

Northeast National Petroleum Reserve-Alaska Reconnaissance Level  
Airborne Related Contaminants Study



January 2007

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DE-AI26-01BC15236



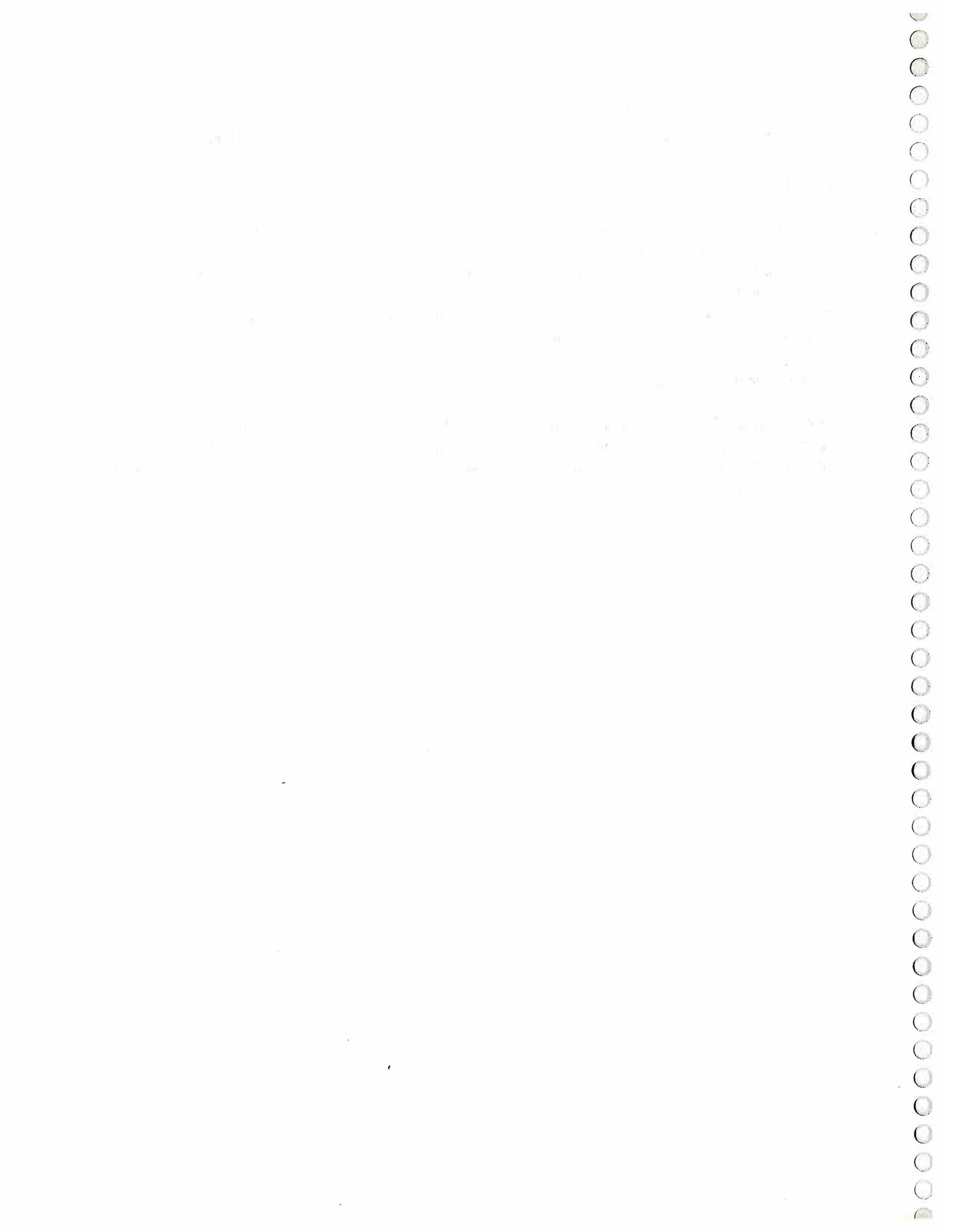
# **Northeast National Petroleum Reserve-Alaska Reconnaissance Level Airborne Related Contaminants Study**

## **Abstract**

From 2002 to 2006, the BLM collected streamflow, channel geometry and water quality data from the Judy and Fish Creek and Kalikpik and Ublutuoch River drainages in northeastern National Petroleum Reserve-Alaska (NPR-A). Supplemental stream surface water and sediment samples were collected and analyzed for petroleum hydrocarbons and heavy metals. This information was used to determine contaminant baselines in the watersheds, prior to oil and gas development within the area.

## **Acknowledgements**

Hydrological data collection was managed and supervised by BLM hydrologist, Richard Kemnitz. BLM fisheries biologist, Matthew Whitman managed and supervised the utilization of semipermeable membrane devices for longer term collection of polycyclic aromatic hydrocarbons (PAHs) in stream waters.

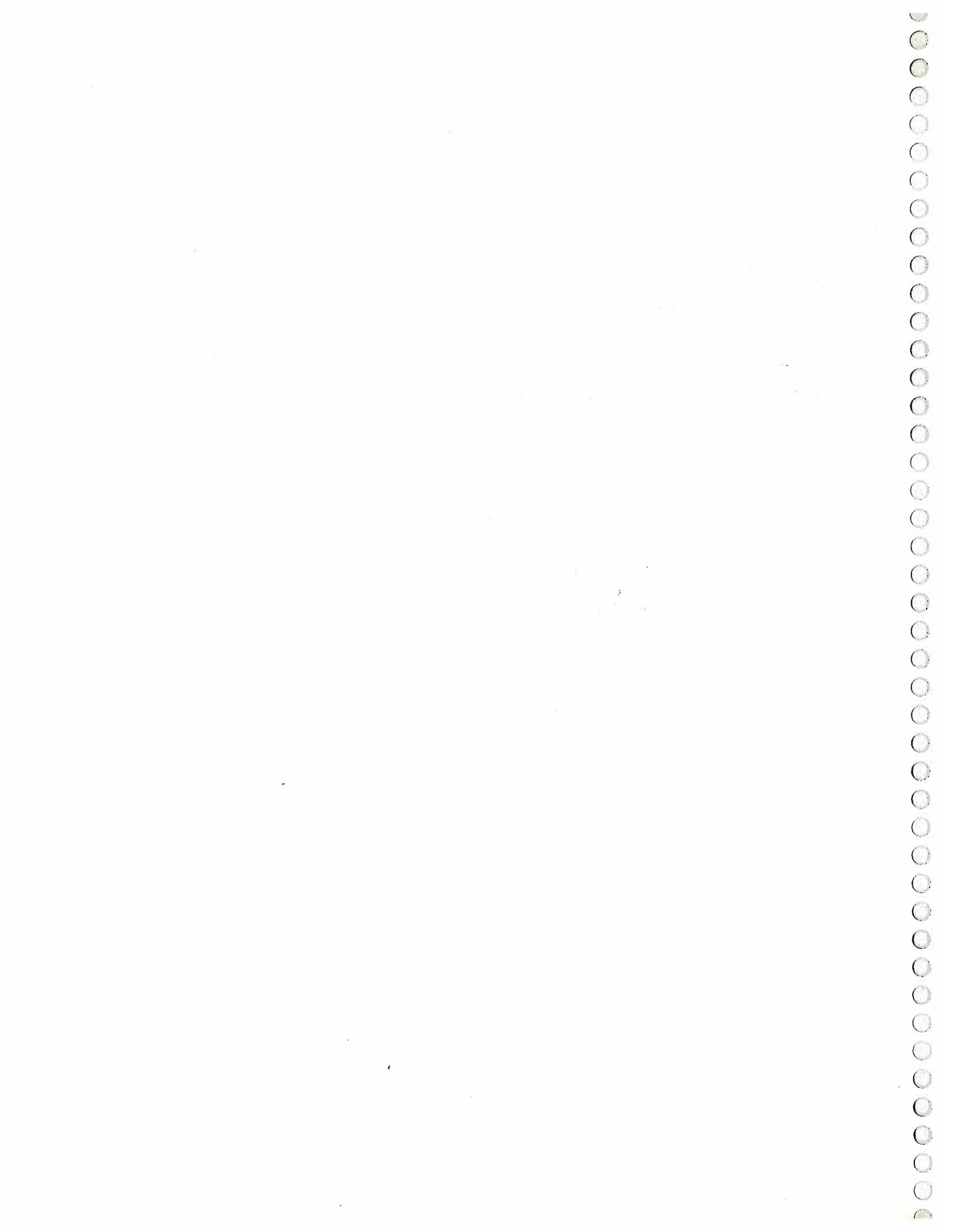


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## **Northeast National Petroleum Reserve-Alaska Reconnaissance Level Airborne Related Contaminants Study**

**Purpose:** This Department of Energy (DOE) National Petroleum Technology Office funded Bureau of Land Management (BLM) study of limited airborne related contaminants impacts on stream surface waters and stream sediments was developed to document baseline conditions prior to oilfield development within the Northeast (NE) National Petroleum Reserve-Alaska (NPR-A). The reconnaissance-level inventory was conducted between 2002 and 2006 during summer field seasons only. The geographic location of the project is depicted in Figures 1 and 2.

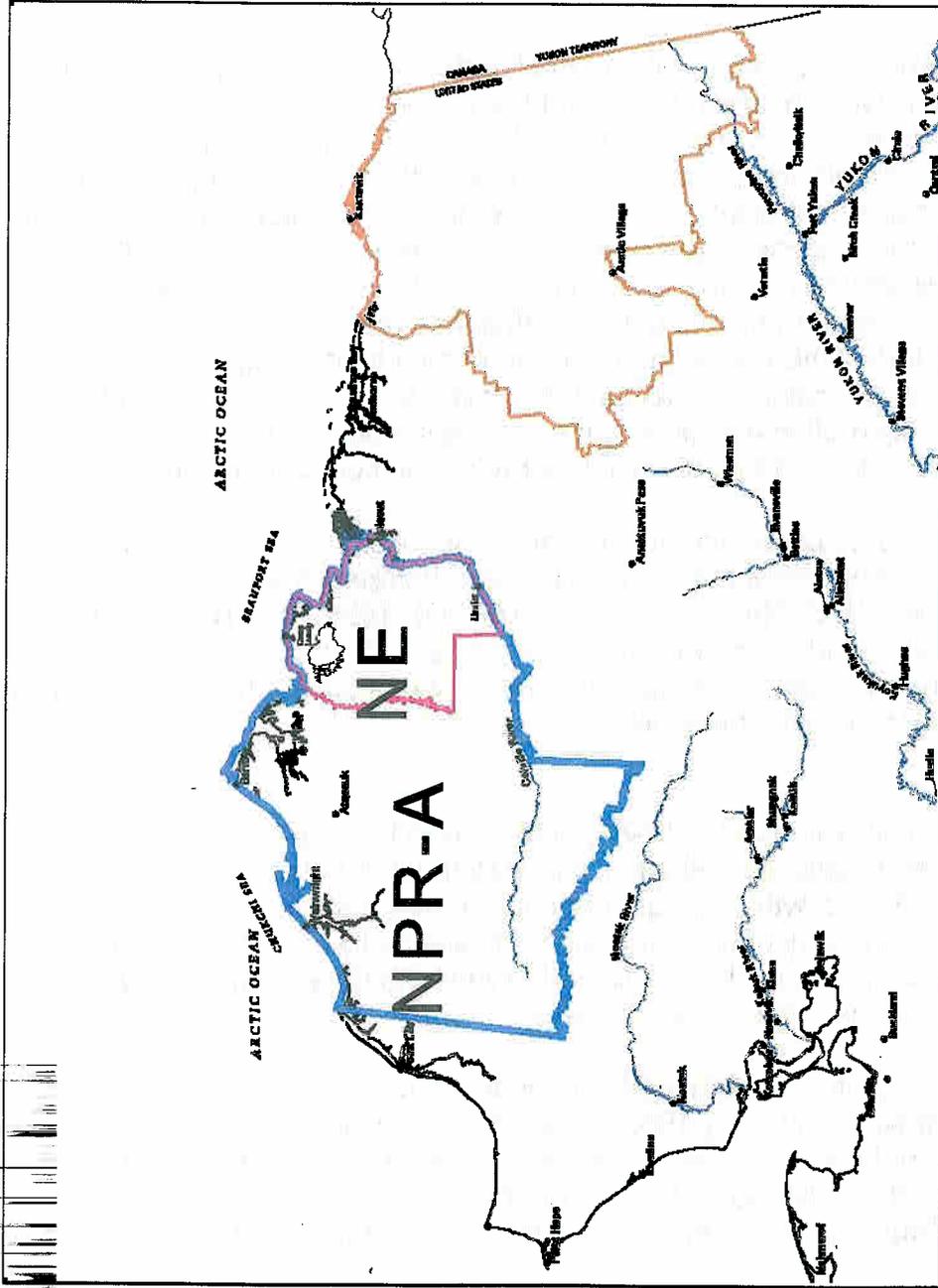
Contaminant impacts to terrestrial and freshwater ecosystems in parts of the circumpolar arctic have been well documented. From the AMAP Fact Sheet, "Transport of Contaminants to the Arctic and their Fate" (AMAP, 2002): "Contaminants are transported to the Arctic by the air and by oceans and rivers. Within the Arctic, they are redistributed, also by ice transport pathways. The air provides a fast transport route – bringing contaminants from Europe to the Arctic within a matter of days. Air transport is particularly important in winter when air masses from Europe travel up into the Arctic, where they are trapped by the stable conditions that prevail during the long Arctic winter, or move down into northern North America - with their contaminant load being deposited along the route." Increases in concentrations of metals, metalloids, and hydrocarbons can occur as a result of oil and gas exploration and production activities, and the analytes chosen for study have been shown to serve as good indicators of such contamination.

This airborne related contaminants inventory is in accordance with BLM's Strategic Plan and meets the requirements of the NE NPR-A Integrated Activity Plan Environmental Impact Statement (EIS) Record of Decision (ROD), 1998. The ROD directed that monitoring be undertaken to determine the status of the various resources in the planning area, to ensure compliance with plan decisions and stipulations, and to measure the effectiveness of protective measures.

**Background:** The Northeast NPR-A planning area is considered to be largely pristine. Activities related to seismic and other exploration have occurred throughout NPR-A in the past 50 years. Winter overland transportation routes have been developed to supply fuel and materials to the City of Barrow and other villages located within and around NPR-A. However, the area remains largely free of permanent developments, such as roads and facilities, and is considered to be roadless.

Atmospheric deposition of industrial chemical contaminants within Alaska's arctic has been observed since the early 1950's. But how and when they are released from the atmosphere is not fully understood. Recent studies within Alaska's North Slope have documented that air and biological transport of these contaminants has occurred. Douglas and Sturm (2000) have focused studies on contaminants accumulating in the

Figure 1. Location of NPR-A and the NE planning unit on Alaska's North Slope.



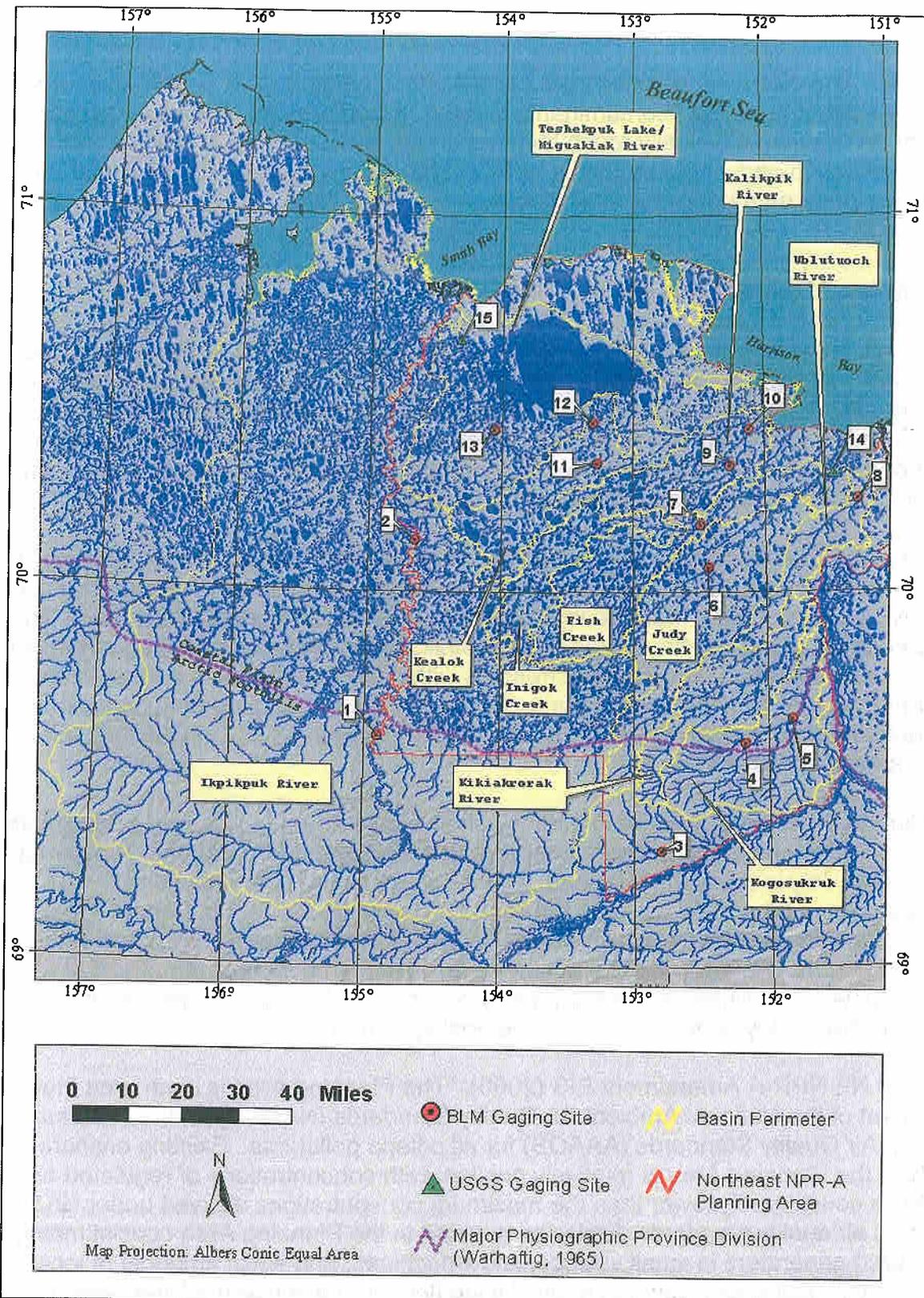


Figure 2. Location of Fish and Judy Creek, Ublutuoch and Kalikpik River watersheds within the NE NPR-A.

snow pack and discuss the occurrence of arctic haze being a most important source of deposited airborne aerosol contaminants in the northern regions of Alaska. Arctic haze aerosol contaminants typically reach their maximum concentration in the late winter months of March and April. Douglas and Sturm have demonstrated, in particular, the accumulation of mercury in the arctic Alaska snowpack.

## **Description of the Study Area**

Two physiographic regions are represented in the Northeast NPR-A, the Arctic Coastal Plain (ACP) and the Arctic Foothills of the Brooks Range. Most of the study area falls within the flat ACP. The entire region is underlain by permafrost, perennially frozen ground, preventing infiltration of surface waters below the summer (a three month ice-free period) thawed active layer zone. The four study watersheds are characterized by a mosaic of lakes, ponds and interconnected streams.

All four study drainages are low-gradient, meandering and braided. Fish Creek and the Kalikpik River are recognized as being amongst the most significant streams and rivers in the NE NPR-A. Of the four streams, Judy Creek is the only one to originate in the Arctic Foothills of the Brooks Range. The foothills have few lakes and range from 500 to 800 feet in elevation. The stream stretches within the foothills have a much steeper gradient than those on the coastal plain. Of the streams originating from lakes, the up-gradient portion of the Kalikpik River drainage is dominated by low, undulating sand dunes known as the Pik Dunes.

The climate of the area is characterized by short summers and long, very cold winters. The mean minimum and maximum temperatures for January are -20 and -8 degrees Fahrenheit. July is the warmest month with mean minimum and maximum temperatures of 34 and 46 degrees Fahrenheit (Selkregg, 1975). The arctic coastal plain region has consistently strong winds. Fog and cloud cover are common in the summer months. Annual precipitation averages less than 8 inches, about half of which falls as snow. The winter snows are heavily windblown. Exposed ridges can be exposed while valley bottoms can become heavily drifted.

From the NE NPR-A Amendment EIS (2005): "The Planning Area is in an area that is in attainment of the National Ambient Air Quality Standards (NAAQS) and the Alaska Ambient Air Quality Standards (AAAQS) for all criteria pollutants. Existing onshore air quality in the Planning Area is relatively pristine, with concentrations of regulated air pollutants considerably lower than the maximum concentrations allowed under NAAQS and state air quality standards. Emission sources in the Planning Area consist mainly of diesel-fired generators in small villages, snowmachines, and small amounts of local vehicle traffic. Emissions sources at the Alpine field production and drilling areas include gas-fired turbines and heaters, incinerators, diesel-fired power generators, storage tanks, fugitive hydrocarbon emissions, and mobile sources (vehicle traffic and aircraft)."

"Pond waters away from development in the Prudhoe Bay area contain 0.1 to 0.2 parts per billion (ppb) total aromatic hydrocarbons, similar to concentrations in pristine marine

waters (Woodward et al. 1988). Concentrations in National Petroleum Reserve – Alaska waters are expected to be similar. Hydrocarbons derived from the various sources are detectable as elevated levels of saturated and polycyclic aromatic hydrocarbons (PAH) in Colville River sediment and in Harrison Bay sediment (Boehm et al. 1987). Additional pyrogenic PAH compounds are present in tundra soils and form a depositional record of atmospheric fallout from tundra fires. Concentrations of indicator hydrocarbons from these multiple sources are high and chemically similar to those found in petroleum, thus making it difficult to detect or distinguish anthropogenic contamination from natural background due to fires. Similarly, high levels of hydrocarbons found in other major Beaufort Sea rivers have been attributed to natural sources (Boehm et al. 1987; Yunker and MacDonald 1995).”

## **Methods and Results**

In general, the Planning Area is large and has had relatively limited human or industrial uses that may have introduced hazardous or solid wastes into the environment. Industrial activity has consisted of USDOD sites, including the Distant Early Warning (DEW)-Line stations to provide military satellite and coastline surveillance; oil and gas drilling programs conducted by the U.S. Navy, the USGS, and private companies; and winter petroleum seismic-exploration operations conducted by private companies. Incidental use by the local Alaska Native population for subsistence hunting, fishing, and travel potentially may have created additional solid and fuel waste on a small scale. Existing development sites, landfills, and/or documented spill sites near or within the study area were identified through literature review and then were ground verified. Existing sites were all oil and gas exploration well sites dating to the 1950's:

Fish Creek Well Site

West Fish Creek Well Site

Inigok Well Site and airstrip

North Inigok Well Site

North Kalikpik Well Site

Square Lake Well Site

Nearby well sites:

Wolf Creek Wells 1-3 Sites

The primary focus of the reconnaissance work from 2002 to present was to inventory watershed conditions and functions. This work is in progress at the time of this report and

results are not available. Each stream, with the exception of Ublutuoch, was roughly divided into lower, middle, and upper reaches. Only two gage sites were placed on the Ublutuoch because the stream length was relatively short, and the watershed generally narrow and uniform, a third gaging location would not have gathered helpful data. Cross-section measurements were conducted and gages installed in each reach. Discharge measurements and periodic stream water quality measurements were collected at each of the gage locations. Since 2002, as part of Richard Kemnitz's hydrological inventory, collected water properties have included discharge, temperature, dissolved oxygen, alkalinity, turbidity, conductivity, pH, Ca, Cl, Fe, K, Mg, Mn, Na, S, and S04.

The gaging data collected to date has been substantial and portions of it are now being consolidated and analyzed by the U.S. Geological Survey Water Resources Division, Alaska District through an Inter-Agency Agreement developed and managed by BLM Arctic Field Office Hydrologist, Richard Kemnitz.

In July and August, 2004, in cooperation with BLM Arctic Field Office Fisheries Biologist, Matthew Whitman, semi-permeable membrane devices (SPMDs) were deployed at four locations for 34 days in an attempt to collect PAHs from the water column. These devices were submersed under 2 to 3 feet of stream water and anchored to a post such that they were suspended in the water column above the stream bottom. For quality control regarding air contamination, a trip blank was exposed to the air at one sampling site. This effort was a pilot study to evaluate the feasibility of using SPMDs in the remote Arctic environment. Locations of deployment included the Ikpikpuk, Miguakiak, and Colville rivers, and Fish Creek. The device in the Colville River was not relocated. Results from the other sites were obtained after processing by Environmental Sampling Technologies and Columbia Analytical Services, Inc. See Appendix for analytical results from the pilot SPMD deployment.

Potential issues identified by the SPMD pilot study include minor membrane damage from rough handling during shipping, and elevated sedimentation resulting from the extended deployment. Other project elements that addressed the concern for using SPMDs in a remote environment, including temperature and delivery-time sensitivities, were successfully accomplished.

In August and September 2004, surface sediment grab samples were collected, one sample per drainage. Similarly, surface water samples were collected for analysis of total metals by immersing a sample container attached to a telescoping rod at an angle to allow water to slowly enter, minimizing aeration of the samples, until the container was full. The water was then transferred to the laboratory-provided sample containers. Filled sample containers were placed in coolers and maintained at approximately 2 to 4 degrees Celsius until delivered to the laboratory.

Due to funding constraints, sample collection was limited to the middle reach gage site locations from each of the four watersheds. The samples were analyzed by Analytica International, Inc. for total metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) by U.S. Environmental Protection Agency (EPA) Methods 6020, 6010B, and 7470A) and for BTEX organics (by EPA Method 8021B). Surface water

grab samples were analyzed for the same parameters. Analytical results showed that all collected samples were non-detectable, or below the analytical method reporting limits.

In September 2004, inventory of the existing environmental conditions of 1950's era U.S. Navy exploration well locations, where drilling mud wastes were simply discharge to the ground surface, rather than contained in a reserve pit, was conducted. Environmental and waste samples were collected from visibly stained soils, directly from drilling mud wastes, and from one background location at the Wolf Creek Navy wells sites. The samples were analyzed by Analytical Alaska, Inc. for polychlorinated biphenyls (PCBs), mercury and for total metals (arsenic, barium, cadmium, chromium, lead, selenium, silver). Analytical results showed that no PCBs or mercury were detectable in the soils or in the wastes samples. Metals results were obtained, specifically barium, which was detected at 6800 mg/Kg in the one drilling waste sample and at 1.4 mg/Kg in the background sample collected. Lead was also detected in the waste sample at 430 mg/Kg. Arsenic in the waste sample was 9.0 mg/Kg, just above the method reporting limit of 8.0 mg/Kg.

In 2005 and 2006, four reserve pits including the North Kalikpik Well Site and reserve pit were characterized by BLM contractor MACTEC of Anchorage, Alaska. Summer season sediment and surface water samples from the reserve pit were collected and analyzed for diesel-range organics (DRO) by State of Alaska Method AK102, BTEX by EPA Method 8021B, and total metals (arsenic, barium, cadmium, calcium, chromium, lead, magnesium, mercury, nickel, selenium, silver, and zinc) by EPA Methods 6020, 6010B, and 7470A. North Creek Analytical, Anchorage, Alaska performed the laboratory analysis for the project. DRO and BTEX were not detected at concentrations above the method detection limit for any sample and did not exceed the 18 AAC 70, Alaska Water Quality Standards (AWQS) (ADEC, 2003b), as required by 18 AAC 60.440. The concentrations of metals for all surface water samples were below the AWQS. Petroleum hydrocarbons DRO and BTEX were not detected in any of the soil samples.

## **Conclusions**

Literature reviews of other existing research shows that atmospheric deposition of metals and hydrocarbon-containing aerosols to Alaska's terrestrial and freshwater environments is documented, although numerous knowledge gaps exist. A regional air sampling station would provide much needed data.

An inventory of development sites was conducted as a part of this study. Sample results from the Wolf Creek wells and the North Kalikpik wellsite did document the existence of generally low levels of total metals in the gravel pads or drilling mud wastes. One exception to this finding was that of an elevated (above background) level of barium found in one sample pulled directly from a drilling mud pile at the Wolf Creek well site. No detectable levels of petroleum hydrocarbons were found in surface sediment or water grab samples at either Wolf Creek wells or at the North Kalikpik site. These findings illustrate that, even at old exploration drilling sites, either non-detectable

or low levels of metals or petroleum hydrocarbons can be found at the soil or water surfaces.

The inventory sampling of surface sediments and stream waters conducted at pristine locations within each of the four watersheds was unable to detect any levels of total metals. The regulatory-level based analytical methodology, for detection of total metals in the surface waters and sediments, is conventional and is the most widely available in laboratory services, was not capable of detecting any levels of metals. Much greater sensitivity in the analytical method reporting levels would need to be obtained to document the trends of atmospheric deposition of contaminants to the terrestrial ecosystem. However, for purposes of monitoring impacts of oil development within the NE NPR-A, conventional laboratory analysis is what will be utilized.

Grab sampling of moving stream surface waters generally is inadequate for detecting petroleum hydrocarbons in minute quantities due to the volatility of hydrocarbons escaping from the water column, which is why the SPMD pilot project was initiated. