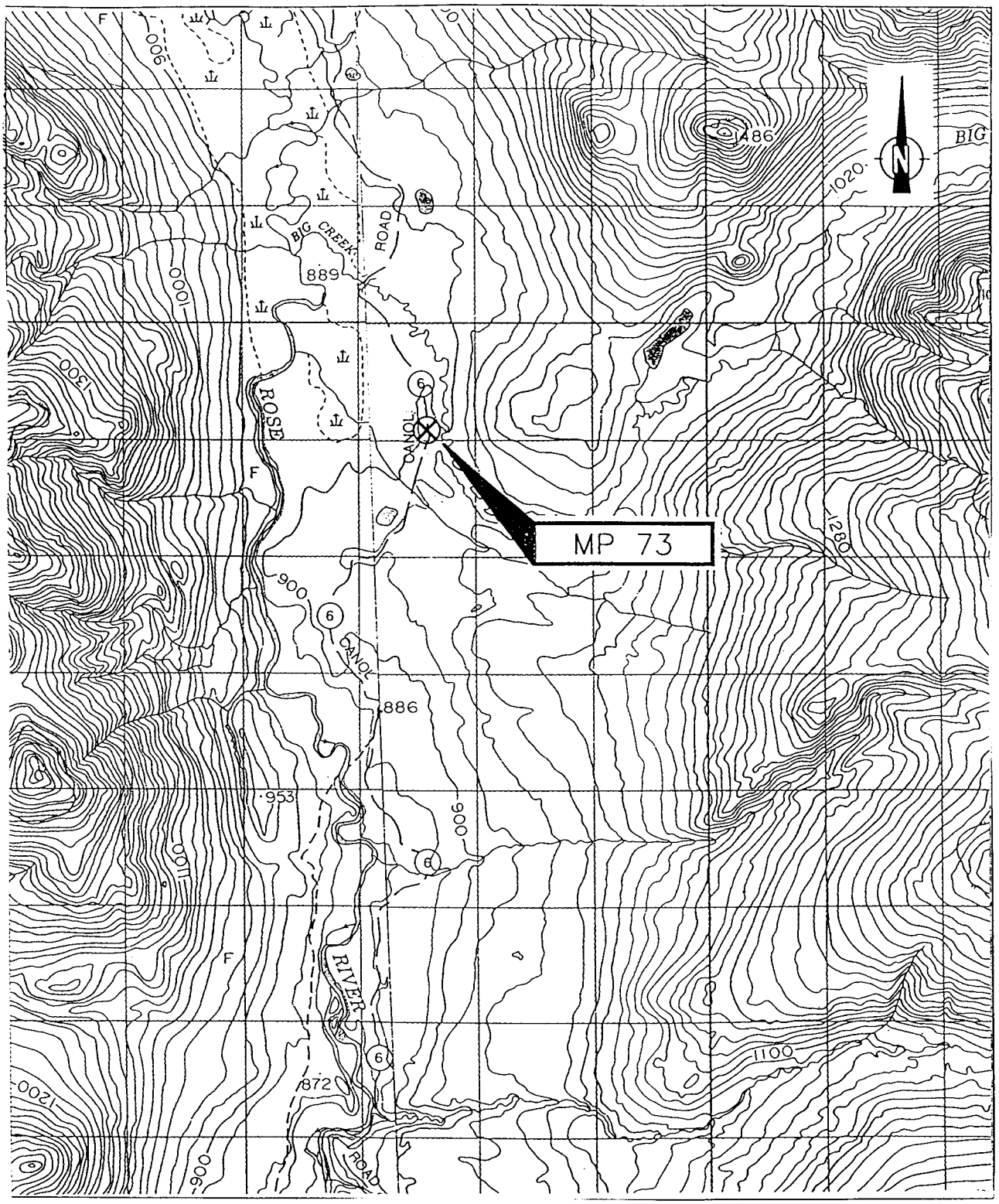
Reinterpretation of the historic site usage has identified the southern most clearing of Area A as potentially the Petroleum, Oil & Lubricants (POL) tank location. There is a small swale leading southwest from the POL tank location. There is a track of desiccated crude oil over several tens of metres down this swale.

4.1.2 1996 Findings

Based upon the 1996 site investigation, the following conclusions were made:

1. soils in excess of 2 m in depth around the POL tank site (Area A in Figure 4) have been impacted by petroleum hydrocarbons at concentrations which exceed the Parkland and Industrial criteria;

2. an Underground Storage Tank (UST) is located adjacent to the pump station foundation (Area B in Figure 4) and the soils beneath the tank have been impacted by petroleum hydrocarbons at concentrations which exceed Special Waste criteria;



Legend

Site Location

Source:
NTS 105 F/6, F/7 Edition 1

0 250 500 1000 1500
metres

Scale 1:50,000

Drawn By: F. Pearson | Project No. 97-751
Site Name: South Canol Road | Date: 04.02.98

Pump Station 10 - MP 73
Site Location

1997 Environemental Investigations
Canol Road

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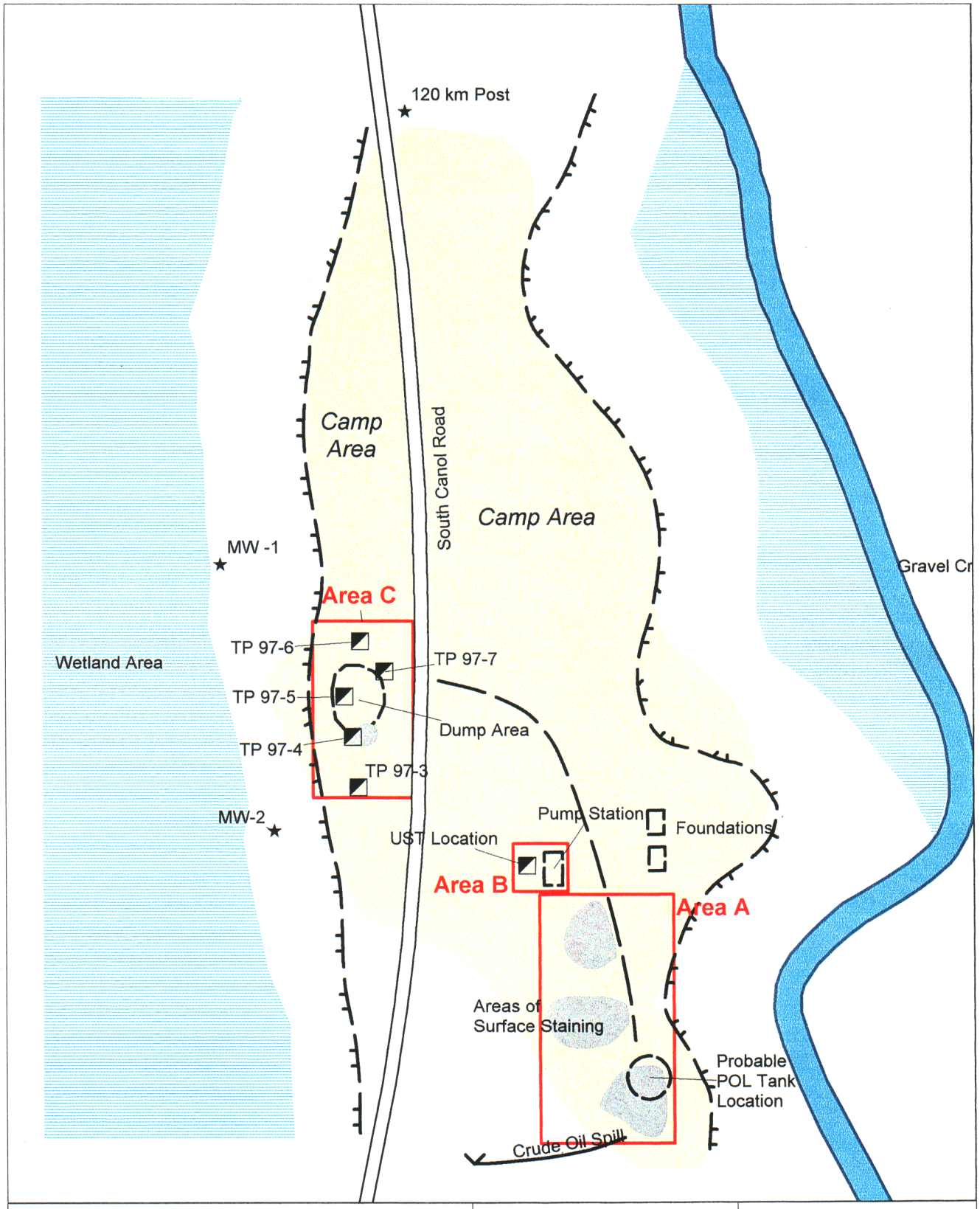
Figure No. 3



Legend

- Surface Staining
- Disturbed Area
- Building Remnants
- Test Pit
- Monitor Well
- Sample Location

0 10 20 40 60 metres

Scale 1:2000 (approximate)

Drawn By: F. Pearson	Project No. 97-751
Site Name: MP 73	Date: 04.02.98

Sketch Map
Pump Station 10

1997 Environemental Investigations
Canol Road

Gartner Lee Limited

Figure No. 4

3. buried refuse, including full cans of oil and crease, are located on the west side of the road in (Area C in Figure 4) and the underlying soils have been impacted with petroleum hydrocarbons at concentrations which exceed the Parkland criteria.

4.1.3 Work Program

Based upon the 1996 results, the 1997 work program was designed to follow-up concerns and outstanding issues at this site. These included:

1. Removal of the UST located adjacent the pump station and isolation of contaminated soils around the excavations.
2. Delineation of the dump site area west of the road.
3. Determination if contaminants are leaving the dump site via groundwater into the wetland receptor west of the dump site.

4.1.3.1 Underground Storage Tank Removal

The Underground Storage Tank located along the west edge of the pump house was found to contain approximately 30 gallons of hydrocarbon product which has been identified as Crude Oil (Phillip sample ID 97031164, Table 4.1.1) and therefore future leakage from this tank into the environment was a concern.

Removal of the UST was conducted August 12th, 1997. The soils around the UST were stockpiled on polyethylene adjacent to the excavation.. The UST was found to consist of three 45-gallon drums that had been welded together at an excavation depth 1.7 m. A sling was passed under the UST and secured to the backhoe bucket to remove the tank from the excavation.

During the tank removal, the weld between two of the drums was found to be previously ruptured and failed during removal of the tank. Care was taken to ensure that there was minimal spillage of the oil sludge from he UST. All spilled material was immediately removed. The oil sludge from the UST and spillage was transferred to a new 45 gallon drum and capped. Once the UST once removed it was wrapped in polyethylene and transferred to Ross River for steam cleaning and destruction. The oil sludge also has been transferred to Ross River and is awaiting disposal options.

After removal of the UST, the three verification samples (samples V-1, V-2, and V-3) were collected to confirm the removal of the contaminated soils. The excavation was then lined with polyethylene and the stockpiled soils were then backfilled into the lined excavation. The excavation was then covered with polyethylene to prevent infiltration of surface water. The rational for encapsulating the soils was to prevent migration of the contaminant from the soils until remediation options can be determined.

4.1.3.2 Dump Site Mapping

A program of test pitting was conducted around the dump site located west of Canol Road. A series of five test pits were dug in the dump site area (TP 97-3 to TP 97-7) on August 12th. Based upon the pits dug, the dump site was delineated as shown on Figure 4—an area of approximately 350 m^2 with a depth of material around 1.5 m. This area is much smaller than originally though, and seems to be centered around TP 96-6 from the 1996 investigation.

Soil samples were collected from test pits that showed visible signs of contamination

Test Pit TP 97-5 in dump site found crushed drums of oil and grease. A sample was collected from one of the drums containing hydrocarbon and has been identified as motor oil. Two drums of grease were excavated from TP 97-5 and are wrapped in polyethylene awaiting disposal options.

4.1.3.3 Groundwater Monitor Installation

Hydrocarbon contamination was found in the dump site (Area C). Two groundwater monitor wells were installed down-gradient of the dump site. There is wetland area west of the dump site that is a potential receptor of contaminates. The locations of the two wells (MW-1 and MW-2) are show on Figure 4. Wells were installed by excavating a pit, installing Waterra environmental grade PVC monitoring wells, and backfilling the pit.

Soil samples were collected during well installation. Water samples were collected from the wells on August 13th 1997, to allow for settlement time in the wells. Wells were developed by extracting three well volumes using a disposable bailer prior to sampling.

4.1.4 Test Results

4.1.4.1 Field Screening

A total of ten samples soil samples were screened in the field using a PID. The results from the field screening are shown in Table 4.1.1.

The soil sample from Test pit 97-5 showed organic vapour concentrations of 120 ppm. Verification samples from around the UST, samples V-1 and V-2 had concentrations of 640 and 430 ppm receptively. The sample from the stockpiled material (Stockpile S-1) from the UST excavation showed organic vapour concentrations 230 ppm. These values are considered elevated, and indicative of hydrocarbon contamination, compared to typical background reading of 2 to 20 ppm.

4.1.4.2 Soil Chemistry

Soil samples were submitted to the analytical laboratory for hydrocarbon content analysis. Based upon the finding in the 1996 field program, hydrocarbons were the significant contaminant of concern This section provide a summary of the analytical results with the complete results presented in Tables 4.2.1 and Appendix B.

Table 4.1.1: Soil Chemistry - Hydrocarbon Results

Pump Station 10 - Mile Post 73

Parameter	Parkland Criteria	Industrial Criteria	Philip ID: / Sample ID: / Sample Description: / MDC	97028591 TP 97-1 surface MW-1 test pit	97028592 TP97-1 0.5m MW-1 test pit	97028593 TP97-2 0.6m MW-2 test pit	97028594 TP97-5 0.5m Dump site test pit	97028595 TP97-6 0.15m Dump site test pit	97031487 TP97-6 0.5m Dump site test pit	97028596 V-1 UST verification	97028597 V-2 UST verification	97028598 V-3 UST verification	97028599 S-1 UST Stockpile	97031164 Oil Sludge Sludge from UST	97031496 Unknown liquid Fluid from drum in dump
Hydrocarbons															
Orangic Vapour Concentration (ppm)				22	14	12	124	98	12	641	432	17	237		
TEH (C10-C30)			5						74	16000	14000	<		410000	240000
TEH Heavy Oil (>C30)			5						<	2100	3300	<		110000	410000
LEPH (C10-<C19)	1000	2000	5						77	8500	7000	<			
HEPH (C19-C32)	1000	5000	5						<	8200	7900	<			
Mineral Oil & Grease	1000	5000	100	<	<	<	15000	3000	<	21000	16000	<	81001		
Polyaromatic Hydrocarbons															
Benzo(a)anthracene	1	10	0.01						<	<	<	<			
Dibenz(a,h)anthracene	1	10	0.02						<	<	<	<			
Crysene			0.01						<	0.57	0.44	<			
Benzo(b)Flourathene	1	10	0.01						<	<	0.04	<			
Benzo(k)fluoranthene	1	10	0.01						<	<	<	<			
Benzo(g,h,I)perylene			0.02						<	<	<	<			
Pyrene	10	100	0.01						<	0.54	0.35	<			
Benzo(a)pyrene			0.01						<	<	<	<			
Indeno(1,2,3-c,d)pyrene	1	10	0.02						<	<	<	<			
Acenaphthene			0.01						<	<	<	<			
Acenaphthylene			0.01						<	<	<	<			
Anthracene			0.01						<	<	<	<			
Fluoranthene			0.01						<	<	<	<			
Naphthalene	5	50	0.01						<	<	<	<			
Phanathrene	5	50	0.01						<	<	<	<			
Total PAH's									<	1.1	0.83	<			
Total Low MW PAH's									<	<	<	<			
Total High MW PAH's									<	1.1	0.83	<			

Notes:

1. All concentrations in ug/g (ppm)
2. 1000 Concentration exceeds Parkland Criteria
3. 5000 Concentration exceeds Industrial Criteria
4. [redacted] Concentration exceeds Special Waste Criteria
5. --- Parameter not analysed
6. < Less than Method Detection Concentraion (MDC)

Gartner Lee

:eed Industrial criteria were detected in three five of
fication samples from the UST excavation exceeded
m the UST stockpiled soil showed the high levels
a. One sample from the dump site (Area C) exceeded
s area exceeded the Parkland criteria.

excavation exceeded the Yukon Contaminated Sites
l heavy hydrocarbons (LEPH & HEPH).

yzed and identified as weathered crude oil. The sample
ntified by the analytical laboratory as motor oil.

the monitor wells installed down gradient of the dump site (MW-1 & MW-2 on Figure 4). Groundwater samples were analyzed for hydrocarbons, total metals, and pesticides. The complete analytical results are presented in Table 4.1.2 and Appendix B.

There were no hydrocarbons detected in the water samples, nor pesticides. All metals detected were below guideline thresholds.

4.1.5 Discussion

The UST and the crude oil sludge contained in the tank have been removed off site and await disposal. Therefore, one potential source of contaminants has been removed. The UST is wrapped in polyethylene and in storage in Ross River. The tank requires steam cleaning, destruction and disposal. The product from cleaned from the tank will require collection and disposal. Additionally, there are approximately 30 gallons of crude oil from the UST in storage in Ross River. Disposal options for this material have yet to be determined to date.

Two verification samples (V-1 & V-2) from the UST excavation show that the excavation did not sufficiently remove contaminated materials. There are soils contaminated above the Industrial criterion at the base of the excavation, and the depth of this contamination is unknown. The likely source of the contamination is through leakage from the rupture in the UST. The excavated soils have been encapsulated in polyethylene and backfilled into the excavation. The stockpile sample (S-1) from this material shows oil and grease contamination above Industrial criterion.

The dump site area has been defined as shown in Figure 4 with an extent of approximately 25 x 20 m. Debris has been encountered in test pitting up to 1.5 m below the surface. The dumps site was found to contain drums of grease and motor oil (Phillip sample ID 97031496). These drums represent potential sources of contamination since they contain free hydrocarbon product. Soil samples from the dump site

Table 4.1.2: Groundwater Chemistry Results
Pump Station 10 - Mile Post 73

Parameter	Aquatic Life Standards	Philip ID: Sample ID: Sample Description: MDC	97028602 MW-1 Monitoring Well #1	97028603 MW-2 Monitoring Well #2
Hydrocarbons				
TEH (C10-C30)		0.1	<	<
TEH Heavy Oil (>C30)		0.1	<	<
EPH (C10 -< C19)		0.1	<	<
EPH (C19 - C32)		0.1	<	<
Polyaromatic Hydrocarbons				
Benzo(a)anthracene		0.00001	<	<
Dibenz(a,h)anthracene		0.00002	<	<
Crysene		0.00001	<	<
Benzo(b)Flourathene		0.00001	<	<
Benzo(k)fluoranthene		0.00001	<	<
Benzo(g,h,I)perylene		0.00002	<	<
Pyrene		0.00001	<	<
Benzo(a)pyrene		0.00001	<	<
Indeno(1,2,3-c,d)pyrene		0.00001	<	<
Acenaphthene		0.00001	<	<
Acenaphthylene		0.00001	<	<
Acridine		0.00005	<	<
Anthracene		0.00001	<	<
Fluoranthene		0.00001	<	<
Fluorene		0.00001	<	<
Naphthalene		0.00001	<	<
Phanathrene		0.00001	<	<
Total PAH's			<	<
Total Low MW PAH's			<	<
Total High MW PAH's			<	<

Notes:

1. All concentrations in mg/L (ppm).
2. MDC - Method Detection Concentration.
3. 0.02 Concentration exceeds Fresh Water Aquatic Life Criteria

Parameter	YCSR Aquatic Life	Philip ID: Sample ID: Sample Description: MDC	97028602 MW-1 Monitoring Well #1	97028603 MW-2 Monitoring Well #2
Metals Total				
Ag	0.001	0.0001	<	<
Al	0.5	0.06	1.93	1.25
As	0.5	0.04	<	<
B	5	0.04	<	<
Ba	10	0.001	0.06	0.045
Be	0.053	0.001	<	<
Bi		0.02	<	<
Ca		0.05	12.2	4.84
Cd	0.008	0.0001	0.0003	0.0003
Co	0.5	0.004	<	<
Cr	0.02	0.002	0.006	<
Cu	0.04	0.002	0.003	0.003
Fe	3	0.05	1.07	0.79
Hg	0.001	0.00005	<	<
K		0.4	1.3	1.3
Mg		0.02	2.84	1.46
Mn	1	0.002	0.064	0.06
Mo	10	0.004	<	<
Na	200	0.4	1.6	1.6
Ni	0.65	0.01	<	<
P		0.04	0.04	0.4
Pb	0.06	0.03	<	0.03
S		0.1	1.8	1.9
Sb	0.3	0.02	<	<
Se	0.01	0.0005	0.0042	0.0038
Si		0.8	2.8	3.2
Sn		0.02	<	0.02
Sr		0.001	0.057	0.033
Te		0.02	<	<
Ti		0.003	0.027	0.012
Tl	3	0.002	<	<
V		0.003	<	<
Zn	0.3	0.01	0.02	0.03
Zr		0.003	<	<

show oil and grease contamination over Industrial criteria. Test pits around the dump site (TP 97-3,4, & 7) did not show signs of contamination and therefore were not sampled. Samples from TP 97-6 just north of the dump site exhibited contamination above the Parkland criteria for oil and grease on the surface, but not at depth.

Two monitor wells were installed down gradient of the dump site. These wells are adjacent to the wetlands west of the site which represents the receptor environment. The water samples from the wells, collected August 12, 1997, did not show signs of contaminants. Soil sample collected during installation of the monitor wells did not show signs of contamination.

Since investigations of the dump site have shown it is smaller than originally anticipated, a third monitor well should be installed between MW-1 and MW-2 to intersect any potential contaminant flow from the center of the dump site. Regular monitoring of these wells should be conducted to determine if contaminant it flowing out of the dump site. Samples should be conducted during the spring freshet, or as soon as the road is open, and secondly mid August during the driest part of the summer.

There is a track of dried crude oil south of Area A in swale leading southwest from the possible POL tank location. This tract of desiccated oil probably came from draining of the POL tank—this practice is seen at almost all the pump stations along the Canol Road. This dried oil is a concern since it was observed at Pump Station 8, MP 174, that bears actively consume.

4.1.6 Conclusions

Based upon the findings of the follow-up work, the following conclusions can be made:

1. the UST and its contents has been removed and awaits disposal options in Ross River;
2. excavated material from around the UST have been encapsulated in polyethylene until remediation options can be determined;
3. verification sampling shows that soils below the UST excavation are contaminated with hydrocarbon above industrial criteria;
4. the dump in area C has been mapped to an area approximately 20 x 25 metres and contains drums of grease and motor oil. Soil are impacted with petroleum hydrocarbons at concentrations which exceed the Industrial criteria;
5. initial sampling of groundwater down gradient from the dump site do not show signs of contamination

4.2 Pump Station 9 - Mile Post 124.5: Lapie River

Pump station 9 is located at MP 124.5, 21 km southwest of Ross River on the South Canol Road (Figure 5) and 0.5 km east of Glacier Creek. The site is located on both the north and south side of the road in an area that slopes southward to the Lapie River. The southern portion of the site is bounded by the South Canol Road to the north and by the Lapie River to the south. This area was uses as the pump station and main camp.

