Final
Phase II Remedial Investigation Report Addendum
1999 Fieldwork
Northeast Cape, Alaska

Contract No. DACA85-93-D-0011
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ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
µg/L	micrograms per liter
AAC	Alaska Administrative Code
AC&W	Aircraft Control and Warning
ADEC	Alaska Department of Environmental Conservation
Alaska District	United States Army Engineer District, Alaska
ANCSA	Alaska Native Claims Settlement Act
ARAR	applicable or relevant and appropriate requirements
ASCI	Alaska Stream Condition Index
AST	aboveground storage tank
BD/DR	building demolition and debris removal
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
CDAP	Chemical Data Acquisition Plan
CDQR	Chemical Data Quality Review
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
DERP	Defense Environmental Restoration Program
DOD	United States Department of Defense
DRO	diesel range organics
DS-2	Decontamination Agent No. 2
E&E	Ecology and Environment, Inc.
ENRI	Environment and Natural Resources Institute
EPA	United States Environmental Protection Agency
ES	Executive Summary
FUDS	Formerly Used Defense Sites
GPS	geographical positioning system
GRO	gasoline range organics
LBP	lead-based paint
MDL	method detection limit
mg/Kg	milligrams per kilogram
mg/L	milligrams per liter
MRL	method reporting limit
msl	mean sea level
MW	Montgomery Watson
NA	not applicable or not analyzed
Navy	United States Department of the Navy
ND	not detected

NES	Northwest EnviroService, Inc.
NHPA	National Historic Preservation Act of 1966
OSHA	Office of Occupational Safety and Health
PACM	presumed asbestos-containing materials
PAH	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyls
pH	hydrogen ion activity
PL	public law
POL	petroleum, oil, and lubricants
PPE	personal protective equipment
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RRO	residual range organics
SARA	Superfund Amendments and Reauthorization Act
SHPO	State Historic Preservation Office
STB	super tropical bleach
SVOC	semivolatile organic compounds
TAL	target analyte list
TCLP	toxicity characteristic leachate procedure
TOC	total organic carbon
TRPH	total recoverable petroleum hydrocarbons
TSCA	Toxic Substance Control Act
TU	toxicity unit
URS	URS Corporation
USAED	United States Army Engineer District, Alaska
USAEHA	United States Army Environmental Hygiene Agency
UST	underground storage tank
VOC	volatile organic compound

EXECUTIVE SUMMARY

The U.S. Air Force operated a military installation at Northeast Cape from 1952 to 1972. The Northeast Cape installation is located on St. Lawrence Island in the Bering Sea, approximately 135 air miles southwest of Nome, Alaska. This report presents the results of environmental work conducted at Northeast Cape in 1999, and is a supplement to the Phase II Remedial Investigation (RI) performed by Montgomery Watson at the Northeast Cape installation during 1996 and 1998. This work was performed as part of the U.S. Army Engineer District, Alaska (Alaska District) Defense Environmental Restoration Program (DERP) (Contract No. DACA85-98-D-0011, Delivery Order No. 0005, Modification No. 3).

The 1999 Phase II RI resolved data gaps remaining from the Phase II RI work performed during 1996 and 1998. Table ES-1 itemizes tasks completed during the 1999 Phase II RI. Table ES-2 summarizes data gaps, work performed, and conclusions drawn from the data collected.

All data gaps were resolved, with the exception of background diesel range organic (DRO) aliphatic and aromatic fractions and background DRO reproducibility. These unresolved issues do not affect Phase II cleanup recommendations. Additional sampling to resolve these issues does not appear to be warranted.

TABLE ES-1
Summary of 1999 Phase II RI Activities

	Description	Soil Sampling	Sediment Sampling	Sludge Sampling	AST Paint Sampling	Building Materials Sampling	Biological Sampling	Buried Drum Investigation	SHPO Documentation	Utilidor Survey	Neutralize Chemical Residuals
		1999 Phase II RI Activities									
Site 1	Burn Site Southeast of Landing Strip										
Site 2	Airport Terminal and Landing Strip				X				X		
Site 3	Fuel Line Corridor and Pumphouse				X				X		
Site 4	Subsistence Fishing and Hunting Camp				X				X		
Site 5	Cargo Beach										
Site 6	Cargo Beach Road Drum Field										
Site 7	Cargo Beach Road Landfill		X								
Site 8	POL Spill Site										
Site 9	Housing and Operations Landfill										
Site 10	Buried Drum Field							X			
Site 11	Fuel Storage Tank Area				X				X		
Site 12	Gasoline Tank Area	X			X				X		
Site 13	Heat and Electrical Power Building				X	X			X	X	
Site 14	Emergency Power/Operations Building				X				X	X	
Site 15	Buried Fuel Line Spill Area										
Site 16	Paint and Dope Storage Building				X				X		
Site 17	General Supply Warehouse and Mess Hall Warehouse					X			X	X	
Site 18	Housing Facilities and Squad Headquarters				X	X			X	X	X
Site 19	Auto Maintenance and Storage Facilities				X				X	X	
Site 20	Air Force Aircraft Control Warning Building								X	X	
Site 21	Wastewater Treatment Facility			X					X	X	
Site 22	Water Wells and Water Supply Building				X				X		
Site 23	Power and Communication Line Corridors										
Site 24	Receiver Building Area								X		
Site 25	Direction Finder Area										
Site 26	Former Construction Camp Area										
Site 27	Diesel Fuel Pump Island								X		
Site 28	Drainage Basin Area						X				
Site 29	Suqitughneq River						X				
Site 30	Background Areas	X	X				X				

AST – aboveground storage tank
POL – petroleum, oil, and lubricants
RI – Remedial Investigation
SHPO – State Historic Preservation Office

Table ES-2
Summary Of 1999 Phase II RI Work and Results

Site Description	Site	Data Gap	Work Performed	Result	Data Gap Resolved	Conclusion
Cargo Beach Road Landfill	7	Are fuel-related compounds present above benchmark screening criteria?	Sediment sample (including QC and QA samples) collected and analyzed for DRO and RRO using most current ADEC methods.	DRO and RRO concentrations below regulatory limits.	Yes	Fuel contamination not indicated in sediments at this site.
		Can previous high TRPH and low DRO results be confirmed?		High RRO and low DRO concentrations detected.	Yes	High TRPH probably due to high background organic content.
Gasoline Tank Area	12	Are fuel constituents present in soil at this site?	Surface soil samples collected and analyzed for GRO, DRO, RRO, BTEX.	No contaminants present above regulatory limits.	Yes	No fuel contamination indicated in soil at this site.
Wastewater Treatment Facility	21	Is the sludge in the tanks a hazardous waste?	Sample collected and analyzed for PCBs and TCLP metals, pesticides, VOCs, and SVOCs.	PCB concentrations above ADEC and federal criteria.	Yes	Sludge must be disposed at a PCB waste permitted facility.
Buildings Scheduled for Demolition	13, 17, 18	How will potential presence of PCBs in paint affect building demolition debris disposal options?	Building material composite samples collected and analyzed for PCBs.	PCB concentration below 18 AAC 60 solid waste disposal limits.	Yes	Building debris can be disposed in a permitted solid waste landfill.
Painted ASTs	Mult -iple	Are ASTs painted with lead-based paint, posing a potential risk to site workers?	Paint samples collected from painted ASTs and analyzed for lead.	Lead present in all paint samples.	Yes	Abatement and/or PPE recommended to protect site workers during tank demolition.
Background Areas	30	Why are TRPH and DRO concentrations so high in background soil samples?	Soil and sediment samples collected and analyzed for GRO, DRO, RRO, TOC, and TAL metals.	TOC, DRO, and RRO consistently high in tundra areas. Chromatograms indicate biogenic source.	Yes	Background tundra areas have biogenic DRO and RRO above ADEC benchmark criteria.
		Can high TRPH with low DRO concentrations in soil samples be explained?			Yes	High levels of biogenic organics are likely source of high TRPH results in tundra areas.
		Do DRO aliphatic and aromatic fractions sum to total DRO concentration?	Background samples were not analyzed for DRO aliphatic and aromatic fractions.	No data obtained to resolve this data gap.	No	Should evaluate whether the value of this data warrants the effort necessary to obtain it.

Table ES-2 (Continued) Summary of 1999 Phase II RI Work and Results

Site Description	Site	Data Gap	Work Performed	Result	Data Gap Resolved	Conclusion
Background Areas (continued)		Are DRO results reproducible?	Current and previous analytical results compared.	Analytes and analytical methods not consistent over the study period; DRO results vary depending on location and soil type.	No	Comparison of DRO data obtained using different analytical methods not recommended.
Buried Drum Field	10	Is POL product present in buried drums and causing soil staining?	Test pits excavated, drums exposed and examined.	No leaking drums were found. One intact drum full of POL product was uncovered.	Yes	Previous surface spills are likely source of soil staining.
Housing Facilities and Squad Headquarters	18	Do STB and DS-2 chemical residuals remain in the former storage area?	Sodium bicarbonate and sodium bisulfate slurries applied to former storage area.	Residuals neutralized by slurry.	Yes	Materials not expected to exhibit hazardous waste characteristics.
Main Operations Complex	Mult -iple	Can the utilidor piping be accessed during BD/DR activities?	Visual survey conducted throughout the utilidor system.	Piping accessibility determined.	Yes	Pipes expected to be easily accessible during BD/DR activities, especially once aboveground structures are removed.
		Does piping insulation consist of PACM?	Piping insulation inspected during utilidor survey.	Pipe insulation includes PACM.	Yes	Pipe insulation will require handling as PACM.
		Do the utilidors provide contaminant migration pathways?	Contaminant migration potential evaluated during utilidor survey.	Utilidors upgradient of spill sites; no contaminant migration observed.	Yes	Utilidors not believed to be contaminant migration pathways.
Drainage Basin Area, Suqitughneq River	28, 29	Has fuel contamination impacted the ecological health of these areas?	Biological sampling performed including sediment toxicity, fish tissue toxicity, and habitat assessments.	Toxicity and bioavailability of contaminants verified in sediment samples; PAHs and PCBs detected in fish tissues.	Yes	Contamination has adversely impacted the ecology downstream of the fuel spill site.

Table ES-2 (Continued) Summary of 1999 Phase II RI Work and Results

Site Description	Site	Data Gap	Work Performed	Result	Data Gap Resolved	Conclusion
Sample Locations	Mult -iple	NA	Sampling and test pit locations surveyed.	Sampling and test pit locations accurately located.	NA	NA
Installation Structures	Mult -iple	NA	Qualified Historical Architect documented installation structures.	SHPO requirements were met.	NA	NA

ADEC - Alaska Department of Environmental Conservation
AST - aboveground storage tank
BD/DR - building demolition and debris removal
BTEX - benzene, toluene, ethylbenzene, and xylenes
DRO - diesel range organic
DS-2 - decontamination agent 2
GRO - gasoline range organic
NA - not applicable
PACM - presumed asbestos-containing materials
PAH - polynuclear aromatic hydrocarbons
PCB - polychlorinated biphenyl
POL - petroleum, oil, and lubricant
PPE - personal protective equipment
QA - quality assurance
QC - quality control
RRO - residual range organic
SHPO - State Historical Preservation Office
STB - super tropical bleach
SVOC - semivolatile organic compound
TAL - target analyte list
TCLP - toxicity characteristic leaching procedure
TOC - total organic content
TRPH - total recoverable petroleum hydrocarbons
VOC - volatile organic compound

1. INTRODUCTION

The Alaska District retained Montgomery Watson to perform additional Phase II RI work at Northeast Cape, St. Lawrence Island, Alaska. These activities were authorized under Contract No. DACA85-93-D-0011, Delivery Order No. 0005, Modification No. 3.

The 1999 Phase II RI was conducted according to the guidelines of the United States Department of Defense (DOD) DERP for Formerly Used Defense Sites (FUDS). This document provides current information on the environmental status of selected areas of the former military installation at Northeast Cape and supplements the Phase II RI report (MW, 1999). Comprehensive background information and site data collected in previous investigations can be found in the Phase I RI report (MW, 1995) and the Phase II RI report (MW, 1999).

This report consists of five sections and seven appendices, as described below:

Section 1 (Introduction) provides project objectives, site background and characteristics, and regulatory setting.

Section 2 (Investigation Approach and Procedures) describes data collection rationale and investigation methods.

Section 3 (Investigation Results and Discussion) presents and interprets data collected during the investigation.

Section 4 (Conclusions and Recommendations) includes a summary of investigation results and site-specific remediation recommendations.

Section 5 (References) lists the documents cited in this report.

Appendix A contains photographs of field conditions.

Appendix B provides complete laboratory results.

Appendix C includes the data quality assessment for the project.

Appendix D contains biological sampling results for the project.

Appendix E contains the site survey results and control report.

Appendix F contains field notes.

Appendix G contains field forms.

Appendix H contains the chemical data quality review.

1.1 PROJECT OBJECTIVES AND ACTIVITIES

The goal of the 1999 Phase II RI was to supplement the Phase II RI (MW, 1999) by collecting the additional data necessary to evaluate the extent of contamination at specific sites and to make remedial action decisions. To resolve the data gaps remaining from the previous Phase II RI work, the following project objectives and field activities were identified:

1. Perform sampling to refine site characterization and to confirm the presence or absence of specific contaminants as follows:
   - Collect a sediment sample at Site 7 to correlate sample results seen in the Phase I RI.
   - Collect soil samples at Site 12 to evaluate for presence or absence of petroleum hydrocarbon contamination.
   - Collect sludge samples from the septic tanks at Site 21 for disposal recommendations.
   - Collect building material samples at three buildings in the main complex area to evaluate presence of polychlorinated biphenyls (PCB) in the painted surfaces.
   - Collect paint chip samples from aboveground storage tanks (AST) throughout the installation to determine the presence/absence of lead-based paint (LBP).
   - Collect additional background soil samples to assist in determining cleanup requirements at contaminated sites.
2. Excavate test holes at Site 10 to evaluate whether buried drums with product have caused the staining observed in previous investigations.
3. Neutralize potential residuals of super tropical bleach (STB) and Decontamination Solution No. 2 (DS-2) in Building 101 to eliminate possible hazardous waste characteristics.
4. Perform a visual survey of the utilidors in the main complex area to evaluate accessibility for piping and asbestos removal and to evaluate the magnitude of contaminant migration potential posed by the utilidors.
5. Gather biological information about the drainage basin, including an assessment of sediment toxicity, fish and macroinvertebrate communities, fish tissue toxicity, and habitat quality in the Suqitughneq River and a control stream, for use in assessing environmental impacts and remedial alternatives in the drainage basin area.
6. Document installation structures in accordance with State Historic Preservation Office (SHPO) requirements.

1.2 PROJECT BACKGROUND

The following subsections briefly summarize the facilities, history, and previous environmental investigations associated with the Northeast Cape installation.

1.2.1 Location

The Northeast Cape installation is located on St. Lawrence Island in the Bering Sea, near territorial waters of Russia, approximately 135 air miles southwest of Nome, Alaska (Figure 1-1). The installation encompasses approximately 4 square miles and extends from the base of the Kinipaghulghat Mountains, which bound the southern portion of the site, to the Bering Sea (Figure 1-2).

1.2.2 Site Description

The installation is divided into 30 distinct sites, which are shown in Figure 1-3 and listed in Table 1-1. The installation consists of a Main Complex Area, radar antennas, an airport runway and terminal building area, a bulk fuel receiving and storage area, direction finder and receiver buildings, and a White Alice site. A subsistence hunting and fish camp is located near the former bulk fuel receiving and storage area, which is located near the beach. During previous remedial investigations, approximately 25 structures in various states of decline were observed throughout the site. Buildings and other structures were constructed on pads made of gravel obtained from a local borrow pit. The surrounding terrain consists of tundra and shallow ponds overlying permafrost.

1.2.3 History

Northeast Cape was acquired by the U.S. Air Force in January 1952. Throughout its existence, the Northeast Cape installation served as a surveillance station providing radar coverage for the Alaskan Air Command and the North American Air Defense Command. In June 1969, the radar operations ceased and most military personnel were demobilized from the site. Most of the facilities were left intact with minimal removal of equipment due to the high cost of transport from the site. The White Alice station, constructed in 1954, remained in operation with minimal military staff until 1972.

In 1972, all lands were withdrawn from the military for classification under the Alaska Native Claims Settlement Act (ANCSA) of 1971, which entitled local community village corporations to select and receive tracts of federal land. In June 1979, unsurveyed lands of St. Lawrence Island were conveyed to Sivuqaq, Inc., and Savoonga Native Corporation. Excepted from transfer were surveyed land, easements, and land use permits effective prior to conveyance.

In 1982, the White Alice operations area was transferred to the U.S. Department of the Navy (Navy). Transfer of cleanup responsibility for the White Alice site from the Navy to the Alaska District was recently completed.. Cleanup issues related to White Alice will be addressed in future investigations.

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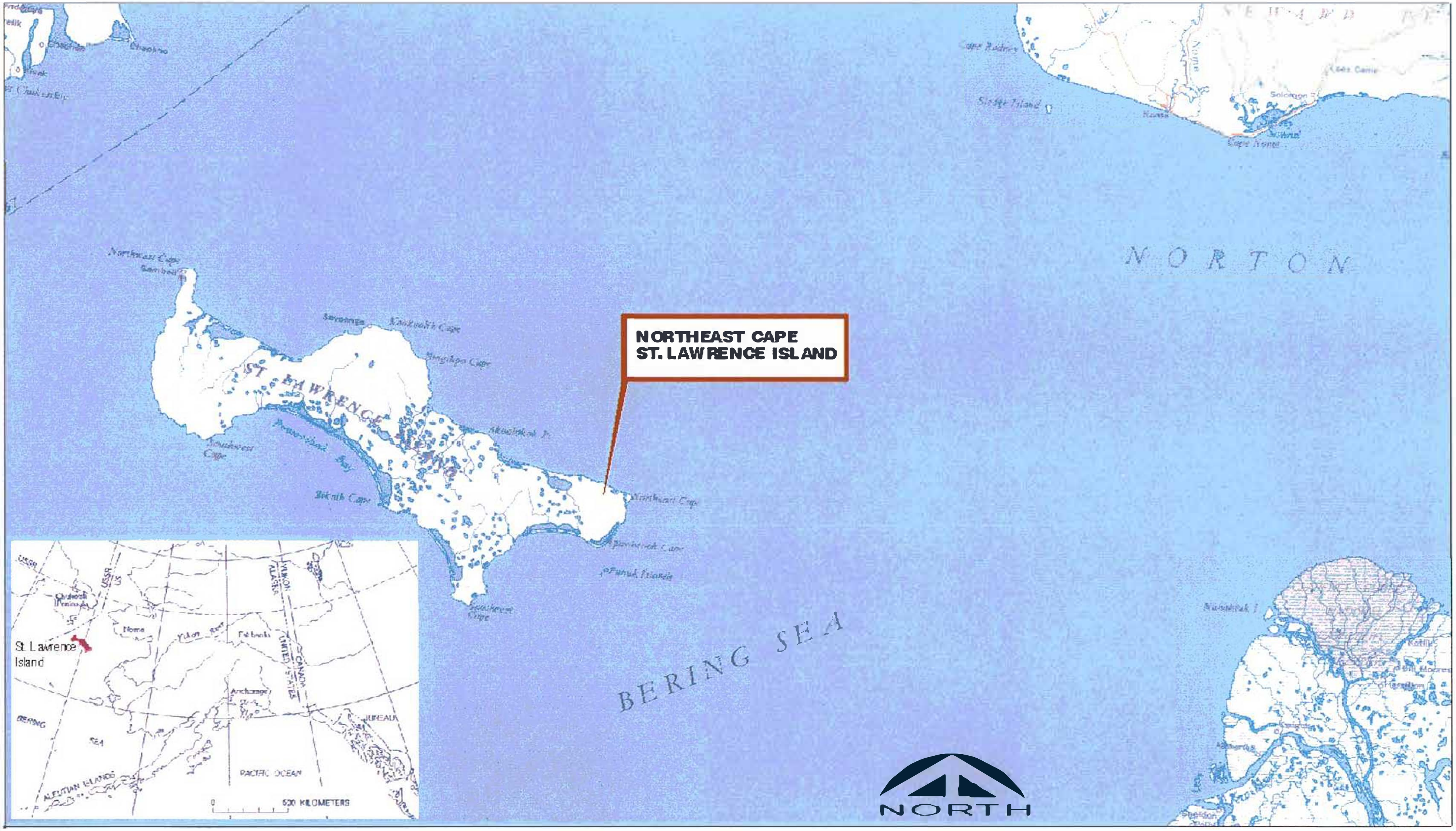

MONTGOMERY WATSON

Anchorage, Alaska

SOURCE: U.S. Department of the Interior
Geological Survey
Reston, Virginia 22092
State of Alaska Map E
Compiled from USGS 1:250,000-scale
topographic map and other official sources
Compiled in 1973, Revised in 1987
Scale 1:2,500,000 Contour Interval 1000'

FIGURE 1-1

U.S. ARMY ENGINEER DISTRICT, ALASKA
N.E. CAPE - ST. LAWRENCE ISLAND, ALASKA

VICINITY MAP
NORTHEAST CAPE

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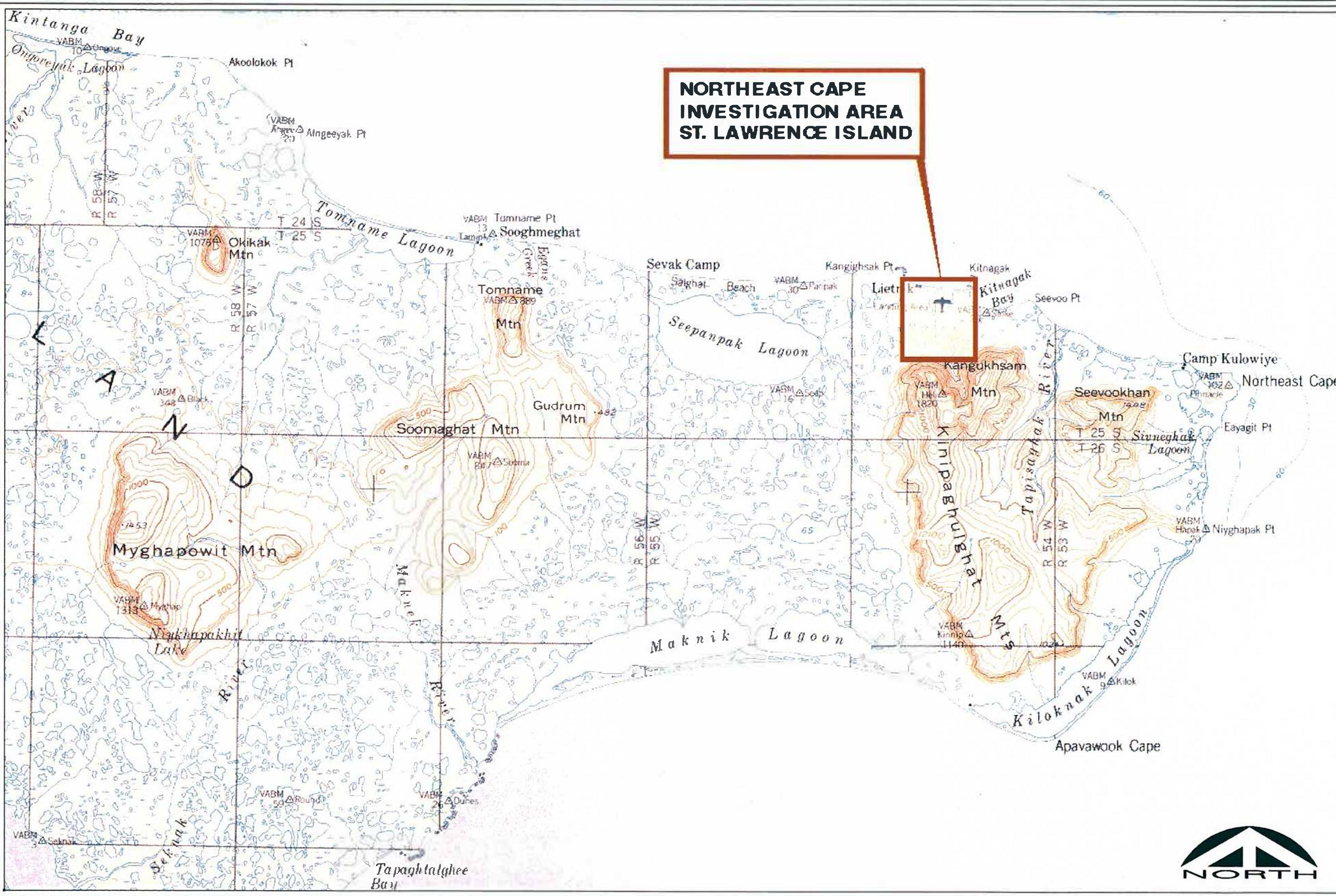

MONTGOMERY WATSON

Anchorage, Alaska

SOURCE: U.S. Geological Survey
Reston, Virginia 22092, 1976
St. Lawrence, Alaska
N6252 – W16830 /60x210
Surveyed 1948, Compiled 1957
Minor Revisions 1974
Scale 1:250,000, Contour Interval =100 Ft., Varies

FIGURE 1-2

U.S. ARMY ENGINEER DISTRICT, ALASKA
N.E. CAPE – ST. LAWRENCE ISLAND, ALASKA

LOCATION MAP
NORTHEAST CAPE INVESTIGATION AREA

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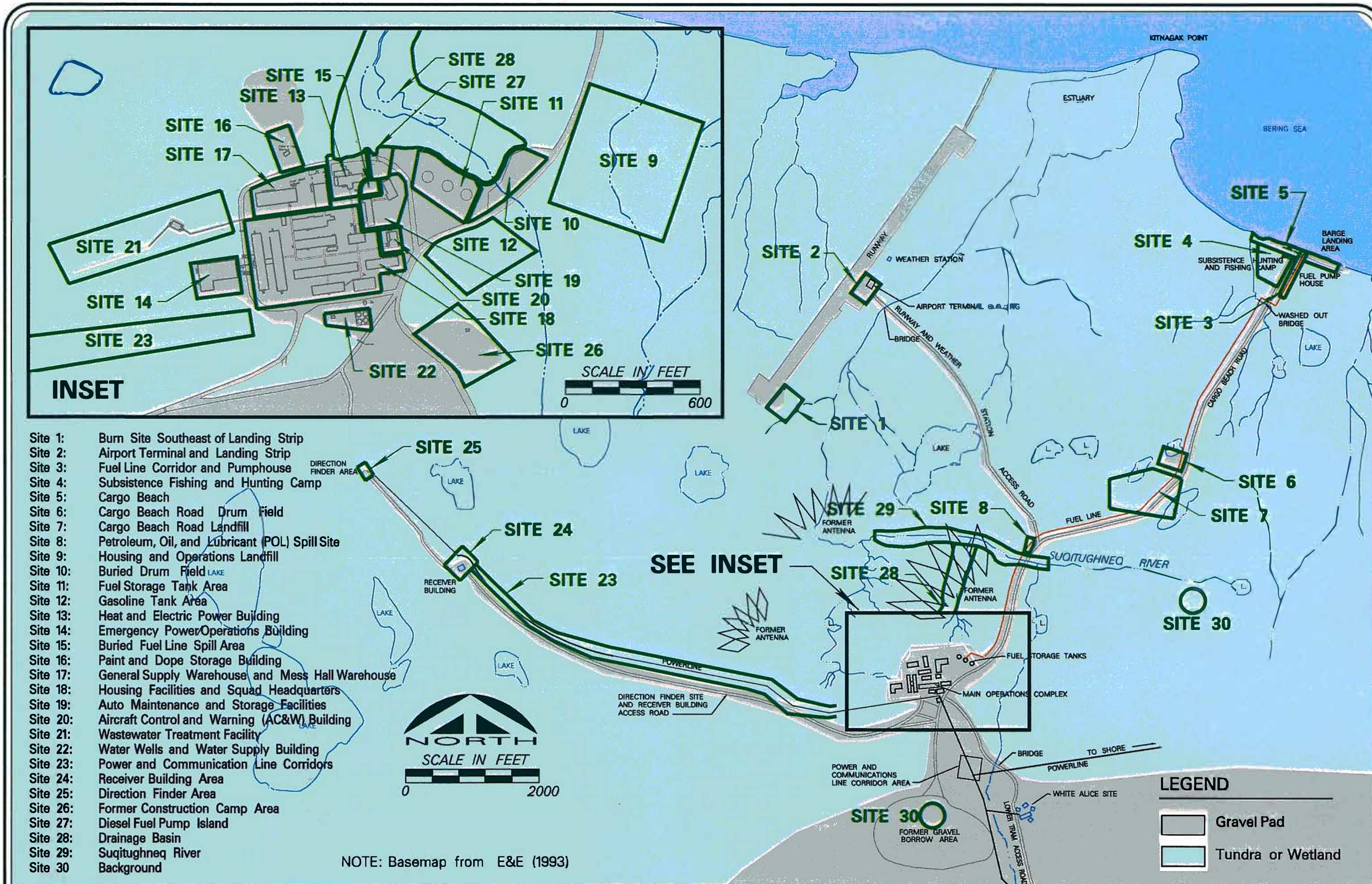

MONTGOMERY WATSON

Anchorage, Alaska

FIGURE 1-3

U.S. ARMY ENGINEER DISTRICT, ALASKA
N.E. CAPE – ST. LAWRENCE ISLAND, ALASKA

INSTALLATION AND SITE LOCATION MAP

Table 1-1 Northeast Cape Site Designations and Descriptions

Site Number	Description
1	Burn Site Southeast of the Landing Strip
2	Airport Terminal and Landing Strip
3	Fuel Line Corridor and Pumphouse
4	Subsistence Hunting and Fishing Camp
5	Cargo Beach
6	Cargo Beach Road Drumfield
7	Cargo Beach Road Landfill
8	Petroleum, Oil and Lubricants (POL) Spill Site
9	Housing and Operations Landfill
10	Buried Drum Field
11	Fuel Storage Tank Area
12	Gasoline Tank Area
13	Heat and Electrical Power Building
14	Emergency Power/Operations Building
15	Buried Fuel Line Spill Area
16	Paint and Dope Storage Building
17	General Supply Warehouse and Mess Hall Warehouse
18	Housing Facilities and Squad Headquarters
19	Auto Maintenance and Storage Facilities
20	Aircraft Control and Warning (AC&W) Building
21	Wastewater Treatment Facility
22	Water Wells and Water Supply Building
23	Power and Communication Line Corridors
24	Receiver Building Area
25	Direction Finder Area
26	Former Construction Camp Area
27	Diesel Fuel Pump Island
28	Drainage Basin
29	Suqitughneq River
30	Background Sampling Areas

1.2.4 Previous Investigations and Actions

Details of previous investigations and actions can be found in the following documents:

- Defense Environmental Restoration Account, City of Gambell and Northeast Cape, St. Lawrence Island, Alaska, Volume II, Final Environmental Assessment. URS Corporation. August 1985.
- Site Inventory, Northeast Cape, St. Lawrence Island, Alaska. Ecology and Environment (E&E). December 1992.
- Chemical Data Acquisition Plan, Site Inventory Update, Northeast Cape, St. Lawrence Island, Alaska. E&E. February 1993.
- Remedial Investigation, Northeast Cape, St. Lawrence Island, Alaska. Montgomery Watson. January 1995.
- HTW Removal at Northeast Cape, St. Lawrence, Alaska. Northwest EnviroService, Inc. (NES). June. 1995.
- Building Demolition and Debris Removal Technical Memorandum, Northeast Cape, St. Lawrence Island, Alaska. Montgomery Watson. January 10, 1995.
- Remedial Action Alternatives Technical Memorandum, Northeast Cape, St. Lawrence Island, Alaska. Montgomery Watson. November 1995.
- Engineering Evaluation/Cost Analysis, Northeast Cape, Alaska. Montgomery Watson. April 1996.
- Draft Phase II Remedial Investigation/Feasibility Study, Northeast Cape, Alaska. Montgomery Watson. December 6, 1996.
- St. Lawrence Island Investigation HTW Activities Summary. Montgomery Watson. September 18, 1997.
- Letter report to Alaska District summarizing wire removal. Montgomery Watson. October 10, 1997.
- Final Phase II Remedial Investigation, Northeast Cape, St. Lawrence Island, Alaska. Montgomery Watson. August 1999.

1.3 REGULATORY SETTING

Authority for cleanup of contaminated sites and regulations and standards applicable to the Northeast Cape Phase II RI are described in this section.

1.3.1 Authority for Cleanup

This work is being performed under the DERP-FUDS program. Authority for DERP-FUDS is derived from the following legislation:

- The Comprehensive Environmental Restoration Compensation, and Liability Act of 1980 (CERCLA), Public Law (PL) 96-510, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, PL-99-499 (codified as 42 USC 9601-9675)
- Environmental Restoration Program, 10 USC 2701-2707

This 1999 Phase II RI for Northeast Cape follows the CERCLA process. In accordance with CERCLA, the Alaska State Oil and Other Hazardous Substance Pollution Control Regulations (18 AAC 75) that govern the cleanup of contaminated sites in Alaska were identified as Applicable Relevant and Appropriate Requirements (ARAR) for Northeast Cape.

1.3.2 Proposed Cleanup and Disposal Criteria

Alaska Department of Environmental Conservation (ADEC) Methods 1, 2, and 3 are used as soil cleanup criteria in this document. A detailed explanation of these methods, and the rationale used to propose cleanup levels within the framework of these methods, is provided in the Phase II RI final report (MW, 1999). For sites where contaminant levels fall below ADEC matrix levels, Method 1 criteria are used to support a recommendation for no further action (Table 1-2). For sites where petroleum levels exceed ADEC matrix levels, Method 2 criteria are used (Table 1-3). If Method 2 criteria are exceeded, site-specific information is used to develop cleanup criteria in accordance with Method 3 procedures, and these site-specific criteria are used to assess the need for cleanup.

In addition, the following regulations and standards apply:

- The 18 AAC 75 regulations refer to site-specific soil cleanup levels for PCBs and lead. Cleanup levels for PCBs in sludge are determined on a case-by-case basis following submittal of a permit application to EPA. The site-specific soil cleanup levels for PCBs were used as screening criteria for sludge during this RI. Site-specific levels for PCBs and lead were proposed and discussed in the Phase II RI final report (MW, 1999) and are summarized in Table 1-4.
- Sediment cleanup standards in 18 AAC 75.345(d) state: "Toxic substances in sediment may not cause, and may not be reasonably expected to cause, a toxic or other deleterious effect on aquatic life, except as authorized under 18 AAC 70".
- Building demolition debris must meet both Toxic Substances Control Act (TSCA) and State of Alaska standards for disposal. TSCA standards are described in 40 CFR 761. The State of Alaska soil standards described in the Solid Waste Management Regulations (18 AAC 60) are used to determine disposal options for building demolition debris (Alaska District, 1998). PCB action levels and disposal requirements for PCB-contaminated paint and building materials are presented in Table 1-5.
- Groundwater cleanup criteria are identified in 18 AAC 75.345, Table C, and are shown in Table 1-6 of this report. At this time, ADEC considers groundwater at Northeast Cape to be a potential drinking water source.
- Surface water cleanup criteria in 18 AAC 75.345(a) and (f) defer to 18 AAC 70 and are shown in Table 1-6 of this report.

Table 1-2 Proposed Soil Cleanup Criteria, ADEC Method 1

		Points	Sites 9-22, 27, 28, 29	Sites 1-8, 23-26
1.	**Depth to Subsurface Water**			
	<5 feet	(10)		
	5 - 15 feet	(8)	8	8
	15 - 25 feet	(6)		
	25 - 50 feet	(4)		
	>50 feet	(1)		
2.	**Mean Annual Precipitation**			
	>40 inches	(10)		
	25 - 40 inches	(5)		
	15 - 25 inches	(3)	3	3
	<15 inches	(1)		
3.	**Soil Type**			
	clean, coarse-grained soils	(10)		
	coarse-grained soils with fines	(8)	8	8
	fine-grained soils (low organic carbon)	(3)		
	fine-grained soils (high organic carbon)	(1)		
4.	**Potential Receptors**			
	public well within 1,000 feet, or private well(s) within 500 feet	(15)	15	
	municipal/private well within 1/2 mile	(12)		
	municipal/private well within 1 mile	(8)		
	no known well within 1/2 mile	(6)		
	no known well within 1 mile	(4)		4
	non-potable groundwater	(1)		
5.	**Volume of Contaminated Soil**			
	>500 cubic yards	(10)	10	
	100 - 500 cubic yards	(8)		
	25 - 100 cubic yards	(5)		
	>De Minimis - 25 cubic yards	(2)		2
	De Minimis	(0)		
	Matrix Score		44	25

Matrix Score		Cleanup Level Estimate in mg/Kg: Diesel-Range Petroleum Hydrocarbons (DRO)	Gasoline-Range Petroleum Hydrocarbons (GRO)	Limiting Cleanup Level (from Method 2) in mg/Kg: Benzene	Toluene	Ethylbenzene	Xylenes
>40	Level A	100	50	0.02	5	6	78
27-40	Level B	200	100	0.02	5	6	78
21-26	Level C	1,000	500	0.02	5	6	78
<20	Level D	2,000	1,000	0.02	5	6	78

Residual Range Organics (RRO) = 2,000 mg/Kg

		Sites 9-22, 27, 28, 29	Sites 1-8, 23-26
Matrix Score		44	25
Matrix Level		A	C
ADEC Site Cleanup Level Estimate (mg/Kg)	**RRO**	2,000	2,000
	DRO	100	1,000
	GRO	50	500
	Benzene	0.02	0.02
	Toluene	5	5
	Ethylbenzene	6	6
	Xylenes	78	78

Source: 18 AAC 75 (ADEC, 1999)

Table 1-3 Proposed Soil Cleanup Criteria, ADEC Method 2

Constituent	Under 40 Inches Rainfall per Year			
	Inhalation	Ingestion	Migration to Groundwater	Limiting Level
	mg/Kg	mg/Kg	mg/Kg	mg/Kg
1,1,1-Trichloroethane	460		1.0	1.0
1,1,2,2-Tetrachloroethane	5.4	42	0.017	0.017
1,1,2-Trichloroethane	10	150	0.017	0.017
1,1-Dichloroethane	890	10000	12	12
1,1-Dichloroethene	0.9	14	0.03	0.03
1,2,4-Trichlorobenzene	570	1000	2	2
1,2-Dichlorobenzene	110	9100	7	7
1,2-Dichloroethane	5	91	0.015	0.015
1,2-Dichloropropane	17	120	0.017	0.017
1,3-Dichloropropene	1.5	30	0.02	0.02
1,4-Dichlorobenzene	8000	350	0.8	0.8
2,4,5-Trichlorophenol		10000	90	90
2,4,6-Trichlorophenol	1500	750	0.6	0.6
2,4-Dichlorophenol		300	0.45	0.45
2,4-Dimethylphenol		2000	4	4
2,4-Dinitrophenol		200	0.2	0.2
2,4-Dinitrotoluene		12	0.005	0.005
2,6-Dinitrotoluene		12	0.0044	0.0044
2-Chlorophenol		510	1.4	1.4
2-Methylphenol (o-Cresol)		5100	7	7
3,3'-Dichlorobenzidine		18	0.02	0.02
4,4'-DDD		35	47	35
4,4'-DDE		24	150	24
4,4'-DDT	5300	24	88	24
4-Chloroaniline		410	0.5	0.5
Acenaphthene		6100	210	210
Acetone		10000	10	10
Aldrin	24	0.5	1.6	0.5
Anthracene		30000	4300	4300
Antimony		41	3.6	3.6
Arsenic		5.5	2	2
Barium		7100	1100	1100
Benzene	9	290	0.02	0.02
Benzo(a)anthracene		11	6	6
Benzo(a)pyrene		1	3	1
Benzo(b)fluoranthene		11	20	11
Benzo(k)fluoranthene		110	200	110
Benzoic acid		410000	390	390
Benzyl butyl phthalate		20000	5600	5600
Beryllium		1.9	42	1.9
Bromodichloromethane		130	0.35	0.35
Bromoform	500	1050	0.38	0.38
Butanol		10000	10	10
Cadmium		100	5	5
Carbazole		420	2	2
Carbon disulfide	453	10000	17	17
Carbon tetrachloride	3.4	64	0.03	0.03

Table 1-3 (Continued)
Proposed Soil Cleanup Criteria, ADEC Method 2

Constituent	Under 40 Inches Rainfall per Year			
	Inhalation mg/Kg	Ingestion mg/Kg	Migration to Groundwater mg/Kg	Limiting Level mg/Kg
Chlordane	140	6	3	3
Chlorobenzene	110	2000	0.6	0.6
Chloroform	3.4	1000	0.34	0.34
Chromium		510	26	26
Chromium +3		100000	1000000	100000
Chromium, Hexavalent		510	26	26
Chrysene		1100	620	620
Cyanide		2000	27	27
Di-n-butyl phthalate		10000	1700	1700
Di-n-octyl phthalate		2000	810000	2000
Dibenzo(a,h)anthracene		1	6	1
Dibromochloromethane		100	0.2	0.2
Dieldrin	8	0.5	0.015	0.015
Diethyl phthalate		81000	190	190
Dimethyl phthalate		1000000	1400	1400
Endosulfan		610	7	7
Endrin		30	0.3	0.3
Ethylbenzene	89	10000	5.5	5.5
Fluoranthene		4100	2100	2100
Fluorene		4100	270	270
Heptachlor	0.8	2	8	0.8
Heptachlor epoxide	33	0.9	0.2	0.2
Hexachlorobenzene	7	5	0.73	0.73
Hexachlorobutadiene	55	20	8	8
Hexachlorocyclopentadiene	7	710	130	7
Hexachloroethane	390	101	1.6	1.6
Indeno(1,2,3-cd)pyrene		11	54	11
Isophorone		8700	3	3
Mercury	18		1.4	1.4
Methoxychlor		510	52	52
Methyl bromide	14	140	0.16	0.16
Methylene chloride	180	1100	0.015	0.015
Naphthalene		4100	43	43
Nickel		2000	87	87
Nitrobenzene	90	51	0.06	0.06
Pentachlorophenol		35	0.01	0.01
Phenol		60800	67	67
Pyrene		3000	1500	1500
Selenium		510	3.5	3.5
Silver		510	21	21
Styrene	280	20300	1.3	1.3
Tetrachloroethene	80	160	0.03	0.03
Toluene	180	20300	5.4	5.4
Toxaphene	620	8	10	8
Tribromomethane	500	1050	0.38	0.38
Trichloroethene	43	750	0.027	0.027

TABLE 1-3 (Continued)
Proposed Soil Cleanup Criteria, ADEC Method 2

Constituent	Under 40 Inches Rainfall per Year			
	Inhalation	Ingestion	Migration to Groundwater	Limiting Level
	mg/Kg	mg/Kg	mg/Kg	mg/Kg
Vanadium		710	3400	710
Vinyl acetate	1500	101000	100	100
Vinyl chloride	0.5	4	0.009	0.009
Xylenes	81	203000	78	78
Zinc		30000	9100	9100
alpha-BHC	5.5	1.3	0.0026	0.0026
beta-BHC	43	4.6	0.009	0.009
bis-(2-Chloroethyl)ether	3	8	0.002	0.002
bis-(2-ethylhexyl)phthalate		590	1200	590
cis-1,2-Dichloroethene		1000	0.2	0.2
gamma-BHC (Lindane)		6.4	0.003	0.003
n-Nitrosodi-n-propylamine		1.2	0.00036	0.00036
n-Nitrosodiphenylamine		1700	3.4	3.4
trans-1,2-Dichloroethene		2000	0.4	0.4
Diesel Range Organics	12500	10250	250	250
Gasoline Range Organics	1400	1400	300	300
Residual Range Organics	22000	10000	11000	10000

Source: 18 AAC 75 (ADEC, 1999)

Table 1-4 Site-Specific Soil Cleanup Criteria

Constituent	Residential mg/Kg	Commercial/Industrial mg/Kg
Lead[1]	400	1,000
PCB (ADEC surface soil)[1]	1	10
PCB (ADEC subsurface soil)[1]	10	25
PCB (Federal)[2]	25	

ADEC – Alaska Department of Environmental Conservation
PCB – polychlorinated biphenyl
[1] ADEC, 1999
[2] 40 CFR 761.61, self-implementing disposal, low occupancy (EPA, 1998)

Table 1-5 Disposal Requirements for PCB-Contaminated Building Debris

Regulations/ Guidance	Waste Stream	PCB Concentration	Disposal Requirements
40 CFR 761	PCB Bulk Product Waste (e.g., non-liquid building demolition debris)	< 50 mg/Kg	Disposal in a permitted non-hazardous waste landfill, with initial notification stating PCB bulk product waste < 50 mg/Kg PCB. Landfill may refuse to accept the waste.
		≥ 50 mg/Kg	Disposal in a permitted non-hazardous waste landfill, with notification on each shipment stating PCB bulk product waste ≥ 50 mg/Kg. Landfill may refuse to accept the waste.
18 AAC 60, USAED 1998	Building debris, including painted surfaces, composited for analysis in accordance with USAEHA *Sampling Protocol, Building Demolition Debris and Buildings Painted with Lead Based Paint*	≤ 10 mg/Kg	Disposal in a permitted non-hazardous waste landfill or monofill.
		> 10 mg/Kg	Disposal in a lined, permitted non-hazardous or hazardous waste landfill. Waiver required for disposal in an unlined permitted landfill if accepted by the landfill.

ADEC – Alaska Department of Environmental Conservation
PCB – polychlorinated biphenyl
USAED – United States Army Engineer District, Alaska
USAEHA - United States Army Environmental Hygiene Agency

Table 1-6 Proposed Groundwater and Surface Water Cleanup Criteria

Constituent	Reg Limit	Units
1,1,1,2-Tetrachloroethane	0.004	mg/L
1,1,1-Trichloroethane	0.2	mg/L
1,1,2-Trichloroethane	0.005	mg/L
1,1-Dichloroethane	3.65	mg/L
1,1-Dichloroethene	0.007	mg/L
1,2,4-Trichlorobenzene	0.07	mg/L
1,2-Dichlorobenzene	0.6	mg/L
1,2-Dichloroethane	0.005	mg/L
1,2-Dichloropropane	0.005	mg/L
1,3-Dichloropropene	0.005	mg/L
1,4-Dichlorobenzene	0.075	mg/L
2,4,5-Trichlorophenol	3.65	mg/L
2,4,6-Trichlorophenol	0.077	mg/L
2,4-Dichlorophenol	0.1	mg/L
2,4-Dimethylphenol	0.7	mg/L
2,4-Dinitrophenol	0.07	mg/L
2,4-Dinitrotoluene	0.00125	mg/L
2,6-Dinitrotoluene	0.00125	mg/L
2-Chlorophenol	0.2	mg/L
2-Methylphenol (o-Cresol)	1.8	mg/L
3,3'-Dichlorobenzidine	0.002	mg/L
4,4'-DDD	0.0036	mg/L
4,4'-DDE	0.0025	mg/L
4,4'-DDT	0.0025	mg/L
4-Chloroaniline	0.15	mg/L
Acenaphthene	2.2	mg/L
Acetone	3.65	mg/L
Aldrin	0.00005	mg/L
Anthracene	11.0	mg/L
Antimony	0.006	mg/L
Arsenic	0.05	mg/L
Barium	2	mg/L
Benzene	0.005	mg/L
Benzo(a)anthracene	0.001	mg/L
Benzo(a)pyrene	0.0002	mg/L
Benzo(b)fluoranthene	0.001	mg/L
Benzo(k)fluoranthene	0.01	mg/L
Benzoic acid	146.0	mg/L
Benzyl butyl phthalate	7.3	mg/L
Beryllium	0.004	mg/L
Bromodichloromethane	0.1	mg/L
Bromoform	0.1	mg/L
Butanol	3.65	mg/L
Cadmium	0.005	mg/L

Table 1-6 (Continued) **Proposed Groundwater and Surface Water Cleanup Criteria**

Constituent	Reg Limit	Units
Carbazole	0.04	mg/L
Carbon disulfide	3.65	mg/L
Carbon tetrachloride	0.005	mg/L
Chlordane	0.002	mg/L
Chlorobenzene	0.1	mg/L
Chloroform	0.1	mg/L
Chromium	0.1	mg/L
Chromium +3	36.5	mg/L
Chromium, Hexavalent	0.1	mg/L
Chrysene	0.1	mg/L
Copper	1.3	mg/L
Cyanide	0.2	mg/L
Di-n-butyl phthalate	3.65	mg/L
Di-n-octyl phthalate	0.7	mg/L
Dibenzo(a,h)anthracene	0.0001	mg/L
Dibromochloromethane	0.06	mg/L
Dieldrin	0.00005	mg/L
Diesel Range Organics	1.5	mg/L
Diethyl phthalate	29.0	mg/L
Dioxin	0.00000003	mg/L
Endosulfan	0.2	mg/L
Endrin	0.002	mg/L
Ethylbenzene	0.7	mg/L
Fluoranthene	1.46	mg/L
Fluorene	1.46	mg/L
Gasoline Range Organics	1.3	mg/L
Heptachlor	0.0004	mg/L
Heptachlor epoxide	0.0002	mg/L
Hexachlorobenzene	0.001	mg/L
Hexachlorobutadiene	0.01	mg/L
Hexachlorocyclopentadiene	0.05	mg/L
Hexachloroethane	0.06	mg/L
Indeno(1,2,3-cd)pyrene	0.001	mg/L
Isophorone	0.9	mg/L
Lead	0.015	mg/L
Mercury	0.002	mg/L
Methoxychlor	0.04	mg/L
Methyl bromide	0.05	mg/L
Methylene chloride	0.005	mg/L
Naphthalene	1.46	mg/L
Nickel	0.1	mg/L
Nitrobenzene	0.018	mg/L
Pentachlorophenol	0.001	mg/L
Phenol	22.0	mg/L
Polychlorinated biphenyls (PCBs)	0.0005	mg/L
Pyrene	1.1	mg/L

Table 1-6 (Continued) Proposed Groundwater and Surface Water Cleanup Criteria

Constituent	Reg Limit	Units
Residual Range Organics	1.1	mg/L
Selenium	0.05	mg/L
Silver	0.18	mg/L
Styrene	0.1	mg/L
Tetrachloroethene	0.005	mg/L
Thallium	0.002	mg/L
Toluene	1.0	mg/L
Toxaphene	0.003	mg/L
Trichloroethene	0.005	mg/L
Vanadium	0.26	mg/L
Vinyl acetate	36.5	mg/L
Vinyl chloride	0.002	mg/L
Xylenes	10.0	mg/L
Zinc	11.0	mg/L
alpha-BHC	0.0001	mg/L
beta-BHC	0.00047	mg/L
bis-(2-Chloroethyl)ether	0.00077	mg/L
bis-(2-ethylhexyl)phthalate	0.006	mg/L
cis-1,2-Dichloroethene	0.07	mg/L
gamma-BHC (Lindane)	0.0002	mg/L
n-Nitrosodi-n-propylamine	0.0001	mg/L
n-Nitrosodiphenylamine	0.17	mg/L
trans-1,2-Dichloroethene	0.1	mg/L

Source: 18 AAC 70 (ADEC, 1999)

1.4 SITE CHARACTERISTICS

Site characteristics, including climate, topography, geology, hydrogeology, hydrology, demography, land use, ecology, and cultural resources, are discussed in detail in the Phase II RI final report (MW, 1999). St. Lawrence Island and Northeast Cape site characteristics are summarized below.

1.4.1 Climate

St. Lawrence Island has a cool, moist, subarctic maritime climate. Precipitation occurs approximately 300 days per year as light rain, mist or snow. Annual precipitation is about 16 inches per year. Summer temperatures average between 48° Fahrenheit (F) and 34° F, with a record high of 65°F. Winter temperatures range from –2°F to 10°F, with an extreme low of -30°F (URS, 1985). Freeze-up normally occurs in October or November, and breakup normally occurs in June.

1.4.2 Topography

The installation acreage consists mainly of flat coastal plains grading into rolling tundra towards the base of the Kinipaghulghat Mountains south of the site. The majority of the former installation acreage is at an elevation of 20 to 80 feet above mean sea level (msl).

1.4.3 Geology

St. Lawrence Island consists of isolated bedrock highlands surrounded by unconsolidated surficial deposits overlying a relatively shallow erosional bedrock surface. Immediately south of the site, the Suqitughneq River has created an erosional valley and alluvial fan of unconsolidated sediments. The primary areas of this investigation are located on this alluvial fan.

The unconsolidated alluvial materials exhibit a soil profile characterized by silts near the surface, overlying more sand-dominated soils at depth. The silt may contain varying quantities of clay/sand/gravel, and may vary from zero to ten feet in thickness. The sand at depth contains varying degrees of silt/gravel/cobbles and may vary from 2 feet to greater than 20 feet in thickness. The depth to bedrock at the site is unknown.

1.4.4 Hydrogeology

Because of the relatively remote and undeveloped nature of St. Lawrence Island, there is little data on the regional groundwater regime. The primary potential aquifer at the Northeast Cape site is unconsolidated alluvial material, which may be affected by permafrost and frozen soils. The deeper unconsolidated deposits at the site are probably permanently frozen, and the shallow soils examined during previous investigations represent an active layer where soils are thawed only during portions of the year. Based on the topography and geology of the site, the regional groundwater flow direction is expected to be from the mountainous recharge area south of the site, flowing north and eventually discharging to the Bering Sea.

1.4.5 Hydrology

Other than the Bering Sea north of the Northeast Cape facility, surface water in the vicinity of the study area consists of small streams, small- to moderate-sized lakes, and marshy areas. Surface water generally flows from the highland area south of the site in a northward direction. Small surface water bodies are common throughout the area. The most significant stream located in the area under investigation is the Suqitughneq River, which receives drainage from the area east of the Cargo Beach Road, Main Operations Complex, and the White Alice Site. The Suqitughneq River (Site 29) is significant because it is the drainage point for the Housing and Operations Landfill (Site 9), Sites 11 through 22, and the Main Operations Complex (Site 27). Drainage from the Main Operations Complex flows across a shallow wetlands area, designated the Drainage Basin (Site 28), prior to joining the Suqitughneq River.

1.4.6 Demography and Land Use

There are currently no permanent residents at the Northeast Cape installation. A small subsistence hunting and fishing village (Site 4) is located at the installation, inhabited primarily in the summer by residents of Savoonga, a village approximately 60 miles northwest of Northeast Cape.

1.4.7 Ecology, Wildlife, and Endangered Species

The Northeast Cape area supports habitat for a variety of seabirds, waterfowl, and mammals that either breed in, or migrate through, the area. The ocean surrounding the Northeast Cape area is used for subsistence hunting of walruses, seals, sea birds, and polar bears.

1.4.7.1 Vegetation

Vegetation in the Northeast Cape area is classified as alpine tundra, with many low-lying areas with lakes, bogs, and poorly drained soils. In these areas, vegetation is typically classified as wet tundra (URS, 1985).

1.4.7.2 Birds

The only breeding seabird colony known to exist at the Northeast Cape installation consists of 60 glaucous gulls on Seevookhan Mountain. Several other species of birds have been sighted in the vicinity of the Northeast Cape site; however, the areas around Northeast Cape have a very low habitat value, with relatively few birds, and the diversity of species appears low (URS, 1985).

1.4.7.3 Mammals

Large mammals are generally not abundant on St. Lawrence Island; however, polar bears can be present year round, especially when the ice pack is near shore. Grizzly bears have been reported on the island but are rarely seen. A dwindling population of several hundred reindeer is present, along with several species of foxes and small rodents. Marine mammals are present in the vicinity of Northeast Cape as seasonal migrants in the offshore and near-shore marine waters and in association with the advancing and retreating pack ice.

1.4.7.4 Fish

There are 10 primary species of fish that reside in the streams and tundra ponds of St. Lawrence Island. These include blackfish, nine-spined stickleback, grayling, Arctic char, and whitefish. Five of the six species of Pacific salmon occur around the island. According to Savoonga inhabitants, the Suqitughneq River once supported large fish populations (including sockeye and silver salmon). Reportedly, the fish population was reduced by a large diesel oil spill emanating from the Fuel Storage Tank Area (Site 11), which entered one of the stream's tributaries. However, the findings of the fish community survey, discussed in Section 3.10.2.2 of this report, indicate that the Suqitughneq River now supports viable populations of Dolly Varden char, Alaska blackfish, and ninespine stickleback, at a minimum.

1.4.7.5 Threatened and Endangered Species

Endangered or threatened species of animals on St. Lawrence Island include the Spectacled eider (threatened), the Steller's eider (threatened), the Steller's sea lion (endangered) and the short-tailed albatross (candidate) (USFW, 1998). The prevalence of these species with respect to the Northeast Cape site is unknown. Polar bears are not an endangered or threatened species; however, they are protected under the Marine Mammal Protection Act. Vegetative species on St. Lawrence Island that have been proposed as threatened are the perennial plants *Rumex krausei* and *Primula tschuktschorum.*

1.4.8 Archaeological, Historical, and Cultural Resources

The Northeast Cape installation has the potential for significant archaeological, historical, and cultural resources. The National Historic Preservation Act of 1966 (NHPA), administered in Alaska by the SHPO, requires that every federal agency take into account how each of its undertakings could affect historic properties. A historic property is defined as any property listed in, or eligible for, the National Register of Historic Places. The Northeast Cape site has not been placed on the National Register; however, it is eligible for consideration. Additionally, the White Alice site adjacent to the Northeast Cape site has been placed on the National Register.

2. INVESTIGATION APPROACH AND PROCEDURES

This section describes the 1999 Phase II RI field activities, including methods and protocols employed to quantify and characterize the extent of contamination. The data collected will be used to:

- Refine the understanding of the nature and extent of contamination, including contaminant migration pathways
- Assess the impact of contamination on human health and the environment
- Identify cleanup objectives and criteria, including alternative cleanup levels
- Identify remediation methods for sites requiring cleanup

2.1 1999 FIELD ACTIVITIES IN 1999

The 1999 field activities were conducted July 30 through August 5, 1999. Table 2-1 summarizes field activities performed during the 1999 Phase II RI. Table 2-2 summarizes the analyses performed and laboratory methods used for the primary samples collected in 1999.

Table 2-1 Summary of 1999 Phase II RI Activities

		1999 Phase II RI Activities									
	Description	Soil Sampling	Sediment Sampling	Sludge Sampling	AST Paint Sampling	Building Materials Sampling	Biological Sampling	Buried Drum Investigation	SHPO Documentation	Utilidor Survey	Neutralize Chemical Residuals
Site 1	Burn Site Southeast of Landing Strip										
Site 2	Airport Terminal and Landing Strip				X				X		
Site 3	Fuel Line Corridor and Pumphouse				X				X		
Site 4	Subsistence Fishing and Hunting Camp				X				X		
Site 5	Cargo Beach										
Site 6	Cargo Beach Road Drum Field										
Site 7	Cargo Beach Road Landfill		X								
Site 8	POL Spill Site										
Site 9	Housing and Operations Landfill										
Site 10	Buried Drum Field							X			
Site 11	Fuel Storage Tank Area				X				X		
Site 12	Gasoline Tank Area	X			X				X		
Site 13	Heat and Electrical Power Building				X	X			X	X	
Site 14	Emergency Power/Operations Building				X				X	X	
Site 15	Buried Fuel Line Spill Area										
Site 16	Paint and Dope Storage Building				X				X		
Site 17	General Supply Warehouse and Mess Hall Warehouse					X			X	X	
Site 18	Housing Facilities and Squad Headquarters				X	X			X	X	X
Site 19	Auto Maintenance and Storage Facilities				X				X	X	
Site 20	Air Force Aircraft Control Warning Building								X	X	
Site 21	Wastewater Treatment Facility			X					X	X	
Site 22	Water Wells and Water Supply Building				X				X		
Site 23	Power and Communication Line Corridors										
Site 24	Receiver Building Area								X		
Site 25	Direction Finder Area										
Site 26	Former Construction Camp Area										
Site 27	Diesel Fuel Pump Island								X		
Site 28	Drainage Basin Area						X				
Site 29	Suqitughneq River						X				
Site 30	Background Areas	X	X				X				

AST – aboveground storage tank
POL – petroleum, oil, and lubricants
RI – Remedial Investigation
SHPO – State Historic Preservation Office

Table 2-2 1999 Phase II RI Primary Sample Summary

Site	7	12	13	17	18	21	Many	30
Matrix/Analysis	**Cargo Beach Road Landfill**	**Gasoline Tank Area**	**Building 110**	**Building 107**	**Building 101**	**Septic Tanks**	**ASTs**	**Background**
Sediment								
DRO/RRO AK102/103	1							1
GRO AK101								1
BTEX SW8021B								1
TOC SW9060M								1
TAL Metals[1] SW1311/6010B/7000								1
Soil								
DRO/RRO AK102/103		5						2
GRO AK101		5						2
BTEX SW8021B		5						2
TOC SW9060M								2
TAL Metals SW1311/6010B/7000								2
Sludge								
TCLP Metals SW1311/6010B/7000						1		
TCLP Pesticides SW1311/8081						1		
TCLP VOCs SW1311/8270C						1		
TCLP SVOCs SW1311/8270C						1		
PCBs SW8082						1		
Building Materials								
PCBs SW8082			1	1	1			
TCLP PCBs SW1311/8082			1	1	1			
Paint								
Pb SW7421							24	

AST - aboveground storage tank
BTEX - benzene, toluene, ethylbenzene, and xylenes
DRO - diesel range organic
GRO - gasoline range organic
Pb - lead
PCB - polychlorinated biphenyl
RRO - residual range organic
SVOC - semivolatile organic compound
TAL - target analyte list
TCLP - toxicity characteristic leaching procedure
TOC - total organic content
VOC - volatile organic compound

[1] TAL: antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, thallium, vanadium, zinc

The following sections briefly describe the activities performed at each site, including the rationale for data collection. Photographs of field conditions and activities are provided in Appendix A. Site maps, including analytical results from current and previous investigations, are presented in Section 3. The analytical data produced by the project and quality assurance (QA) laboratories are summarized in Section 3 and provided in their entirety in Appendix B.

2.1.1 Sediment Sampling at Cargo Beach Road Landfill - Site 7

This site includes the solid waste disposal area in use from 1965 until 1974. Previous investigations found concentrations of DRO and total recoverable petroleum hydrocarbons (TRPH) above benchmark screening criteria in soil around the perimeter of the refuse mass and in the sediment of both ponds at the site.

In 1999, a sediment sample was collected near former sediment sample SD 103, previously found to have high TRPH and relatively low DRO concentrations (15,000 and 815 mg/Kg, respectively) (MW, 1999). This sample was analyzed for DRO and residual range organics (RRO) to help correlate previous anomalous results.

2.1.2 Soil Sampling at Gasoline Tank Area - Site 12

Site 12 is adjacent to the Main Operations Complex. This site contains a fuel pump and two ASTs, which formerly contained leaded gasoline; tank sizes are 15,000 and 30,000 gallons. Potential sources of contamination include the two ASTs and fuel dispenser pump; however, no evidence of discharge was observed during previous investigations (E&E, 1993; MW, 1999).

During the 1999 Phase II RI, five soil samples were collected and analyzed for DRO, RRO, GRO, and benzene, toluene, ethylbenzene, and xylenes (BTEX) to assess whether soils in the vicinity of the tanks have been contaminated by fuel spills. The samples included four surface soil samples taken at the bottom edge of the embankment supporting the ASTs, downgradient of the ASTs. One subsurface soil sample was collected at 2 feet below ground surface under the fuel dispenser.

2.1.3 Sludge Sampling at Wastewater Treatment Facility - Site 21

Site 21 consists of the wastewater treatment system which served the Housing and Operations Complex. This facility is located east of the perimeter road and includes two side-by-side concrete septic settling tanks (AST 21-1 and AST 21-2), that are approximately 15 feet wide by 50 feet long and 8 feet deep. In 1998, the tanks were approximately 50% full of septage, estimated to be 45,000 gallons in each tank. These settling tanks discharge to a third tank (AST 21-3), perpendicular to ASTs 21-1 and 21-2. Effluent from AST 21-3 was discharged via an 8-inch insulated cast iron pipe to a wetland area approximately 450 feet to the east.

In 1999, Montgomery Watson collected representative sludge samples to determine if the contents will require disposal as hazardous waste. The sludge was sampled for toxic characteristics leachate procedure (TCLP) Resource Conservation and Recovery Act (RCRA) metals, TCLP pesticides, TCLP volatile organic compounds (VOC), TCLP semivolatile organic compounds (SVOC), and PCBs.

2.1.4 Building Materials Sampling - Sites 13, 17, and 18

Based on the sampling of building materials at other, similar DOD sites in Alaska, there is a potential that the paint applied to buildings at Northeast Cape could contain PCBs. Presence of PCBs may impact disposal options.

In 1999, Montgomery Watson sampled three representative buildings in accordance with procedures described in the U.S. Army Environmental Hygiene Agency (USAEHA) Sampling Protocol, Building Demolition Debris and Buildings Painted with Lead-Based Paint. Sampled buildings included Building 101 (Housing Facilities and Squad Headquarters), Building 107 (Mess Hall Warehouse), and Building 110 (Power Plant). One composite sample was collected for each selected structure and included approximate proportions of all materials constituting the structure. The samples were analyzed for PCBs and TCLP PCBs. No QA or quality control (QC) samples were collected.

2.1.5 Paint Sampling at Aboveground Storage Tanks

Based on inventories performed during prior investigations, there are 27 ASTs at Northeast Cape. The septic tanks at the Wastewater Treatment Facility (Site 21), AST 21-1, AST 21-2, and AST 21-3 are constructed of concrete and have not been painted. The remaining 24 tanks are constructed of steel and are presumed to have been painted. It is probable that the tanks were painted with LBP. To determine proper tank disposal and to protect site workers from LBP dust, painted tanks may require abatement or special handling during demolition and disposal.

During the 1999 Phase II RI, Montgomery Watson collected a paint sample from each AST that was visibly coated with paint to determine the presence of LBP. No QA or QC samples were collected. The percentage of surface area covered with paint and the condition of the paint was also noted and recorded.

2.1.6 Background Soil and Sediment Sampling - Site 30

TRPH, RRO, DRO, metals, and VOCs have been detected in background soil and sediment samples from previous investigations (MW, 1999). Levels of TRPH and DRO were unexpectedly high in some background samples and exceeded regulatory criteria proposed for the site. In many areas, TRPH levels in soil exceeded DRO levels, sometimes by an order of magnitude. Additionally, the aromatic and aliphatic fractions of DRO did not sum to the total DRO found using laboratory method AK 102. DRO levels in background soil samples did not appear to be reproducible.

Montgomery Watson collected three additional background samples in 1999 to help explain these phenomena and to assist in determining cleanup requirements. Background samples consisted of one sediment sample and two surface soil samples. The samples were analyzed for DRO, RRO, GRO, total organic carbon (TOC), and TAL metals.

The sediment sample and one of the soil samples were collected from an area approximately ¼ mile east of Cargo Beach Road. The sediment sample was collected in a lake and the soil sample was collected from tundra area near the lakeshore. This area was selected as a background sampling location based on its distance from areas of known contamination and facility activities, and its physical similarity to other tundra and surface water areas at the site. The remaining soil sample was collected from an area at the toe of the mountain, near the gravel pit. This gravel pit provided the fill used to construct the gravel pads throughout the installation, and the soil sample collected from this location represents background conditions for the pads.

2.1.7 Test Pits at Buried Drum Field - Site 10

This area was used as a drum storage area for a variety of POL types (Toolie, 1996). A long-time resident reported that he remembered numerous 5-gallon buckets of 90-weight lubrication oil and 10 to 20 drums (contents unknown) being buried there (Toolie, 2000). A large stained area is visible towards the northwest corner of the burial plateau along with numerous smaller stained areas on the surface of the site. Visible staining is also present along the northwest face of the site.

A potential source of environmental contamination at this site is the buried drums (MW, 1999). During previous investigations, surface and subsurface soils, surface water, and sediment from within and surrounding the landfill were sampled and analyzed for TRPH, DRO, gasoline range organics (GRO), PCBs, SVOCs, pesticides, and priority pollutant metals. Soil analytical results exceeded the Soil Cleanup Standards for TRPH and DRO. Surface water collected from a downgradient location that receives runoff from several sites, including Site 10, exceeded the criteria for DRO, PCB, and lead (total and dissolved).

In 1999, Montgomery Watson hand-excavated three test pits at Site 10 to evaluate if the stained soil was caused by leaking buried drums, and to evaluate if drums containing product are buried at this site. Laborers provided by the Savoonga Native Corporation assisted Montgomery Watson. A metal detector was used to determine the best locations for the test pits. No samples were collected.

2.1.8 Chemical Neutralization at Building 101 - Site 18

Building 101 (Housing Facilities and Squad Headquarters), on the western side of Site 18, contained several containers of STB and DS-2. STB is a white powder consisting of a mixture of calcium oxychloride and calcium oxide. DS-2 is a light amber solution consisting of 70% diethylenetriamine, 28% ethylene glycol monomethyl ether, and 2% sodium hydroxide. These chemicals were stored at the facility for use in decontaminating materials in the event of enemy use of chemical weapons. These chemicals were standard issue for most military units during the era that this facility was active. In September 1998, Montgomery Watson containerized, overpacked and transported the wastes offsite for disposal.

During the 1999 Phase II RI, Montgomery Watson examined the flooring area where STB and DS-2 were stored and neutralized the chemical residuals that may have remained on the floor where these containers were found. STB is classified as an oxidizer and about 6 pounds of sodium bicarbonate with water was used to reduce reactivity and neutralize any STB residual. DS-2 is an alkali and is classified as a corrosive due to its high pH. A slurry consisting of 2 liters of sodium bisulfate and water was used to lower the pH and neutralize any DS-2 residual.

2.1.9 Utilidor Survey

There are several utilidors containing piping with asbestos insulation in the area of the Main Operations Complex. During the 1999 Phase II RI, Montgomery Watson visually surveyed and photographed the utilidors to assess access to piping. This information was used to determine access requirements for removal of the piping and insulation. The field team also evaluated the affects the utilidors may pose on contaminant migration in this area by considering such factors as proximity and relationship (upgradient or downgradient) to known contaminated areas and presence of standing or flowing water in the utilidors. No samples were collected.

2.1.10 Biological Sampling at Drainage Basin, Suqitughneq River, and Control Stream - Sites 28, 29 and 30

The Drainage Basin Area lies between and north of Site 11 (Fuel Storage Tank Area) and Site 27 (Diesel Fuel Pump Island). Diesel releases from Tank 2 at Site 11 and from the diesel fuel pump island at Site 27 have impacted a common drainage basin that flows to the Suqitughneq River (MW, 1999). Surface soil and surface water/sediment samples collected from the Drainage Basin during previous investigations indicated elevated levels of diesel in the Drainage Basin and Suqitughneq River. PCBs were also detected in the Drainage Basin.

In 1999, a biological assessment was conducted within the Drainage Basin by the Environment and Natural Resources Institute (ENRI) in cooperation with Montgomery Watson. The assessment concentrated on evaluating 1) sediment toxicity, 2) impairment to macroinvertebrate and fish communities, 3) accumulation of toxins in fish tissues, and 4) habitat quality. Separate reports from ENRI and Alaska District are included in Appendices D and E, respectively.

A reference site (control stream) was established at the Quangeghsaq River because its physical stream characteristics are similar to the Drainage Basin and Suqitughneq River, but the Quangeghsaq River is removed from the impacted watershed. The sampling locations are shown on Figure 3-10 and are described as follows:

- Suqitughneq River, potentially stressed location: 50 m below to 200 m above runway bridge (slsuq01)
- Spill Tributary, potentially stressed location: 200 m reach from large pool below spill to confluence with Suqitughneq River (slurc01)
- Suqitughneq River, upstream control: upstream of confluence with receptor creek, 100 m above to 200 m below access road culvert (slsuq02)
- Suqitughneq River Tributary, downstream control: 100 m reach in headwaters of small tributary (slsut01)

- Quangeghsaq River, control stream: 200 m just upstream of highest storm tide (slqan01)

2.1.10.1 Sediment Toxicity

The Microtox® bacterial bioassay was used in the site assessment to evaluate the presence, bioavailability, and degree of toxicity within the stream sediment. Because Montgomery Watson identified specific toxins in 1996, chemical analyses were not conducted (MW, 1999). In 1999, Microtox® samples were collected at four sites along the impacted stream. Microtox® testing was also completed at the reference site in order to document baseline conditions and verify that the diesel spill is the source of toxicity in the study stream.

2.1.10.2 Community Assessments

Macroinvertebrate and fish population assessments conducted during the 1999 Phase II RI are discussed in this section.

2.1.10.2.1 Macroinvertebrates

Results of a macroinvertebrate assessment conducted in 1996 were inconclusive (MW, 1996b). Difficulties in interpreting information from the assessment may have been related to inappropriate macroinvertebrate sampling methods and potentially impacted conditions at the reference site.

In 1999, benthic macroinvertebrates were collected systematically from all available in-stream habitats. The collected material was composited, preserved in the field, and returned to the laboratory for processing and insect identification.

2.1.10.2.2 Fish

Based on observations from past investigations and anecdotal information from local seasonal residents and site visitors, the Suqitughneq River was generally not believed to support a viable fish community. The drainage was reportedly used for subsistence fishing in the past, but recent subsistence fishing has not taken place due to low fish populations (Toolie, 1999).

During the 1999 biological assessment, fish were collected using minnow traps, electrofishing techniques, and angling. The fish were sorted by species, measured, photographed, counted, and visually inspected for deformities and disease. Fish tissue samples were submitted for laboratory analysis to determine tissue toxicity.

2.1.10.3 Fish Tissue Toxicity

Analyses of water and sediment conducted by Montgomery Watson (1996b) suggested that the diesel spilled at the site in 1969 released toxic chemicals to Suqitughneq River within the Drainage Basin. In addition, the spill may have mobilized PCB contaminants from another source. These compounds have been shown to cause lesions, tumors, and reproductive dysfunction in fish (Crawford et al., 1993), potentially affecting survival and reproduction of the fish community. Previous surveys did not investigate fish population in the impacted stream; therefore, the effects of the spill on the fish community were not evaluated.

During the 1999 Phase II RI, an inventory/assessment of the fish community was conducted. Because naturally occurring lipids can interfere with petroleum/diesel analysis, tissues were analyzed for polynuclear aromatic hydrocarbons (PAH). The toxicity, mutagenic effects, and bioavailability of PAHs vary with molecular weight. Therefore, a PAH scan was conducted on each tissue sample in order to determine the biological and ecological risks. Fish tissues were also analyzed for the presence of PCBs, which can cause reproductive dysfunction in fish and, because fish cannot break them down, are available to higher trophic levels.

In addition to fish tissue, mollusks for tissue analysis were to be collected in the estuarine areas at the outflow of the Suqitughneq River. Site investigations revealed that mollusks did not inhabit these areas; therefore, mollusks were not collected for analysis.

2.1.10.4 Habitat Assessment

The 1999 Phase II RI habitat assessment was conducted using the Alaska Stream Condition Index (ASCI), which is a multihabitat bioassessment method developed specifically for Alaska streams by ENRI with the support of ADEC and the United States Environmental Protection Agency (EPA) (Major and Barbour, 1997). The ASCI method involves visually assessing habitat quality and rating each macroinvertebrate site in order to evaluate stream condition and to assist with interpretation of biological data (Major and Barbour, 1998).

2.1.11 Site Surveying

The surveying work for the 1999 Phase II RI was conducted at Northeast Cape on August 4, 1999. The purpose of the survey was to accurately locate soil, water, and biological sampling sites and report these locations on the same coordinate system as previous surveys conducted by Lounsbury and Associates during the Phase I RI in 1994.

The 1999 survey work was conducted by Mullikin Surveys (Donald E. Mullikin, P.L.S.) of Homer, Alaska. Trimble 4700 geographic positioning system (GPS) survey units were used in static mode. Geographic position on St. Lawrence Island was established by simultaneous observations with NGS continuous operating reference stations at Kenai, Cold Bay, and Central, Alaska. Elevations for new 1999 points were generated using the 1996 geoid undulation model. Surveying results from the 1999 Phase II RI are provided in Appendix E.

2.1.12 Historical Architectural Recordation

Montgomery Watson, through a subcontractor, performed a historic architectural recordation at Northeast Cape, St. Lawrence Island, Alaska in accordance with SHPO requirements. The subcontractor was Krochina Architects, based in Anchorage, Alaska, and the qualified Historic Architect was Mr. Patrick Krochina. The fieldwork consisted of taking 35-mm black and white photographs and preparing Architectural Recordation Forms for each building at the Housing and Operations Area of the Northeast Cape site.

The historical architectural recordation report was submitted under a separate cover.

2.2 SAMPLE COLLECTION

Field work included surface soil, subsurface soil, sediment, sludge, paint, building materials, and biological sampling. All samples were collected in accordance with protocols in the following documents:

- Final Work Plan Addendum, 1999 Phase II RI, Northeast Cape, St. Lawrence Island, Alaska. Montgomery Watson. July 1999.
- Final Work Plan 1998-1999 Phase II Remedial Investigation, Northeast Cape, St. Lawrence Island, Alaska. Montgomery Watson. August 24, 1998.
- Remedial Investigation, Northeast Cape, St. Lawrence Island, Alaska. Montgomery Watson. January 1995.
- Chemical Data Acquisition Plan, Site Inventory Update, Northeast Cape, St. Lawrence Island, Alaska. E&E. February 1993.

2.2.1 Surface and Subsurface Soil Sampling

Soil and sediment sampling were performed according to the standard methodology detailed in the Chemical Data Acquisition Plan (CDAP) (E&E, 1993). However, as documented during the Phase I field work, a Microtip IS-3000 photoionization detector was used instead of an HNu to detect organic vapors. Surface soil samples were collected using disposable spoons, and subsurface samples were collected using a hand auger.

Samples for different analytes from a single sampling location were collected in the following order:

1. BTEX/GRO
2. DRO, PAHs, and/or other chemical analytes
3. Physical parameters

For BTEX and GRO analyses, 50 grams of sample material were placed in the sample jar, and 25 milliliters of methanol were added. Standard procedure is to use a one-to-one ratio of sample material and methanol, but a two-to-one ratio was used during this project to lower the method detection limit to a level below the site cleanup limit.

2.2.2 Sludge Sampling

Sludge sampling was attempted at the access portals at the influent ends of ASTs 21-1 and 21-2; however, only water was recovered during these attempts. A sludge sample was recovered at the access portal for AST 21-3 using a sludge sampler. Several scoops of sludge were collected and composited in a tub prior to being placed in sample containers.

2.2.3 Paint Sampling

The exterior paint coatings on 24 ASTs were sampled for LPB. Paint sampling was performed according to the standard methodology detailed in the CDAP (E&E, 1993). Procedures provided in 5.3.1 of Appendix 5 of the Lead-Based Paint Interim Guidelines (HUD, 1990) were followed for the collection of paint samples.

2.2.4 Building Materials Sampling

Three buildings were sampled using procedures in conformance with the USAEHA Sampling Protocol, Building Demolition Debris and Buildings Painted with Lead-Based Paint. Building materials from the structures were analyzed for PCBs and TCLP PCBs.

One composite sample was collected for each selected structure. Individual component samples were collected using a portable drill, saw, hammer, and chisel. During the Phase I RI, proportions of structure materials were determined by measuring volumes of each building's various materials (e.g., wood, tile, siding, insulation). Once the volumes of all materials constituting each structure were inventoried, the percentages of individual materials constituting the whole structure were established. Each composite sample included approximate representative proportions of all structural materials. Materials proportions for the buildings sampled during the 1999 Phase II RI are shown in Table 2-3.

Table 2-3 Building Materials Proportions Summary

Site No.	Bldg. No.	Building Name	Building Materials Proportions										
			Wood Structure %	Corkwall %	Cement Board %	Metal %	Painted Area %	Roofing %	Roof tar %	Wall insulation %	PACM siding %	Vinyl PACM %	Total %
13	110	Heat and Electrical Power Bldg.	60.5		10	1	1	25	1		1.5		100
17	107	Mess Hall Warehouse	39	1	3	0.3	1	44	1	10	0.7		100
18	101	Dormitory West	39.5		18	0.5	1	19	1		20	1	100

PACM - presumed asbestos-containing material

2.2.5 Biological Sampling

The following is a brief summary of the biological sampling procedures used during the 1999 Phase II RI. The full reports submitted by ENRI and Alaska District are included in Appendices D and E.

2.2.5.1 Sediment Toxicity Sampling

Sediment toxicity was measured using the Microtox® bacterial bioassay. Sediment samples were collected from designated sites and tested with the Microtox® solid phase bioassay to determine potential toxicity. Three replicate samples were tested from each sampling site. Samples were kept on ice until analyzed. Analysis was performed within 48 hours of collection using the Microtox® bacterial bioassay solid phase test protocol and the Microbics Model 500 analyzer. The solid-phase test measures light output after a 20-minute exposure of the bacteria to the sediment.

To interpret results accurately, study stream sediment samples must have the same particle-size distribution as control stream samples. Because grain size composition differs between sites, Suqitughneq River samples could only be compared to control stream samples with identical sediment composition (Benton et al., 1995; Ringwood et al., 1997). Separate sediment samples were collected for sediment grain size characterization at each of the Microtox sampling locations, so toxicity results could be interpreted accurately.

2.2.5.2 Community Assessments

Community assessments included evaluating macroinvertebrate and fish populations, as described below.

2.2.5.2.1 Macroinvertebrates

Benthic macroinvertebrates were collected systematically from all available in-stream habitats by kicking the substrate or jabbing with a D-frame dip net. A total of twenty kicks or jabs were taken from all major productive habitat types in each reach.

The collected material was composited, preserved in the field in 95% alcohol, and returned to the laboratory for processing and insect identification. In the laboratory, the samples were processed to a 300-organism sub-sample (+ 20%) using a Caton sub-sampler (Caton, 1991). The remaining sample was then quickly examined for large and/or rare organisms not collected in the sub-sample. Collected organisms were identified to genus level (Clifford, 1991, Stewart and Stark, 1993, Merritt and Cummins, 1996, and Wiggins, 1996). Annelids were identified to class. *Chironomidae*, *Simullidae*, and *Ceratopogonidae* were identified to family. Functional feeding group designations were assigned according to Merritt and Cummins (1996) or Pennak (1989). Once samples were processed, the insects were preserved in 70% ethanol.

2.2.5.2.2 Fish

Fish were collected from the stream areas noted in Section 2.1.10 for fish population assessment and tissue analysis. ENRI personnel collected and sorted the fish. Fish were collected using an electrofishing unit, seines, dipnets, and sports tackle. The Alaska District obtained necessary permits and operated the electrofishing unit. Fish were sorted by species, measured, photographed, counted, and visually inspected for deformities and disease. Several of each species were preserved as reference species to ensure correct identification. The entire sample from each site (typically several fish) was wrapped in aluminum foil and placed in a Ziploc™ bag. All samples were kept on ice in clean coolers for shipment from Nome to Anchorage.

2.2.5.3 Fish Tissue Toxicity Sampling

Fish were collected from the study stream areas as detailed above. Fish tissue samples were also collected from the control stream in order to verify the spill as the source of any bioaccumulated toxins at the study stream.

2.2.5.4 Habitat Assessment

The 1999 Phase II RI habitat assessment was conducted using the ASCI, an intensive, multihabitat bioassessment method developed specifically for Alaskan streams with the support of the ADEC and the EPA (Major and Barbour, 1997). Ten parameters were evaluated as "Excellent", "Good," "Fair," or "Poor" and assigned point values. Field parameters (water temperature, dissolved oxygen, conductivity, and pH) were also collected at each site and assigned point values.

3. INVESTIGATION RESULTS AND DISCUSSION

This section presents investigative and analytical results of the 1999 Phase II RI. Full-page tables and figures are presented at the end of this Section. Complete laboratory results and data quality assessments are provided in Appendices B and C, respectively. Biological sampling results are provided in Appendix D. A Chemical Data Quality Review (CDQR) is presented in Appendix H (ETHIX, 2000). No data quality deficiencies were found during preparation of the CDQR. All data generated during this project should be considered usable as reported.

3.1 SEDIMENT SAMPLING AT CARGO BEACH ROAD LANDFILL - SITE 7

Sediment in a pond near the drums was sampled and analyzed for DRO and RRO. One primary sample (99NEC07SD901), one duplicate (QC) sample, and one triplicate (QA) sample were collected. Analytical results are summarized in Table 3-6 and compared with the cleanup criteria. Sample locations are shown on Figure 3-1.

DRO concentrations in the 1999 primary and duplicate samples (380 and 340 mg/Kg, respectively) were below both the background sediment sample DRO concentration (580 mg/Kg) and the maximum allowable concentration for soil using Method 1 (500 mg/Kg). RRO concentrations in the 1999 primary and duplicate samples (3,900 and 3,600 mg/Kg, respectively) exceeded the background concentration and the maximum allowable limit for soil using Method 1 (2,000 mg/Kg); however, these RRO concentrations were well below the allowable limiting level using Method 2 (10,000 mg/Kg).

Sample SD901 was collected near the same location where sample SD103 was collected in 1994. These sample results are compared in Table 3-1. Also listed are the results of the background sediment sample collected in 1999 (SD903).

Table 3-1 Comparison of Results From Sites 7 and 30 (Background)

Sample No. (note)	DRO (mg/Kg)	RRO (mg/Kg)	TRPH (mg/Kg)
SD901 (1999)	380	3,900	not analyzed
SD103 (1994)	815	not analyzed	15,600
SD903 (1999 background)	580	3,200	not analyzed

DRO - diesel range organics
RRO - residual range organics
TRPH - total recoverable petroleum hydrocarbon

Several observations and inferences can be drawn from this data:

- The DRO/RRO results for SD901 and the background sample (SD903) are similar, suggesting that the hydrocarbons detected in SD901 represent background conditions and not contamination.
- Although sample SD901 was collected from approximately the same location as sample SD103, the samples were collected 5 years apart, so some variation in results would be expected due to altered conditions (e.g., natural attenuation of any contaminants).

The analytical method used to detect DRO in 1999 (Method AK102) was different than the method used in 1994 (Method 8100M). The two methods are not directly comparable and differ in several ways. The most significant distinction is that Method AK102 corresponds to an n-alkane range of C_{10} to C_{25} and Method 8100M corresponds to a range of C_{10} to C_{28}. Therefore, for the same sample, DRO measured by Method AK102 could be less than that measured by Method 8100M.

- The analytical parameter RRO (Method AK103), measured in 1999, is significantly different than TRPH (Method 418.1), measured in 1994. The two methods are not directly comparable and differ in several ways. The most significant distinction is that Method AK103 corresponds to an n-alkane range of C_{25} to C_{36}, whereas Method 418.1 corresponds to a range of C_1 and above (i.e., Method 418.1 measures all hydrocarbons contained in the sample).
- Method AK103 will screen out some naturally occurring organics, whereas Method 418.1 (without a silica gel cleanup) does not screen out any organics. A silica gel cleanup was not used in 1994 (MW, 1999).
- Samples SD901 and SD103 were collected from a stagnant tundra pond, where relatively high levels of naturally occurring hydrocarbons would be expected.

Relatively high concentrations of TRPH compared to DRO concentrations were observed in several samples collected in 1994. Based on the DRO/RRO data collected in 1998-9, it was concluded that there is a significant amount of naturally occurring organic compounds associated with the samples collected. Much of the TRPH detected in the 1994 samples was likely caused by naturally occurring organic compounds.

3.2 SOIL SAMPLING AT GASOLINE TANK AREA - SITE 12

Five primary soil samples, one QC sample, and one QA sample were collected and analyzed for DRO, RRO, GRO, and BTEX. Analytical results are presented in Table 3-6 and compared with the cleanup criteria. Sample locations are shown on Figure 3-2.

With the exception one DRO result (sample 12SB901), all analyte concentrations were below Method 1 cleanup levels. The DRO concentration for sample 12SB901 (140 mg/Kg), collected at 2 feet below ground surface (bgs) at the fuel dispenser, exceeded the Method 1 level (100 mg/Kg), but was less than Method 2 cleanup level (250 mg/Kg).

The data suggest that no significant spills or leaks occurred near the tanks at Site 12 and that any release(s) from the fuel dispenser was minor. Consequently, no remediation work is indicated for Site 12.

3.3 SLUDGE SAMPLING AT WASTEWATER TREATMENT FACILITY - SITE 21

One sludge sample was collected and analyzed for TCLP metals, TCLP pesticides, TCLP VOCs, TCLP SVOCs, and total PCBs. Analytical results are presented in Table 3-7 and compared with the regulatory criteria. The sample location is shown on Figure 3-3.

Two PCBs were detected in the sample, Aroclor™ 1254 and Aroclor™ 1260. Both PCBs were present in concentrations exceeding ADEC and federal regulatory limits. Only two analytes from the TCLP analyses, barium and cresols (methyl phenols), were present in the sample above detection limits. Concentrations of both analytes were well below RCRA criteria limits.

Due to its PCB content, the sludge must be removed from the site and shipped to a permitted disposal facility.

3.4 BUILDING MATERIALS SAMPLING - SITES 13, 17 AND 18

One composite sample of building materials was collected and analyzed for PCBs and leachable PCBs at each of the following buildings:

- Building 110, Heat and Electrical Power Building (Site 13);
- Building 107, Mess Hall Warehouse (Site 17); and
- Building 101, Dormitory West Building (Site 18).

Analytical results are presented in Table 3-2 and on Figure 3-4 with the building locations.

Table 3-2 Results for Building Composite Samples

		Bldg. #	110	107	101	18 AAC 60 Limit for Disposal in Permitted Non-Hazardous Waste Landfill
		99NEC:	13BD901	17BD901	18BD901	
Method	**Analyte**	**Units**				
SW8082	PCB-1016 (Aroclor™ 1016)	mg/Kg	ND	ND	ND	≤ 10
	PCB-1221 (Aroclor™ 1221)	mg/Kg	ND	ND	ND	≤ 10
	PCB-1232 (Aroclor™ 1232)	mg/Kg	ND	ND	ND	≤ 10
	PCB-1242 (Aroclor™ 1242)	mg/Kg	ND	ND	ND	≤ 10
	PCB-1248 (Aroclor™ 1248)	mg/Kg	ND	0.11	0.16	≤ 10
	PCB-1254 (Aroclor™ 1254)	mg/Kg	ND	ND	ND	≤ 10
	PCB-1260 (Aroclor™ 1260)	mg/Kg	0.28	2.6	1.6	≤ 10
	Total PCBs	mg/Kg	0.28	2.7	1.8	≤ 10
SW1311/ 8082	PCB-1016 (Aroclor™ 1016)	μg/L	ND	ND	ND	
	PCB-1221 (Aroclor™ 1221)	μg/L	ND	ND	ND	
	PCB-1232 (Aroclor™ 1232)	μg/L	ND	ND	ND	
	PCB-1242 (Aroclor™ 1242)	μg/L	ND	ND	ND	
	PCB-1248 (Aroclor™ 1248)	μg/L	ND	ND	ND	
	PCB-1254 (Aroclor™ 1254)	μg/L	ND	ND	ND	
	PCB-1260 (Aroclor™ 1260)	μg/L	ND	1.5	ND	
	Total PCBs	μg/L	ND	1.5	ND	

ND - not detected
PCB - polychlorinated biphenyl

Low levels of PCBs were found in all three composite samples, ranging from 0.28 to 2.7 mg/Kg. These levels are well below the State of Alaska's regulatory limit (10 mg/Kg) for disposal in a permitted non-hazardous waste landfill. One of the three samples showed a detectable concentration of leachable PCBs when leached by TCLP (1.5 µg/L). The TCLP data were qualified because the holding time was exceeded for extraction of these samples (the holding time is 21 days and the samples were extracted on the 24th day); however, the data are considered usable because the method holding time was only slightly exceeded (3 days) and PCBs are inherently stable, especially when contained in paint that is over 30 years old.

EPA regulates PCB bulk product wastes (e.g., PCB paint, PCB insulation, etc.) that is 50 mg/Kg PCB in the original item (e.g., paint, waterproofing) at the time of disposal. This is not based on a composite building sample. Historically, PCBs have been detected in a number of building materials including certain paint formulations, coatings for ceiling tiles, roofing, and siding materials, adhesives, waterproofing compounds, and any number of other chemical uses such as additives and plasticizers.

The three buildings sampled were chosen to represent all the buildings at Northeast Cape with respect to the composition of potential PCB-containing building materials. Based on the analytical results obtained, debris resulting from the Northeast Cape building demolition may be disposed in a state-permitted solid waste landfill provided the landfill is notified in advance that the debris contains PCB bulk product waste that leaches less than 10 µg/L PCB.

3.5 PAINT SAMPLING AT ABOVEGROUND STORAGE TANKS

Paint samples were collected from 22 steel ASTs and analyzed for lead. Another two ASTs were inspected, but no samples were collected because not enough paint was present to yield the necessary sample quantity. Table 3-8 shows an inventory of ASTs sampled for LBP, including associated analytical results. Tank locations and lead concentrations are shown on Figures 3-5 and 3-6.
All but two of the 22 ASTs sampled had LBP coatings, with concentrations ranging from 99 to 140,000 mg/Kg. These lead concentrations indicate that lead in airborne dust generated during cutting of the tanks could exceed Occupational Safety and Health Administration (OSHA) standards of 50 µg/M^3 for worker exposure (29 CFR 1926.62). State of Alaska construction codes limit airborne lead dust exposure to 30 µg/M^3 (AK.05.265). Air monitoring during BD/DR work is recommended.

3.6 BACKGROUND SOIL AND SEDIMENT SAMPLING - SITE 30

Two background surface soil samples and one background sediment sample were collected and analyzed for DRO, RRO, GRO, BTEX, TOC, and TAL metals. Sample locations are shown on Figure 3-7. Analytical results are provided in Table 3-6.

Results from the tundra soil sample and the sediment sample, collected from a lake in a wet tundra area, show much higher DRO and RRO concentrations when compared to results from the soil sample collected from the gravel borrow area. This is not surprising given that TOC results were also much higher for the tundra-area soil and sediment samples. These results may explain the high TRPH and relatively low DRO concentrations found in background and other samples collected in previous studies. TRPH measures all hydrocarbons, including those that are naturally occurring. As evidenced by soil and sediment samples collected in tundra areas, background concentrations of some organic compounds are higher than ADEC cleanup criteria. This is supported by interpretation of the sample chromatograms, which indicate that the predominant organic pattern in the samples is biogenic, not fuel-related.

Very low organic and TOC concentrations in the background gravel sample indicate that high TRPH and low DRO concentrations found during previous studies in samples collected from gravel pad areas may not be attributable to naturally-occurring organic material. If more detailed information is required for remediation decisions, gravel pad sites showing high TRPH and low DRO concentrations may warrant further sampling and analysis for GRO, DRO, RRO, and TOC.

3.7 TEST PITS AT BURIED DRUM FIELD - SITE 10

Three test pits were hand-excavated within the fill material at Site 10 (Figure 3-8). Test pit locations were selected using information from a previous geophysical survey (MW, 1995) and after scanning the area with a metal locator. Fill material soils consisted of crushed and broken cobbles with boulders (some boulders weighed in excess of 200 lbs.).

Two test pits (TP1 and TP3) were located on the upper bank of the fill, above an area with high DRO contamination found in previous samples. Miscellaneous metal debris was found in TP1 and TP3, but no drums were observed. Heavy surface soil staining was evident at TP3 and staining increased with depth of excavation.

The largest test pit (TP2) measured 45 feet by 6 feet and was located in the center of the fill area. Crushed empty drums were found in the eastern end of this test pit, but no evidence of any residual products was observed. In the middle area and western end of TP2, numerous crushed drums and old timbers were uncovered. Other crushed or dented drums were observed under this debris layer. One drum full of liquid was exposed in TP2. The field crew made a small hole in this drum and extracted a pale amber-colored low viscosity product with a faint POL odor. The hole was sealed and the drum was left in place. No evidence of leaking product was observed in TP2. Excavation beneath the top debris layer was not attempted due to safety concerns about the full drum, other rusted debris, and weak timbers collapsing. It is recommended that all debris be removed from TP2 and disposed as necessary.

3.8 CHEMICAL NEUTRALIZATION AT BUILDING 101 - SITE 18

The area in Building 101 (Figure 3-4) where STB and DS-2 were formerly stored was examined. The floor was covered with 2-4 inches of water. Sodium bisulfate and sodium bicarbonate were applied to the appropriate areas on the floor to neutralize any chemical residuals where chemicals were previously stored. A slight fizzing sound was noted during slurry application; however, no other evidence of chemical reactions was observed.

3.9 UTILIDOR SURVEY

Where accessible without danger to the field team, utilidors were surveyed for ease of access and the presence of pipes and insulation, and evaluated for potential as contaminant migration pathways. Utilidor access areas are shown on Figure 3-9.

Most utilidors were located beneath arctic walkways that connected the Main Operations Complex buildings. These utilidors were accessed from outside the arctic walkways by removing tile or wood siding. The utilidor trenches were typically open 2 to 4 feet bgs and the pipes were located from 2 feet bgs to approximately 1 foot above grade. Utilidors away from the buildings were accessed via plywood or steel hatches on concrete vaults. Due to confined space restrictions, field workers did not enter these vaults.

Utilidors in the central and eastern portions of the utilidor system contained five pipes, described below:

- One 8-inch diameter fiberglass-wrapped pipe
- One 12-inch diameter fiberglass-wrapped pipe
- One 8-inch diameter pipe with ½-inch thick PACM wrap
- One 8-inch diameter steel pipe with no insulation
- One 12-inch pipe with 2-inch thick unknown insulation (possibly polystyrene)

Most utilidors in the western portion of the utilidor system contained pipes with no insulation. One exception, the utilidor connecting the Emergency Power and Operation Building (Site 14) to Building 101 West (western edge of Site 18), contained four pipes with the following characteristics:

- One 2-inch diameter pipe with 1-inch thick gray PACM wrap
- One 8-inch diameter steel pipe with no insulation
- One 8-inch diameter pipe with 2-inch thick pink PACM wrap
- One 12-inch diameter pipe with 2-inch thick polystyrene wrap

Based on field observations, utilidor pipes wrapped in PACM would be easily accessible following removal of aboveground structures during BD/DR operations. Access to PACM-wrapped pipes in concrete vaults and building basements may be difficult due to structural instability and flooding problems.

Because the utilidor system is located upgradient of known fuel spill sites at Northeast Cape, the utilidors are not likely contaminant migration pathways for these contaminants.

3.10 BIOLOGICAL SAMPLING AT DRAINAGE BASIN, SUQITUGHNEQ RIVER, AND CONTROL STREAM - SITES 28, 29, AND 30

The following is a brief summary of the biological sampling results from the 1999 Phase II RI. Results presented in this section are meant to serve as an overview of the biological sampling work conducted. Detailed explanations of sampling and analysis methodology and more thorough discussions of results and conclusions are provided in the reports produced by ENRI and the Alaska District. Biological sampling sites are shown on Figure 3-10. Full reports submitted by ENRI and Alaska District are included in Appendix D.

3.10.1 Sediment Toxicity

Sediment toxicity was measured using the Microtox® bacterial bioassay to determine if the stream ecosystem has been impacted by site contaminants. Sediment toxicity results are shown in Table 3-3.

Table 3-3 Sediment Toxicity Results

Reach	Location	TU
Quangeghsaq River, control stream: 200 m just upstream of highest storm tide	Downstream	65.9
Quangeghsaq River, control stream: 200 m just upstream of highest storm tide	Upstream	34.9
Suqitughneq River Tributary, downstream control: 100 m reach in headwaters of small tributary	Mid-channel	202.1
Suqitughneq River, upstream control: upstream of confluence with receptor creek, 100 m above to 200 m below access road culvert	Right Bank	72.5
Suqitughneq River, potentially stressed location: 50 m below to 200 m above runway bridge	Left Bank	174.1
Suqitughneq River, potentially stressed location: 50 m below to 200 m above runway bridge	Right Bank	423.6
Spill tributary, potentially stressed location: 200 m reach from large pool below spill to confluence with Suqitughneq River	Upstream	213.3
Spill tributary, potentially stressed location: 200 m reach from large pool below spill to confluence with Suqitughneq River	Downstream	846.0

TU - toxicity unit

Toxicity unit (TU) values were significantly higher for samples from stressed sites than for control samples with similar substrate characteristics. These results indicate that the stream environment has been impacted by contamination, probably from the 1969 diesel fuel spill.

3.10.2 Community Assessments

Community assessments included evaluation of macroinvertebrate and fish populations in the affected reaches. Results of these assessments are presented below.

3.10.2.1 Macroinvertebrates

Assessment of the macroinvertebrate community consisted of sampling at the study reaches within the Suqitughneq River drainage and control stream. Results indicated macroinvertebrate community impairment below the spill area and at the spill tributary. The site below the spill area was characterized by lower total taxa richness than the control stream. At the spill tributary, density was an order of magnitude lower than at any other site.

3.10.2.2 Fish

Dolly Varden char, Alaska blackfish, ninespine stickleback, and fourhorn sculpin were captured in the Suqitughneq River during the 1999 survey. Dolly Varden and blackfish were captured throughout the drainage, while stickleback and a single marine sculpin were captured only at the furthest downstream reach near the intertidal lagoon. Blackfish were the only species captured in the spill tributary.

In addition to minnow trapping and electroshocking, angling was attempted at the mouths of the Suqitughneq and Tapisaghak Rivers to compare fish communities. The Tapisaghak River is approximately 3 miles east of the Northeast Cape site. One adult Dolly Varden was captured at the mouth of the Suqitughneq River, and several adult Dolly Varden and two pink salmon were captured in the Tapisaghak River (control stream).

3.10.3 Fish Tissue Toxicity

Fish tissue samples were collected and analyzed for the presence of PAHs and PCBs. Results for PAHs and PCBs detected in fish tissue samples are shown in Table 3-4. Complete fish tissue sampling results are presented in Appendix D.

Fish tissue was tested for 18 PAHs; 5 were present in the blackfish samples collected at the spill tributary (slurc01). PAHs were not detected in tissue samples from any other site. The PCB Aroclor™ 1260 was present in tissue samples of Dolly Varden char collected from the downstream stressed site (slsuq01) and the upstream control site (slsuq02). Aroclor™ 1260 was also present in blackfish from the spill tributary (slurc01). PCBs were not detected in tissue samples from any other site.

Based on EPA (1999) guidelines, concentrations of PCBs in Dolly Varden and blackfish throughout the Suqitughneq River drainage were within the "no consumption recommended" risk category.

Table 3-4 Fish Tissue Toxicity Sampling Results Exceeding Method Reporting Limits

Analytes	Fish Species / Sample Collection Sites		
	Dolly Varden Char (slsuq01)	Dolly Varden Char (slsuq02)	Alaska Blackfish (slurc01)
PAHs (µg/Kg)			
2-Methylnaphthalene			71
Acenaphthene			7
Fluorene			11
Naphthalene			16
Phenanthrene			9
PCBs (µg/Kg) wet weight			
Aroclor™ 1260	140	160	100

PAH - polynuclear aromatic hydrocarbon
PCB - polychlorinated biphenyl

3.10.4 Habitat Assessment

The 1999 Phase II RI habitat assessment was conducted using the ASCI method. Ten parameters, as described in the ENRI report (Appendix D of this document), were evaluated as "Excellent", "Good", "Fair" or "Poor." Point values were assigned based on these evaluations. Physical habitat measurements and field parameters (water temperature, dissolved oxygen, conductivity, and pH) were also collected at each site and assigned point values for the habitat assessment score.

Physical habitat quality was similar between control and stressed sites as reflected in the habitat assessment scores provided in Table 3-5.

Table 3-5 Habitat Assessment Scores

Reach	Habitat Score
Suqitughneq River, potentially stressed location: 50 m below to 200 m above runway bridge (slsuq01)	170
Spill Tributary, potentially stressed location: 200 m reach from large pool below spill to confluence with Suqitughneq River (slurc01)	172
Suqitughneq River, upstream control: upstream of confluence with receptor creek, 100 m above to 200 m below access road culvert (slsuq02)	176
Suqitughneq River Tributary, downstream control: 100 m reach in headwaters of small tributary (slsut01)	172
Quangeghsaq River, control stream: 200 m just upstream of highest storm tide (slqan01)	164

These scores indicate optimal habitat conditions for macroinvertebrate communities with potential to support similar diversity and abundance. Despite similar physical habitat quality and availability, biological communities in the contaminant-impacted areas are less abundant and diverse than surrounding habitat should support.

TABLE 3-6
RESULTS FOR SITES 7, 12, AND 30

Method	Analyte	Location:	Site 7		Site 12						Site 30 (Background Locations)			ADEC Regulatory Criteria		
		99NEC:	07SD901	07SD902	12SB901	12SS902	12SS906	12SS903	12SS904	12SS905	30SS901	30SS902	30SD903	Method 1	Method 1	Method 2
		Units:	Sediment	Sediment (901 QC)	Subsurface Soil	Surface Soil	Surface Soil (902 QC)	Surface Soil	Surface Soil	Surface Soil	Background Surface Soil (Gravel)	Background Surface Soil (Tundra)	Background Sediment	Site 7	Site 12	Limiting
AK101	GRO	mg/Kg			22	ND	ND	ND	11	ND	ND	ND	ND	500	50	300
AK102	DRO	mg/Kg	380	340	140	42	46	68	59	29	ND	**430**	**580**	1000	100	250
AK103	RRO	mg/Kg	3900	3600	230	560	390	620	470	290	59	2300	3200	2000	2000	10000
SW8021F	Benzene	mg/Kg			ND	ND	ND	ND	ND	ND	ND	ND	ND			0.02
	Ethylbenzene	mg/Kg			0.11	ND	ND	ND	ND	ND	ND	ND	ND			5.5
	Toluene	mg/Kg			ND	ND	ND	0.031	ND	ND	ND	0.12	0.89			5.4
	Xylenes	mg/Kg			0.16	ND	ND	ND	0.035	ND	ND	ND	ND			78
SW9060	TOC	Percent									0.26	36	25			
SW6010	Antimony	mg/Kg									ND	ND	ND			3.6
	Barium	mg/Kg									65	46	49			1100
	Beryllium	mg/Kg									0.79	ND	ND			1.9
	Cadmium	mg/Kg									0.31	ND	ND			5
	Calcium	mg/Kg									3200	2200	1700			
	Chromium	mg/Kg									**49**	5.2	6.9			26
	Cobalt	mg/Kg									8.6	ND	ND			
	Copper	mg/Kg									31	4.3	4.4			
	Iron	mg/Kg									21000	8800	7900			
	Magnesium	mg/Kg									6700	1100	1100			
	Manganese	mg/Kg									290	22	43			
	Nickel	mg/Kg									24	3.8	4.3			87
	Potassium	mg/Kg									2100	470	270			
	Silver	mg/Kg									ND	ND	ND			21
	Vanadium	mg/Kg									28	8.3	10			710
	Zinc	mg/Kg									77	12	15			9100
SW7060	Arsenic	mg/Kg									**3.6**	ND	ND			2
SW7421	Lead	mg/Kg									25	4.8	4			400
SW7471	Mercury	mg/Kg									ND	ND	ND			1.4
SW7740	Selenium	mg/Kg									ND	ND	ND			3.5
SW7841	Thallium	mg/Kg									ND	ND	ND			

ADEC - Alaska Department of Environmental Conservation
DRO - diesel range organics
GRO - gasoline range organics
ND - not detected
QC - quality control
RRO - residual range organics
TOC - total organic content

Table 3-7 Results for Site 21

Method	Analyte	Location 99NEC: Matrix Units	Site 21 21SD901 Sediment (Sewage Sludge)	Cleanup Criteria Co-Disposal of MS with Sewage Sludge[2.]	RCRA Toxicity Characteristic[1.]
SW8082	PCB-1016 (Aroclor™ 1016)	mg/Kg	ND		
	PCB-1221 (Aroclor™ 1221)	mg/Kg	ND		
	PCB-1232 (Aroclor™ 1232)	mg/Kg	ND		
	PCB-1242 (Aroclor™ 1242)	mg/Kg	ND		
	PCB-1248 (Aroclor™ 1248)	mg/Kg	ND		
	PCB-1254 (Aroclor™ 1254)	mg/Kg	**52**		
	PCB-1260 (Aroclor™ 1260)	mg/Kg	**70**		
	Total PCB	mg/Kg	122	50	
SW1311 /6010	Arsenic	mg/L	ND		5
	Barium	mg/L	0.83		100
	Cadmium	mg/L	ND		1
	Chromium	mg/L	ND		5
	Lead	mg/L	ND		5
	Selenium	mg/L	ND		1
	Silver	mg/L	ND		5
SW1311 /7470A	Mercury	mg/L	ND		0.2
SW1311 /8081A	Chlordane	mg/L	ND		0.03
	Endrin	mg/L	ND		0.02
	Heptachlor	mg/L	ND		0.008
	Heptachlor epoxide	mg/L	ND		0.008
	Methoxychlor	mg/L	ND		10
	Toxaphene	mg/L	ND		0.5
	gamma-BHC (Lindane)	mg/L	ND		0.4
SW1311 /8260A	1,1-Dichloroethene	mg/L	ND		0.7
	1,2-Dichloroethane	mg/L	ND		0.5
	2-Butanone (MEK)	mg/L	ND		200
	Benzene	mg/L	ND		0.5
	Carbon Tetrachloride	mg/L	ND		0.5
	Chlorobenzene	mg/L	ND		100
	Chloroform	mg/L	ND		6
	Tetrachloroethene	mg/L	ND		0.7
	Trichloroethene	mg/L	ND		0.5
	Vinyl chloride	mg/L	ND		0.2
SW1311 /8270	1,4-Dichlorobenzene	mg/L	ND		7.5
	2,4,5-Trichlorophenol	mg/L	ND		400
	2,4,6-Trichlorophenol	mg/L	ND		2
	2,4-Dinitrotoluene	mg/L	ND		0.13
	Cresols (Methyl Phenols)	mg/L	0.026		200
	Hexachlorobenzene	mg/L	ND		0.13
	Hexachlorobutadiene	mg/L	ND		0.5
	Hexachloroethane	mg/L	ND		3
	Nitrobenzene	mg/L	ND		2
	Pentachlorophenol	mg/L	ND		100
	Pyridine	mg/L	ND		5

ND - not detected
PCB - polychlorinated biphenyl
RCRA - Resource Conservation Recovery Act

1. 40 CFR 261.24
2. 40 CFR 503

Table 3-8 Lead Results for Painted ASTs

Site	Tank Number	Capacity (gallons)	Past Contents	Current Contents	Paint Color(s)	Paint Coverage	Pb mg/Kg
2	AST 2-1	1,000	Diesel	Empty	Green, white	< 1%	NA
3	AST 3-1	500	Diesel	Empty	White	< 1%	ND
	AST 3-2	335	Diesel	Empty	White	< 1%	ND
4	AST 4-1	15,000	Potable water	Empty	White	< 5%	1,100
	AST 4-2	400	Potable water	30% full (rainwater)	White, blue	25%	2,100
6	AST 6-1	500	Potable water	Empty	Red	End 100%, Body < 10%	42,000
11	AST 11-1	400,000	Diesel	1.3% full (rainwater with sheen)	Green, black	90%	1,400
	AST 11-2	400,000	Diesel	Empty	Green, black	90%	920
	AST 11-3	400,000	Diesel	Empty	Green, black	90%	1,200
12	AST 12-1	15,000	Gasoline	Empty	Red, black	End 95%, Body 80%	64,000
	AST 12-2	30,000	Gasoline	Empty	(none)	(none)	NA
13	AST 13-1	1,000	Diesel	Empty	Gray	< 20%	99
	AST 13-4	5,000	Diesel	Empty	Green, red, orange	60%	100,000
	AST 13-5	500	Potable water	Empty	Green, orange	95%	110,000
	AST 13-6	204,000	Potable water	Empty	Orange, green, red, gray	90%	100,000
14	AST 14-1	5,000	Fuel	50% full (rainwater)	Orange, yellow	< 1%	49,000
16	AST 16-1	1,000	Oil for roads (probably used motor oil)	50% full (rainwater, sludge and floating product)	Orange, black	5%	140,000
18	AST 18-1	200	Unknown	Empty	White	5%	350
19	AST 19-1	250	Spent antifreeze	20% full (spent antifreeze)	Red, green	< 2%	4,100
	AST 19-2	250	Potable water	Empty	Yellow, red	50%	93,000
22	AST 22-2	60,000	Potable water	Empty	Gray, orange, green, blue	75%	100,000
	AST 22-3	60,000	Potable water	Empty	Gray, orange, green, blue	75%	93,000
	AST 22-4	60,000	Potable water	Empty	Gray, orange, green, blue	75%	110,000
	AST 22-5	60,000	Potable water	Empty	Gray, orange, green, blue	75%	83,000

AST - aboveground storage tank
NA - Not analyzed
ND - Not detected
Pb - lead

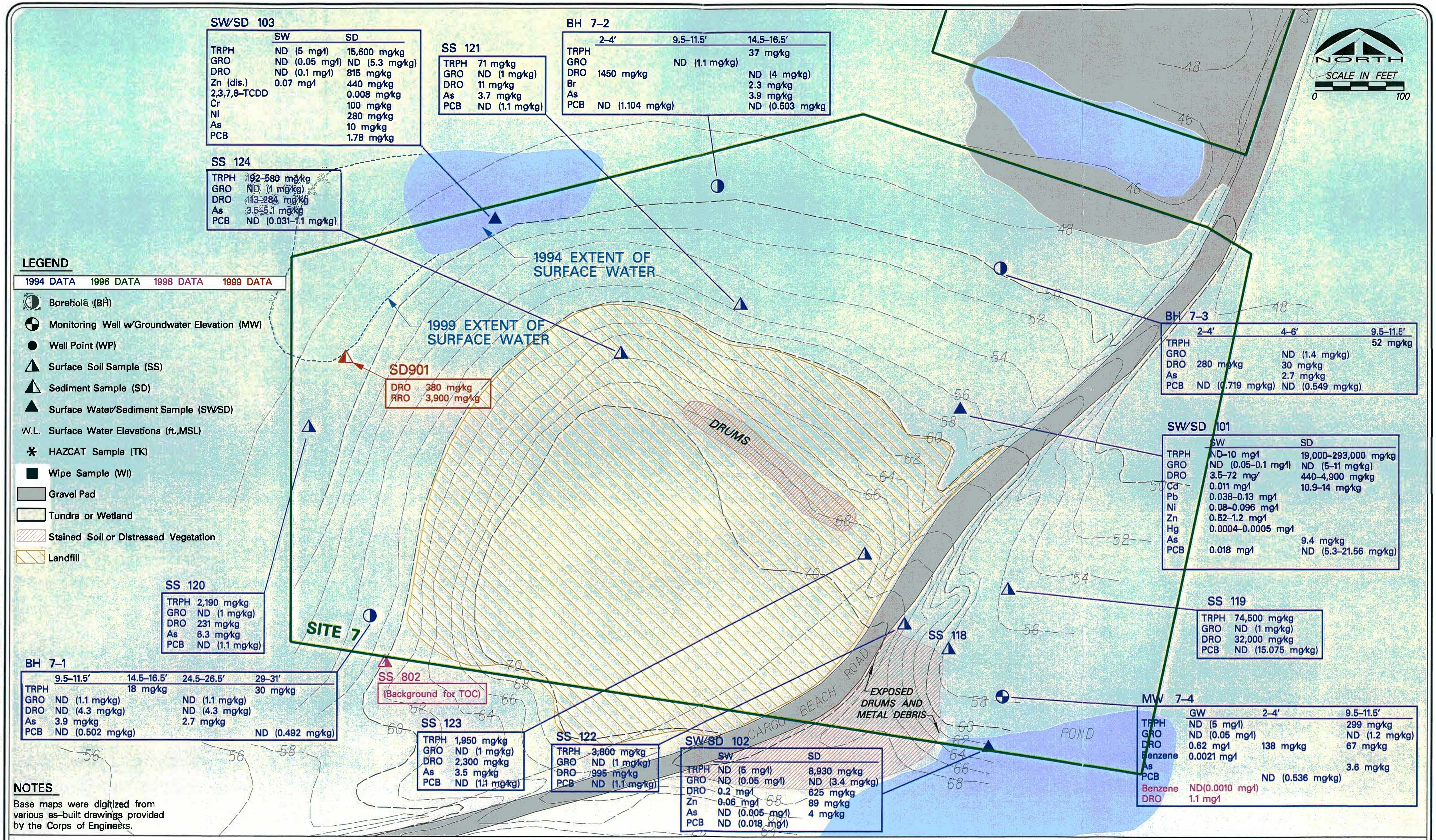

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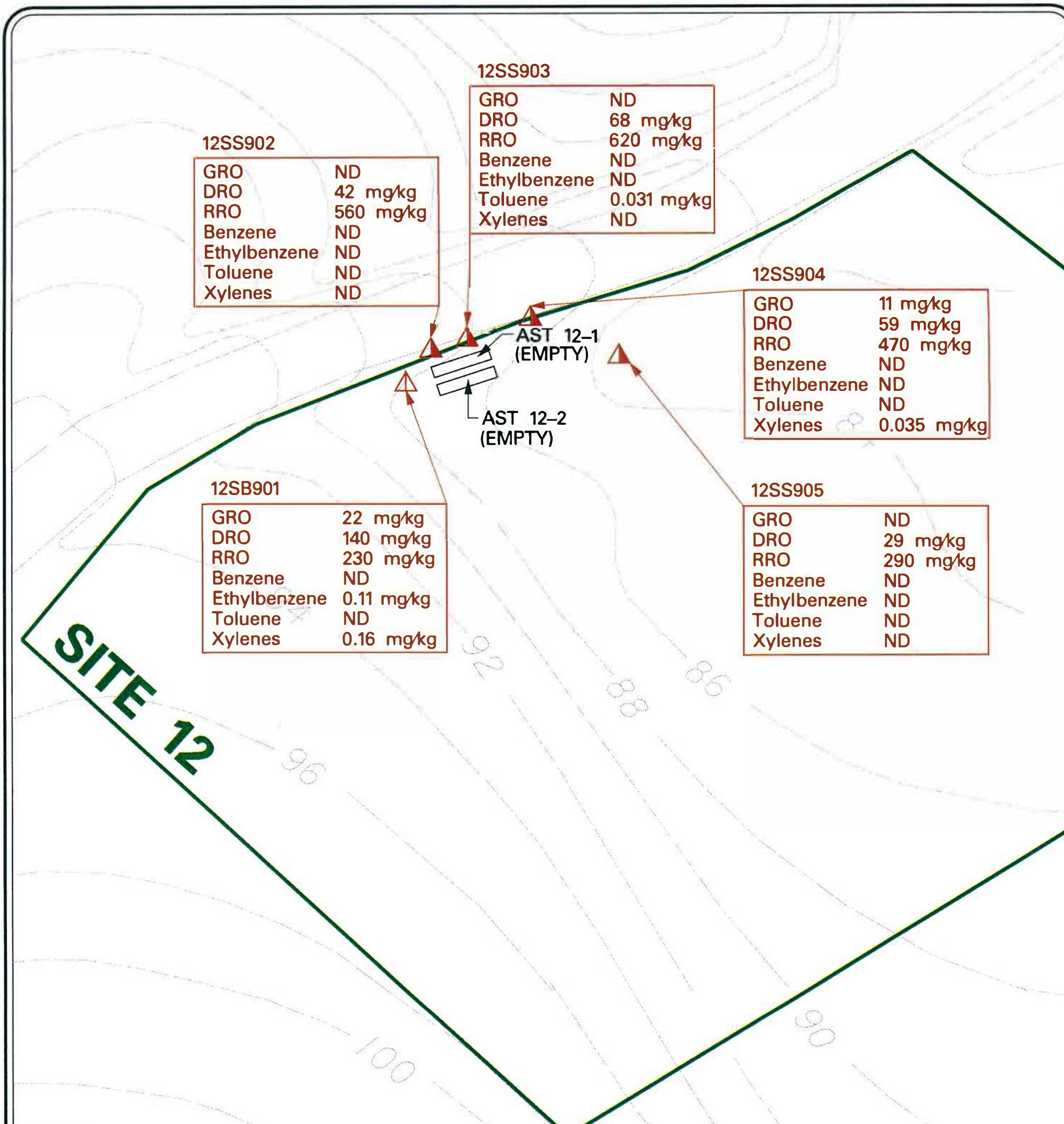
FIGURE 3-1
U.S. ARMY ENGINEER DISTRICT, ALASKA
N.E. CAPE – ST. LAWRENCE ISLAND, ALASKA
SITE 7 – CARGO BEACH ROAD LANDFILL



LEGEND

1999 Surface Soil Sample (SS)

1999 Subsurface Soil Sample (SB)

NOTES

Base maps were digitized from various as-built drawings provided by the Corps of Engineers.

NORTH

SCALE IN FEET

0 100

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FIGURE 3-2

U.S. ARMY ENGINEER DISTRICT, ALASKA
N.E. CAPE – ST. LAWRENCE ISLAND, ALASKA

SITE 12 – GASOLINE TANK AREA

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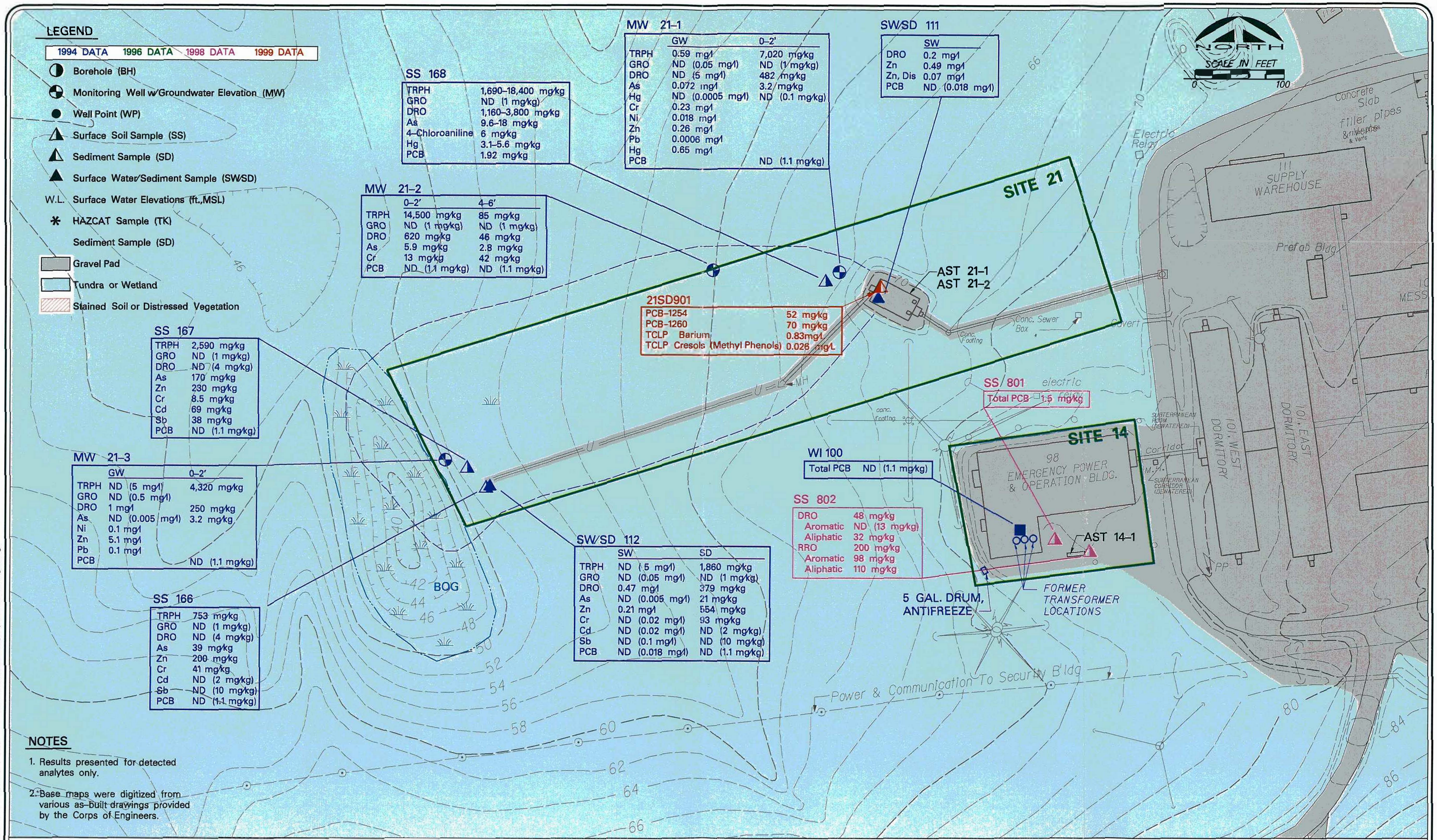

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FIGURE 3–3

U.S. ARMY ENGINEER DISTRICT, ALASKA

N.E. CAPE – ST. LAWRENCE ISLAND, ALASKA

SITES 21 – WASTEWATER TREATMENT FACILITY

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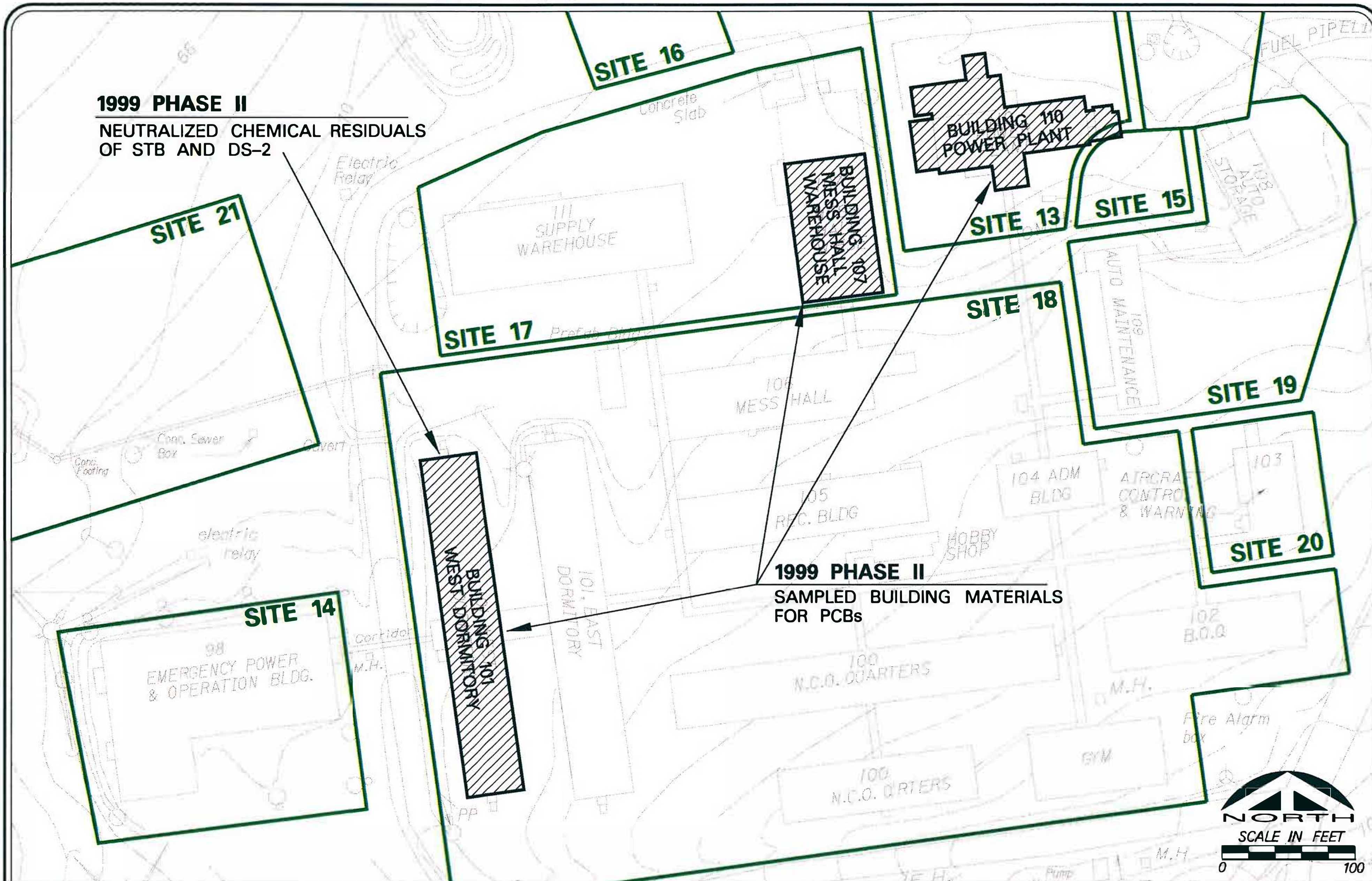

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FIGURE 3-4

U.S. ARMY ENGINEER DISTRICT, ALASKA
N.E. CAPE – ST. LAWRENCE ISLAND, ALASKA

BUILDINGS 101, 107, AND 110

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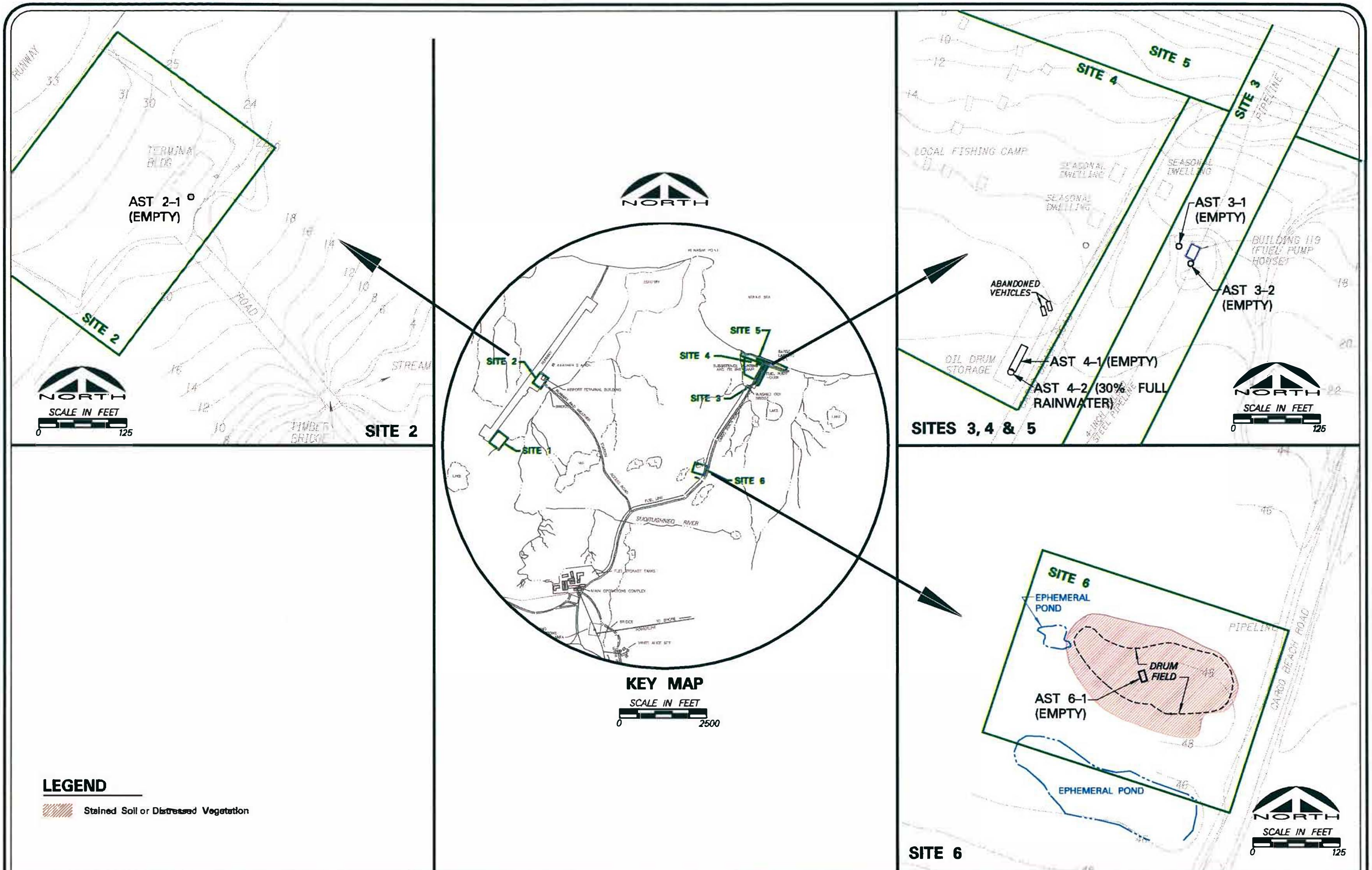

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FIGURE 3-5

U.S. ARMY ENGINEER DISTRICT, ALASKA
N.E. CAPE – ST. LAWRENCE ISLAND, ALASKA

AST LOCATIONS (SITES 2 – 6)

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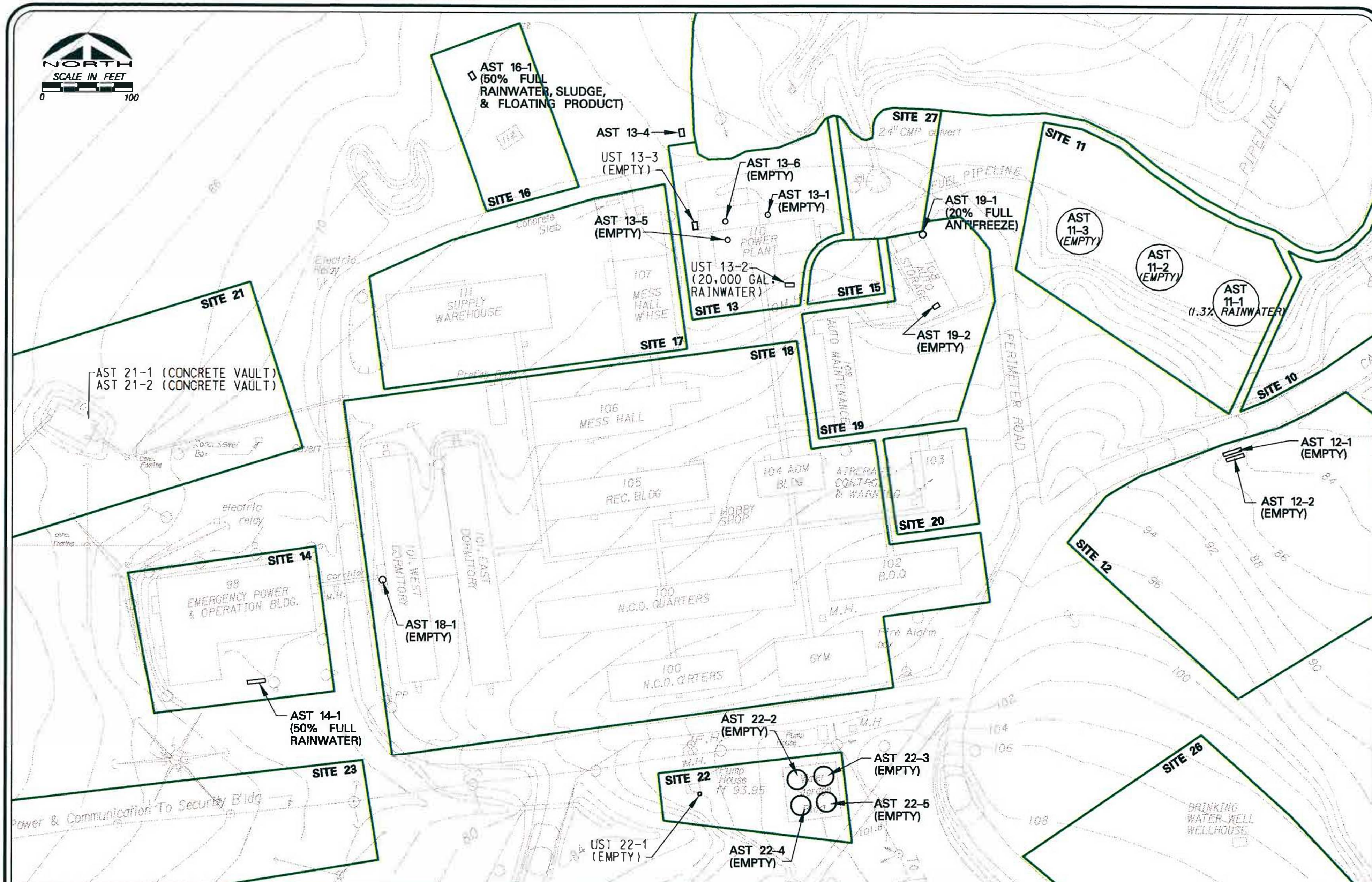

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FIGURE 3-6

U.S. ARMY ENGINEER DISTRICT, ALASKA
N.E. CAPE – ST. LAWRENCE ISLAND, ALASKA

AST LOCATIONS (SITES 11 – 22)

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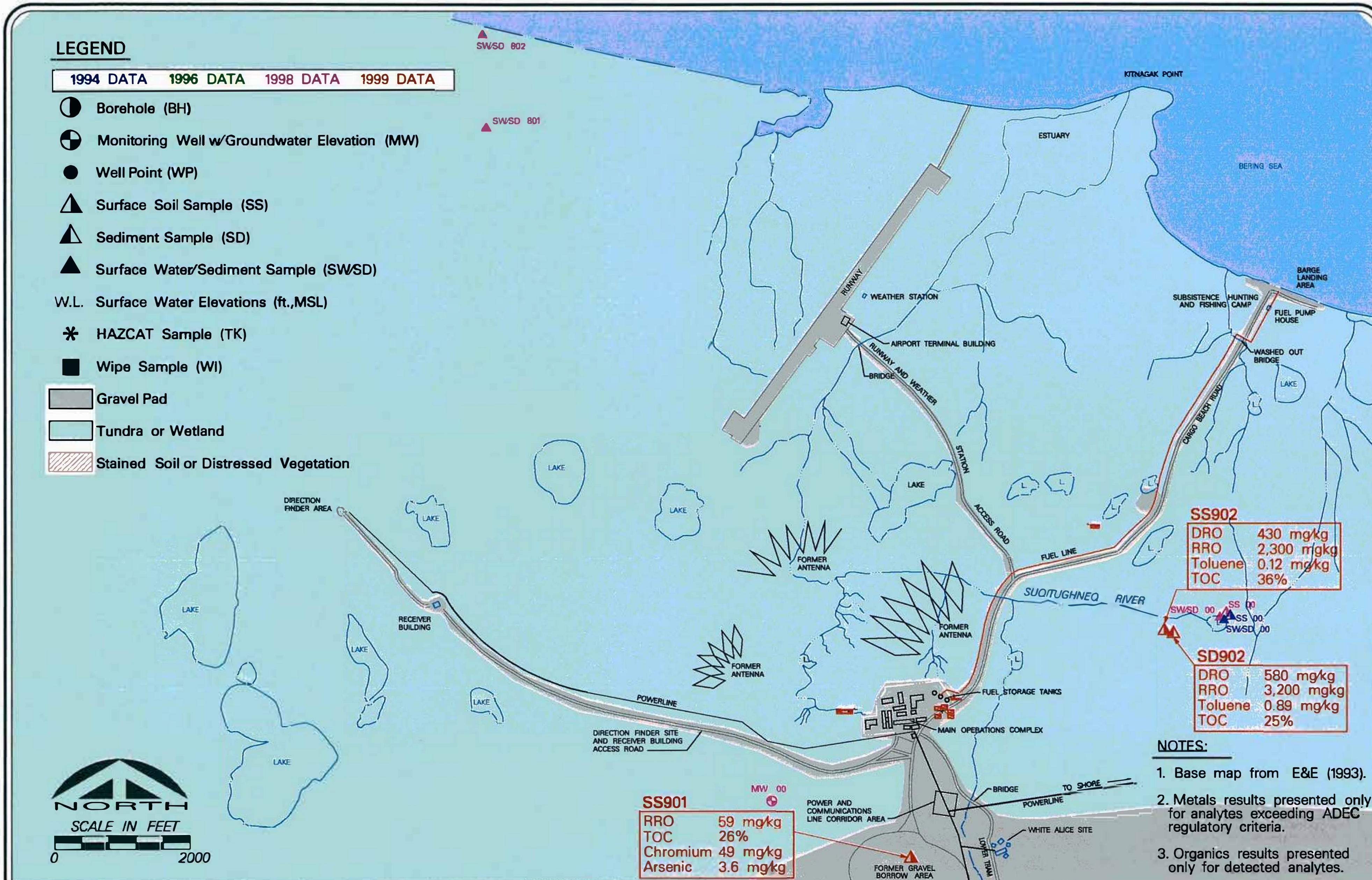

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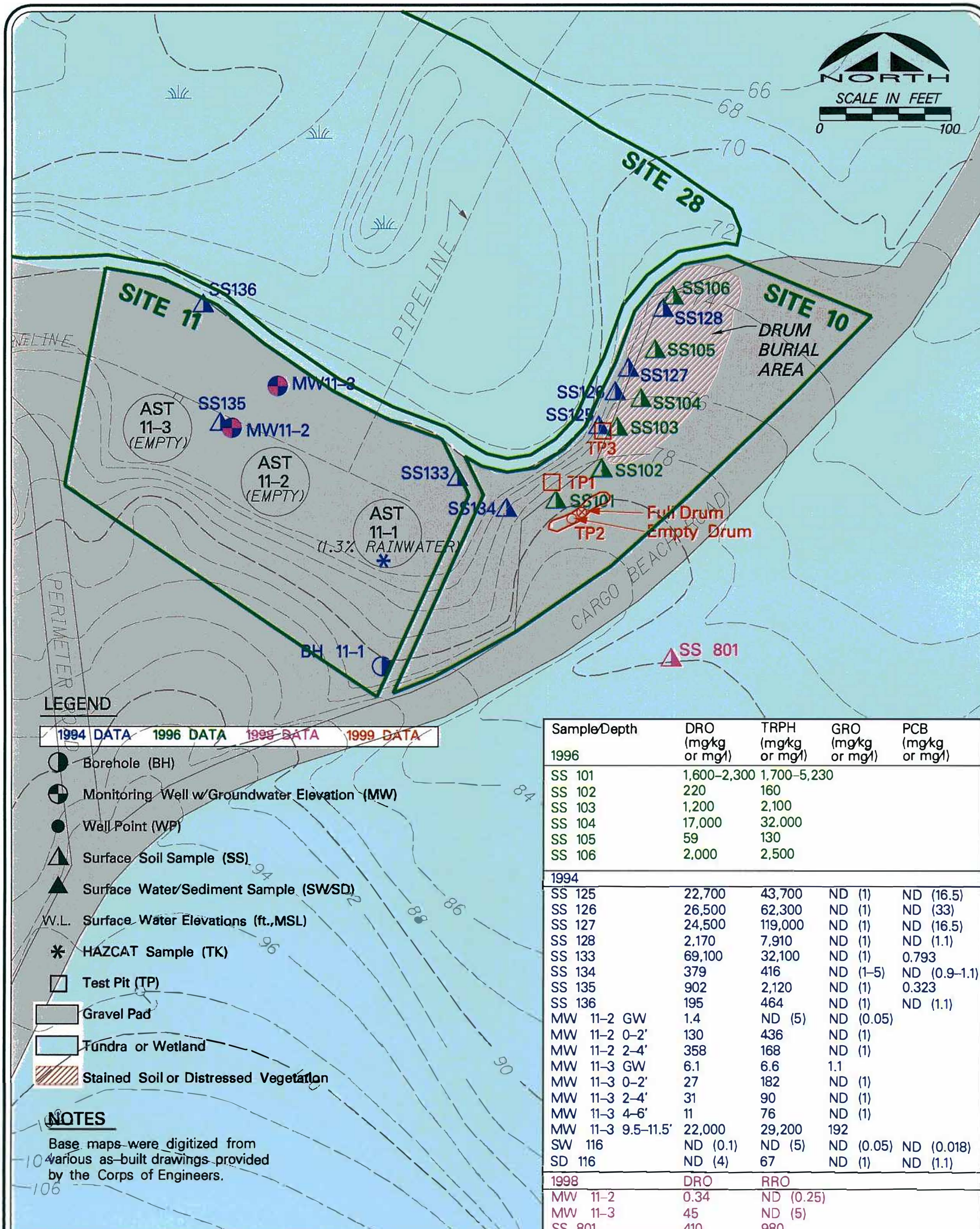
FIGURE 3-7

U.S. ARMY ENGINEER DISTRICT, ALASKA
N.E. CAPE – ST. LAWRENCE ISLAND, ALASKA

SITE 30 BACKGROUND



Sample/Depth	DRO (mg/kg or mg/l)	TRPH (mg/kg or mg/l)	GRO (mg/kg or mg/l)	PCB (mg/kg or mg/l)
1996				
SS 101	1,600–2,300	1,700–5,230		
SS 102	220	160		
SS 103	1,200	2,100		
SS 104	17,000	32,000		
SS 105	59	130		
SS 106	2,000	2,500		
1994				
SS 125	22,700	43,700	ND (1)	ND (16.5)
SS 126	26,500	62,300	ND (1)	ND (33)
SS 127	24,500	119,000	ND (1)	ND (16.5)
SS 128	2,170	7,910	ND (1)	ND (1.1)
SS 133	69,100	32,100	ND (1)	0.793
SS 134	379	416	ND (1–5)	ND (0.9–1.1)
SS 135	902	2,120	ND (1)	0.323
SS 136	195	464	ND (1)	ND (1.1)
MW 11-2 GW	1.4	ND (5)	ND (0.05)	
MW 11-2 0-2'	130	436	ND (1)	
MW 11-2 2-4'	358	168	ND (1)	
MW 11-3 GW	6.1	6.6	1.1	
MW 11-3 0-2'	27	182	ND (1)	
MW 11-3 2-4'	31	90	ND (1)	
MW 11-3 4-6'	11	76	ND (1)	
MW 11-3 9.5-11.5'	22,000	29,200	192	
SW 116	ND (0.1)	ND (5)	ND (0.05)	ND (0.018)
SD 116	ND (4)	67	ND (1)	ND (1.1)
1998	DRO	RRO		
MW 11-2	0.34	ND (0.25)		
MW 11-3	45	ND (5)		
SS 801	410	980		

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FIGURE 3-8

U.S. ARMY ENGINEER DISTRICT, ALASKA
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SITE 10 - BURIED DRUM FIELD

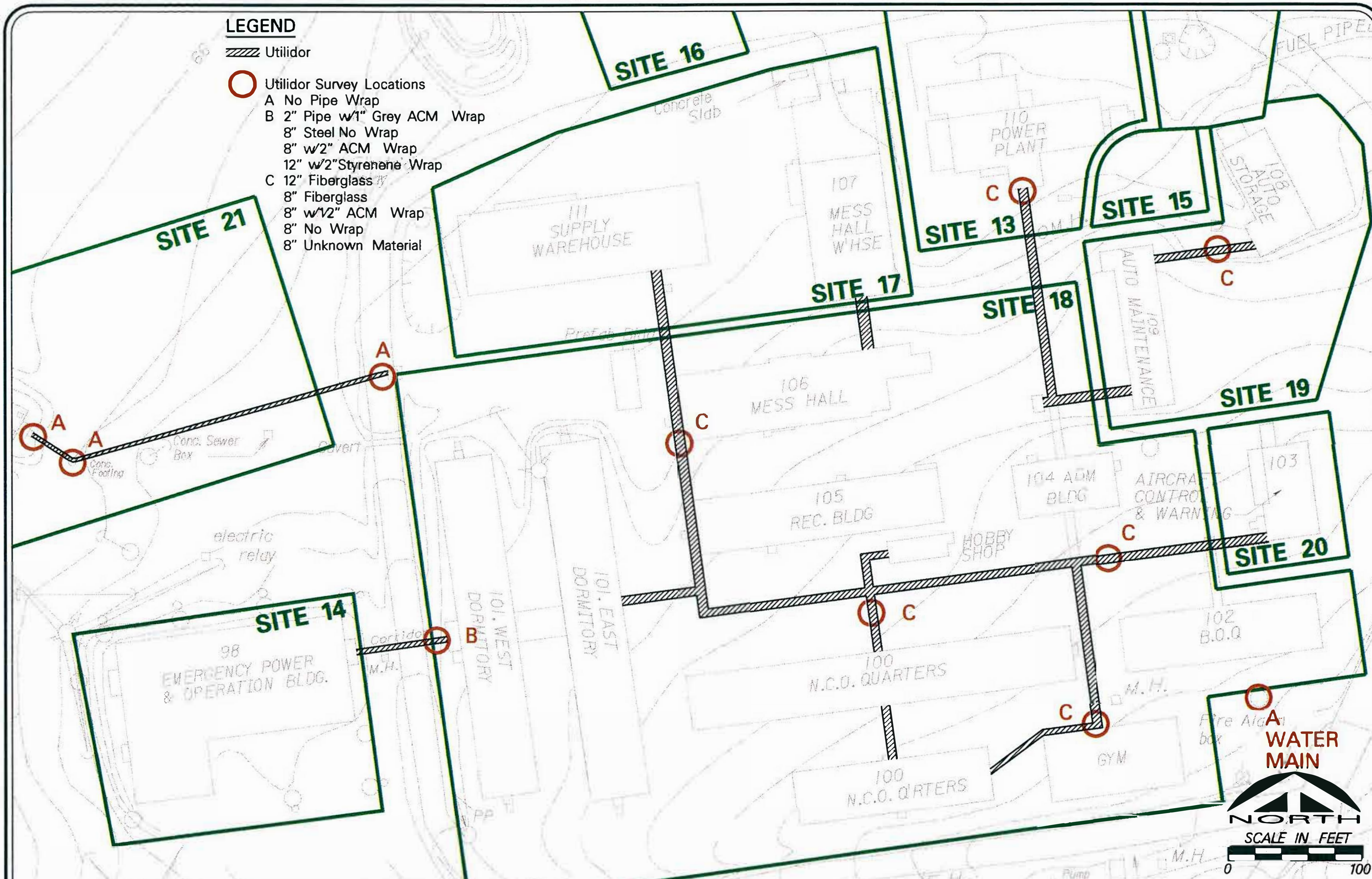

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FIGURE 3-9

U.S. ARMY ENGINEER DISTRICT, ALASKA
N.E. CAPE – ST. LAWRENCE ISLAND, ALASKA

UTILIDOR SAMPLE LOCATIONS

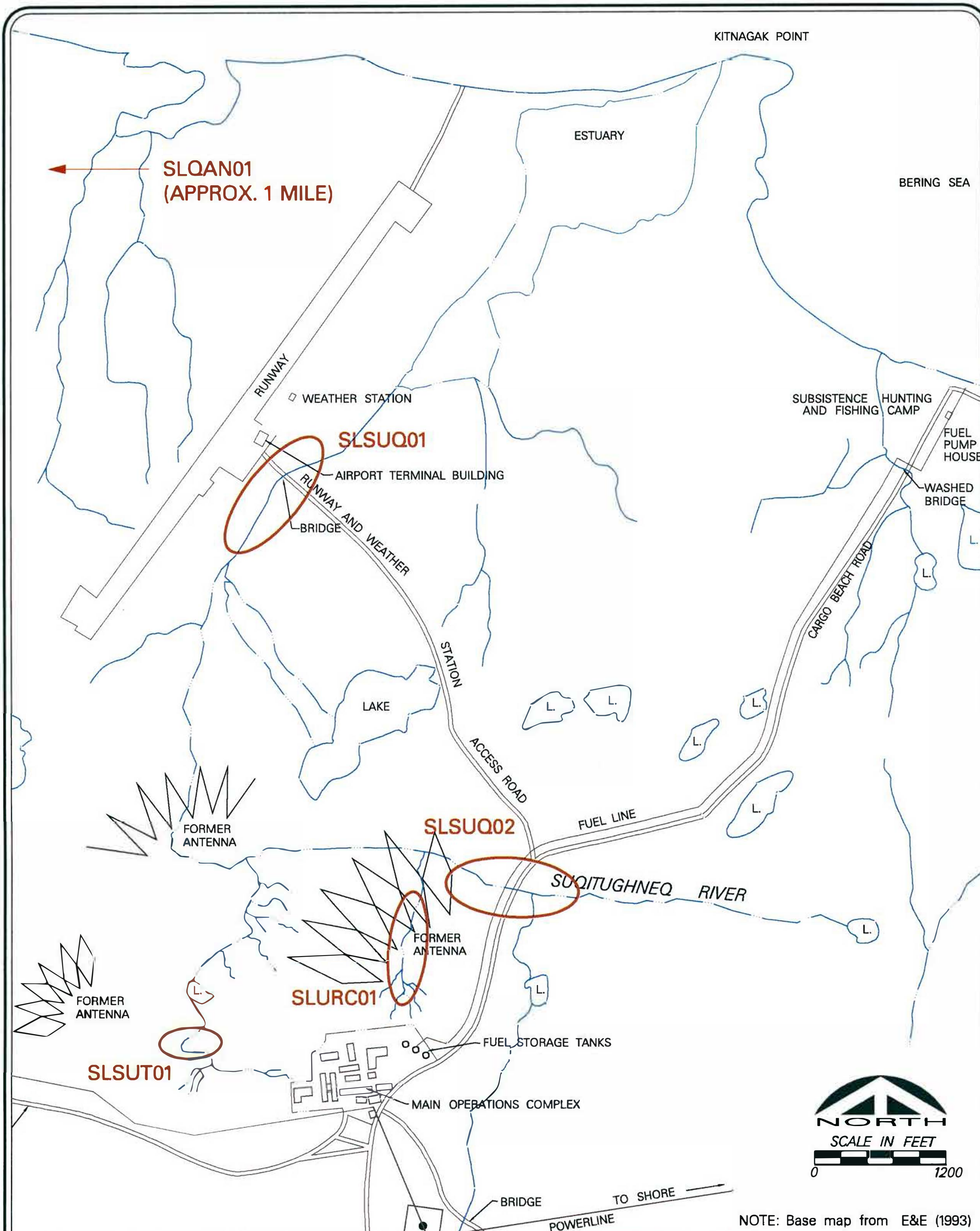

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FIGURE 3–10

U.S. ARMY ENGINEER DISTRICT, ALASKA
N.E. CAPE – ST. LAWRENCE ISLAND, ALASKA

BIOLOGICAL SAMPLING SITES

4. CONCLUSIONS AND RECOMMENDATIONS

The Northeast Cape 1999 Phase II RI was performed to fill data gaps associated with results from 1996 and 1998 Phase II RI work. Conclusions of the Northeast Cape 1999 Phase II RI are summarized in Table 4-1. For sites where new data has affected data interpretation or remediation options, recommendations are presented.

4.1 BACKGROUND SOIL AND SEDIMENT - SITE 30

Background soil and sediment data were required to resolve four data gaps identified during previous investigations:

1. Levels of TRPH and DRO were unexpectedly high and exceeded regulatory criteria in many previous samples, including a background sample.
2. In many areas where DRO was the only fuel contaminant of concern and naturally occurring organics were expected to be low, TRPH levels in soil exceeded DRO levels by up to an order of magnitude. This phenomenon was also observed in a background soil sample collected in 1994, where background levels of 190 mg/Kg DRO and 3,040 mg/Kg TRPH were confirmed by laboratory analysis.
3. In samples collected during 1998, the aromatic and aliphatic fractions of DRO did not sum to the total DRO found using laboratory method AK 102.
4. DRO levels in background soil samples did not appear to be reproducible.

To resolve these data gaps, Montgomery Watson collected three additional background samples in 1999. These samples consisted of:

- One sediment sample representative of sediment collected from surface water in tundra areas
- One soil sample representative of surface soil in tundra areas
- One soil sample representative of surface soil used to construct the gravel pads at the installation

Analysis of 1999 background samples revealed high concentrations of TOC, DRO, and RRO in soil and sediment collected from tundra areas, suggesting that results from samples collected in tundra areas may be heavily influenced by biogenic organic material. The unexpectedly high levels of TRPH and DRO found in previous investigations can probably be attributed to background organics for samples collected from tundra areas.

The only sample collected to represent gravel pad background concentrations was collected during the 1999 Phase II RI. TOC, DRO, and RRO concentrations were low in the background soil sample, indicating that DRO and RRO concentrations for samples collected from gravel pad areas are generally not influenced by naturally occurring organics. Fuel components from

Table 4-1 Summary Of 1999 Phase II RI Work and Results

Site Description	Site	Data Gap	Work Performed	Result	Data Gap Resolved	Conclusion
Cargo Beach Road Landfill	7	Are fuel-related compounds present above benchmark screening criteria?	Sediment sample (including QC and QA samples) collected and analyzed for DRO and RRO using most current ADEC methods.	DRO and RRO concentrations below regulatory limits.	Yes	Fuel contamination not indicated in sediments at this site.
		Can previous high TRPH and low DRO results be confirmed?		High RRO and low DRO concentrations detected.	Yes	High TRPH probably due to high background organic content.
Gasoline Tank Area	12	Are fuel constituents present in soil at this site?	Surface soil samples collected and analyzed for GRO, DRO, RRO, BTEX.	No contaminants present above regulatory limits.	Yes	No fuel contamination indicated in soil at this site.
Wastewater Treatment Facility	21	Is the sludge in the tanks a hazardous waste?	Sample collected and analyzed for PCBs and TCLP metals, pesticides, VOCs, and SVOCs.	PCB concentrations above ADEC and federal criteria.	Yes	Sludge must be disposed at a PCB waste permitted facility.
Buildings Scheduled for Demolition	13, 17, 18	How will potential presence of PCBs in paint affect building demolition debris disposal options?	Building material composite samples collected and analyzed for PCBs.	PCB concentration below 18 AAC 60 solid waste disposal limits.	Yes	Building debris can be disposed in a permitted solid waste landfill.
Painted ASTs	Mult-iple	Are ASTs painted with lead-based paint, posing a potential risk to site workers?	Paint samples collected from painted ASTs and analyzed for lead.	Lead present in all paint samples.	Yes	Abatement and/or PPE recommended to protect site workers during tank demolition.
Background Areas	30	Why are TRPH and DRO concentrations so high in background soil samples?	Soil and sediment samples collected and analyzed for GRO, DRO, RRO, TOC, and TAL metals.	TOC, DRO, and RRO consistently high in tundra areas. Chromatograms indicate biogenic source.	Yes	Background tundra areas have biogenic DRO and RRO above ADEC benchmark criteria.
		Can high TRPH with low DRO concentrations in soil samples be explained?			Yes	High levels of biogenic organics are likely source of high TRPH results in tundra areas.
		Do DRO aliphatic and aromatic fractions sum to total DRO concentration?	Background samples were not analyzed for DRO aliphatic and aromatic fractions.	No data obtained to resolve this data gap.	No	Should evaluate whether the value of this data warrants the effort necessary to obtain it.

Table 4-1 (Continued) Summary Of 1999 Phase II RI Work and Results

Site Description	Site	Data Gap	Work Performed	Result	Data Gap Resolved	Conclusion
Background Areas (continued)		Are DRO results reproducible?	Current and previous analytical results compared.	Analytes and analytical methods not consistent over the study period; DRO results vary depending on location and soil type.	No	Comparison of DRO data obtained using different analytical methods not recommended.
Buried Drum Field	10	Is POL product present in buried drums and causing soil staining?	Test pits excavated, drums exposed and examined.	No leaking drums were found. One intact drum full of POL product was uncovered.	Yes	Previous surface spills are likely source of soil staining.
Housing Facilities and Squad Headquarters	18	Do STB and DS-2 chemical residuals remain in the former storage area?	Sodium bicarbonate and sodium bisulfate slurries applied to former storage area.	Residuals neutralized by slurry.	Yes	Materials not expected to exhibit hazardous waste characteristics.
Main Operations Complex	Mult -iple	Can the utilidor piping be accessed during BD/DR activities?	Visual survey conducted throughout the utilidor system.	Piping accessibility determined.	Yes	Pipes expected to be easily accessible during BD/DR activities, especially once aboveground structures are removed.
		Does piping insulation consist of PACM?	Piping insulation inspected during utilidor survey.	Pipe insulation includes PACM.	Yes	Pipe insulation will require handling as PACM.
		Do the utilidors provide contaminant migration pathways?	Contaminant migration potential evaluated during utilidor survey.	Utilidors upgradient of spill sites; no contaminant migration observed.	Yes	Utilidors not believed to be contaminant migration pathways.
Drainage Basin Area, Suqitughneq River	28, 29	Has fuel contamination impacted the ecological health of these areas?	Biological sampling performed including sediment toxicity, fish tissue toxicity, and habitat assessments.	Toxicity and bioavailability of contaminants verified in sediment samples; PAHs and PCBs detected in fish tissues.	Yes	Contamination has adversely impacted the ecology downstream of the fuel spill site.

Table 4-1 (Continued) Summary Of 1999 Phase II RI Work and Results

Site Description	Site	Data Gap	Work Performed	Result	Data Gap Resolved	Conclusion
Sample Locations	Mult -iple	NA	Sampling and test pit locations surveyed.	Sampling and test pit locations accurately located.	NA	NA
Installation Structures	Mult -iple	NA	Qualified Historical Architect documented installation structures.	SHPO requirements were met.	NA	NA

ADEC - Alaska Department of Environmental Conservation
AST - aboveground storage tank
BD/DR - building demolition and debris removal
BTEX - benzene, toluene, ethylbenzene, and xylenes
DRO - diesel range organic
DS-2 - decontamination agent 2
GRO - gasoline range organic
NA - not applicable
PACM - presumed asbestos-containing materials
PAH - polynuclear aromatic hydrocarbons
PCB - polychlorinated biphenyl
POL - petroleum, oil, and lubricant
PPE - personal protective equipment
QA - quality assurance
QC - quality control
RRO - residual range organic
SHPO - State Historical Preservation Office
STB - super tropical bleach
SVOC - semivolatile organic compound
TAL - target analyte list
TCLP - toxicity characteristic leaching procedure
TOC - total organic content
TRPH - total recoverable petroleum hydrocarbons
VOC - volatile organic compound

outside the DRO and RRO ranges may be responsible for the high TRPH levels previously found in some gravel pad samples. This could be confirmed only by further sampling.

Several TAL metals were found in all 1999 background samples in concentrations exceeding ADEC Method 2 criteria by up to two orders of magnitude. The background gravel area sample had the highest metals concentrations.

Given the 1999 data, there is enough evidence to suggest that background concentrations could effect the interpretation of some analytical data. This should be taken into consideration when making remediation recommendations for sites with metals contamination or sites with high DRO concentrations located in tundra environments. DRO and RRO found in gravel pad areas are probably not due to biogenic organics.

The 1999 data cannot be used to calculate background concentrations for application installation-wide as alternate cleanup levels because not enough background samples were collected to constitute a statistically significant population. Therefore, no new site-specific cleanup levels or changes to the remediation recommendations made in the Phase II RI Final Report (MW, 1999) are proposed at this time. Alternate cleanup levels for DRO and metals could be calculated if adequate additional background samples were collected. Alternate cleanup levels based on background concentrations have the potential to be markedly different than the cleanup levels currently proposed for Northeast Cape.

4.2 BIOLOGICAL ASSESSMENT AT DRAINAGE BASIN, SUQITUGHNEQ RIVER, AND CONTROL STREAM - SITES 28, 29 AND 30

Macroinvertebrate and fish community assessments and Microtox® bacterial bioassays verified the toxicity and bioavailability of contaminants in the downstream Suqitughneq River and the spill tributary. PCBs and PAHs were detected in fish tissues of Dolly Varden char and Alaska blackfish collected throughout the Suqitughneq River drainage.

The 1999 biological assessment did not determine the extent to which the Suqitughneq River drainage is used by wildlife or whether toxicants have accumulated in wildlife tissue. Migration of fish to other water bodies on St. Lawrence Island and potential for human consumption of wildlife species that have accumulated toxicants should be evaluated to refine the remedial action plan and more accurately measure risks to human and ecosystem health from the Northeast Cape FUDS.

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APPENDIX A

Site Photographs

Biological Sampling at SLSUQ01

SLSUQ01

Biological Sampling at SLSUQ01

Biological sampling at SLSUQ01

Sheen after kicking the bank at SLSUQ01

Electrofishing at SLSUQ01

MONTGOMERY WATSON
Anchorage, Alaska

APPENDIX A

U.S. ARMY ENGINEER DISTRICT, ALASKA
NORTHEAST CAPE PHASE II R. I., 1999 FIELD WORK

SITE PHOTOGRAPHS

Electrofishing at SLSUQ01

Biological sampling at drainage basin upstream of Suqitughneq River

Sediment sampling location at Site 7

Site 10 bluff

Site 10 excavation

Digging test pits at Site 10

Digging test pits
at Site 10

Site 10 excavation

Buried drum excavated at Site 10

Clearing cobbles before collecting soil sample SS01 at Site 12

MONTGOMERY WATSON
Anchorage, Alaska

APPENDIX A

U.S. ARMY ENGINEER DISTRICT, ALASKA
NORTHEAST CAPE PHASE II R. I., 1999 FIELD WORK

SITE PHOTOGRAPHS

Site 12, SS04, SS03, and SS02 locations

Site 12, SS05 location

Sampling building materials at Site 13

Sampling building materials at Site 13

Preparing to sample building materials at Site 17

Using a saw to access the utilidor at Site 19

Utilidor pipes at Site 13

Utilidor pipes at Site 13

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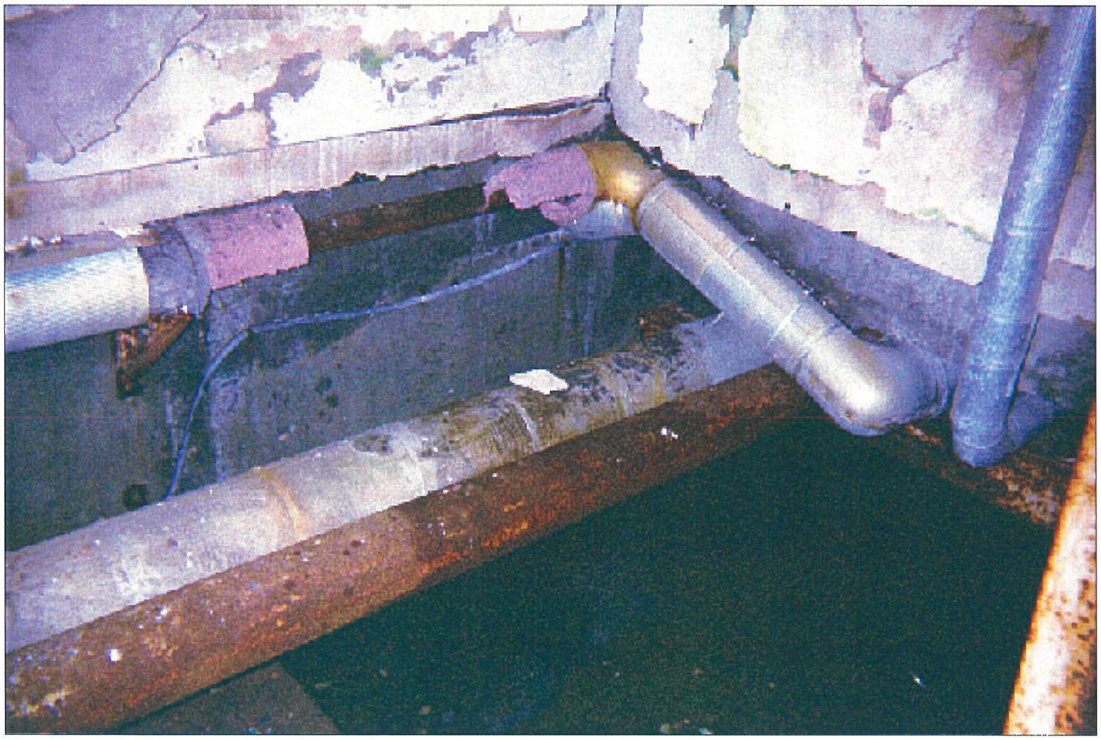
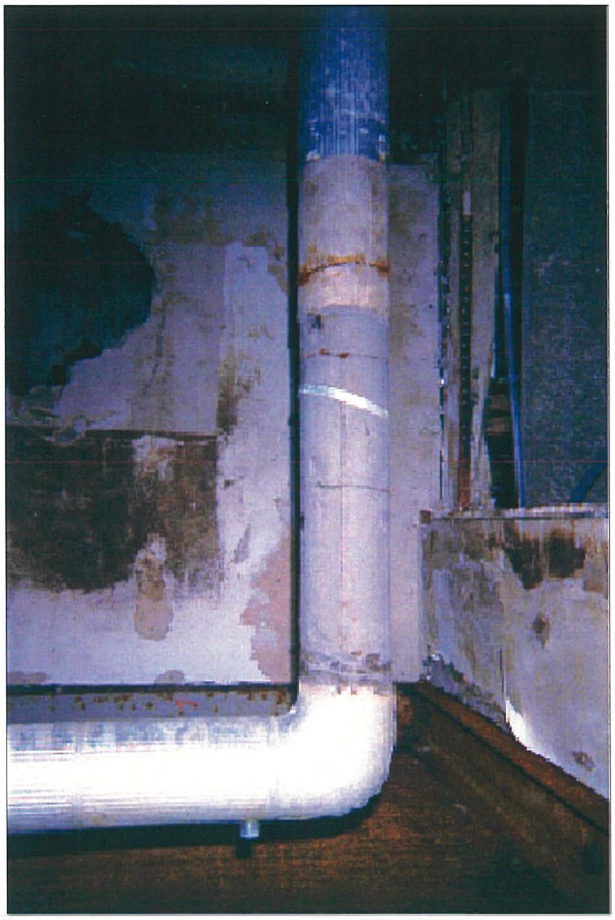


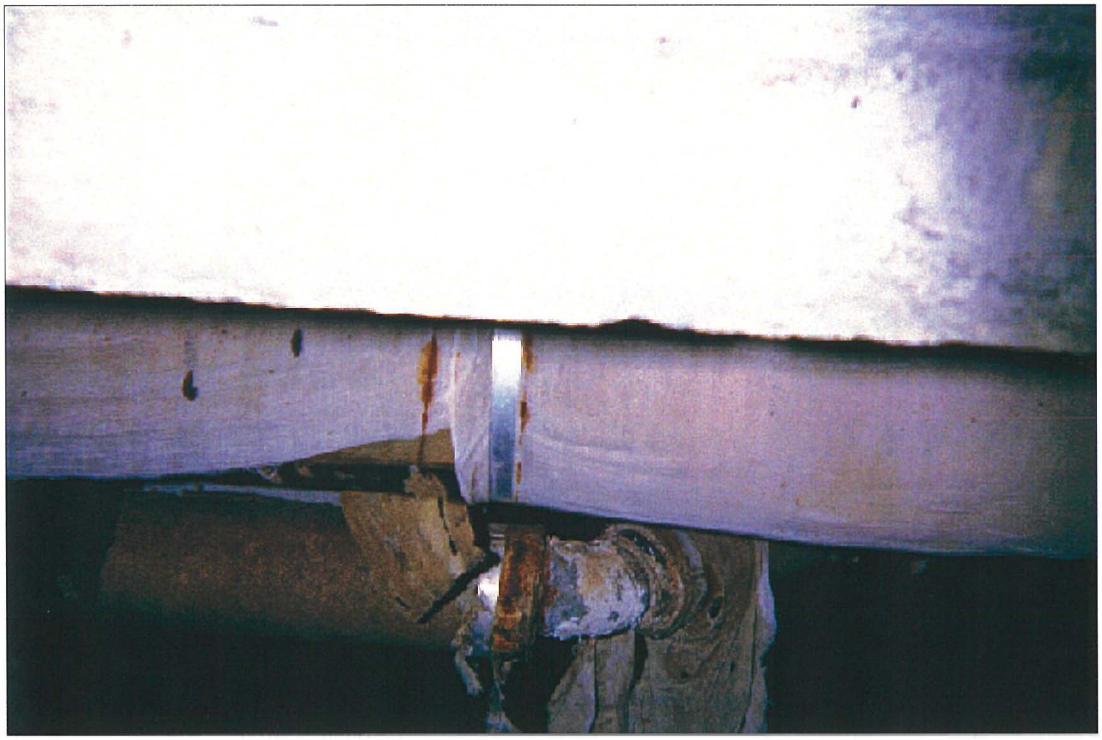
Utilidor pipes at Site 13

Utilidor pipes at Site 13

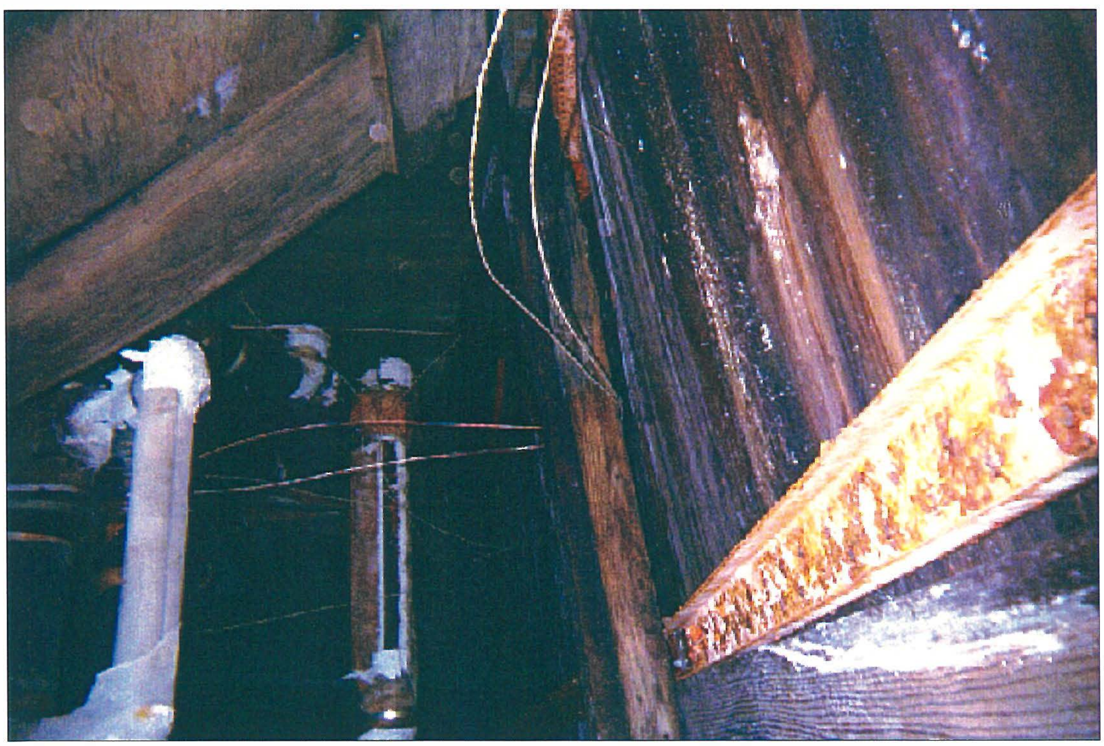


Pipes with wrap, Site 13

Partially collapsed arctic walkway over utilidor



Piping in utilidor



Piping in utilidor

Vault from Rec Hall

Pipe vault at Site 21 attached to structure

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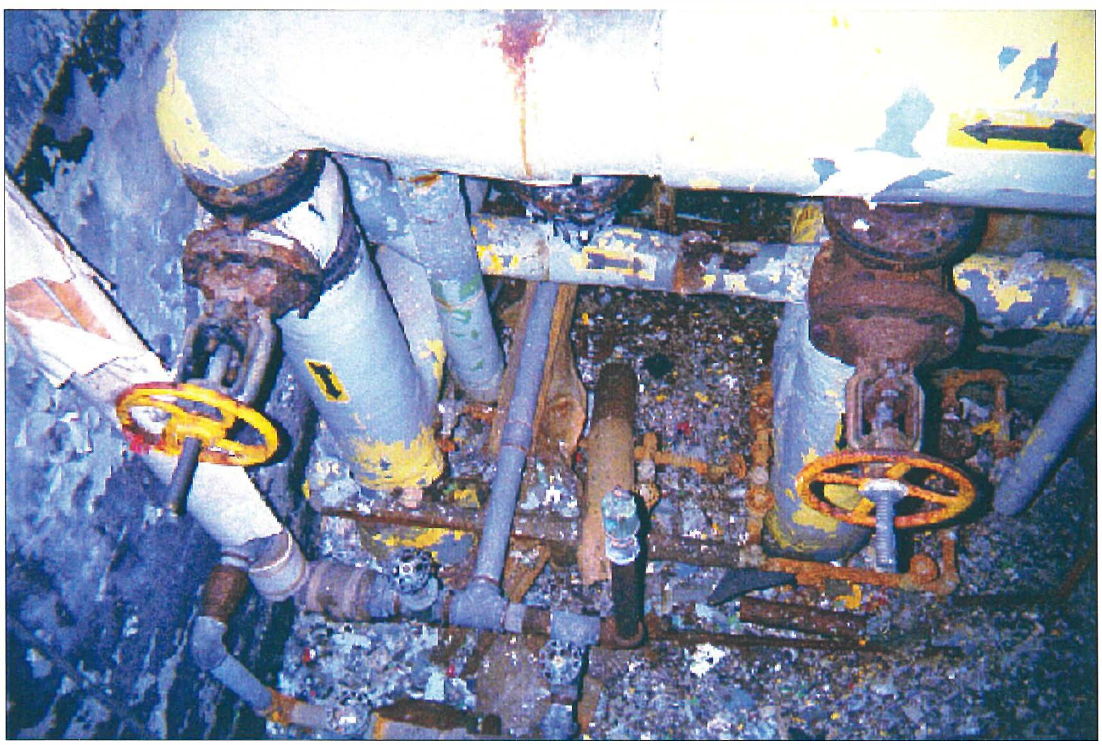
MONTGOMERY WATSON
Anchorage, Alaska

APPENDIX A

U.S. ARMY ENGINEER DISTRICT, ALASKA
NORTHEAST CAPE PHASE II R. I., 1999 FIELD WORK

SITE PHOTOGRAPHS

Pipe vault leading to Site 21 on east side of road



Pipes and pipe wrap in Building 101

Pipes and pipe wrap
in Building 101

Utilidor pipes

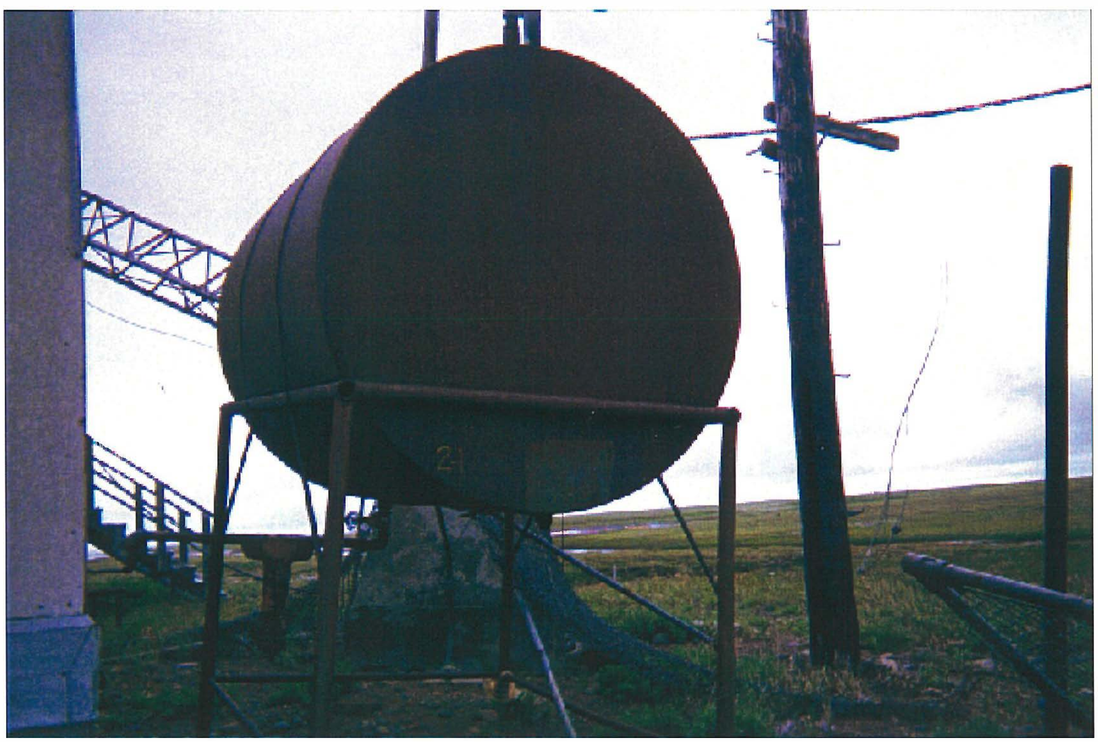
Chemical neutralization
in Building 101

Chemical neutralization in Building 101

Chemical neutralization in Building 101

Sludge sampling attempt at Site 21

Composting a sludge sample at Site 21



Tank 2-1

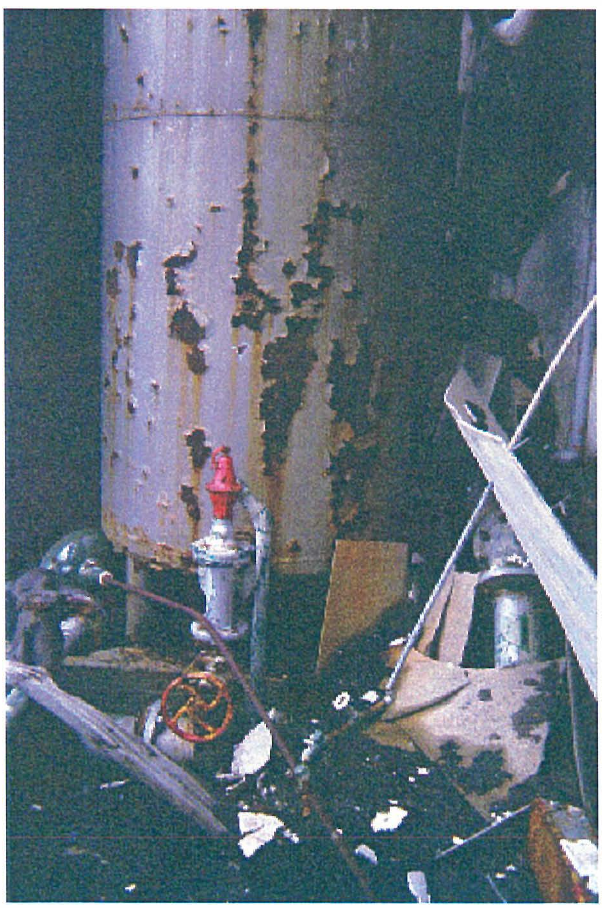
Tank 6-1

Tanks 11-2, 11-3

Tank 13-4

Site 13 interior water tank

Tank 16-1



AST in building at Site 13
(next to water tank)

Background sampling location at gravel area

Background soil and sediment sample location with White Alice in the distance

Survey at Site 10

Survey at Site 7

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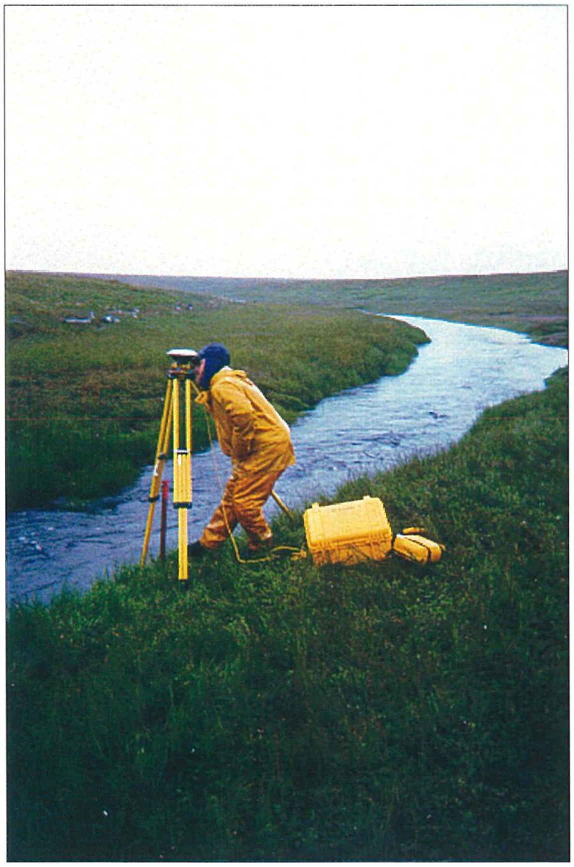

Survey at reference stream

Montgomery Watson field team leader Bonnie McLean with local residents and visitors

APPENDIX B

Laboratory Results

Northeast Cape
Complete Analytical Data

Field Sample ID	Samp. Date	Parameter	Result	MRL	Units	Flag	Method	Lab Samp. No.	Lab
99NEC03MI901	07/31/1999	Lead	ND	(16.0000)	mg/kg	U,CI	SW6010	821765-1	MAS
99NEC03MI902	07/31/1999	Lead	ND	(31.0000)	mg/kg	U,CI	SW6010	821765-2	MAS
99NEC04MI901	07/31/1999	Lead	1100.0000	(16.0000)	mg/kg		SW6010	821765-3	MAS
99NEC04MI902	07/31/1999	Lead	2100.0000	(110.0000)	mg/kg		SW6010	821765-4	MAS
99NEC06MI901	08/01/1999	Lead	42000.0000	(190.0000)	mg/kg		SW6010	821765-5	MAS
99NEC07SD901	08/01/1999	Diesel Range Organics	380.0000	(110.0000)	mg/kg		AK102	821760-1	MAS
99NEC07SD901	08/01/1999	Oil, Misc.	3900.0000	(220 0000)	mg/kg		AK103	821760-1	MAS
99NEC07SD902	08/01/1999	Diesel Range Organics	340.0000	(77.0000)	mg/kg		AK102	821760-2	MAS
99NEC07SD902	08/01/1999	Oil, Misc.	3600.0000	(150.0000)	mg/kg		AK103	821760-2	MAS
99NEC11MI901	08/01/1999	Lead	1400.0000	(16.0000)	mg/kg		SW6010	821765-6	MAS
99NEC11MI902	08/01/1999	Lead	920.0000	(16.0000)	mg/kg		SW6010	821765-7	MAS
99NEC11MI903	08/01/1999	Lead	1200.0000	(16.0000)	mg/kg		SW6010	821765-8	MAS
99NEC12MI901	08/01/1999	Lead	64000.0000	(320.0000)	mg/kg		SW6010	821765-18	MAS
99NEC12SB901	08/01/1999	Gasoline Range Organics	22.0000	(5.0000)	mg/kg		AK101	821760-3	MAS
99NEC12SB901	08/01/1999	Diesel Range Organics	140.0000	(11.0000)	mg/kg		AK102	821760-3	MAS
99NEC12SB901	08/01/1999	Oil, Misc.	230.0000	(22.0000)	mg/kg		AK103	821760-3	MAS
99NEC12SB901	08/01/1999	Benzene	ND	(0.0200)	mg/kg	U	SW8021F	821760-3	MAS
99NEC12SB901	08/01/1999	Ethylbenzene	0.1100	(0.0250)	mg/kg		SW8021F	821760-3	MAS
99NEC12SB901	08/01/1999	Toluene	ND	(0.0250)	mg/kg	U	SW8021F	821760-3	MAS
99NEC12SB901	08/01/1999	Xylenes	0.1600	(0.0250)	mg/kg		SW8021F	821760-3	MAS
99NEC12SS902	08/01/1999	Gasoline Range Organics	ND	(5.7000)	mg/kg	U	AK101	821760-4	MAS
99NEC12SS902	08/01/1999	Diesel Range Organics	42.0000	(12.0000)	mg/kg		AK102	821760-4	MAS
99NEC12SS902	08/01/1999	Oil, Misc.	560.0000	(24.0000)	mg/kg		AK103	821760-4	MAS
99NEC12SS902	08/01/1999	Benzene	ND	(0.0230)	mg/kg	U	SW8021F	821760-4	MAS
99NEC12SS902	08/01/1999	Ethylbenzene	ND	(0.0280)	mg/kg	U	SW8021F	821760-4	MAS
99NEC12SS902	08/01/1999	Toluene	ND	(0.0280)	mg/kg	U	SW8021F	821760-4	MAS
99NEC12SS902	08/01/1999	Xylenes	ND	(0.0280)	mg/kg	U	SW8021F	821760-4	MAS
99NEC12SS903	08/01/1999	Gasoline Range Organics	ND	(6.0000)	mg/kg	U	AK101	821760-5	MAS
99NEC12SS903	08/01/1999	Diesel Range Organics	68.0000	(60.0000)	mg/kg		AK102	821760-5	MAS
99NEC12SS903	08/01/1999	Oil, Misc.	620.0000	(120.0000)	mg/kg		AK103	821760-5	MAS
99NEC12SS903	08/01/1999	Benzene	ND	(0.0240)	mg/kg	U	SW8021F	821760-5	MAS
99NEC12SS903	08/01/1999	Ethylbenzene	ND	(0.0300)	mg/kg	U	SW8021F	821760-5	MAS
99NEC12SS903	08/01/1999	Toluene	0.0310	(0.0300)	mg/kg		SW8021F	821760-5	MAS
99NEC12SS903	08/01/1999	Xylenes	ND	(0.0300)	mg/kg	U	SW8021F	821760-5	MAS
99NEC12SS904	08/01/1999	Gasoline Range Organics	11.0000	(6.1000)	mg/kg		AK101	821760-6	MAS
99NEC12SS904	08/01/1999	Diesel Range Organics	59.0000	(11.0000)	mg/kg		AK102	821760-6	MAS
99NEC12SS904	08/01/1999	Oil, Misc.	470.0000	(23.0000)	mg/kg		AK103	821760-6	MAS
99NEC12SS904	08/01/1999	Benzene	ND	(0.0240)	mg/kg	U	SW8021F	821760-6	MAS
99NEC12SS904	08/01/1999	Ethylbenzene	ND	(0.0310)	mg/kg	U	SW8021F	821760-6	MAS
99NEC12SS904	08/01/1999	Toluene	ND	(0.0310)	mg/kg	U	SW8021F	821760-6	MAS
99NEC12SS904	08/01/1999	Xylenes	0.0350	(0.0310)	mg/kg		SW8021F	821760-6	MAS
99NEC12SS905	08/01/1999	Gasoline Range Organics	ND	(5.9000)	mg/kg	U	AK101	821760-7	MAS
99NEC12SS905	08/01/1999	Diesel Range Organics	29.0000	(13.0000)	mg/kg		AK102	821760-7	MAS
99NEC12SS905	08/01/1999	Oil, Misc.	290.0000	(26.0000)	mg/kg		AK103	821760-7	MAS
99NEC12SS905	08/01/1999	Benzene	ND	(0.0240)	mg/kg	U	SW8021F	821760-7	MAS
99NEC12SS905	08/01/1999	Ethylbenzene	ND	(0.0290)	mg/kg	U	SW8021F	821760-7	MAS
99NEC12SS905	08/01/1999	Toluene	ND	(0.0290)	mg/kg	U	SW8021F	821760-7	MAS
99NEC12SS905	08/01/1999	Xylenes	ND	(0.0290)	mg/kg	U	SW8021F	821760-7	MAS
99NEC12SS906	08/01/1999	Gasoline Range Organics	ND	(5.6000)	mg/kg	U	AK101	821760-8	MAS
99NEC12SS906	08/01/1999	Diesel Range Organics	46.0000	(11.0000)	mg/kg		AK102	821760-8	MAS
99NEC12SS906	08/01/1999	Oil, Misc.	390.0000	(22.0000)	mg/kg		AK103	821760-8	MAS
99NEC12SS906	08/01/1999	Benzene	ND	(0.0230)	mg/kg	U	SW8021F	821760-8	MAS
99NEC12SS906	08/01/1999	Ethylbenzene	ND	(0.0280)	mg/kg	U	SW8021F	821760-8	MAS
99NEC12SS906	08/01/1999	Toluene	ND	(0.0280)	mg/kg	U	SW8021F	821760-8	MAS

:ag Key: CI See narrative
J EPA Flag. Estimated value
U EPA Flag - Compound was analyzed for, but was not detected
VLB Val. Qual.: Result negatively biased.
VQQ Val. Qual.: PQL approx. due to QC or matrix effects
VR Val. Qual.: rejected value

Field Sample ID	Samp. Date	Parameter	Result	MRL	Units	Flag	Method	Lab Samp. No.	Lab
99NEC12SS906	08/01/1999	Xylenes	ND	(0.0280)	mg/kg	U	SW8021F	821760-8	MAS
99NEC12TB901	08/01/1999	Gasoline Range Organics	ND	(5.3000)	mg/kg	U	AK101	821760-13	MAS
99NEC12TB901	08/01/1999	Benzene	ND	(0.0210)	mg/kg	U	SW8021F	821760-13	MAS
99NEC12TB901	08/01/1999	Ethylbenzene	ND	(0.0270)	mg/kg	U	SW8021F	821760-13	MAS
99NEC12TB901	08/01/1999	Toluene	ND	(0.0270)	mg/kg	U	SW8021F	821760-13	MAS
99NEC12TB901	08/01/1999	Xylenes	ND	(0.0270)	mg/kg	U	SW8021F	821760-13	MAS
99NEC13BD901	08/02/1999	PCB-1016 (Aroclor 1016)	ND	(3.3000)	ug/l	U,VQQ	SW8082	821774-1	MAS
99NEC13BD901	08/02/1999	PCB-1016 (Aroclor 1016)	ND	(0.0330)	mg/kg	U,VQQ	SW8082	821774-1	MAS
99NEC13BD901	08/02/1999	PCB-1221 (Aroclor 1221)	ND	(6.7000)	ug/l	U,VQQ	SW8082	821774-1	MAS
99NEC13BD901	08/02/1999	PCB-1221 (Aroclor 1221)	ND	(0.0330)	mg/kg	U,VQQ	SW8082	821774-1	MAS
99NEC13BD901	08/02/1999	PCB-1232 (Aroclor 1232)	ND	(3.3000)	ug/l	U,VQQ	SW8082	821774-1	MAS
99NEC13BD901	08/02/1999	PCB-1232 (Aroclor 1232)	ND	(0.0330)	mg/kg	U,VQQ	SW8082	821774-1	MAS
99NEC13BD901	08/02/1999	PCB-1242 (Aroclor 1242)	ND	(3.3000)	ug/l	U,VQQ	SW8082	821774-1	MAS
99NEC13BD901	08/02/1999	PCB-1242 (Aroclor 1242)	ND	(0.0330)	mg/kg	U,VQQ	SW8082	821774-1	MAS
99NEC13BD901	08/02/1999	PCB-1248 (Aroclor 1248)	ND	(3.3000)	ug/l	U,VQQ	SW8082	821774-1	MAS
99NEC13BD901	08/02/1999	PCB-1248 (Aroclor 1248)	ND	(0.0330)	mg/kg	U,VQQ	SW8082	821774-1	MAS
99NEC13BD901	08/02/1999	PCB-1254 (Aroclor 1254)	ND	(3.3000)	ug/l	U,VQQ	SW8082	821774-1	MAS
99NEC13BD901	08/02/1999	PCB-1254 (Aroclor 1254)	ND	(0.0330)	mg/kg	U,VQQ	SW8082	821774-1	MAS
99NEC13BD901	08/02/1999	PCB-1260 (Aroclor 1260)	ND	(3.3000)	ug/l	U,VQQ	SW8082	821774-1	MAS
99NEC13BD901	08/02/1999	PCB-1260 (Aroclor 1260)	0.2800	(0.0330)	mg/kg	VLB	SW8082	821774-1	MAS
99NEC13BD901	08/02/1999	Total Polychlorinatedbiphenyls	ND	(3.3000)	ug/l	U,VQQ	SW8082	821774-1	MAS
99NEC13BD901	08/02/1999	Total Polychlorinatedbiphenyls	0.2800	(0.0330)	mg/kg	VLB	SW8082	821774-1	MAS
99NEC13MI901	07/31/1999	Lead	99.0000	(33.0000)	mg/kg		SW6010	821765-9	MAS
99NEC13MI902	08/01/1999	Lead	100000.0000	(410.0000)	mg/kg		SW6010	821765-10	MAS
99NEC13MI903	08/01/1999	Lead	110000.0000	(500.0000)	mg/kg		SW6010	821765-11	MAS
99NEC13MI904	08/01/1999	Lead	100000.0000	(410.0000)	mg/kg		SW6010	821765-12	MAS
99NEC14MI901	07/31/1999	Lead	49000.0000	(330.0000)	mg/kg		SW6010	821765-13	MAS
99NEC16MI901	08/01/1999	Lead	140000.0000	(570.0000)	mg/kg		SW6010	821765-14	MAS
99NEC17BD901	08/02/1999	PCB-1016 (Aroclor 1016)	ND	(3.3000)	ug/l	U,VQQ	SW8082	821774-2	MAS
99NEC17BD901	08/02/1999	PCB-1016 (Aroclor 1016)	ND	(0.0330)	mg/kg	U,VQQ	SW8082	821774-2	MAS
99NEC17BD901	08/02/1999	PCB-1221 (Aroclor 1221)	ND	(6.7000)	ug/l	U,VQQ	SW8082	821774-2	MAS
99NEC17BD901	08/02/1999	PCB-1221 (Aroclor 1221)	ND	(0.0330)	mg/kg	U,VQQ	SW8082	821774-2	MAS
99NEC17BD901	08/02/1999	PCB-1232 (Aroclor 1232)	ND	(3.3000)	ug/l	U,VQQ	SW8082	821774-2	MAS
99NEC17BD901	08/02/1999	PCB-1232 (Aroclor 1232)	ND	(0.0330)	mg/kg	U,VQQ	SW8082	821774-2	MAS
99NEC17BD901	08/02/1999	PCB-1242 (Aroclor 1242)	ND	(3.3000)	ug/l	U,VQQ	SW8082	821774-2	MAS
99NEC17BD901	08/02/1999	PCB-1242 (Aroclor 1242)	ND	(0.0330)	mg/kg	U,VQQ	SW8082	821774-2	MAS
99NEC17BD901	08/02/1999	PCB-1248 (Aroclor 1248)	ND	(3.3000)	ug/l	U,VQQ	SW8082	821774-2	MAS
99NEC17BD901	08/02/1999	PCB-1248 (Aroclor 1248)	0.1100	(0.0330)	mg/kg	VLB	SW8082	821774-2	MAS
99NEC17BD901	08/02/1999	PCB-1254 (Aroclor 1254)	ND	(3.3000)	ug/l	U,VQQ	SW8082	821774-2	MAS
99NEC17BD901	08/02/1999	PCB-1254 (Aroclor 1254)	ND	(0.0330)	mg/kg	U,VQQ	SW8082	821774-2	MAS
99NEC17BD901	08/02/1999	PCB-1260 (Aroclor 1260)	1.5000	(3.3000)	ug/l	J,VLB	SW8082	821774-2	MAS
99NEC17BD901	08/02/1999	PCB-1260 (Aroclor 1260)	2.6000	(0.3300)	mg/kg	VLB	SW8082	821774-2	MAS
99NEC17BD901	08/02/1999	Total Polychlorinatedbiphenyls	1.5000	(3.3000)	ug/l	J,VLB	SW8082	821774-2	MAS
99NEC17BD901	08/02/1999	Total Polychlorinatedbiphenyls	2.7000	(0.0330)	mg/kg	VLB	SW8082	821774-2	MAS
99NEC18BD901	08/02/1999	PCB-1016 (Aroclor 1016)	ND	(3.3000)	ug/l	U,VQQ	SW8082	821774-3	MAS
99NEC18BD901	08/02/1999	PCB-1016 (Aroclor 1016)	ND	(0.0330)	mg/kg	U,VQQ	SW8082	821774-3	MAS
99NEC18BD901	08/02/1999	PCB-1221 (Aroclor 1221)	ND	(6.7000)	ug/l	U,VQQ	SW8082	821774-3	MAS
99NEC18BD901	08/02/1999	PCB-1221 (Aroclor 1221)	ND	(0.0330)	mg/kg	U,VQQ	SW8082	821774-3	MAS
99NEC18BD901	08/02/1999	PCB-1232 (Aroclor 1232)	ND	(3.3000)	ug/l	U,VQQ	SW8082	821774-3	MAS
99NEC18BD901	08/02/1999	PCB-1232 (Aroclor 1232)	ND	(0.0330)	mg/kg	U,VQQ	SW8082	821774-3	MAS
99NEC18BD901	08/02/1999	PCB-1242 (Aroclor 1242)	ND	(3.3000)	ug/l	U,VQQ	SW8082	821774-3	MAS
99NEC18BD901	08/02/1999	PCB-1242 (Aroclor 1242)	ND	(0.0330)	mg/kg	U,VQQ	SW8082	821774-3	MAS
99NEC18BD901	08/02/1999	PCB-1248 (Aroclor 1248)	ND	(3.3000)	ug/l	U,VQQ	SW8082	821774-3	MAS
99NEC18BD901	08/02/1999	PCB-1248 (Aroclor 1248)	0.1600	(0.0330)	mg/kg	VLB	SW8082	821774-3	MAS

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Field Sample ID	Samp. Date	Parameter	Result	MRL	Units	Flag	Method	Lab Samp. No.	Lab
99NEC18BD901	08/02/1999	PCB-1254 (Aroclor 1254)	ND	(3.3000)	ug/l	U,VQQ	SW8082	821774-3	MAS
99NEC18BD901	08/02/1999	PCB-1254 (Aroclor 1254)	ND	(0.0330)	mg/kg	U,VQQ	SW8082	821774-3	MAS
99NEC18BD901	08/02/1999	PCB-1260 (Aroclor 1260)	ND	(3.3000)	ug/l	U,VQQ	SW8082	821774-3	MAS
99NEC18BD901	08/02/1999	PCB-1260 (Aroclor 1260)	1.6000	(0.3300)	mg/kg	VLB	SW8082	821774-3	MAS
99NEC18BD901	08/02/1999	Total Polychlorinatedbiphenyls	ND	(3.3000)	ug/l	U	SW8082	821774-3	MAS
99NEC18BD901	08/02/1999	Total Polychlorinatedbiphenyls	1.8000	(0.0330)	mg/kg	VLB	SW8082	821774-3	MAS
99NEC18MI901	08/01/1999	Lead	350.0000	(31.0000)	mg/kg		SW6010	821765-15	MAS
99NEC19MI901	07/31/1999	Lead	4100.0000	(17.0000)	mg/kg		SW6010	821765-16	MAS
99NEC19MI902	07/31/1999	Lead	93000.0000	(410.0000)	mg/kg		SW6010	821765-17	MAS
99NEC21SD901	08/01/1999	Percent Moisture	54.0000	(0.0000)	percent		CLPPM	821760-12	MAS
99NEC21SD901	08/01/1999	Arsenic	ND	(0.1000)	mg/l	U	SW6010	821760-12	MAS
99NEC21SD901	08/01/1999	Barium	0.8300	(0.2000)	mg/l		SW6010	821760-12	MAS
99NEC21SD901	08/01/1999	Cadmium	ND	(0.0050)	mg/l	U	SW6010	821760-12	MAS
99NEC21SD901	08/01/1999	Chromium	ND	(0.0100)	mg/l	U	SW6010	821760-12	MAS
99NEC21SD901	08/01/1999	Lead	ND	(0.0300)	mg/l	U	SW6010	821760-12	MAS
99NEC21SD901	08/01/1999	Selenium	ND	(0.1000)	mg/l	U	SW6010	821760-12	MAS
99NEC21SD901	08/01/1999	Silver	ND	(0.0100)	mg/l	U	SW6010	821760-12	MAS
99NEC21SD901	08/01/1999	Mercury	ND	(0.0002)	mg/l	U	SW7470A	821760-12	MAS
99NEC21SD901	08/01/1999	Chlordane	ND	(0.0007)	mg/l	U	SW8081A	821760-12	MAS
99NEC21SD901	08/01/1999	Endrin	ND	(0.0003)	mg/l	U	SW8081A	821760-12	MAS
99NEC21SD901	08/01/1999	Heptachlor	ND	(0.0002)	mg/l	U	SW8081A	821760-12	MAS
99NEC21SD901	08/01/1999	Heptachlor epoxide	ND	(0.0002)	mg/l	U	SW8081A	821760-12	MAS
99NEC21SD901	08/01/1999	Methoxychlor	ND	(0.0017)	mg/l	U	SW8081A	821760-12	MAS
99NEC21SD901	08/01/1999	Toxaphene	ND	(0.0050)	mg/l	U	SW8081A	821760-12	MAS
99NEC21SD901	08/01/1999	gamma-BHC (Lindane)	ND	(0.0002)	mg/l	U	SW8081A	821760-12	MAS
99NEC21SD901	08/01/1999	PCB-1016 (Aroclor 1016)	ND	(0.7200)	mg/kg	U,CI	SW8082	821760-12	MAS
99NEC21SD901	08/01/1999	PCB-1221 (Aroclor 1221)	ND	(0.7200)	mg/kg	U,CI	SW8082	821760-12	MAS
99NEC21SD901	08/01/1999	PCB-1232 (Aroclor 1232)	ND	(0.7200)	mg/kg	U,CI	SW8082	821760-12	MAS
99NEC21SD901	08/01/1999	PCB-1242 (Aroclor 1242)	ND	(0.7200)	mg/kg	U,CI	SW8082	821760-12	MAS
99NEC21SD901	08/01/1999	PCB-1248 (Aroclor 1248)	ND	(0.7200)	mg/kg	U,CI	SW8082	821760-12	MAS
99NEC21SD901	08/01/1999	PCB-1254 (Aroclor 1254)	52.0000	(7.2000)	mg/kg		SW8082	821760-12	MAS
99NEC21SD901	08/01/1999	PCB-1260 (Aroclor 1260)	70.0000	(7.2000)	mg/kg		SW8082	821760-12	MAS
99NEC21SD901	08/01/1999	Total Polychlorinatedbiphenyls	120.0000	(0.7200)	mg/kg		SW8082	821760-12	MAS
99NEC21SD901	08/01/1999	1,1-Dichloroethene	ND	(0.0100)	mg/l	U	SW8260A	821760-12	MAS
99NEC21SD901	08/01/1999	1,2-Dichloroethane	ND	(0.0100)	mg/l	U	SW8260A	821760-12	MAS
99NEC21SD901	08/01/1999	2-Butanone	ND	(0.1000)	mg/l	U	SW8260A	821760-12	MAS
99NEC21SD901	08/01/1999	Benzene	ND	(0.0100)	mg/l	U	SW8260A	821760-12	MAS
99NEC21SD901	08/01/1999	Carbon tetrachloride	ND	(0.0100)	mg/l	U	SW8260A	821760-12	MAS
99NEC21SD901	08/01/1999	Chlorobenzene	ND	(0.0100)	mg/l	U	SW8260A	821760-12	MAS
99NEC21SD901	08/01/1999	Chloroform	ND	(0.0100)	mg/l	U	SW8260A	821760-12	MAS
99NEC21SD901	08/01/1999	Tetrachloroethene	ND	(0.0100)	mg/l	U	SW8260A	821760-12	MAS
99NEC21SD901	08/01/1999	Trichloroethene	ND	(0.0100)	mg/l	U	SW8260A	821760-12	MAS
99NEC21SD901	08/01/1999	Vinyl chloride	ND	(0.0100)	mg/l	U	SW8260A	821760-12	MAS
99NEC21SD901	08/01/1999	1,4-Dichlorobenzene	ND	(0.0330)	mg/l	U	SW8270	821760-12	MAS
99NEC21SD901	08/01/1999	2,4,5-Trichlorophenol	ND	(0.1700)	mg/l	U	SW8270	821760-12	MAS
99NEC21SD901	08/01/1999	2,4,6-Trichlorophenol	ND	(0.0330)	mg/l	U	SW8270	821760-12	MAS
99NEC21SD901	08/01/1999	2,4-Dinitrotoluene	ND	(0.0330)	mg/l	U	SW8270	821760-12	MAS
99NEC21SD901	08/01/1999	Cresols (Methyl Phenols)	0.0260	(0.0330)	mg/l	J	SW8270	821760-12	MAS
99NEC21SD901	08/01/1999	Hexachlorobenzene	ND	(0.0330)	mg/l	U	SW8270	821760-12	MAS
99NEC21SD901	08/01/1999	Hexachlorobutadiene	ND	(0.0330)	mg/l	U	SW8270	821760-12	MAS
99NEC21SD901	08/01/1999	Hexachloroethane	ND	(0.0330)	mg/l	U	SW8270	821760-12	MAS
99NEC21SD901	08/01/1999	Nitrobenzene	ND	(0.0330)	mg/l	U	SW8270	821760-12	MAS
99NEC21SD901	08/01/1999	Pentachlorophenol	ND	(0.1700)	mg/l	U	SW8270	821760-12	MAS
99NEC21SD901	08/01/1999	Pyridine	ND	(0.1700)	mg/l	U	SW8270	821760-12	MAS

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99NEC22MI901	07/31/1999	Lead	100000.0000	(380.0000)	mg/kg		SW6010	821765-19	MAS
99NEC22MI902	07/31/1999	Lead	93000.0000	(410.0000)	mg/kg		SW6010	821765-20	MAS
99NEC22MI903	07/31/1999	Lead	110000.0000	(490.0000)	mg/kg		SW6010	821765-21	MAS
99NEC22MI904	07/31/1999	Lead	83000.0000	(470.0000)	mg/kg		SW6010	821765-22	MAS
99NEC30SD903	08/01/1999	Gasoline Range Organics	ND	(27.0000)	mg/kg	U	AK101	821760-11	MAS
99NEC30SD903	08/01/1999	Diesel Range Organics	580.0000	(56.0000)	mg/kg		AK102	821760-11	MAS
99NEC30SD903	08/01/1999	Oil, Misc.	3200.0000	(110.0000)	mg/kg		AK103	821760-11	MAS
99NEC30SD903	08/01/1999	Percent Moisture	80.0000	(0.0000)	percent		CLPPM	821760-11	MAS
99NEC30SD903	08/01/1999	Antimony	ND	(13.0000)	mg/kg	U	SW6010	821760-11	MAS
99NEC30SD903	08/01/1999	Barium	49.0000	(2.7000)	mg/kg		SW6010	821760-11	MAS
99NEC30SD903	08/01/1999	Beryllium	ND	(1.3000)	mg/kg	U	SW6010	821760-11	MAS
99NEC30SD903	08/01/1999	Cadmium	ND	(1.3000)	mg/kg	U	SW6010	821760-11	MAS
99NEC30SD903	08/01/1999	Calcium	1700.0000	(27.0000)	mg/kg		SW6010	821760-11	MAS
99NEC30SD903	08/01/1999	Chromium	6.9000	(2.7000)	mg/kg		SW6010	821760-11	MAS
99NEC30SD903	08/01/1999	Cobalt	ND	(2.7000)	mg/kg	U	SW6010	821760-11	MAS
99NEC30SD903	08/01/1999	Copper	4.4000	(2.7000)	mg/kg		SW6010	821760-11	MAS
99NEC30SD903	08/01/1999	Iron	7900.0000	(13.0000)	mg/kg		SW6010	821760-11	MAS
99NEC30SD903	08/01/1999	Magnesium	1100.0000	(13.0000)	mg/kg		SW6010	821760-11	MAS
99NEC30SD903	08/01/1999	Manganese	43.0000	(2.7000)	mg/kg		SW6010	821760-11	MAS
99NEC30SD903	08/01/1999	Nickel	4.3000	(2.7000)	mg/kg		SW6010	821760-11	MAS
99NEC30SD903	08/01/1999	Potassium	270.0000	(54.0000)	mg/kg		SW6010	821760-11	MAS
99NEC30SD903	08/01/1999	Silver	ND	(2.7000)	mg/kg	U	SW6010	821760-11	MAS
99NEC30SD903	08/01/1999	Vanadium	10.0000	(2.7000)	mg/kg		SW6010	821760-11	MAS
99NEC30SD903	08/01/1999	Zinc	15.0000	(2.7000)	mg/kg		SW6010	821760-11	MAS
99NEC30SD903	08/01/1999	Arsenic	ND	(1.3000)	mg/kg	U	SW7060	821760-11	MAS
99NEC30SD903	08/01/1999	Lead	4.0000	(0 7400)	mg/kg		SW7421	821760-11	MAS
99NEC30SD903	08/01/1999	Mercury	ND	(0.5200)	mg/kg	U	SW7471	821760-11	MAS
99NEC30SD903	08/01/1999	Selenium	ND	(1.3000)	mg/kg	U	SW7740	821760-11	MAS
99NEC30SD903	08/01/1999	Thallium	ND	(1.3000)	mg/kg	U	SW7841	821760-11	MAS
99NEC30SD903	08/01/1999	Benzene	ND	(0.1100)	mg/kg	U	SW8021F	821760-11	MAS
99NEC30SD903	08/01/1999	Ethylbenzene	ND	(0.1300)	mg/kg	U	SW8021F	821760-11	MAS
99NEC30SD903	08/01/1999	Toluene	0.8900	(0.1300)	mg/kg		SW8021F	821760-11	MAS
99NEC30SD903	08/01/1999	Xylenes	ND	(0.1300)	mg/kg	U	SW8021F	821760-11	MAS
99NEC30SD903	08/01/1999	Total Organic Carbon (TOC)	25.0000	(0.0000)	percent		SW9060	821760-11	MAS
99NEC30SS901	08/01/1999	Gasoline Range Organics	ND	(4.7000)	mg/kg	U	AK101	821760-9	MAS
99NEC30SS901	08/01/1999	Diesel Range Organics	ND	(11.0000)	mg/kg	U	AK102	821760-9	MAS
99NEC30SS901	08/01/1999	Oil, Misc.	59.0000	(22.0000)	mg/kg		AK103	821760-9	MAS
99NEC30SS901	08/01/1999	Percent Moisture	12.0000	(0.0000)	percent		CLPPM	821760-9	MAS
99NEC30SS901	08/01/1999	Antimony	ND	(2.9000)	mg/kg	U	SW6010	821760-9	MAS
99NEC30SS901	08/01/1999	Barium	65.0000	(0.5700)	mg/kg		SW6010	821760-9	MAS
99NEC30SS901	08/01/1999	Beryllium	0.7900	(0.2900)	mg/kg		SW6010	821760-9	MAS
99NEC30SS901	08/01/1999	Cadmium	0.3100	(0.2900)	mg/kg		SW6010	821760-9	MAS
99NEC30SS901	08/01/1999	Calcium	3200.0000	(110.0000)	mg/kg		SW6010	821760-9	MAS
99NEC30SS901	08/01/1999	Chromium	49.0000	(0.5700)	mg/kg		SW6010	821760-9	MAS
99NEC30SS901	08/01/1999	Cobalt	8.6000	(0.5700)	mg/kg		SW6010	821760-9	MAS
99NEC30SS901	08/01/1999	Copper	31.0000	(0.5700)	mg/kg		SW6010	821760-9	MAS
99NEC30SS901	08/01/1999	Iron	21000.0000	(57.0000)	mg/kg		SW6010	821760-9	MAS
99NEC30SS901	08/01/1999	Magnesium	6700.0000	(57.0000)	mg/kg		SW6010	821760-9	MAS
99NEC30SS901	08/01/1999	Manganese	290.0000	(0.5700)	mg/kg		SW6010	821760-9	MAS
99NEC30SS901	08/01/1999	Nickel	24.0000	(0.5700)	mg/kg		SW6010	821760-9	MAS
99NEC30SS901	08/01/1999	Potassium	2100.0000	(11.0000)	mg/kg		SW6010	821760-9	MAS
99NEC30SS901	08/01/1999	Silver	ND	(1.1000)	mg/kg	U,CI	SW6010	821760-9	MAS
99NEC30SS901	08/01/1999	Vanadium	28.0000	(0.5700)	mg/kg		SW6010	821760-9	MAS
99NEC30SS901	08/01/1999	Zinc	77.0000	(0.5700)	mg/kg		SW6010	821760-9	MAS

Flag Key: CI See narrative
J EPA Flag. Estimated value
U EPA Flag - Compound was analyzed for, but was not detected
VLB Val. Qual.: Result negatively biased.
VQQ Val. Qual.: PQL approx. due to QC or matrix effects
VR Val. Qual.: rejected value

Field Sample ID	Samp. Date	Parameter	Result	MRL	Units	Flag	Method	Lab Samp. No.	Lab
99NEC30SS901	08/01/1999	Arsenic	3.6000	(1.4000)	mg/kg		SW7060	821760-9	MAS
99NEC30SS901	08/01/1999	Lead	25.0000	(3.4000)	mg/kg		SW7421	821760-9	MAS
99NEC30SS901	08/01/1999	Mercury	ND	(0.1100)	mg/kg	U	SW7471	821760-9	MAS
99NEC30SS901	08/01/1999	Selenium	ND	(0.3000)	mg/kg	U	SW7740	821760-9	MAS
99NEC30SS901	08/01/1999	Thallium	ND	(0.6000)	mg/kg	U,CI	SW7841	821760-9	MAS
99NEC30SS901	08/01/1999	Benzene	ND	(0.0190)	mg/kg	U	SW8021F	821760-9	MAS
99NEC30SS901	08/01/1999	Ethylbenzene	ND	(0.0230)	mg/kg	U	SW8021F	821760-9	MAS
99NEC30SS901	08/01/1999	Toluene	ND	(0.0230)	mg/kg	U	SW8021F	821760-9	MAS
99NEC30SS901	08/01/1999	Xylenes	ND	(0.0230)	mg/kg	U	SW8021F	821760-9	MAS
99NEC30SS901	08/01/1999	Total Organic Carbon (TOC)	0.2600	(0.0000)	percent		SW9060	821760-9	MAS
99NEC30SS902	08/01/1999	Gasoline Range Organics	ND	(20.0000)	mg/kg	U	AK101	821760-10	MAS
99NEC30SS902	08/01/1999	Diesel Range Organics	430.0000	(43.0000)	mg/kg		AK102	821760-10	MAS
99NEC30SS902	08/01/1999	Oil, Misc.	2300.0000	(87.0000)	mg/kg		AK103	821760-10	MAS
99NEC30SS902	08/01/1999	Percent Moisture	81.0000	(0.0000)	percent		CLPPM	821760-10	MAS
99NEC30SS902	08/01/1999	Antimony	ND	(14.0000)	mg/kg	U	SW6010	821760-10	MAS
99NEC30SS902	08/01/1999	Barium	46.0000	(2.7000)	mg/kg		SW6010	821760-10	MAS
99NEC30SS902	08/01/1999	Beryllium	ND	(1.4000)	mg/kg	U	SW6010	821760-10	MAS
99NEC30SS902	08/01/1999	Cadmium	ND	(1.4000)	mg/kg	U	SW6010	821760-10	MAS
99NEC30SS902	08/01/1999	Calcium	2200.0000	(27.0000)	mg/kg		SW6010	821760-10	MAS
99NEC30SS902	08/01/1999	Chromium	5.2000	(2.7000)	mg/kg		SW6010	821760-10	MAS
99NEC30SS902	08/01/1999	Cobalt	ND	(2.7000)	mg/kg	U	SW6010	821760-10	MAS
99NEC30SS902	08/01/1999	Copper	4.3000	(2.7000)	mg/kg		SW6010	821760-10	MAS
99NEC30SS902	08/01/1999	Iron	8800.0000	(14.0000)	mg/kg		SW6010	821760-10	MAS
99NEC30SS902	08/01/1999	Magnesium	1100.0000	(14.0000)	mg/kg		SW6010	821760-10	MAS
99NEC30SS902	08/01/1999	Manganese	22.0000	(2.7000)	mg/kg		SW6010	821760-10	MAS
99NEC30SS902	08/01/1999	Nickel	3.8000	(2.7000)	mg/kg		SW6010	821760-10	MAS
99NEC30SS902	08/01/1999	Potassium	470.0000	(55.0000)	mg/kg		SW6010	821760-10	MAS
99NEC30SS902	08/01/1999	Silver	ND	(2.7000)	mg/kg	U	SW6010	821760-10	MAS
99NEC30SS902	08/01/1999	Vanadium	8.3000	(2.7000)	mg/kg		SW6010	821760-10	MAS
99NEC30SS902	08/01/1999	Zinc	12.0000	(2.7000)	mg/kg		SW6010	821760-10	MAS
99NEC30SS902	08/01/1999	Arsenic	ND	(1.4000)	mg/kg	U	SW7060	821760-10	MAS
99NEC30SS902	08/01/1999	Lead	4.8000	(0.7700)	mg/kg		SW7421	821760-10	MAS
99NEC30SS902	08/01/1999	Mercury	ND	(0.5500)	mg/kg	U	SW7471	821760-10	MAS
99NEC30SS902	08/01/1999	Selenium	ND	(1.4000)	mg/kg	U	SW7740	821760-10	MAS
99NEC30SS902	08/01/1999	Thallium	ND	(1.4000)	mg/kg	U	SW7841	821760-10	MAS
99NEC30SS902	08/01/1999	Benzene	ND	(0.0810)	mg/kg	U	SW8021F	821760-10	MAS
99NEC30SS902	08/01/1999	Ethylbenzene	ND	(0.1000)	mg/kg	U	SW8021F	821760-10	MAS
99NEC30SS902	08/01/1999	Toluene	0.1200	(0.1000)	mg/kg		SW8021F	821760-10	MAS
99NEC30SS902	08/01/1999	Xylenes	ND	(0.1000)	mg/kg	U	SW8021F	821760-10	MAS
99NEC30SS902	08/01/1999	Total Organic Carbon (TOC)	36.0000	(0.0000)	percent		SW9060	821760-10	MAS

Flag Key: CI See narrative
J EPA Flag. Estimated value
U EPA Flag - Compound was analyzed for, but was not detected
VLB Val. Qual.: Result negatively biased.
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APPENDIX C

Data Quality Assessment

1999 Phase II RI
Northeast Cape, St. Lawrence Island, Alaska
Data Quality Assessment

Twenty-seven samples were collected between July 31 and August 2, for diesel range organics/residual range organics (DRO/RRO), gasoline range organics/benzene, toluene, ethylbenzenes, and xylenes (GRO/BTEX), polychlorinated biphenyls (PCB), lead, target analyte list (TAL) metals, full toxicity characteristic leaching procedure (TCLP), TCLP/PCBs and total organic content (TOC). Samples were extracted and analyzed within holding time criteria, with the exception of total and TCLP/PCBs. Cooler temperatures were in control for all sample shipments. Samples were reported on a dry weight basis as applicable. The trip blanks and method blanks were free of target analyte. For results reported between the method reporting limit (MRL) and the method detection limit (MDL), data are qualified as estimates with a VJ. This qualification is intended to clarify the data and in no way impacts data quality. Data are considered valid and useable for the project objectives, with qualifications, as discussed below.

TCLP/PCBs – SW1311/8082

- Samples for TCLP/PCBs were extracted 8 days past the 14-day holding time for 99NEC13BD901, 99NEC17BD901 and 99NEC18BD901. Positive results were qualified as biased low with a VLB and MRLS were qualified as estimates with a VQQ due to the missed holding time.

Total PCBs – SW8082

- Samples for total PCBs were extracted 4 days past the 14-day holding time for samples 99NEC13BD901, 99NEC17BD901 and 99NEC18BD901. Positive results were qualified as biased low with a VLB and MRLs were qualified as estimates with a VQQ due to the missed holding time.

DRO/RRO – Methods AK102/203

- There was no qualification of DRO/RRO results. However, evaluation of the chromatograms shows that reported results consisted of predominantly biogenic hydrocarbons rather than petroleum hydrocarbons.

BTEX – SW8021

- Surrogate recovery (55%) for 99NEC30SD903 was below acceptance limits (63-119) due to high percent moisture in the sample. Thus, positive results were qualified as biased low with a VLB and MRLs were qualified as estimates with a VQQ.

- MRLs for several samples were elevated due to high percent moisture and/or low sample volumes.

APPENDIX D

Biological Sampling Results
ENRI Report
Alaska District Report

Tier II Ecological Assessment *for* Northeast Cape, St. Lawrence Island, Alaska

Tier II Ecological Assessment *for* Northeast Cape, St. Lawrence Island, Alaska

REVISED DRAFT REPORT

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November 1999

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Introduction

The U.S. Air Force established a surveillance site on the Northeast Cape of St. Lawrence Island, Alaska, in 1952 that provided radar coverage for the area until 1972. In 1969, a fuel tank within the facility spilled 180,000 gal of diesel fuel that, along with other nearby sources, contaminated the Suqitughneq River drainage. Northeast Cape is now classified as a Formerly Used Defense Site (FUDS). In 1995, Montgomery Watson, a private contractor, completed Phase I of a remedial investigation (RI) of the site as part of the U.S. Department of Defense Environmental Restoration Program, as implemented by the U.S. Army Corps of Engineers (COE). In 1996, Montgomery Watson initiated Phase II of the RI to: (1) delineate the area contaminated by the 1969 spill, (2) evaluate impairment to water quality and biological communities (benthic macroinvertebrates, phytoplankton, and zooplankton), and (3) collect information needed to recommend and implement the most appropriate remedial action to protect human health and minimize ecological impairment.

The results of the Phase II surface water and sediment screening at 8 sites indicated significant potential for adverse ecological effects to biological communities inhabiting the area (Montgomery Watson 1996). Concentrations of diesel range organics (DROs) and polychlorinated biphenyls (PCBs) detected in bulk sediment and surface water were well above the toxicity benchmark values as calculated and reported by Montgomery Watson. These results indicated a potential for ecological effects from exposure to polynuclear aromatic hydrocarbons (PAHs) and PCBs. In addition, DROs were detected in sediment samples collected upstream of the spill area by Montgomery Watson in 1996, suggesting an upstream source of contamination.

Although the RI studies identified potential ecological and human health risks, there was insufficient information to support decisions about remediation. Needed were quantitative data pertaining to the ecological resources at risk within the drainage, terrestrial and aquatic wildlife using those resources, and DROs and PCBs present in the diet and tissues of flora and fauna (Montgomery Watson 1996). Consequently, Montgomery Watson contracted with the University of Alaska Anchorage's Environment and Natural Resources Institute (ENRI) in 1998 to conduct a Tier II Ecological Assessment of the Northeast Cape area to provide information for development of an appropriate remedial action plan

The objectives of the Tier II Ecological Assessment were to: (1) physically characterize each of the study sites, (2) evaluate sediment toxicity using the Microtox® bacterial bioassay, (3) document and assess the macroinvertebrate and fish communities, and (4) quantify the accumulation of toxins in fish tissues. ENRI conducted fieldwork from 31 July to 3 August 1999. Chain-of-custody requirements were followed as outlined by Montgomery Watson. All samples, voucher collections, data, and other materials associated with the assessment are the property of Montgomery Watson.

Study Area

The Northeast Cape FUDS is approximately 9 mi west of the northeastern cape of St. Lawrence Island and encompasses approximately 4 sq mi (Figure 1). The Suqitughneq River is the primary stream drainage in the area, extending from the base of the Kinipaghulghat Mountains (at an elevation of approximately 100 ft above mean sea level) to the Bering Sea. The site is situated on a tundra plain with few changes in elevation. Hydrology, flora, and fauna reported for the area are characteristic of tundra ecosystems (Montgomery Watson 1996).

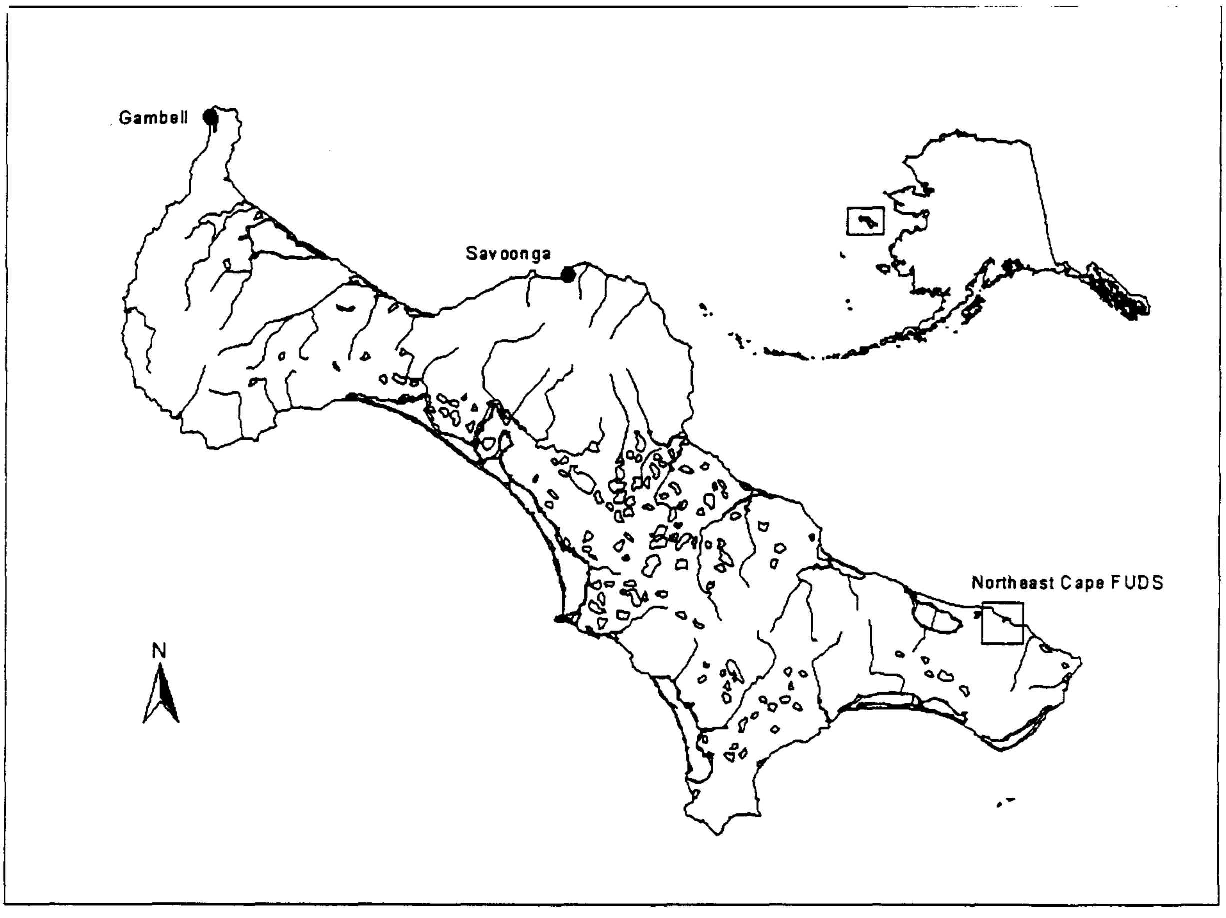

Figure 1. St. Lawrence Island and Northeast Cape FUDS.

Methods

Five primary study sites were established for the Tier II Ecological Assessment: four within the Suqitughneq River drainage and one in the Quangeghsaq River drainage (Figure 2). ENRI site identification codes and descriptions are displayed in Table 1, as well as the Montgomery Watson codes. The Suqitughneq River drainage was sampled at two control sites outside of the original 1969 spill area, one at a downstream tributary (slsut01) and one upstream on the river's main channel (slsuq02). Two stressed sites were also established in the Suqitughneq River drainage, one 2 km downstream of the spill area (slsuq01) and one at the spill tributary (slurc01). In the Quangeghsaq River drainage, one control site (slqan01) was sampled. It was selected because it was nearby, physically similar to the Suqitughneq River, and not impaired.

Table 1. Site locations, identification codes, and descriptions.

Location	ENRI ID	Montgomery Watson ID	Type	Reach Description
Quangeghsaq River	slqan01	99NEBK	Control	200 m just upstream of highest storm tide.
Suqitughneq River	slsuq02	99NE00	Upstream control	Upstream of confluence with receptor creek, 100 m above to 200 m below access road culvert.
Suqitughneq River	slsuq01	99NE01	Potentially stressed	50 m below to 200 m above runway bridge.
Suqitughneq River Tributary	slsut01	99NE02	Downstream control	100 m reach in headwaters of small tributary.
Spill Tributary	slurc01	99NERC	Potentially stressed	200 m reach from large pool below spill to confluence with Suqitughneq River.

The methods used to conduct the Tier II Ecological Assessment for site characterization, sediment toxicity, community assessment, and fish tissue toxicity are described below.

Site Characterization

Each site was evaluated to define the chemical and physical conditions that could influence community assessments and ecosystem health and to determine whether control sites were similar to stressed sites. Water chemistry information was collected using a Hydrolab Surveyor 4 Data Display and MiniSonde equipped with pH, dissolved oxygen, conductivity, and water temperature data probes.

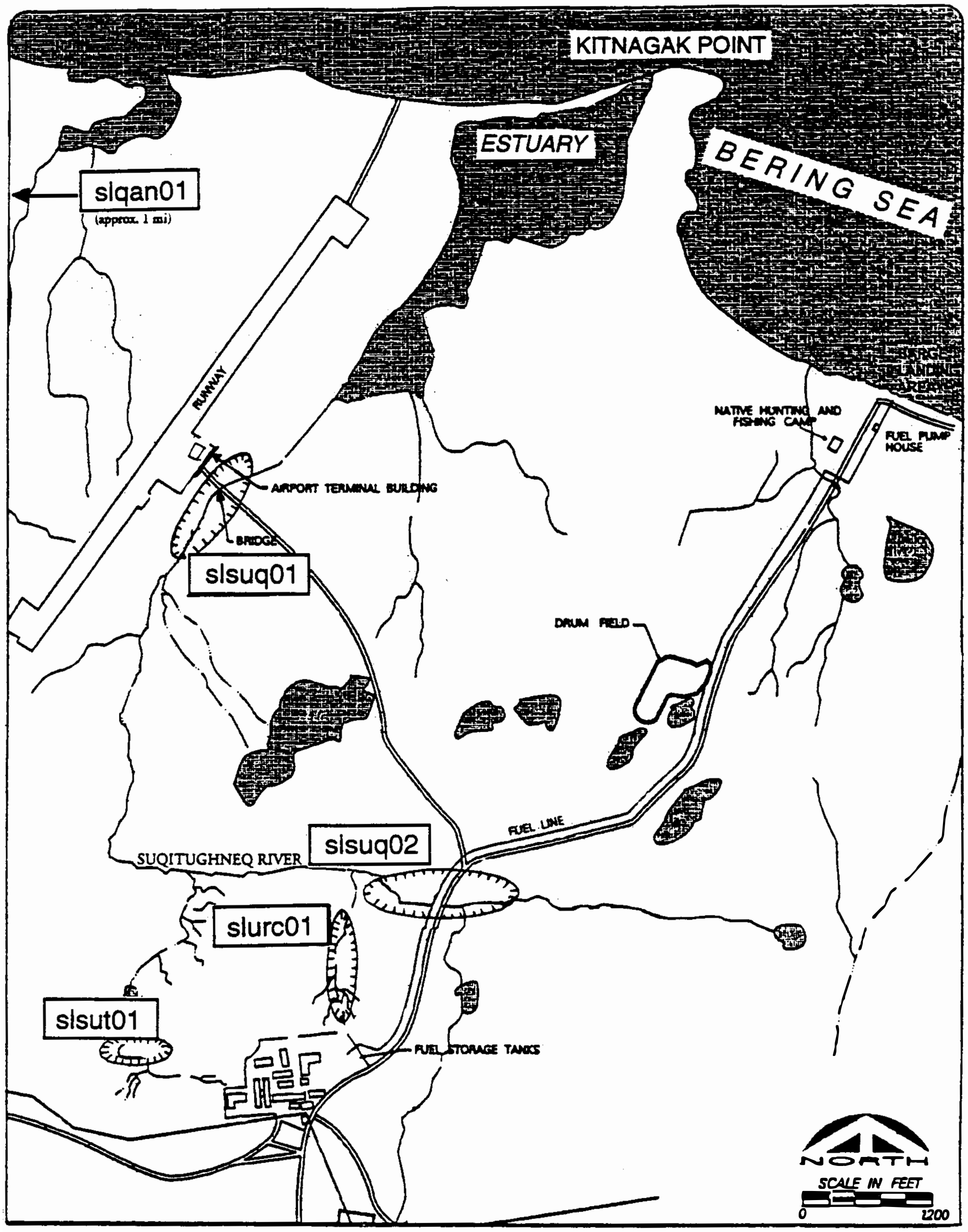

Figure 2. Northeast Cape sampling sites.

Physical parameters were measured at various points throughout the sampling reaches. Three cross-channel transects were established within each 100 m sampling reach and generally encompassed the widest and narrowest points of the stream. Width and depth measurements were taken of a riffle, run, and pool (if present) at each transect. Stream discharge was measured at the most downstream transect using a Marsh-McBirney flow meter. Gradient over the stream reach was measured using a hand level and flow rod. Substrate composition and percent habitat type were visually estimated. Riparian vegetation information and local watershed characteristics were also documented.

Habitat quality was visually assessed and rated at each sampling site following the Alaska Stream Condition Index (ASCI) habitat assessment method developed by ENRI (Major and Barbour 1997; Major and Houston 1999). With the ASCI, 10 habitat parameters are visually assessed for an optimal total score of 200. The assessment evaluates the condition and quality of major habitat characteristics that support macroinvertebrate communities. Habitat quality is correlated with the abundance and diversity of biological communities (Barbour and Stribling 1994). Parameters assessed include instream characteristics (habitat availability and variability, degree of sediment deposition, loss of habitat, and channel morphology), bank and vegetative stability, and riparian zone measurements.

Sediment Toxicity

Sediment samples were collected to characterize toxicity of the instream sediments using the Microtox® solid-phase bacterial bioassay. Sediment-associated contaminant availability has been recognized as a link in defining ecosystems and characterizing ecosystem perturbations (Burton 1991). Microtox® toxicity assessments were used to determine the bioavailable fraction of the contaminants. This technique uses lysed cells of the luminescent marine bacteria *Vibrio fisheria* as an indicator of overall potential sediment toxicity. The bacteria's light-producing mechanism is tied to the metabolic processes of the cell, and exposure of the bacteria to toxic substances in sediment samples causes a reduction in metabolic activity. Bacteria luminescence is proportional to the degree of toxicity. The bioassay is based on detecting changes in light output between control samples and various concentrations of sediment. The reduction in metabolic luminescence is calculated as median effective concentration (EC50) and reported as relative toxicity unit (TU) values for each sample. The EC50 is a calculated toxicity value representing the sample concentration, in percent, estimated to cause a 50% response by exposed test organisms. The TU value is based on the calculated toxicity value and is used for reporting purposes because it has a positive relationship with toxicity. It is calculated as the inverse of the EC50 multiplied by 100.

Grain-size composition has a direct effect on toxicity results, and comparisons of control and stressed samples should only be made if sites have similar sediment grain-size composition (Benton et al. 1995; Ringwood et al. 1997). ENRI carefully selected the sediment-sampling areas within each site so only fine-grained sediments would be tested. Samples were collected from the left and right banks of the Suqitughneq River below the spill area (slsuq01), from up- and downstream of the spill tributary reach (slurc01), from up- and downstream on the Quangeghsaq River reach (slqan01), from upstream of the spill area at the Suqitughneq River (slsuq02), and from the downstream tributary (slsut01).

A stainless steel Ekman dredge was used to collect the sediment samples, which were thoroughly homogenized in a stainless steel bowl with a spoon and the overlying water poured off. Two replicates were collected from each site and spooned into labeled, precleaned, U.S. Environmental Protection Agency (USEPA) level 3 glassware. One was used for the bioassay and the other for the sediment grain-size analysis. Samples were labeled, refrigerated until shipment to ENRI's laboratory, and analyzed within 48 hr of collection using the Microtox® bacterial bioassay solid-phase protocol and the Microbics model 500 analyzer. Three replicates were tested from each sample. Light output was recorded after a 20 min exposure of the bacteria to the sediment.

Solid-phase diluent was added to the sediment in a 2:1 dilution scheme from an initial sample concentration of 10%. After temperature equilibration of the sample and diluent, the reagent was reconstituted and 20 μL of reagent were added to each solid-phase test tube. Samples were mixed well and allowed to incubate 20 min. The filtrate was then extracted and transferred to Microtox® cuvettes in the Microtox® incubation block. Three control samples were used to calibrate the light readings after a 5 min temperature equilibration period. Sample light readings were recorded and TU values calculated using the Microtox® data-reduction program. The replicates tested from each sample were averaged, reported as average TUs, and a coefficient of variation (CV) was calculated on the mean of the TU by site. CV was calculated by dividing the standard deviation of TU for each sample and by the mean TU for each sample.

Sediment grain-size was determined by weight in the laboratory after each sample had been dried and sieved using nested 1 mm, 495 μm, and 250 μm mesh sieves. Each size fraction was washed until the water ran clear. Material less than 250 μm was captured with the rinse water in a plastic 5 gal bucket. Each size fraction was wrapped in aluminum foil and placed in a drying oven for 24 hr, cooled, and then weighed. Proportions of coarse particulate organic matter (CPOM) (> 1 mm) and fine particulate organic matter (FPOM) (< 1 mm) were visually estimated for each size fraction. To estimate the amount of silt (particle size < 250 μm) in each sediment sample, the rinse water was stirred vigorously until the material was in suspension. A 20 mL sample was extracted, placed in a ceramic crucible in the drying oven for 24 hr, and weighed.

Percent similarities were used to compare substrate compositions among samples. TU values from study sites were compared to control samples when grain-size-composition similarity was 90% or more.

Community Assessments

Macroinvertebrates

Assessment of the macroinvertebrate community consisted of sampling at the four selected sites within the Suqitughneq River drainage (slsuq01, slsuq02, slsut01, slurc01) and the Quangeghsaq River control site (slqan01). Samples were collected following ASCI rapid bioassessment sampling protocols developed specifically for Alaska streams (Major and Barbour 1997; Major et al. 1998; Major and Houston 1999). The ASCI uses an array of measures that individually provide information on diverse biological attributes and, when integrated, an overall assessment of biological condition. ENRI selected metrics for this study that have been shown to detect perturbations caused by chemical contamination using taxa richness, taxonomic and functional composition, community tolerance measures, and abundance. Metrics based on evaluating sensitive taxa within the orders Ephemeroptera, Plecoptera, and Trichoptera (EPT) were also selected. Table 2 provides definitions and expected responses of macroinvertebrate metrics to stressors.

A D-frame dip net was used to collect a composite sample of 20 sweeps or jabs from the predominant habitats represented over a 100 m reach of the stream. Habitat types were sampled in proportion to representation within the selected stream reach. The collected material was composited, preserved in the field with 90% ethanol, and returned to ENRI's laboratory for processing and identification. Samples were subsampled to 300 organisms (+20%) using a Caton subsampler (Caton 1991). The entire sample was then quickly examined for large and/or rare organisms not collected in the subsample to ensure accuracy of the taxa richness measures.

Organisms were identified to genus level when possible (Clifford 1991; Merritt and Cummins 1996; Stewart and Stark 1993; Wiggins 1996). Annelids were identified to class, and Hydracarina were identified to family. For each sample, a 100 organism subsample of Chironomids was mounted on slides and identified to genus (Wiederholm 1983). The antennae and mentum of the Chironomidae identified were inspected for deformities to compare the incidence of deformity among sample sites.

Table 2. Expected metric responses to stress.

Metric	Definition	Response
Taxa richness measures		
Total taxa	Variety of macroinvertebrate assemblage	Decrease
EPT taxa	Number of mayfly, stonefly, and caddisfly taxa	Decrease
Chironomidae taxa	Number of chironomidae taxa	Decrease
Composition measures		
% EPT/(% EPT + Chironomidae)	Ratio of mayfly, stonefly, and caddisfly larvae	Decrease
Tolerance/intolerance measures		
% Dominant Taxon	Measure of single most abundant taxon	Increase
Feeding and habit measures		
% Predators	Percent of predator functional feeding group	Decrease
% Clingers	Percent of organisms with behavioral or morphological adaptations for attachment to surfaces in flowing water	Decrease
Population measures		
Estimated density	Abundance corrected to number per sq mi	Decrease

Fish

Minnow trapping and electroshocking were the primary sampling techniques used to determine fish presence and relative abundance in the Suqitughneq River drainage. Hook-and-line sampling was also used to confirm the presence of anadromous char and salmon at the mouth of the Suqitughneq and Tapisaghak Rivers. At each of the four sites in the Suqitughneq River drainage, minnow trapping was conducted to determine the presence and size of juvenile fish. Wire minnow traps baited with salmon eggs were fished overnight. Electroshocking was conducted using a Cofelt backpack electroshocker, and dip nets were used to catch a representative sample of the fish community at sites in the Suqitughneq River drainage (slsuq01 and slut01) and in the Quangeghsaq River control site (slqan01). Captured fish were identified, enumerated, and visually inspected for deformities and disease. Fork lengths were measured to the nearest millimeter. Length-frequency distributions of Dolly Varden char (*Salvelinus malma*) from the Suqitughneq and Quangeghsaq Rivers and Alaska blackfish (*Dallia pectoralis*) from the Suqitughneq River were determined.

Fish Tissue Toxicity

Fish tissue was analyzed to determine any human health risks related to fish consumption. (ENRI also proposed to collect and analyze mollusk tissue, but no mollusks were found in the Suqitughneq River outflow areas.) Table 3 shows the recommended monthly consumption limits for PCBs for fish consumers based on the USEPA values for risk assessment parameters (EPA-823-F-99-019, September 1999). USEPA guidelines were used because Alaska has not established fish-tissue monitoring or fish consumption advisory guidelines for PCBs. USEPA (1999) recommends that tissue samples be analyzed for PAHs, because naturally occurring lipids may interfere with petroleum/diesel analysis.

Table 3. USEPA (1999) default risk-based consumption limits.

Risk-Based Consumption Limit	Noncancer Health Endpoints	Cancer Health Endpoints
Fish Meals* /Month	Fish Tissue Concentrations (ppb wet weight)	Fish Tissue Concentrations (ppb wet weight)
16	>6-12	>1.5-3
12	>12-16	>3-4
8	>16-24	>4-6
4	>24-48	>6-12
3	>48-64	>12-16
2	>64-97	>16-24
1	>97-190	>24-48
<0.5	>190-390	>48-97
None (<0.5)*	>390	>97

*Meal = 8 oz fish tissue; None = no consumption recommended.

A whole-fish, composite sample weighing approximately 200–300 g was taken from the fish collected for the community assessment (see methods above). Each fish tissue sample was placed on ice in a Ziploc bag while in the field. They were wrapped in aluminum foil, labeled, and frozen within 8 hr of collection. Tissue samples were then sent to the laboratory of Columbia Analytical Services in Kelso, Washington, where they were analyzed for the presence of PAHs and PCBs following USEPA preparation and analysis methods (Table 4). This was done in accordance with the firm's quality assurance program.

Table 4. Sample preparation and analysis methods for PAHs and PCBs.

Parameter	Preparation Method	Analysis Method	Detection Limit (ppb)
PAHs			
2-Methylnaphthalene	EPA 3540	SIM	5
Acenaphthene	EPA 3540	SIM	5
Anthracene	EPA 3540	SIM	5
Benz(a)anthracene	EPA 3540	SIM	5
Benzo(a)pyrene	EPA 3540	SIM	5
Benzo(b)fluoranthene	EPA 3540	SIM	5
Benzo(g,h,i)perylene	EPA 3540	SIM	5
Benzo(k)fluoranthene	EPA 3540	SIM	5
Chrysene	EPA 3540	SIM	5
Dibenz(a,h)anthracene	EPA 3540	SIM	5
Dibenzofuran	EPA 3540	SIM	5
Fluoranthene	EPA 3540	SIM	5
Fluorene	EPA 3540	SIM	5
Indeno(1,2,3-cd)pyrene	EPA 3540	SIM	5
Naphthalene	EPA 3540	SIM	5
Phenanthrene	EPA 3540	SIM	5
Pyrene	EPA 3540	SIM	5
PCBs			
Aroclor 1016	EPA 3540C	EPA 8082	50
Aroclor 1221	EPA 3540C	EPA 8082	50
Aroclor 1232	EPA 3540C	EPA 8082	50
Aroclor 1242	EPA 3540C	EPA 8082	50
Aroclor 1248	EPA 3540C	EPA 8082	50
Aroclor 1254	EPA 3540C	EPA 8082	50
Aroclor 1260	EPA 3540C	EPA 8082	50

Results

Site Characterization

Water chemistry information displayed values typical for Alaska for each parameter tested, and dissolved oxygen and pH were similar for each of the sites tested in this Tier II assessment. Temperatures varied from 3°C at the downstream control (slsut01) to 10°C at the spill tributary (slurc01). Conductivity ranged from 75 µmhos at the Suqitughneq River control (slsuq02) to 142 µmhos at the Quangeghsaq River (slqan01). The pH ranged from 6.6 at the Quangeghsaq River (slqan01) to 7.4 at the spill tributary (slurc01). Site characterization data (physical and chemical) are provided in Appendix A, and site photographs are provided in Appendix B.

Physical characteristics and predominant habitat type were evaluated for the sites. Gradient, channel morphology, and substrate composition in run and pool areas in the lower Suqitughneq River site (slsuq01) were similar to Suqitughneq River control sites (slsuq02 and slsut01). Gravel, sand, and silt were the dominant substrates. Gradient, channel morphology, and drainage characteristics of the Quangeghsaq River were similar to the Suqitughneq River sites, except for having sandier substrates and slightly lower pH. The much smaller spill tributary (slurc01) differed from the other sites in that it had an unconfined channel and lower flows.

Predominant habitat types differed between the lower Suqitughneq River site (slsuq01) and control sites (slsuq02 and slsut01). Percent habitat was visually estimated as 55% run, 35% riffle, and 10% pool at the downstream stressed site (slsuq01), while 50% run and 50% pool at the control sites (slsuq02 and slsut01). The riffle at the downstream stressed site (slsuq01) was characterized by stable substrate, which is optimal for macroinvertebrate colonization. The spill tributary (slsurc01) displayed different habitat types estimated as 50% run, 25% riffle, and 25% pool. The Quangeghsaq River site habitat types were estimated as 85% run, 10% riffle, and 5% pool.

It should be noted that diesel oils were evident in the substrate during sampling at slsuq01 and slurc01. The Suqitughneq River was at flood stage during sampling; depths were difficult to measure and were estimated to be 1.5 to 2.0 ft above normal. These conditions are reflected in the site characterization information collected throughout the drainage. Although depth of the run at the site (slsuq02) was estimated at 2.5 ft, the tributary does not normally flow during summer months (E. Toolie, pers. comm.). Channel widths within the Suqitughneq River drainage ranged from 4 to 7 ft in the run and 12 to 15 ft in the pool areas.

Physical habitat quality was similar between control and stressed sites as reflected in the habitat assessment scores: 170 at the Suqitughneq River below the spill area (slsuq01), 172 at both the spill tributary (slurc01) and the downstream control (slsut01), 176 at the Suqitughneq River above the spill site (slsuq02), and 164 at the Quangeghsaq River site (slqan01). These scores indicate optimal habitat conditions for macroinvertebrate communities with potential to support similar diversity and abundance. Physical habitat assessment scores are displayed by parameter in Appendix A.

Sediment Toxicity

Microtox® bioassay sample identification and sample results are displayed in Table 5. Montgomery Watson identifiers are included with the CV for the sample TUs. Because sediment particle size has a direct relationship to toxicity, only samples with similar sediment grain-size composition were compared. Analyses of sediment size fractions classified sediment samples into three groups, primarily based on percent fines. Figure 3 pairs the groups of sites by percent sediment size fractions with the TU values for those sites.

Samples collected from the up- and downstream or left and right banks at each site did not have similar sediment grain-size characteristics and were only compared to a control sample with similar attributes. Samples from slqan01 (upstream), slsuq01 (right bank), and slurc01 (upstream) were not dominated by fine-grained sediments and are shown in Figure 3a. Fine sediments made up a larger fraction of the samples for slqan01 (downstream) and slsuq01 (left bank) (Figure 3b). Fine sediments (< 250 μm) dominated substrate composition of three samples: slsuq02 (right bank), slurc01 (downstream), and slsut01 (midchannel) (Figure 3c).

Microtox® analyses verified toxicity at the spill tributary from both up- and downstream samples (slurc01) and at the lower Suqitughneq River from both the right and left bank samples (slsuq01). TU values for samples from stressed sites were significantly higher than values from control samples with similar substrate characteristics (Figures 3d–f).

Table 5. Microtox® bioassay sample identification information and results.

ENRI ID	Location	Montgomery Watson ID	Date	CV	TU
slquan01	Downstream	99NEBKSD100	8-3-99	31.1	65.9
slquan01	Upstream	99NEBKSD101	8-3-99	50.0	34.9
slsut01	Midchannel	99NE02SD100	8-2-99	33.1	202.1
slsuq02	Right bank	99NE00SD100	8-2-99	15.7	72.5
slsuq01	Left bank	99NE01SD100	8-2-99	44.2	174.1
slsuq01	Right bank	99NE01SD101	8-2-99	23.0	423.6
slurc01	Upstream	99NERCSD100	8-2-99	37.5	213.3
slurc01	Downstream	99NERCSD100	8-2-99	45.6	846.0

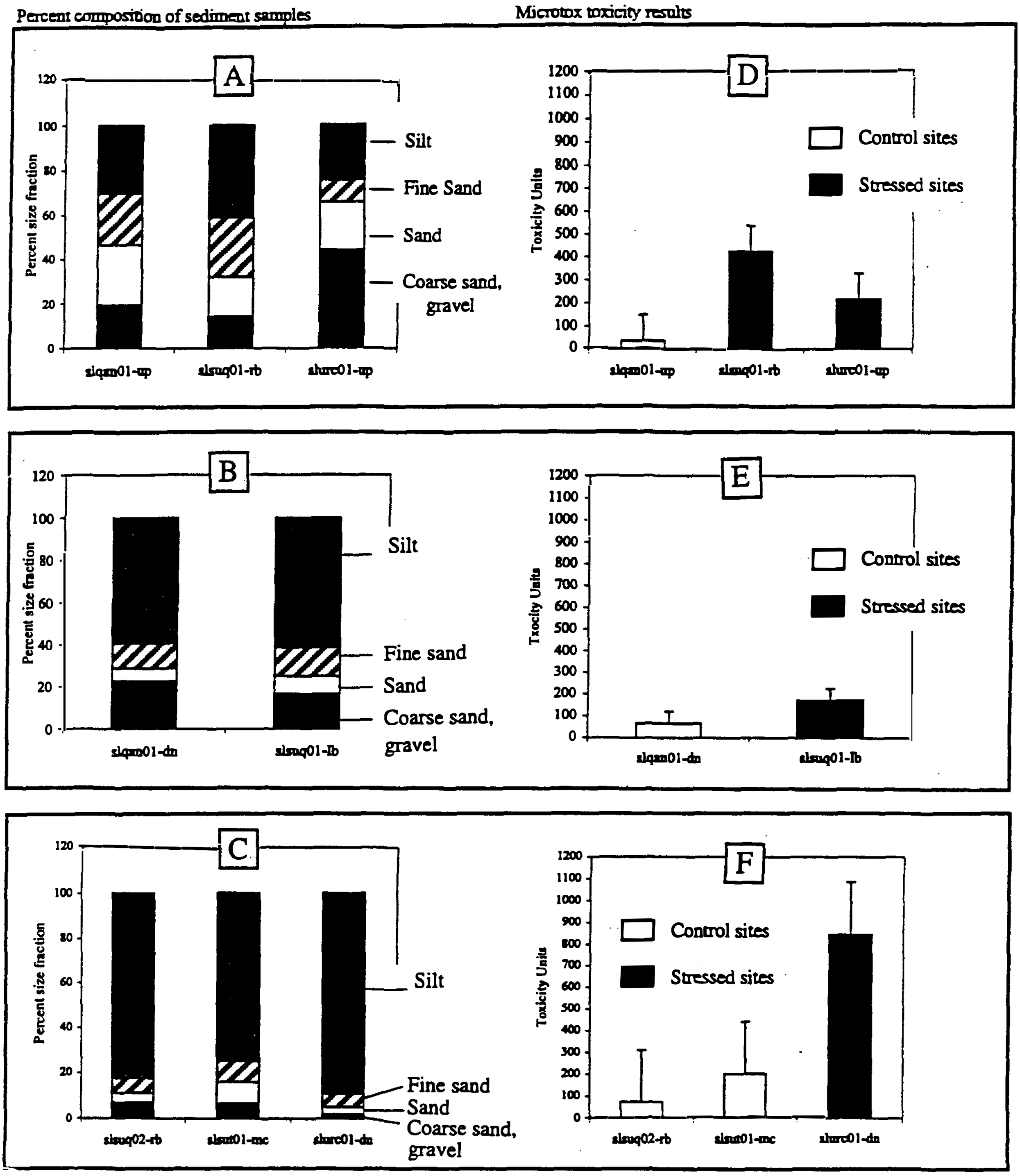

Figure 3. Sediment grain-size analysis and Microtox® results. Error bars reflect sample variability (rb=right bank, lb=left bank, mc=midchannel, up=upstream, dn=downstream).

Community Assessments

Macroinvertebrates

Metric results are displayed in Table 6. Like the sediment toxicity results, they indicate impairment below the spill area (slsuq01) and at the spill tributary (slurc01). The site below the spill area was characterized by lower total taxa richness and chironomid taxa richness and higher percent dominant taxon than the Quangeghsaq River control site (slqan01) and the upstream Suqitughneq River control site (slsuq02) (Figures 4 and 5). The spill tributary (slurc01) had similar numbers of total taxa, but no pollution-sensitive EPT taxa were collected at the site. Density was also an order of magnitude lower at the spill tributary (slurc01) than at any other site.

Table 6. Macroinvertebrate metric results.

Metric	slqan01	slsuq02	slsuq01	slsut01	slurc01
Taxa richness measures					
Total taxa	18	21	14	13	17
EPT taxa	3	3	3	1	0
Chironomidae taxa	8	10	5	7	9
Composition measures					
%EPT/%EPT+%Chironomidae	15	29	14	1	0
% dominant taxon	24	23	68	24	33
Feeding and habit measures					
% predators	1	3	5	2	1
% clingers	5	8	1	3	1
Population measures					
Estimated abundance (no./sq mi)	2165	1291	2960	2238	261

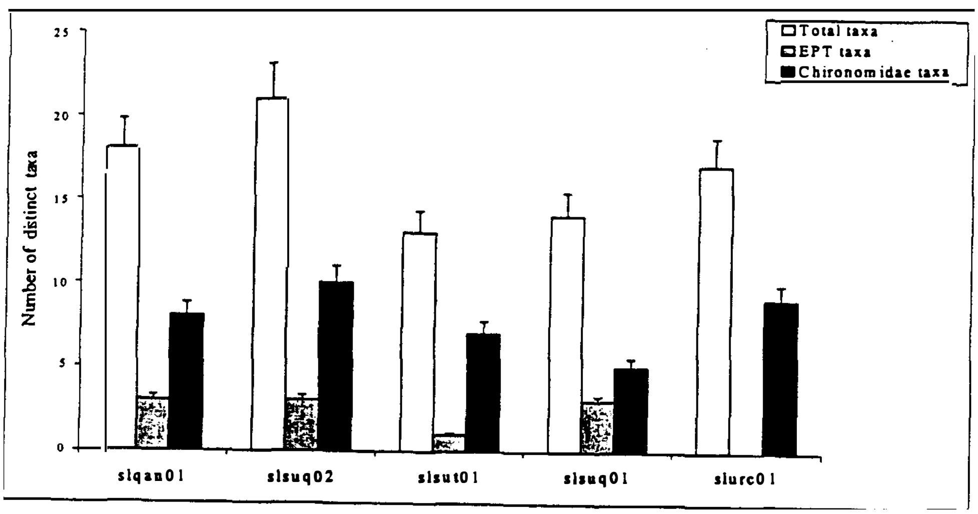

Figure 4. Results of taxa richness. (Error bars represent sampling variability.)

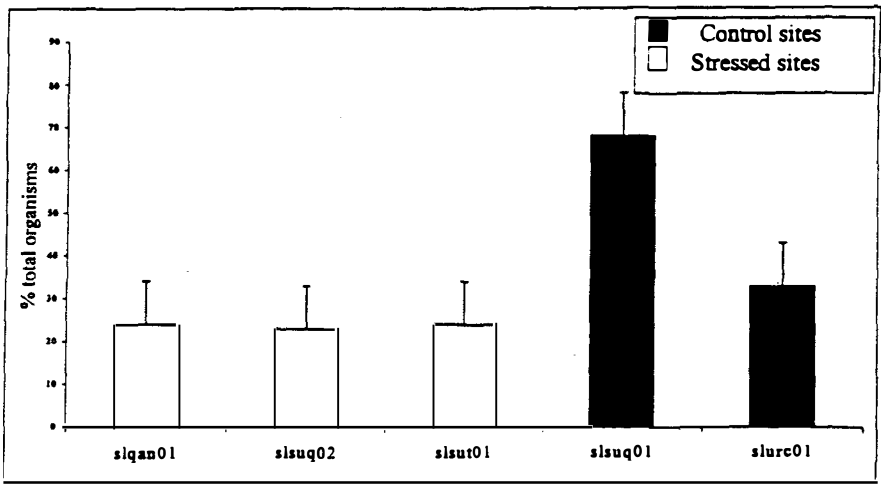

Figure 5. Percent dominant taxon. (Error bars reflect sampling variability.)

Fish

Dolly Varden char, Alaska blackfish, ninespine stickleback (*Pungitius pungitius*), and fourhorn sculpin (*Myoxocephalus quadricornis*) were captured in the Suqitughneq River during the 1999 survey (Table 7). Dolly Varden and blackfish were captured throughout the drainage, while stickleback and a single marine sculpin were captured only at the furthest downstream reach (slsuq01) near the intertidal lagoon. Blackfish was the only species captured in the spill tributary (slurc01). Dolly Varden and ninespine stickleback were captured in the Quangeghsaq River control site (slqan01).

Table 7. Summary of fish capture information.

Location	Site	Date	Sampling Method	Species*	Effort (hr)	No. of Fish	Length Range (mm)
Suqitughneq River	slsuq01	8/1/99	Minnow trap	CHAR	20	14	73–166
	slsuq01	8/1/99	Electroshock	SCUP	1	1	125
				9SSB	1	27	40–70
				CHAR	1	52	41–225
	slsuq01	8/2/99	Electroshock	9SSB	0.5	48	42–65
	slsuq02	8/2/99	Minnow trap	CHAR	20	20	114–212
				BLFS	20	2	90–117
	slut01	8/1/99	Minnow trap	BLFS	20	1	118
		8/2/99	Electroshock	CHAR	1	4	155–180
	slurc01	8/2/99	Minnow trap	BLFS	20	11	90–145
Quangeghsaq River	slqan01	8/2/99	Electroshock	CHAR	1	17	137–195
				9SSB	1	20	45–65

* CHAR = Dolly Varden char; SCUP = fourhorn sculpin; 9SSB = ninespine stickleback; BLFS = Alaska blackfish

Dolly Varden captured from the Suqitughneq River drainage ranged in size from 41 to 225 mm and the length-frequency histogram (Figure 6) shows a relatively even distribution of sizes. Dolly Varden captured in the Quangeghsaq River drainage showed a much smaller size range distribution. A length-frequency histogram is provided in Figure 7 for blackfish captured in the Suqitughneq River drainage.

In addition to minnow trapping and electroshocking, angling was also attempted at the mouths of the Suqitughneq and Tapisaghak Rivers to compare fish communities. The Tapisaghak River is approximately 3 mi east of the Northeast Cape FUDS. One adult Dolly Varden was captured at the mouth of the Suqitughneq River, and several adult (450–600 mm) Dolly Varden and two pink salmon (*Oncorhynchus gorbuscha)* were captured in the Tapisaghak River.

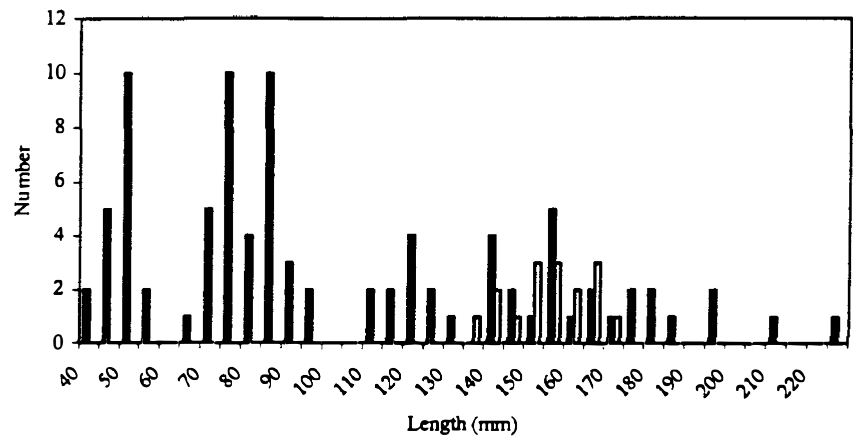

Figure 6. Length-frequency histograms of Dolly Varden char collected in Suqitughneq (black bars) and Quangeghsaq Rivers (white bars).

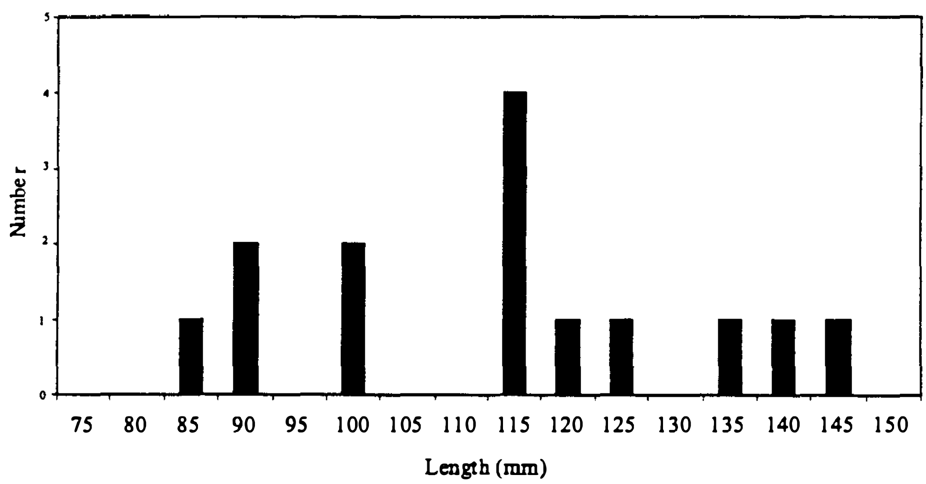

Figure 7. Length-frequency histogram of blackfish captured in Suqitughneq River.

Fish Tissue Toxicity

Of the 18 PAHs tested, 5 were detected in the blackfish samples collected at the spill tributary (slurc01) (Table 8). The PCB Aroclor 1260 was present in tissue samples of Dolly Varden collected from the downstream stressed site (slsuq01) and the upstream control site (slsuq02), as well as in blackfish from the spill tributary (slurc01). Results of the sample analyses and quality assurance procedures of Columbia Analytical Services are provided in Appendix C.

Table 8. Concentrations in parts per billion of PAHs and PCBs detected in fish tissue samples.

Parameter	Site and Fish Species Codes*		
	slsuq01 CHAR	slsuq02 CHAR	slurc01 BLFS
PAHs			
2-Methylnaphthalene			71
Acenaphthene			7
Fluorene			11
Naphthalene			16
Phenanthrene			9
PCBs			
Aroclor 1260	140	160	100

* CHAR = Dolly Varden char; BLFS = Alaska blackfish

Discussion

In 1966, high levels of DROs and PCBs were detected in sediment and/or water samples collected at the spill tributary in the Suqitughneq River above and below the spill area (Montgomery Watson 1996). Sediment samples collected by ENRI in 1999 and analyzed using the Microtox® bacterial bioassay verify the sediment toxicity and bioavailability of chemical contaminants within the spill tributary and at the downstream Suqitughneq River site. The Microtox® sediment toxicity tests did not reveal any evidence of contamination or stress upstream of the spill area.

Assessment of the macroinvertebrate community indicated impairment at the downstream Suqitughneq River site and at the spill tributary, supporting Microtox® bioassay results. At the downstream Suqitughneq River site, the macroinvertebrate community was characterized by lower total taxa richness, lower Chironomidae taxa richness, and higher percent dominant taxon when compared to sites with similar physical characteristics (the Quangeghsaq River or upstream of the Suqitughneq River). These results indicate that loss of taxa is due primarily to chemical contamination. In areas primarily impacted by chemical contaminants, biological communities have been shown to be less abundant and diverse than surrounding habitat should support (Barbour and Stribling 1994; Bennett and Cubbage 1992).

Assessment of the spill tributary was more difficult because of physical features differentiating this site from the larger Suqitughneq and Quangeghsaq Rivers. The spill tributary was characterized by marsh areas supporting hydrophilic vegetation and bottom substrates dominated by mud/muck and silt, while the Suqitughneq and Quangeghsaq Rivers were characterized by defined stream channels and cobble/gravel and sand substrates. Differences in these stream characteristics can affect benthic diversity in the absence of any chemical contamination (Barbour and Stribling 1994). However, the habitat assessment conducted at the spill tributary indicated habitat conditions were optimal and could potentially support a diverse macroinvertebrate community. The low abundance of organisms and lack of EPT taxa are indicative of a site affected by chemical contamination (Barbour et al. 1999).

The most significant finding related to the fish community is that the Suqitughneq River supports viable populations of Dolly Varden, blackfish, and ninespine stickleback. Of the species of fish found in the Suqitughneq River, Dolly Varden was the most common and widespread. Dolly Varden were captured both up- and downstream of the spill site. The wide and evenly distributed size range of the Dolly Varden suggests several year classes presently occupy the drainage. The capture of very small juveniles (< 50 mm) suggests this species is spawning in the drainage as well.

Based on the physical appearance of the captured Dolly Varden, both resident and anadromous forms occur in the study area. Resident fish appear very colorful and sexually mature at small sizes (125–200 mm), while the anadromous forms are almost completely silver. Only Dolly Varden resembling the anadromous form were captured in the Quangeghsaq River. There was no evidence of spawning taking place in this drainage. The capture of many large anadromous Dolly Varden at the mouth of the Tapisaghak River indicates that this is an important spawning drainage for this species. Blackfish was also relatively common throughout the Suqitughneq River drainage and was the only species captured in the spill tributary. Ninespine stickleback was common in the lower Suqitughneq River just upstream of the lagoon. The fourhorn sculpin captured in the lower Suqitughneq River is a relatively common nearshore species that often ascends freshwater streams.

Dolly Varden fish tissue analyses from the Suqitughneq River indicated potential toxicity and subsequent risks to human health from consumption. Fish tissue analyses detected the PCB Aroclor 1260 in Dolly Varden tissue collected from the Suqitughneq River both above and below the spill area and in blackfish from the spill tributary. Five PAHs were detected in tissue samples collected from blackfish in the spill tributary. Contaminants were also detected in fish tissues collected from areas where no sediment toxicity was noted. This is probably due to fish movement throughout the Suqitughneq River drainage.

The toxicity and bioavailability of PAHs varies with molecular weight (Research Triangle Institute 1995). Three of the five compounds identified in fish tissues from the study area (acenaphthene, fluorine, and phenanthrene) have low molecular weights and are generally considered to have relatively low toxicity (Eisler 1987). Naphthalene, which was also found, is not carcinogenic but has a higher molecular weight and may cause acute toxicity and other adverse affects to organisms (Research Triangle Institute 1995). It also sorbs less readily to sediment and organic compounds in soil and is, therefore, more available to biological communities (Research Triangle Institute 1995). The analyses also identified 2-methylnaphthalene in fish tissue, but no information was found in the literature concerning toxicity and bioavailability characteristics. Lesions and eroded fins, common mutagenic effects of PAHs on fish, were not observed in fish captured at any site.

Based on USEPA (1999) guidelines, concentrations of PCBs in Dolly Varden and blackfish throughout the Suqitughneq River drainage were within the "No consumption recommended" risk category. USEPA consumption limits are calculated as the number of allowable fish meals per month, based on the ranges of PCBs in the consumed fish tissue (fillets). The concentrations detected in samples collected at Northeast Cape are based on whole-fish, composite samples and, therefore, may not be directly comparable to USEPA consumption limits. PCBs are lipophilic and tend to collect in fatty tissues (belly flap, subcutaneous and dorsal fat, internal organs, gills, eyes, and brain), so concentrations detected at Northeast Cape represent the maximum levels of PCBs and PAHs consumed in whole fish. Actual exposure and risk to humans consuming these fish could depend on how they are prepared for consumption (i.e., eaten raw, cooked, and parts consumed) (USEPA 1999).

The human health risk from direct consumption of fish caught within the Suqitughneq River is presumed to be low, because the drainage is reportedly not used for subsistence fishing (E. Toolie, pers. comm.). Prior to this investigation, the Suqitughneq River was generally not believed to support a viable fish community. However, there is potential for human health concerns due to the migratory pattern of Dolly Varden. Although PCBs were not detected in Dolly Varden from the Quangeghsaq River, contaminated fish may be migrating to other water bodies. There may also be human health risk from consuming game tissue contaminated with PCBs. COE personnel observed and documented wildlife and waterfowl within the Suqitughneq River drainage during ENRI's Tier

II Ecological Assessment (COE 1999). However, the extent to which the drainage is used by wildlife and the accumulation of PCBs and PAHs in wild game inhabiting or foraging in the area has not been determined.

Conclusions

Macroinvertebrate and Microtox® bacterial bioassays verified the toxicity and bioavailability of contaminants in the downstream Suqitughneq River and the spill tributary. Although the Suqitughneq River supported a viable fish population, PCBs and PAHs were detected in fish tissues of Dolly Varden char and Alaska blackfish collected throughout the drainage.

At the request of the COE, the Agency of Toxic Substances and Disease Registry (ATSDR) has provided its expertise to help address health issues raised by the Alaska Native Board of Health concerning the Northeast Cape FUDS. The fish tissue analyses conducted during the 1999 Tier II Ecological Assessment may assist in completion of a site-specific health assessment. ENRI recommends that this report be forwarded to the ATSDR.

Further studies will be needed to determine the extent to which the Suqitughneq River drainage is used by wildlife, and whether toxicants are accumulating in wildlife tissue. ENRI recommends that tissue from wildlife species observed in the area and fish tissue samples from other St. Lawrence Island water bodies be collected and analyzed for PAHs and PCBs. This will provide information to refine the remedial action plan and to accurately measure risks to human and ecosystem health from the Northeast Cape FUDS.

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Appendix A

Site Characterization Data

Appendix A, Table 1. Macroinvertebrate taxa lists.

	Station					
Taxa	slqan01	slqan01	slsuq01	slsuq02	slsut01	slurc01
Ephemeroptera						
Baetidae						
Diphetor	4	5	16	44		
Baetidae UNID	3		27	14		
Plecoptera						
Nemouridae						
Nemoura		1				
Perlodidiae						
Arcynopteryx			1			
Perlodidae UNID	1					
Trichoclinocera						2
Trichoptera						
Apataniidae						
Apatania				2		
Limnephilidae						
Dicosmoecus			1	1		
Grensia	7	28				
Limnephilidae UNID	7	7	3	1	4	
Diptera						
Chironomidae						
Tanypodinae						
Brundiniella		2				
Orthocladinae						
Corynoneura						17
Cricotopus	8	19		5	18	14
Cricotopus/ Orthocladius	19	40	30	47	60	72
Diplocladius					88	
Euorthocladius					32	
Heterotrissocladius		2	3			
Limnophyes						6
nr. Hydrobaenus					14	
nr. Nanocladius						6
nr. Tokunagayusurika				3		
Orthocladius	32	43		8		23
Parakiefferiella				5		
Tvetenia	42	87	250	57	42	106
Zalutschia				3		14
Orthocladinae UNID dif		2				3
Orthocladinae UNID	4	7		2	14	26
Chironominae						
Chironomus						3
Constempellina			3	3		
Phaenopsectra	23	19		6		
Paratanytarsus		2		3	4	

Appendix A, Table 1. Macroinvertebrate taxa list.

Taxa	slqan01	slqan01	Station slsuq01	slsuq02	slsut01	slurc01
Diamesa			3	8	67	
Empididae						
Simuliidae						
Simulium			3	11	12	2
Tipulidae						
Dicranota		1		1	5	
Prionocera						3
Tipulidae UNID dif		1				
Tipulidae UNID						16
Coleoptera						
Dytiscidae						
Hydaticus						1
Helophoridae						
Helophorus		1				
Nematoda	1					
Annelida						
Oligochaeta	12	77	2	5	7	8
Hirudinea				1		
Turbellaria			4			
Crustacea						
Isopoda						
Lirceus	1	8				
Amphipoda						
Gammarus		2	2	2	1	2
Ostracoda						3
Hydracarina	3	2	5	9		1
Lebertiidae					2	
Sperchonidae			14	6		
Mollusca						
Sphaeriidae				2		
Total	167	358	367	249	370	328

Appendix A Table 2. Physical and chemical site characterization data.

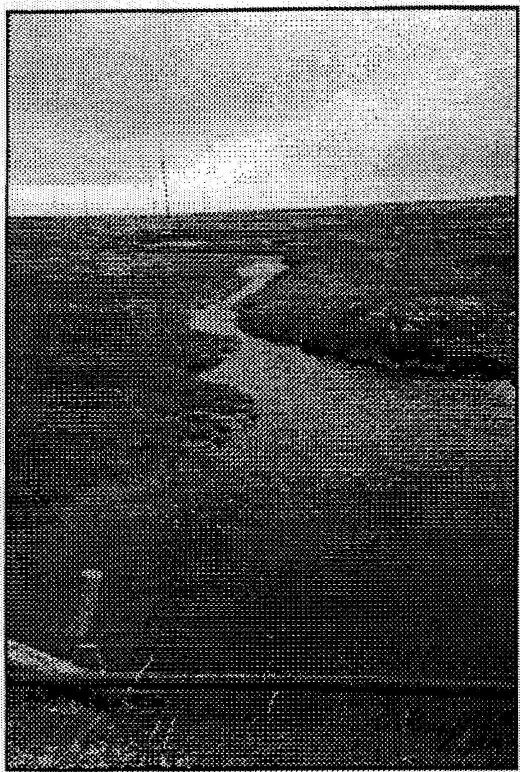
StationID	slqan01	slsuq01	slsuq02	slsut01	slurc01
Collection date	8/3/99	8/2/99	8/1/99	7/31/99	8/1/99
Collection time (24 hrs)	1050	1120	1130	1300	1700
Discharge (ft^3/s)	3.4	19.3	13	0.3	4.1
Gradient of reach (ft/100ft)	<0.01	<0.01	<0.01	0.01	<0.01
Average width (ft)	5	6	3.5	5.5	2*
Average depth (ft)					
Riffle	1	2	---	0.7	0.2
Run	1.5	2.5	4	2.5	0.9
Pool	0.8	3	5	3	1.2
% Substrate composition					
Boulder	2	2	0	0	0
Cobble	15	18	2	0	10
Gravel	35	30	24	1	15
Sand	55	40	60	20	20
Silt	0	10	14	80	55
Field chemistry					
Temperature (°C)	8.7	6.1	5.8	3	10.1
Dissolved oxygen (mg/l)	9.1	10.7	11.9	12.3	10.7
pH (s.u.)	6.6	7.3	7.0	6.9	7.4
Conductivity (umhos)	142.3	103.8	74.8	97.8	88.3

Appendix A Table 3. Habitat assessment results by site.

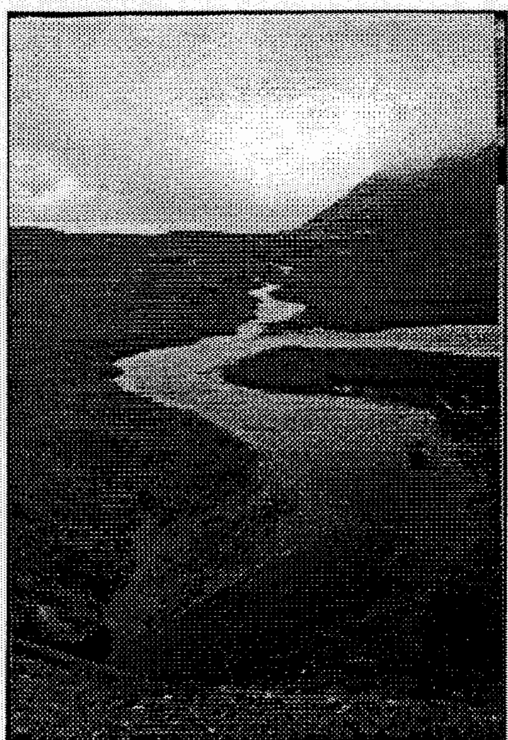
	Site				
Habitat parameters	slqan01a	slsuq02a	slsuq01a	slsut01a	slurc01a
Instream measurements					
Quality/ availability instream habitat	14	15	17	13	11
Substrate embeddedness	19	20	15	16	11
Velocity-depth combinations	9	14	16	17	13
Sediment deposition	15	19	13	16	18
Channel flow status	19	20	20	20	20
Channel alteration	19	20	20	19	20
Sinuosity	9	8	9	11	19
Bank and vegetative stability					
Bank stability-LB	10	10	10	10	10
Bank stability-RB	10	10	10	10	10
Bank vegetative protection-LB	10	10	10	10	10
Bank vegetative protection-RB	10	10	10	10	10
Riparian zone measurements					
Riparian vegetative zone width-LB	10	10	10	10	10
Riparian vegetative zone width-RB	10	10	10	10	10
Total habitat score	164	176	170	172	172

Appendix B

Site Photographs



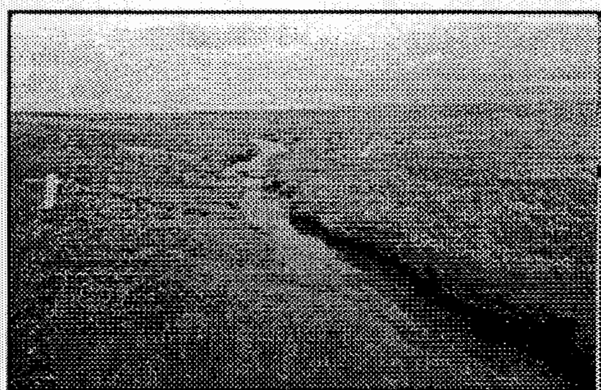
slsuq02 downstream of culvert bridge.



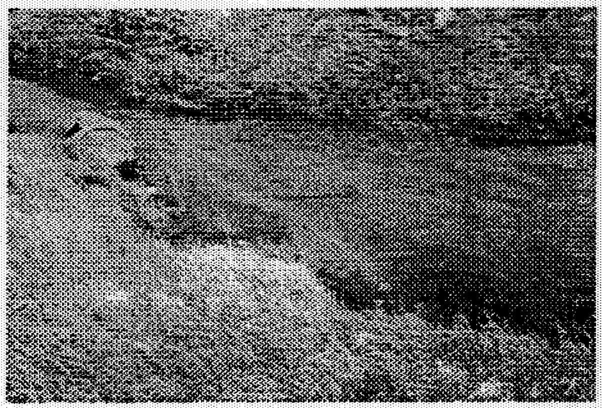
slsuq02 upstream of culvert bridge

slsuq01upstream of access road near runway

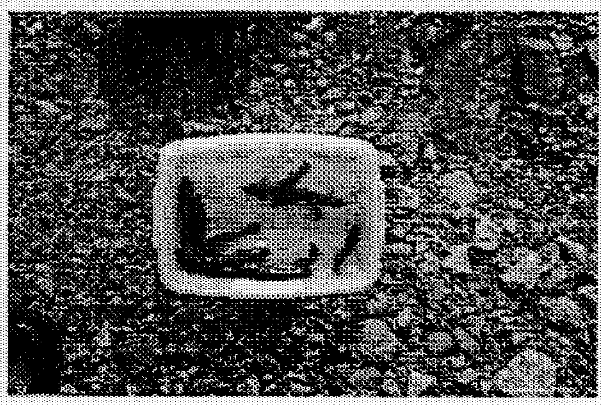
slsut01: Photo taken at downstream edge of reach



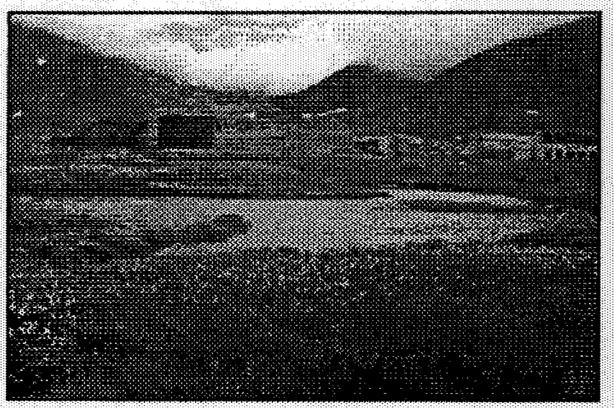
slqan01: Photo taken at downstream edge of reach



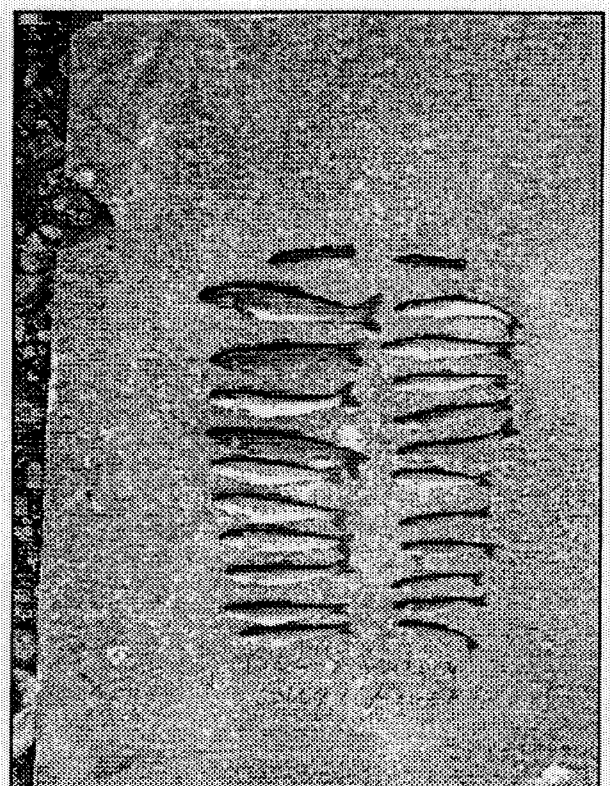
slurc01 showing petroleum sheen



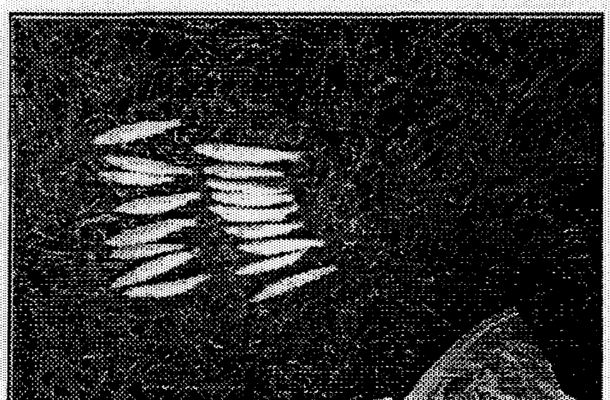
Blackfish collected at slurc01



Receiving pond at slurc01



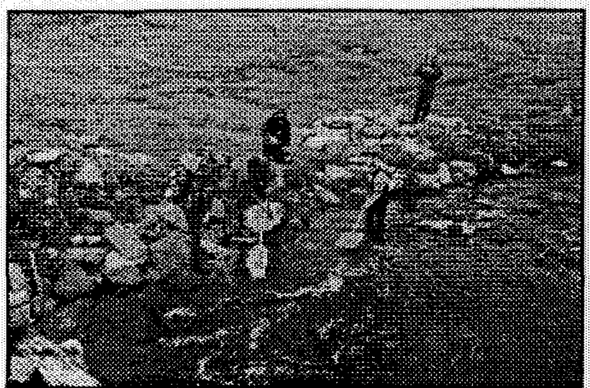
Blackfish and dolley varden collected at slsuq01.



Anadromous dolley varden collected at slqan01.

slsuq01

slsuq01



slsuq01

slsuq01

slsuq01

sltan01

Appendix C

Laboratory and Quality Assurance Procedure Results

Rec'd Nov 8 1999

Columbia Analytical Services INC.
An Employee-Owned Company

September 14, 1999

Service Request No: A9900436

Lisa Houston
University of Alaska - ENRI
707 A Street
Anchorage, AK 99501

Re: Ecological Assessment of Northeast Cape, St. Lawrence Island

Dear Lisa:

Enclosed are the results of the samples submitted to our laboratory on August 6, 1999. For your reference, these analyses have been assigned our service request number A9900436. All analyses were performed in our Kelso, Washington laboratory under service request number K9905279.

All analyses were performed according to our laboratory's quality assurance program. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions. My extension is 0821.

Respectfully submitted,

Columbia Analytical Services, Inc.

Abbie Spielman
Abbie Spielman
Laboratory Director

AS/bej

4600 Business Park Blvd., Ste. 32 • Anchorage, AK 99503-7143 • 907-563-0846 • Fax 907-563-2973

Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
J	Estimated concentration. The value is less than the method reporting limit, but greater than the method detection limit.
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NAN	Not Analyzed
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected at or above the MRL
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Alaska, University of (Anchorage)	**Service Request:**	K9905279
Project:	Ecological Assessment of Northeast Cape, St.Lawrence Island	**Date Collected:**	8/2/99
Sample Matrix:	Tissue	**Date Received:**	8/6/99
		Date Extracted:	8/25/99
		Date Analyzed:	8/25/99

Lipids
Gravimetric
Units: Percent (%)
As Received Basis

Sample Name	Lab Code	Result
slsuq02a-DV	K9905279-001	5.06
slqan01a-DV	K9905279-002	2.49
slqan01a-9SB	K9905279-003	5.77
·rc01a-BF	K9905279-004	2.06
.sut01a-BF	K9905279-005	4.41
slsut01a-DV	K9905279-006	3.20
slsuq01a-DV	K9905279-007	5.38
slsuq01a-9SB	K9905279-008	4.58

Approved By: Carol Johnson Date: 8-26-99

1A/102094
05279SVG.AB1 - TSolids 8/26/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Alaska, University of (Anchorage)	**Service Request:**	K9905279
Project:	Ecological Assessment of Northeast Cape, St.Lawrence Island	**Date Collected:**	8/2/99
Sample Matrix:	Tissue	**Date Received:**	8/6/99

Polychlorinated Biphenyls (PCBs)

Sample Name:	slsuq02a-DV	Units:	ug/Kg (ppb)
Lab Code:	K9905279-001	Basis:	As Received
Test Notes:	C		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aroclor 1016	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
Aroclor 1221	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
Aroclor 1232	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
Aroclor 1242	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
Aroclor 1248	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
lor 1254	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
.clor 1260	EPA 3540C	8082	50	5	8/18/99	8/28/99	160	

C The MRL is elevated because the sample required diluting.

Approved By: PJM Date: 8-31-99

1S22/020597p

05279SVG.AY1 - 1 8/31/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Alaska, University of (Anchorage)	**Service Request:**	K9905279
Project:	Ecological Assessment of Northeast Cape, St.Lawrence Island	**Date Collected:**	8/2/99
Sample Matrix:	Tissue	**Date Received:**	8/6/99

Polychlorinated Biphenyls (PCBs)

Sample Name:	slqan01 a-DV	Units:	ug/Kg (ppb)
Lab Code:	K9905279-002	Basis:	As Received
Test Notes:	C		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aroclor 1016	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
Aroclor 1221	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
Aroclor 1232	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
Aroclor 1242	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
Aroclor 1248	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
or 1254	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
.lor 1260	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	

C The MRL is elevated because the sample required diluting.

Approved By: PJM Date: 8-31-99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Alaska, University of (Anchorage)	**Service Request:**	K9905279
Project:	Ecological Assessment of Northeast Cape, St.Lawrence Island	**Date Collected:**	8/2/99
Sample Matrix:	Tissue	**Date Received:**	8/6/99

Polychlorinated Biphenyls (PCBs)

Sample Name:	slqan01a-9SB	Units:	ug/Kg (ppb)
Lab Code:	K9905279-003	Basis:	As Received
Test Notes:	C		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aroclor 1016	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
Aroclor 1221	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
Aroclor 1232	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
Aroclor 1242	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
Aroclor 1248	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
:lor 1254	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
.clor 1260	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	

C The MRL is elevated because the sample required diluting.

Approved By: PJM Date: 8-31-99

1S22/020597p

05279SVG.AY1 - 3 8/31/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Alaska, University of (Anchorage)	**Service Request:**	K9905279
Project:	Ecological Assessment of Northeast Cape, St.Lawrence Island	**Date Collected:**	8/2/99
Sample Matrix:	Tissue	**Date Received:**	8/6/99

Polychlorinated Biphenyls (PCBs)

Sample Name:	slurc01a-BF	Units:	ug/Kg (ppb)
Lab Code:	K9905279-004	Basis:	As Received
Test Notes:	C		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aroclor 1016	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
Aroclor 1221	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
Aroclor 1232	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
Aroclor 1242	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
Aroclor 1248	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
lor 1254	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
.clor 1260	EPA 3540C	8082	50	5	8/18/99	8/28/99	100	

Approved By: PJM Date: 8-31-99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Alaska, University of (Anchorage)	**Service Request:**	K9905279
Project:	Ecological Assessment of Northeast Cape, St.Lawrence Island	**Date Collected:**	8/1/99
Sample Matrix:	Tissue	**Date Received:**	8/6/99

Polychlorinated Biphenyls (PCBs)

Sample Name:	slsut01a-BF	Units:	ug/Kg (ppb)
Lab Code:	K9905279-005	Basis:	As Received
Test Notes:	F		

Analyte	**Prep Method**	**Analysis Method**	**MRL**	**Dilution Factor**	**Date Extracted**	**Date Analyzed**	**Result**	**Result Notes**
Aroclor 1016	EPA 3540C	8082	20	1	8/18/99	8/28/99	ND	
Aroclor 1221	EPA 3540C	8082	20	1	8/18/99	8/28/99	ND	
Aroclor 1232	EPA 3540C	8082	20	1	8/18/99	8/28/99	ND	
Aroclor 1242	EPA 3540C	8082	20	1	8/18/99	8/28/99	ND	
Aroclor 1248	EPA 3540C	8082	20	1	8/18/99	8/28/99	ND	
lor 1254	EPA 3540C	8082	20	1	8/18/99	8/28/99	ND	
clor 1260	EPA 3540C	8082	20	1	8/18/99	8/28/99	ND	

F The MRL is elevated because of the low percent solids in the sample as received.

Approved By: PJM Date: 8-31-99

1S22/020597p

05279SVG AY1 - 5 8/31/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Alaska, University of (Anchorage)	**Service Request:**	K9905279
Project:	Ecological Assessment of Northeast Cape, St.Lawrence Island	**Date Collected:**	8/1/99
Sample Matrix:	Tissue	**Date Received:**	8/6/99

Polychlorinated Biphenyls (PCBs)

Sample Name:	slsut01a-DV	Units:	ug/Kg (ppb)
Lab Code:	K9905279-006	Basis:	As Received
Test Notes:	C		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aroclor 1016	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
Aroclor 1221	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
Aroclor 1232	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
Aroclor 1242	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
Aroclor 1248	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
'or 1254	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	
...clor 1260	EPA 3540C	8082	50	5	8/18/99	8/28/99	ND	

C The MRL is elevated because the sample required diluting.

Approved By: PJM Date: 8-31-99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Alaska, University of (Anchorage)	**Service Request:**	K9905279
Project:	Ecological Assessment of Northeast Cape, St.Lawrence Island	**Date Collected:**	8/1/99
Sample Matrix:	Tissue	**Date Received:**	8/6/99

Polychlorinated Biphenyls (PCBs)

Sample Name:	slsuq01a-DV	Units:	ug/Kg (ppb)
Lab Code:	K9905279-007	Basis:	As Received
Test Notes:	C		

Analyte	**Prep Method**	**Analysis Method**	**MRL**	**Dilution Factor**	**Date Extracted**	**Date Analyzed**	**Result**	**Result Notes**
Aroclor 1016	EPA 3540C	8082	50	1	8/18/99	8/28/99	ND	
Aroclor 1221	EPA 3540C	8082	50	1	8/18/99	8/28/99	ND	
Aroclor 1232	EPA 3540C	8082	50	1	8/18/99	8/28/99	ND	
Aroclor 1242	EPA 3540C	8082	50	1	8/18/99	8/28/99	ND	
Aroclor 1248	EPA 3540C	8082	50	1	8/18/99	8/28/99	ND	
or 1254	EPA 3540C	8082	50	1	8/18/99	8/28/99	ND	
...clor 1260	EPA 3540C	8082	50	1	8/18/99	8/28/99	140	

C The MRL is elevated because the sample required diluting.

Approved By: PDM. Date: 8-31-99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Alaska, University of (Anchorage)	**Service Request:**	K9905279
Project:	Ecological Assessment of Northeast Cape, St.Lawrence Island	**Date Collected:**	NA
Sample Matrix:	Tissue	**Date Received:**	NA

Polychlorinated Biphenyls (PCBs)

Sample Name:	Method Blank	Units:	ug/Kg (ppb)
Lab Code:	K990818-MB	Basis:	As Received
Test Notes:			

Analyte	**Prep Method**	**Analysis Method**	**MRL**	**Dilution Factor**	**Date Extracted**	**Date Analyzed**	**Result**	**Result Notes**
Aroclor 1016	EPA 3540C	8082	10	1	8/18/99	8/28/99	ND	
Aroclor 1221	EPA 3540C	8082	20	1	8/18/99	8/28/99	ND	
Aroclor 1232	EPA 3540C	8082	10	1	8/18/99	8/28/99	ND	
Aroclor 1242	EPA 3540C	8082	10	1	8/18/99	8/28/99	ND	
Aroclor 1248	EPA 3540C	8082	10	1	8/18/99	8/28/99	ND	
lor 1254	EPA 3540C	8082	10	1	8/18/99	8/28/99	ND	
..oclor 1260	EPA 3540C	8082	10	1	8/18/99	8/28/99	ND	

Approved By: PJM Date: 8-31-99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Alaska, University of (Anchorage)	**Service Request:**	K9905279
Project:	Ecological Assessment of Northeast Cape, St.Lawrence Island	**Date Collected:**	8/1/99
Sample Matrix:	Tissue	**Date Received:**	8/6/99

Polychlorinated Biphenyls (PCBs)

Sample Name:	slsuq01a-9SB	Units:	ug/Kg (ppb)
Lab Code:	K9905279-008	Basis:	As Received
Test Notes:	C		

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aroclor 1016	EPA 3540C	8082	50	1	8/18/99	8/28/99	ND	
Aroclor 1221	EPA 3540C	8082	50	1	8/18/99	8/28/99	ND	
Aroclor 1232	EPA 3540C	8082	50	1	8/18/99	8/28/99	ND	
Aroclor 1242	EPA 3540C	8082	50	1	8/18/99	8/28/99	ND	
Aroclor 1248	EPA 3540C	8082	50	1	8/18/99	8/28/99	ND	
or 1254	EPA 3540C	8082	50	1	8/18/99	8/28/99	ND	
.or 1260	EPA 3540C	8082	50	1	8/18/99	8/28/99	ND	

C The MRL is elevated because the sample required diluting.

Approved By: PJM Date: 8-31-99

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Alaska, University of (Anchorage)	**Service Request:**	K9905279
Project:	Ecological Assessment of Northeast Cape, St.Lawrence Island	**Date Collected:**	8/2/99
Sample Matrix:	Tissue	**Date Received:**	8/6/99

Polynuclear Aromatic Hydrocarbons

Sample Name:	slsuq02a-DV	Units:	ug/Kg (ppb)
Lab Code:	K9905279-001	Basis:	As Received
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
2-Methylnaphthalene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Acenaphthylene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Acenaphthene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Dibenzofuran	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
[illegible]ene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
[illegible]anthrene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Anthracene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Fluoranthene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Pyrene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benz(a)anthracene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Chrysene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benzo(b)fluoranthene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benzo(k)fluoranthene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benzo(a)pyrene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Indeno(1,2,3-cd)pyrene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Dibenz(a,h)anthracene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benzo(g,h,i)perylene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	

Approved By: [illegible] Date: SEP 10 1999

1S22/020597p

05279SVM.AY1 - 1 9/9/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Alaska, University of (Anchorage)	**Service Request:**	K9905279
Project:	Ecological Assessment of Northeast Cape, St.Lawrence Island	**Date Collected:**	8/2/99
Sample Matrix:	Tissue	**Date Received:**	8/6/99

Polynuclear Aromatic Hydrocarbons

Sample Name:	slurc01a-BF	Units:	ug/Kg (ppb)
Lab Code:	K9905279-004	Basis:	As Received
Test Notes:			

Analyte	**Prep Method**	**Analysis Method**	**MRL**	**Dilution Factor**	**Date Extracted**	**Date Analyzed**	**Result**	**Result Notes**
Naphthalene	EPA 3540	SIM	5	1	8/18/99	9/3/99	16	
2-Methylnaphthalene	EPA 3540	SIM	5	1	8/18/99	9/3/99	71	
Acenaphthylene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Acenaphthene	EPA 3540	SIM	5	1	8/18/99	9/3/99	7	
Dibenzofuran	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
rene	EPA 3540	SIM	5	1	8/18/99	9/3/99	11	
anthrene	EPA 3540	SIM	5	1	8/18/99	9/3/99	9	
Anthracene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Fluoranthene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Pyrene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benz(a)anthracene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Chrysene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benzo(b)fluoranthene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benzo(k)fluoranthene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benzo(a)pyrene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Indeno(1,2,3-cd)pyrene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Dibenz(a,h)anthracene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benzo(g,h,i)perylene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	

Approved By: C Haines Date: SEP 10 1999

1S22/020597p

05279SVM.AY1 - 4 9/9/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Alaska, University of (Anchorage)	**Service Request:**	K9905279
Project:	Ecological Assessment of Northeast Cape, St.Lawrence Island	**Date Collected:**	8/2/99
Sample Matrix:	Tissue	**Date Received:**	8/6/99

Polynuclear Aromatic Hydrocarbons

Sample Name:	slqan01a-DV	Units:	ug/Kg (ppb)
Lab Code:	K9905279-002	Basis:	As Received
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
2-Methylnaphthalene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Acenaphthylene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Acenaphthene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Dibenzofuran	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
›rene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
.enanthrene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Anthracene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Fluoranthene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Pyrene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benz(a)anthracene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Chrysene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benzo(b)fluoranthene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benzo(k)fluoranthene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benzo(a)pyrene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Indeno(1,2,3-cd)pyrene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Dibenz(a,h)anthracene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benzo(g,h,i)perylene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	

Approved By: C Haines Date: SEP 10 1999

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Alaska, University of (Anchorage)	**Service Request:**	K9905279
Project:	Ecological Assessment of Northeast Cape, St.Lawrence Island	**Date Collected:**	8/2/99
Sample Matrix:	Tissue	**Date Received:**	8/6/99

Polynuclear Aromatic Hydrocarbons

Sample Name:	slqan01a-9SB	Units:	ug/Kg (ppb)
Lab Code:	K9905279-003	Basis:	As Received
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
2-Methylnaphthalene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Acenaphthylene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Acenaphthene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Dibenzofuran	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
[illegible]ne	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
[illegible]anthrene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Anthracene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Fluoranthene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Pyrene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benz(a)anthracene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Chrysene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benzo(b)fluoranthene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benzo(k)fluoranthene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benzo(a)pyrene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Indeno(1,2,3-cd)pyrene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Dibenz(a,h)anthracene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benzo(g,h,i)perylene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	

Approved By: C L[illegible] Date: SEP 10 1999

1S22/020597p

05279SVM.AY1 - 3 9/9/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Alaska, University of (Anchorage)	**Service Request:**	K9905279
Project:	Ecological Assessment of Northeast Cape, St.Lawrence Island	**Date Collected:**	8/1/99
Sample Matrix:	Tissue	**Date Received:**	8/6/99

Polynuclear Aromatic Hydrocarbons

Sample Name:	slsut01a-BF	Units:	ug/Kg (ppb)
Lab Code:	K9905279-005	Basis:	As Received
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3540	SIM	10	1	8/18/99	9/3/99	ND	
2-Methylnaphthalene	EPA 3540	SIM	10	1	8/18/99	9/3/99	ND	
Acenaphthylene	EPA 3540	SIM	10	1	8/18/99	9/3/99	ND	
Acenaphthene	EPA 3540	SIM	10	1	8/18/99	9/3/99	ND	
Dibenzofuran	EPA 3540	SIM	10	1	8/18/99	9/3/99	ND	
[illegible]ene	EPA 3540	SIM	10	1	8/18/99	9/3/99	ND	
[illegible]anthrene	EPA 3540	SIM	10	1	8/18/99	9/3/99	ND	
Anthracene	EPA 3540	SIM	10	1	8/18/99	9/3/99	ND	
Fluoranthene	EPA 3540	SIM	10	1	8/18/99	9/3/99	ND	
Pyrene	EPA 3540	SIM	10	1	8/18/99	9/3/99	ND	
Benz(a)anthracene	EPA 3540	SIM	10	1	8/18/99	9/3/99	ND	
Chrysene	EPA 3540	SIM	10	1	8/18/99	9/3/99	ND	
Benzo(b)fluoranthene	EPA 3540	SIM	10	1	8/18/99	9/3/99	ND	
Benzo(k)fluoranthene	EPA 3540	SIM	10	1	8/18/99	9/3/99	ND	
Benzo(a)pyrene	EPA 3540	SIM	10	1	8/18/99	9/3/99	ND	
Indeno(1,2,3-cd)pyrene	EPA 3540	SIM	10	1	8/18/99	9/3/99	ND	
Dibenz(a,h)anthracene	EPA 3540	SIM	10	1	8/18/99	9/3/99	ND	
Benzo(g,h,i)perylene	EPA 3540	SIM	10	1	8/18/99	9/3/99	ND	

Approved By: [illegible] Date: SEP 10 1999

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Alaska, University of (Anchorage)	**Service Request:**	K9905279
Project:	Ecological Assessment of Northeast Cape, St.Lawrence Island	**Date Collected:**	8/1/99
Sample Matrix:	Tissue	**Date Received:**	8/6/99

Polynuclear Aromatic Hydrocarbons

Sample Name:	slsuq01a-9SB	Units:	ug/Kg (ppb)
Lab Code:	K9905279-008	Basis:	As Received
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
2-Methylnaphthalene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Acenaphthylene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Acenaphthene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Dibenzofuran	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
rene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
anthrene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Anthracene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Fluoranthene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Pyrene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benz(a)anthracene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Chrysene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benzo(b)fluoranthene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benzo(k)fluoranthene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benzo(a)pyrene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Indeno(1,2,3-cd)pyrene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Dibenz(a,h)anthracene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benzo(g,h,i)perylene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	

Approved By: C Haines Date: SEP 10 1999

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Alaska, University of (Anchorage)	**Service Request:**	K9905279
Project:	Ecological Assessment of Northeast Cape, St.Lawrence Island	**Date Collected:**	8/1/99
Sample Matrix:	Tissue	**Date Received:**	8/6/99

Polynuclear Aromatic Hydrocarbons

Sample Name:	slsuq01a-DV	Units:	ug/Kg (ppb)
Lab Code:	K9905279-007	Basis:	As Received
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
2-Methylnaphthalene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Acenaphthylene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Acenaphthene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Dibenzofuran	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
rene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
anthrene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Anthracene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Fluoranthene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Pyrene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benz(a)anthracene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Chrysene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benzo(b)fluoranthene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benzo(k)fluoranthene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benzo(a)pyrene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Indeno(1,2,3-cd)pyrene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Dibenz(a,h)anthracene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benzo(g,h,i)perylene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	

Approved By: C (Hanes) Date: SEP 10 1999

1S22/020597p

05279SVM.AY2 - 7 9/9/99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Alaska, University of (Anchorage)	**Service Request:**	K9905279
Project:	Ecological Assessment of Northeast Cape, St.Lawrence Island	**Date Collected:**	8/1/99
Sample Matrix:	Tissue	**Date Received:**	8/6/99

Polynuclear Aromatic Hydrocarbons

Sample Name:	slsut01a-DV	Units:	ug/Kg (ppb)
Lab Code:	K9905279-006	Basis:	As Received
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
2-Methylnaphthalene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Acenaphthylene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Acenaphthene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Dibenzofuran	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
[illegible]ene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
[illegible]anthrene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Anthracene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Fluoranthene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Pyrene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benz(a)anthracene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Chrysene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benzo(b)fluoranthene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benzo(k)fluoranthene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benzo(a)pyrene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Indeno(1,2,3-cd)pyrene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Dibenz(a,h)anthracene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	
Benzo(g,h,i)perylene	EPA 3540	SIM	5	1	8/18/99	9/3/99	ND	

Approved By: C.[illegible] Date: SEP 10 1999

1S22/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Alaska, University of (Anchorage)	**Service Request:**	K9905279
Project:	Ecological Assessment of Northeast Cape, St.Lawrence Island	**Date Collected:**	NA
Sample Matrix:	Tissue	**Date Received:**	NA

Polynuclear Aromatic Hydrocarbons

Sample Name:	Method Blank	Units:	ug/Kg (ppb)
Lab Code:	KWG9902683-4	Basis:	As Received
Test Notes:			

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Naphthalene	EPA 3540	SIM	5	1	8/18/99	9/7/99	ND	
2-Methylnaphthalene	EPA 3540	SIM	5	1	8/18/99	9/7/99	ND	
Acenaphthylene	EPA 3540	SIM	5	1	8/18/99	9/7/99	ND	
Acenaphthene	EPA 3540	SIM	5	1	8/18/99	9/7/99	ND	
Dibenzofuran	EPA 3540	SIM	5	1	8/18/99	9/7/99	ND	
[illegible]ene	EPA 3540	SIM	5	1	8/18/99	9/7/99	ND	
[illegible]anthrene	EPA 3540	SIM	5	1	8/18/99	9/7/99	ND	
Anthracene	EPA 3540	SIM	5	1	8/18/99	9/7/99	ND	
Fluoranthene	EPA 3540	SIM	5	1	8/18/99	9/7/99	ND	
Pyrene	EPA 3540	SIM	5	1	8/18/99	9/7/99	ND	
Benz(a)anthracene	EPA 3540	SIM	5	1	8/18/99	9/7/99	ND	
Chrysene	EPA 3540	SIM	5	1	8/18/99	9/7/99	ND	
Benzo(b)fluoranthene	EPA 3540	SIM	5	1	8/18/99	9/7/99	ND	
Benzo(k)fluoranthene	EPA 3540	SIM	5	1	8/18/99	9/7/99	ND	
Benzo(a)pyrene	EPA 3540	SIM	5	1	8/18/99	9/7/99	ND	
Indeno(1,2,3-cd)pyrene	EPA 3540	SIM	5	1	8/18/99	9/7/99	ND	
Dibenz(a,h)anthracene	EPA 3540	SIM	5	1	8/18/99	9/7/99	ND	
Benzo(g,h,i)perylene	EPA 3540	SIM	5	1	8/18/99	9/7/99	ND	

Approved By: C Havens Date: SEP 10 1999

Appendix A

Laboratory QC Results

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Alaska, University of (Anchorage)	**Service Request:**	K9905279
Project:	Ecological Assessment of Northeast Cape, St.Lawrence Island	**Date Collected:**	8/1 - 2/99
Sample Matrix:	Tissue	**Date Received:**	8/6/99
		Date Extracted:	8/18/99
		Date Analyzed:	8/28/99

Surrogate Recovery Summary
Polychlorinated Biphenyls (PCBs)

Prep Method:	EPA 3540C	Units:	PERCENT
Analysis Method:	8082	Basis:	NA

Sample Name	**Lab Code**	**Test Notes**	**Percent Recovery** Decachlorobiphenyl
slsuq02a-DV	K9905279-001		97
slqan01a-DV	K9905279-002		89
slqan01a-9SB	K9905279-003		87
slurc01a-BF	K9905279-004		92
slsut01a-BF	K9905279-005		93
slsut01a-DV	K9905279-006		88
slsuq01a-DV	K9905279-007		94
slsuq01a-9SB	K9905279-008		92
'ethod Blank	K990818-MB		100

CAS Acceptance Limits: 20-142

Approved By: PJM. Date: 8-31-99

SUR1/110697p
05279SVG.AY1 - SUR 8/31/99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

ient:	Alaska, University of (Anchorage)	**Service Request:**	K9905279
roject:	Ecological Assessment of Northeast Cape, St.Lawrence Island	**Date Collected:**	8/2/99
ample Matrix:	Tissue	**Date Received:**	8/6/99
		Date Extracted:	8/18/99
		Date Analyzed:	8/28/99

Matrix Spike/Duplicate Matrix Spike Summary
Polychlorinated Biphenyls (PCBs)

ample Name:	slsuq02a-DV		Units:	ug/Kg (ppb)
ab Code:	K9905279-001MS,	K9905279-001DMS	Basis:	As Received
st Notes:				

nalyte	**Prep Method**	**Analysis Method**	**MRL**	**Spike Level MS**	**Spike Level DMS**	**Sample Result**	**Spike Result MS**	**Spike Result DMS**	**Percent Recovery MS**	**Percent Recovery DMS**	**Percent Recovery CAS Acceptance Limits**	**Relative Percent Difference**	**Result Notes**
oclor 1016	EPA 3540C	8082	50	200	200	ND	160	160	80	80	35-140	<1	
oclor 1260	EPA 3540C	8082	50	200	200	160	340	340	90	90	35-140	<1	

proved By: PJM Date: 8-31-99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Alaska, University of (Anchorage)	**Service Request:**	K9905279
Project:	Ecological Assessment of Northeast Cape, St.Lawrence Island	**Date Collected:**	NA
LCS Matrix:	Tissue	**Date Received:**	NA
		Date Extracted:	8/18/99
		Date Analyzed:	8/28/99

Laboratory Control Sample Summary
Polychlorinated Biphenyls (PCBs)

Sample Name:	Lab Control Sample	Units:	ug/Kg (ppb)
Lab Code:	K990818-LCS	Basis:	As Received
Test Notes:			

Analyte	**Prep Method**	**Analysis Method**	**True Value**	**Result**	**Percent Recovery**	**CAS Percent Recovery Acceptance Limits**	**Result Notes**
Aroclor 1016	EPA 3540C	8082	200	152	76	50-130	
Aroclor 1260	EPA 3540C	8082	200	187	94	50-130	

Approved By: PJM Date: 8-31-99

LCS/080797p
05279SVG.AY1 - LCS(nr) 8/31/99

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	Alaska, University of (Anchorage)	**Service Request:**	K9905279
Project:	Ecological Assessment of Northeast Cape, St.Lawrence Island	**Date Collected:**	8/1-2/99
Sample Matrix:	Tissue	**Date Received:**	8/6/99
		Date Extracted:	8/18/99
		Date Analyzed:	9/3-7/99

Surrogate Recovery Summary
Polynuclear Aromatic Hydrocarbons

Prep Method:	EPA 3540	Units:	PERCENT
Analysis Method:	SIM	Basis:	NA

Sample Name	Lab Code	Test Notes	Percent Recovery Fluorene-d10	Fluoranthene-d10	Terphenyl-d14
slsuq02a-DV	K9905279-001		45	48	48
slqan01a-DV	K9905279-002		42	45	52
slqan01a-9SB	K9905279-003		43	45	48
slurc01a-BF	K9905279-004		46	44	52
slsut01a-BF	K9905279-005		38	42	44
slsut01a-DV	K9905279-006		45	50	49
slsuq01a-DV	K9905279-007		41	46	50
slsuq01a-9SB	K9905279-008		45	49	50
Method Blank	KWG9902683-4		24	45	44
CAS Acceptance Limits:			13-144	13-144	15-145

Approved By: [signature] Date: SEP 10 1999

SUR3/111397p
05279SVM.AY1 - SUR 9/9/99

Appendix B

Chain of Custody Information
Cooler Receipt Form

A9900436

University of Alaska Anchorage-Environment and Natural Resources Institute
Field Chain of Custody Record
Fish Tissue Samples
Study: Ecological Assessment of Northeast Cape, St. Lawrence Island

Fund Code: 230612

000028

	Station #	Date mm/dd/yy	Time 24 hr	Species Code	Collector's Initials	Parameter: PCB	Parameter: PAH	Parameter: Diesel Modified	Pres.	Lab I.D. #
1	slsuq02a	08/02/99	1200	DV	LB, MK, LH	X	X	X	ice	9900436-1
2	slqan01a	08/02/99	1545	DV	LB, MK, LH	X	X	X	ice	-2
3	slqan01a	08/02/99	1545	9SB	LB, MK, LH	X	X	X	ice	-3
4	slurc01a	08/02/99	1430	BF	LB, MK, LH	X	X	X	ice	-4
5	slsut01a	08/01/99	1030	BF	LB, MK, LH	X	X	X	ice	-5
6	slsut01a	08/01/99	1030	DV	LB, MK, LH	X	X	X	ice	-6
7	slsuq01a	08/01/99	1500	DV	LB, MK, LH	X	X	X	ice	-7
8	slsuq01a	08/01/99	1500	9SB	LB, MK, LH	X	X	X	ice	-8

Samples analyzed by ______________________ Date __________ Time __________ hrs

LH
Lisa Houston
Samples Collected By (Signature and initial of one collector from each team)

Fredha S. Olson 8/4/99 16:10
Samples Received by (Signature) Date/Time

Lisa Houston 8/6/99 830
Samples Received by (Signature) Date/Time

Tim Westlake 8/6/99 0845
Samples Received in Lab By (Signature) Date/Time

Received frozen

Lisa Houston 8-4-99 1610 hrs
Relinquished by (Signature of one collector from each crew) Date/Time

Fredha S. Olson 8/6/99 8:30
Relinquished by (Signature) Date/Time

Relinquished by (Signature) Date/Time

Send Report to: Lisa Houston, UAA - ENRI
707 A Street
Anchorage, AK 99501
(907) 257-2744
257-2712

Columbia Analytical Services Inc.
Cooler Receipt And Preservation Form

Preliminary Examination:

Project/Client UAA - ENRI Work Order A99 00436

Cooler received on 8-6-99 and opened on 8/6/99 by T. Westlake

Carrier ——— Shipping Number ——— NA

1. Were custody seals on outside of shipping container? YES NO NA
   If yes, how many and where? HP
2. Were seals intact and signature & date correct? YES NO NA
3. Temperature of cooler / Temperature blank upon receipt (circle): N/A - Frozen bag of Fish
4. Were custody papers properly filled out (ink, signed, etc.)? YES NO NA

Login Examination

Date samples were Logged-in 8-6-99 and unpacked by T. Westlake

5. Type of packing material present garbage bag
6. Did all sample containers arrive in good condition (unbroken)? YES NO NA
7. Were all sample labels complete (*i.e.* analysis, preservation, etc.)? YES NO NA
8. Did all sample labels and tags agree with custody papers? YES NO NA
9. Were the correct types of containers used for the tests indicated? YES NO NA
10. Were all of the preserved samples received at the lab with the appropriate pH? YES NO NA
11. Were VOA vials checked for absence of air bubbles, and if present, noted below? YES NO NA
12. Did the sample containers originate from CAS/AK or a branch laboratory? ____ YES NO NA

Explain any discrepancies

Samples that required preservation or received outside of temperature range at the lab(circle)

Sample ID	Reagent	Volume	Lot Number	Initials

Verified By

A9900 36

University of Ala Anchorage-Environment and Natural Resources Institute

Field Chain of Custody Record

Fund Code: 230612

Fish Tissue Samples

K9905279

Study: Ecological Assessment of Northeast Cape, St. Lawrence Island

00030

Station #	Date mm/dd/yy	Time 24 hr	Species Code	Collector's Initials	Parameter PCB	PAH	Diesel Modified	Pres.	Lab I.D. #
slsuq02a	08/02/99	1200	DV	LB, MK, LH	X	X	X	ice	A9900436-1
slqan01a	08/02/99	1545	DV	LB, MK, LH	X	X	X	ice	-2
slqan01a	08/02/99	1545	9SB	LB, MK, LH	X	X	X	ice	-3
slurc01a	08/02/99	1430	BF	LB, MK, LH	X	X	X	ice	-4
slsut01a	08/01/99	1030	BF	LB, MK, LH	X	X	X	ice	-5
slsut01a	08/01/99	1030	DV	LB, MK, LH	X	X	X	ice	-6
slsuq01a	08/01/99	1500	DV	LB, MK, LH	X	X	X	ice	-7
slsuq01a	08/01/99	1500	9SB	LB, MK, LH	X	X	X	ice	-8

Samples analyzed by ______ Date ______ Time ______ hrs

LH
Lisa Houston
Samples Collected By (Signature and initial of one collector from each team)

Lisa Houston 8-4-99 1610 hrs
Relinquished by (Signature of one collector from each crew) Date/Time

Fredra S. Olson 8/4/99 16:10
Samples Received by (Signature) Date/Time

Fredra S. Olson 8/6/99 8:30
Relinquished by (Signature) Date/Time

Lisa Houston 8/6/99 830
Samples Received by (Signature) Date/Time

Tim Westlake 8/6/99 0845
Samples Received in Lab By (Signature) Date/Time

8/7/99 1135
Relinquished by (Signature) Date/Time

Reed

Received frozen

8/6/5 16.30

Send Report to: Lisa Houston, UAA - ENRI
707 A Street
Anchorage, AK 99501
(907) 257-2744

A9900 4[illegible]

University of Ala: Anchorage-Environment and Natural Resources Inst.

Field Chain of Custody Record

Fish Tissue Samples

P. 2 Fund Code: 230612

Study: Ecological Assessment of Northeast Cape, St. Lawrence Island

000031

	Station #	Date mm/dd/yy	Time 24 hr	Species Code	Collector's Initials	Parameter PCB	PAH	Diesel Modified	Pres.	Lab I.D. #
1	slsuq02a	08/02/99	1200	DV	LB, MK, LH	X	X	X	ice	9900436-1
2	slqan01a	08/02/99	1545	DV	LB, MK, LH	X	X	X	ice	-2
3	slqan01a	08/02/99	1545	9SB	LB, MK, LH	X	X	X	ice	-3
4	slurc01a	08/02/99	1430	BF	LB, MK, LH	X	X	X	ice	-4
5	slsut01a	08/01/99	1030	BF	LB, MK, LH	X	X	X	ice	-5
6	slsut01a	08/01/99	1030	DV	LB, MK, LH	X	X	X	ice	-6
7	slsuq01a	08/01/99	1500	DV	LB, MK, LH	X	X	X	ice	-7
8	slsuq01a	08/01/99	1500	9SB	LB, MK, LH	X	X	X	ice	-8

Samples analyzed by ______________ Date ________ Time ________ hrs

LH

Lisa Houston

Samples Collected By (Signature and initial of one collector from each team)

Lisa Houston 8-4-99 1610 hrs

Relinquished by (Signature of one collector from each crew) Date/Time

Fredra S. Olson 8/4/99 16:10

Samples Received by (Signature) Date/Time

Fredra S. Olson 8/6/99 8:30

Relinquished by (Signature) Date/Time

Lisa Houston 8/6/99 8:30

Samples Received by (Signature) Date/Time

Relinquished by (Signature) Date/Time

Tim Westlake 8/6/99 0845

Samples Received in Lab By (Signature) Date/Time

Received frozen

Send Report to: Lisa Houston, UAA - ENRI
707 A Street
Anchorage, AK 99501
(907) 257-2744

AUG- 6-99 FRI 6:28 PM CAS Alaska FAX NO. 907 5632973

Columbia Analytical Services Inc.
Cooler Receipt And Preservation Form

Project/Client CAS AK Work Order K99 05229

Cooler received on 9/7/99 and opened on 9/7/99 by [illegible]

1. Were custody seals on outside of cooler? YES NO
   If yes, how many and where? 2 F&B Davis
2. Were seals intact and signature & date correct? YES NO
3. COC #
   Temperature of cooler(s) upon receipt: 0.2
   Temperature Blank: N/A
4. Were custody papers properly filled out (ink, signed, etc.)? YES NO
5. Type of packing material present NONE
6. Did all bottles arrive in good condition (unbroken)? YES NO
7. Were all bottle labels complete (*i.e.* analysis, preservation, etc.)? YES NO
8. Did all bottle labels and tags agree with custody papers? YES NO
9. *Were the correct types of bottles used for the tests indicated?* YES NO
10. Were all of the preserved bottles received at the lab with the appropriate pH? ~~YES NO~~
11. Were VOA vials checked for absence of air bubbles, and if present, noted below? ~~YES NO~~
12. Did the bottles originate from CAS/K or a branch laboratory? YES NO

Explain any discrepancies

Samples that required preservation or received outside of temperature range at the lab (circle)

Sample ID	Reagent	Volume	Lot Number	Initials

TRIP REPORT

Suqitughneq River Fish Community Assessment and Habitat Characterization

Northeast Cape

Saint Lawrence Island, Alaska

ABSTRACT

The fish community of the Suqitughneq River at Northeast Cape, Saint Lawrence Island, Alaska was assessed between 31 July and 4 August 1999. Baited minnow traps, a Coffelt electroshocker and sport tackle were used to capture fish. Four species, Dolly Varden, Alaska blackfish, ninespine stickleback, and fourhorn sculpin were captured. Year classes from young-of-year juvenile to adult Dolly Varden were captured. Resident and anadromous Dolly Varden were present. The fork length of Dolly Varden and Alaska blackfish was recorded. Fall out-migrating smolt were observed. The Quangeghsaq River was selected as a control stream based on the presence of habitat similar to that in the sampled reaches of Suqitughneq River. Anadromous Dolly Varden were captured in the Quangeghsaq River. The Tapisaghak River was sampled with sport tackle to confirm the presence of anadromous Dolly Varden and pink salmon. Anadromous Dolly Varden and pink salmon were captured in the Tapisaghak River. The Suqitughneq River mouth was sampled with sport tackle to confirm the presence of anadromous Dolly Varden. Anadromous Dolly Varden were captured at the mouth of the Suqitughneq River. A species list of wildlife seen on the project site was compiled. Dominant species of riparian vegetation were identified. Conclusions and recommendations are noted.

BACKGROUND

Northeast Cape is approximately 15 kilometers west of the northeastern cape of Saint Lawrence Island, Alaska. The project site is situated on a tundra plain between the northern base of the Kinipaghulghat Mountains and the Bering Sea. Tundra lakes, streams, flora and fauna characterize the area. Access is by air or boat.

Construction of Northeast Cape facilities began in the early 1950's and the site was occupied by the military from the mid-1950's through the early 1970's. In 1969, 180,000 gallons of diesel fuel leaked from the center of three fuel tanks. The diesel fuel from this spill, and other nearby sources contaminated a small tributary drainage, and ultimately the Suqitughneq River.

Northeast Cape is classified as a Formerly Used Defense Site (FUDS). Montgomery Watson, a private contractor, completed phase I of a remedial investigation (RI) in 1995 as part of the Alaska District's Defense Environmental Restoration Program. Montgomery Watson started phase II of the RI in 1996 and continued through 1999. This fish community assessment is part of the phase II biological sampling of the Suqitughneq River.

GOALS

In cooperation with Environment and Natural Resources Institute (ENRI) biologists (contracted by Montgomery Watson), complete the following:

1. Identify the species of resident and anadromous fish present in the Suqitughneq River between 31 July and 4 August 1999.

2. Investigate the suitability of two rivers, the Tapisaghak River and the Quangeghsaq River, as a control stream based on the presence of habitat similar to the Suqitughneq River.
3. Collect a 200 gram sample of each species for tissue samples within a 200 meter reach:
    - Upstream of the tributary where the spill occurred (hereafter referred to as the spill ditch).
    - Downstream of the spill ditch.
    - The spill ditch.
    - From a control stream with habitat similar to the sampled reaches in the Suqitughneq River.
4. Preserve a reference specimen of each species collected in 95% denatured ethyl alcohol (ETOH).
5. Investigate the presence or absence of anadromous salmon *Oncorhynchus sp.* in the Suqitughneq River, Tapisaghak River, and Quangeghsaq River.
6. Characterize the channel morphology of the Suqitughneq River and control stream.
7. Identify the riparian vegetation of the Suqitughneq River and control stream.
8. Develop a species list of wildlife observed on the project site.

METHODS

Collecting methods employed:

1. Minnow traps baited with cured salmon eggs.
2. Coffelt model BP-6 backpack electroshocker producing direct current and powered by a modified Tanaka-Kogyo model QEG-300R generator.
3. Dip nets.
4. Sport tackle.

Minnow traps were soaked overnight (18 to 24 hours) in habitat judged suitable to hold fish. The electroshocker was used to augment samples collected in minnow traps or, in the case of the Quangeghsaq River control stream, to collect the entire sample. Sport tackle was used to confirm the presence of anadromous char, presumably Dolly Varden *Salvelinus malma*, and pink salmon *O. gorbuscha* at the mouth of the Tapisaghak River and anadromous Dolly Varden at the mouth of the Suqitughneq River.

RESULTS

FISH SPECIES COLLECTED

Fish species collected in the Suqitughneq River were:

1. Dolly Varden *Salvelinus malma.*
2. Alaska blackfish *Dallia pectoralis.*
3. Ninespine stickleback *Pungitius pungitius.*

4. Fourhorn sculpin *Myoxocephalus quadricornis*.

Fish species collected in the Quangeghsaq River were:

1. Dolly Varden *Salvelinus malma.*
2. Alaska blackfish *Dallia pectoralis.*
3. Ninespine stickleback *Pungitius pungitius*.

Fish species collected in the Tapisaghak River were:

5. Dolly Varden *Salvelinus malma.*
6. Pink salmon *Oncorhynchus gorbuscha.*

COLLECTING REACHES IDENTIFIED

Reach #1. Reach #1 was upstream of the spill ditch confluence and sampled with minnow traps (figure 1). It was in two 100-meter sections: the first section was upstream of the access road culvert and ended at the culvert while the second section started approximately 100 meters downstream of the culvert and continued downstream for 100 meters.

Sampling with electroshock gear could not be conducted in this reach because the water was too deep and unstable cutbanks made standing at the river's edge very hazardous. The size of fish captured in reach #1 was limited by the size of the opening in the minnow traps. Regardless of the limitations, both anadromous and resident forms of Dolly Varden were captured. The fork lengths of fish captured in this reach are presented in Appendix A1.

Reach #2. Reach #2 (figure 1) was several hundred meters downstream of where the spill occurred and began immediately upstream of the highest storm tide or lagoon flooding due to berm formation on the beach. Changes in channel morphology and sediment deposition identified this point. Reach #2 was sampled with minnow traps and the electroshocker. A 305-mm Dolly Varden was captured with the electroshocker in reach #2 but revived and released because the 200-gram tissue sample had been previously reached. The fork lengths of fish captured in this reach are presented in Appendix A1.

Reach #3. Reach #3 (figure 1) was within the spill ditch. Minnow traps were used to sample the spill ditch. Only Alaska blackfish were captured in this reach. The fork lengths of blackfish captured in this reach are presented in Appendix A1.

Reach #4. Reach #4 (figure 1) was in the headwaters of a small tributary that entered the Suqitughneq River a few hundred meters downstream of the spill ditch. This reach was sampled with minnow traps and the electroshocker. The fork lengths of fish captured in this reach are presented in Appendix A1.

Control reach. The Quangeghsaq River was selected as a control stream based on the presence of habitat similar to that in the sampled reaches in the Suqitughneq River. The control reach was a 200 meter-long reach immediately upstream of the highest storm tide or lagoon flooding due to berm formation on the beach. Vegetation changes and the position of drift logs identified this point. Fish community samples in the control reach were collected with the electroshocker and during the invertebrate sampling. The fork lengths of fish captured in this reach are presented in Appendix A1.

All positions of sample reaches were fixed and staked by survey methods on 4 August 1999.

Disposition of Specimens Collected

In excess of two hundred grams of Dolly Varden tissue was collected from reach #1, #2 and the Quangeghsaq River. Approximately 200 grams of Alaska blackfish were collected from reach #3. The habitat in reach #3 was not the type typically occupied by Dolly Varden and they were not found to be present. Although two species, Dolly Varden and Alaska blackfish were captured in reach #4, insufficient quantities of tissue were collected for analysis.

Fish in excess of the 200 grams required for tissue analysis were packaged and frozen in the manner of the tissue samples and given to the Alaska Department of Fish and Game in Nome, Alaska. Reference specimens of each species (juvenile, and anadromous and resident adults in the case of Dolly Varden) were preserved in 95% ETOH and retained by the ENRI biologists.

Sampling of the Suqitughneq River Mouth with Sport Tackle

The mouth of the Suqitughneq River lagoon was briefly sampled with sport tackle on 4 August 1999 for the presence of anadromous fish (figure 1). Tide levels were favorable but the river was at flood stage, a strong wind was blowing, and sampling conditions were poor. The prime holding water could not be covered under the existing conditions. One large anadromous Dolly Varden was caught during approximately 20 minutes of sampling with sport tackle. The presence of large anadromous Dolly Varden entering the Suqitughneq River lagoon from the Bering Sea was confirmed with the capture of this 402-mm fish. The fish was released.

Sampling of the Tapisaghak River Mouth with Sport Tackle

The Tapisaghak River was not selected for a control stream because it is much larger then the Suqitughneq River and had dissimilar habitat characteristics (figure 1). The Tapisaghak River was sampled with sport tackle on 3 August 1999. Fish caught on sport tackle were not counted or measured and the number of Dolly Varden and the lengths are estimated. Approximately 20 anadromous Dolly Varden between about 406 and 558 mm, and two pink salmon adults about 508 mm were caught in the lagoon. Dolly Varden appeared to be more abundant than pink salmon. The intent of this effort was only to determine a presence of the sought species. The fish were released.

Stream Characterization

Suqitughneq River.

The Suqitughneq River is typical of the type of drainage found in northern-tundra soils. It originates in a small lake and runs west then north (figure 1) through peat supported by permafrost.

Typical of many tundra drainages, the channel is narrow but relatively deep as it cuts through the predominantly peat soils. Channel width at the surface ranged from approximately 1 to 8 meters. The widest reaches are associated with a few small ponds and a single riffle area immediately upstream of the lagoon. Depth ranged from approximately 0.6 meters in the riffle area to over 2 meters in the peat-soil areas. Steep, undercut banks typified the peat-soil areas. Substrate ranges from mud and sand with an occasion boulder in the peat-soil area to boulders, cobble and gravel in the riffle area. Rusted fuel drums and sheetmetal occasionally litter the substrate. Although not measured, the gradient is low. The lagoon is studded with large boulders protruding from a mud bottom. Soft sand dominates the lagoon substrate near the beach.

Physical parameters of the sampled reaches are in Appendix B1. Water color and turbidity measurements were not taken.

Suqitughneq River tributaries.

Numerous tributaries enter the Suqitughneq River. Tributaries range from low-gradient wetland drainages originating in ponds, lakes, and springs to high-gradient rills originating in the rocky, Kinipaghulghat Mountains about one kilometer south of the main river channel.

The spill ditch tributary is a low-gradient, low-velocity, heavily vegetated drainage interspersed with shallow ponds. The substrate is mud.

Quangeghsaq River.

The Quangeghsaq River originates from several small lakes on an elevated tundra wetland at the western base of the Kinipaghulghat Mountains. The river flows northerly approximately 4.5 kilometers to where it enters the Bering Sea 2.8 kilometers west of the Suqitughneq River.

The headwater reach is characterized by a narrow and deep channel cutting through tundra soil and heavily vegetated with grass. The headwater area was flooded during the survey and the substrate type could not be identified.

Steep banks cut through peat and clay characterize the survey reach. Channel width ranges from about 1 to 3 meters and depth ranges from about 0.5 to 1.5 meters in deeper holes. The substrate is soft and composed of sand and mud with an occasional boulder. Cobbles were occasionally present under the mud.

Discharge measurements were taken by ENRI biologists and will be reported their report but on 2 and 3 August 1999, discharge of the Quangeghsaq River appeared to be approximately 66 percent of the Suqitughneq River.

The Quangeghsaq River enters a small lagoon before flowing into the Bering Sea. The outlet of the lagoon was not sampled for the presence of anadromous Dolly Varden.

Physical parameters of the control reach are in Appendix B1. Water color and turbidity measurements were not taken.

Tapisaghak River.

The Tapisaghak River originates on the slopes of the Kinipaghulghat Mountains and Seevookhan Mountains and flows northerly into the Bering Sea approximately 5.3 kilometers southeast of the Suqitughneq River. The Tapisaghak River is several times larger than the Suqitughneq River. The gradient is much steeper and braided channels interspersed with unvegetated gravel bars characterize it. The substrate in the lower reach is composed of sand and gravel. The upper reach was not surveyed. A small lagoon is at its mouth.

Water quality measurements were not taken.

Riparian Vegetation

Riparian vegetation was typical of tundra habitat. Grasses, sedges, willow and wildflowers dominated. Dominant riparian plants were collected for identification. Plants identified were:

1. Cotton grass *Eriophorium sp.* (especially *E. angustifolium*).
2. Coltsfoot *Petasites sp.* (especially *P. frigidus*).
3. Jacobs's ladder *Polemonium sp.* (especially *P. acutiflorum*).
4. Club mosses *Lycopdium sp.*

5. Willow *Salix sp.* (especially *S. chamissonis*, *S. arcticus*, and *S. pulchra*).
6. Crowfoot *Thalictrum sp.*
7. Nagoon berry *rubis arcticus.*
8. Monkshood *Aconitum sp.*
9. Arctic dock *Rumex arcticus.*
10. Rose root *Sedum sp.*
11. Bog star *Parnassia kotzebuei.*
12. Swamp horsetail *Equisetum fluviatile.*
13. Polargrass *Arctagrostis latifolia.*

WILDLIFE

Wildlife was observed but was not particularly abundant on the Northeast Cape project site during the 31 July to 5 August 1999 visit. The birds and mammals seen at the project site are included in the list below.

1. Common raven *Corvus corax.*
2. Sandhill crane *Grus canadensis.*
3. Unidentified loons *Gravia sp.*
4. Long-tailed Jaeger *Stercoraius longicaudus.*
5. Glaucous gull *Larus hyperboreus.*
6. Glaucous-winged gull *Larus glaucescens.*
7. Black-legged kittiwake *Rissa brevirostris.*
8. Arctic tern *Sterna paradisaea.*
9. Unidentified duck (brown with white on wings).
10. Northern phalarope *Lobipes lobatus.*
11. Common snipe *Capella gallinago.*
12. Semipalmated plover *charadrius semipalmatus.*
13. Snow bunting *Plectrophenax nivalis.*
14. McKay's bunting *Plectrophenax hyperboreus.*
15. Lapland longspur *Calcarius lapponicus.*
16. Unidentified brown sparrows, possibly Savanah sparrows *Passerculus sandwichensis.*
17. Unidentified sandpipers.
18. Arctic ground squirrel *Spermophilus parryii.*
19. Arctic fox *Alopex lagopus.*

DISCUSSION

FISH COMMUNITY

Dolly Varden

The fish species sampled in the Suqitughneq River were as expected for the region. The dominant species was presumably Dolly Varden, a species of char common to the area. Both anadromous and resident forms of the species were present in the Suqitughneq River. Only the anadromous form was seen in the Tapisaghak River and Quangeghsaq River.

The life history of Dolly Varden can be complex. There are two population groups: the southern and northern groups. Saint Lawrence Island Dolly Varden belong to the northern group. They spawn in streams, usually during the fall from mid-August to November. The eggs develop slowly in the cold water temperatures present during the incubation period. Hatching may occur in March, four to five months after fertilization. After hatching, the young Dolly Varden feed from their yolk sac and usually do not emerge from the gravel until this food source is used up. Emergence from the gravel usually occurs in June for the northern form.

Young Dolly Varden rear in streams before beginning their first migration to sea. Some never go to sea and become resident in their natal drainage. During this rearing period, their growth is slow. Young Dolly Varden often remain on the bottom, hidden from view under stones and logs, or in undercut areas along the stream bank, and appear to select most of their food from the stream bottom.

Most Dolly Varden migrate to sea in their third or fourth year, but some wait as long as their sixth year. At the time of their first seaward migration, they are about 5 inches long and are called smolt. This migration usually occurs in May or June, although significant but smaller numbers have been recorded migrating to sea in September and October. Once at sea, they begin a fascinating pattern of migration.

After their first seaward migration, Dolly Varden usually spend the rest of their lives wintering in and migrating to and from fresh water. Most, but not all, northern Dolly Varden overwinter in rivers.

At maturity, Dolly Varden return to spawn in the stream from which they originated. Dolly Varden in the northern group usually overwinter in the river system in which they have spawned.

Northern Dolly Varden reach maturity at age 5 to 9 after having spent three or four summers at sea, and may be 16 to 24 inches long. Mortality after spawning varies depending on the sex and age of the fish. Males suffer a much higher mortality rate after spawning, partly due to fighting and the subsequent damage inflicted on each other. It is doubtful that much more than 50 percent of the Dolly Varden live to spawn a second time. A small number may live to spawn more than twice. Northern Dolly Varden may live as long as 16 years, but individuals over age 10 are uncommon. Dolly Varden typically grow to between 15 and 22 inches and up to 4 pounds; however, occasional 9- to 12-pounders are sometimes reported in northern populations.

Dissecting and aging the otolith is the standard method for Dolly Varden because their scales are too small to age. However, by applying biological knowledge of the northern group to the Suqitughneq River population, the age and year class of live fish can be roughly estimated. Based on this knowledge of Dolly Varden, there appears to be multiple year classes present, included young-of-year juveniles, rearing juveniles and smolting parr in addition to resident and anadromous adults, in the Suqitughneq River. Evidence is that the Suqitughneq River is an important spawning and rearing habitat for the species.

The spawning areas in the Suqitughneq River were not determined because of the high water present during the survey but numerous juveniles in the 40 to 50 mm size class were captured in the boulder-cobble-gravel riffle in reach #2 near the runway with the electroshocker. Fish this size were spawned in fall of 1998 and emerged from the spawning gravel at about 30 to 35 mm long in early June 1999. It is most likely the fish were spawned and hatched in this reach because the habitat is ideal for spawning and rearing Dolly Varden. Not all Dolly Varden captured were killed for tissue samples but several other year classes up to and including adults were present in this reach. Young-of-year juveniles were not captured in any other reach sampled.

The majority of Dolly Varden smolt migrate to sea in the spring but some migrate in the fall. Several Dolly Varden smolt, with parr marks faintly visible, were captured during this study. Even though fall migrating smolt were captured, it is assumed the population follows normal Dolly Varden life history patterns and the major smolt migration takes place in the spring.

Two assumptions were dispelled during the survey. The rumored "steelhead" that once inhabited the Suqitughneq River is not the anadromous rainbow trout *Oncorhynchus mykiss* commonly known as "steelhead" but is actually a male Dolly Varden in spawning colors. This was determined by drawing a picture of a fish with spawning colors and features, and interviewing local Native elders. In fact, it turns out that the locals have several names for the same fish depending on what life-cycle phase the fish is in. These multiple local names for the same species can lead the uninitiated to conclude there are several species of fish present when there is actually only one.

A second assumption was that there were no longer any fish in the Suqitughneq River. Based on the finding of this survey, the Suqitughneq River is a viable producer of Dolly Varden. The timing of this survey however, was slightly too early, the water conditions were too adverse and the gear taken on the trip was ineffective for the capture of additional large fish fresh from the sea.

If Dolly Varden numbers were reduced in the Suqitughneq River due to degraded habitat or water quality, they may be in natural recovery due to improving habitat and water quality. A baseline population estimate could be established with additional research but comparison of current abundance with pre-spill abundance is not possible.

Pink Salmon

A conclusion to rumor of pink salmon running in the Suqitughneq River in past years was not reached. There are two and possibly more, theoretical explanations why pink salmon may have been observed in the Suqitughneq River in recent memory but may be no longer present. Some points to consider follow:

- The Suqitughneq River is not, and never has been, a large river.
- The lagoon at the mouth of the Suqitughneq River is open to the sea during periods of prolonged southerly winds.

- The lagoon at the mouth of the Suqitughneq River is bermed during periods of prolonged northerly winds and ice movement and, according to the testimony of local Natives and physical evidence, there is no opening to the sea during these times.
- The sea level has been static for approximately the past 4,000 years of Dolly Varden and pink salmon evolution.
- The nearby, and much larger, Tapisaghak River has a run of pink salmon.
- Pink salmon are noted for straying from their natal drainages.
- The probability of a non-natal river receiving more strays increases during years of pink salmon abundance.
- Pink salmon are noted to spawn intertidally and the riffle area at the head of the lagoon appears to be suitable spawning habitat for the species.
- Pink salmon fry migrate to the sea immediately after emerging from spawning gravel.
- Pink salmon fry are an important food source for Dolly Varden.
- Dolly Varden are present in the Suqitughneq River and lagoon in varying but unknown numbers.
- Pink salmon feed at sea for two years before returning to spawn, i.e. there are no multiple-year returns from a single brood year.

Theory #1: Pink salmon have never successfully colonized the Suqitughneq River.
The continued success of pink salmon in the Suqitughneq River may revolve around natural conditions relating to the direction of prevailing winds, sea ice, and river discharge.

It is reasonable to surmise that pink salmon strays from the nearby Tapisaghak River would occasionally establish a temporary foothold in the Suqitughneq River. There are however, several important reasons why the species may not have, or be able to, successfully adapt to the Suqitughneq River.

First, because pink salmon emerge and go directly to sea, the timing of pink salmon emergence is very important in relation to the condition of the receiving estuary. Food resources must be non-limiting and predator abundance within limits for the species to survive. Second, according to local testimony and physical evidence, north winds and sea ice berm the mouth of the lagoon and because the Suqitughneq River has always been a small river, it may have never have had adequate spring discharge to breach the berm in step with pink salmon emergence. Late or irregular breaching of the Suqitughneq River lagoon berm could subject out-migrating fry to hostile lagoon conditions and work against the long-term survival of the species. Third, late or irregular breaching could contain and subject out-migrating pink salmon fry to an abundance of predators (Dolly Varden) in the lagoon. Pink salmon that do attempt to colonize the Suqitughneq River may succeed only temporarily and die out after several returns. Conditions such as described could possibly have made pink salmon presence coincide with recent memories. In contrast, because the Tapisaghak River has a much larger discharge, it may be able to overcome these limiting obstacles and support annual migrations of pink salmon.

If the above description is the case why there are currently no pink salmon present, no amount of habitat enhancement or reintroduction will guarantee successful, long-term establishment of the species.

Theory #2: Pink salmon were present but died out due to man made causes.
It is also possible that a small run of pink salmon (a small run because of limited spawning habitat) adapted to the natural conditions of the system and was successful. Pink salmon spend two years feeding at sea before returning to spawn in fresh water. It is possible that water quality was unacceptable for the production of pink salmon for several brood years in a row, thus effectively destroying the gene pool specific to the Suqitughneq River. If this is the case, natural re-colonization by strays will be a random process that could take centuries to complete. An alternative to the natural process would be reintroduction of the species. Adaptation of non-natal (introduced) pink salmon to the specific conditions of the system however, may not be successful.

Alaska Blackfish

Alaska blackfish were found to be common in suitable Suqitughneq River habitat. This small, bottom-dwelling fish is found only in eastern Siberia and Alaska. They typically live in densely vegetated areas of lowland swamps, ponds, rivers, and lakes. They normally grow up to about 200 mm and live to about eight years. Blackfish eat insects and other small invertebrates in addition to small fish including other blackfish. They are also air-breathers and can live in moist environments for extended periods.

Blackfish were present in all reaches sampled and in the control stream. They appeared to be more abundant in reach #3 (the spill ditch) because of what appeared to be more suitable habitat but the high water conditions during the survey may have prevented their effective capture in the main river channel. Blackfish captured in the spill ditch may be an important indicator species because of their long life and habitat preferences in proximity to petroleum contaminated soils on the project site.

It is interesting to note that blackfish specimens were shown to Native elders visiting the project site from Savoonga and Gambell and they did not know the species and did have a local name for it. This apparent lack of local knowledge was surprising because the species is well documented in literature as indigenous to Saint Lawrence Island.

Ninespine Stickleback

Ninespine stickleback was common in reach #2 and in the control stream. This small fish can tolerate brackish water but requires freshwater to spawn. They can grow up to 90 mm but most do not exceed 65 mm. Males seldom live longer than 3 years but females can live up to 5 years. Food consists mainly of copepods, chironomids, Cladocera, and other small crustaceans. They in turn, are a important food source for arctic char and Dolly Varden.

Ninespine stickle back appeared to be relatively abundant in reach #2 when it was electroshocked for samples. A quantity of the species was collected for tissue analysis. The species was not found in the other, more upstream reaches.

Fourhorn Sculpin

The fourhorn sculpin is an arctic marine species that sometimes inhabits freshwater for extended periods. A single specimen was captured near the lagoon with the electroshocker and is considered atypical of the drainage.

STREAM CHARACTERIZATION

The main channel of the Suqitughneq River is typical of tundra drainages. It is deep and narrow with steep undercut banks that were hazardous to stand on. At the time of the fish community survey, the river was reported by Montgomery-Watson staff on site to be at the highest flow observed during the past six summers and entering the water to sample in most places was not safe.

During some summers the river was reported to be much lower and with more of a riffle-pool configuration. The high water during the survey eliminated all riffles except the riffle in reach #2.

Tributaries originating in the mountains were reported to be dry in some years by Mr. Eugene Toolie, an Alaska Native who was born on site, and currently has a summer fish camp in the area. Mr. Toolie reported that the tributary selected by ENRI biologist and designated reach #4 in this report, is frequently dry during the summer. This fact may have affected the diversity and abundance of the fish present during this survey. The reach was selected by ENRI biologists the first day on site (31 July 1999) because the Suqitughneq River was at flood stage and they thought they would not be able to sample the main stem for invertebrates and sediments.

Riparian Vegetation

Major riparian vegetation appeared low in species diversity but high in area coverage. There were no major examples of erosion noted on the main river channel. The river was running so high that riparian vegetation was up to 0.6 meters underwater in some places. During the extreme high flow on 4 August 1999, a tributary originating in the valley behind the White Alice site was turbid and discolored the main river downstream from its confluence. The spill ditch, although higher than reported by previous visitors to the site, appeared unaffected by the variation in flow during the survey.

The upper portion of the spill ditch has a dense growth of polargrass growing in the wetted area. This dense growth may be benefiting from the hydrocarbons leeching from nearby contaminated soils.

OBSERVATIONS OF CONTAMINATION

On the surface the main river downstream of the spill ditch appeared clean. The water was clear and although the river was running high, the bottom could be seen in all areas except the deepest holes. However, while sampling reach #2 a light sheen smelling of petroleum was observed surfacing after disturbing underwater mud deposits along the westside bank where the river enters the lagoon.

The spill ditch included a small pond, partially filled with sediment that receives drainage from a tributary ditch leading from an old fueling area complete with a gas pump. Petroleum sheen was present on the surface of this tributary ditch during each of several visits. The mud on the margins of the pond also had a petroleum odor when disturbed. Two minnow traps were set in the pond but no blackfish were caught. Black fish were caught up and downstream from this pond. A pair of northern phalaropes was observed feeding on the pond's surface during each of three site visits.

Downstream of the polargrass and cottongrass are growing profusely and choke the channel. Hydrocarbon enrichment may be partially responsible for this profuse growth.

WILDLIFE

The project site supports a diverse fauna. The surrounding tundra is a maze of pathways and tunnels made by small rodents. Although none were seen, the pathways are most likely made by the tundra vole *Mycrotus oeconomus*, or perhaps the brown lemming *Lemmus sibericus* or Saint Lawrence Island lemming *Dicrostonyx exsul.* Arctic fox *Alopex lagopus*, long-tailed jaegers *Stercoraius longicaudus*, sandhill cranes *Grus canadensis*, and glaucous gulls *Larus hyperboreus* were observed hunting them on several occasions. These small rodents are also an important food source for ravens *Corvus corax*. A raven nest in the tram building contained the bones of many small rodents. Small rodents should be trapped and identified on subsequent visits to the project site.

Local Natives report polar bears *Thalarctos maritimus* to be common on the site during winter and occasionally during summer. Domestic raindeer *Rangifer tarandus tarandus* are also common but no live animals were seen. Red fox *Vulpes vulpes* in the cross fox color phase are also reported as present but only arctic fox in summer pelage were seen.

FINDINGS

The findings of this fish community survey are:

1. The Suqitughneq River supports viable populations of anadromous and resident Dolly Varden char, and a viable population of Alaska blackfish, and ninespine stickleback at minimum.
2. The Quangeghsaq River supports a viable population of Dolly Varden char, Alaska blackfish, and ninespine stickleback at minimum.
3. The Tapisaghak River supports a viable population of Dolly Varden char and pink salmon at minimum.
4. The Northeast Cape project site supports a diverse wildlife fauna.

RECOMMENDATIONS

If further fisheries assessment is needed, the following are recommended.

1. Estimate the potential contribution of the drainage to the local subsistence fishery and provide baseline escapement data by operation of a adult fish weir at the downstream end of reach #2 between approximately 25 July and 10 September, one season before, during, and one season after cleanup operations.
2. Adclip and tag captured Dolly Varden 150 mm and longer with numbered tags to assess future contributions to nearby subsistence fisheries.
3. Pursue an aggressive advertising and mail campaign of island residents to recover tag data.
4. Monitor cleanup operations.

If assessment of the adult return suggests that additional in-depth research is needed, then:

5. Construct and operate a smolt weir at the downstream end of reach #2 from immediately after ice-out to about 30 June to estimate the smolt production of the drainage.

6. Initiate a bio-remediation study to evaluate the effects of polargrass and cottongrass on hydrocarbon uptake in the spill ditch.

APPENDIX A

Fork length in millimeters by species, reach, and gear type.

Appendix A1. The fork length in millimeters of captures by reach, gear type, and species.

	Reach #1		Reach #2					Reach #3	Reach #4		Control Reach		
Method	MT		MT	ES				MT	MT	ES	ES		Net
Species	DV	AKBF	DV	DV	9SSB	AKBF	FHS	AKBF	AKBF	DV	DV	9SSB	AKBF
Length mm	212	114	73	41				145	118	180	137		
	180		75	44				127		176	152		
	199		76	46				120		158	169		
	124		78	47				88		155	140		
	155		78	47				117			167		
	171		82	49				90			152		
	163		118	49				144			157		
	175		121	50				136			170		
	168		122	50				117			156		
	154		127	50				100			141		
	125		130	50				101			163		
	143		143	52							195		
	140		144	53							166		
	147		166	54							147		
	155			54							155		
	159			54							150		
	116			54							164		
	148			56									
	123			59									
	116			68									
	120			72									
				73									
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				90									
				92									
				98									
				98									
				114									
				185									
				195									
Count	21	1	14	51	27	1	1	11	1	4	17	20	1
Mean	152	114	110	76				117	118	167	158		
Median	154	114	120	75				117	118	167	156		
Maximum	212	114	166	195				145	118	180	195		
Minimum	116	114	73	41				88	118	155	137		

Definitions:
mm = millimeters
MT = minnow trap
ES = electroshocker
DV = Dolly Varden
AKBF = Alaska blackfish
9SSB = 9-spine stickleback
FHS = 4-horn sculpin

APPENDIX B

Physical parameters of sampled reaches.

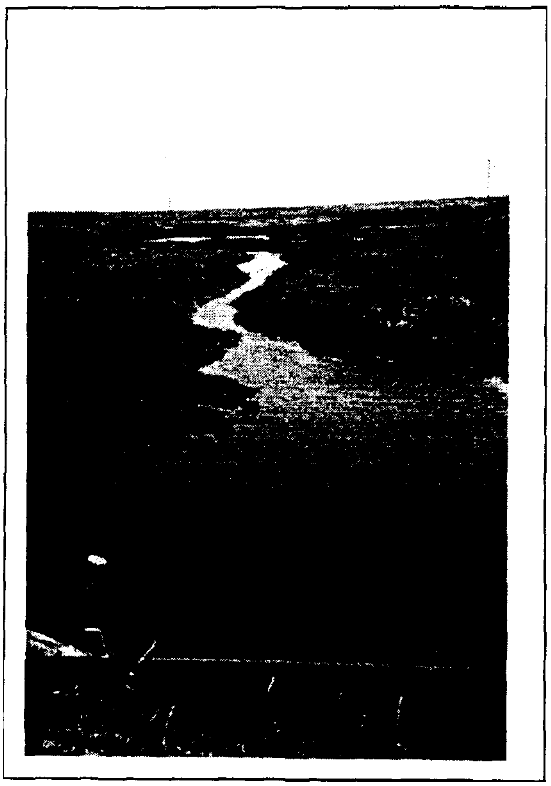
Appendix B1. Temperature (°C), specific conductivity (µmhos/cm), dissolved oxygen (DO, mg/l), and pH of the water at reaches sampled for fish communities on the Suqitughneq River at Northeast Cape, Saint Lawrence Island, Alaska from 31 July through 3 August 1999.

	Reach #1	Reach #2	Reach #3	Reach #4	Control
Sample date	8/1/99	8/2/99	8/1/99	7/31/99	8/3/99
Sample time	11:30	11:20	17:00	13:00	10:50
Temperature (°C)	5.8	6.1	10.05	3.0	8.7
Conductivity (µmhos/cm)	74.8	103.8	88.3	97.8	142.3
DO (mg/l)	11.9	10.7	10.72	12.3	9.06
pH	7.02	7.25	7.38	6.9	6.57

APPENDIX C

Photographs.

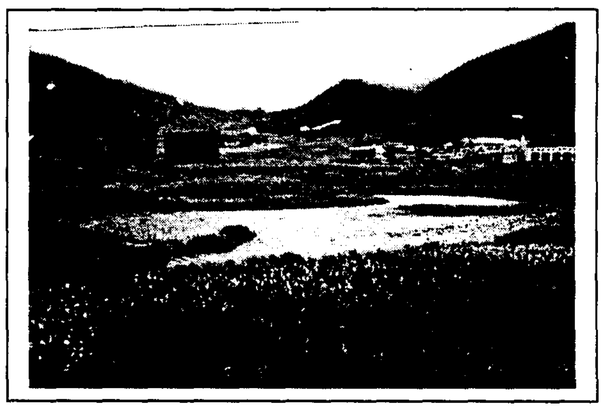
Reach #1 upstream view.



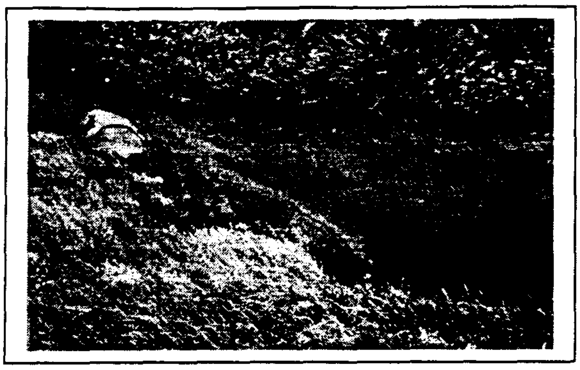
Reach #1 downstream view.

Reach #2 upstream view.

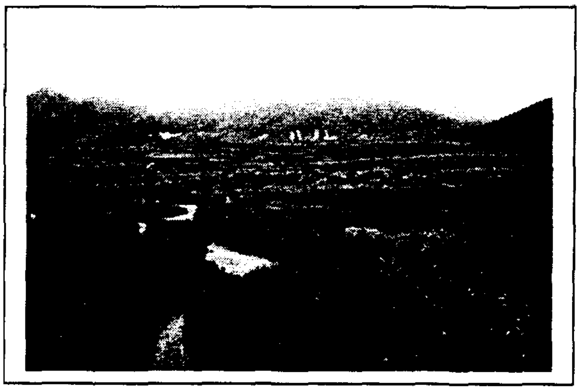
Reach #2 downstream view, sampling with electroshocker.



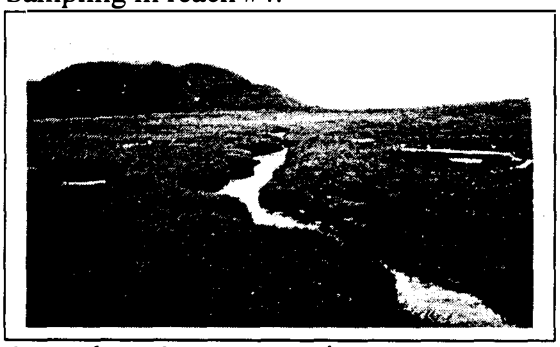
Reach #3 upstream view of receiving pond.



Petroleum sheen in Reach #3 tributary ditch.

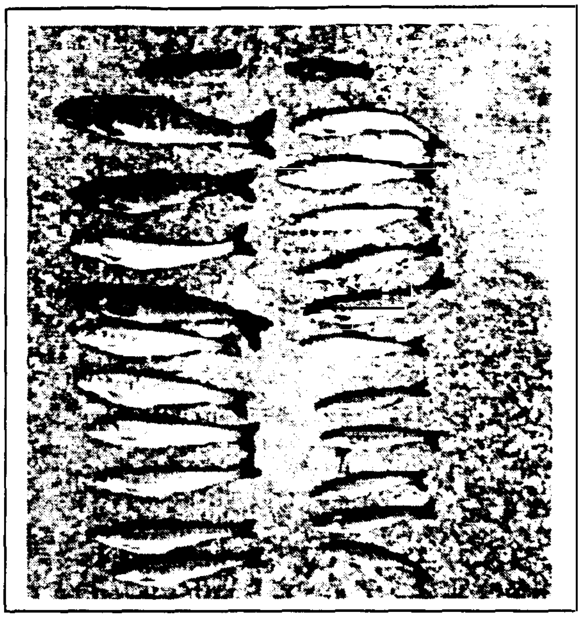


Sampling in reach #4.

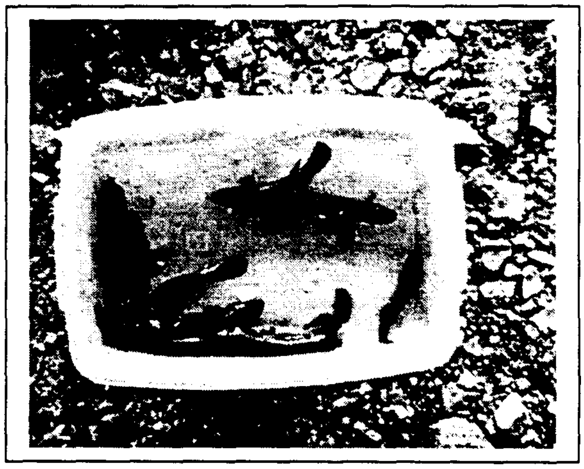


Control reach upstream view.

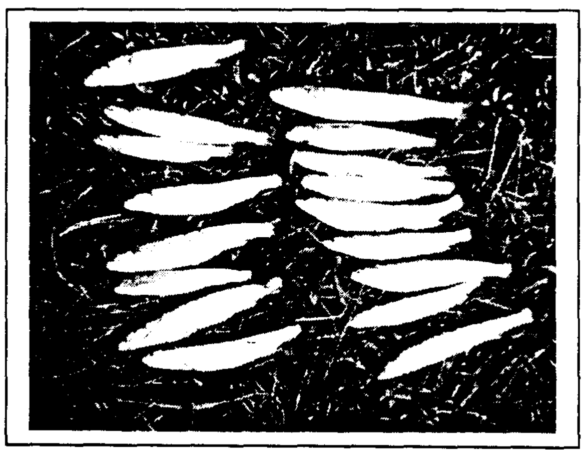
Control Reach downstream view.



Dolly Varden and Alaska blackfish captured in reach #1.



Alaska blackfish captured in reach #3.



Dolly Varden captured in the control reach.

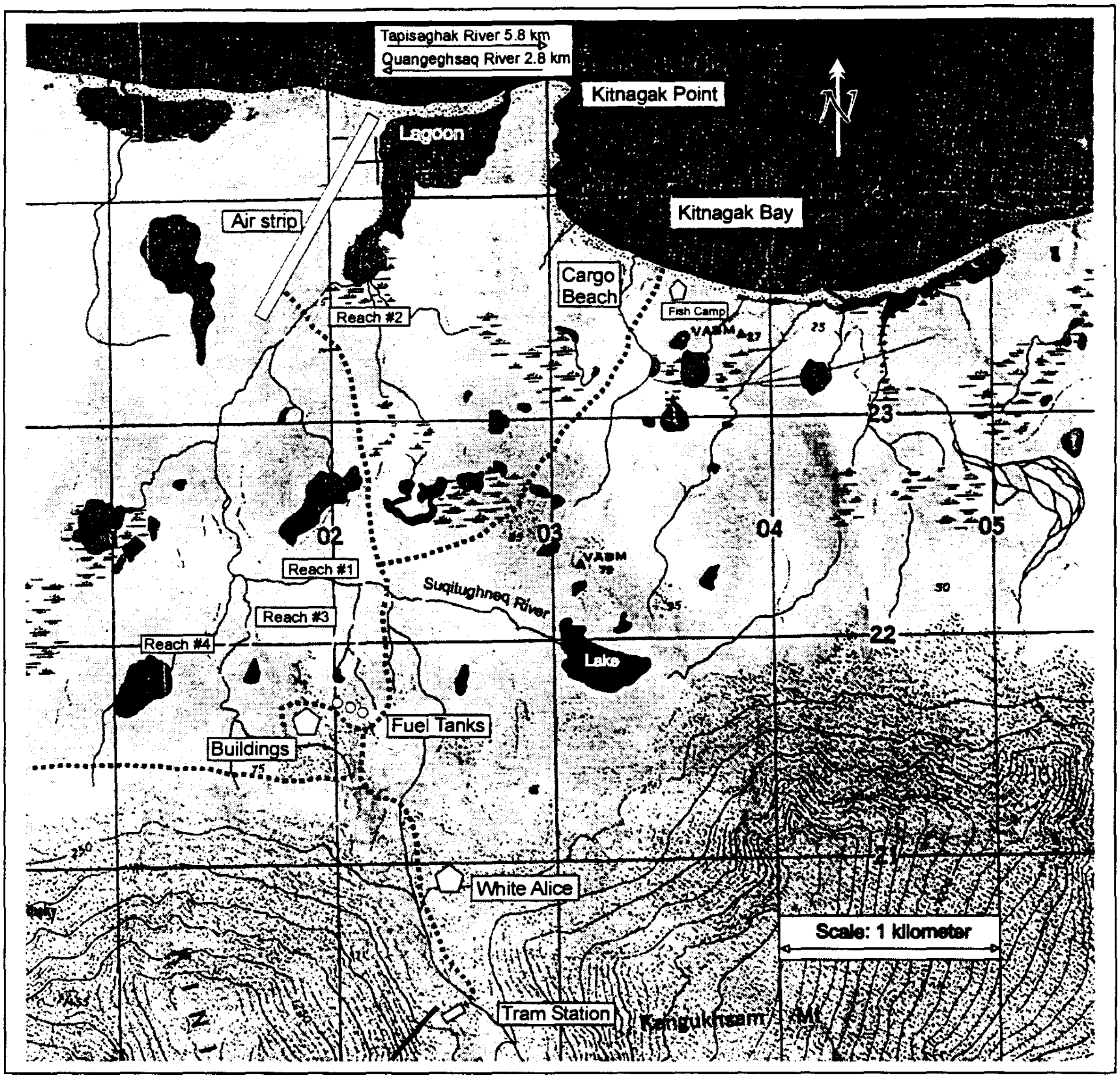


Figure 1. Fish community assessment reaches #1 through #4 on the Suqitughneq River in proximity to the Northeast Cape FUDS, Saint Lawrence Island, Alaska, sampled from 31 July through 3 August 1999.

APPENDIX E

Site Survey and Control Report

MULLIKIN SURVEYS

381 E. Bonanza Ave., P.O. Box 790, Homer, AK 99603-0790

Ph. & Fax: (907) 235-8975 E-mail: mullikin@xyz.net

August 17, 1999

Gary Busse
Montgomery Watson
4100 Spenard Road
Anchorage AK 99517-2901

LETTER OF TRANSMITTAL

Dear Gary:

We have completed our survey of Northeast Cape, St. Lawrence Island, and enclose the following:

- Survey Report
- Copy of Email sent to Larry Gall
- hard copy coordinate file 99nec.pts
- hard copy spreadsheet of control points
- copy of field book
- invoice
- floppy disk of autocad drawing, coordinate file, spreadsheet, survey report

Thank you for using Mullikin Surveys

Call if you have questions.

Sincerely,

Tim

Timothy L. Mullikin, P.L.S.

C:\My Documents\LETTERS\nec99cover.wpd

MULLIKIN SURVEYS

381 E. Bonanza Ave., P.O. Box 790, Homer, AK 99603-0790

Ph. & Fax: (907) 235-8975 E-mail: mullikin@xyz.net

August 17, 1999

SURVEY REPORT FOR NORTHEAST CAPE, ST LAWRENCE ISLAND

Field work was conducted on September 4, 1999 at an abandoned military base on St. Lawrence Island. During the survey it was raining, 47 degrees (F.), wind 20 mph estimated.

The purpose of the survey was to measure locations as staked by Montgomery Watson personnel.

Trimble 4700 GPS survey units were used in static mode. Geographic position on St. Lawrence Island was established by simultaneous observations with NGS Continuous Operating Reference Stations at Kenai, Cold Bay, and Central, Alaska, and is reported in the excell format spread sheet for points GPS 1 & 2, set in 1998, and tied in 1998 to previous survey control.

The 1999 local coordinates were rotated to match the previous USCOE datum. Elevations for new 1999 points were generated using the 1996 geoid undulation model.

C:\My Documents\LETTERS\nec99.wpd

To: larry.gall@us.mw.com
From: "Donald E. Mullikin" <mullikin@xyz.net>
Subject: NE CAPE, 1999
Cc:
Bcc:
Attached: A:\99nec.pts; A:\NEC99.xls; A:\Necape.dwg;

Dear Larry:

Attached are there files, in similar format to our 1998 submission:
** necape.dwg, an autocad version 12 c.3 for dos;
** nec99.xls, an excell format spreadsheet of control monuments, with latitude and longitude added;
** 99nec.pts, an ascii file, comma delimited: point number, northing, easting, elevation, description.

As I said on the phone last week, many of the lath were not marked. Hopefully your field crew can cross reference them so that you can change the description of the points for your final product.

PLease call if you have any questions.

tim mullikin
235-8975 phone & fax

File: A:99NEC.PTS

700,	107155.8050,	89931.3930,	2.8650,	99NEC LATH
701,	106672.7250,	89931.9310,	2.7600,	99NEC LATH
702,	95780.5380,	96201.6180,	191.6170,	99NEC LATH
703,	97622.2620,	95105.8620,	54.0120,	99NEC LATH
704,	97705.2300,	94884.2310,	50.3190,	99NEC LATH
705,	99173.5680,	99956.0100,	54.3390,	99NEC 30 SS902
706,	100762.7240,	98829.6570,	47.1640,	99NEC 7-1
708,	99641.4270,	97547.1310,	45.8110,	99NEC SET SPIKE
709,	100179.7470,	98613.2740,	58.3740,	99NEC FND SPIKE
710,	101981.1100,	93684.9440,	25.5280,	99NEC FND AL CAP --2058
720,	97974.6010,	96705.6640,	84.1320,	99NEC 12-5
721,	97997.2090,	96674.6270,	86.4120,	99NEC 12-4
722,	97990.6060,	96650.7800,	87.5520,	99NEC 12-3
723,	97985.2970,	96635.9760,	88.2820,	99NEC 12-2
724,	97967.4890,	96631.1700,	88.8820,	99NEC 12-1
725,	98222.0690,	96847.9800,	76.2820,	TEST PIT 3
726,	98154.1900,	96820.1280,	79.7420,	99NEC TEST PIT 2
727,	98183.7710,	96809.5940,	76.0820,	99NEC TEST PIT 1
728,	99601.9200,	97874.7580,	39.5210,	99NEC UPSTREAM
729,	98161.5060,	96840.4240,	78.7910,	99NEC -- 707
730,	99928.5800,	96962.9400,	37.3910,	99NEC DOWNSTREAM
731,	99736.3500,	97155.5420,	37.3210,	99NEC UPSTREAM
733,	103506.3230,	95556.4450,	2.8020,	99NEC LATH DWNSTR
734,	103418.0630,	95412.6210,	5.4120,	99NEC LATH UPSTRM
735,	103177.1690,	95227.4070,	6.1820,	99NEC LATH MOST UPSTRRM
736,	99173.5680,	99956.0100,	52.6400,	99NEC EDGE H2O

	A	B	C	D	E	F	G	H	I
1	2000	NE Cape, St. Lawrence Is.	St. Lawrence Is.	Mullikiin	GPS2	1998	US Feet	1950 MSL	26.262
2	2058	NE Cape, St. Lawrence Is.	St. Lawrence Is.	Mullikiin	GPS1	1998	US Feet	N950 MSL	25.645

	J	K	L	M	N	O	P	Q	R
1			103549.699	95161.128	9			1039119.61	551588.39
2			101981.082	93684.912	9			1038634.67	551145.89

	S	T
1	2000-FND AL CAP ON 5/8" REBAR, 4469-S, GPS-2	
2	2058-FND AL CAP ON 5/8" REBAR, 4469-S, 1998	

MULLIKIN SURVEYS

P.O. Box 790,
Homer, AK 99603

(907) 235-8975

MONTGOMERY WATSON __ NORTHEAST CAPE

1

N.E. CAPE - 1999

MONTGOMERY WATSON

BOX AT PT 2000

HI = 4.55'

4 6½" L

GPS FAST STATIC SURVEYS
TRIMBLE 4700
USED CORS FOR LATITUDE & LONG.

PT 700 # LATH - NO MARKS

FS 10:57 AM LOCAL

701 HT = 5.1

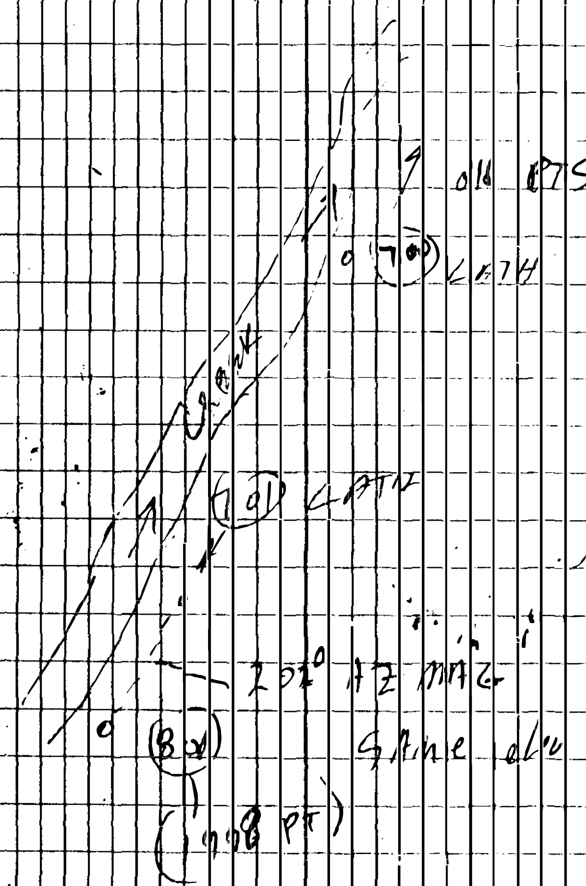
801 = 98NEC BK SW/SD 801.

(1990 PT)

4 AUG 99

47° Rain
20 MPH
WIND

D. MULLIKIN
Melissa MARKELL



N.E. CAPE 1999

(702) HI 4.75

BOUL GROUND #1 LATH

BEGIN 12:20 PM 2004Z

ON SIDE OF MT. TO SOUTH OF BUILDINGS

(703) HI=5.5 UPStream

ON N. Side CR. & 500' W. O.F. Bldg

(704) ON S SIDE

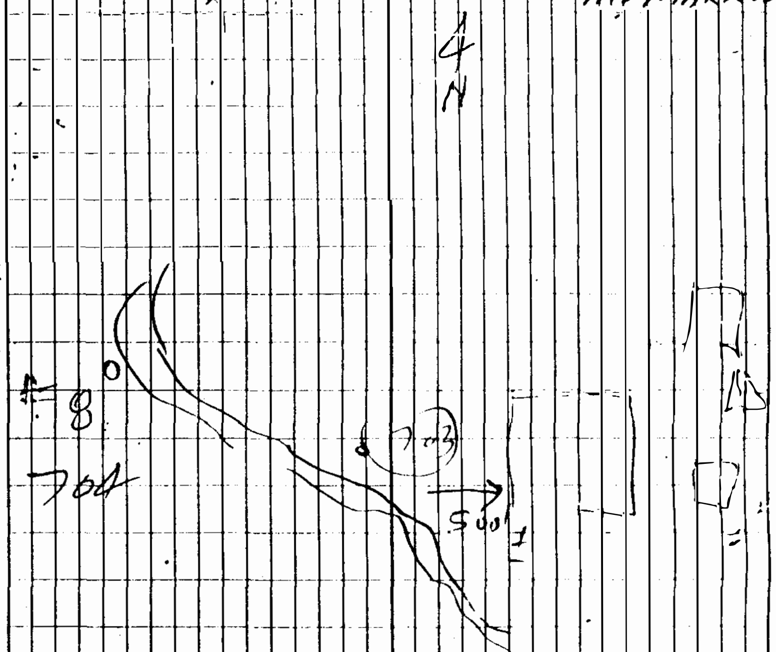
HI 4.7 - Downstream & ON S. Side

BEGIN 1 PM LATH #8

4 AUG 99

RAIN, WIND

D. MULLIKAN
M. MARKELL



704 - 7?? 102° MAG.

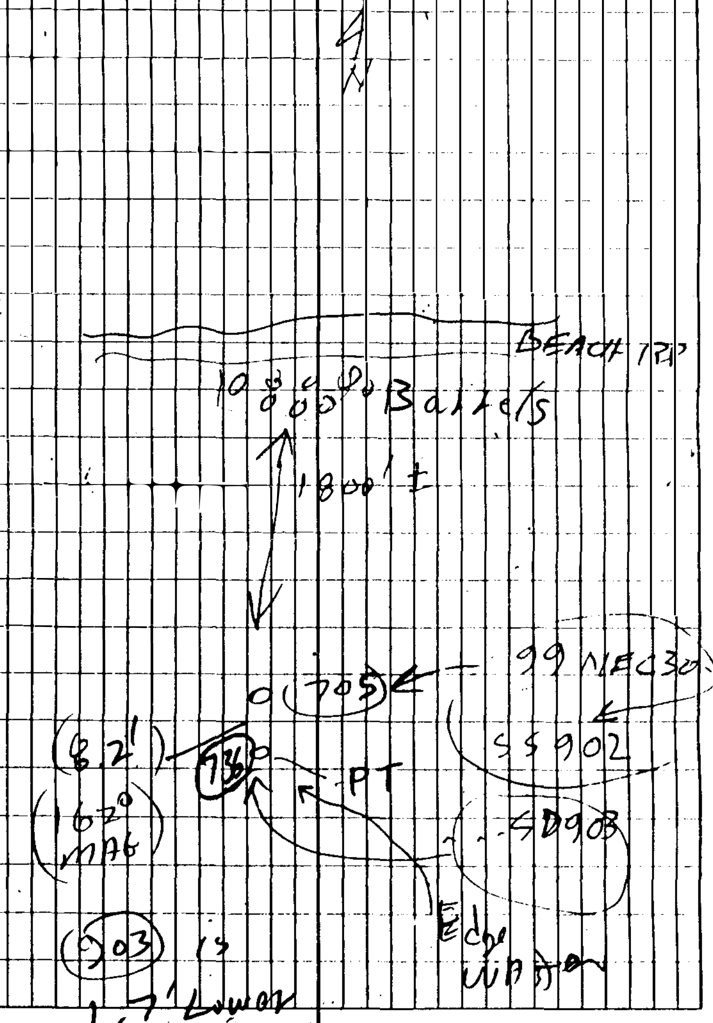
N.E CAPE – 1999

(705) 1800' S. OF BEACH ROAD

4 AUG 99

RAIN, WIND 20-30 MPH

D. MULLIKIN
M. MARKELL



NE CAPE - 99

4 AUG 99

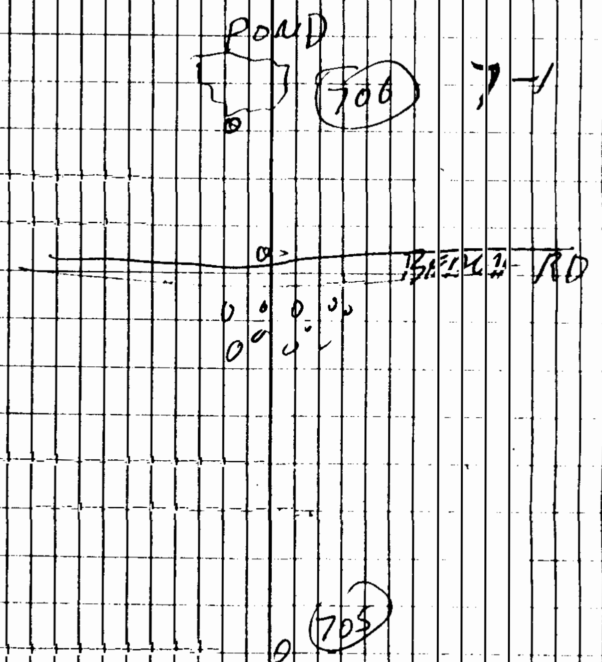
RAIN, WIND

P. MULLIKIN
M. MARKEL

(706) LATH 7-1

HI=4.95

Begin 2:26 PM
Local



N.E. CAPE -99

707 AND Spike WHISKERS

HI = 5.01

Begin Logging in

D.C.

2:53 PM

△ @ 707 HI = 5.233

BS 2000

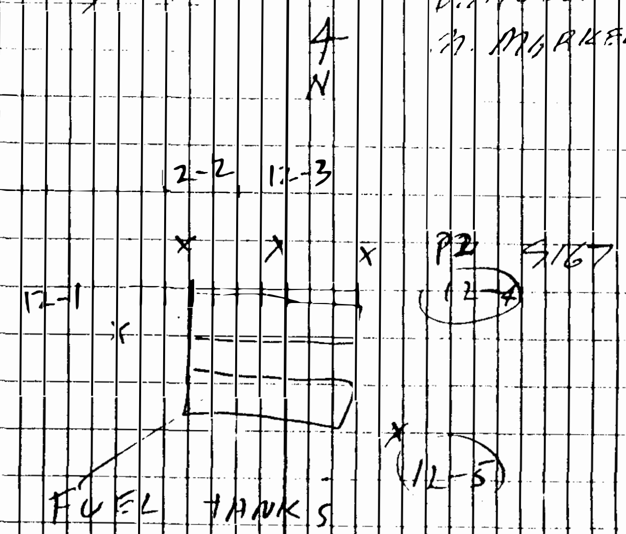
(HT = 6.5)	∡ RT	H DIST	VERT DIFF	V∡
720 12-5	233°07	230.04	+ 5.82	88°33'
721 12-4	242°36'	233.05	+ 8.10	88°02'
722 12-3	245°19	254.93	9.24	88°55'
723 12-2	246°35'	269.55	9.97	87°53'
A 12-1	244°30'	285' -	10.57	87°53'

4 AUG 99

7

RAIN, WIND

D. MULLIGAN
B. MARKELL



92°32'51" V∡ TO 2000

USED TOPCON 303
FOR ∡ AND DISTANCE

N.E. CAPE – 99

TC (707) BS (2000)

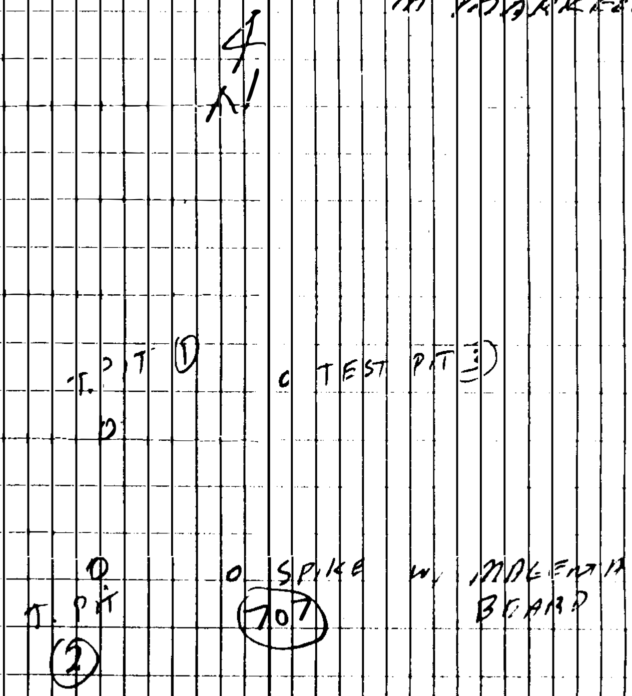
SITE (10)

H4

TEST PIT (HT=6.9)			V. Diff.	Z ∡
(775) 3	24°32'	61.4	– 2.03	91°54'
(776) 2	263°13'	21.3'	+ 1.43	86°09
(777) 1	323°43'	38.1	– 2.23	93°21

4 AUG 99

D. WALKER
M. MARKFEL



NE CAPE - 99

(709) SET 6" SPIKE

20' W 6' CMP

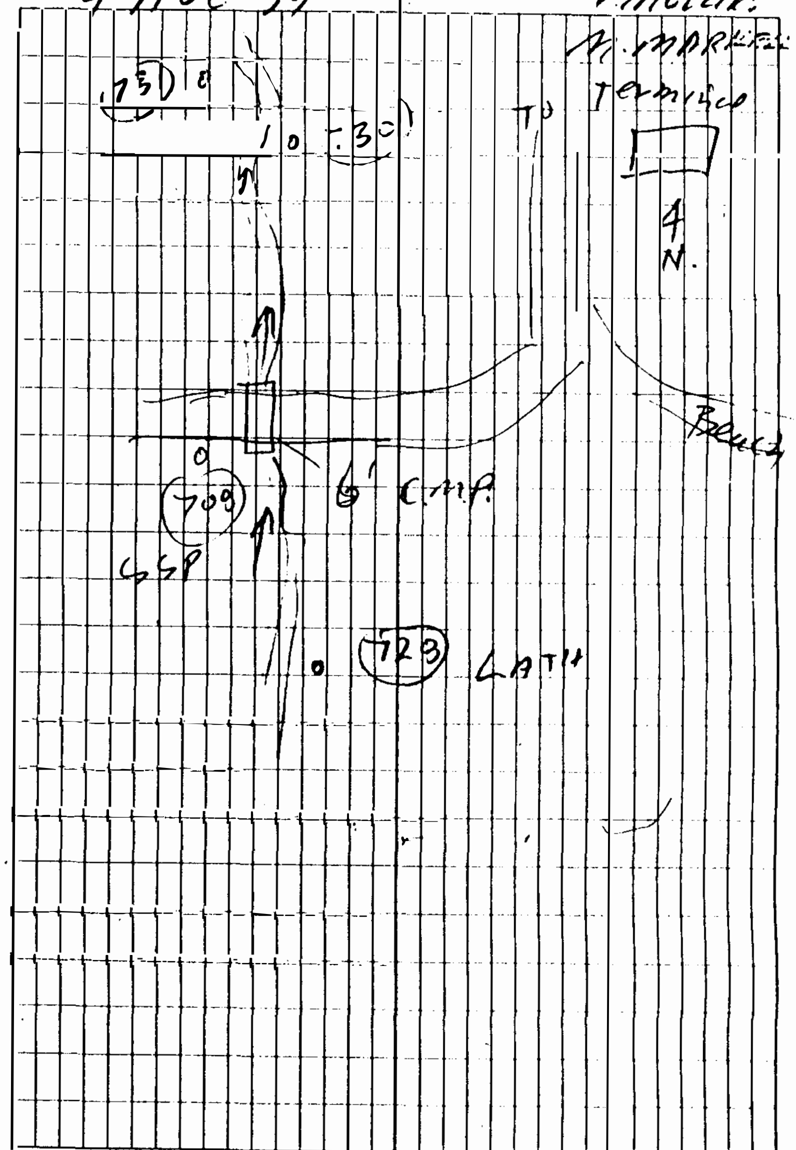
ON N SH. RD

TC (709) BS (707)

HI = 5.33

		H.D.	V.Diff	Z∠
PT Upstream HT = 6.0				
(738)	251°21'	330.0'	-5.62	92°58'
(707) (720)	0°	1640.25	33.65	88°40'30"

4 AUG 99



N.E CAPE - 99

SET SPIKE

IP (709) BS (707)

HT = 5 33

221°09"
LATH - 98
45'±

SPIKE 4.7 HT

FND BENCH RP 217° 25'30" 89°25'25 (HT = 4.7)

GPS = OLD CONTROL PT (10)

709

4:50 PM

Begin

	HAH	HDIST	VDIFF	
HI = 5.09	90°39	650.95	-5.26	90°27
730 DOWN stream PT				
UP st 731	78°06'	402.97	-5.32	90°45

4 AUG 99 (10)

RAIN, WIND

D. MULLIKEN
D. MARKEL

N

N.E. CAPE - 99

GPS(2)

Δ@ (2001) BS GPS(1) (710)

END ALCAP ON 5/8 RB.

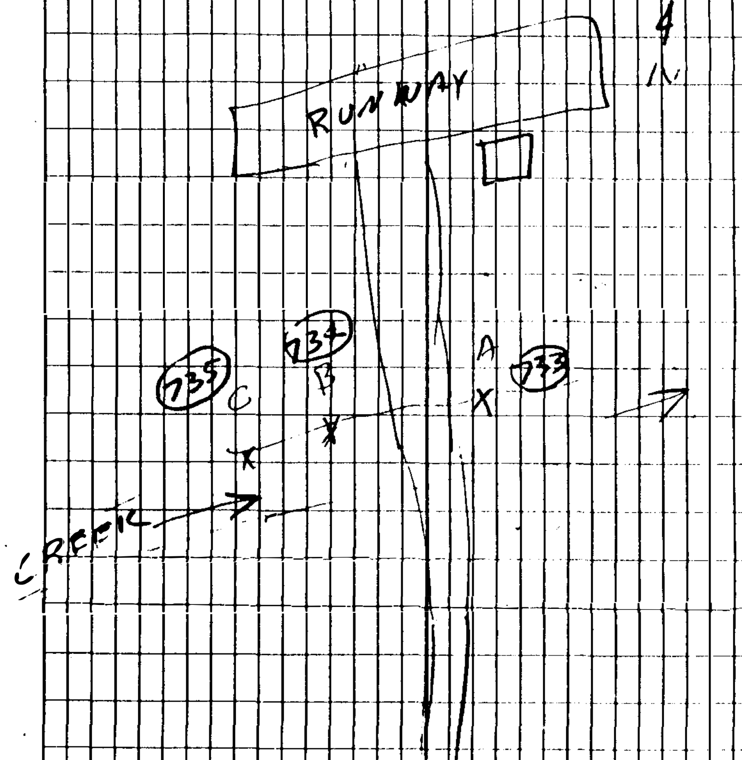
HI = 4.83

			VD	
(732)		2154.34	0.248	89°50' 46"
6° HT				
HT = 6°				
A (733)	233°	307.69	-22.49	93°12'32"
B (734)	254°22'	283.86	-19.60	93°58'
C (735)	306°39'	318.38	-18.91	92°52'

4 AUG 99 (111)

RAIN, WIND

D. MULLIKIN
M. MARKELL



N.E. CAPE - 99

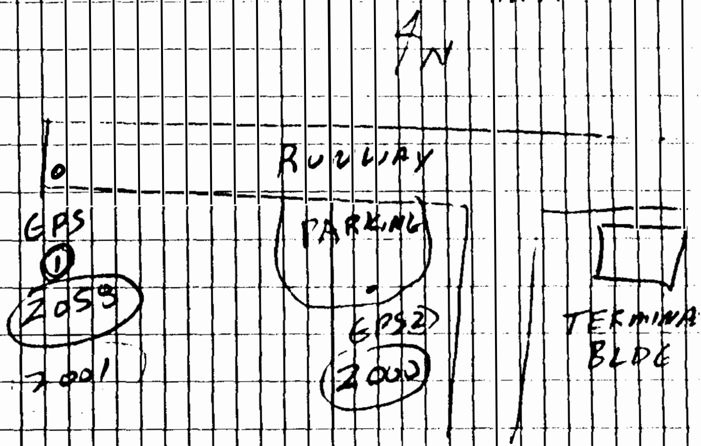
F. STATIC
GPS 1

Begin 5:30 PM
#1 = 5:09

4 AUG 99

RAIN, WIND

D. MULLIKEN
M. MARKELL



APPENDIX F

Field Notes

MONTGOMERY WATSON

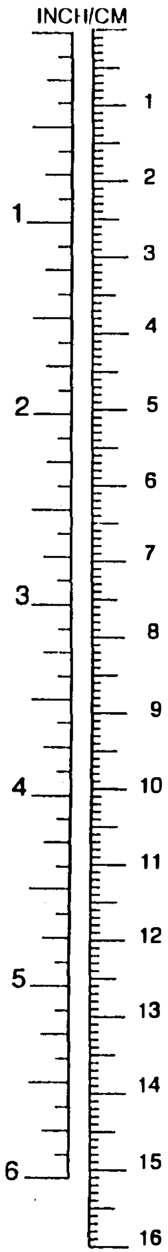
NEC

1999

118098-

05050

Bonnie McLean



MEASUREMENT CONVERSIONS

IF YOU KNOW	MULTIPLY BY	TO FIND
LENGTH		
inches	2.540	centimeters
feet	30.480	centimeters
yards	0.914	meters
miles	1.609	kilometers
millimeters	0.039	inches
centimeters	0.393	inches
meters	3.280	feet
meters	1.093	yards
kilometers	0.621	miles
WEIGHT		
ounces	28.350	grams
pounds	0.453	kilograms
grams	0.035	ounces
kilograms	2.204	pounds
VOLUME		
fluid ounces	29.573	milliliters
pints	0.473	liters
quarts	0.946	liters
gallons (U.S.)	3.785	liters
milliliters	0.033	fluid ounces
liters	1.056	quarts
liters	0.264	gallons (U.S.)

TEMPERATURE

°C = (F°-32) x .555
°F = (°C x 1.8) + 32

Inches	Decimals of foot	Milli-meters
1/16	.0052	1.5875
1/8	.0104	3.1750
3/16	.0156	4.7625
1/4	.0208	6.3500
5/16	.0260	7.9350
3/8	.0313	9.5250
1/2	0417	12.700
5/8	.0521	15.875
3/4	.0625	19.050
7/8	.0729	22.225
1"	.0833	25.400
2"	.1667	50.800
3"	.2500	76.200
4"	.3333	101.60
5"	.4167	127.00
6"	.5000	152.40
7"	.5833	177.80
8"	.6667	203.20
9"	.7500	228.60
10"	.8333	254.00
11"	.9167	279.40
1 foot	1.000	304.80

"Rite in the Rain"

MONTGOMERY WATSON

4100 Spenard Road
Anchorage, Alaska
99517-2901

Telephone: 907 248 8883
Direct: 907 266 1141
800 Number: 888 686 6442
Fax: 907 248 8884
bonnie.mclean@mw.com

Bonnie G. McLean
Environmental Scientist
H/W Field Supervisor
Health & Safety Officer

Serving the World's Environmental Needs

Phone

Project NEC
118909F.050130

"Rite in the Rain"—a unique all-weather writing surface created to shed water and to enhance the written image. Makes it possible to write sharp, legible field data in any kind of weather.

a product of

J. L. DARLING CORPORATION
TACOMA, WA 98421-3696 USA

7-30-99 USACOE NEC
830 ARRIVE AIA
940 Leave for Nome #152
1210 ARRIVE NOME
1300 TAXI to NANUAQ
P/U keys for Apt. #5 & 9
P/U 1 VAN - 95 Ford
1 P/U - 93 FORD
from Storm pad
Go to Bering most equipment
has been delivered but its
mixed with stuff for Nome
Go to AK AL P/U remaining
equipmt. Sort out stuff
for NEC & Nome
Get 2 - 30 gal. Unleaded
1 - 25. gal. heating fuel
At AC P/U Eugene's Stuff
Go to Apt's #5 has someone
in it - Go back to Nanuaq
Will P/U 2nd Apt keys
Sat. from manager.
Back to #9 - Set up
FAX Message machine

Bgm

NEC 99

-30-99 (cont.)
Spoke with Atlenkim - they
won't be to Nome until late
Sunday to go out Monday
AM -
Explained Friday was
a demob day only - if they
needed 5 field days they
would be out Sat to go to
NEC Sunday. He said
they would be out to NEC Mon.
Back to Nome mob.
?30 at AK Air Plu Melissa
Phone 30-40 mins late
015 Melissa arrives
2100 back to #9.
out. unpack end 2130
0830 - 2130
13 Hrs

Bom

7-31-99
0730 Pack out Equipment
0800 Arrive AK Air
CASA loaded
Load Kerry Air
Doug to Plu Emri
Delay in fueling
Tail gate Mtg. Completed
Leave Nome 0920
Arrive NEC 1010
Clean up mob area
1100 Casa arrives,
Eugene has 2-ATV's
for rent
Case #1 brings in
two ATV & 2 trls.
Returns to SAV -
for remain ATV & trls.

Started LBL TANK Sampling
See pg. 7

Bio State Streams to high
& Alright to complete
all objectives

Bom

7-31-99 NEC #2-5

1500 Bldg 101 - W

Applied - 12 lbs of sodium bicarbonate (Baking Soda) to the area in the center of Room where STB residual might have been. Est 4-6 inches rain water pounding in center.

Applied 2 ? of sodium bisulfate to SW corner of room where DS2 residue may have spilled.

Returned to LBP chip sampling

1700 Person arrives w/ COE (3) and Gary.
DQ & I escort
Have Bering stand by
1.5 Hrs for escort of site
1830 Leave NEC
1915 arrive Nome
Complete notes 2100.
Jane calls - Betx, Gora > 1 Bottle of sugar.
BRM

7-31-99 NEC

LBP Chip Sampling

Site	TANK	Time
3	1	1200
3	2	1230
4	1	1300
4	2	1330
13	1	1400
13	4	1430
19	1	1500
19	2	1530
22	2	1545
22	3	1600
22	4	1630
22	5	1645
14	1	1700

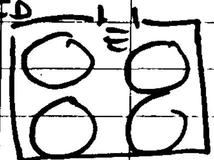
Remaining:
2-1 ✓ ✓ 6-1
16-1 ✓ 11-1 ✓
13-5, -6 11-2 ✓
12-1 11-3 ✓
12-2

~~No None AST~~ ✓
18-1
18-1 in stream fm
No paint on Concrete crib
13-5
13-6

see 8/14/99

BRM

7-31-99 NEC
LBP Sampling

LAB ID	TANK ID			LAB ID
901	22-2		22-3	902
903	22-4		22-5	904

See pg. 14 Bgn

~~NO AST Found @ site 18~~

AST 21-1 concrete vaults
22-2 no paint

AST 19-1
19-2 yellow 85%

No entry

Bgn

8-1-99 NEC
0800 arrive Berry
0920 arrive NEC
0940 Complete Safety Tail Gate Mtg.
1030 at SJE 21 LBP

SITE 12

AST 12 ~~21~~-1 Red & Black
Ends 95% sides 80%
AST 12 ~~21~~-2 No paint

Return to Bldg. 101
Neutralized Room -

pH of standing water center of Rm
range 6.7 - 7.0 - 7.5

pH in corner - DS2 -
7 - 7.9 - 8.2 range

Bgn

8-1-99 NEC
LBP Chip Sampling Site 11 —

@ Time	1045	1100	1115
ID	11-1	11-2	11-3
	AST	AST	AST

6" paint piping 50' 110' 130'

30' each 90% green & Black
NOT PAINTED includes piping ~~to~~ running w/ each separate tank.

13-4 LBP Chip

TANK 13-4 AST @ 1130

N
SAMPLE 13MI 904

60%

green over red orange

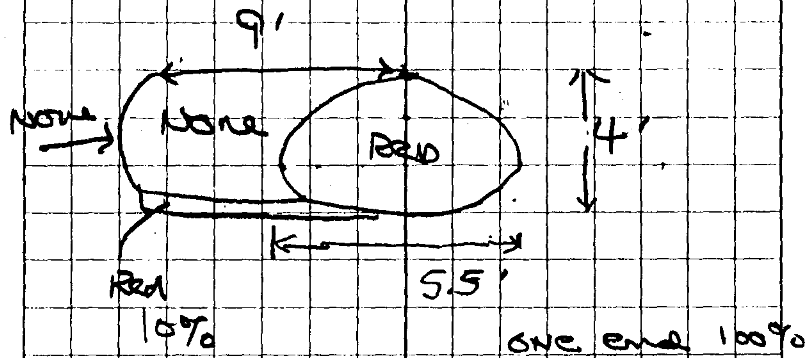
layered orange green orange Red grey

110

Site 13. Bldg 110
13-2
@ 1145
90%
21'
13.2
13.3 Tank 5000 gal
13-5
TANK 13-6 204,000 gal

BGM

8-1-99 NEC LBP Sampling
Site 6 6-1 @ 1200



one end 100%

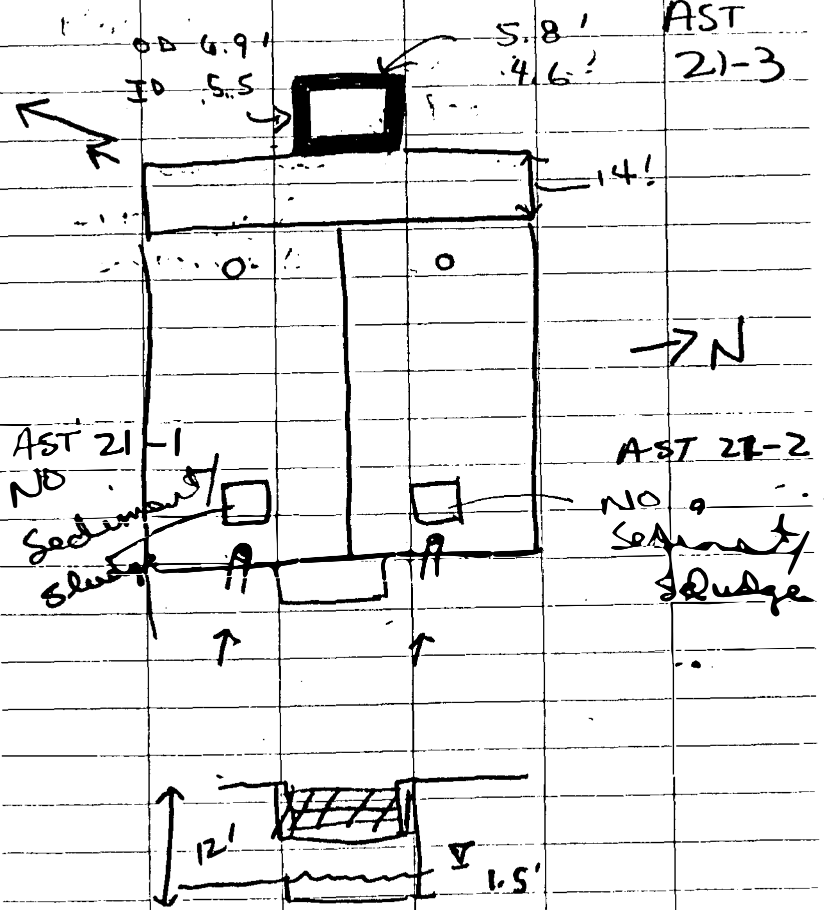
Site 13
Tank 13-6
Tank 13-5
20,000
5000
ID 13-3
@ 1400
ID 13-2
green over orange
orange (bottom) 95% Red
green
orange
Red
grey

BGM

8-1-99 Sediment

Site 21

Sediment



Only one sediment sample collected — Dupe & Split

8-1-99

Site 21

We were unable to get any sediment from the 2 Cribs at the intake.

Sediment/sludge was available from the Crib connecting the intake Cribs to the outfall piping. Sample was collected with Wildco sludge sampler. Six grab samples were composited into sample 99 NEC 21 SD 901 @1300

8-1-99 NEC
Site 18 Bldg 101 E
Subterranean Plumbers
Room
AST @ 1415
18-1
white 20 %
DiA 1.5"
Length 2.0
200 gal.
Contents : Empty
Original contents Unk

Steam Room - Bldg 101 E
18-2 AST - PACM covered
hot water tank / Steam
elevated
11' x 4'

TANK 2-1
<.01 % No samples
collected
small green white patch
6" x 4"

Bgr

8-1-99 NEC
Tanks

6-1	1200	
11-1	1045	w/ piping
11-2	1100	"
11-3	1115	"
13-2	1145	20,000
13-3	1400	
13-4	1130	
~~13-1~~		
16-1	1430	
18-1	1415	SubTarrian
~~19~~		
21-1	1030	

Complete task

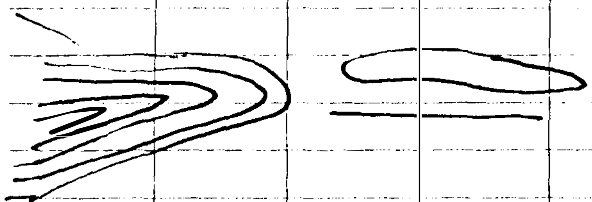
99 NEC __ __ __ __ 9 0 __
Site LBP YR Sample # in site

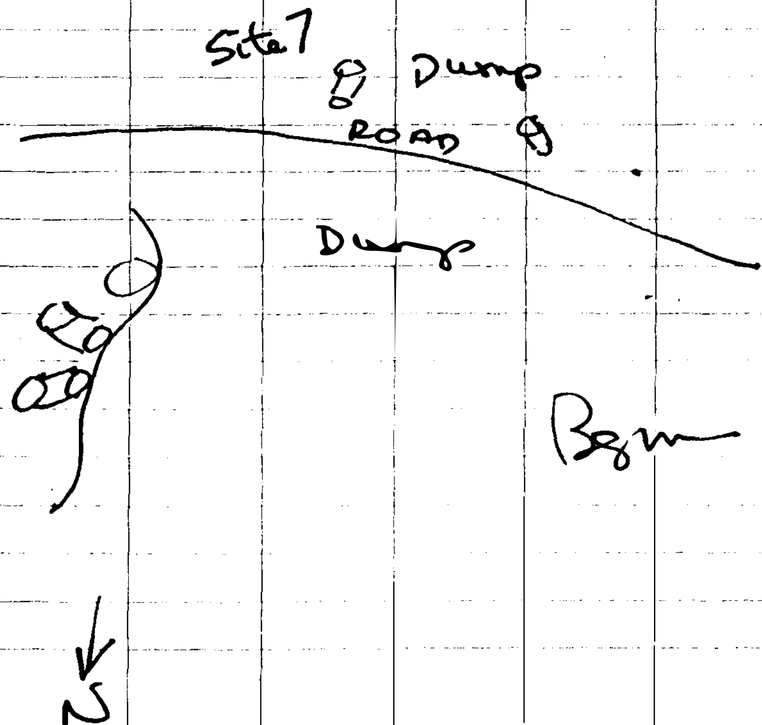
Site 30 8-1-99

Background S. of Site 7

1500 99 NEC 30 SS 902

1510 ~~Dupe~~ 99 NEC 30 SS 903





Bgm

8-1-99

Back to MOB area

Prepared samples & equipment for shipping

Gas & oil added to ATV

1800 Bering Air at NEC

1900 arrive Nome

unpack equipment

prepared LBP chips

& all soil/sediment/sludge samples.

2230 End Day

Bgm

8-2-99
Rain - stopped 10 am
Windy - Cl dy.

8-2-99 NEC
0800 leave Nome - Bering air King air
0850 arrive NEC
Bering leaves for SAV to p/u 3 workers
Tailgate Safety Mtg. Completed
1015 SAV folks arrives -
George - coeliason with crew
George says Bert -
Sivuqaq Inc VP waiting in Gambell
Penn air pilots off walking
George takes ATV to find
Penn air goes to Gambell
1300 arrives back to NEC
Larry Bio shows
fish he's caught in creek
At Site 10 - digging
Test Pits
Use metal detector over whole area ID Test Pit #2 - 40' x 6' spot - start digging N. end
unearth crushed 55 gal

8-2-95 Site 10 Test Pit
"10-wt oil drum -
some soil stained on top
only rain water in one
end - no sheen No residual
product seen in water.

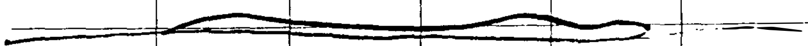
digging in mid center of
anomaly 2.5' bgs - locate
a full ... 55-gal
drum - unable to see
any markings
open small hole - clear
oil liq. no smell.
reseal hole w/ wooden
plug wrapped w/teflon tape.
Other debris is crushed
drums - 3 no residual
Blacken timbers cover debris
large voids seen - Est.
6-8 crushed drums
Pit #2 is the only elevated
part of drum storage
pad. Eugene said last
people dug & buried
drums. BGM

8-2-95 Site 10
Pit #1
Dig on west end - unearth
only a particle drum top
Test Pit #3
Dig on North Bank in
stained soil area directly
above - contaminated DB
area. No metal detected.
Nothing found in
Excavation. K

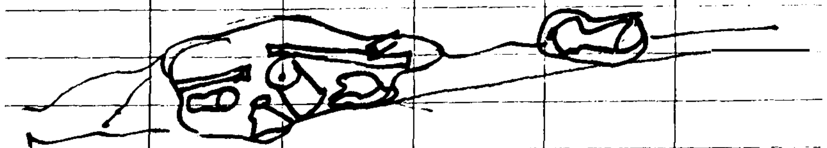
End 1600
Toured site
Watch Fish Stocking at
Bridge.

NAJ: Renain unable
to return to Gambel with
Bent - 1700
Take passengers to SAV-
GAM & then return
to Nome
1900.
End. 2015. BGM

Test Pit 2



45'



8-3-99 NEC

0800 @ Bering Air
Environ Alaska they will be done today
Katrina also will be done & leave tonight

915
Arrive NEC - Tailgate Safety Completed - Utilidor survey Completed

RAIN, cold

~~Sampled Septic Bgn~~

Doug to Return Anch
Suri complete sampling
SHOP sub complete work

8-4-99

0930 Tailgate mtg Completed
Don Mulligan - Surveyor
on site
Melissa will help/assist
surveyor -
Rain / cold / high wind

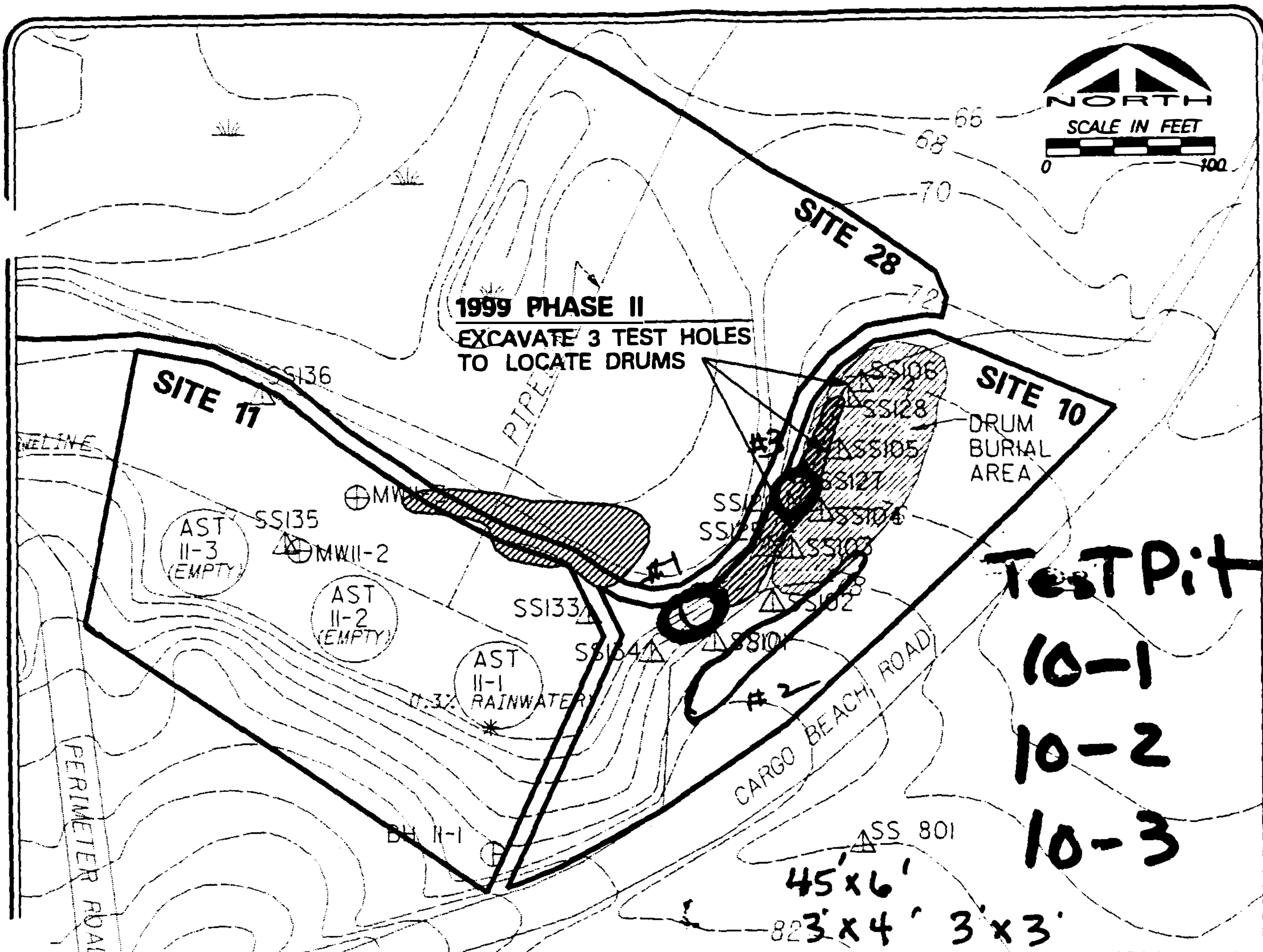
0945 Rich Jackson & Larry
arrive -
Review Safety SOP -
Rich practices ride ATV
Go with Rich & show
him everything we did -
Unable to cross upper
creek to White Alice
because of flooding.
Pack out Equipmt.
leave site 1800
Pick up stuff at [illegible]

End 2300.

[illegible signature]

8-5-99
0800 @ Bering Air
0900 arrive NEC
Plane will stand by
0920 Pen Air arrive
Lt Col Tulians
ADEC Jeff Bramlee
EPA
COE Rich Jackson
-Rain -
· Tailgate mtg complete
ATV familiarization complete
Tour site
1400 - I go to Terminal
to pack out remaining
Equipment
Others to White Alice
1600 Leave site -
arrive Nome - cargo
to AK. A.L. will be
in Anch. Sat.
Leave Nome 2015
Arrive Anch 2200

[signature]



LEGEND

- Borehole (BH)
- Monitoring Well (MW)
- Surface Soil Sample (SS)
- HAZCAT Sample (TK)
- Stained Soil or Distressed Vegetation

NOTES

Base maps were digitized from various as-built drawings provided by the Corps of Engineers. (See Section 4.1)

Sample/Depth	DRO (mg/kg or mg/l)	TRPH (mg/kg or mg/l)	GRO (mg/kg or mg/l)	Aroclor 1254 (mg/kg)
1996				
SS 101	1,900	1,700		
SS 102	220	160		
SS 103	1,200	2,100		
SS 104	17,000	32,000		
SS 105	59	130		
SS 106	2,000	2,500		
1994				
SS 125	22,700	43,700		
SS 126	26,500	62,300		
SS 127	24,500	119,000		
SS 128	2,170	7,910		
SS 133	69,100	32,100		
SS 134	379	416		
SS 135	902	2,120		
SS 136	195	464		
MW 11-2 GW	3.2			
MW 11-2 0-2'	130	436	ND	
MW 11-2 2-4'	358	168	ND	
MW 11-3 GW	6.1	6.6	1.1	
MW 11-3 0-2'	27	182		
MW 11-3 2-4'	31	90		
MW 11-3 4-6'	11	76		
MW 11-3 9.5-11.5'	22,000	29,200	192	
1998	DRO	RRO		
MW 11-2	0.34	ND (0.25)		
MW 11-3	46	ND (5)		
SS 801	410	980		

MONTGOMERY WATSON
Anchorage, Alaska

FIGURE 2-2

U.S. ARMY ENGINEER DISTRICT, ALASKA
N.E. CAPE – ST. LAWRENCE ISLAND, ALASKA

SITE 10 – BURIED DRUM FIELD

JOB No. 889098.050120 TIME: 29-JUL-1999 16:51 FILE: e:\usace\necape\99-p\dr-af11\fig2_02.dgn

MONTGOMERY WATSON

By [signature] Date 8-2-99 Client USACOE Sheet ___ of ___

Chkd. By ___ Description NEC Site 10 Job No ___

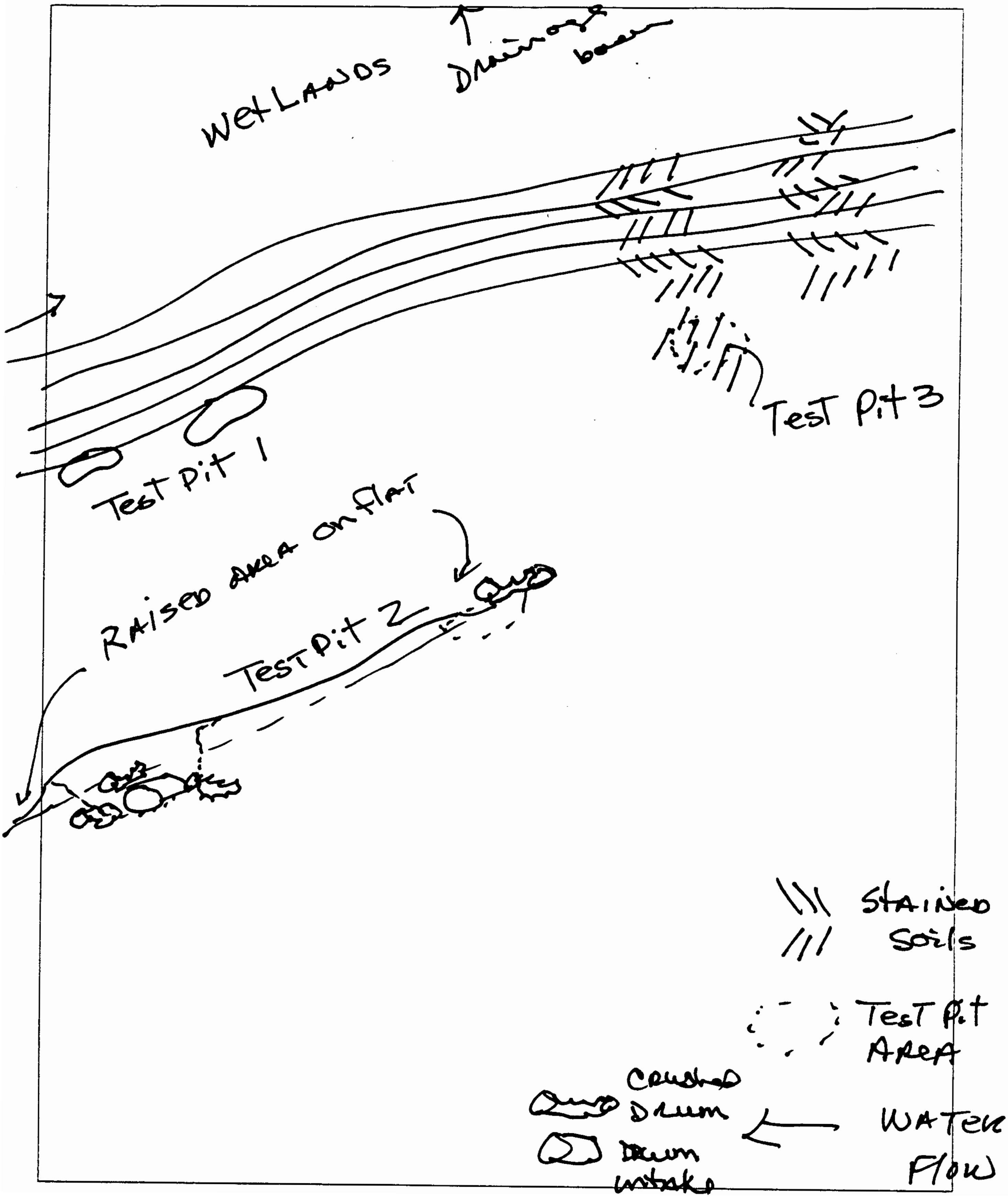


Table 3
Summary of TCLP Results
Northeast Cape, St. Lawrence Island, Alaska

Site	Building #	Building Name	Sample identification	wood structure (%)	corkwall (%)	cement board (%)	metal (%)	painted area (%)	roofing (%)	roof tar (%)	wall insulation (%)	ACM siding (%)	clay tile (%)	vinyl ACM (%)	concrete (%)	ceiling (%)	total (%)	TCLP results (mg/l)	MRL (mg/l)
NE 02	N/A	Airport Terminal with Tower	95NE02401BD1	60		10	10	2	3		2	10		3			100	0.14	0.05
NE 03	119	Fuel Pumphouse	95NE03119BD1														0	0.13	0.05
NE 13	110	Heat and Electrical Power Building	95NE13110BD1	50 ~~60.5~~		10	1	1	25	1		1 65					100	0.22	0.05
NE 14	098	Emergency Power Operations Building	95NE14098BD1	10		2	30	3			5			5	45		100	ND	0.05
NE 14	N/A	Debris Pile	95NE14401BD1				100	0									100	5.54*	0.05
NE 14	N/A	Debris Pile	95NE14401BD2				100	0									100	4.41	0.05
NE 14	N/A	Debris Pile	95NE14401BD3				100	0									100	4.2	0.05
NE 16	112	Paint and Dope Building	95NE16112BD1	29		3	1	1	21	1	42	2					100	0.34	0.05
NE 17	106	Mess Hall Building	95NE17106BD1	50.5	1.7	4	0.2	1	27	1	10	1.5	2.5	0.6			100	ND	0.05
NE 17	107	Mess Hall Warehouse Building	95NE17107BD1	39	1	3	0.3	1	44	1	10	0.7					100	0.16	0.05
NE 17	111	General Supply Warehouse Building	95NE17111BD1	33		3	0.5	1.5	49	1	10	1		1			100	0.3	0.05
NE 18	099	Recreation Building	95NE18099BD1	48			50	2									100	ND	0.05
NE 18	100	NCO Quarters - N&S buildings	95NE18100BD1	45.5		20	0.5	1	20		1	10		2			100	0.09	0.05
NE 18	101	Dormitory E&W buildings	95NE18101BD1	39.5		18	0.5	1	19	1		20		1			100	2.85	0.05
NE 18	102	BOQ Building	95NE18102BD1	50		5		1	18			3		3		20	100	0.15	0.05
NE 18	104	Administration Building	95NE18104BD1	52		15	0.5	1	15		5	8		3.5			100	0.38	0.05
NE 18	105	Theater Building	95NE18105BD1	25		5	1	1	25		1	12		5		25	100	0.07	0.05
NE 19	108	Vehicle Storage Building	95NE19108BD1	37.3		2.8	0.4	1	26	1	30	1.5					100	0.57	0.05
NE 19	108	Vehicle Storage Building	95NE19108BD2	37.3		2.8	0.4	1	26	1	30	1.5					100	0.34	0.05
NE 19	108	Vehicle Storage Building	95NE19108BD3	37.3		2.8	0.4	1	26	1	30	1.5					100	0.27	0.05
NE 19	109	Garage Building	95NE19109BD1	37.3		2.8	0.4	1	26	1	30	1.5					100	0.19	0.05
NE 20	103	Aircraft Control and Warning Building	95NE20103BD1														0	ND	0.05
NE 22	113	Water Supply Building	95NE22113BD1	60			19	1				20					100	ND	0.05
NE 22	114	Pump Station Building	95NE22114BD1	30			1	30	19			20					100	0.2	0.05

*** Adjusted TCLP results taking into account the steel girders sampled at the debris pile (Site 14) that are present in Building 98 (Site 14) :**

Assuming that the steel girders do not occupy more than 1/4 of the total volume of Building 98; the adjusted TCLP result is:

3/4 (95NE14098BD1) + 1/4 (95NE14401BD1) = TCLP

3/4 (ND) + 1/4 (5.54%) = 1.39 % TC LP

Component	**Thickness (assumptions based on field observations)**
Window	1/4"
Door Trim	1/2"
Interior Wallboard	1/2"
Wood Structure	2" x 6" w/16" center
Roof Insulation (glass foam)	3"
ACM Siding	1/8"
Tarpaper	1/16"
Metal Flashing	1/32" (12" height for both floor and roof)
Wall Insulation	4"
Door	2"
Wood Siding	1"

Table 3
Summary of TCLP Results
Northeast Cape, St. Lawrence Island, Alaska

Site	Building #	Building Name	Sample identification	wood structure (%)	corkwall (%)	cement board (%)	metal (%)	painted area (%)	roofing (%)	roof tar (%)	wall insulation (%)	ACM siding (%)	clay tile (%)	vinyl ACM (%)	concrete (%)	ceiling (%)	total (%)	TCLP results (mg/l)	MRL (mg/l)
NE 02	N/A	Airport Terminal with Tower	95NE02401BD1	60		10	10	2	3		2	10		3			100	0.14	0.05
NE 03	119	Fuel Pumphouse	95NE03119BD1														0	0.13	0.05
NE 13	110	Heat and Electrical Power Building	95NE13110BD1	50 ~~60.5~~		10	1	1	25 ~~35~~	1		10 ~~1.5~~					100	0.22	0.05
NE 14	098	Emergency Power Operations Building	95NE14098BD1	10		2	30	3			5			5	45		100	ND	0.05
NE 14	N/A	Debris Pile	95NE14401BD1				100	0									100	5.54*	0.05
NE 14	N/A	Debris Pile	95NE14401BD2				100	0									100	4.41	0.05
NE 14	N/A	Debris Pile	95NE14401BD3				100	0									100	4.2	0.05
NE 16	112	Paint and Dope Building	95NE16112BD1	29		3	1	1	21	1	42	2					100	0.34	0.05
NE 17	106	Mess Hall Building	95NE17106BD1	50.5	1.7	4	0.2	1	27	1	10	1.5	2.5	0.6			100	ND	0.05
NE 17	107	Mess Hall Warehouse Building	95NE17107BD1	39	1	3	0.3	1	44	1	10	0.7					100	0.16	0.05
NE 17	111	General Supply Warehouse Building	95NE17111BD1	33		3	0.5	1.5	49	1	10	1		1			100	0.3	0.05
NE 18	099	Recreation Building	95NE18099BD1	48			50	2									100	ND	0.05
NE 18	100	NCO Quarters - N&S buildings	95NE18100BD1	45.5		20	0.5	1	20		1	10		2			100	0.09	0.05
NE 18	101	Dormitory E&W buildings	95NE18101BD1	39.5		18	0.5	1	19	1		20		1			100	2.85	0.05
NE 18	102	BOQ Building	95NE18102BD1	50		5		1	18			3		3		20	100	0.15	0.05
NE 18	104	Administration Building	95NE18104BD1	52		15	0.5	1	15		5	8		3.5			100	0.38	0.05
NE 18	105	Theater Building	95NE18105BD1	25		5	1	1	25		1	12		5		25	100	0.07	0.05
NE 19	108	Vehicle Storage Building	95NE19108BD1	37.3		2.8	0.4	1	26	1	30	1.5					100	0.57	0.05
NE 19	108	Vehicle Storage Building	95NE19108BD2	37.3		2.8	0.4	1	26	1	30	1.5					100	0.34	0.05
NE 19	108	Vehicle Storage Building	95NE19108BD3	37.3		2.8	0.4	1	26	1	30	1.5					100	0.27	0.05
NE 19	109	Garage Building	95NE19109BD1	37.3		2.8	0.4	1	26	1	30	1.5					100	0.19	0.05
NE 20	103	Aircraft Control and Warning Building	95NE20103BD1														0	ND	0.05
NE 22	113	Water Supply Building	95NE22113BD1	60			19	1				20					100	ND	0.05
NE 22	114	Pump Station Building	95NE22114BD1	30			1	30	19			20					100	0.2	0.05

* **Adjusted TCLP results taking into account the steel girders sampled at the debris pile (Site 14) that are present in Building 98 (Site 14) :**

Assuming that the steel girders do not occupy more than 1/4 of the total volume of Building 98; the adjusted TCLP result is:

3/4 (95NE14098BD1) + 1/4 (95NE14401BD1) = TCLP

3/4 (ND) + 1/4 (5.54%) = 1.39 % TC LP

Component	Thickness (assumptions based on field observations)
Window	1/4"
Door Trim	1/2"
Interior Wallboard	1/2"
Wood Structure	2" x 6" w/16" center
Roof Insulation (glass foam)	3"
ACM Siding	1/8"
Tarpaper	1/16"
Metal Flashing	1/32" (12" height for both floor and roof)
Wall Insulation	4"
Door	2"
Wood Siding	1"

4.1 TCLP Sampling Methodology

Each structure or item of debris was evaluated to determine or confirm if it contained suspected lead-based paint. Once this determination was made, TCLP core sampling was accomplished.

TCLP samples were collected using procedures in conformance with the U.S. Army Environmental Hygiene Agency Sampling Protocol for Building Demolition Debris and Buildings Painted with Lead-Based Paint as found in the Interim Final Report Lead-Based Paint Contaminated Debris Waste Characterization Study (USEHA 1993). To ensure an 80 percent confidence level in the determination of TCLP lead, each structure or debris suspected of containing lead-based paint was sampled.

One composite sample was collected for each selected sample structure. The composite sample included approximate proportions of all materials constituting the structure. Proportions of structure materials were determined by measuring volumes using the Disto® hand-held distance meter. The area of each wall, ceiling and floor was calculated, and this value was multiplied by the thickness of each individual material, such as wall insulation or cork. Once the volumes of all materialsconstituting that structure was calculated, the percentages of individual material compared to the whole structure was established, and the weight of that particular material which would go into the 120 gram sample was noted.

Certain assumptions were made as to the thickness of selected materials based on field observations. These were used only if the material was found to be a constituent of the structure being sampled. Assumed components and their thicknesses are as follows:

Component	Thickness
window	1/4"
door trim	1/2"
interior wallboard	1/2"
wood structure	2 X 6" with 16" centers
roof insulation (glass foam)	3"
Asbestos siding	1/8"
tarpaper	1/16"
metal flashing	1/32" (12" height for both floor and roof flashing)
wall insulation	4"
door	2"
wood siding	1"
clay tile	1/2"
vinyl asbestos tile	1/8"
cork wall	2"

Tools used to collect component samples were the DeWault® portable hand drill, a metal saw, a hammer and chisel, and an electric hand saw powered by a generator.

1 TCLP Sampling Methodology

Each structure or item of debris was evaluated to determine or confirm if it contained suspected lead-based paint. Once this determination was made, TCLP core sampling was accomplished.

TCLP samples were collected using procedures in conformance with the U.S. Army Environmental Hygiene Agency Sampling Protocol for Building Demolition Debris and Buildings Painted with Lead-Based Paint as found in the Interim Final Report Lead-Based Paint Contaminated Debris Waste Characterization Study (USEHA 1993). To ensure an 80 percent confidence level in the determination of TCLP lead, each structure or debris suspected of containing lead-based paint was sampled.

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Tools used to collect component samples were the DeWault® portable hand drill, a metal saw, a hammer and chisel, and an electric hand saw powered by a generator.

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CONTENTS

PAGE	REFERENCE	DATE

7-30-99

0925 - Depart ANC for Nom

1220 - Arrive Nom

Get Van and Pickup from Stampede Rent a Car at Aurora Inn.

Mobilize Equipment

Get Unleaded fuel and Heating fuel

[signature] 7/30/99

7-31-99

0800 - To Airport for fuel trip to Nec.

Mellisa and I (Doug) to collect Paint chip samples from AST's

AST 4-1, AST 4-2, AST 3-1, AST 3-2
AST 13-1, AST 13-4,

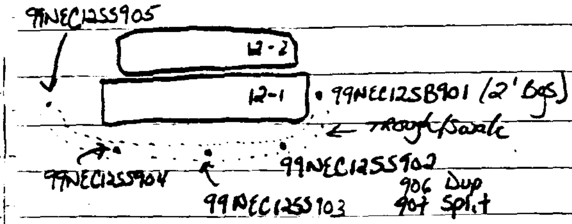
Set Sampling points for Site 12 Soil and Subsurface Soil Sampling.

1700 - PenAir Arrives w/ Colonel Jahn Suzanne Beauchamp, Larry (Biologist) and Gary Busse. Escort Suzanne and Colonel Jahn through site.

1800 - Depart for Nom [signature] 7/31/99

8-1-99

Collect Soil Samples from Site 12



No Clear Contamination with the Exception of Disturbed Soil @ 901
All Samples Collected @ 6' Bgs
except 901 @ 2' Bgs.

8-1-99

Collect Background Sample @ the Toe of the Mountain at the gravel Borrow Pit Area

99NEC30SS901

Collect Confirmation Sample @ Site 7 Near NW Toe of Landfill Mass.

99NEC07SS901
904 Dup
903 Split

Collect Background SS and SD from Pond Edge approx 1/4 mile from Site 7.

99NEC30SS901
99NEC30SD902

[signature] 8/1/99

8-2-99

Meet Pat Kuckens (SHPO/HABS Survey) with Bill.

Proceed to Composite Sample Buildings 107, 110, 101 @

Samples. 99NEC13BD901 900
99NEC17BD901 1000
99NEC18BD901. 1100

Accompany Pat Kuckens out to Site 24 Receiver Building.

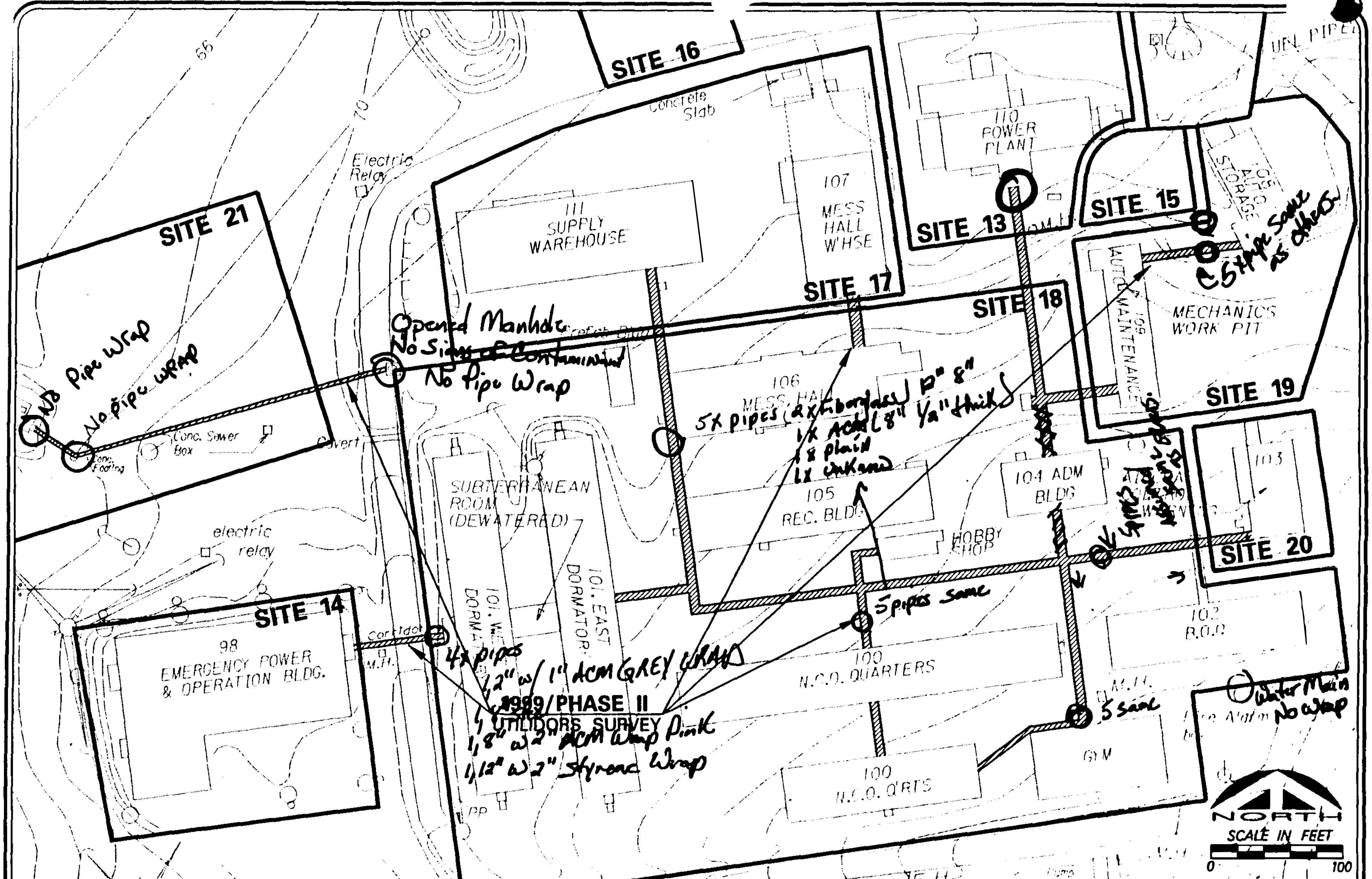
Return and Began utilidor Survey. See map for Notes on utilidor Contents.

8-2-99

Most UTILIDORS CONTAIN 5 pipes. 2 w/ ACM WRAP, 1 w/ Fiberglass wrap 1 unknown (Poly Styrene? Similar to roofing). and 1 Bare Expansion? See Map for Dimensions

[signature] 8/2/99

JOB No. #89098.050... ...E: 29-JUL-1999 16:53 FILE: e:\usace\necape\99wp\draft\fig2_05.dgn



MONTGOMERY WATSON

Anchorage, Alaska

FIGURE 2-5

U.S. ARMY ENGINEER DISTRICT, ALASKA
N.E. CAPE - ST. LAWRENCE ISLAND, ALASKA

UTILIDOR SYSTEM

APPENDIX G

Field Forms

1999 Northeast Cape Sample Check List
Site 7, Site 12, and Site 13

Analytical Laboratory: MultiChem Analytical Sevices

Phone: 907-248-8273 Fax: 907-248-8274

Sample Identification	Location Description	Date	Time	Depth	Sediment: DRO/RRO - AK102/AK103 4 oz amber glass jar	Soil: GRO/BTEX - AK101/SW8021B 4 oz amber glass jar MeOH	Soil: DRO/RRO - AK102/AK103 4 oz amber glass jar	Soil: TAL Metals SW6010/7000 8 oz amber glass	Soil: TOC - SW9060 4 oz glass jar	Sludge: TCLP Metals SW1311/6010B/7000 4 oz, amber glass	Sludge: TCLP VOCs SW1311/8260 4 oz, amber glass	Sludge: TCLP Pesticides SW1311/8081 4 oz, amber glass	Sludge: TCLP SVOCs SW1311/8270B 4 oz, amber glass	Sludge: PCBs SW8082 4 oz amber glass jar	Bldg. Materials: TCLP PCBs SW1311/8082 4 oz, amber glass	Bldg. Materials: PCBs SW8082 4 oz amber glass jar	Paint: Pb SW7421 4 oz amber glass jar
Northeast Cape																	
Site 7 Cargo Beach Road Landfill	Authorized samples				1	QA/QC samples: MS/MSD and field duplicate											
99NEC 07SD901	Resample Location	8/1/99	1230	6"	✓	MS/MSD											
99NEC 07SD902 MAS. Dup of 01	at NEW TOE OF	8/1/99	1235	6"	✓	QC											
99NEC 07SD903 Analy. Split of 01	LandFill Mass	8/1/99	1240	6"	✓	QA											
99NEC																	
Site 12 Gasoline Tank Area	Authorized samples					5	5										
99NEC 12SB901	Fill End of Tanks	8/1/99	1100	2'		✓	✓										
99NEC 12SS902		8/1/99	1120	6"		✓	✓										
99NEC 12SS903		8/1/99	1130	6"		✓	✓										
99NEC 12SS904		8/1/99	1140	6"		✓	✓										
99NEC 12SS905		8/1/99	1150	6"		✓	✓										
99NEC 12SS906 TO MAS QC	Duplicate of 2	8/1/99	1125	6"		✓	✓										
99NEC 12SS907 TO Analytical QA	Split of 2	8/1/99	1130														
Site 13 Building 110	Authorized samples				No QA/QC required										1	1	
99NEC 13BD901		8-2	900	Cyc 3											X	X	
99NEC																	
99NEC																	
99NEC																	

1999 Northeast Cape Sample Check List
Site 17, Site 18, and Site 21

Analytical Laboratory: MultiChem Analytical Sevices

Phone: 907-248-8273 Fax: 907-248-8274

Sample Identification	Location Description	Date	Time	Depth	Sediment: DRO/RRO - AK102/AK103 4 oz amber glass jar	Soil: GRO/BTEX - AK101/SW8021B 4 oz amber glass jar MeOH	Soil: DRO/RRO - AK102/AK103 4 oz amber glass jar	Soil: TAL Metals SW6010/7000 8 oz amber glass	Soil: TOC - SW9060 4 oz glass jar	Sludge: TCLP Metals SW1311/6010B/7000 4 oz, amber glass	Sludge: TCLP VOCs SW1311/8260 4 oz, amber glass	Sludge: TCLP Pesticides SW1311/8081 4 oz, amber glass	Sludge: TCLP SVOCs SW1311/8270B 4 oz, amber glass	Sludge: PCBs SW8082 4 oz amber glass jar	Bldg. Materials: TCLP PCBs SW1311/8082 4 oz, amber glass	Bldg. Materials: PCBs SW8082 4 oz amber glass jar	Paint: Pb SW7421 4 oz amber glass jar
Northeast Cape																	
Site 17 Building 107	Authorized samples			No QA/QC required											1	1	
99NEC 17 BD 901		8-2	1000	Conc 3													
99NEC																	
99NEC																	
99NEC																	
Site 18 Building 101	Authorized samples			No QA/QC required											1	1	
99NEC 18 BD 901		8-2	1100	Conc 3											1	1	
99NEC																	
99NEC																	
99NEC																	
Site 21 Septic Tanks	Authorized samples			No QA/QC required						2	2	2	2	2			
99NEC																	
99NEC																	
99NEC																	
99NEC																	

1999 Northeast Cape Sample Check list
Site 30 and Site 21

Analytical Laboratory: MultiChem Analytical Sevices

Phone: 907-248-8273 **Fax:** 907-248-8274

					Sediment	Soil				Sludge					Bldg. Materials		Paint
Sample Identification	Location Description	Date	Time	Depth	DRO/RRO - AK102/AK103 4 oz amber glass jar	GRO/BTEX - AK101/SW8021B 4 oz amber glass jar MeOH	DRO/RRO - AK102/AK103 4 oz amber glass jar	TAL Metals SW6010/7000 8 oz amber glass	TOC - SW9060 4 oz glass jar	TCLP Metals SW1311/6010B/7000 4 oz, amber glass	TCLP VOCs SW1311/8260 4 oz, amber glass	TCLP Pesticides SW1311/8081 4 oz, amber glass	TCLP SVOCs SW1311/8270B 4 oz, amber glass	PCBs SW8082 4 oz amber glass jar	TCLP PCBs SW1311/8082 4 oz, amber glass	PCBs SW8082 4 oz amber glass jar	Pb SW7421 4 oz amber glass jar
Northeast Cape																	
Site 30 Background *	Authorized Samples					3	3	3	3	2	2	2	2	2			
99NEC30SS901	Top of Mountain Edge of Gravel	8/1/99	1200	6"		✓	✓	✓	✓								
99NEC30SS902	Pond S of Site 7	8/1/99	1500	6"		✓	✓	✓	✓								
99NEC30SD903	Pond S of Site 7	8/1/99	1510	6"		Sed ✓	Sed ✓	Sed ✓	Sed ✓								
99NEC																	
99NEC																	
99NEC																	
99NEC																	
99NEC																	
Site 21 Septic Tanks	AST 21-3 Authorized samples			No QA/QC required											1	1	
99NEC21SD901	Northern Edge of Septic tank	8/1/99	1300	1.5 Below water Level						✓	✓	✓	✓	✓			
99NEC																	
99NEC																	
99NEC																	

*Site 30 Background (00 is the background site, DB for drainage basin, SR for Suqi River, and BK for the uncontaminated control stream)

1999 Northeast Cape Sample Check List
Pb

Pg. 1

Analytical Laboratory: MultiChem Analytical Sevices

Phone: 907-248-8273 Fax: 907-248-8274

					Sediment	Soil				Sludge					Bldg. Materials		Paint
Sample Identification	Location Description	1999 Date	Time	Color % ~~Depth~~	DRO/RRO - AK102/AK103 4 oz amber glass jar	GRO/BTEX - AK101/SW8021B 4 oz amber glass jar MeOH	DRO/RRO - AK102/AK103 4 oz amber glass jar	TAL Metals SW6010/7000 8 oz amber glass	TOC - SW9060 4 oz glass jar	TCLP Metals SW1311/6010B/7000 4 oz, amber glass	TCLP VOCs SW1311/8260 4 oz, amber glass	TCLP Pesticides SW1311/8081 4 oz, amber glass	TCLP SVOCs SW1311/8270B 4 oz, amber glass	PCBs SW8082 4 oz amber glass jar	TCLP PCBs SW1311/8082 4 oz, amber glass	PCBs SW8082 4 oz amber glass jar	Pb SW7421 4 oz amber glass jar
~~Multiple AST~~	TANK	Authorized samples				No QA/QC required											✓ 26
99NEC 03 MI 901	3-01	7-31	1200														✓
99NEC 03 MI 902	3-2	7-31	1230														✓
99NEC 04 MI 901	4-1	7-31	1300	white <5%													✓
99NEC 04 MI 902	4-2	7-31	1330	Blue white 25%													✓
99NEC 06 MI 901	6-1	8-01	1200	Red Brick 10% Brick <10%													✓
99NEC 11 MI 901	11-1	8-01	1045	90% green and BK													✓
99NEC 11 MI 902	11-2	8-01	1100	90% "													✓
99NEC 11 MI 903	11-3	8-01	1115	90% "													✓
99NEC 13 MI 901	13-1	7-31	1400	grey <20%													✓
99NEC 13 MI 902	13-6	8-1	1145	orange green orange Red grey 90%													✓
99NEC 13 MI 903	13-5	8-1	1400	green orange 95%													✓
99NEC 13 MI 904	13-4	8-1	1130	green orange 60%													✓
99NEC 14 MI 901	14-1	7-31	1700	orange yellow <1%													✓
99NEC 16 MI 901	16-1	8-01	1430	orange black 5%													✓

Pg 2

1999 Northeast Cape Sample Check List
Pb

Analytical Laboratory: MultiChem Analytical Sevices

Phone: 907-248-8273 **Fax:** 907-248-8274

					Sediment	Soil				Sludge					Bldg. Materials		Paint
Sample Identification	Location Description	1999 Date	Time	Depth	DRO/RRO - AK102/AK103 4 oz amber glass jar	GRO/BTEX - AK101/SW8021B 4 oz amber glass jar MeOH	DRO/RRO - AK102/AK103 4 oz amber glass jar	TAL Metals SW6010/7000 8 oz amber glass	TOC - SW9060 4 oz glass jar	TCLP Metals SW1311/6010B/7000 4 oz, amber glass	TCLP VOCs SW1311/8260 4 oz, amber glass	TCLP Pesticides SW1311/8081 4 oz, amber glass	TCLP SVOCs SW1311/8270B 4 oz, amber glass	PCBs SW8082 4 oz amber glass jar	TCLP PCBs SW1311/8082 4 oz, amber glass	PCBs SW8082 4 oz amber glass jar	Pb SW7421 4 oz amber glass jar
Multiple AST	Authorized samples					No QA/QC required											✓ 26
99NEC 18 MI 901	18-1 (Sub Basemnt)	8-1	1415	<5	White												✓
99NEC 19 MI 901	19-1	8-31	1520	<2%	Pink/green												✓
99NEC 19 MI 902	19-2 BGM	7-31	1530	80%	yellow/Red												✓
Site 12 99NEC 21 MI 901	~~21-1~~ 12-1	8-1	1030	85%	Red & Black												✓
99NEC 22 MI 901	22-2	7-31	1545	75%													✓
99NEC 22 MI 902	22-3	7-31	1600	75%													✓
99NEC 22 MI 903	22-4	7-31	1630	75%													✓
99NEC 22 MI 904	22-5	7-31	1645	75%													✓
99NEC																	
99NEC																	
99NEC																	
99NEC																	
99NEC																	
99NEC																	

USACE Northeast Cape
Sampling

CoC # **99NEC_01**
01A/01B

Montgomery Watson 4100 Spenard Road Anchorage AK 99517 (907)248-8883 Fax (907) 248-8884 ATTN: Eileen Maus	Analytical Laboratory: MultiChem Analytical Services Contact: Tori Bayly Phone: 907-248-8273 Fax: 907-248-8274 **MW Job Number:** **1189098.050130** **30-DAY TURNAROUND**
Sampler's Signature: [signature]	
Sampler's Name: MCLEAN	

Date	Time	[illegible]	[illegible]	[illegible]	Sediment: DRO/RRO - AK102/AK103 4 oz amber glass jar	Soil: GRO/BTEX - AK101/SW8021B 4 oz amber glass jar MeOH	Soil: DRO/RRO - AK102/AK103 4 oz amber glass jar	Soil: TAL Metals SW6010/7000 8 oz amber glass	Soil: TOC - SW9060 4 oz glass jar	Sludge: TCLP Metals SW1311/6010B/7000 4 oz, amber glass	Sludge: TCLP VOCs SW1311/8260 4 oz, amber glass	Sludge: TCLP Pesticides SW1311/8081 4 oz, amber glass	Sludge: TCLP SVOCs SW1311/8270B 4 oz, amber glass	Sludge: PCBs SW8082 4 oz amber glass jar	Bldg. Materials: TCLP PCBs SW1311/8082 4 oz, amber glass	Bldg. Materials: PCBs SW8082 4 oz amber glass jar	Paint: Pb SW7421 4 oz amber glass jar	Comments
8/1/99	1230	99NEC 07SD901	Sediment	~~X~~ 1	✓													ms/msD
8/1/99	1235	99NEC 07SD902	↓	~~X~~ 1	✓													
8/1/99	1100	99NEC 12SB901	Soil	2	X	✓	✓											
8/1/99	1120	99NEC 12SS902			2	X	✓	✓											
8/1/99	1130	99NEC 12SS903			2	X	✓	✓											
8/1/99	1140	99NEC 12SS904			2	X	✓	✓											
8/1/99	1150	99NEC 12SS905			2	X	✓	✓											
8/1/99	1125	99NEC 12SS906	↓	2	X	✓	✓											
8/1/99	1200	99NEC 30SS901	Soil	4		✓	✓	✓	✓									
8/1/99	1500	99NEC 30SS902	↓	4		✓	✓	✓	✓									
8/1/99	1510	99NEC 30SD903	Sediment	4		✓	✓	✓	✓									
8/1/99	1300	99NEC 21SD901	↓	6						✓	✓	✓	✓	✓				
8/1/99	2100	99NEC 12TB901	TB	1		✓												

Relinquished by: [signature] Company Name: Montgomery Watson	Date 8-2-99 Time 800	Hand Delivered Y N	Shipped Via: Goldstreak	Shipping Number: 1151 7391
Received by: Company Name:	Date Time	Relinquished by: Company Name:	Date Time	Cooler Name:
Received by: Company Name:	Date Time	Relinquished by: Company Name:	Date Time	Cooler Temperature Upon Arrival: °C Custody seal #s:

USACE Northeast Cape
Sampling

QA / LAB

CoC # 99NEC 02

17328/17322

Montgomery Watson
4100 Spenard Road
Anchorage AK 99517
(907)248-8883
Fax (907) 248-8884
ATTN: Eileen Maus

Analytical Laboratory: ~~MultiChem Analytical Services~~ Analytical Alaska
~~Contact: Tori Buyly~~ 611 W 8th Ave
Phone: 907-~~248-8293~~ 258-2155 Anchorage AK
Fax: 907-~~248-8234~~ 99501

MW Job Number:
1189098.050130
30-DAY TURNAROUND

Sampler's Signature: Bonnie McLean

Sampler's Name:

					Sediment	Soil				Sludge					Bldg. Materials		Paint	
					DRO/RRO - AK102/AK103 4 oz amber glass jar	GRO/BTEX - AK101/SW8021B 4 oz amber glass jar MeOH	DRO/RRO - AK102/AK103 4 oz amber glass jar	TAL Metals SW6010/7000 8 oz amber glass	TOC - SW9060 4 oz glass jar	TCLP Metals SW1311/6010B/7000 4 oz, amber glass	TCLP VOCs SW1311/8260 4 oz, amber glass	TCLP Pesticides SW1311/8081 4 oz, amber glass	TCLP SVOCs SW1311/8270B 4 oz, amber glass	PCBs SW8082 4 oz amber glass jar	TCLP PCBs SW1311/8082 4 oz, amber glass	PCBs SW8082 4 oz amber glass jar	Pb SW7421 4 oz amber glass jar	Comments
8/1/99	1240	99NEC07SD903	Sediment		✓													
8/1/99	1130	99NEC12SS907	Soil	2		✓	✓											
		~~99NEC~~																
		99NEC																
		99NEC																
		99NEC																
		99NEC			LAST Item													Project End.
		99NEC																
		99NEC																
		99NEC																
		99NEC																
8/1/99	2100	99NEC12TB902		1		✓												
~~8/1/99~~	~~2100~~	~~99NEC TB~~	Def															

Relinquished by: Bonnie McLean	Date 8-2-99	Hand Delivered Y (N)	Shipped Via Gold Streak	Shipping Number: 6279 4045
Company Name: Montgomery Watson	Time 800			
Received by:	Date	Relinquished by:	Date	Cooler Name:
Company Name:	Time	Company Name:	Time	
Received by:	Date	Relinquished by:	Date	Cooler Temperature Upon Arrival: °C
Company Name:	Time	Company Name:	Time	Custody seal #s:

USACE Northeast Cape
Sampling

COPY

CoC # 99NEC_03

821774 Revised

Montgomery Watson
4100 Spenard Road
Anchorage AK 99517
(907)248-8883
Fax (907) 248-8884
ATTN. Eileen Maus

Analytical Laboratory:
MultiChem Analytical Services
Contact: Tori Bayly
Phone: 907-248-8273
Fax: 907-248-8274
MW Job Number:
1189098.050130
30-DAY TURNAROUND

Sampler's Signature:
Sampler's Name: Bonnie Mehan

Date 1999	Time	Sample ID	Matrix	# Containers	Sediment: DRO/RRO - AK102/AK103, 4 oz amber glass jar	Soil: GRO/BTEX - AK101/SW8021B, 4 oz amber glass jar MeOH	Soil: DRO/RRO - AK102/AK103, 4 oz amber glass jar	Soil: TAL Metals SW6010/7000, 8 oz amber glass	Soil: TOC - SW9060, 4 oz glass jar	Sludge: TCLP Metals SW1311/6010B/7000, 4 oz. amber glass	Sludge: TCLP VOCs SW1311/8260, 4 oz. amber glass	Sludge: TCLP Pesticides SW1311/8081, 4 oz. amber glass	Sludge: TCLP SVOCs SW1311/8270B, 4 oz. amber glass	Sludge: PCBs SW8082, 4 oz amber glass jar	Bldg. Materials: TCLP PCBs SW1311/8082, 4 oz. amber glass	Bldg. Materials: PCBs SW8082, 4 oz amber glass jar	Paint: Pb SW7421, 4 oz amber glass jar	Comments
8-2	900	99NEC 13BD 901	Bldg	1											X	X Bgm		Delete PCB 1
8-2	1000	99NEC 17 BD 901	MAT.	1											X	X Bgm		" 2
8-2	1100	99NEC 18 BD 901		1											X	X Bgm		" 3
		99NEC																
		99NEC																
		99NEC																
		99NEC																
		99NEC																
		99NEC																
		99NEC																
		99NEC																
		99NEC																
		99NEC																

LAST Samples Job Complete

Relinquished by: Bonnie Mehan	Date 8-11-99	Hand Delivered (Y) N	Shipped Via: N/A
Company Name: Montgomery Watson	Time 1235		Shipping Number:
Received by: John Mandsager	Date 8/11/99	Relinquished by:	Date
Company Name: MASAK	Time 1235	Company Name:	Time
			Cooler Name:
Received by:	Date	Relinquished by:	Date
Company Name	Time	Company Name:	Time
			Cooler Temperature Upon Arrival: °C
			Custody seal #s:

USACE Northeast Cape
Sampling

CoC # 99NEC_03

Montgomery Watson
4100 Spenard Road
Anchorage AK 99517
(907)248-8883
Fax (907) 248-8884
ATTN: Eileen Maus

Analytical Laboratory:
MultiChem Analytical Services
Contact: Tori Bayly
Phone: 907-248-8273
Fax: 907-248-8274
MW Job Number:
1189098.050130
30-DAY TURNAROUND

Sampler's Signature:

Sampler's Name: [signature]

Cool to 4 deg C

1999 Date	Time	Sample ID	Matrix	Total Containers	Sediment: DRO/RRO - AK102/AK103 4 oz amber glass jar	Soil: GRO/BTEX - AK101/SW8021B 4 oz amber glass jar MeOH	Soil: DRO/RRO - AK102/AK103 4 oz amber glass jar	Soil: TAL Metals SW6010/7000 8 oz amber glass	Soil: TOC - SW9060 4 oz glass jar	Sludge: TCLP Metals SW1311/6010B/7000 4 oz, amber glass	Sludge: TCLP VOCs SW1311/8260 4 oz, amber glass	Sludge: TCLP Pesticides SW1311/8081 4 oz, amber glass	Sludge: TCLP SVOCs SW1311/8270B 4 oz, amber glass	Sludge: PCBs SW8082 4 oz amber glass jar	Bldg. Materials: TCLP PCBs SW1311/8082 4 oz, amber glass	Bldg. Materials: PCBs SW8082 4 oz amber glass jar	Paint: Pb SW7421 4 oz amber glass jar	Comments
8-2	900	99NEC 13BD 901	Bldg.	1											X	X		
8-2	1000	99NEC 17 BD 901	MAT.	1											X	X		
8-2	1100	99NEC 18 BD 901	|	1											X	X		
		99NEC																
		99NEC																
		99NEC																
		99NEC																
		99NEC																
		99NEC																
		99NEC																
		99NEC																
		99NEC																
		99NEC																

LAST Samples
Job Complete

Relinquished by: [signature]	Date 8-11-99	Hand Delivered Y N	Shipped Via: N/A		Shipping Number:
Company Name: Montgomery Watson	Time 1235				
Received by: John Mandsaag	Date 8/11/99	Relinquished by:		Date	Cooler Name:
Company Name: MASAK	Time 1235	Company Name:		Time	
Received by:	Date	Relinquished by:		Date	Cooler Temperature Upon Arrival: °C
Company Name:	Time	Company Name:		Time	Custody seal #s:

USACE Northeast Cape
Sampling

CoC # 99NEC 04

821675

Pg 1 of 2.

Montgomery Watson
4100 Spenard Road
Anchorage AK 99517
(907)248-8883
Fax (907) 248-8884
ATTN: Eileen Maus

Analytical Laboratory:
MultiChem Analytical Services
Contact: Tori Bayly
Phone: 907-248-8273
Fax: 907-248-8274

MW Job Number:
1189098.050130
30-DAY TURNAROUND

Sampler's Signature:

Sampler's Name:

Cool to 4 degrees C

Date	Time	Sample ID	Matrix	Total Containers	Sediment: DRO/RRO - AK102/AK103 4 oz amber glass jar	Soil: GRO/BTEX - AK101/SW8021B 4 oz amber glass jar MeOH	Soil: DRO/RRO - AK102/AK103 4 oz amber glass jar	Soil: TAL Metals SW6010/7000 8 oz amber glass	Soil: TOC - SW9060 4 oz glass jar	Sludge: TCLP Metals SW1311/6010B/7000 4 oz, amber glass	Sludge: TCLP VOCs SW1311/8260 4 oz, amber glass	Sludge: TCLP Pesticides SW1311/8081 4 oz, amber glass	Sludge: TCLP SVOCs SW1311/8270B 4 oz, amber glass	Sludge: PCBs SW8082 4 oz amber glass jar	Bldg. Materials: TCLP PCBs SW1311/8082 4 oz, amber glass	Bldg. Materials: PCBs SW8082 4 oz amber glass jar	Paint: Pb ~~SW7421~~ (6010) TB 3/6/99 4 oz amber glass jar	Comments
7/31/99	1200	99NEC 03MI901	Paint	1													✓	-1
7/31/99	1230	99NEC 03MI902	↓	1													✓	2
7/31/99	1300	99NEC 04MI901		1													✓	3
7/31/99	1330	99NEC 04MI902		1													✓	4
8/1/99	1200	99NEC 06MI901		1													✓	5
8/1/99	1045	99NEC 11MI901		1													✓	6
8/1/99	1100	99NEC 11MI902		1													✓	7
8/1/99	1115	99NEC 11MI903		1													✓	8
7/31/99	1400	99NEC 13MI901		1													✓	9
8/1/99	1145	99NEC 13MI902		1													✓	10
8/1/99	1400	99NEC 13MI903		1													✓	11
8/1/99	1130	99NEC 13MI904		1													✓	12
7/31/99	1700	99NEC 14MI901	↓	1													✓	13

Relinquished by: Melissa L Markell
Company Name: Montgomery Watson
Date 8-6-99
Time 1445

Hand Delivered (Y) N

Shipped Via: —

Shipping Number:

Received by: T Bayly
Company Name:
Date 8-6-99
Time 1445

Relinquished by:
Company Name:
Date
Time

Cooler Name:

Received by:
Company Name:
Date
Time

Relinquished by:
Company Name:
Date
Time

Cooler Temperature Upon Arrival: °C

Custody seal #s:

USACE Northeast Cape
Sampling

CoC # 99NEC 04

Pg. 2 of 2 Revised 8/17 Bgm

Montgomery Watson
4100 Spenard Road
Anchorage AK 99517
(907)248-8883
Fax (907) 248-8884
ATTN: Eileen Maus

Analytical Laboratory:
MultiChem Analytical Services
Contact: Tori Bayly
Phone: 907-248-8273
Fax: 907-248-8274
MW Job Number:
1189098.050130
30-DAY TURNAROUND

Sampler's Signature:

Sampler's Name:

Cool to 4 degree C

Date	Time	Sample ID	Matrix	Total Containers	Sediment: DRO/RRO - AK102/AK103 4 oz amber glass jar	Soil: GRO/BTEX - AK101/SW8021B 4 oz amber glass jar MeOH	Soil: DRO/RRO - AK102/AK103 4 oz amber glass jar	Soil: TAL Metals SW6010/7000 8 oz amber glass	Soil: TOC - SW9060 4 oz glass jar	Sludge: TCLP Metals SW1311/6010B/7000 4 oz, amber glass	Sludge: TCLP VOCs SW1311/8260 4 oz, amber glass	Sludge: TCLP Pesticides SW1311/8081 4 oz, amber glass	Sludge: TCLP SVOCs SW1311/8270B 4 oz, amber glass	Sludge: PCBs SW8082 4 oz amber glass jar	Bldg. Materials: TCLP PCBs SW1311/8082 4 oz, amber glass	Bldg. Materials: PCBs SW8082 4 oz amber glass jar	Paint: Pb ~~SW7421~~ (6010) B 8/6/99 4 oz amber glass jar	Comments
8/1/99	1430	99NEC 16 MI901	Paint	1													✓	14
8/1/99	1415	99NEC 18 MI901		1													✓	15
7/31/99	1500	99NEC 19 MI901		1													✓	16
7/31/99	1530	99NEC 19 MI902		1													✓	17
8/1/99	1030	99NEC 20 MI901 12		1													✓	18 ← This should be 12 MI901
7/31/99	1545	99NEC 02 MI901		1													✓	19
7/31/99	1600	99NEC 21 MI902		1													✓	20
7/31/99	1630	99NEC 22 MI903		1													✓	21
7/31/99	1645	99NEC 22 MI904		1													✓	22
		99NEC																
		99NEC																
		99NEC																
		99NEC																

Relinquished by: Melissa L. Markle
Company Name: Montgomery Watson
Date 8-6-99
Time 1445
Hand Delivered (Y) N
Shipped Via: _
Shipping Number:

Received by: T Bayly
Company Name:
Date 8-6-99
Time 1445

Relinquished by:
Company Name:
Date
Time
Cooler Name:

Received by:
Company Name:
Date
Time

Relinquished by:
Company Name:
Date
Time
Cooler Temperature Upon Arrival: °C
Custody seal #s:

F A X

MONTGOMERY WATSON

4100 Spenard Road
Anchorage, Alaska
99517-2901

Tel: 907 248 8883
Fax: 907 248 8884

Date: 8-17-99

To: MAS

Fax No: 248 8274

Reference:

From: Bonnie

No. of Pages: 2
(including cover)

Subject: NEC

CofC # 99 NEC 04

Please change Sample ID

#

99 NEC 21 MI 901

To Correct

99 NEC 12 MI 901

Thanks B

If there are any problems with this transmission, please call 907-248-8883 for assistance. Thank you.

USACE Northeast Cape
Sampling

CoC # 99NEC 04

Pg. 2 of 2

Montgomery Watson
4100 Spenard Road
Anchorage AK 99517
(907)248-8883
Fax (907) 248-8884
ATTN: Eileen Maus

Analytical Laboratory:
MultiChem Analytical Services
Contact: Tori Bayly
Phone: 907-248-8273
Fax: 907-248-8274

MW Job Number:
1189098.050130
30-DAY TURNAROUND

Sampler's Signature:

Sampler's Name:

Cool to 4 degrees C

Date	Time	Sample ID	Matrix	Total Containers	Sediment: DRO/RRO - AK102/AK103, 4 oz amber glass jar	Soil: GRO/BTEX - AK101/SW8021B, 4 oz amber glass jar MeOH	Soil: DRO/RRO - AK102/AK103, 4 oz amber glass jar	Soil: TAL Metals SW6010/7000, 8 oz amber glass	Soil: TOC - SW9060, 4 oz glass jar	Sludge: TCLP Metals SW1311/6010B/7000, 4 oz, amber glass	Sludge: TCLP VOCs SW1311/8260, 4 oz, amber glass	Sludge: TCLP Pesticides SW1311/8081, 4 oz, amber glass	Sludge: TCLP SVOCs SW1311/8270B, 4 oz, amber glass	Sludge: PCBs SW8082, 4 oz amber glass jar	Bldg. Materials: TCLP PCBs SW1311/8082, 4 oz, amber glass	Bldg. Materials: PCBs SW8082, 4 oz amber glass jar	Paint: Pb ~~SW7421~~ (6010) B 8/6/99, 4 oz amber glass jar	Comments
8/1/99	1430	99NEC 16MI901	Paint	1													✓	14
8/1/99	1415	99NEC 18MI901		1													✓	15
7/31/99	1500	99NEC 19MI901		1													✓	16
7/31/99	1530	99NEC 19MI902		1													✓	17
8/1/99	1030	99NEC 20MI901		1													✓	18 ← This should be 12 MI901
7/31/99	1545	99NEC 02MI901		1													✓	19
7/31/99	1600	99NEC 21MI902		1													✓	20
7/31/99	1630	99NEC 22MI903		1													✓	21
7/31/99	1645	99NEC 22MI904		1													✓	22
		99NEC																
		99NEC																
		99NEC 12																
		99NEC																

Relinquished by: Melissa L Markle
Company Name: Montgomery Watson
Date 8-6-99
Time 1445

Received by: T Bayly
Company Name:
Date 8.6.99
Time 1445

Received by:
Company Name:
Date
Time

Hand Delivered (Y) N
Shipped Via:

Relinquished by:
Company Name:
Date
Time

Relinquished by:
Company Name:
Date
Time

Shipping Number:
Cooler Name:
Cooler Temperature Upon Arrival: °C
Custody seal #s:

USACE Northeast Cape Sampling

COPY

CoC # 99NEC_05

821774

Montgomery Watson
4100 Spenard Road
Anchorage AK 99517
(907)248-8883
Fax (907) 248-8884
ATTN: Eileen Maus

Analytical Laboratory:
MultiChem Analytical Services
Contact: Tori Buyly
Phone: 907-248-8273
Fax: 907-248-8274
MW Job Number:
1189098.050130
30-DAY TURNAROUND

Sampler's Signature: Bonnie McKean

Sampler's Name: B McKean

1999 Date	Time	Sample ID	Matrix	# Containers	Sediment: DRO/RRO - AK102/AK103 4 oz amber glass jar	Soil: GRO/BTEX - AK101/SW8021B 4 oz amber glass jar MeOH	Soil: DRO/RRO - AK102/AK103 4 oz amber glass jar	Soil: TAL Metals SW6010/7000 8 oz amber glass	Soil: TOC - SW9060 4 oz glass jar	Sludge: TCLP Metals SW1311/6010B/7000 4 oz, amber glass	Sludge: TCLP VOCs SW1311/8260 4 oz, amber glass	Sludge: TCLP Pesticides SW1311/8081 4 oz, amber glass	Sludge: TCLP SVOCs SW1311/8270B 4 oz, amber glass	Sludge: PCBs SW8082 4 oz amber glass jar	Bldg. Materials: TCLP PCBs SW1311/8082 4 oz, amber glass	Bldg. Materials: PCBs SW8082 4 oz amber glass jar	Paint: Pb SW7421 4 oz amber glass jar	Comments
8-2	900	99NEC 13BD901	Bldg. Mat.	1												X		1
8-2	1000	99NEC 17BD901		1												X		2
8-2	1100	99NEC 18BD901		1												X		3
		99NEC																LAST Project
		99NEC																Samples
		99NEC																
		99NEC																
		99NEC																
		99NEC																
		99NEC																
		99NEC																
		99NEC																
		99NEC																

Relinquished by: Bonnie McKean Company Name: Montgomery Watson	Date 8-16-99 Time 1340	Hand Delivered (Y) N	Shipped Via: N/A
Received by: [signature] Company Name:	Date 8-16-99 Time 1340	Relinquished by: Company Name:	Date Time
Received by: Company Name:	Date Time	Relinquished by: Company Name:	Date Time

Shipping Number:

Cooler Name:

Cooler Temperature Upon Arrival: °C

Custody seal #s:

C of C 99NEC04

TABLE 2-2
Aboveground Storage Tank Inventory
Northeast Cape, St. Lawrence Island, Alaska

99NEC

Site	Tank Number	Paint Color and Coverage	Contents	Sample ID	Size (gallons)
2	AST 2-1	6" x 4" green / white less than .01 %	No Empty	NONE	1,000
3	AST 3-1	White <.01 %	Empty	03 MI 901	500
	AST 3-2	White <.01 %	Empty	03 MI 902	335
4	AST 4-1	White <5%	Empty	04 MI 901	15,000
	AST 4-2	White / Blue (All) <25%	Rain Water	04 MI 902	400
6	AST 6-1	Red End 100% Body Red <10%	Empty	06 MI 901	500
11	AST 11-1	green & Blk sides 90%	empty	11 MI 901	400,000
	AST 11-2	sides green & Blk 90%	Empty	11 MI 902	400,000
	AST 11-3	sides green & Blk 90%	Empty	11 MI 903	400,000
12	AST 12-1	Red Black End 95% sides 80%	Empty	21 MI 901	15,000
	AST 12-2	No Paint	Empty	N/A	30,000
13	AST 13-1	Grey <20%	Empty	13 MI 901	1,000
	AST 13-4	green red orange 60%	out in field	13 MI 904	5,000
	AST 13-5	green orange 75%	empty	13 MI 903	5000

	AST 13-6	orange green orange red grey 90%	empty	13 MI 902	204,000
14	AST 14-1	Orange yellow <1%	50% rainwater	14 MI 901	5,000
16	AST 16-1	orange black 5%	tar emulsion 50% rainwater	16 MI 901	1,000
18	AST 18-1	white 5%	1.5' x 2' empty	18 MI 901	200
19	AST 19-1	red/green <2%	20% rainwater/Antifreeze	19 MI 901	250
	AST 19-2	yellow/red 50%	empty	19 MI 902	250
21	AST 21-1[1]	Concrete NO paint	- 1.5' water	N/A	Over 10,000
	AST 21-2[1]	concrete no paint	1.5 water	N/A	Over 10,000
22	AST 22-2	75%	empty (1% rain)	22 MI 901	60,000
	AST 22-3	75%	empty (1% water)	22 MI 902	60,000
	AST 22-4	75%	Empty (1% rain)	22 MI 903	60,000
	AST 22-5	75%	Empty (1% water)	22 MI 904	60,000

[1] Concrete vault - not a metallic tank.

Bmchean

TAILGATE SAFETY MEETING FORM

Date: 7-31-99 Time: 1030 Job Number: 1189098.050130

Client: USACOE Site Location: Northeast Cape Scope of Work:

Sampling, tours,

Safety Topics Presented

ProtectiveClothing/Equipment: Steel toed boots, ear and eye protection, inner and chemical protective gloves or leather gloves, Tyvek, rain gear or cold weather gear as needed
ATV Helmet (while Riding) hard hat in MAIN complex

Chemical Hazards: Diesel fuel, gasoline, ~~hexane~~ Asbestos, LBP

Physical Hazards: ATV transportation; slips, trips, and falls; muscle strain Flying objects

Special Equipment: SATELLITE phone, CB, Air-gard, ETL, MARINE band, PID,

Other: Eye WASh, First Aid Kit, Emg. Supplies

Emergency Procedures: apply first AID - proceed to PenAir Plane

Hospital: Norton Sound Regional Hospital, Nome Phone: 1-907-443-3311

Air Ambulance Phone: LifeGuard Alaska 1-800-478-LIFE (5433)

Hospital Address and Route: N/A

ATTENDEES

NAME PRINTED	SIGNATURE
Michael D. Kelly	Michael D. Kelly
Elizabeth Houston	Elizabeth A Houston
Melissa Markell	Melissa L Markell
Kevin Lee Ahl	[signature]
Brian Weckwerth	B. Weckwerth
Douglas Quist	Douglas Quist

Meeting Conducted By: B McLean
Name Printed
Signature

Project Safety Officer: B McLean Project Manager:

TAILGATE SAFETY MEETING FORM

Date: 8-1-99 Time: 930 Job Number: 1189098.050130

Client: USACOE Site Location: Northeast Cape Scope of Work:

Safety Topics Presented

ProtectiveClothing/Equipment: Steel toed boots, ear and eye protection, inner and chemical protective gloves or leather gloves, Tyvek, rain gear or cold weather gear as needed

Chemical Hazards: Diesel fuel, gasoline, hexane

Physical Hazards: ATV transportation; slips, trips, and falls; muscle strain
Wind

Special Equipment:

Other:

Emergency Procedures:

Hospital: Norton Sound Regional Hospital, Nome Phone: 1-907-443-3311

Air Ambulance Phone: LifeGuard Alaska 1-800-478-LIFE (5433)

Hospital Address and Route: N/A

ATTENDEES

NAME PRINTED	SIGNATURE
Melissa Markell	[signature]
Douglas Quist	[signature]
Michael Kelly	[signature]
Elizabeth Houston	Elizabeth Houston

Meeting Conducted By: B McLean (Name Printed) B McLean (Signature)

Project Safety Officer: Project Manager:

TAILGATE SAFETY MEETING FORM

Date: 8-2-99 Time: 930 Job Number: 1189098.050130

Client: USACOE Site Location: Northeast Cape Scope of Work: Uplands survey, fish sampling, bio sampling, test pit excavation

Safety Topics Presented

ProtectiveClothing/Equipment: Steel toed boots, ear and eye protection, inner and chemical protective gloves or leather gloves, Tyvek, rain gear or cold weather gear as needed

Chemical Hazards: Diesel fuel, gasoline, ~~hexane~~ propane

Physical Hazards: ATV transportation: slips, trips, and falls: muscle strain, bear w/cubs, electronic fish shocking, fox, flying debris, noise

Special Equipment: PID, satellite phone, hand held radio

Other: spill response

Emergency Procedures:

Hospital: Norton Sound Regional Hospital, Nome Phone: 1-907-443-3311

Air Ambulance Phone: LifeGuard Alaska 1-800-478-LIFE (5433)

Hospital Address and Route: N/A

ATTENDEES

NAME PRINTED	SIGNATURE
Douglas Quist	[signature]
Melissa Markell	[signature]
Michael Kelly	Michael A. Kelly
Elizabeth Houston	Elizabeth Houston
PATRICK KROCHINA	[signature]

Meeting Conducted By: B McLean

Name Printed Signature

Project Safety Officer: Project Manager:

TAILGATE SAFETY MEETING FORM

Date: 8-3-99 Time: 920 Job Number: 1189098.050130

Client: USACOE Site Location: Northeast Cape Scope of Work: Drum

sampling, survey setup

Safety Topics Presented

ProtectiveClothing/Equipment: Steel toed boots, ear and eye protection, inner and chemical protective gloves or leather gloves, Tyvek, rain gear or cold weather gear as needed

Chemical Hazards: Diesel fuel, gasoline, ~~hexane~~, propane

Physical Hazards: ATV transportation: slips, trips, and falls; muscle strain, flying debris, metal debris, Bear w/cubs, fox

Special Equipment: hand held radio (A) satellite phone, spill response

Other:

Emergency Procedures:

Hospital: Norton Sound Regional Hospital, Nome Phone: 1-907-443-3311

Air Ambulance Phone: LifeGuard Alaska 1-800-478-LIFE (5433)

Hospital Address and Route: N/A

ATTENDEES

NAME PRINTED	SIGNATURE
Melissa Markell	[illegible]
Douglas Quist	[illegible]
[illegible]	[illegible]
Michael A. [illegible]	[illegible]

Meeting Conducted By: B McKeown [illegible]

Name Printed Signature

Project Safety Officer: Project Manager:

TAILGATE SAFETY MEETING FORM

Date: 8-4-99 Time: 7:15 Job Number: 1189098.050130

Client: USACOE Site Location: Northeast Cape Scope of Work:

Safety Topics Presented

ProtectiveClothing/Equipment: Steel toed boots, ear and eye protection, inner and chemical protective gloves or leather gloves, Tyvek, rain gear or cold weather gear as needed

Chemical Hazards: Diesel fuel, gasoline, ~~hexane~~ propane

Physical Hazards: ATV transportation; slips, trips, and falls; muscle strain, flying debris, bear w/cubs, poor visibility, Nails in debris

Special Equipment:

Other:

Emergency Procedures:

Hospital: Norton Sound Regional Hospital, Nome Phone: 1-907-443-3311

Air Ambulance Phone: LifeGuard Alaska 1-800-478-LIFE (5433)

Hospital Address and Route: N/A

ATTENDEES

NAME PRINTED	SIGNATURE
DAVID E. MULLIKIN	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

Meeting Conducted By: B McKean (Name Printed) [signature] (Signature)

Project Safety Officer: Project Manager:

Attachment A: Personal Acknowledgment

s a component of the Site Safety and Health Plan (SHSP) designed to provide personnel safety ring the remedial investigation of this project, you are required to read and understand the SHSP. When you have fulfilled this requirement, please sign and date this personal acknowledgment.

Signature

Michael D Kelly

Name (Printed)

7/22/99

Date

Northeast Cape Health and Safety Plan

Site Health and Safety Plan, Ecology and Environment, Inc.

Attachment A: Personal Acknowledgment

As a component of the Site Safety and Health Plan (SHSP) designed to provide personnel safety during the remedial investigation of this project, you are required to read and understand the SHSP. When you have fulfilled this requirement, please sign and date this personal acknowledgment.

Elizabeth S Houston
Signature

Elizabeth S. Houston
Name (Printed)

7-23-99
Date

2'

Attachment A: Personal Acknowledgment

As a component of the Site Safety and Health Plan (SHSP) designed to provide personnel safety during the remedial investigation of this project, you are required to read and understand the SHSP. When you have fulfilled this requirement, please sign and date this personal acknowledgment.

Signature

PAT KROCHINA
Name (Printed)

7/30/99
Date

LAND-USE AGREEMENT COMMITTMENT

The CONTRACTOR and any CONTRACTOR representative arriving on St. Lawrence Island will abide by the land-use agreement in-place between the land holders and the USACOE. Any actions not in accordance with this agreement by a CONTRACTORs representative shall require immediate removal from St. Lawrence Island at the CONTRACTORs expense. All expenses incurred by MONTGOMERY WATSON while awaiting personnel replacement shall be reimbursed by the CONTRACTOR. The following are the major points of the Land-Use Agreement which will be enforced:

- No alcohol in any form will be transported, consumed, or offered without compensation, for sale or trade on St. Lawrence Island.
- No non-prescription drugs will be transported, consumed, or offered without compensation, for sale or trade on St Lawrence Island.
- No prescription drugs will be offered for sale, trade or provided to any others on St. Lawrence Island.
- No fire arms will be transported, carried, used, or discharged by CONTRACTORs personnel on St. Lawrence Island.
- No one will collect or purchase any raw material covered under the U.S. Marine Protection Act (i.e. bones, ivory, baleen).
- No one will collect any artifact while on St. Lawrence Island.

7/30/99

DATE

LAND-USE AGREEMENT COMMITTMENT

The CONTRACTOR and any CONTRACTOR representative arriving on St. Lawrence Island will abide by the land-use agreement in-place between the land holders and the USACOE. Any actions not in accordance with this agreement by a CONTRACTORs representative shall require immediate removal from St. Lawrence Island at the CONTRACTORs expense. All expenses incurred by MONTGOMERY WATSON while awaiting personnel replacement shall be reimbursed by the CONTRACTOR. The following are the major points of the Land-Use Agreement which will be enforced:

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- No one will collect or purchase any raw material covered under the U.S. Marine Protection Act (i.e. bones, ivory, baleen).
- No one will collect any artifact while on St. Lawrence Island.

MontgomeryWATSON

7-31-99

DATE

QA/QC for USCOE

Project Name NEC Phase II
Project Number 1189098. 050130

Date:	COC:		Completed By: DQ	
8/1/99				
Primary	**Replicate**	**Split**	**Parameters**	
99NEC12SS902	99NEC12SS906	99NEC12SS907	DRO/RRO GRO/BTEX	
99NEC07SD901	99NEC07SD902	99NEC07SD901	DRO/RRO	
Trip Blank-P	**Trip Blank-S**	**Trip Blank Date**		
99NEC12TB901	99NEC12TB902		8/1/99	
Rinsate-P	**Rinsate-S**	**Sample Type**	**Sample Prior**	**Sample After**

APPENDIX H

Chemical Data Quality Review

MONTGOMERY WATSON

CHEMICAL DATA QUALITY REVIEW

Northeast Cape

Sampling Event 1999

Project #

99-NEC

Received: 12/22/99

Prepared for

Army Corps of Engineers - Alaska Division

1.0 Introduction

This report summarizes the technical review of analytical results generated in support of the sampling event at Northeast Cape, St. Lawrence Island, Alaska. The criteria applied for this review are consistent with analytical method protocols, in conjunction with the laboratory-established control limits. In cases where specific guidance was not available from either of these sources, the data have been evaluated using professional judgement consistent with industry standards. The review included evaluation of sample collection, holding time and summary information for blanks (to assess contamination), sample duplicates (to assess precision), laboratory control samples (to assess accuracy) and matrix spike and surrogate recoveries (to assess matrix effect). Instrument calibration review and raw data verification were not performed.

The report is arranged by method; within each method section is a sub-section addressing each data quality indicator. In situations where all applicable criteria were met, it will be stated. If criteria were not met , the non-compliance, qualifier and associated samples are listed. Appendices A and B list qualifier definitions and acronyms, respectively. Appendix C, the data summary table, displays all sample results, as well as qualifiers and descriptors that may apply. Appendix D includes a summary of all qualified data, by analytical method.

I certify that all data validation criteria described above were assessed, and any qualifications made to the data were in accordance with the cited reference documents.

Authorized Signature (209) 576-2621

2.0 Sample Collection, Preservation and Handling

Samples were collected July 31, August 1, and 2, 1999. Samples were received by MultiChem Analytical Services, Inc. and Columbia Analytical Services, Inc. within one to nine days of collection. The following samples were collected and analyzed by all applicable methods:

Laboratory: **CASK**

Project / Lab ID	Field ID	Field QC ID	Matrix	Date Collected	Temp °C	Q[1]	Bias	RC
K9905279-001	slsuq02a-DV		Tissue	8/2/99	Frozen	none		
K9905279-002	slqan01a-DV		Tissue	8/2/99	Frozen	none		
K9905279-003	slqan01a-9SB		Tissue	8/2/99	Frozen	none		
K9905279-004	slurc01a-BF		Tissue	8/2/99	Frozen	none		
K9905279-005	slsut01a-BF		Tissue	8/1/99	Frozen	none		
K9905279-006	slust01a-DV		Tissue	8/1/99	Frozen	none		
K9905279-007	slsuq01a-DV		Tissue	8/1/99	Frozen	none		
K9905279-008	slsuq01a-9SB		Tissue	8/1/99	Frozen	none		

Laboratory: **MASR**

Project / Lab ID	Field ID	Field QC ID	Matrix	Date Collected	Temp °C	Q[1]	Bias	RC
821760-01	99NEC07SD90		SE	8/1/99	5.1	none		
821760-02	99NEC07SD90		SE	8/1/99	5.1	none		
821760-03	99NEC12SB90		SO	8/1/99	5.1	none		
821760-04	99NEC12SS90		SO	8/1/99	5.1	none		
821760-05	99NEC12SS90		SO	8/1/99	5.1	none		
821760-06	99NEC12SS90		SO	8/1/99	5.1	none		
821760-07	99NEC12SS90		SO	8/1/99	5.1	none		
821760-08	99NEC12SS90		SO	8/1/99	5.1	none		
821760-09	99NEC30SS90		SO	8/1/99	4.7	none		
821760-09	99NEC30SS90		SO	8/1/99	5.1	none		
821760-10	99NEC30SS90		SO	8/1/99	5.1	none		
821760-10	99NEC30SS90		SO	8/1/99	4.7	none		
821760-11	99NEC30SD90		SE	8/1/99	4.7	none		
821760-11	99NEC30SD90		SE	8/1/99	5.1	none		
821760-12	99NEC21SD90		SE	8/1/99	4.7	none		
821760-13	99NEC12TB90	Trip Blank	SO	8/1/99	5.1	none		

Project / Lab ID	Field ID	Field QC ID	Matrix	Date Collected	Temp °C	Q[1]	Bias	RC
821765-01	99NEC03MI90		Paint	7/31/99	NA	none		
821765-02	99NEC03MI90		Paint	7/31/99	NA	none		
821765-03	99NEC04MI90		Paint	7/31/99	NA	none		
821765-04	99NEC04MI90		Paint	7/31/99	NA	none		
821765-05	99NEC06MI90		Paint	8/1/99	NA	none		
821765-06	99NEC11MI90		Paint	8/1/99	NA	none		
821765-07	99NEC11MI90		Paint	8/1/99	NA	none		
821765-08	99NEC11MI90		Paint	8/1/99	NA	none		
821765-09	99NEC13MI90		Paint	7/31/99	NA	none		
821765-10	99NEC13MI90		Paint	8/1/99	NA	none		
821765-11	99NEC13MI90		Paint	8/1/99	NA	none		
821765-12	99NEC13MI90		Paint	8/1/99	NA	none		
821765-13	99NEC14MI90		Paint	7/31/99	NA	none		
821765-14	99NEC16MI90		Paint	8/1/99	NA	none		
821765-15	99NEC18MI90		Paint	8/1/99	NA	none		
821765-16	99NEC19MI90		Paint	7/31/99	NA	none		
821765-17	99NEC19MI90		Paint	7/31/99	NA	none		
821765-18	99NEC12MI90		Paint	8/1/99	NA	none		
821765-19	99NEC22MI90		Paint	7/31/99	NA	none		
821765-20	99NEC22MI90		Paint	7/31/99	NA	none		
821765-21	99NEC22MI90		Paint	7/31/99	NA	none		
821765-22	99NEC22MI90		Paint	7/31/99	NA	none		

Project / Lab ID	Field ID	Field QC ID	Matrix	Date Collected	Temp °C	Q [1]	Bias	RC
821774-01	99NEC13BD90		Bldg. Mat.	8/2/99	NA	none		
821774-02	99NEC17BD90		Bldg. Mat.	8/2/99	NA	none		
821774-03	99NEC18BD90		Bldg. Mat.	8/2/99	NA	none		

[1] According to the National Functional Guidelines for Data Review, if the sample temperature exceeds 2-6° C, for selected analytes all associated detected and nondetected results as estimated (J/UJ)

All sampling and sample receipt documentation were present and reviewed. No problems or discrepancies were observed.

3.0 BTEX/Gas (SW8021/AK101)

3.1 Holding Time

All samples were analyzed within the required technical holding time.

3.2 Surrogates

All surrogate recoveries were within the required limits except the following:

Laboratory: MASR

Field ID	Matrix	Dil Factor	Surrogate	% Rec	Recovery Limits[1]	Q[2]	Bias	RC
99NEC30SD903	SE	1	4-bromofluorobenzene	55	63 - 119	J/UJ	L	b

[1] Laboratory - established limits

[2] According to the Functional Guidelines for Organic Data Review, if the surrogate recovery is > UCL, flag detected results J; if the surrogate recovery is < LCL, flag detected results J and non-detects UJ; if the surrogate recovery is less than 10%, flag detected results J and non-detects UR

3.3 Blanks

Method blanks were analyzed at the minimum required frequency. All target compounds were reported as non-detect at the method detection limit.

One trip blank was collected for analysis by this method. All target compounds were reported as non-detect at the method detection limit.

No field rinsate blanks were collected for analysis by this method.

3.4 Matrix Spike/Matrix Spike Duplicates

MS/MSDs were analyzed at the required frequency. Recoveries and RPDs were within the laboratory - established limits.

3.5 Laboratory Control Samples

Laboratory control samples were analyzed at the required frequency. All recoveries and RPDs were within the required limits.

3.6 Quantitation Limits

The practical quantitation limits (PQLs) achieved by the laboratory were acceptable relative to the estimated quantitation limits (EQL) suggested by this method for soil samples. All detected results reported were above the quantitation limit.

3.7 Overall Assessment

Due to low surrogate recovery, one sample was qualified as estimated for BTEX and gasoline range organics Estimated data are useable for limited purposes.

3.7 Overall Assessment

Minor data quality deficiencies were found, which had a slight impact to data useability. All data generated by this method, except where noted, should be considered useable as reported.

4.0 Diesel/Residual Range Organics (AK102/AK103)

4.1 Holding Time

All samples were prepared and analyzed within the required technical holding time.

4.2 Surrogates

All surrogate recoveries were within the required limits.

4.3 Blanks

Method blanks were analyzed at the minimum required frequency. All target compounds were reported as non-detect at the method detection limit.

No field rinsate blanks were collected for analysis by this method.

4.4 Matrix Spike/Matrix Spike Duplicates

MS/MSDs were analyzed at the required frequency. Recoveries and RPDs were within the laboratory - established limits.

4.5 Laboratory Control Samples

Laboratory control samples were analyzed at the required frequency. All recoveries and RPDs were within the required limits.

4.6 Quantitation Limits

The practical quantitation limits (PQLs) achieved by the laboratory were acceptable relative to the quantitation limits suggested by this method for soil samples. All detected results reported were above the quantitation limit.

4.7 Overall Assessment

No data quality deficiencies were found. All data generated by this method should be considered useable as reported.

5.0 Toxicity Characteristic Leaching Procedure (TCLP)

TCLP extraction was performed on one sample for volatile organics, semivolatile organics, pesticides and metals, and four samples for polychlorinated biphenyls.

5.1 Holding Time

All samples were prepared and analyzed within the required technical holding time except the following:

Laboratory: MASR

Polychlorinated Biphenyls - TCLP					Holding Time (Days)		RTHT[1] (Days)				
Field ID	**Matrix**	**Collected**	**Prepared**	**Analyzed**	**Prep**	**Analysis**	**Prep**	**Analysis**	**Q**	**Bias**	**RC**
99NEC13BD901	Bldg. Mat.	8/2/99	8/26/99	8/28/99	24	2	21	40	J/UJ	L	e
99NEC17BD901	Bldg. Mat.	8/2/99	8/26/99	8/28/99	24	2	21	40	J/UJ	L	e
99NEC18BD901	Bldg. Mat.	8/2/99	8/26/99	8/28/99	24	2	21	40	J/UJ	L	e

[1] Required technical holding time established for the method

5.2 Surrogates

All surrogate recoveries were within the required limits.

5.3 Blanks

Method blanks were analyzed at the minimum required frequency. All target compounds were reported as non-detect at the method detection limit.

No field rinsate blanks were collected for analysis by this method.

5.4 Matrix Spike/Matrix Spike Duplicates

MS/MSDs were analyzed at the required frequency. Recoveries and RPDs were within the laboratory - established limits.

5.5 Laboratory Control Samples

Laboratory control samples were analyzed at the required frequency. All recoveries and RPDs were within the required limits except the following:

Laboratory: MASR
LCS Batch ID: 0811-8270T
Prep Date: 8/11/99
Matrix: SE

Analyte	LCS	LCSD	RPD	Limits[1] % Rec	Limits[1] RPD	Q[2]	Bias	RC
hexachloroethane	114	NA	NA	34 - 111	20	J/none	H	d

Associated Samples: 99NEC21SD90 (821760-12)

[1] Laboratory-established Limits

[2] For specific analytes in all samples associated with the preparation batch - if the LCS recovery is > UCL apply J to all detect results; if the LCS recovery is < LCL apply J to all detected results, apply UR to all non-detects; if the RPD is > UCL, apply J t detected results, apply UJ to all nondetects (qualifiers do not apply to surrogate analytes)

5.6 Quantitation Limits

The practical quantitation limits (PQLs) achieved by the laboratory were acceptable relative to the quantitation limits suggested by this method for soil samples. The following detected results reported were below the quantitation limit, and are flagged "J":

Polychlorinated Biphenyls - TCLP

Field ID	Matrix	Dil Factor	Analyte	Result	PQL	Units	Q
99NEC17BD901	Bldg. Mat.	1	total aroclors	1.5	3.3	UG/L	J
99NEC17BD901	Bldg. Mat.	1	aroclor 1260	1.5	3.3	UG/L	J

Semivolatile Organics - TCLP

Field ID	Matrix	Dil Factor	Analyte	Result	PQL	Units	Q
99NEC21SD901	SE	1	cresol	0.03	0.033	MG/L	J

Results below the quantitation limit are considered qualitatively acceptable but quantitatively unreliable.

5.7 Overall Assessment

Due to holding time exceedance, three samples were qualified as estimated for polychlorinated biphenyls. Estimated data are useable for limited purposes.

5.7 Overall Assessment (cont.)

Minor data quality deficiencies were found, which had a significant impact to polychlorinated biphenyls data useability. All data generated by this method, except where noted, should be considered useable as reported.

6.0 Polychlorinated Biphenyls (SW8082)

6.1 Holding Time

All samples were prepared and analyzed within the required technical holding time except the following:

Laboratory: CASK

Field ID	Matrix	Collected	Prepared	Analyzed	Holding Time (Days) Prep	Holding Time (Days) Analysis	RTHT[1] (Days) Prep	RTHT[1] (Days) Analysis	Q	Bias	RC
slqan01a-9SB	Tissue	8/2/99	8/18/99	8/28/99	16	10	14	40	J/UJ	L	e
slqan01a-DV	Tissue	8/2/99	8/18/99	8/28/99	16	10	14	40	J/UJ	L	e
slsuq01a-9SB	Tissue	8/1/99	8/18/99	8/28/99	17	10	14	40	J/UJ	L	e
slsuq01a-DV	Tissue	8/1/99	8/18/99	8/28/99	17	10	14	40	J/UJ	L	e
slsuq02a-DV	Tissue	8/2/99	8/18/99	8/28/99	16	10	14	40	J/UJ	L	e
slsut01a-BF	Tissue	8/1/99	8/18/99	8/28/99	17	10	14	40	J/UJ	L	e
slurc01a-BF	Tissue	8/2/99	8/18/99	8/28/99	16	10	14	40	J/UJ	L	e
slust01a-DV	Tissue	8/1/99	8/18/99	8/28/99	17	10	14	40	J/UJ	L	e

Laboratory: MASR

Field ID	Matrix	Collected	Prepared	Analyzed	Holding Time (Days) Prep	Holding Time (Days) Analysis	RTHT[1] (Days) Prep	RTHT[1] (Days) Analysis	Q	Bias	RC
99NEC13BD901	Bldg. Mat.	8/2/99	8/20/99	8/24/99	18	4	14	40	J/UJ	L	e
99NEC17BD901	Bldg. Mat.	8/2/99	8/20/99	8/24/99	18	4	14	40	J/UJ	L	e
99NEC18BD901	Bldg. Mat.	8/2/99	8/20/99	8/24/99	18	4	14	40	J/UJ	L	e

[1] Required technical holding time established for the method

6.2 Surrogates

All surrogate recoveries were within the required limits except the following:

Field ID	Matrix	Dil Factor	Surrogate	% Rec	Recovery Limits[1]	Q[2]	Bias	RC
99NEC21SD901	SE	10	decachlorobiphenyl	0	28 - 165	none*	NA	NA

[1] Laboratory - established limits

[2] According to the Functional Guidelines for Organic Data Review, if the surrogate recovery is > UCL, flag detected results J; if the surrogate recovery is < LCL, flag detected results J and non-detects UJ; if the surrogate recovery is less than 10%, flag detected re and non-detects UR

* qualifiers do not apply if the sample was diluted by >5 times and the recovery is <LCL

6.3 Blanks

Method blanks were analyzed at the minimum required frequency. All target compounds were reported as non-detect at the method detection limit.

6.3 Blanks (cont.)

No field rinsate blanks were collected for analysis by this method.

6.4 Matrix Spike/Matrix Spike Duplicates

MS/MSDs were analyzed at the required frequency. Recoveries and RPDs were within the laboratory - established limits.

6.5 Laboratory Control Samples

Laboratory control samples were analyzed at the required frequency. All recoveries and RPDs were within the required limits.

6.6 Quantitation Limits

The practical quantitation limits (PQLs) achieved by the laboratories were acceptable relative to the estimated quantitation limits (EQL) suggested by this method for soil samples. All detected results reported were above the quantitation limit.

6.7 Overall Assessment

Due to holding time exceedance, eleven samples were qualified as estimated for all target compounds. Estimated data are useable for limited purposes.

Minor data quality deficiencies were found, which had a significant impact to data useability. All data generated by this method, except where noted, should be considered useable as reported.

7.0 Total Metals

7.1 Holding Time

All samples were prepared and analyzed within the required technical holding time.

7.2 Blanks

Method blanks were analyzed at the minimum required frequency. All target analytes were reported as non-detect at the method detection limit.

No field rinsate blanks were collected for analysis by this method. All target analytes were reported as non-detect at the practical quantitation limit.

7.3 Matrix Spike/ Sample Duplicates

Matrix spikes were analyzed at the required frequency. Recoveries were within the laboratory - established limits except for lead, cadium, iron, magnesium and manganese. In all cases the concentration of the sample was greater than four times the amount spiked.

7.4 Laboratory Control Samples

Laboratory control samples were analyzed at the required frequency. All recoveries were within the required limits.

7.5 Quantitation Limits

The practical quantitation limits (PQLs) achieved by the laboratories were acceptable relative to the estimated quantitation limits (EQL) suggested by this method for soil samples. All detected results reported were above the quantitation limit. The reporting limits for lead were elevated for sample 99NEC03MI901 and 99NEC03MI902, and for silver by a factor of two for sample 99NEC30SS901, due to matrix interference from high levels of iron.

7.6 Overall Assessment

No data quality deficiencies were found. All data generated by this method should be considered useable as reported.

8.0 Field Duplicates

Field duplicates were not collected for this project.

9.0 References

"USEPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods", July 1992 (SW-846)

"National Functional Guidelines for Organic Data Review", February, 1994

"State of Alaska Method AK101, Determination of Gasoline Range Organics"

"State of Alaska Method AK102, Determination of Diesel Range Organics"

"State of Alaska Method AK103, Determination of Residual Range Organics"

"USACOE Chemical Quality Assurance for HTRW Projects", October 1997

Appendix A

Qualifier Definitions

B	The sample result is less than 5 or 10 times (for common laboratory contaminants) the associated blank contamination.
U	The analyte was analyzed for, but was not detected above the reported quantitation limit.
UJ	The analyte was not detected above the reported quantitation limit. However, the reported quantitation is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
J/none	Sample results for the analyte are estimated for positive results; results reported below the quantitation limit are not qualified (high bias).
J/UJ	Sample results for the analyte are estimated for both positive results and results reported below the quantitation limit (low bias).
R/UR	The sample results are rejected for both positive results and results reported below the quantitation limit due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

Appendix B

Acronyms

CASK -	Columbia Analytical Services, Inc.
CRQL -	Contract Required Quantitation Limit
H -	High Bias
L -	Low Bias
LCL -	Lower Control Limit
LCS/LCSD -	Laboratory Control Sample/Laboratory Control Sample Duplicate
MASR -	MultiChem Analytical Services, Inc.
MB -	Method Blank
MDL -	Method Detection Limit
MS/MSD -	Matrix Spike/Matrix Spike Duplicate
N -	No Bias Determined
NA -	Not Applicable
NE -	Not Established
NR -	Not Reported
PQL -	Practical Quantitation Limit
Q -	Qualifier
QA -	Quality Assurance
QC -	Quality Control
RPD -	Relative Percent Difference
RRL -	Required Reporting Limit
RSD -	Relative Standard Deviation
RTHT -	Required Technical Holding Time
SD -	Sample Duplicate
SE -	Sediment
SO -	Soil
SW-846 -	EPA Test Methods for Evaluating Solid Waste
UCL -	Upper Control Limit

Appendix C

Data Summary Table

QUALIFIER REASON CODES

a	- The analyte was found in the method blank
a-	- Negative drift observed in instrument calibration blanks
b	- Surrogate spike recovery outside control limits
c	- Matrix Spike/Matrix Spike Duplicate (MS/MSD) recovery outside control limits
d	- Laboratory Control Sample (LCS) recovery outside control limits
e	- Holding time exceeded
f	- MS/LCS sample duplicate failed precision criteria
h	- Second column results indicate that the environmental results were not confirmed
i	- Instrument Calibration outside control limits
k	- The analyte was found in the field blank
m	- Numerical value between the MDL and PQL
n	- Field duplicate precision problem
o	- Result reported exceeds calibration range
p	- Sample was not properly collected, preserved or shipped
s	- Internal Standard outside control limits
t	- Sample temperature outside acceptance criteria

(Note: Where multiple qualifiers have been applied the first qualifier corresponds to the first reason code)

DATA SUMMARY TABLE

Sample ID	821760-03			821760-04			821760-05			821760-06			821760-07			821760-08		
Field ID	99NEC12SB901			99NEC12SS902			99NEC12SS903			99NEC12SS904			99NEC12SS905			99NEC12SS906		
Matrix	SO			SO			SO			SO			SO			SO		
Dil Factor	1			1			1			1			1			1		
Date Collected	8/1/99			8/1/99			8/1/99			8/1/99			8/1/99			8/1/99		
Units	MG/KG			MG/KG			MG/KG			MG/KG			MG/KG			MG/KG		
Analyte	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC
benzene	0.02	U		0.023	U		0.024	U		0.024	U		0.024	U		0.023	U	
ethylbenzene	0.11			0.028	U		0.03	U		0.031	U		0.029	U		0.028	U	
toluene	0.025	U		0.028	U		0.031			0.031	U		0.029	U		0.028	U	
xylenes, total	0.16			0.028	U		0.03	U		0.035			0.029	U		0.028	U	
gasoline range organics	22			5.7	U		6	U		11			5.9	U		5.6	U	

DATA SUMMARY TABLE

Sample ID	821760-09			821760-10			821760-11			821760-13		
Field ID	99NEC30SS901			99NEC30SS902			99NEC30SD903			99NEC12TB901		
Matrix	SO			SO			SE			SO		
Dil Factor	1			1			1			1		
Date Collected	8/1/99			8/1/99			8/1/99			8/1/99		
Units	MG/KG			MG/KG			MG/KG			MG/KG		
Analyte	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**
benzene	0.019	U		0.081	U		0.11	UJ	b	0.021	U	
ethylbenzene	0.023	U		0.1	U		0 13	UJ	b	0.027	U	
toluene	0.023	U		0.12			0.89	J	b	0.027	U	
xylenes, total	0.023	U		0.1	U		0.13	UJ	b	0.027	U	
gasoline range organics	4.7	U		20	U		27	UJ	b	5.3	U	

Sample ID	821760-01			821760-02			821760-03			821760-04			821760-05			821760-06		
Field ID	99NEC07SD901			99NEC07SD902			99NEC12SB901			99NEC12SS902			99NEC12SS903			99NEC12SS904		
Matrix	SE			SE			SO			SO			SO			SO		
Dil Factor	1			1			1			1			5			1		
Date Collected	8/1/99			8/1/99			8/1/99			8/1/99			8/1/99			8/1/99		
Units	MG/KG			MG/KG			MG/KG			MG/KG			MG/KG			MG/KG		
Analyte	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**
diesel range organics	380			340			140			42			68			59		

Diesel Range Organics

DATA SUMMARY TABLE

Sample ID	821760-07			821760-08			821760-09			821760-10			821760-11			
Field ID	99NEC12SS905			99NEC12SS906			99NEC30SS901			99NEC30SS902			99NEC30SD903			
Matrix	SO			SO			SO			SO			SE			
Dil Factor	1			1			1			1			1			
Date Collected	8/1/99			8/1/99			8/1/99			8/1/99			8/1/99			
Units	MG/KG			MG/KG			MG/KG			MG/KG			MG/KG			
Analyte	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	
diesel range organics	29			46			11	U		430			580			

Organochlorine Pesticides - TCLP

DATA SUMMARY TABLE

Sample ID	821760-12							
Field ID	99NEC21SD901							
Matrix	SE							
Dil Factor	1							
Date Collected	8/1/99							
Units	MG/L							
Analyte	**RESULT**	**Q**	**RC**					
gamma-BHC	0 0002	U						
chlordane	0 0007	U						
endrin	0.0003	U						
heptachlor	0.0002	U						
heptachlor epoxide	0.0002	U						
methoxychlor	0.0017	U						
toxaphene	0.005	U						

Polychlorinated Biphenyls

DATA SUMMARY TABLE

Sample ID	821760-12							
Field ID	99NEC21SD901							
Matrix	SE							
Dil Factor	10							
Date Collected	8/1/99							
Units	MG/KG							
Analyte	RESULT	Q	RC					
aroclor 1016	0.72	U						
aroclor 1221	0.72	U						
aroclor 1232	0.72	U						
aroclor 1242	0.72	U						
aroclor 1248	0.72	U						
aroclor 1254	52							
aroclor 1260	70							
total aroclors	120							

Sample ID	821760-01			821760-02			821760-03			821760-04			821760-05			821760-06		
Field ID	99NEC07SD901			99NEC07SD902			99NEC12SB901			99NEC12SS902			99NEC12SS903			99NEC12SS904		
Matrix	SE			SE			SO			SO			SO			SO		
Dil Factor	1			1			1			1			5			1		
Date Collected	8/1/99			8/1/99			8/1/99			8/1/99			8/1/99			8/1/99		
Units	MG/KG			MG/KG			MG/KG			MG/KG			MG/KG			MG/KG		
Analyte	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC
hydrocarbons quantitated as motor oil	3900			3600			230			560			620			470		

Sample ID	821760-07			821760-08			821760-09			821760-10			821760-11			
Field ID	99NEC12SS905			99NEC12SS906			99NEC30SS901			99NEC30SS902			99NEC30SD903			
Matrix	SO			SO			SO			SO			SE			
Dil Factor	1			1			1			1			1			
Date Collected	8/1/99			8/1/99			8/1/99			8/1/99			8/1/99			
Units	MG/KG			MG/KG			MG/KG			MG/KG			MG/KG			
Analyte	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	
hydrocarbons quantitated as motor oil	290			390			59			2300			3200			

Sample ID	821760-12							
Field ID	99NEC21SD901							
Matrix	SE							
Dil Factor	1							
Date Collected	8/1/99							
Units	MG/L							
Analyte	**RESULT**	**Q**	**RC**					
cresol	0.026	J	m					
1,4-dichlorobenzene	0.033	U						
2,4-dinitrotoluene	0.033	U						
hexachlorobenzene	0.033	U						
hexachlorobutadiene	0.033	U						
hexachloroethane	0.033	U						
nitrobenzene	0.033	U						
pentachlorophenol	0.17	U						
pyridine	0.17	U						
2,4,5-trichlorophenol	0.17	U						
2,4,6-trichlorophenol	0.033	U						

TCLP Metals

DATA SUMMARY TABLE

Sample ID	821760-12							
Field ID	99NEC21SD901							
Matrix	SE							
Dil Factor	1							
Date Collected	8/1/99							
Units	MG/L							
Analyte	**RESULT**	**Q**	**RC**					
arsenic	0.1	U						
barium	0.83							
cadmium	0 005	U						
chromium	0.01	U						
lead	0.03	U						
mercury	0.0002	U						
selenium	0.1	U						
silver	0.01	U						

DATA SUMMARY TABLE

Sample ID	821760-09			821760-10			821760-11		
Field ID	99NEC30SS901			99NEC30SS902			99NEC30SD903		
Matrix	SO			SO			SE		
Dil Factor	1			1			1		
Date Collected	8/1/99			8/1/99			8/1/99		
Units	MG/KG			MG/KG			MG/KG		
Analyte	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC
antimony	2.9	U		14	U		13	U	
arsenic	3.6			1.4	U		1.3	U	
barium	65			46			49		
beryllium	0.79			1.4	U		1.3	U	
cadmium	0.31			1.4	U		1.3	U	
calcium	3200			2200			1700		
chromium	49			5.2			6.9		
cobalt	8.6			2.7	U		2.7	U	
copper	31			4.3			4.4		
iron	21000			8800			7900		
lead	25			4.8			4		
magnesium	6700			1100			1100		
manganese	290			22			43		
mercury	0.11	U		0.55	U		0.52	U	
nickel	24			3.8			4.3		
potassium	2100			470			270		
selenium	0.3	U		1.4	U		1.3	U	
silver	1.1	U		2.7	U		2.7	U	
thallium	0.6	U		1.4	U		1.3	U	
vanadium	28			8.3			10		
zinc	77			12			15		

Sample ID	821760-12		
Field ID	99NEC21SD901		
Matrix	SE		
Dil Factor	1		
Date Collected	8/1/99		
Units	MG/L		
Analyte	RESULT	Q	RC
vinyl chloride	0.01	U	
1,1-dichloroethene	0.01	U	
1,2-dichloroethane	0.01	U	
2-butanone	0.1	U	
chloroform	0.01	U	
carbon tetrachloride	0.01	U	
benzene	0.01	U	
trichloroethene	0.01	U	
tetrachloroethylene	0.01	U	
chlorobenzene	0.01	U	

DATA SUMMARY TABLE

Sample ID	821765-01			821765-02			821765-03			821765-04			821765-05			821765-06		
Field ID	99NEC03MI901			99NEC03MI902			99NEC04MI901			99NEC04MI902			99NEC06MI901			99NEC11MI901		
Matrix	Paint			Paint			Paint			Paint			Paint			Paint		
Dil Factor	10			20			10			10			50			10		
Date Collected	7/31/99			7/31/99			7/31/99			7/31/99			8/1/99			8/1/99		
Units	MG/KG			MG/KG			MG/KG			MG/KG			MG/KG			MG/KG		
Analyte	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**
lead	16	U		31	U		1100			2100			42000			1400		

Total Metals **DATA SUMMARY TABLE**

Sample ID	821765-07			821765-08			821765-09			821765-10			821765-11			821765-12		
Field ID	99NEC11MI902			99NEC11MI903			99NEC13MI901			99NEC13MI902			99NEC13MI903			99NEC13MI904		
Matrix	Paint			Paint			Paint			Paint			Paint			Paint		
Dil Factor	10			10			20			250			300			250		
Date Collected	8/1/99			8/1/99			7/31/99			8/1/99			8/1/99			8/1/99		
Units	MG/KG			MG/KG			MG/KG			MG/KG			MG/KG			MG/KG		
Analyte	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**
lead	920			1200			99			100000			110000			100000		

Total Metals **DATA SUMMARY TABLE**

Sample ID	821765-13			821765-14			821765-15			821765-16			821765-17			821765-18		
Field ID	99NEC14MI901			99NEC16MI901			99NEC18MI901			99NEC19MI901			99NEC19MI902			99NEC12MI901		
Matrix	Paint			Paint			Paint			Paint			Paint			Paint		
Dil Factor	200			250			20			10			250			200		
Date Collected	7/31/99			8/1/99			8/1/99			7/31/99			7/31/99			8/1/99		
Units	MG/KG			MG/KG			MG/KG			MG/KG			MG/KG			MG/KG		
Analyte	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**
lead	49000			140000			350			4100			93000			64000		

Total Metals DATA SUMMARY TABLE

Sample ID	821765-19			821765-20			821765-21			821765-22				
Field ID	99NEC22MI901			99NEC22MI902			99NEC22MI903			99NEC22MI904				
Matrix	Paint			Paint			Paint			Paint				
Dil Factor	250			250			300			300				
Date Collected	7/31/99			7/31/99			7/31/99			7/31/99				
Units	MG/KG			MG/KG			MG/KG			MG/KG				
Analyte	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC	RESULT	Q	RC		
lead	100000			93000			110000			83000				

Sample ID	821774-01			821774-02			821774-03		
Field ID	99NEC13BD901			99NEC17BD901			99NEC18BD901		
Matrix	Bldg. Mat.			Bldg. Mat.			Bldg. Mat.		
Dil Factor	1			1			1		
Date Collected	8/2/99			8/2/99			8/2/99		
Units	MG/KG			MG/KG			MG/KG		
Analyte	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**
aroclor 1016	0.033	UJ	e	0.033	UJ	e	0.033	UJ	e
aroclor 1221	0.033	UJ	e	0.033	UJ	e	0.033	UJ	e
aroclor 1232	0.033	UJ	e	0.033	UJ	e	0.033	UJ	e
aroclor 1242	0.033	UJ	e	0.033	UJ	e	0.033	UJ	e
aroclor 1248	0.033	UJ	e	0.11	J	e	0.16	J	e
aroclor 1254	0.033	UJ	e	0.033	UJ	e	0.033	UJ	e
aroclor 1260	0.28	J	e	2.6	J	e	1.6	J	e
total aroclors	0.28	J	e	2.7	J	e	1.8	J	e

Polychlorinated Biphenyls - TCLP

DATA SUMMARY TABLE

Sample ID	821774-01			821774-02			821774-03					
Field ID	99NEC13BD901			99NEC17BD901			99NEC18BD901					
Matrix	Bldg. Mat.			Bldg. Mat.			Bldg. Mat.					
Dil Factor	1			1			1					
Date Collected	8/2/99			8/2/99			8/2/99					
Units	UG/L			UG/L			UG/L					
Analyte	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**			
aroclor 1016	3.3	UJ	e	3.3	UJ	e	3.3	UJ	e			
aroclor 1221	6.7	UJ	e	6.7	UJ	e	6.7	UJ	e			
aroclor 1232	3.3	UJ	e	3.3	UJ	e	3.3	UJ	e			
aroclor 1242	3.3	UJ	e	3.3	UJ	e	3.3	UJ	e			
aroclor 1248	3.3	UJ	e	3.3	UJ	e	3.3	UJ	e			
aroclor 1254	3.3	UJ	e	3.3	UJ	e	3.3	UJ	e			
aroclor 1260	3.3	UJ	e	1.5	J	e,m	3.3	UJ	e			
total aroclors	3.3	UJ	e	1.5	J	e,m	3.3	UJ	e			

Sample ID	K9905279-001			K9905279-002			K9905279-003			K9905279-004			K9905279-005			K9905279-006		
Field ID	slsuq02a-DV			slqan01a-DV			slqan01a-9SB			slurc01a-BF			slsut01a-BF			slust01a-DV		
Matrix	Tissue			Tissue			Tissue			Tissue			Tissue			Tissue		
Dil Factor	5			5			5			5			1			5		
Date Collected	8/2/99			8/2/99			8/2/99			8/2/99			8/1/99			8/1/99		
Units	UG/KG			UG/KG			UG/KG			UG/KG			UG/KG			UG/KG		
Analyte	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**
aroclor 1016	50	UJ	e	50	UJ	e	50	UJ	e	50	UJ	e	20	UJ	e	50	UJ	e
aroclor 1221	50	UJ	e	50	UJ	e	50	UJ	e	50	UJ	e	20	UJ	e	50	UJ	e
aroclor 1232	50	UJ	e	50	UJ	e	50	UJ	e	50	UJ	e	20	UJ	e	50	UJ	e
aroclor 1242	50	UJ	e	50	UJ	e	50	UJ	e	50	UJ	e	20	UJ	e	50	UJ	e
aroclor 1248	50	UJ	e	50	UJ	e	50	UJ	e	50	UJ	e	20	UJ	e	50	UJ	e
aroclor 1254	50	UJ	e	50	UJ	e	50	UJ	e	50	UJ	e	20	UJ	e	50	UJ	e
aroclor 1260	160	J	e	50	UJ	e	50	UJ	e	100	J	e	20	UJ	e	50	UJ	e

Sample ID	K9905279-007			K9905279-008		
Field ID	slsuq01a-DV			slsuq01a-9SB		
Matrix	Tissue			Tissue		
Dil Factor	1			1		
Date Collected	8/1/99			8/1/99		
Units	UG/KG			UG/KG		
Analyte	**RESULT**	**Q**	**RC**	**RESULT**	**Q**	**RC**
aroclor 1016	50	UJ	e	50	UJ	e
aroclor 1221	50	UJ	e	50	UJ	e
aroclor 1232	50	UJ	e	50	UJ	e
aroclor 1242	50	UJ	e	50	UJ	e
aroclor 1248	50	UJ	e	50	UJ	e
aroclor 1254	50	UJ	e	50	UJ	e
aroclor 1260	140	J	e	50	UJ	e

Appendix D

Data Quality Summary

by Analysis Type

Data Quality Summary

BTEX/Gas

	Data Points	% of Data	% of Qualified Data	Bias (low/none/high)
TOTAL DATA POINTS:	**50**	-	-	-
TOTAL QUALIFIED DATA POINTS:	**5**	10.0%	-	-
TOTAL REJECTED DATA POINTS:	**0**	0.0%	-	-
Qualified/Rejected as a result of:				
b - Surrogate spike recovery outside control limits	5	10.0%	100.0%	L

Data Quality Summary

Diesel/Residual Range Organics

	Data Points	% of Data	% of Qualified Data	Bias (low/none/high)
TOTAL DATA POINTS:	22	-	-	-
TOTAL QUALIFIED DATA POINTS:	0	0.0%	-	-
TOTAL REJECTED DATA POINTS:	0	0.0%	-	-

Qualified/Rejected as a result of:

No Qualified Data

Data Quality Summary

Toxicity Characteristic Leaching Procedure (TCLP)

			Data Points	% of Data	% of Qualified Data	Bias (low/none/high)
TOTAL DATA POINTS:			**52**	-	-	-
TOTAL QUALIFIED DATA POINTS:			**25**	48.1%	-	-
TOTAL REJECTED DATA POINTS:			**0**	0.0%	-	-
Qualified/Rejected as a result of:						
e	-	Holding time exceeded	22	42.3%	88.0%	L
e,m	-	Multiple Reasons	2	3.8%	8.0%	L
m	-	Numerical value is between the MDL and RL	1	1.9%	4.0%	N

Data Quality Summary

Polychlorinated Biphenyls

	Data Points	% of Data	% of Qualified Data	Bias (low/none/high)
TOTAL DATA POINTS:	**88**	-	-	-
TOTAL QUALIFIED DATA POINTS:	**80**	90.9%	-	-
TOTAL REJECTED DATA POINTS:	**0**	0.0%	-	-
Qualified/Rejected as a result of:				
e - Holding time exceeded	80	90.9%	100.0%	L

Data Quality Summary

Total Metals

	Data Points	% of Data	% of Qualified Data	Bias (low/none/high)
TOTAL DATA POINTS:	**85**	-	-	
TOTAL QUALIFIED DATA POINTS:	**0**	0.0%	-	
TOTAL REJECTED DATA POINTS:	**0**	0.0%	-	

Qualified/Rejected as a result of:

No Qualified Data

REVIEW COMMENTS **PROJECT: Northeast Cape DOCUMENT: Draft Phase II RI Addendum**
LOCATION: St. Lawrence Island, Alaska

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-EE-TE	DATE: 04/06/00 REVIEWER: Jeff Brownlee (ADEC) PHONE: (907) 269-3053	Action taken on comment by:

Item No.	Drawing Sht. No., Spec. Para.	COMMENTS	REVI CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	MW RESPONSE	USAED RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
1	General Doc. Title	As the initial Phase II RI took place in 1998, perhaps the title for this report should include the term "Addendum".	A	The final report will be retitled as follows: Final, Phase II Remedial Investigation Report Addendum, 1999 Fieldwork, Northeast Cape, Alaska	
2	General	Throughout section 2 where there has been sampling performed please point the reader to the location where the results can be found. For example the last sentence of sections 2.1.2 and 2.1.3 describe the analyses sampled for, but give no location where the results can be found.	Noted	The report is organized in a traditional RI report format where Section 2 describes the work performed and Section 3 presents the findings of the investigation. The last sentence of the second paragraph in Section 2.1 tells the reader that analytical data are presented in Section 3 and Appendix B.	
3	General	Please include a results table where applicable in the figures (2-2, 2-3, 2-7).	A	For clarity, Montgomery Watson proposes to move all the figures from Sections 2 to Section 3, and add analytical results to the figures (including previous and new results).	
4	Page 1-16, 17	These pages were the same in my copy, so was missing the cleanup criteria for the chemicals in between Chromium and Xylene.	A	The table will be corrected.	
5	Page 2-1, 1rst ¶	The third bullet mentions one of the study uses to be the identification of criteria for alternative cleanup levels. This topic wasn't brought up again in the text. Total Organic Carbon was sampled for a few times, but a discussion of hydraulic conductivity and aquifer gradient was not included. Please clarify the possible use of a method 3 or 4 closure in relation to the presented information.	A	The topic "alternative cleanup levels" is discussed again on page 4-5, the last paragraph in Section 4.1. TOC data was gathered to assess background levels only and discussed on page 3-8, the last paragraph of Section 3.6. A discussion regarding possible use of Methods 3 and 4 will be added to Section 4 (Conclusions and Recommendations). Also, alternative cleanup levels will be addressed in the feasibility study.	
6	Page 2-9, Section 2.1.6 - 3rd ¶	As mentioned in the conclusions, the one background sample collected to represent the gravel pads is not enough of a sample set to be statistically valid. Please note in this	Noted	As noted in the response to Comment 2, Section 2 only describes the work that was performed – not the findings. A discussion of the background sampling results is presented in	

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-EE-TE	**DATE:** 04/06/00 **REVIEWER:** Jeff Brownlee (ADEC) **PHONE:** (907) 269-3053	**Action taken on comment by:**

Item No.	Drawing Sht. No., Spec. Para.	COMMENTS	REVI CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	MW RESPONSE	USAED RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
		section of text also.		Section 3.6.	
7	Page 2-9, Section 2.1.7, 1rst ¶	Perhaps we should stop referring to the 29,000 buried drums in the reports. If Eugene Toolie was the original reference for that figure there must have been a transcription error, as he stated 25-30 drums at the last RAB meeting on March 26, 2000.	A	Eugene Toolie stated at the RAB meeting that he remembered 10 to 20 drums (contents unknown) being buried there and numerous 5-gallon buckets of 90-weight lube oil. The text will be revised with this updated information.	
8	Section 2.1.8	Please explain what STB and DS-2 are and what they were/may have been used for.	A	Text will be added in Section 2.1.8 discussing what these substances are and may have been used for.	
9	Section 2.9	Please explain what criteria were used to evaluate the utilidors as potential contaminant migration pathways.	A	Text will be added in Section 2.1.9 that explains the criteria used to evaluate the utilidor pathways.	
10	Figure 2-8	Please indicate where the drums and buried were found on the figure.	A	The figure will be revised to indicate where the drums were found.	
11	Section 2.2, Page 2-19	Please include the Final Work Plan 1998-1999 Phase II RI, NE Cape, St. L. Is. as a referenced document for sample protocols.	A	The final work plan will be added as a referenced document.	
12	Table 3-2	Please change the Site-Specific cleanup levels for PCBs to 10 mg/kg.	A	The table will be revised.	
13	Section 3.4, last ¶	Please note that for the disposal of PCBs that the landfill operator or landowner must agree to the acceptance of the PCB waste.	A	Text will be added to note that the landfill operator must approve the acceptance of PCB waste.	
14	Table 4-1	The table indicates that the data gap has been resolved, however further characterization and confirmation sampling will be necessary during the cleanup of this area. PCB, nickel and chromium were above cleanup criteria in sample SW/SD 103.	Noted	The sampling performed in 1999 was only intended to address a data gap concerning certain petroleum hydrocarbon constituents. Further sampling is being planned.	

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Pamela Miller's Comments (3/31/00)		
1	Noted	Posting of fish advisory signs is being considered by USACE.
2	Noted	Additional work to resolve remaining data gaps is being planned.
3	Noted	TRPH, DRO, and RRO have been detected at relatively high concentrations in background samples collected in 1998 and 1999. Therefore, it's not an unreasonable assumption that for certain sites and sample locations, the petroleum hydrocarbon constituents detected are probably attributable to naturally occurring organics. In addition, inspections of the chromatograms have indicated the presence of natural organics in many samples. It's noted that background and primary samples are not always comparable due to the reasons given (i.e., particle size distribution, percent organic material, etc.).
4	Noted	All sampling methods were described in detail in the Work Plan (Montgomery Watson, July 1999) as referenced in Section 2.2.
5	Noted	The purpose for the composite sampling of building materials was to assess what, if any, affect that any PCBs contained in paint might have in regards to building debris disposal options, not to assess PCB "contamination" in buildings per se. As noted in Section 2.1.4, PCBs have been found as a paint constituent at other DOD facilities built in the same era as NEC. To our knowledge, it has not been found in concentrations that have affected disposal options for similar demolition projects. Therefore, based on the minimal amount of PCBs found in the NEC samples and at other, similar DOD facilities in Alaska, the extent of building sampling appears adequate.
6	A	The background samples were selected from areas where there were no expectations or indications of contamination caused by facility activities. Additional text will be added in Section 2.1.6 to provide justification for these sample locations.
7	Noted	As noted in Section 2.1.7, a geophysical investigation had previously been conducted at this site. Only a small anomaly was found in this area, suggesting a limited amount of buried debris. The metal detector used was adequate to locate appropriate test pits locations for the hand digging planned. A full characterization was not the intent of this investigation; the intent is described in Section 2.1.7.
8	Noted	As noted in Section 2.1.8, several containers of DS2 and STB were removed in 1998. There was evidence that some of the DS2 had leaked as indicated by a stain on the wood floor near the containers. The containers holding the STB had broken open and some if this material was found on the floor. As much of the spilled material as possible was scooped up and transported off-site in 1998 with the containers of STB. The neutralization performed in 1999 was done as a precaution in the event that some residuals of the chemicals remained on the floor. DS2 is a light amber solution consisting of diethylenetriamine (70%), sodium hydroxide (2%) and ethylene glycol monomethyl ether (28%). It is an alkali and is classified as a corrosive due to its high pH. A sodium bisulfate solution was used to neutralize any residual (i.e., lower pH). STB is a white powder consisting of a mixture of calcium oxychloride and calcium oxide. It is classified as an oxidizer. Sodium bicarbonate was used to neutralize any residual (i.e., reduce reactivity).
9	Noted	We don't understand the assertion of inconsistencies. Key findings, conclusions, and recommendations of the ENRI and USACE reports were summarized in Sections 2.1.10, 3.10. and 4.2.

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10	Noted	Further investigations are being planned.
11	Noted	The objective for this sampling was described in Section 2.1.1. The objective was not to conduct a complete characterization of this site.
12	Noted	The chromium reported is total Cr. Because this is a background sample, the Cr is not considered to be contamination, but instead, naturally occurring.
13	Noted	Only one sludge sample could be collected due to confined space restrictions. The sample result indicated that the sludge must be handled and disposed of as a regulated waste. Removal and disposal of the waste will by addressed by Nugget Construction.
14	Noted	Removal and disposal of the waste will by addressed by Nugget Construction.
15	Noted	Please refer to explanation of procedure in Section 3.2.6 of the Work Plan. TU values are relative; therefore, comparison of site TU values to TU values from published literature is not valid. This method is based on comparing TU values of samples from contaminated areas against TU values of samples from uncontaminated, reference (similar substrates) areas.
16	A	The building composite samples were analyzed for both total PCBs and TCLP PCBs. The data deficiencies noted pertained only to missed holding times for TCLP PCB analysis (the method holding time for TCLP extractions is 21 days; these samples were not extracted until the 24th day). The data was considered to be useable because there was only a slight exceedance of the method holding time (3 days) and PCBs are inherently stable, especially when contained in paint that is over 30 years old. An explanation will be added in Section 3.4.
17	Noted	An independent USACE contractor (Ethix) made the typo in the footer.

Sivuqaq, Inc. & Savoonga Native Corp.'s Comments - Provided by Jerry Reichlin (3/31/00)		
1	A	The text will be updated with the most current status of the White Alice Site.
2	A	Site 10, as it has been defined, includes only the drum burial area, not the drainage area downgradient. The text in this section will be amended to add that the surface water samples were collected downgradient from this site, not within this site. The downgradient surface water area receives runoff from several sites, and the PCBs and lead are believed to originate from a source area other than Site 10 (probably from the Power Plant at Site 13).
3	Noted	Site 30, where Cr and As were found at concentrations that exceed ADEC cleanup levels, consists of background samples. These samples were collected from areas that are not believed to been contaminated. Therefore, the sample results represent naturally occurring metals and organics (e.g., DRO, RRO, and TRPH) - not contamination. It is very common, in fact expected, to find naturally occurring compounds like these at all sites. Furthermore, it is not uncommon that the background concentrations exceed cleanup levels for certain analytes, as occurred here at NEC.
4	Noted	Further sampling is being planned.
5	Noted	Drum removal and excavation of contaminated soil is being considered for this site.
6	Noted	Further sampling is being planned.
7	A	The building composite samples were analyzed for both total PCBs and TCLP PCBs. The data deficiencies noted pertained only to missed holding times for TCLP PCB analysis (the method holding time for TCLP extractions is 21 days; these samples were not extracted by the

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		laboratory until the 24th day). The data was considered to be useable because there was only a slight exceedance of the method holding time (3 days) and PCBs are inherently stable, especially when contained in paint that is over 30 years old. An explanation will be added in Section 3.4.
8	Noted	The purpose for the composite sampling of building materials was to assess what, if any, affect that any PCBs contained in paint might have in regards to building debris disposal options, not to assess PCB “contamination” in buildings per se. As noted in Section 2.1.4, PCBs have been found as a paint constituent at other DOD facilities built in the same era as NEC. To our knowledge, it has not been found in concentrations that have affected disposal options for similar demolition projects. Therefore, based on the minimal amount of PCBs found in the NEC samples and at other, similar DOD facilities in Alaska, the extent of building sampling appears adequate.
9	Noted	There were no septic leach fields at this site. As noted in Section 2.1.3, effluent from the septic settling tanks was discharged through an 8-inch insulated cast iron pipe to a wetland area approximately 450 feet to the east. Soil, sediment, surface water, and groundwater samples were collected near the discharge in 1994; the findings were reported and discussed in the Final Phase II RI Report (Montgomery Watson, August 1999).
10	Noted	Further investigations and studies are being planned.