Remnants of the pumping station were observed at east end of the site, on the south side of the Canol Road adjacent to the Lapie River (Figure 6). The burmed area identified in Area B is now interpreted to be the location of the pump station's POL tank. There is dried crude oil in the swale leading south from the tank location towards the river. This is a typical source of contaminant associated with the POL tanks. The concrete foundations west of the pump station, identified in Area A, is most likely the footings for the "surge tank" seen along the Canol Trail in the Northwest Territories (RRMC, 1994)

4.2.1 1996 Findings

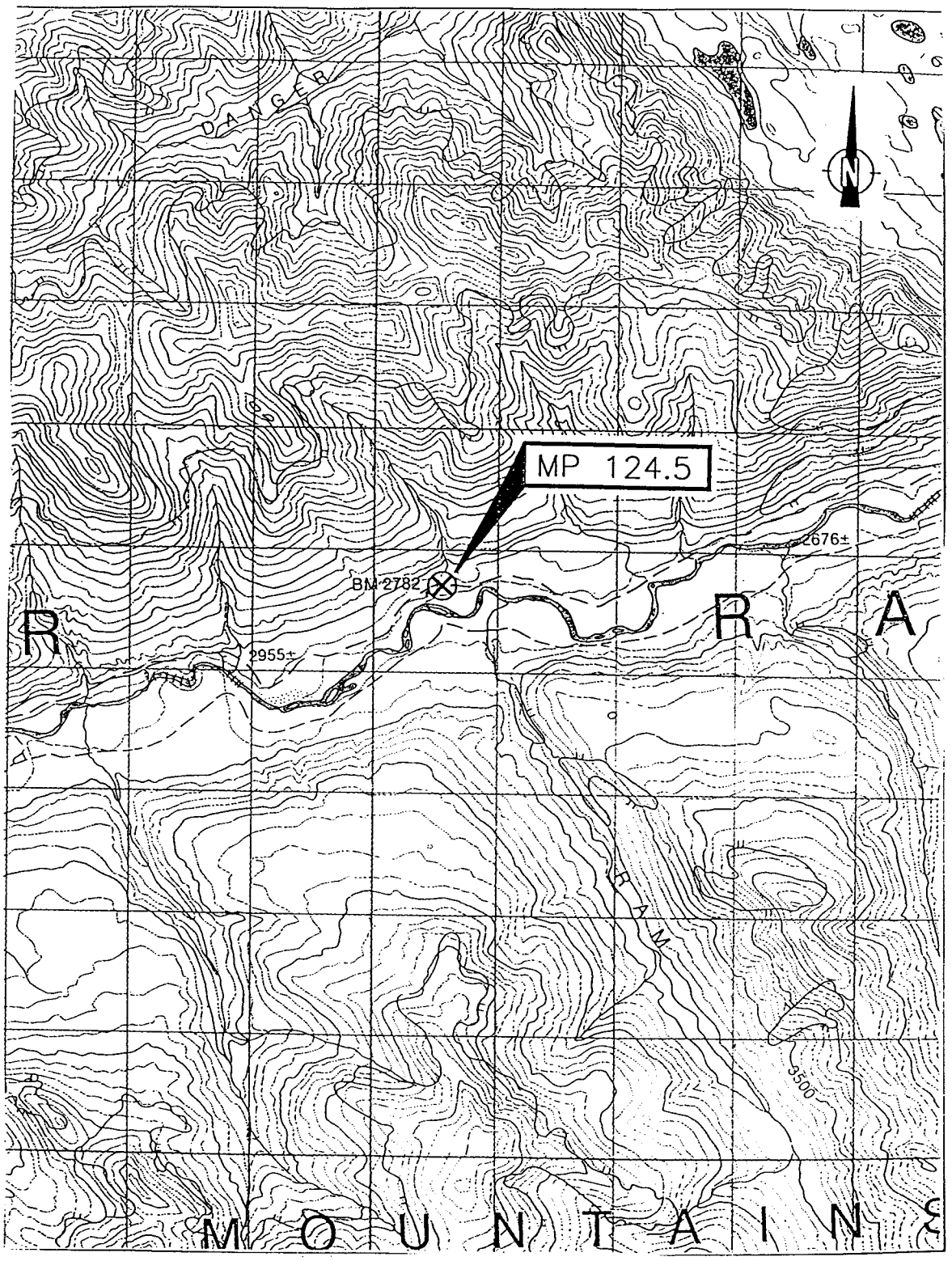
Based upon the 1996 site investigations, the following conclusions were made:

1. a UST was located containing petroleum product remains in the ground adjacent to the pump station foundation;
2. soils down slope from the POL tank (Area B) have been impacted with crude oil a levels which exceed the Special Waste criterion—this down gradient receptor of this area is the Lapie River.
3. soils have been contaminated above the Special Waste criteria around the UST. Contamination above the Industrial criteria exists around the Surge tank foundation, which lies to the west of the pump station.

4.2.2 Work Program

The 1997 work program at this site dealt specifically with the removal of the Underground Storage Tank (UST). The UST was know to contain hydrocarbon product, and therefore if ruptured, could be a source of future contamination.

Soils above the UST were excavated, and then using a hand pump, the contents of the UST were pumped into 45 gallon drums. The product was considerable less viscous than that found in the UST at Pump Station 10. Analytical results determined that this product was weather diesel. The product pumped from the UST appeared to be an emulsion of hydrocarbon and water. ed



Legend

○ Site Location

Source:
NTS 105 F/6, F/7 Edition 1

0 250 500 1000 1500
metres

Scale 1:50,000

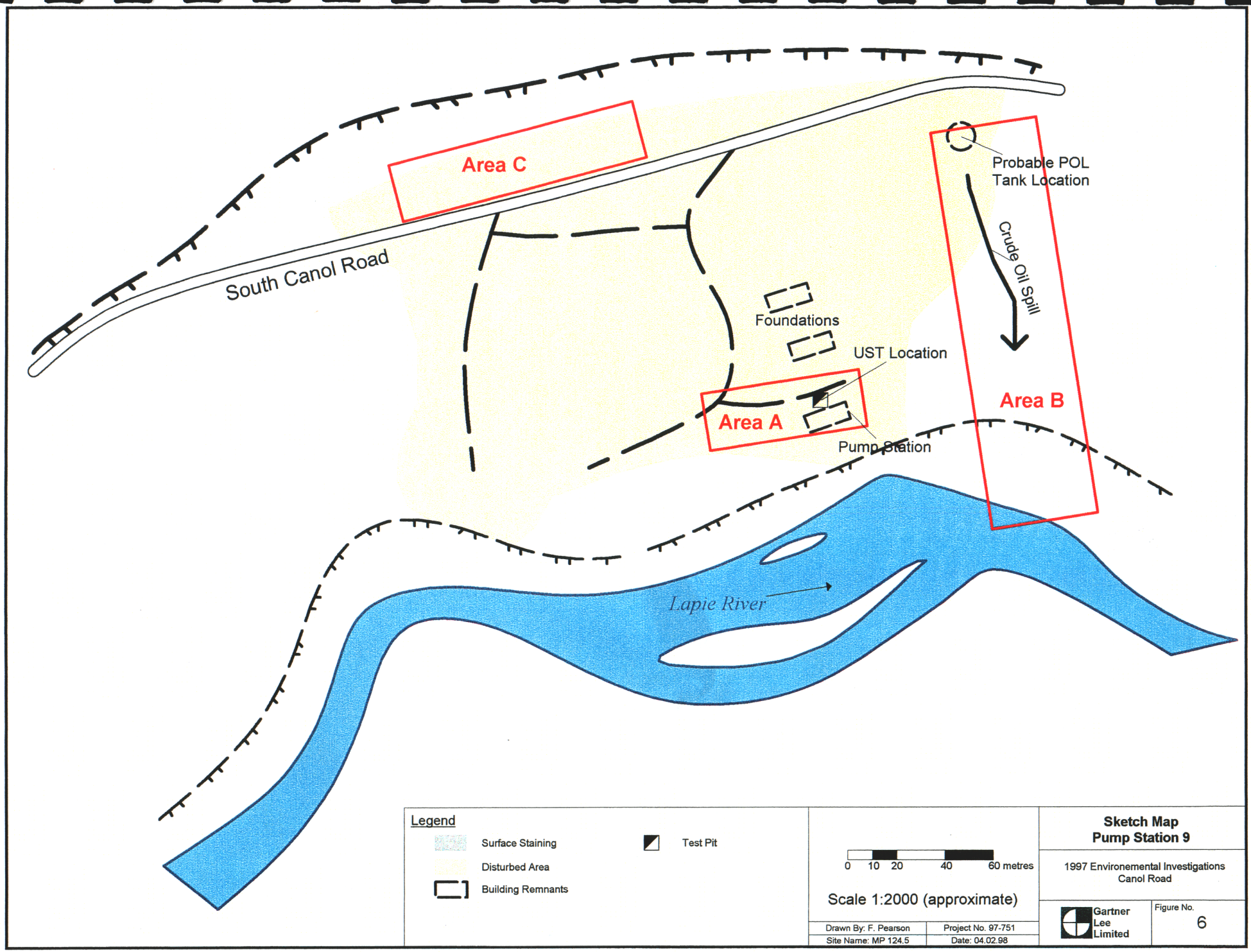
Drawn By: F. Pearson	Project No. 97-751
Site Name: South Canol Road	Date: 04.02.98

Pump Station 9 - MP 124.5
Site Location

1997 Environemental Investigations
Canol Road

Gartner Lee Limited

Figure No. 5


Area C
South Canol Road
Probable POL
Tank Location
Crude Oil Spill
Foundations
UST Location
Area A
Area B
Pump Station
Lapie River
Legend
Surface Staining
Disturbed Area
Building Remnants
Test Pit
0 10 20 40 60 metres
Scale 1:2000 (approximate)
Drawn By: F. Pearson
Project No. 97-751
Site Name: MP 124.5
Date: 04.02.98
Sketch Map
Pump Station 9
1997 Environemental Investigations
Canol Road
Gartner Lee Limited
Figure No.
6

After emptying the UST, excavation continued around the tank. The tank was removed by passing a sling under the tank and lifting using the backhoe bucket. The tank was removed intact and wrapped in polyethylene. The tank is currently in storage in Ross River awaiting cleaning and disposal.

Qualitative inspection of the excavation did not show significant amounts of hydrocarbon contamination under the UST. Two verification samples were collected. Since the soils appears "clean" under field observation, the UST excavation was backfilled with the excavated soils.

4.2.3 Test Results

4.2.3.1 Field Screening

Two verification samples were collected from around the UST excavation. Excavated soils did not exhibit signs of hydrocarbon contamination in the field. Both samples were field screened for organic vapour concentrations using the PID. Sample V-1 revealed organic vapour concentrations above what would be considered background concentrations—a value of 102 ppm was measured.

4.2.3.2 Soil Chemistry

Two verification samples were submitted to the analytical laboratory for analysis of hydrocarbons. A summary of the analytical results are presented here, with the compete results presented in Table 4.2.1 and Appendix B.

Of the two samples verification samples collected from the UST excavation, only one exceeded criteria. Sample V1 exceeded Parkland criteria from both LEPH and HEPH. The sample also exceeded Industrial criteria for mineral oil and grease. Sample V-2 showed no hydrocarbon contamination.

4.2.4 Discussion

The Underground Storage Tank and the hydrocarbon product the tank contained has been removed from the site. This UST was a potential source of future contamination, and therefore has been mitigated. The UST is currently sealed in polyethylene plastic and in storage in Ross River. The tank requires steam cleaning, destruction and disposal. Two 45-gallon drums of weathered diesel and water emulsion pumped from the UST are in storage in Ross River.

Field examination and the two verification samples show that there was not significant amounts of soil contaminated around the UST. There are areas of surficial contamination and hot spots around the UST excavation. One verification sample did not show contamination, where a second sample exceeded Parkland and Industrial criteria for hydrocarbon contamination. Soils did not appear to be contaminated at depth.

Table 4.2.1: Soil Chemistry - Hydrocarbon Results

Pump Station 9 - Mile Post 124.5

Parameter	Parkland Criteria	Industrial Criteria	Philip ID: **Sample ID:** Sample Description: **MDC**	97028600 **V-1** UST Verification Sample	97028601 **V-2** UST Verification Sample	97031165 **124.5 Oil** UST Diesel Sample
Hydrocarbons						
Orangic Vapour Concentration (PID)				102	---	---
TEH (C10-C30)			5	5700	<	400000
TEH Heavy Oil (>C30)			5	1900	<	83000
LEPH (C10-<C19)	1000	2000	5	2600	<	---
HEPH (C19-C32)	1000	5000	5	3400	<	---
Mineral Oil & Grease	1000	5000	100	6900	<	---
Polyaromatic Hydrocarbons						
Benzo(a)anthracene	1	10	0.01	<	<	
Dibenz(a,h)anthracene	1	10	0.02	<	<	
Crysene			0.01	0.21	<	
Benzo(b)Flourathene	1	10	0.01	<	<	
Benzo(k)fluoranthene	1	10	0.01	<	<	
Benzo(g,h,l)perylene			0.02	<	<	
Pyrene	10	100	0.01	<	<	
Benzo(a)pyrene			0.01	<	<	
Indeno(1,2,3-c,d)pyrene	1	10	0.02	<	<	
Acenaphthene			0.01	<	<	
Acenaphthylene			0.01	<	<	
Anthracene			0.01	<	<	
Fluoranthene			0.01	<	<	
Naphthalene	5	50	0.01	0.03	<	
Phanathrene	5	50	0.01	<	<	
Total PAH's				0.24	<	
Total Low MW PAH's				0.03	<	
Total High MW PAH's				0.21	<	

Notes:

1. All concentrations in ug/g (ppm)
2. 1000 Concentration exceeds Parkland Criteria
3. 5000 Concentration exceeds Industrial Criteria
4. Concentration exceeds Special Waste Criteria
5. --- Parameter not analysed
6. < Less than Method Detection Concentraion (MDC)

Gartner

Lee

The dried crude oil in the swale east of the pump station is recognized as a spill created by draining of a POL tank. This tank most likely resided within the bermed area adjacent to the Canol Road. This desiccated crude oil is a concern since in is leads directly into the Lapie River and it has been observed elsewhere that bears are attracted to and consume this dried oil. The concrete foundation to the west of the pump station is currently interpreted to be the footings for a "surge" tank as seen in the Northwest Territories portion of the Canol Road.

4.2.5 Conclusions

Based upon the field investigations and work conducted at this site, the following conclusions can be made:

1. the UST and its contents have been removed and await disposal options in Ross River.
2. soils around the excavation do show some signs of surface contamination, but no extensive contamination to depth;
3. the soils in Area B contaminated above the Special Waste criterion were created by the draining of crude oil from a POL tank

4.3 Old Ross Townsite

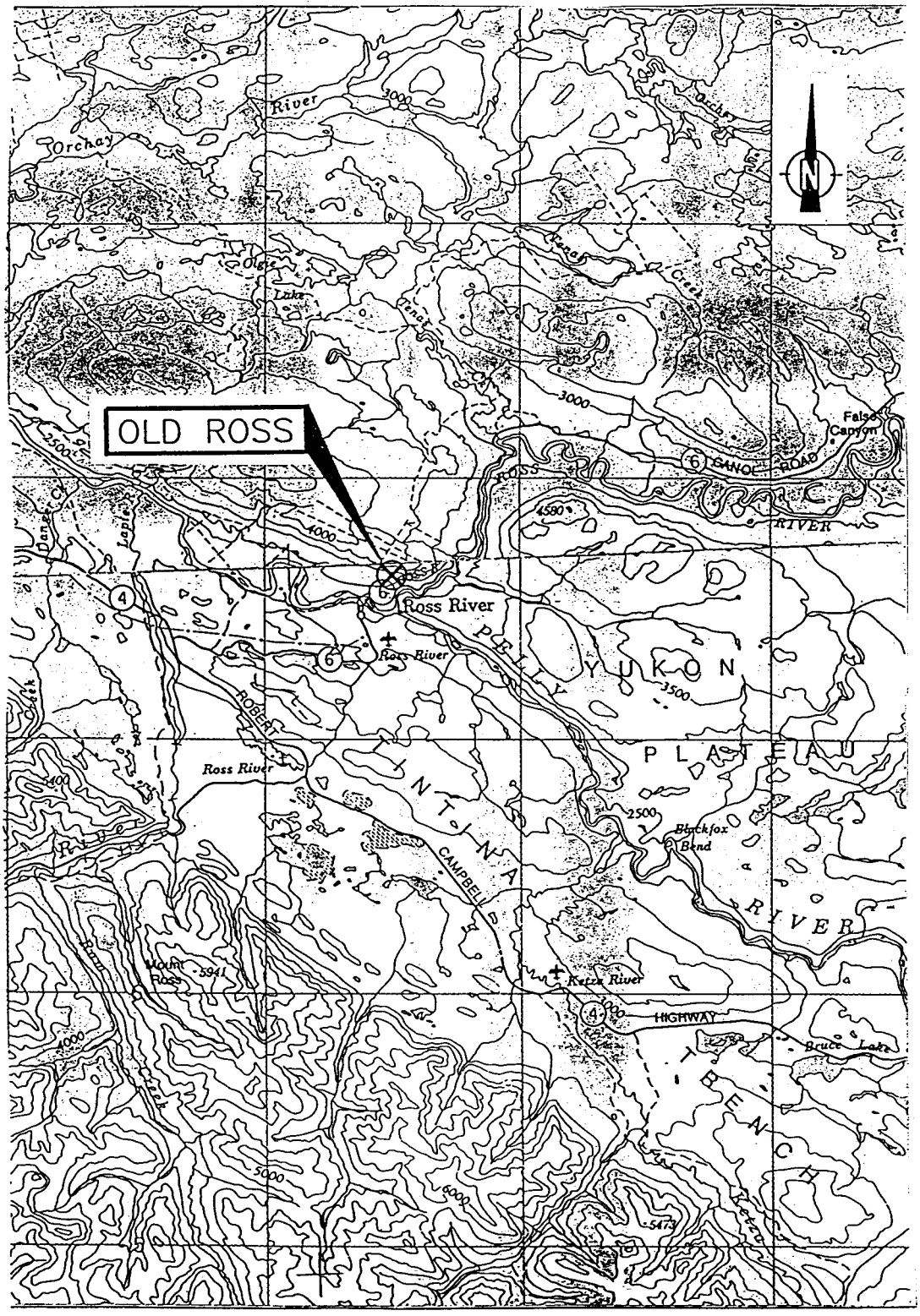
The Old Ross Townsite is located approximately 0.5 km north of the town of Ross River; the site located on the south side of North Canol Road (Figure 7). The site is accessed from a gravel road that leads to a cut line which was formerly a powerline corridor to the old townsite. The area is relatively flat with a slight increase in elevation the west.

4.3.1 1996 Findings

Based upon the 1996 site investigations, the following conclusions were made:

1. two areas of debris were observed at this site; one area is a former dump and the other consisted of wooden an metal remnants of buildings;
2. concentrations of two metals were found to exceed Parkland criteria and one of the elements, arsenic, appears to be associated with the refuse.

The focus of the 1997 field work is the garbage dump area. The dump consists of a 17 x 5 m shallow pit (0.6 m deep) that was full of tin cans and some vehicle parts. Within the area surrounding the pit there were a few small areas of other metal and wooden debris. No areas of surface staining by petroleum were observed.



Legend

Site Location

Source:
NTS 105 F, K Edition 3 and 4

0 250 500 1000 1500
metres

Scale 1:50,000

Drawn By: F. Pearson	Project No. 97-751
Site Name: South Canol Road	Date: 04.02.98

Old Ross Town Site Location

1997 Environemental Investigations
Canol Road

Gartner Lee Limited

Figure No. 7

Interviews with Ross River residents were conducted to determine the location of other potential waste sites in an around Ross River. These investigations did not yield any new sites of concern.

4.3.2 Work Program

The 1997 field program consisted of clean-up of the dump site by the Ross River students. Clean-up work at the Old Ross Townsite was conducted during the week of August 4th 1997. Debris was sorted by the students into tin and other waste. Tin cans were crushed and transported to Whitehorse using a trailer expedited from Ross River. The tin waste was taken to Raven Recycling in Whitehorse for recycling. The remaining waste was transported to the current Ross River Dump.

No analytical testing of samples were required for this work.

4.3.3 Conclusions

The dump site at in the Old Ross Townsite has been cleaned up. All waste has either been taken for recycling or to the Ross River dump.

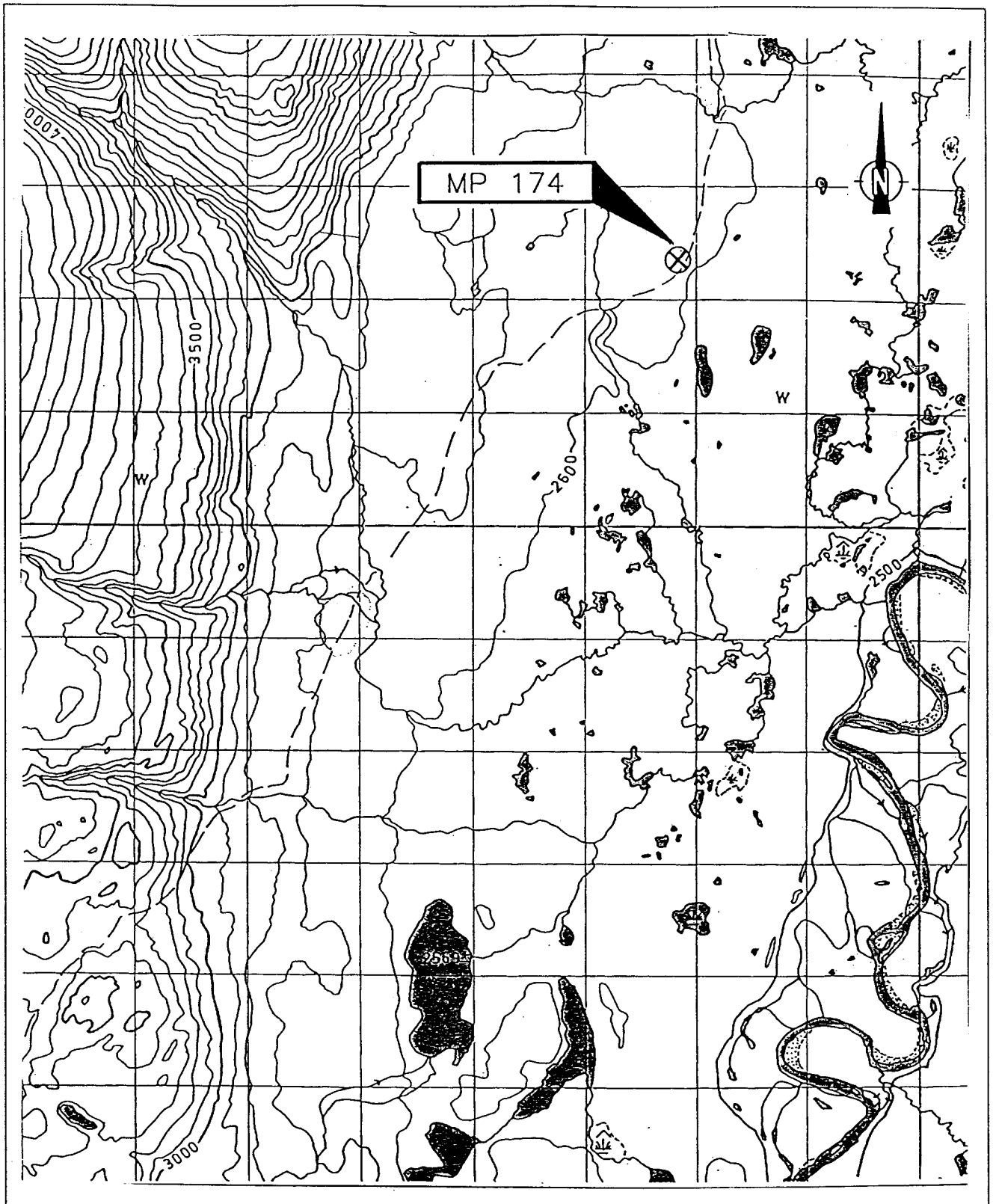
4.4 Pump Station 8 - Mile Post 174: Flat Creek

Pump Station 8 is located at old Mile Post 174, 60 km northeast of Ross River on the North Canol Road (Figure 8). The site is situated on both sides of the road, with the west side formerly occupied by a pumping station and the east side the former camp location.

The focus of the 1997 field work was to investigate at dump site located by Ross River elder Arthur John. The dump site was located approximately 140 m south east of the camp site. The area consists of an "L" shaped clearing in the forest (Figure 9). There has been significant surface disturbance as shown by small berms along the perimeter of the clearing where surface soils have been excavated by earth moving equipment.

The dump site has some re-growth of vegetation, mostly by willows, wild rose and lupins—some areas were gravel covered. Tops of partially buried crushed drums were found protruding from the surface.

The area of desiccated oil found on the west side of the road (see Gartner Lee, 1997) is now interpreted to be created by draining crude oil from the pump station's POL tank.



Legend

Site Location

Source:
NTS 105 J/4 Edition 1

0 250 500 1000 1500
metres

Scale 1:50,000

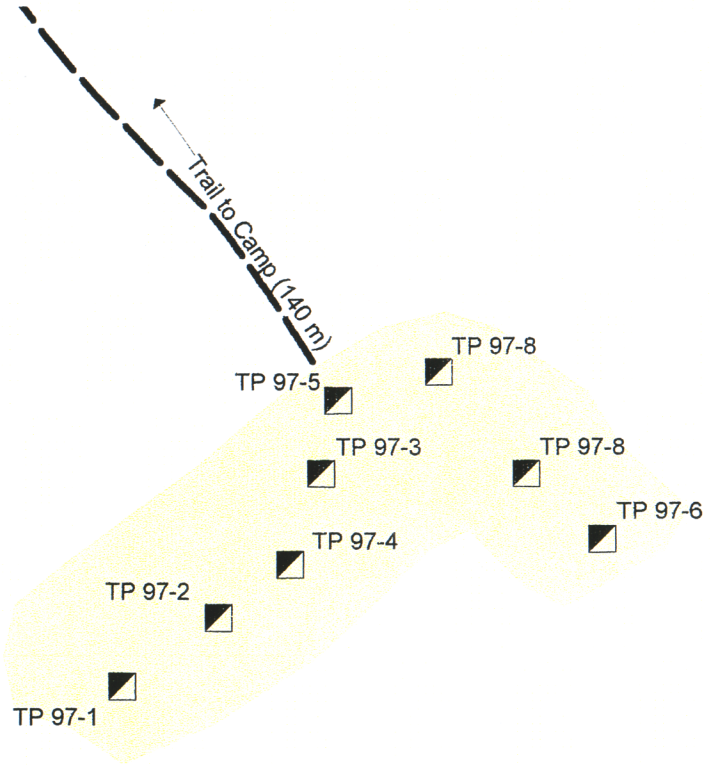
Drawn By: F. Pearson	Project No. 97-751
Site Name: South Canol Road	Date: 04.02.98

Pump Station 8 - MP 174
Site Location

1997 Environemental Investigations
Canol Road

Gartner Lee Limited

Figure No. 8



Legend

Disturbed Area

Test Pit

0 5 10 20 30 metres

Scale 1:1000 (approximate)

Drawn By: F. Pearson

Project No. 97-751

Date: 04.02.98

Sketch Map
Pump Station 8 Dump Site

1997 Environemental Investigations
Canol Road

Gartner Lee Limited

Figure No. 9

4.4.1 1996 Findings

Based upon the 1996 site investigations, the following conclusions were made:

1. shallow soils in the area of solidified crude oil have been impacted by petroleum hydrocarbons at levels exceeding the Special Waste criterion.
2. The large area of soildified crude oil was created by draining of the pump station's POL tank
3. The site is underlain by a dense till at shallow depths preventing the migration of contaminants to a greater depth.

4.4.2 Work Program

The 1997 field program focused on investigating the new dump site area. A series of eight test pits were excavated throughout the clearing (Figure 9). These pits encountered mainly metal debris such as cat tracks, vehicle frames and crushed barrels.

No field signs of significant hydrocarbon contamination were seen at this site. Soil samples were collected from test pits were hydrocarbon contamination was suspected or buried material was encountered.

4.4.3 Test Results

4.4.3.1 Field Screening

Five samples were screened for organic vapour concentrations using the PID. The results from the screening procedure are presented in Table 4.4.1.

Of the five samples, only one had elevated organic vapour concentrations above background levels. The sample from TP 97-5 had concentrations of 68 ppm. Background levels were considered to range from 6 to 13 ppm.

4.4.3.2 Soil Chemistry

Selected soil samples were submitted to the analytical laboratory for analysis of hydrocarbon contaminants. Analytical results are presented in Table 4.4.1 and in Appendix B.

None of the five samples submitted for analysis exceed contamination criteria. Elevated levels of mineral oil and grease were encountered in Test Pit 97-5, but did not exceed Parkland criteria.

Table 4.4.1: Soil Chemistry - Hydrocarbon Results
Pump Station 8 - Mile Post 174

Parameter	YCSR Parkland Criteria	YCSR Industrial Criteria	Philip ID: Sample ID: Sample Description: MDC	97031464 TP-2 0.46m Test Pit 97-2	97031465 TP-2 1.02m Test Pit 97-2	97031466 TP-3 0.46m Test Pit 97-3	97031463 TP-4 0.29 Test Pit 97-4	97031462 TP-5 0.24 Test Pit 97-5
Hydrocarbons								
Orangic Vapour Concentration (PID)				11	9	6	13	68
TEH (C10-C30)	400	5000	5	—	6	—	—	—
TEH Heavy Oil (>C30)			5	—	110	—	—	—
EPH (C10-<C19)	1000	2000	5	—	<	—	—	—
EPH (C19-C32)	1000	5000	5	—	14	—	—	—
Mineral Oil & Grease	1000	5000	100	<	<	<	<	310
Polyaromatic Hydrocarbons								
Benzo(a)anthracene	1	10	0.01		<			
Dibenz(a,h)anthracene	1	10	0.02		<			
Crysene			0.01		<			
Benzo(b)Flourathene	1	10	0.01		<			
Benzo(k)fluoranthene	1	10	0.01		<			
Benzo(g,h,I)perylene			0.02		<			
Pyrene	10	100	0.01		<			
Benzo(a)pyrene			0.01		<			
Indeno(1,2,3-c,d)pyrene	1	10	0.02		<			
Acenaphthene			0.01		<			
Acenaphthylene			0.01		<			
Anthracene			0.01		<			
Fluoranthene			0.01		<			
Naphthalene	5	50	0.01		<			
Phanathrene	5	50	0.01		<			
Total PAH's					<			
Total Low MW PAH's					<			
Total High MW PAH's					<			

Notes:

1. All concentrations in ug/g (ppm)
2. 1000 Concentration exceeds YCSR Parkland Criteria
3. 5000 Concentration exceeds YCSR Industrial Criteria
4. Concentration exceeds B.C. Special Waste Criteria
5. — Parameter not analysed
6. < Less than Method Detection Concentraion (MDC)

4.4.4 Discussion

Pump Station 8 dump site was investigated during the 1997 field season. Test pitting showed that mostly metallic debris is buried in the dump area. The dump site has modest re-growth, and there were no signs of surface hydrocarbon staining. Soil sampling showed some low levels of contamination, but no samples exceeded Yukon Contaminated Sites criteria.

4.4.5 Conclusions

Based upon these findings, it is concluded that:

1. A small dump site exists southeast of the pump station site. The dump consists mostly of buried metallic waste. No significant hydrocarbon contamination was found.
2. the soils in north of the Canol Road at this site contaminated above the Special Waste criterion were created by the draining of crude oil from a POL tank

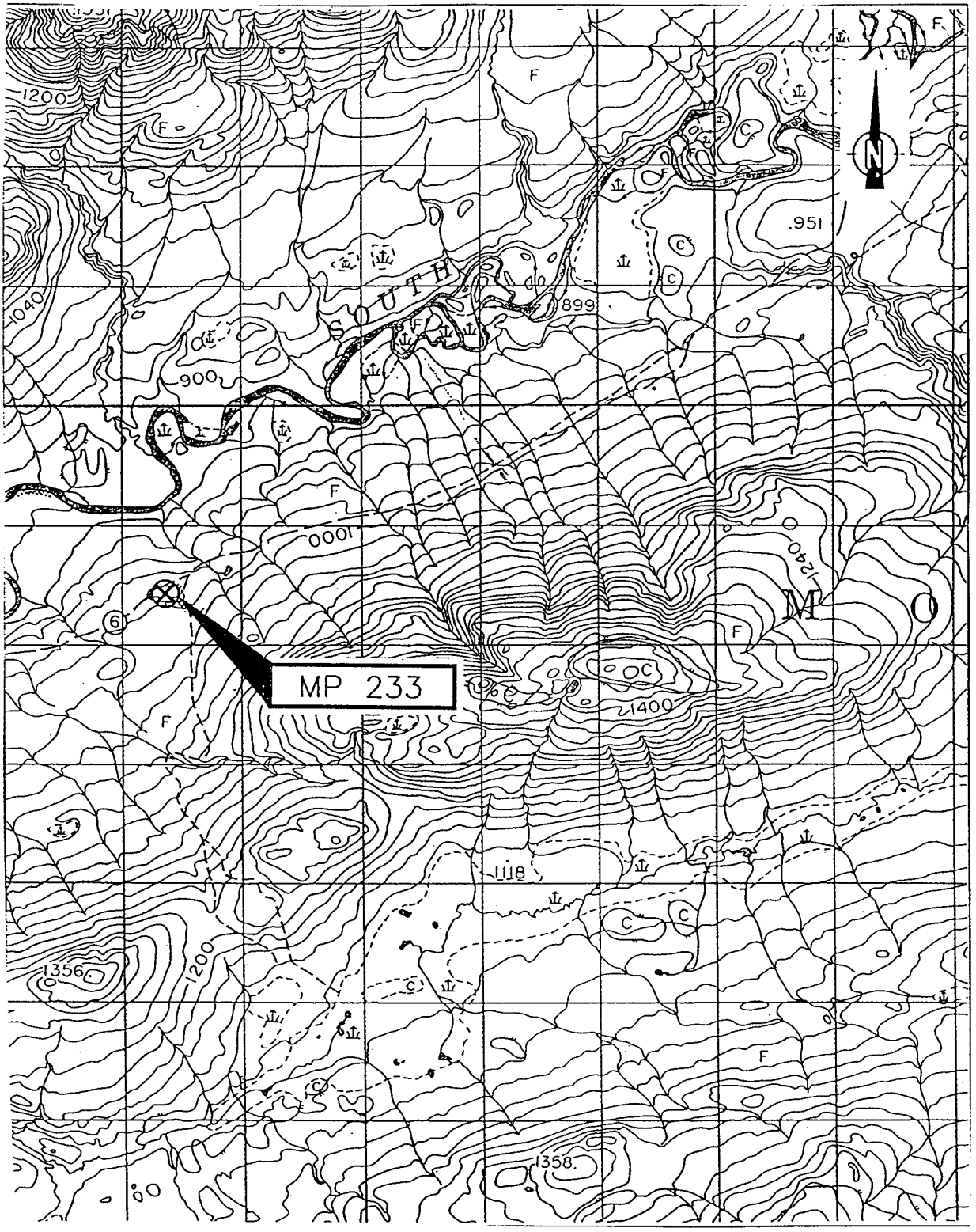
4.5 Pump Station 7 - Mile Post 233

Pump Station 7 - Mile Post 233 is located 154 km northwest of Ross River, 4 km past Moose Creek, on both sides of the North Canol Road (Figure 10) The site consists of a rounded bedrock knob and face exposed on the north side of the road, and a low lying swampy area on the south side.

The swampy area on the south side of the road appears to be a discharge zone at the base of the slope. There area areas of ponded water which outlets to a small creek which flows down the hillside at the east end of the site. Water samples collected during the 1996 field work identified elevated metals content. Specifically, levels of mercury and copper were found to exceed Freshwater Aquatic Life criteria.

4.5.1 Work Program

The 1997 work program at this site was to collect a follow-up sample from the ponded water south of the ad. The goal of this sampling was to confirm the elevated metal concentrations found in 1996.
Up gradient reconnaissance work was conducted to locate potential dump sites. Examination of aerial photographs south of the pump station site, and a ground inspection was conducted. These efforts failed to locate a dump site south of the North Canol road at this location.



Legend

Site Location

Source:
NTS 105 J/4 Edition 1

0 250 500 1000 1500
metres

Scale 1:50,000

Drawn By: F. Pearson	Project No. 97-751
Site Name: South Canol Road	Date: 04.02.98

Pump Station 7 - MP 233
Site Location

1997 Environemental Investigations
Canol Road

Gartner Lee Limited

Figure No. 10

4.5.2 Test Results

4.5.2.1 Surface Water Chemistry

Results from the surface water sample collected are presented in Table 4.5.1 with complete analytical results in Appendix B. This sample did not show the elevated metal loading present in 1996. No metals were found to exceed Freshwater Aquatic Life criteria. Iron levels were elevated in the samples, and this is probably due to the rusting barrels found in the water at this site.

4.5.3 Conclusions

From the above findings, it is concluded that:

1. the elevated metal concentrations in 1996 were not confirmed and may be considered anomalous.

Table 4.5.1: Surface Water Chemistry Results
Pump Station 7 - Mile Post 233

Parameter	YCSR Aquatic Life	Philip ID: Sample ID: Sample Description: MDC	97030716 MP 233-5 Water sample
Metals Total			
Ag	0.001	0.0001	<
Al	0.5	0.06	0.1
As	0.5	0.04	<
B	5	0.04	<
Ba	10	0.001	0.062
Be	0.053	0.001	<
Bi		0.02	<
Ca		0.05	6.75
Cd	0.008	0.0001	<
Co	0.5	0.004	<
Cr	0.02	0.002	<
Cu	0.04	0.002	<
Fe	3	0.05	2.25
Hg	0.001	0.00005	<
K		0.4	<
Mg		0.02	3.84
Mn	1	0.002	0.353
Mo	10	0.004	<
Na	200	0.4	1.5
Ni	0.65	0.01	0.01
P		0.04	<
Pb	0.06	0.03	<
S		0.1	4.1
Sb	0.3	0.02	<
Se	0.01	0.0005	<
Si		0.8	2.5
Sn		0.02	<
Sr		0.001	0.042
Te		0.02	<
Ti		0.003	<
Tl	3	0.002	<
V		0.003	<
Zn	0.3	0.01	0.02
Zr		0.003	<

Notes:

1. All concentrations in mg/L (ppm).
2. MDC - Method Detection Concentration.
3. 0.02 Concentration exceeds Fresh Water Aquatic Life Criteria

4.6 Mile Post 234 - Military Camp

MP 234 Military Camp was a major construction camp associated with Pump Station 7 at MP 233. The site is located 156 km east of Ross River on the north and south side of the road (Figure 11). The site is located at the base of a north facing mountain slope on a gently northward sloping bench.

Surface water appears to runs north down the mountain slope into a ditch excavated on the south side of the road. This ditch flows east to a small creek running along the east side of the site.

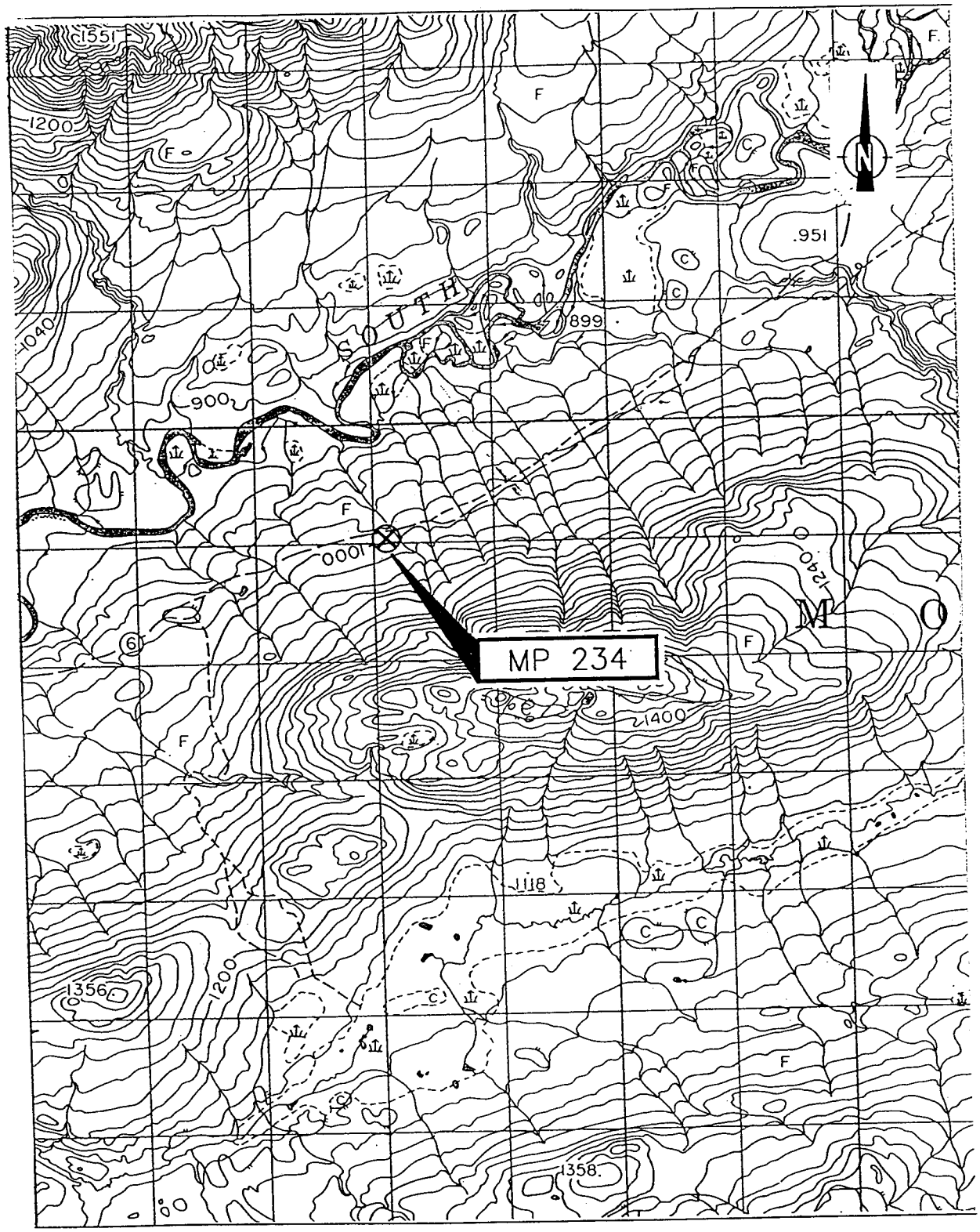
1997 field work revealed that the camp site consists of four distinct areas (see Figure 12). These include:

1. The camp debris burial area—this area is described in this section. The area was investigated in 1996 and follow-up work was conducted in this area during the 1997 program. Detail of this area is shown in Figure 13. This area is easily located north of the road by the large number of vehicle hulks aligned along the road. Investigations have revealed that drums of oil and grease have been buried along with other metallic waste in this area. Burial of material at this site was most likely conducted during clean-up efforts along the road in the mid-1970's.

2. A second pump station was located in 1997 near the MP234 camp. This area has been identified as a new site, and is described in detail in section 7.2. The remnants of the concrete pump station foundation were found approximately 300 m south of the Canol Road. West of the pump station three crescent shaped berms were found by examining aerial photography (see section 7.2). Although the berms and the land around the berms is quite overgrown, scrap metal and hydrocarbon staining were found on the southern most berm, this indicates that these berms once contained POL (Petroluem, Oil & Lubricant) tanks. A large wooden maintenance shed is shown in the 1975 photography to the east of the pump station, but no sign of this building exists today.

3. The main camp area at this site is south of the Canol Road and east of the pump station. The camp area is heavily overgrown by willows and alders. Photographs from 1975 show that there were over 20 building ruins in this area. In 1997 only a few overgrown remains of these camp buildings could be found. No issues related to contamination, and minimal unsightly waste was found in the main camp area. No further work was conducted in this area.

4. Less than one kilometre east of the main burial site, a second debris burial site was located south of the North Canol Road. This site has been called MP 234.5 and is described as a new site in Section 7.3. The site was located by Ross River residents and consists of a clearing approximately 30 south of the road. Pieces of culvert are piled on the northeast side of the clearing, and dried grease, desiccated oil and crushed drums are found sporadically over the area.



Legend

O Site Location

Source:
NTS 105 J/15 Edition 1

0 250 500 1000 1500
metres

Scale 1:50,000

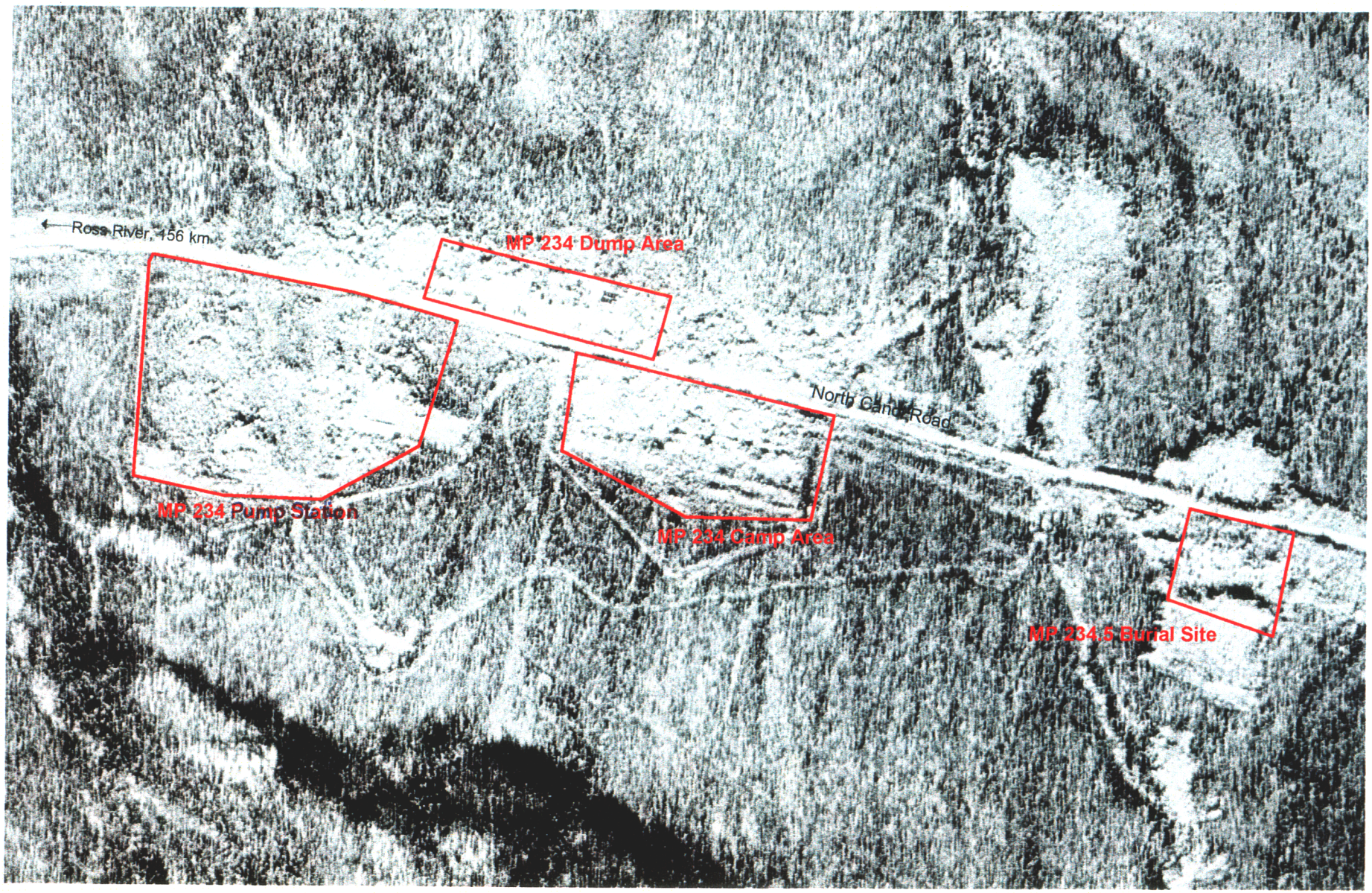
Drawn By: F. Pearson	Project No. 97-751
Site Name: North Canol Road	Date: 04.02.98

MP 234
Site Location

1997 Environemental Investigations
Canol Road

Gartner Lee Limited

Figure No. 11



Legend

MP 234 Site Components

Not to Scale

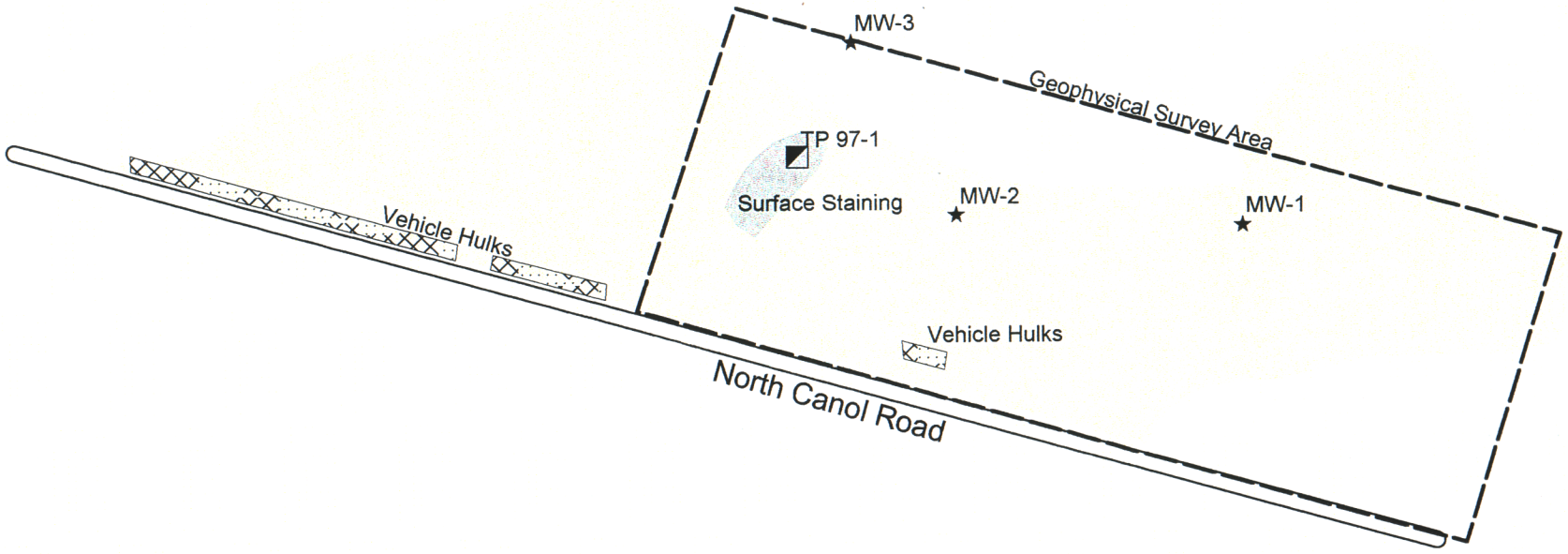
Drawn By: F. Pearson	Project No. 97-751
Site Name: MP 234	Date: 04.02.98

MP 234 Overview

1997 Environemental Investigations
Canol Road

Gartner Lee Limited

Figure No. 12



Legend

- Surface Staining
- Disturbed Area
- Building Remnants
- Test Pit
- Monitor Well

0 10 20 40 60 metres

Scale 1:2000 (approximate)

Drawn By: F. Pearson	Project No. 97-751
Site Name: MP 234	Date: 04.02.98

Sketch Map
MP 234 Dump Site

1997 Environemental Investigations
Canol Road

Gartner Lee Limited

Figure No. 13

The following describes follow-up work conducted at the main burial site at MP 234 as identified in 1996 (GLL, 1996). The pump station and secondary burial site are described in section 7.2 and 7.3 as new sites respectively.

4.6.1.1 1996 Findings

Based upon the 1996 investigations of main burial area, the following conclusions were made:

1. the site was used as a burial area for drums full of oil and grease in the 1970's;
2. the site is heavily impacted by petroleum hydrocarbons at levels which exceed the Contaminated Site criteria;

3. elevated metal concentrations in the soil and vegetation are likely related the regional geochemistry.

4.6.2 Work Program

The 1997 work program for these site was as follows:

1. Determination if contaminants are leaving the dump site via groundwater down gradient north and east of the dump site.
2. Delineation of the burial area found north of the road.

4.6.2.1 Groundwater Monitor Installation

The 1996 field program detected soil contamination above contaminated sites criteria in dump site area. Three groundwater monitor wells were installed down-gradient from the burial area. The locations of these three wells (MW-1, MW-2 and MW-3) are shown on Figure 13. Wells were installed by excavating a pit, installing Waterra environmental grade PVC monitoring wells, and then backfilling the pit.

Monitor Well # 1 encountered significant amounts of buried metal debris. This well is located in the eastern portion of the site and had not previously been recognized as burial area. Hydrocarbon sheen was found on the groundwater in this test pit and a strong hydrocarbon odour was detected.

Soil samples were collected during well installation. Water samples were collected from the wells on August 27th, 1997. Wells were developed by extracting three well volumes using a disposable bailer prior to sampling..

4.6.2.2 Geophysical Survey- Main Burial Site Mapping

A terrain conductivity survey was completed over the main burial area using a Geonics EM31 Ground Conductivity Meter. The survey was conducted to help detect and delineate the presence of buried metal objects such as metal debris and steel drums at the site.

Prior to the geophysical survey, a temporary baseline was established along the North Canol road. The baseline consisted of flagging tape spaced 5 m apart and affixed to vegetation. The geophysical survey was conducted along lines run perpendicular to the baseline at 5 m intervals. The lines were run north from the Canol Road baseline. Grid coordinates are shown on Figures 14 and 15.

Following the completion of the surveys, the data are plotted and interpreted from the profile lines of the geophysical data and notes collected in the field. Final presentation of the data is in the form of colour contour maps on Figures 14 and 15.

A follow-up test pit was excavated in the main burial area to the west. This area had previously been test pitted in 1996 as TP 96-1 and TP 96-4. A soil sample was collected from this pit and analyzed for hydrocarbon content. During excavation, two partial full grease drums were removed. These drums were wrapped in polyethylene are awaiting disposal options in Whitehorse.

4.6.3 Test Results

4.6.3.1 Field Screening

One soil samples from the main burial area was screened in the field using a PID. The results from this screening are shown in Table 4.6.1.

The sample collected from TP 97-1 did show slightly elevated organic vapour concentrations which was around 27 ppm.

4.6.3.2 Soil Chemistry

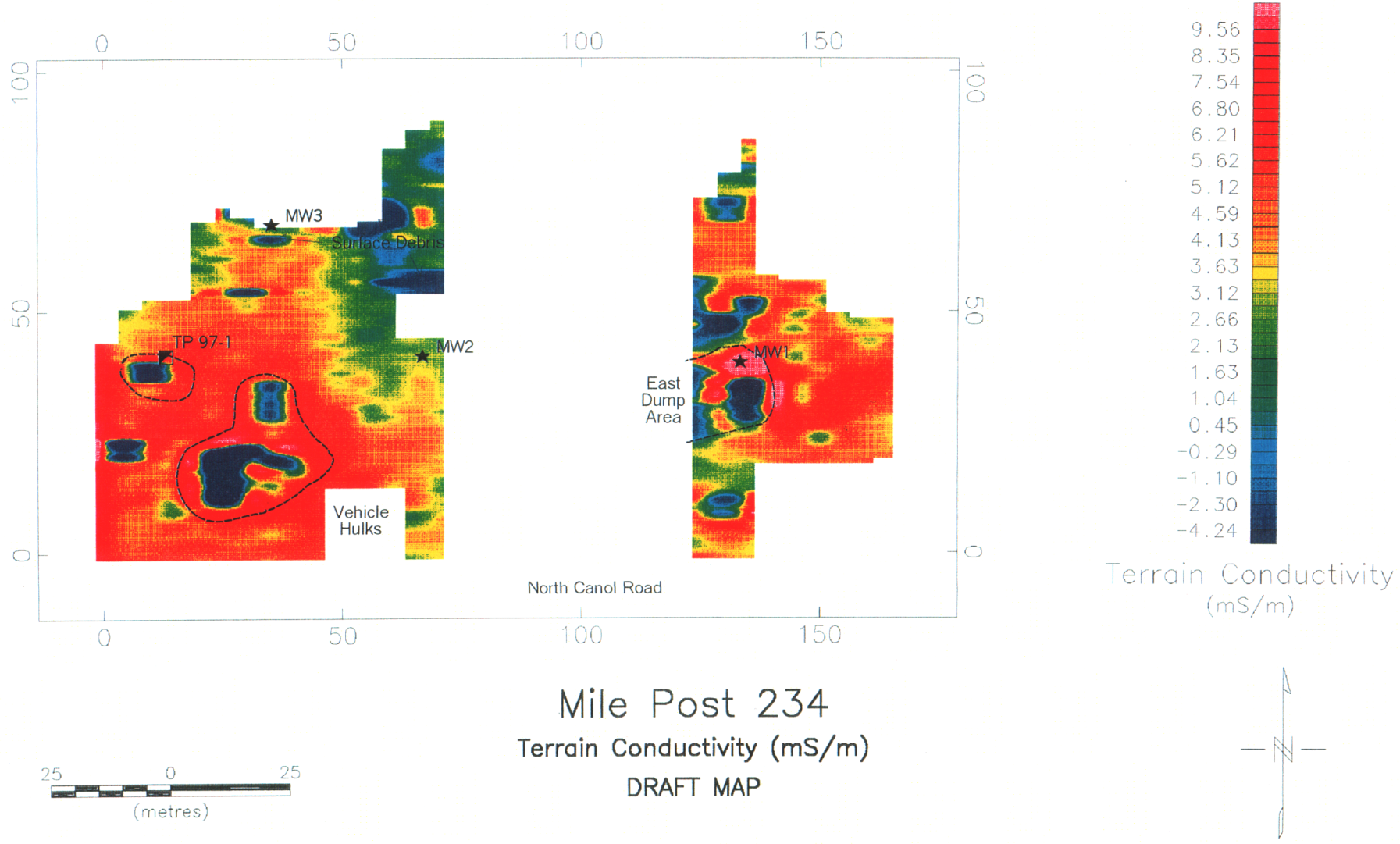
Selected soil samples were submitted to the analytical laboratory for analysis for hydrocarbon contamination. This section provides a summary of the analytical results with the complete results presented in Tables 4.6.1 and Appendix B.

One soils sample from test pit TP 97-1 was submitted from analysis. This sample was found to have elevated oil & grease content, but it did not exceed criteria.

4.6.3.3 Groundwater Chemistry

Three groundwater samples were collected from the monitor wells installed down gradient of the dump site (MW-1, MW-2 & MW-3 on Figure 11). Groundwater samples were analyzed for hydrocarbons. The complete analytical results are presented in Table 4.6.2 and Appendix B.

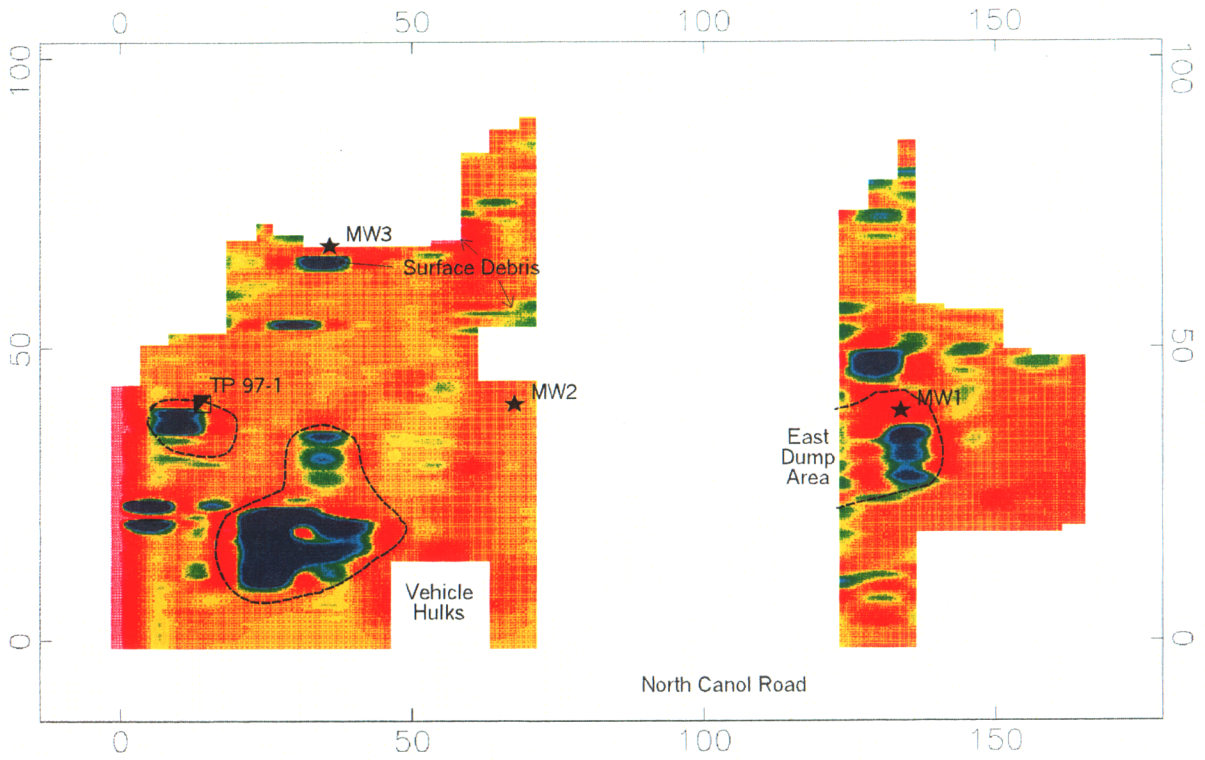
Of the three samples, only MW-1 detected hydrocarbons. Although there are no regulated guidelines for hydrocarbon concentrations in groundwater, the light extractable hydrocarbon concentrations encountered in MW-1 (0.9 mg/L) were quite high

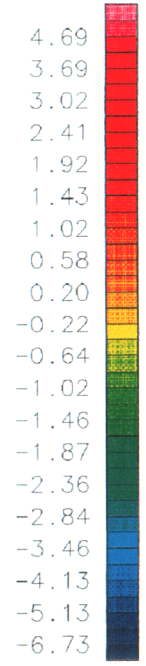


Mile Post 234

Terrain Conductivity (mS/m)

DRAFT MAP





In-phase
(ppt)

Mile Post 234

In-phase Component (ppt)

DRAFT MAP

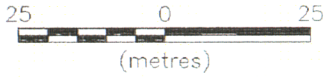


Table 4.6.1: Soil Chemistry - Hydrocarbon Results

Mile Post 234 Dump Site

Parameter	YCSR Parkland Criteria	YCSR Industrial Criteria	Philip ID: / Sample ID: / Sample Description: MDC	97031489 / TP 97-1, 1.15m / Test Pit 97-1
Hydrocarbons				
Orangic Vapour Concentration (ppm)				27
TEH (C10-C30)			5	17
TEH Heavy Oil (>C30)			5	91
EPH (C10-<C19)	1000	2000	5	<
EPH (C19-C32)	1000	5000	5	31
Mineral Oil & Grease	1000	5000	100	160
Polyaromatic Hydrocarbons				
Benzo(a)anthracene	1	10	0.01	<
Dibenz(a,h)anthracene	1	10	0.02	<
Crysene			0.01	<
Benzo(b)Flourathene	1	10	0.01	<
Benzo(k)fluoranthene	1	10	0.01	<
Benzo(g,h,I)perylene			0.02	<
Pyrene	10	100	0.01	0.01
Benzo(a)pyrene			0.01	<
Indeno(1,2,3-c,d)pyrene	1	10	0.02	<
Acenaphthene			0.01	<
Acenaphthylene			0.01	<
Anthracene			0.01	<
Fluoranthene			0.01	0.01
Naphthalene	5	50	0.01	<
Phanathrene	5	50	0.01	0.01
Total PAH's				0.04
Total Low MW PAH's				0.02
Total High MW PAH's				0.02

Notes:

1. All concentrations in ug/g (ppm)
2. 1000 Concentration exceeds Yukon Contaminated Sites Regulations Parkland Criteria
3. 5000 Concentration exceeds Yukon Contaminated Sites Regulations Industrial Criteria
4. Concentration exceeds B.C. Special Waste Criteria
5. --- Parameter not analysed
6. < Less than Method Detection Concentraion (MDC)

Gartner
Lee

Table 4.6.2: Groundwater Chemistry Results
Mile Post 234 Dump Site

Parameter	YCSR Aquatic Life	Philip ID: / Sample ID: / Sample Description: MDC	97030710 / MP234 MW-1 / Monitoring Well #1	97031151 / MP234 MW-2 / Monitoring Well #2	97031152 / MP234 MW-3 / Monitoring Well #3
Hydrocarbons					
TEH (C10-C30)	0.1	0.1	0.9	<	<
TEH Heavy Oil (>C30)		0.1	<	<	<
EPH (C10 -< C19)		0.1	0.9	<	<
EPH (C19 - C32)		0.1	<	<	<
Polyaromatic Hydrocarbons					
Benzo(a)anthracene		0.00001	<		
Dibenz(a,h)anthracene		0.00002	<		
Crysene		0.00001	<		
Benzo(b)Flourathene		0.00001	<		
Benzo(k)fluoranthene		0.00001	<		
Benzo(g,h,I)perylene		0.00002	<		
Pyrene		0.00001	<		
Benzo(a)pyrene		0.00001	<		
Indeno(1,2,3-c,d)pyrene		0.00001	<		
Acenaphthene		0.00001	<		
Acenaphthylene		0.00001	<		
Acridine		0.00005	<		
Anthracene		0.00001	<		
Fluoranthene		0.00001	<		
Fluorene		0.00001	<		
Naphthalene		0.00001	<		
Phanathrene		0.00001	<		
Total PAH's			<		
Total Low MW PAH's			<		
Total High MW PAH's			<		

Notes:

1. All concentrations in mg/L (ppm).
2. MDC - Method Detection Concentration.
3. [redacted] Concentration exceeds Fresh Water Aquatic Life Criteria

4.6.4 Discussion

The dump site area identified in 1996 has been delineated by a geophysical anomaly shown on Figures 14 and 15. The area is approximately 30 m by 25 m. This area contains drums containing oil & grease, and soils are contaminated above Industrial Criteria.

A second area to the east of the original burial had been found during excavation of MW-1. The geophysical survey has indicated an eastern extent to the buried material, but due to time constrains, the westerly limits of the dump area are yet to be determined. Soil sampling in this eastern dump area should be conducted to determine is soil contamination is associated with the burial of the metallic debris encountered.

Groundwater sampling indicates that hydrocarbon contamination was detected in MW-1. This well was installed directly in the eastern dump area. Follow-up groundwater sampling should be conducted at this site to confirm these sampling results. Additionally, water sampling down-gradient from this eastern dump site should be conducted to determine if contamination is leaving the site and entering the environment.

Water sampling from down gradient and to the east of the western dump area (MW-3 and MW-2 respectively) failed to detect the presence of hydrocarbons. This indicates that hydrocarbons may not be leaving the western dump area. . Regular monitoring of these wells should be conducted to determine if contaminant it flowing out of the dump site. Samples should be conducted during the spring freshet, or as soon as the road is open, and secondly mid August during the driest part of the summer.

4.6.5 Conclusions

From the above findings, it is concluded that:

1. The western dump site identified in 1996 is approximately 30 by 25 m.

2. A second, eastern dump area has been located and is at least 20 by 20 m.

3. Groundwater samples from the eastern dump area indicate hydrocarbon contamination.

4. Soils in the western portion of the dump site are heavily impacted by petroleum hydrocarbons which exceed the Special Waste criteria;

5. initial sampling of groundwater down gradient from the western dump site does not show signs of contamination

5. 1997 Reconnaissance Site Investigations

Community consultation and elder interviews reveled several sites along the Yukon portion Canol Road that warranted preliminary investigation. Five reconnaissance sites were visited. The findings at these sites are presented as separate subsections from 5.1 to 5.5.

5.1 Upper Sheep Creek

Reports of waste and debris were followed up at the Stormy Mountain mineral occurrence (Yukon Minfile #105F 011). This site is at the headwaters of Sheep Creek, and is the remnants and debris associated with pervious mineral exploration project at this site. Several collapsed buildings were located at the site as well as at least 30 empty 45-gallons drums. One of the drums is half buried and open at the top. A marmot body was found in this drum, and it is assumed that it died after becoming trapped in the drum. Members of the RRDC expressed concern over such wildlife hazards.

This reconnaissance visit did not identify contamination-related issues at this site. It is recommend that clean-up efforts be conducted at this site to remove the debris and unsightly waste left by previous exploration projects as part of future exploration work at this site.

5.2 Boulder Creek RR 048

Reports of drums north of the Canol Road near Boulder Creek were investigated. The site lies approximately 45 km southwest of Ross River on the South Canol Road. The site consists of an overgrown road alignment north of the current road. In the forest surrounding the old road alignment, 13 empty 45-gallon drums were located over approximately 300 m of trail.

This reconnaissance visit did not identify contamination-related issues at this site. It is recommended that when unsightly debris clean-up efforts along the Canol Road are conducted that the drums at this site be removed and disposed of appropriately.

5.3 Ram Creek - Mile Post 124.5

The Ram Creek site is located on the south side of the Lapie River, across from Pump Station 9 at MP 124.5. The site was most likely the south side of the pipeline crossing over the river. Bridge foundations were observed on the north bank at the pump station. The site is very well re-grown, and there is almost

no sign of previous activities. The occasional tin can was found in the forest, as well as the remnants of a small log cabin. Three 45-gallon drums were located scattered through the forest.

This reconnaissance visit did not identify contamination-related issues at this site. It is recommend that no further work be conducted at this site due to is state of re-vegetation and the access difficulties at this site.

5.4 Tenas Creek

An abandoned sawmill site was located by Ross River residents south of the North Canol Road, approximately 10 km from Ross River. At this site some minor metallic debris was encountered. Two 45-gallon drums were found to contain unknown hydrocarbon product.

It is recommended that two drums of hydrocarbon product be sampled and sent to an analytical laboratory for identification. The drums should be removed from the site and transported to Ross River. It is recommended that the drums be moved by helicopter due to the lack of road access to the site. When the material is identified, disposal options can be developed.

5.5 Sheldon Sawmill - Mile Post 215

A sawmill site was identified by Ross River elder Art John on the north side of the Canol Road near Sheldon Lake. The site is located approximately 130 km northeast of Ross River. Located approximately 300 m north of the road, the site consists of three clearings. The access road is heavily overgrown with alders and leads to the central clearing. An overgrown sawdust mound creates the western clearing. The eastern clearing contains slab lumber that was discarded during the milling process. At least 19 empty 45-gallon drums were located between the Canol Road and the mill site. A small area of oil stained ground was identified between the western and central clearings. This oil staining was most likely created by spillage of saw lubricating oil.

This reconnaissance identifies only minimal contamination related issues at this site. It is recommended that when unsightly debris clean-up efforts along the Canol Road are conducted that the drums at this site be removed and disposed of appropriately.

6. Northwest Territories Reconnaissance Sites

This section details a two day reconnaissance trip into the Northwest Territories side of the MacMillan Pass area conducted September 9th-11th by members of the Ross River Dena Council and Gartner Lee Limited personnel. The members of the trip included:

- George Smith - Ross River Dena Council Land Claims
- Jason Smith - George's son, RRDC
- Robert Etzel - Ross River Elder
- Stephen Morison - Gartner Lee Limited

The team visited four sites. These sites, as identified by Royal Roads Military College (RRMC, 1994) are:

- Site 20 (MP222)
- Site 19B (MP216)
- Site 19A (MP215)
- Pump Station 6 (MP208)

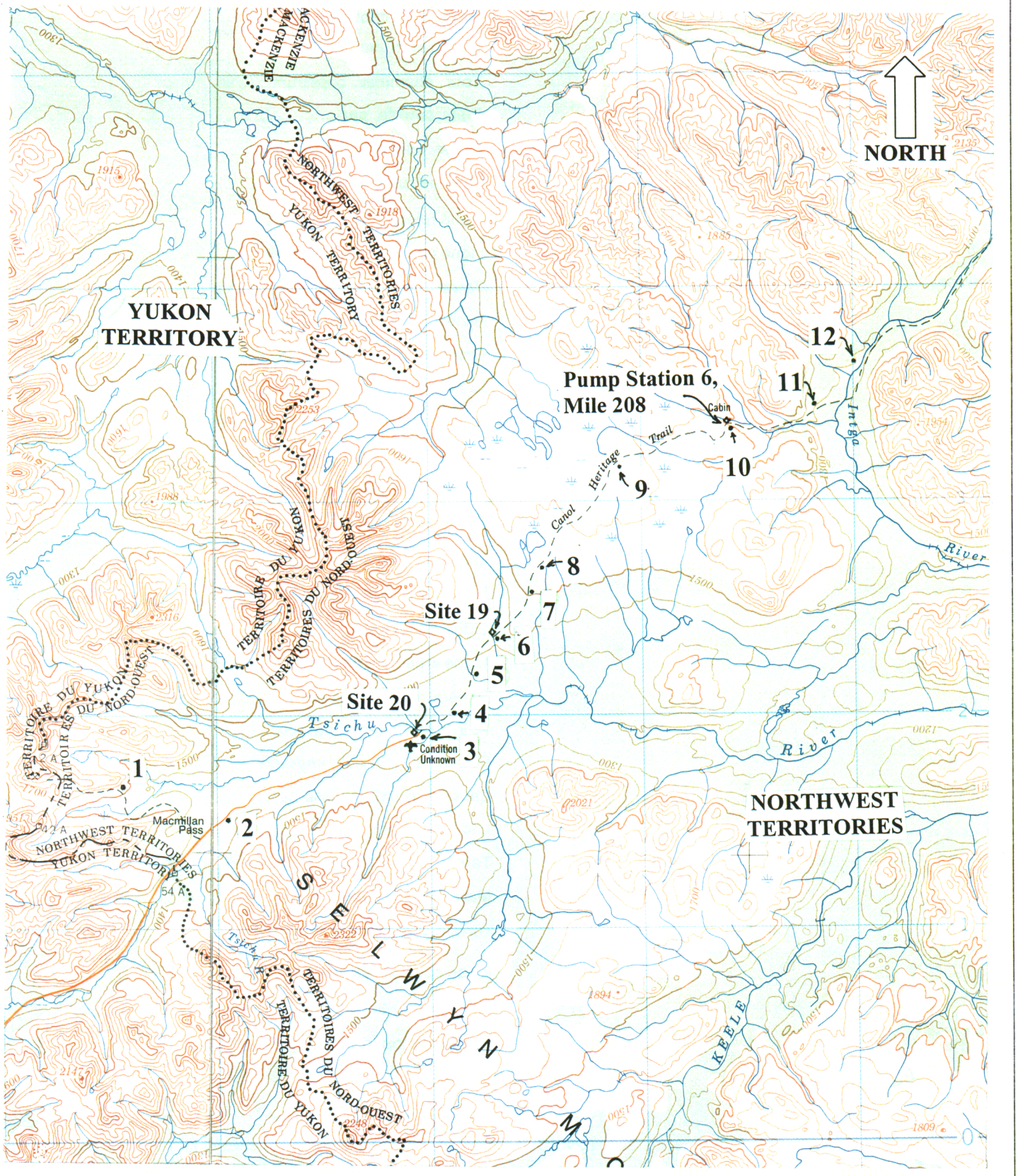
The sites are identified on Figure 16. For detailed site descriptions and a preliminary waste inventory, the reader is referred to Bowen (1994) and RRMC (1994).

During the reconnaissance visit, field notes, photographs and video footage were collected. Several soil and water samples were collected at one site.

6.1 Site 20 - Mile Post 222 NWT

6.1.1 General Description

This site is described as a vehicle bone yard. In addition to vehicle hulks, there is a substantial amount of metal debris pushed off the side of the gravel mound. Between Site 20 and Site 19 over 3000 feet of telegraphy wire was reported adjacent to the road by George Smith. This area also has evidence of recent camping activities (e.g. tent frames, fire pits etc.) for hunting purposes as shown by the caribou remains which were observed at this site.



Legend

- ◇ Site Location
- ● First Nation Camp Site

Source:
NTS 105 I

0 250 500 1000 1500
metres

Scale 1:50,000

Drawn By: F. Pearson	Project No. 97-751
Site Name: Canol Trail	Date: 04.02.98

NWT Reconnaissance Site Locations

1997 Environemental Investigations
Canol Road

Gartner Lee Limited

Figure No. 16

6.1.2 Findings

There were few issues related to this site beyond the amount of debris and garbage at this site. There may be some small oil stained areas from vehicles, but a more in-depth assessment would be required.

6.2 Site 19B - Mile Post 216 NWT

6.2.1 General Description

This site contains a single caboose and a pile of drums. There was surface staining noted due to leaking drums at this site. Spot checks showed the occasional barrel 1/3 full of fluid—most were empty.

As shallow soil pit (10 cm) was dug in the main drum cash. Sample SM97-01 was collect at the base of this pit.

A second soil pit was dug approximately 20 m down gradient from the barrel dump in a small depression. Two soil samples were collected from this pit (~20 cm deep), SM97-03 from the upper soil layers and SM97-02 from the base of the pit.

Other issues related to this site included a potentially unstable buildings with large metal debris on roof. There is some risk associated with the collapse of this building especially considering the iron tank on the roof.

6.2.2 Findings

The analytical results from the soils samples collected at this site (SM96-01, 02 & 03) are found in Table 6.2.1. These samples were analyzed for their hydrocarbon content. Sample SM96-01 (adjacent to the barrel dump) at this site shows light hydrocarbon (C10-C18) levels above Yukon Contaminated Sites Criteria for Parkland. Of greater concern, the soil sample collected down-gradient from the barrel cache, sample SM96-03, shows elevated hydrocarbon levels. This indicates that there has been some migration of hydrocarbons in the surface environment at this site. Given the use of this area by the Ross River people and the environmental setting of this sites, a follow up sampling program should be conducted to assess the extent of hydrocarbon migration. This follow-up sampling program should be designed to consider the environmental setting (e.g. wetland area, shallow groundwater) and the traditional usage of this area.

Table 6.2.1: Soil Chemistry - Hydrocarbon Results

NWT Reconnaissance Sites

Parameter	Parkland Criteria	Industrial Criteria	Philip ID: / Sample ID: / Sample Description: / MDC	SM96-01 Site 19B - Mile Post 216 NWT	SM96-02 Site 19B - Mile Post 216 NWT	SM96-03 Site 19B - Mile Post 216 NWT	SM96-06 Site 19A - Mile Post 215 NWT	SM96-07 Site 19A - Mile Post 215 NWT
Hydrocarbons								
Orangic Vapour Concentration (ppm)				---	---	---	---	---
TEH (C10-C30)	400	2000	5	2100	13	600	---	66
TEH Heavy Oil (>C30)			5	62	20	310	46	71
LEPH (C10-<C19)	1000	2000	5	1700	<	21	7	<
HEPH (C19-C32)	1000	5000	5	410	16	650	39	79
Mineral Oil & Grease	1000	5000	100					350
Polyaromatic Hydrocarbons								
Benzo(a)anthracene	1	10	0.01					<
Dibenz(a,h)anthracene	1	10	0.02					<
Crysene			0.01					---
Benzo(b)Flourathene	1	10	0.01					<
Benzo(k)fluoranthene	1	10	0.01					<
Benzo(g,h,I)perylene			0.02					---
Pyrene	10	100	0.01					<
Benzo(a)pyrene			0.01					<
Indeno(1,2,3-c,d)pyrene	1	10	0.02					<
Acenaphthene			0.01					---
Acenaphthylene			0.01					---
Anthracene			0.01					---
Fluoranthene			0.01					---
Naphthalene	5	50	0.01					0.01
Phanathrene	5	50	0.01					0.02
Total PAH's								---
Total Low MW PAH's								---
Total High MW PAH's								---

Notes:

1. All concentrations in ug/g (ppm)
2. 1000 Concentration exceeds Parkland Criteria
3. 5000 Concentration exceeds Industrial Criteria
4. Concentration exceeds Special Waste Criteria
5. --- Parameter not analysed
6. < Less than Method Detection Concentraion (MDC)

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Table 6.2.2: Surface Water Chemistry Results
NWT Reconnaissance Sites

Parameter	Aquatic Life Standards	Philip ID: Sample ID: Sample Description: MDC	SM96-04 Site 19A - Mile Post 215 NWT	SM96-05 Site 19A - Mile Post 215 NWT	SM96-08 Site 19A - Mile Post 215 NWT
Hydrocarbons					
TEH (C10-C30)	100	0.1	<	<	<
TEH Heavy Oil (>C30)		0.1	<	<	<
LEPH (C10-<C19)		0.1	<	<	<
HEPH (C19-C32)		0.1	<	<	<
Metals Total					
Ag	0.001	0.0001			<
Al	0.5	0.06			<
As	0.5	0.04			<
B	5	0.04			<
Ba	10	0.001			0.053
Be	0.053	0.001			<
Bi		0.02			<
Ca		0.05			7.2
Cd	0.008	0.0001			<
Co	0.5	0.004			<
Cr	0.02	0.002			<
Cu	0.04	0.002			0.006
Fe	3	0.05			0.13
Hg	0.001	0.00005			<
K		0.4			1
Mg		0.02			1.71
Mn	1	0.002			0.005
Mo	10	0.004			<
Na	200	0.4			0.6
Ni	0.65	0.01			0.01
P		0.04			0.22
Pb	0.06	0.03			<
S		0.1			7.2
Sb	0.3	0.02			<
Se	0.01	0.0005			<
Si		0.8			1.7
Sn		0.02			<
Sr		0.001			0.013
Te		0.02			<
Ti		0.003			<
Tl	3	0.002			<
V		0.003			<
Zn	0.3	0.01			0.02
Zr		0.003			<

Notes:

1. All concentrations in mg/L (ppm).
2. MDC - Method Detection Concentration.
3. 0.02 Concentration exceeds Fresh Water Aquatic Life Criteria

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Other concerns at this site include the stability of the caboose. This building has a large metal drum (a possibly a water boiler) on its roof and if the building collapsed, the metal debris could seriously injure a person. The telegraph wire along the road needs to be cleaned up due to the risk it poses for wildlife entanglement.

6.3 Site 19A - Mile Post 215 NWT

6.3.1 General Description

This site contains a borrow pit (with ponded water in the pit), as well as several barrel dumps and cabooses. This area is used as a camp site by Ross River people, and there is concern regarding contamination in and around the pond. Potential pathways for contaminant uptake by people include:

- soil ingestion,
- water ingestion,
- consumption of waterfowl found at the pond, and
- consumption of ground squirrels living in and around contaminated soils.

George Smith found snares at this site used by his people for hunting ground squirrels. The ponded water in the pit may be used for drinking water as it appears readily available adjacent to the Canol Road. As noted in previous reports, there are many barrels dumped in and around this pond. There were field observations of hydrocarbon sheen on the water and hydrocarbon contaminated soils around the pond.

Other hazards noted at this site include:

- telegraph wire found amongst barrel debris,
- propane tanks—quite heavy indicating a potential charge,
- hydrocarbon tars, and
- partially full fuel drums.

6.3.2 Findings

6.3.2.1 Soil Chemistry

The analytical results for the soil samples are shown on Tables 6.2.1. Soils sample SM96-06 shows almost 50% heavy hydrocarbons—this is an extremely contaminated. No Oil & Grease analysis was run on this sample. Note that this sample was collected immediately adjacent to the pond. Sample SM96-07 did not exceed criteria, but did show low levels of hydrocarbon.

6.3.2.2 Surface Water Chemistry

Water samples SM96-04, 05 & 08 all did not exceed water quality guidelines for hydrocarbons (Table 6.3.2). Sample SM96-08 was also analyzed for metals and the results shows there are no issues. It is our experience that a hydrocarbon sheen and other field evidence of hydrocarbon contamination (e.g. smell) may not be reflected in follow up laboratory analysis. Field observations clearly show a hydrocarbon residue found on the water of this pond.

In addition to the drums and debris, there are several areas of surface staining due to hydrocarbons. Many of the drums are submerged in the water and there is significant algae growth associated with these drums.

The First Nation have expressed concern over this site since the area is used for trapping of ground squirrels, hunting of ducks and there may even be drinking water taken from the pond. The abandoned propane tanks at this site also present a risk is they may contain a charge and tampering with the tank could result in a discharge.

6.4 Pump Station 6 - Mile Post 208 NWT

6.4.1 General Description

Pump Station 6 is a large site containing debris stretching over one kilometre. The site consists of a standing pump station, several buildings, quanset huts, multiple barrel dumps and a POL and surge tank. A creek runs through the centre of the site. This site may be one of the most heavily contaminated along the Canol road and it is frequently used by both the First Nation and outfitters & hunters. The pump station is currently used as a horse stable and corral by the outfitter. First Nation members reported many barrels on site containing fluids, and drums of grease which bears have been consuming. There were numerous areas (some over 250 m^2) with hydrocarbon stained soils throughout the pump station area. Many of the buildings appear to be in unstable condition. Additionally, the First Nation expressed concern that the "laydown area," as described by RRMC one kilometre east of the pump station, is a man made mound of debris and refuse.

Work conducted along Yukon side of the Canol road highlights several issues related to pump stations that may have been overlooked by previous studies. These include:

- Underground storage tanks have been commonly found adjacent to pump stations. Two USTs along the South Canol Road were found to contain hydrocarbons and were pumped out and removed in 1997.
- There is usually a large area coated by crude oil adjacent to the POL tanks—this oil tar is sometimes consumed by bears.
- Recognition of the adjacent creek as a significant receptor from contaminates from this site.

6.4.2 Findings

This extensive site contains high potential for significant environmental risks. Previous reports and this reconnaissance trip noted many areas of hydrocarbon soil contamination. For example, there is a large crude oil spill associated with the POL tank—which is located immediately adjacent the creek. Another spill area was estimated at over 250 m^2. This site contains the second highest number of barrels containing hydrocarbon along the Canol Trail—RRMC located at least 37 fuel barrels and grease drums with product. Furthermore, due to the presence of pipes extending underground, there is potential of underground fuel storage tanks such as found on the South Canol Road In addition to there being high potential for contamination at this site, there is significant amounts of waste and debris, as well as buildings that are potentially unstable

The creek passing through this site may also be transporting hydrocarbon contaminants off- site and contaminating other areas. Additionally, it has been observed by the Ross River Dena people that bears are consuming the grease and crude oil tar at this site. These grease drums are still on site as well 3 full fuel drums were found on site. Therefore an in-depth program of environmental site assessment and clean-up need to be conducted at this site to mitigate immediate and potential environmental risks.

7. New Site Investigations

This section provides a summary of the field observations for each new site as well as analytical results, a discussion of the findings, conclusions and recommendations. All five new sites are included in this section of the report, with each site represented as a separate subsection from 7.1 to 7.5.

7.1 Sheldon Pullouts - Mile Post 220

7.1.1 Physical Setting

7.1.1.1 General Description

Potential burial sites were reported around MP 220 adjacent the North Canol Road along Sheldon Lake (Figure 17). The site is located on a gentle south facing slope that drains to Sheldon Lake.

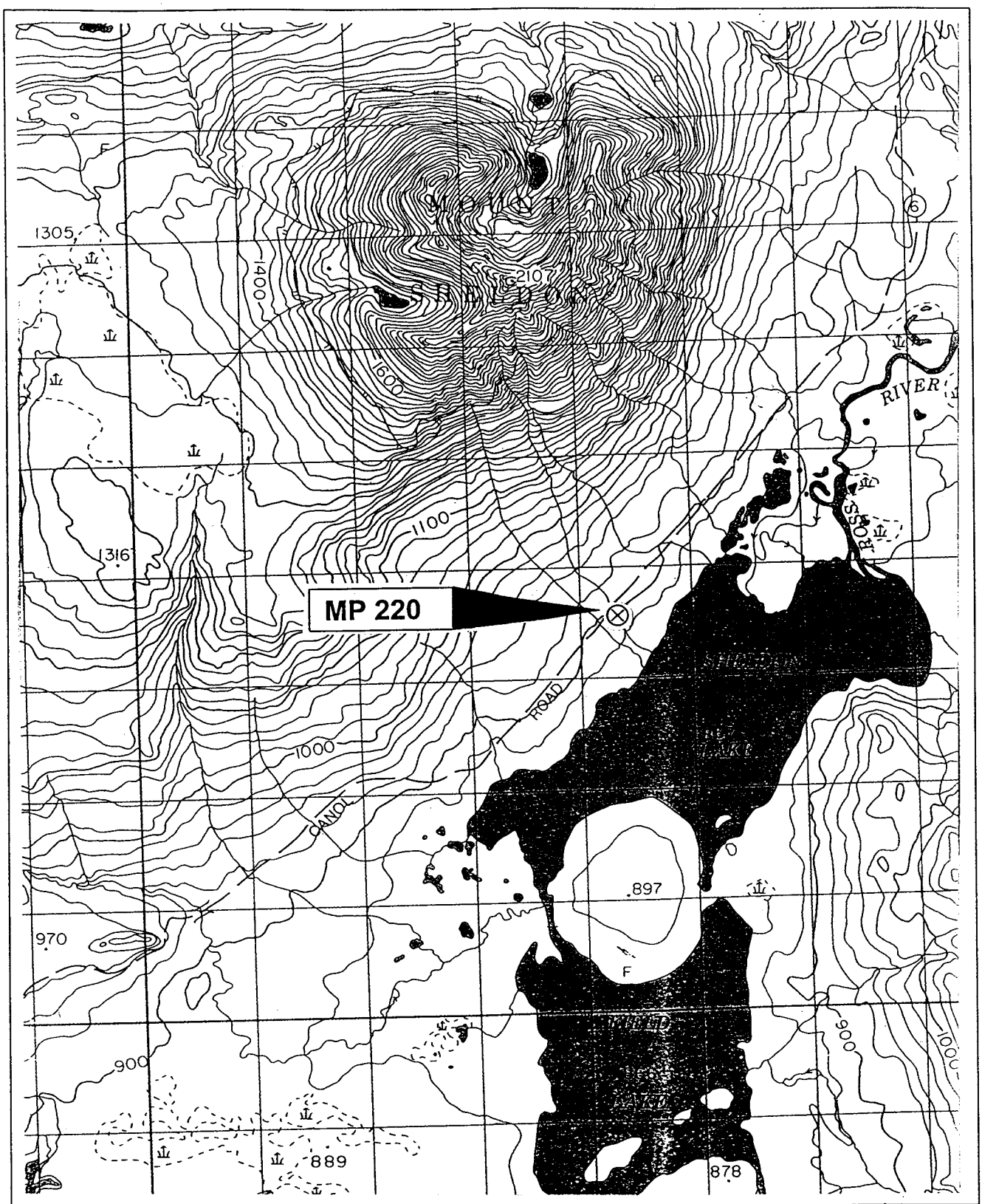
Two disturbed, partially re-vegetated areas were located approximately 500 metres apart along the south side of the road (Figure 18). The western "pullout" lies 250 metres south to the road and represents a clearing created by 1 metre of gravel fill overlying the surrounding vegetation. The access road to the clearing is overgrown with small (up to 3 cm diameter) poplars. The eastern "pullout" is for the most part un-vegetated and is created by over 1 metre of gravel fill. Tent poles are found at this site and maybe used as a traditional camping site. Metallic debris, including at least 5 drums, is found protruding from southwestern toe of the fill.

7.1.1.2 Hydrogeology

The hydrogeology of the area is characterized by a shallow unconfined aquifer. Groundwater was not encountered during test pitting, but is interpreted to be less than 2 metres from the surface based upon surface characteristics. The inferred direction for flow is south towards the lake.

7.1.1.3 Vegetation

The site is located on a gently south facing slope towards Sheldon Lake. The vegetation community on the site consists of re-growth of aspen (*Populus tremuloides*) and a ground cover of moss and sporadic clumps of grasses. The surrounding undisturbed vegetation consists of black spruce (*Picea mariana*), with an understory of willows (*Salix sp.*), Fethermoss (*Pleruozium sp.),* Labrador Tea (*Ledum groenlandicum*), and crow berries (*Empetrum nigrium*).



Legend

Site Location

Source:
NTS 105 J/11 Edition 1

0 250 500 1000 1500
metres

Scale 1:50,000

Drawn By: F. Pearson	Project No. 97-751
Site Name: North Canol Road	Date: 04.02.98

MP 220 - Sheldon Site Location

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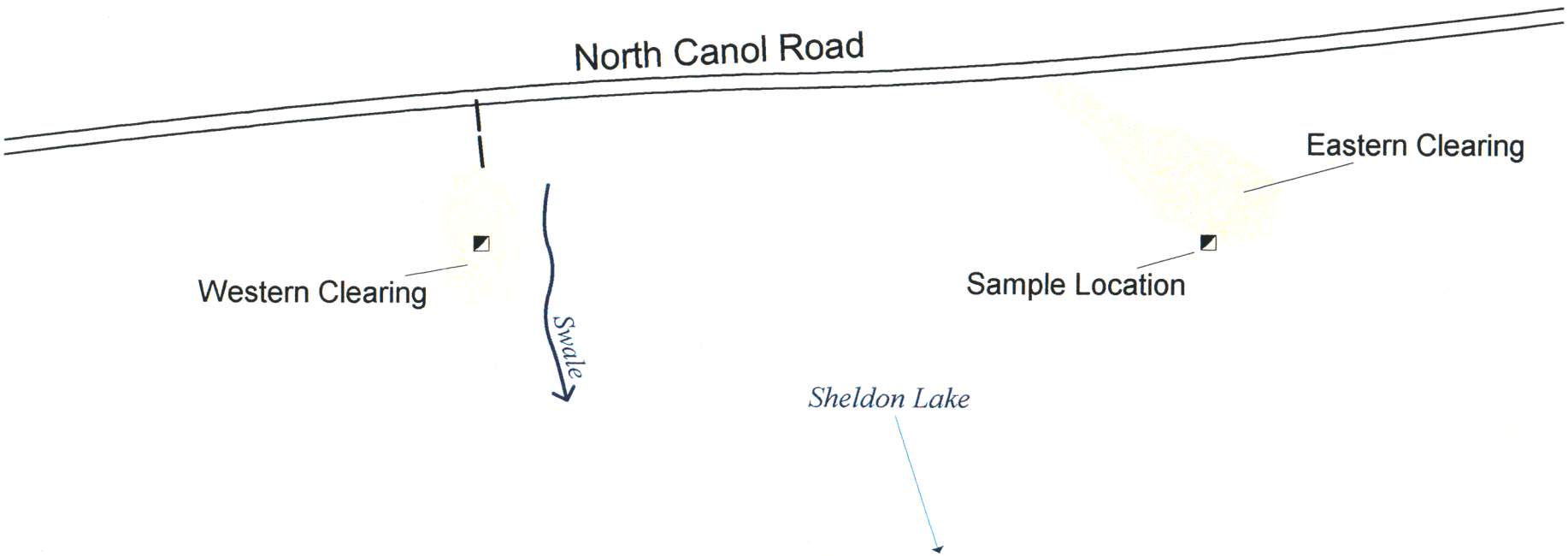
Figure No. 17



Legend

Disturbed Area

Test Pit

0 20 40 80 120 metres

Scale 1:4000 (approximate)

Drawn By: F. Pearson	Project No. 97-751
Site Name: MP 220	Date: 04.02.98

Sketch Map
Sheldon "Pullouts"

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Figure No. 18

7.1.1.4 Surface Water

No surface water courses are found near this site. Sheldon Lake lies down gradient approximately 500 m to the south.

7.1.2 Test Results

7.1.2.1 Field Testing and Observations

Test pits were excavated at both the eastern and western "pullouts". Surface and pit observations at the western pullout site did not indicate any potential for contamination or waste. No metallic debris or otherwise was detected, and no soil samples collected. At the eastern "pullout", a test pit was excavated in the metallic debris on the south side of the filled area. A soil sample was collected from this site.

The soil sample collected at the eastern "pullout" site was field screened for organic vapour concentrations using the PID. The results of the field sceening procedures are presented in Table 7.1.1. The sample showed concentrations of 11 ppm, which may be considered to be equivalent to a background reading.

7.1.2.2 Soil Chemistry

The soil sampled collected from the test pit excavated in the eastern "pullout" area was submitted to the analytical laboratory for analysis of potential hydrocarbon contamination. A summary of the complete results is presented in Table 7.1.1 and Appendix B.

Petroleum hydrocarbons were detected in the test pit excavated near the buried debris in the eastern "pullout". Elevated levels of oil and grease were detected as well as heavy extractable petroleum hydrocarbons (HEPH). The concentrations of oil & grease were the highest of the hydrocarbon parameters, with concentrations of 130 ug/g, but this does not exceed any contaminated sites criteria.

7.1.3 Discussion

The western "pullout" area appears to be an area of gravel fill, or a road fill dump. No buried wastes were detected at this site. This site is well re-grown, and no signs of contaminated soils were observed indicating very little potential for contamination at this site.

At the eastern "pullout" buried metallic debris was encountered. At least 5 drums and other miscellaneous debris was found protruding from the fill bank. The soils sample collected showed elevated oil & grease levels, but did not exceed criteria. The oil & grease detected is most likely related to residue from the buried drums and metallic waste.

Table 7.1.1: Soil Chemistry - Hydrocarbon Results

Sheldon Lake "Pullouts"

Parameter	Parkland Criteria	Industrial Criteria	Philip ID: / Sample ID: / Sample Description: MDC	97031488 / Sheldon Pullout / Test pit at eastern clearing
Hydrocarbons				
Orangic Vapour Concentration (ppm)				
TEH (C10-C30)			5	32
TEH Heavy Oil (>C30)			5	130
LEPH (C10-<C19)	1000	2000	5	<
HEPH (C19-C32)	1000	5000	5	45
Mineral Oil & Grease	1000	5000	100	130
Polyaromatic Hydrocarbons				
Benzo(a)anthracene	1	10	0.01	<
Dibenz(a,h)anthracene	1	10	0.02	<
Crysene			0.01	<
Benzo(b)Flourathene	1	10	0.01	<
Benzo(k)fluoranthene	1	10	0.01	<
Benzo(g,h,I)perylene			0.02	<
Pyrene	10	100	0.01	0.01
Benzo(a)pyrene			0.01	<
Indeno(1,2,3-c,d)pyrene	1	10	0.02	<
Acenaphthene			0.01	<
Acenaphthylene			0.01	<
Anthracene			0.01	<
Fluoranthene			0.01	0.01
Naphthalene	5	50	0.01	<
Phanathrene	5	50	0.01	0.01
Total PAH's				0.01
Total Low MW PAH's				0.01
Total High MW PAH's				<

Notes:

1. All concentrations in ug/g (ppm)
2. 1000 Concentration exceeds Parkland Criteria
3. 5000 Concentration exceeds Industrial Criteria
4. 30000 Concentration exceeds Special Waste Criteria
5. — Parameter not analysed
6. < Less than Method Detection Concentraion (MDC)

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7.1.4 Conclusions

Based on the findings of the site investigations, the following conclusions can be made:

1. the western clearing, or "pullout" shows no sign of buried wastes or contamination;
2. the eastern clearing, or "pullout" contains some buried metallic debris, and sampling shows very low levels of oil & grease associated with the debris.

7.2 Mile Post 234 Pump Station

7.2.1 Physical Setting

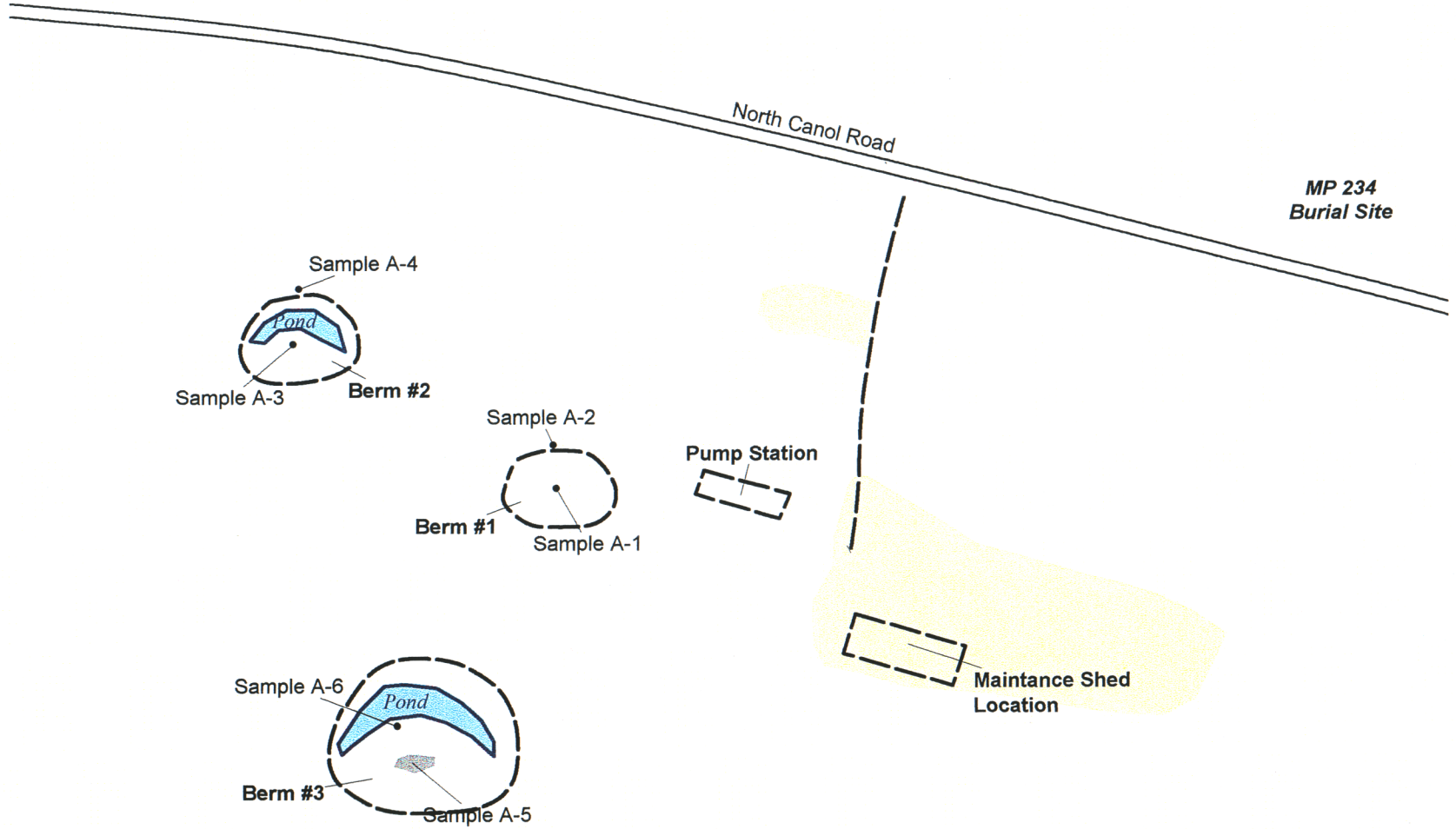
7.2.1.1 General Description

The MP 234 pump station is located approximately 300 metres south of the Canol Road, directly across from the 234 Burial site (section 4.6 in this report). The site is located approximately 156 km northeast of Ross River (Figure 11 and Figure 12). The terrain at the site consists of a gently northward sloping bench.

Work conducted in this area consisted of preliminary reconnaissance and identification of site issues. This site is heavily overgrown and consists of five main structures as shown in Figure 19.

- Aerial photographs and historical photos show a large maintenance shed at the east end of this area. This building has been completely removed and there is no sign of the building today. The building area today consists of rubbly bedrock fragments heavily overgrown with willows. No contamination related issues were found at this site.

- A pump station foundation was found to the west of the access road into the site. There has been vigorous re-growth of willows, alders and dwarf birch around the pump station foundation. The foundation has been severely damaged by permafrost action. This has caused the pump foundations to be jacked out of the ground and above the pump station floor level. At this site a pipe leading underground was found along the north edge of the foundation. This location corresponds to the location of the underground storage tanks found at Pump Stations 9 and 10 along the South Canol Road. Excavation was conducted around and following the pipe, but the pipe ended underground. No sign of a UST was found. No visible sign of hydrocarbon contamination was encountered.



Legend

- Surface Staining
- Disturbed Area
- Building Remnants
- Sample Location

0 20 40 80 120 metres

Scale 1:4000 (approximate)

Drawn By: F. Pearson	Project No. 97-751
Site Name: MP 234	Date: 04.02.98

Sketch Map
MP 234 Pump Station

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Figure No. 19

- Three bermed areas to the west of the pump station were located. The crescent shaped berms are heavily overgrown by willows, dwarf birch, alders and black spruce These berms are interpreted to have once contained crude oil POL tanks.
  - Berm #1 - approximately 50 m west of the pump station is the first of the three bermed areas. There is a partially collapsed wooden platform in the centre of the berm. This is interpreted to be a POL tank foundation. A similar wooden tank foundation has been located at Pump Station 2 in the Northwest Territories. Two samples were collected from this location, one in the centre near the wooden foundation (S-1), and one on the north edge of the berm where a berm overflow or spillway is located (S-2). No visual indication of hydrocarbon contamination was found.
  - Berm #2 - located approximately 150 m west of berm #1. This berm is slightly larger than the previous and is ponding a small volume of water. Some small wooden debris was found in the centre of the berm, and a 5 cm diametre rubber hose was found leading over the berm to the north. Two samples were collected from this site, S-3 from an overflow location on the north side of the berm, and S-4 from the centre of the berm. No visual indication of hydrocarbon contamination was found.
  - Berm #3 - is the largest of the three bermed areas, located uphill and approximately 150 m southwest of berm #1. This large berm retains a crescent shaped pond. In the centre of the berm, metallic debris such as railings, rivets and strapping associated with a POL tank were found. Some of the gravelly soils have not re-grown and there is a small area of desiccated oil and other surficial staining. Two samples were collected from this areas of hydrocarbon staining. Sample S-5 from the area of dried crude oil, and S-6 from an area of hydrocarbon stained gravel adjacent to the pond.

7.2.1.2 Geology

The regional geological mapping of this area as shown on GSC Surficial Geology Map 1833A (Jackson, 1993) indicates that the surface geology in this area is comprised of a till blanket which has a silty sand matrix, with pebbles, cobbles and occasional boulders. These sediments were deposited either directly by glacial ice or by gravity flows from the glacier ice.

The terrain analysis conducted for this site also indicates a morainal or till blanket with active surface an shallow subsurface gullying with broad areas which contain permafrost. Due to the presence of angular rock fragments in some part of the site, it is interpreted that shallow bedrock (less than 1 metre) is found sporadically at the site.

7.2.1.3 Hydrolgeology

The site appears to be a groundwater discharge zone at the base of the mountain slope. This is inferred as groundwater was encountered as surface seepage. The direction of the groundwater flow is inferred to be to the north (e.g. downgradient into the MacMillan River)

7.2.1.4 Vegetation

The site is very well re-grown and appears to be reaching a natural state. There is almost no sign of pervious activities at this site. Vegetation consists of a typical north facing mix of willow, Dwarf Birch (*Betula glandulosa*) and black spruce (*Picea mariana*). Groundcover consists of a thick mat of sphagnum and labrador tea (*ledum groenlandicum*)

7.2.2 Test Results

7.2.2.1 Field Screening

A total of nine soil samples were field screened for organic vapour concentrations using the PID. The results of the field sceening procedures are presented in Table 7.2.1 and Appendix B

Elevated vapour concentrations were found in four of the six samples collected. These values ranged from 89 ppm to 337 ppm; organic vapour concentrations around 10 ppm were considered to be background

7.2.2.2 Soil Chemistry

The soil sampled collected from the POL tank berms area was submitted to the analytical laboratory for analysis of potential hydrocarbon contamination. A summary of the complete results is presented in Table 7.2.1 and Appendix B.

Two Samples collected from around the POL tank berms were found to exceed Parkland criteria for oil & grease. The elevated oil and grease samples (A-2 and A-4) from the northern POL tank berms (berms #1 and #2) had concentrations of 1200 ug/g and 1700 ug/g respectively.

The two samples collected within the centre of the southern most tank berm were found to exceed the Industrial criteria. These concentrations were 61000 ug/g and 9800 ug/g for samples A-5 and A-6 respectively. Sample A-6 represents a sample of desiccated crude oil.

7.2.3 Discussion

Reconnaissance work had identified a pump station and three POL tank containment berms. This site is heavily re-vegetated and appears to be approaching an undisturbed state. Excavation adjacent to pump station did not locate a UST such as found associated with pump stations along the South Canol Road.

Soil sampling from the POL berms detected hydrocarbon contamination. At both of the northern berms (berms #1 and #2), contaminated soils were found at the berm spillway locations. Although the vegetation down gradient of the overflow areas did not appear to be stressed, there may be hydrocarbon contamination due to overflow, and systematic soil sampling should be conducted to determine the down gradient extent of this contamination.

Table 7.2.1: Soil Chemistry - Hydrocarbon Results

Mile Post 234 Pump Station

Parameter	Parkland Criteria	Industrial Criteria	Philip ID: / Sample ID: / Sample Description: / MDC	97031490 / A-1 / POL Tank Berm #1	97031491 / A-2 / POL Tank Berm #1	97031492 / A-3 / POL Tank Berm #2	97031493 / A-4 / POL Tank Berm #2	97031494 / A-5 / POL Tank Berm #3	97031495 / A-6 / POL Tank Berm #3
Hydrocarbons									
Orangic Vapour Concentration (ppm)				7	86	9	123	337	213
TEH (C10-C30)	400	2000	5						
TEH Heavy Oil (>C30)			5						
LEPH (C10-<C19)	1000	2000	5						
HEPH (C19-C32)	1000	5000	5						
Mineral Oil & Grease	1000	5000	100	<	1200	190	1700	61000	9800
Polyaromatic Hydrocarbons									
Benzo(a)anthracene	1	10	0.01						
Dibenz(a,h)anthracene	1	10	0.02						
Crysene			0.01						
Benzo(b)Flourathene	1	10	0.01						
Benzo(k)fluoranthene	1	10	0.01						
Benzo(g,h,I)perylene			0.02						
Pyrene	10	100	0.01						
Benzo(a)pyrene			0.01						
Indeno(1,2,3-c,d)pyrene	1	10	0.02						
Acenaphthene			0.01						
Acenaphthylene			0.01						
Anthracene			0.01						
Fluoranthene			0.01						
Naphthalene	5	50	0.01						
Phanathrene	5	50	0.01						
Total PAH's									
Total Low MW PAH's									
Total High MW PAH's									

Notes:

1. All concentrations in ug/g (ppm)
2. 1000 Concentration exceeds Parkland Criteria
3. 5000 Concentration exceeds Industrial Criteria
4. 30000 Concentration exceeds Special Waste Criteria
5. --- Parameter not analysed
6. < Less than Method Detection Concentraion (MDC)

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Desiccated crude oil and hydrocarbon stained soils were observed at the southern berm (berm #3). These observations were further confirmed by soil samples that exceeded Industrial Criteria for contaminated sites. Since this high level of contamination was found in the center of this berm, the other berm centres (#1 and #2) should be systematically sampled for hydrocarbon contamination. The ponded water at berm #3 should also be sampled to determine is contaminants are impacting the surface water.

7.2.4 Conclusions

Based on the findings of the site investigations, the following conclusions can be made:

1. A new pump station has been located at this site, but no UST was found simlar to that on the South Canol Road
2. Three POL tank berms were located at this site
3. The northern berms showed hydrocarbon contamination above Industrial criteria near their spillway locations
4. The southern berm (#3) has soils contaminated about Special Waste criteria
5. The site is very well re-grown and approaching a natural state of vegetation

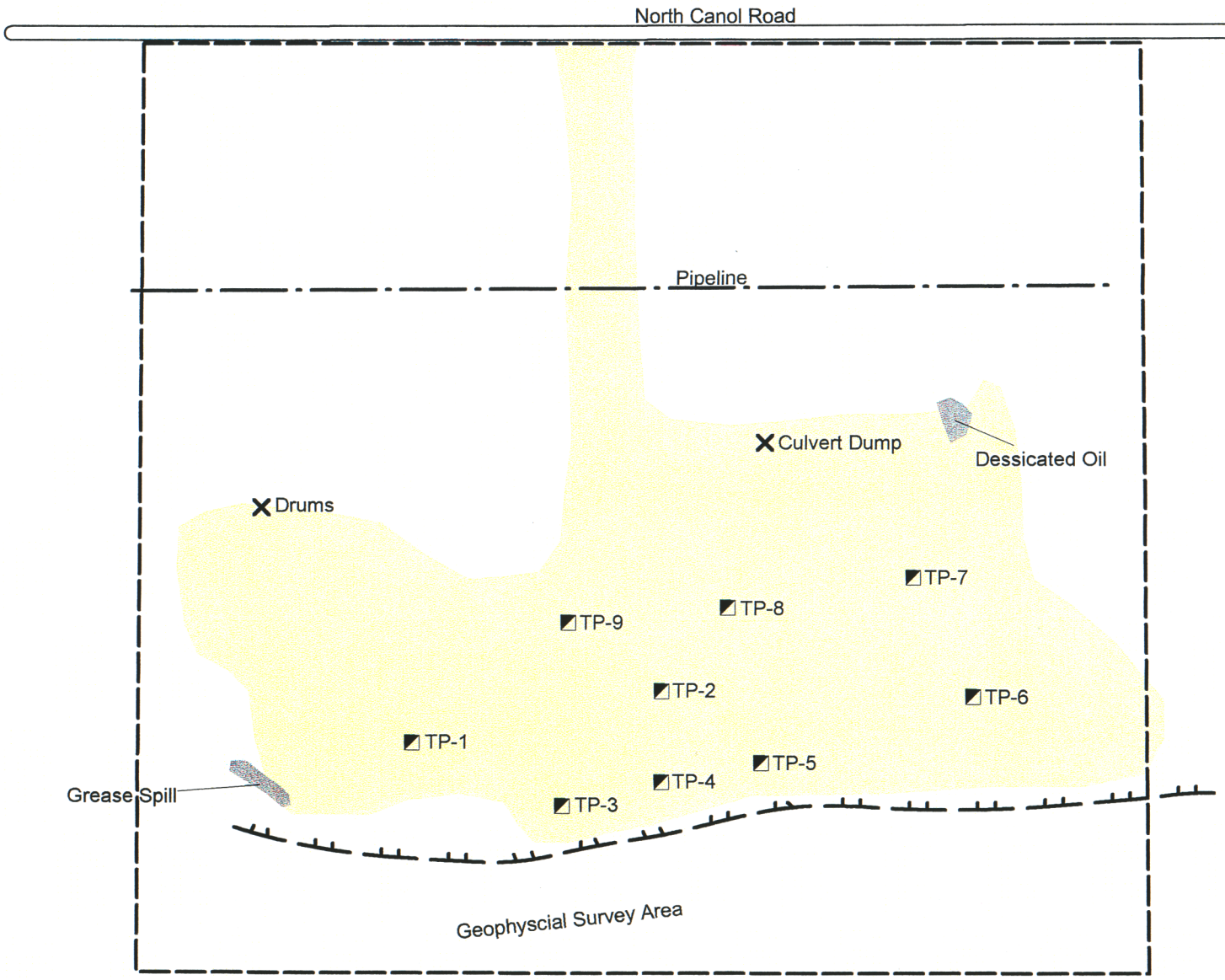
7.3 Mile Post 234.5 Burial site

7.3.1 Physical Setting

7.3.1.1 General Description

Less than one kilometre east of site MP 234, a second debris burial site was located south of the North Canol road (Figure 11 and 12). This site has been called MP 234.5 and was located by Ross River residents. The site consists of a clearing approximately 30 south of the road. Pieces of culvert are piled on the northeast side of the clearing, and dried grease, desiccated oil and crushed drums are found sporadically over the area. Details of this area are shown in Figure 20.

A series of nine test pits were excavated in this clearing to investigate the buried waste. Soil samples were collected from all test pits and analyzed for hydrocarbon content. The location of the test pits are shown on Figure 20. Significant amounts of metallic debris were encountered in test pits TP 97-4 and TP 97-9. This debris consisted mostly of vehicle parts and miscellaneous metal.



Legend

Surface Staining

Disturbed Area

Test Pit

0 2.5 5 10 15 metres

Scale 1:500 (approximate)

Drawn By: F. Pearson	Project No. 97-751
Site Name: MP 234.5	Date: 04.02.98

Sketch Map
MP 234.5 Dump Site

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Figure No. 20

7.3.1.2 Vegetation

The burial site is somewhat poorly re-vegetated due to the rocky nature of the soils. There is a sparse cover of sporadic grass, moss and the occasional willow (*Salix sp.*). Vegetation surrounding the site consists of a typical north facing mix of willow, Dwarf Birch (*Betula glandulosa*) and black spruce (*Picea mariana*). Groundcover consists of a mat of feathermoss and reindeer moss.

7.3.1.3 Hydrogeology

Groundwater was not encountered during test pitting, but is interpreted to be less than 2 metres from the surface based upon surface characteristics. The inferred direction for flow is north towards the MacMillan River.

7.3.1.4 Surface Water

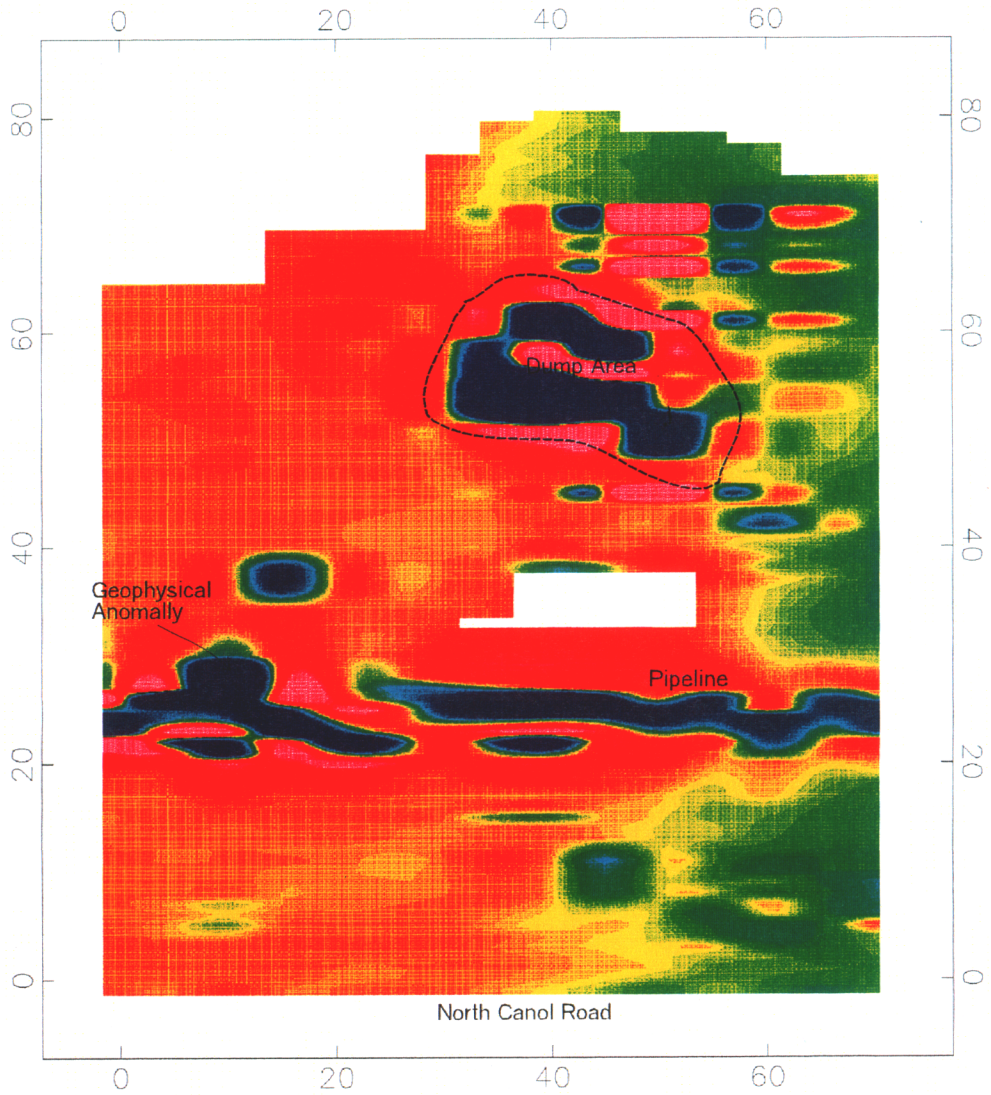
A very small creek is found the west of burial site. This creek flows north, through a culvert under the Canol Road towards the MacMillan River. No surface water was observed in the immediate burial site area.

7.3.1.5 Geophysical Survey

A terrain conductivity survey was completed over the dump area using a Geonics EM31 Ground Conductivity Meter. The survey was conducted to help detect and delineate the presence of buried metal objects such as metal debris and steel drums at the site.

Prior to the geophysical survey, a temporary baseline was established along the North Canol road. The baseline consisted of flagging tape spaced 5 m apart and affixed to vegetation. The geophysical survey was conducted along lines run perpendicular to the baseline at 5 m intervals. The lines were run south from the Canol Road baseline. Grid coordinates are shown on Figures 21 and 22.

Following the completion of the surveys, the data are plotted and interpreted from the profile lines of the geophysical data and notes collected in the field. Final presentation of the data is in the form of colour contour maps on Figures 21 and 22.



10.17
8.61
7.56
6.60
5.84
5.08
4.43
3.75
3.15
2.50
1.84
1.25
0.57
-0.08
-0.84
-1.60
-2.56
-3.61
-5.17
-7.67

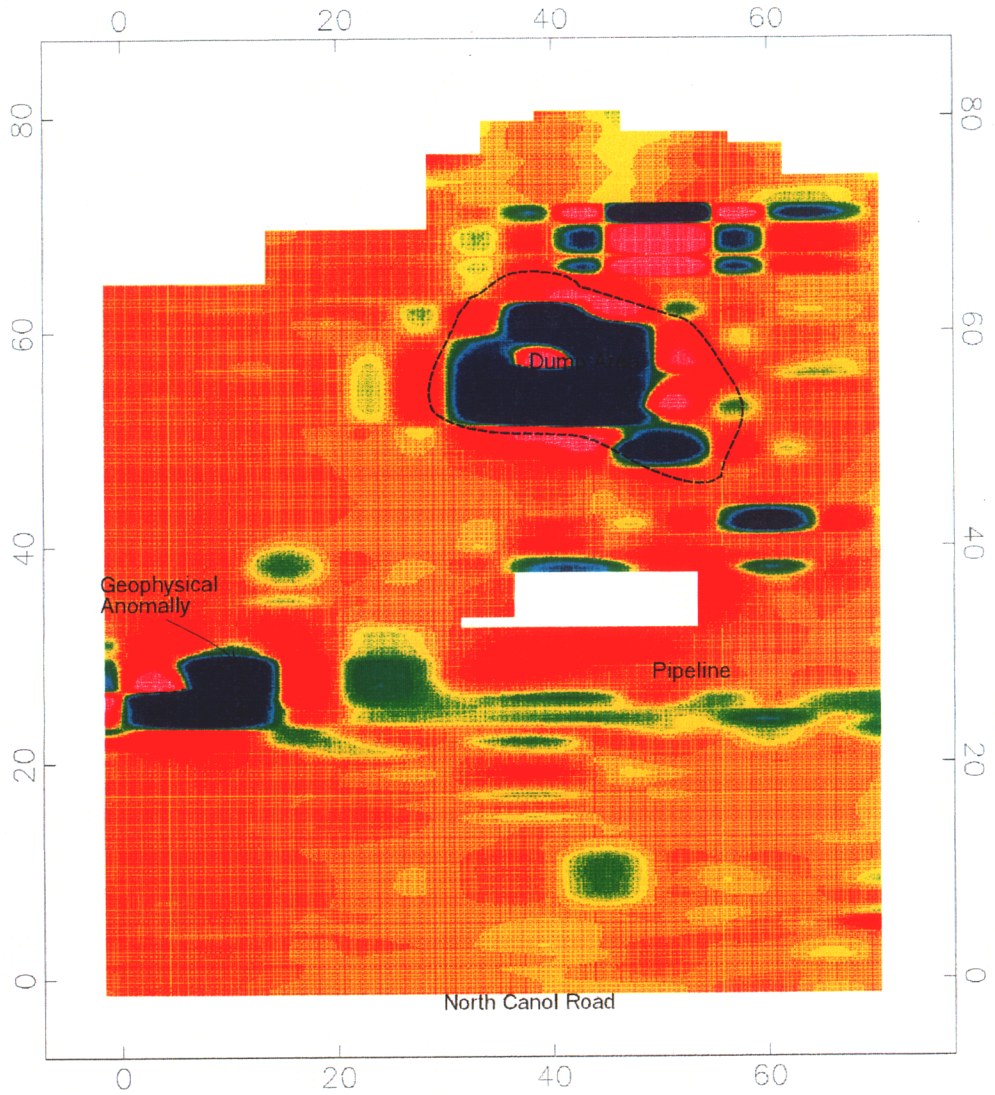
Terrain Conductivity
(mS/m)

Mile Post 234.5

Terrain Conductivity (mS/m)

DRAFT MAP

10 0 10 20
(metres)



5.88
4.58
3.71
2.91
2.28
1.65
1.11
0.54
0.05
-0.50
-1.04
-1.53
-2.11
-2.64
-3.28
-3.91
-4.71
-5.58
-6.88
-8.96

In-phase Component
(ppt)

Mile Post 234.5

In-phase Component (ppt)

DRAFT MAP

10 0 10 20
(metres)

N

7.3.2 Test Results

7.3.2.1 Field Screening

A total of nine soil samples were field screened for organic vapour concentrations using the PID. The results of the field screening procedures are presented in Table 7.3.1.

At the burial site, only one sample was found to have organic vapour concentrations above background levels. The sample (TP 97-9) had vapour concentrations of 47 ppm. Background concentrations were assumed to be 3 to 11 ppm.

7.3.2.2 Soil Chemistry

The soil samples collected from the test pits were submitted to the analytical laboratory for analysis of potential hydrocarbon contamination. A summary of the complete results is presented in Table 7.3.1 and Appendix B.

Of the nine samples collected from test pits at this site, only one sample was found to contain hydrocarbons. Sample TP 97-9, 1.30m was found to have concentrations of oil and grease at 260 ug/g—this is below contaminated site criteria.

7.3.3 Discussion

A burial site south of the Canol Road at this site has been identified. Test pitting found mostly metallic debris buried at this site. Samples collected from the test pits did not show significant contamination. It is therefore assumed that this site was not used for burial of drums containing hydrocarbons.

Two areas of surface hydrocarbon contamination were observed, but not sampled. An area or spilt grease approximately 2 m long by ½ m wide is found in the southwest corner of the site. A small area of desiccated oil (1 m by 1m) is found in the northeast corner of the site.

The geophysical survey at this site shows geophysical anomalies coincident with test pits 2, 3 and 4. Significant metallic debris was encountered in these test pits. A linear anomaly between the clearing and the road is interpreted to be a portion of the Canol pipeline. An anomaly in the northeast corner of the site is un-accounted for. This geophysical anomaly is coincident with surficial oil staining. This area may represent a very small area of buried drums. Follow-up excavations should be conducted at this location to determine the nature of the anomaly.

Table 7.3.1: Soil Chemistry - Hydrocarbon Results
Mile Post 234.5 Burial Site

Parameter	Parkland Criteria	Industrial Criteria	Philip ID: / Sample ID: / Sample Description: MDC	97031475 TP1, 0.29m Burial Site Test Pit	97031477 TP2, 0.37m Burial Site Test Pit	97031476 TP2, 0.94m Burial Site Test Pit	97031478 TP5, 1.86m Burial Site Test Pit	97031479 TP6, 1.06m Burial Site Test Pit	97031480 TP7, 0.98m Burial Site Test Pit	97031481 TP8, 0.78m Burial Site Test Pit	97031482 TP8, 1.20m Burial Site Test Pit	97031483 TP9, 1.30m Burial Site Test Pit
Hydrocarbons												
Orangic Vapour Concentration (ppm)				11	8	9	8	3	7	7	4	47
TEH (C10-C30)			5				<					
TEH Heavy Oil (>C30)			5				<					
LEPH (C10-<C19)	1000	2000	5				<					
HEPH (C19-C32)	1000	5000	5				<					
Mineral Oil & Grease	1000	5000	100	<	<	<	<	<	<	<	<	290
Polyaromatic Hydrocarbons												
Benzo(a)anthracene	1	10	0.01				<					
Dibenz(a,h)anthracene	1	10	0.02				<					
Crysene			0.01				<					
Benzo(b)Flourathene	1	10	0.01				<					
Benzo(k)fluoranthene	1	10	0.01				<					
Benzo(g,h,I)perylene			0.02				<					
Pyrene	10	100	0.01				<					
Benzo(a)pyrene			0.01				<					
Indeno(1,2,3-c,d)pyrene	1	10	0.02				<					
Acenaphthene			0.01				<					
Acenaphthylene			0.01				<					
Anthracene			0.01				<					
Fluoranthene			0.01				<					
Naphthalene	5	50	0.01				<					
Phanathrene	5	50	0.01				<					
Total PAH's							<					
Total Low MW PAH's							<					
Total High MW PAH's							<					

Notes:

1. All concentrations in ug/g (ppm)
2. 1000 Concentration exceeds Parkland Criteria
3. 5000 Concentration exceeds Industrial Criteria
4. 30000 Concentration exceeds Special Waste Criteria
5. --- Parameter not analysed
6. < Less than Method Detection Concentraion (MDC)

Gartner
Lee

7.3.4 Conclusions

Based on the findings of the site investigations, the following conclusions can be made:

1. A small metallic burial area is located around test pits 2, 3 and 4. This area is coincidental with a geophysical anomaly
2. Hydrocarbon contamination of the soils was not found in the test pits
3. Two small areas of oil and grease contaminated soils exist at this site
4. An unaccounted for geophysical anomaly is coincidental with a small area of desiccated oil.

7.4 Mile Post 247

7.4.1 Physical Setting

7.4.1.1 General Description

MP 247 is located approximately 165 km northeast of Ross River on the North Canol Road, and approximately 10 km east of the Wagon Creek bridge (Figure 23). The site was used as shot point during the Lithoprobe project in late August, 1997.

The site located on a northward bend in the road, and is composed of two areas located on the east side of a bend in the road (Figure 24). A rounded gravel hill separates the northern half of the site from the southern half. This site was previously identified as a significant drum cache, but most of the metallic debris has been removed from the site in previous clean-up efforts.

The northern part of the site consists of a long narrow clearing on the north side of the small hill. The clearing runs from the Canol Road on the west to a natural grassy clearing to the west and is approximately 130 metres long. North of the clearing lies a small wetland area with shallow ponded water. At the western end of the clearing there is some metallic debris scattered on the surface. A broken open tractor battery is also found in this area. There is a small area of no vegetation around the battery. The floor of a caboose or small building lies near the road along the northern edge of the clearing. Immediately behind the building is a small area of dried oil and grease approximately 3 m long by 1 m wide.

The southern part of the site is interpreted to be an old gravel borrow pit area. A short (25m) road provides access to the site south of the Canol Road. The small gravel hill between this half and the northern half lies to the west of the clearing. The terrain dips slightly to the west of this half of the site. Miscellaneous machinery debris and culvert pieces are found at the south end of the clearing. To the south of the clearing is an overgrown tin can dump approximately 50 m long by 50 m wide.. There are several small modern oil stained created by leaking machinery that may have been parked at this site.

The largest of these is a small, 1 m by 1 m oil stain at the north end of the clearing. Two large diameter drill holes have been constructed at this site for the 1997 Lithoprobe project.

7.4.1.2 Hydrogeology

The hydrogeology of this area is characterized by a shallow unconfined aquifer with a depth to groundwater at less than 2 m for most of this site. Further to the north, the depth to the water table decreases and groundwater is observed at or near the surface as the terrain becomes swampy. The inferred direction of flow is to the north towards the MacMillan River.

7.4.1.3 Vegetation

The site itself has been cleared and much of the ground contains an irregular or sparse cover of ground cover such as Fireweed (*Epilobium anustifolium*) and a variety of grass tufts and sedges. The gravelly soils are probably responsible for the retarded rate or regeneration. The surrounding terrain is vegetated with homogenous cover of Dwarf Birch (*Betula glandulosa*) with the occasional Black Spruce (*Picea mariana*). The ground cover is a thick mat reindeer lichen (*cladina sp. or cladonia sp.*) and blueberries (*vaccinium sp.*).

7.4.1.4 Surface Water

There were no surface water drainage observed on or near the site. As discussed above, there is low lying area with shallow ponded water to the north of the site. General topography would indicated general drainage off-site towards the low lying areas to the north and west.

7.4.2 Test Results

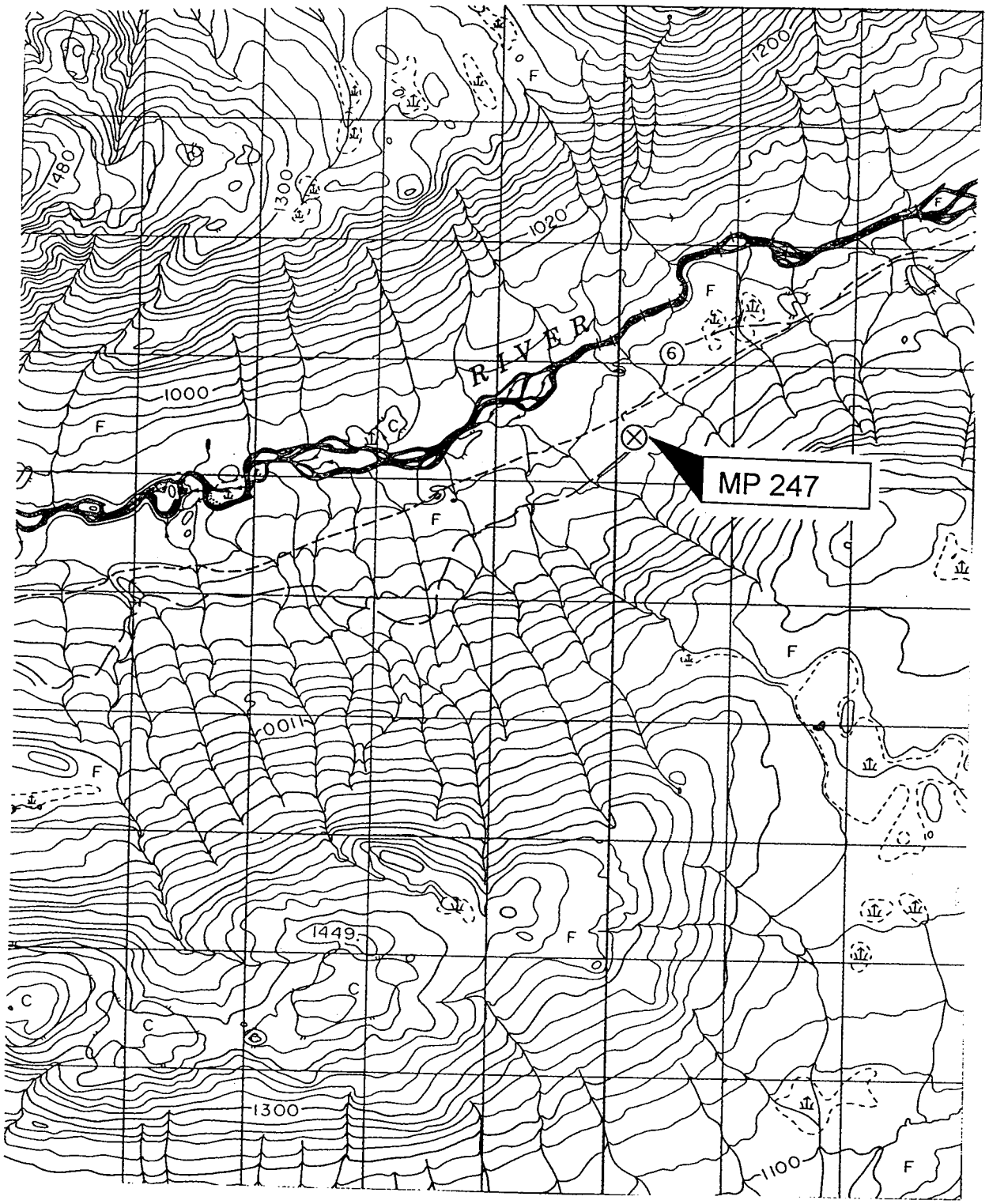
7.4.2.1 Field Testing

A total of six soil samples were field screened for organic vapours using the PID . The results of the field screening procedures are presented in Table 7.4.1.

Of the six samples screened for organic vapours, two had concentrations which were considered to be above background. Concentrations in these samples ranged from 255 to 327 ppm.

7.4.2.2 Soil Chemistry

Selected soil samples were submitted to the analytical laboratory for analysis of hydrocarbon contaminants. This section provides a summary of the analytical results with complete results presented in Tables 7.4.1 and Appendix B.



Legend

Site Location

Source:
NTS 105 J/15 Edition 1

0 250 500 1000 1500
metres

Scale 1:50,000

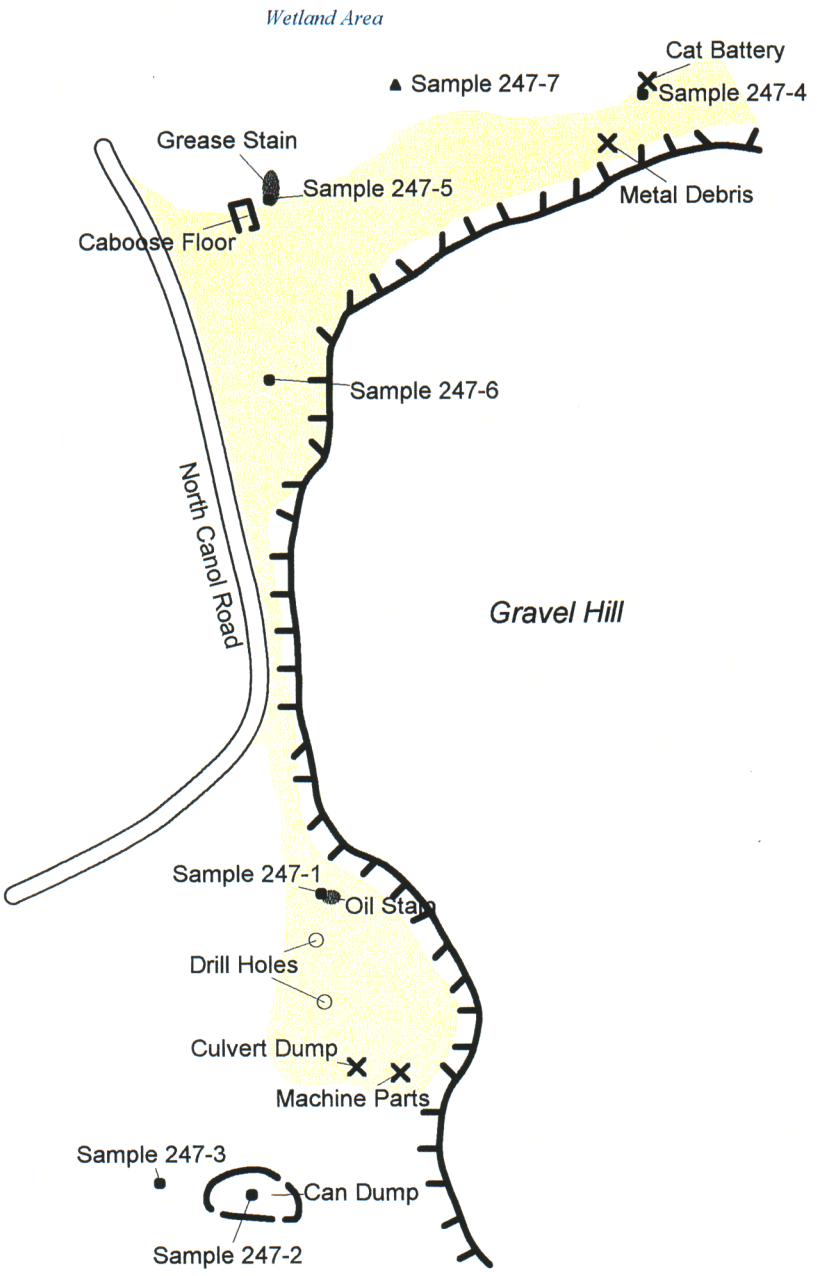
Drawn By: F. Pearson	Project No. 97-751
Site Name: North Canol Road	Date: 04.02.98

MP 247
Site Location

1997 Environemental Investigations
Canol Road

Gartner Lee Limited

Figure No. 23



Legend

- Surface Staining
- Disturbed Area
- Building Remnants
- Sample Location

0 2.5 5 10 15 metres

Scale 1:500 (approximate)

Drawn By: F. Pearson	Project No. 97-751
Site Name: MP 247	Date: 04.02.98

Sketch Map
MP 247

1997 Environemental Investigations
Canol Road

Gartner Lee Limited

Figure No. 24

Table 7.4.1: Soil Chemistry - Hydrocarbon Results
Mile Post 247

Parameter	Parkland Criteria	Industrial Criteria	Philip ID: / Sample ID: / Sample Description: MDC	97031467 / MP247-1 / Modern Surface Stain	97031468 / MP247-2 / Can Dump	97031469 / MP247-3 / Down-gradient of can dump	97031470 / MP247-4 / Tractor battery kill zone	97031471 / MP247-5 / Surface oil & grease sample	97031472 / MP247-6 / "Background" sample
Hydrocarbons									
Orangic Vapour Concentration (ppm)				255	10	7	5	327	6
TEH (C10-C30)			5						
TEH Heavy Oil (>C30)			5						
LEPH (C10-<C19)	1000	2000	5						
HEPH (C19-C32)	1000	5000	5						
Mineral Oil & Grease	1000	5000	100	16000	<	<	190	34000	210

Notes:

1. All concentrations in ug/g (ppm)
2. 1000 Concentration exceeds Parkland Criteria
3. 5000 Concentration exceeds Industrial Criteria
4. 30000 Concentration exceeds Special Waste Criteria
5. — Parameter not analysed
6. < Less than Method Detection Concentraion (MDC)

Table 7.4.2: Surface Water Chemistry Results
Mile Post 247

Parameter	Aquatic Life Standards	Philip ID: / Sample ID: / Sample Description: MDC	97030711 / MP247-7 / Surface Water
Hydrocarbons			
TEH (C10-C30)	0.1	0.1	<
TEH Heavy Oil (>C30)		0.1	<
LEPH (C10-<C19)		0.1	<
HEPH (C19-C32)		0.1	<

Notes:

1. All concentrations in mg/L (ppm).
2. MDC - Method Detection Concentration.
3. 0.02 Concentration exceeds Fresh Water Aquatic Life Criteria

Oil and grease was detected in four of the six samples submitted for analysis. Two of the samples had oil and grease levels above Parkland Criteria and one of these was above Special Waste Criteria. Sample 247-1 was collected from a modern oil stain in the southern part of the site, and sample 247-5 was collected from the desiccated oil & grease at the north end of the site—this is the sample that exceeded the Special Waste Criteria.

Elevated hydrocarbon levels were detected in both samples 247-4 and 247-6, but neither of these exceeded criteria.

7.4.2.3 Surface Water Chemistry

Results from the surface water sample from the wetland area to the north of the site presented in Table 7.4.2 with complete analytical results in Appendix B. This sample analysis did not detect any hydrocarbon contamination.

7.4.3 Discussion

The significant area of concern at this site is the dried oil & grease dump area at the north end of the site. Anecdotal accounts describe this area behind the old shack or caboose as being used to dump all the waste oil and grease products. Although this area is small, approximately 3 m long by 1 m wide on the surface, it does contain levels of oil and grease above Special Waste criteria. The subsurface extent of this contamination is unknown. There is a small wetland body adjacent to this contaminated area, and is a potential receptor water body.

There area elevated hydrocarbon levels around the broken tractor battery were sample 247-4 was collected. Soil analysis should be conducted at this site to determine if metal contamination of the soil related to the battery is an issue. Additionally, the small wetland area adjacent to this area, and the oil & grease dump described above should be sampled for potential metal contamination of the water. A water sample was collected (247-7) and analysis showed no contamination due to hydrocarbons, but no analysis was conducted for metal content.

Sample number 247-6 was collected to represent "background" conditions, but it did reveal elevated oil & grease content—210 ppm. Review of historical literature shows that the area from which this sample was collected was an old drum cache. These drums were removed and disposed of during the 1970's clean-up efforts. Therefore, the elevated hydrocarbon levels detected in the sample are most likely from residual leakage from these drums.

The southern half of the site contains unsightly metal debris and waste. There are several small (1 m x 1 m) modern oil spills in this area. Sample 247-1 was collected from one of these such stains. These are most likely created by parked vehicles and equipment at this site.

The can dump at the extreme southern end of the site is quite over grown, and seems to be composed mostly of tin can from the road construction. Samples from this area did not indicate any contaminants of concern.

7.4.4 Conclusions

Based on the findings of the site investigation, the following conclusions can be made:

1. There is a small area of oil & grease contamination that exceeds Special Waste Criteria;
2. There are small areas of modern oil stained soils in the southern half of the site which exceed Industrial Criteria;
3. There appear to be no contamination issues related to the can dump at the south end of the site.

7.5 Mile Post 267.5

7.5.1 Physical Setting

7.5.1.1 General Description

MP 267.5 is located just before the MacMillan River #2 crossing 210 km northeast of Ross River (Figure 25). The site is an old military camp, and is located 500 metres south of the MP 268 site which was investigated in 1996 (GLL, 1997). The site is located on the southwest side of the road, and is mainly flat lying and slopes gently to the northeast towards the river.

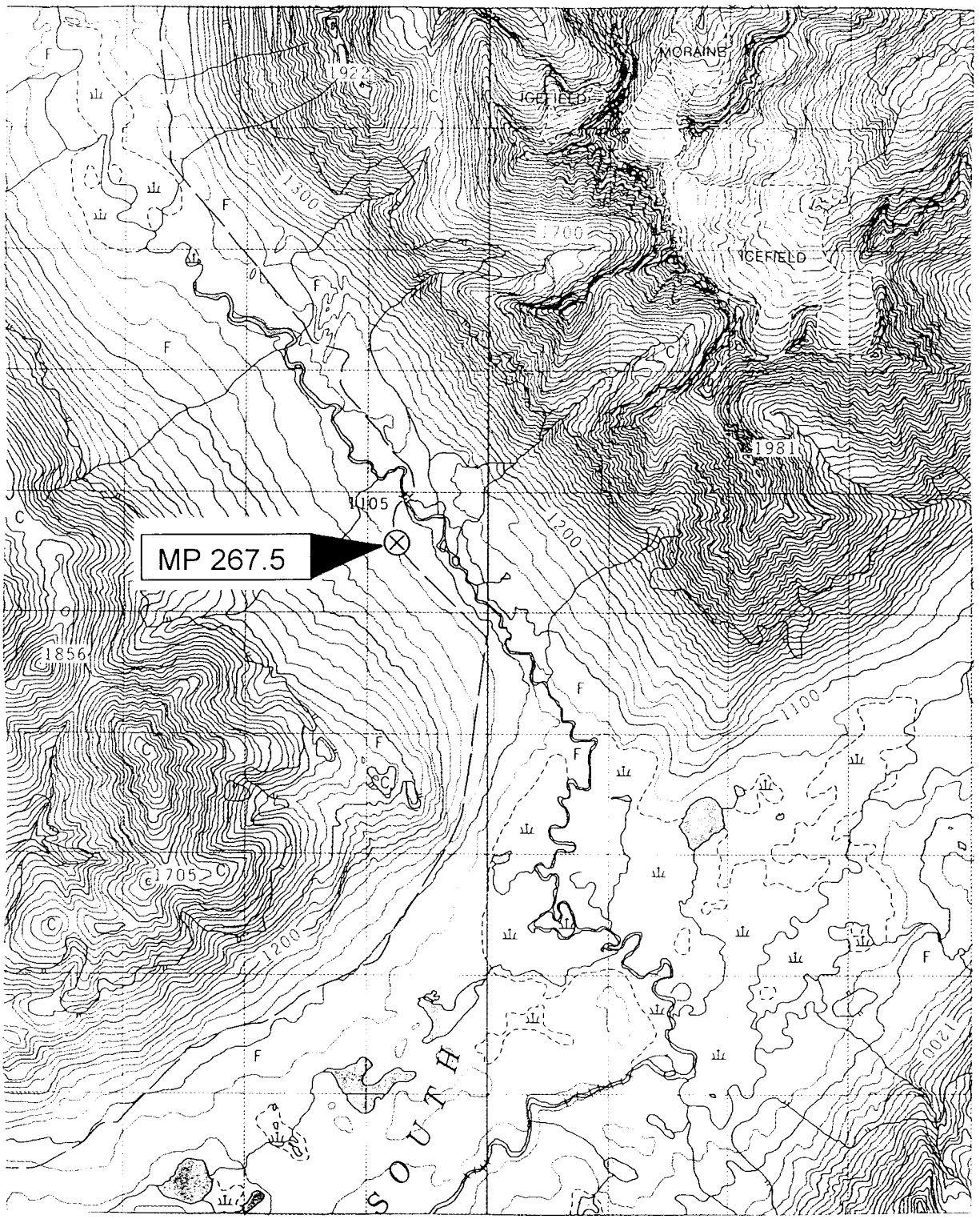
The site consists of an well overgrown clearing that was once a military maintenance camp (Figure 26). There are several clearing that are not completely overgrown due to the rocky nature of the exposed soils. 1975 Photography of the site shows there were eight to nine buildings at this site, but at the time of the 1997 site investigation, only four foundations could be found, and these appeared to be burnt.

7.5.1.2 Hydrogeology

Due to the swampy and wet nature of the site, it appears to be a groundwater discharge zone at the base of the mountain slope or an area underlain by permafrost. This is inferred as water was found ponding and discharging in various areas throughout the site. The direction of groundwater flow is inferred to be to the northeast (eg. Down-gradient into the MacMillan River)

7.5.1.3 Vegetation

Vegetation on the majority of the site shows signs of vigorous re-vegetation. The vegetation on the site is dominated by dense shrub willow 2 to 4 m tall. The surrounding lands contain typical open, stunted black spruce forest (*Picea mariana*) with an understory of Labrador Tea (*Ledum groenlandicum*) and feathermoss.



Legend

Site Location

Source:
NTS 105 O/01 Edition 1

0 250 500 1000 1500
metres

Scale 1:50,000

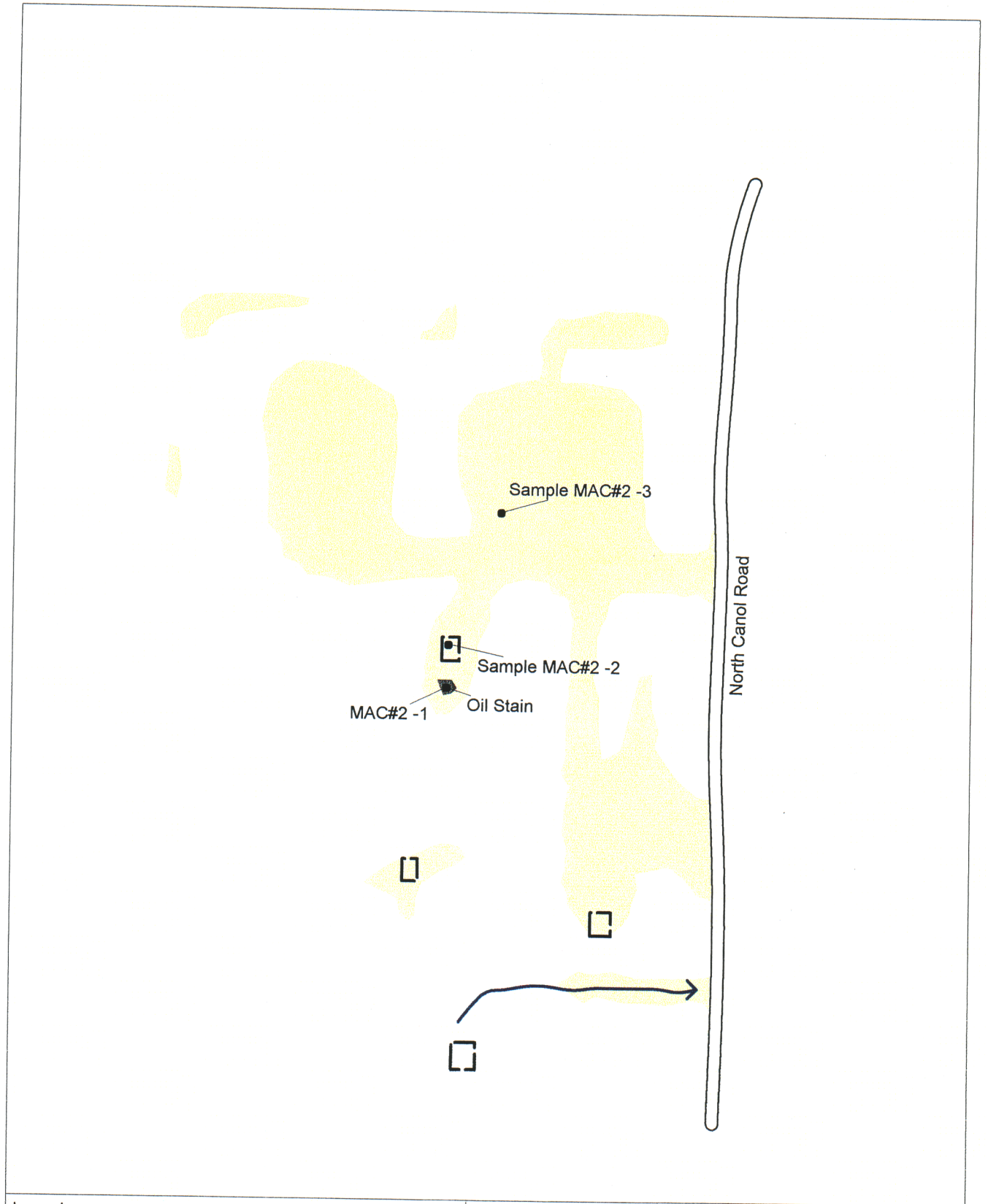
Drawn By: F. Pearson	Project No. 97-751
Site Name: North Canol Road	Date: 04.02.98

MP 267.5
Site Location

1997 Environemental Investigations
Canol Road

Gartner Lee Limited

Figure No.
25



Legend

Surface Staining

Disturbed Area

Building Remnants

Sample Location

0 5 10 20 30 metres

Scale 1:1000 (approximate)

Drawn By: F. Pearson | Project No. 97-751

Site Name: MP 267.5 | Date: 04.02.98

Sketch Map
MP 267.5 - MacMillan #2 Camp

1997 Environemental Investigations
Canol Road

Gartner Lee Limited

Figure No. 26

7.5.1.4 Surface Water

Surface discharge of water were observed to the north of the site and at the south end of the site. The southern surface water flow is shown on Figure 26. The general flow path is northeast towards the Canol Road, where surface flow is captured in the road ditch. A culvert passes the water under the road at the south end of the site, toward the MacMillan River.

7.5.2 Test Results

7.5.2.1 Field Testing

A total of three samples were field screened for organic vapour concentrations using the PID. There results from the screening are shown on Table 7.5.1.

Elevated concentrations were detected in all the samples, including sample MAC#2-3 which was collected as a background reading. The values varied from 23 ppm to 95 ppm.

7.5.2.2 Soil Chemistry

Three samples were submitted to the analytical laboratory for analysis of potential hydrocarbon contamination. This section provides a summary of the analytical results with the complete results presented in Table 7.5.1 and Appendix B.

Oil & grease concentrations were detected above Industrial Criteria for two of the samples. Sample MAC#2-1 had concentrations of 28,000 mg/g oil & grease and was collected from an obviously oil stained area. Sample MAC#2-2 was collected nearby the previous sample from a building ruin, but the sample location did not exhibit obvious field signs of contamination.

Sample MAC#2-3 was collected as a "background" sample, yet it returned elevated oil & grease concentrations. These concentrations (410 mg/g) did not exceed criteria, but are still significant.

Table 7.5.1: Soil Chemistry - Hydrocarbon Results
Mile Post 267.5

Parameter	Parkland Criteria	Industrial Criteria	Philip ID: / Sample ID: / Sample Description: MDC	97031484 / MAC#2-1 / Surface Stained Soil	97031485 / MAC#2-2 / Building Ruin	97031486 / MAC#2-3 / Background
Hydrocarbons						
Orangic Vapour Concentration (ppm)				95	68	23
TEH (C10-C30)			5			
TEH Heavy Oil (>C30)			5			
LEPH (C10-<C19)	1000	2000	5			
HEPH (C19-C32)	1000	5000	5			
Mineral Oil & Grease	1000	5000	100	28000	21000	410

Notes:

1. All concentrations in ug/g (ppm)
2. 1000 Concentration exceeds Parkland Criteria
3. 5000 Concentration exceeds Industrial Criteria
4. 50000 Concentration exceeds Special Waste Criteria
5. --- Parameter not analysed
6. < Less than Method Detection Concentraion (MDC)

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7.5.3 Discussion

MP 267.5 was the location of a military camp. The building ruins were most likely burnt and metallic debris removed during clean-up efforts during the 1970's. Very little of the camp site remains today beyond a few building foundations. The site is well re-vegetated with shrub willows and moss mat.

Sampling of soils revealed oil & grease contamination above Industrial Criteria. These samples were collected from an area that is interpreted to once contain a vehicle maintenance building. Therefore, the contamination would have come from oil & lubricant storage and spills.

Canadian Forces 1970 report show a barrel cache on the northeast side of the across from the camp area. During the 1997 field investigations, a clearing was observed at the site of this barrel cache. Follow-up sampling should be conducted in this area to determine if leakage from the barrel cache contained soils in this area.

7.5.4 Conclusions

Based on the findings of the site investigation, the following conclusions can be made:

1. areas of soil with oil & grease contamination above Industrial Criteria exist at this site;
2. the site is well re-vegetated with little to no woody or metallic debris.

8. References

Appendix A

Community Consultation

- Coordinator & Student Employment Announcements
- Community Newsletter
- Project Updates

Ross River Dena Council

ROSS RIVER, YUKON
Y0B 1S0

PHONE 969-2278

EMPLOYMENT OPPORTUNITY-COMMUNITY COORDINATOR

1997 ENVIRONMENTAL ASSESSMENT OF SITES ON THE NORTH AND SOUTH CANOL ROAD

A Community Coordinator is required to assist with the 1997 contaminants program along the North and South Canol Road. The successful candidate will be selected according to the following selection criteria:

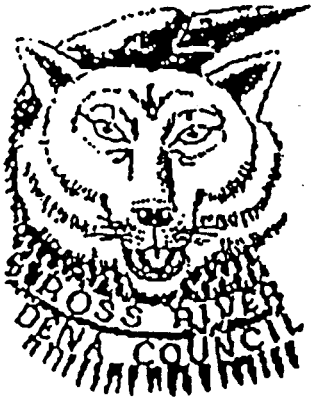
- The successful applicant must complete a training program.
- Applicants will be assessed on enthusiasm, maturity, interest level and overall personal suitability
- The successful applicant must have successfully completed Grade 10 secondary school education
- A background in the coordination and/or management of field programs and familiarity with field equipment will be considered to be an asset.

Employment Period: July 10, 1997 to August 20, 1997

Hourly Wage: $ 15.00 per hour

For Further Information: contact Vera Sterriah, Land Claims

DEADLINE FOR APPLICATIONS: JULY 7, 1997



Ross River Dena Council

ROSS RIVER, YUKON
Y0B 1S0

PHONE 969-2278

STUDENT EMPLOYMENT OPPORTUNITY

1997 ENVIRONMENTAL ASSESSMENT OF SITES ON THE NORTH AND SOUTH CANOL ROAD

A total of 4 students are required to assist with the 1997 field contaminants program along the North and South Canol Road. Students will be selected according to the following selection criteria:

- Successful applicants must complete a training program
- Applicants will be assessed on enthusiasm, maturity, interest level and overall personal suitability
- A student leader will be selected to assist with the coordination of activities

Employment Period: July 10, 1997 to August 15, 1997

Hourly Wage: Range from $ 8.50 per hour to $ 9.50 per hour depending on experience level

For Further Information: contact Vera Sterriah, Land Claims

DEADLINE FOR APPLICATIONS: JULY 7, 1997

Ross River Dena Council

ROSS RIVER, YUKON
Y0B 1S0

PHONE 969-2278

MEMORANDUM

STUDENT APPLICANTS- 1997 ENVIRONMENTAL ASSESSMENT CANOL ROAD PROJECT

FROM: GEORGE SMITH, ASSISTANT LAND CLAIMS NEGOTIATOR

DATE: JULY 10, 1997

SUBJECT: **RESULTS OF COMPETITION- JULY 9, 1997**

The following applicants have been chosen to participate in this year's student program on the north and south Canol Road:

- ☐ Rose Shorty
- ☐ Jordon Caesar
- ☐ Michael Dick
- ☐ Verna Nukon
- ☐ Joanie Acklack

Due to the high interest level for this work plus the impressive interviews by the students we decided to hire a total of five for this work.

A training program for this year's program will start today at 2:00 PM at the Curling Rink. **Please note to be eligible for this work, you must complete this training program.** If you decide not to accept this work, please let either myself or Steve Morison, Gartner Lee Limited, know as soon as possible as there are other applicants who are eligible for this program.

I would like to congratulate each student who participated in these interviews for a job well done. The decisions were difficult to make and you each did an excellent job during the interview.

Please note, for the applicants not chosen for this work, there will be other opportunities posted for students this summer.

Once again, congratulations on a job well done.

George Smith, Councillor, Ross River Dena Council

Do You Know of Any Old Construction Camps or Waste Sites Along the North and South Canol Road?

We Seek Community Input to Locate and Assess These Sites.

1997 Environmental Investigations Along The Canol Road

Ross River Dena Council
Gartner Lee Limited

1997 ENVIRONMENTAL

INVESTIGATIONS ALONG THE CANOL ROAD

COMMUNITY UPDATE BY THE ROSS RIVER DENA COUNCIL AND GARTNER LEE LIMITED

The 1997 field program to assess contaminated sites on the north and south Canol road has started. As with last year's program, 5 Ross River students have been selected to assist Gartner Lee Limited technical staff with the field asssessments of these sites. The students helping this year include: Rose Shorty, Vernna Etzel, Michael Dick, Jordan Caesar and Joanie Acklack. The Community Coordinator this summer is Fran Etzel.

This year we will be starting clean-up on some of the sites which were assessed last summer. We will also be visiting new sites and we are looking for your guidance on which sites should be visited and worked on this year. If you know of potentially contaminated areas on the Canol Road please let us know.

Gartner Lee Technical Staff:

Terry Duffy
Forest Pearson

Gartner Lee

If you have any information about these sites, please contact:

Vera Sterriah
Fran Etzel, Community Coordinator

Or the students:
Rose Shorty
Vernna Etzel
Michael Dick
Jordan Caesar
Joanie Acklack

The above can be contacted through the Land Claims Office
Tel: 969-2832

Ross River Dena Council
Ross River, Yukon
YOB 1S0
Tel: 969-2832
Fax: 969-2405

Gartner Lee Limited

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Tel: (403) 633-6474
Fax: (403) 633-6321
Cell: (403) 393-1504
E-mail: Smorison@hypertech.yk.ca

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August 11, 1997

Ross River Dena Council
Ross River, Yukon
Y0B 1S0

Department of Indian Affairs and Northern Development (DIAND)
Waste Management Program
345-300 Main Street
Whitehorse, Yukon
Y1A 2B5

Attention: Vera Sterriah, Director, Land Claims
Brett Hartshorne, Manager, Waste Management Program

Dear Ms. Sterriah/Mr. Hartshorne,

Re: 1997 Canol Road Environmental Site Assessment Program-Project Update

As required in the DIAND correspondence dated, May 29, 1997 and as follow-up to the Gartner Lee response dated June 3, 1997, please find attached a summary of the 1997 program which outlines the work which has been conducted to date.

The purpose of this status report is to seek approval to conduct detailed work on the proposed sites which have been chosen as a result of the reconnaissance field work and the community consultation which was recently completed. I have also attached a summary of the protocol for your approval which will be followed for excavating the UST's at sites MP 73 and MP 124.5.

Please note the field crew is currently setting up camp for work on the south Canol Road and it is expected that they will be initiating the detailed site assessment work early this week.

To date, this program has been carried out as planned and is on target. If you have concerns or questions with any of the attached don't hesitate to contact me.

Yours truly,
GARTNER LEE LIMITED

S.R. Morison

S.R. Morison
Manager/Senior Geoscientist

STATUS REPORT- 1997 ENVIRONMENTAL INVESTIGATIONS ALONG THE CANOL ROAD

1.0 Student Field Assistants and Community Coordinator

A total of 14 students were interviewed for the field assistant positions and 4 candidates were interviewed for the Community Coordinator position. The interviews were conducted by Gartner Lee technical staff and recommendations were made to Mr. George Smith for the final selection of the successful candidates. It was originally planned to hire 4 student assistants but due to the enthusiasm and qualifications of the students, a total of 5 were hired to support the program.

The training session for the students and the Community Coordinator took place on July 10th and July 11th.

2.0 Additional Site Identification and Reconnaissance

The reconnaissance phase of the 1997 environmental investigations along the Canol Road has been completed during which a total of 13 sites were visited in the field. These sites were selected as a result of the following :

- Background information on these sites was collected during interviews with members and elders from the Ross River Dena community.
- Elders from the community accompanied the field team for many of the reconnaissance site visits.
- The Ross River students distributed information pamphlets to every home in the community introducing the program and seeking input on which sites should be assessed (see attached). This was also done as follow-up to provide the Ross River Dena community with a mid-summer status report on the project (see attached).

The following chart summarizes the sites which were visited during the reconnaissance phase:

Site Name	Description
1. Flat Creek - MP 147	Buried garbage from old camp.
2. Ram Creek	Pieces of pipe; 2 drums.
3. MP 247	Floor of old building; metal debris; stained soils; buried garbage.
4. Lapie Lakes	Drums in lake (empty).

Site Name	Description
5. Sheep Creek	Old exploration camp; old buildings; 15-20 drums; 2 dead marmots found in drum.
6. Sheldon Lake	Old sawmill; 17 empty drums; old road with buried drums and debris.
7. Tenas Creek	Old sawmill; 3 drums (full of product); several empty drums
8. Boulder Creek (North Canol)	Pieces of pipe; 2 empty drums
9. Twin Creeks	Reported old dump site.
10. MP 234	Buried debris larger area than anticipated; debris also along south side of road.
11. MacMillan # 2 - MP 268	Old army camp.
12. Old Ross Town Site	Reported pipeline break on bluff; village site; buried garbage.
13. Pelly River Crossing	Buried debris.

As outlined above, the results from these visits have been presented to the Ross River Dena community via pamphlets to each home.

3.0 1997 Site Selections

Based upon the above preliminary field surveys and Dena community concerns, the following list of sites are proposed for detailed site investigations:

1. Dump behind camp at MP 147 (Flat Creek)
2. Sheldon Lake drum burial site.
3. Construction camp and dump site at MP 234
4. Construction camp at MP 247
5. Construction camp at MP 268 (MacMillan R. #2)

These sites will be mapped in detail using and hip chain and compass methods. The following field sampling will be conducted where appropriate to delineate areas which have potential concerns:

- soil samples will be collected from test pits excavated at each site;
- wherever possible surface water samples will be collected at each site and down gradient from each site as appropriate.

Test pitting in conjunction with shallow EM geophysical surveys will be conducted to determine the extent of subsurface contamination, and to determine the nature of the buried waste.

4.0 Follow-up Work- 1996 Sites

Detailed site investigations and preliminary cleanup (UST removals) from the 1996 program will be completed as outlined in this year's proposal. These sites include:

- MP 73
- MP 124.5 - Lapie River
- MP 233
- MP 234

4.1 Proposed Tank Removal Protocol

Removal of Underground Storage Tanks (UST) will be conducted at MP 73 and MP 124.5 using standard UST removal protocols based on Canadian Council of Ministers of Environment guidelines for the storage and handling of petroleum products. These protocols include the following:

1. If hydrocarbon product remains in the tank, it will be pumped out into a clean 55-gallon drum. The product will be sampled and sent out for laboratory analysis. If the product is standard waste oil, then the drum will be transported to Whitehorse's waste oil facility for disposal. If the product is not suitable for disposal in Whitehorse, then other arrangements will be made for proper disposal at a licensed facility.

2. The UST will be excavated using a small bucket excavator. The tank will be loaded into a truck and transported to Whitehorse. There, the tank will be stream cleaned, crushed, and disposed of by an approved sub-contractor. Documentation of tank destruction will be provided.

3. The surrounding soils will be excavated and stockpiled until the UST is removed. Verification sampling from the walls and floor of the excavation will be conducted, also composite samples from each stockpile will be collected and sent for analysis.

4. The excavation will be lined will heavy grade polyethylene and the excavated soils will be used to back fill the excavation. The polyethylene will then be folded over the top of the excavation to enclose the soils and prevent the infiltration of surface water and groundwater.

5. The analytical data from the field soil sampling will be used to determine the nature and extent of any contamination of the excavated materials as well as any residual contamination surrounding the excavation.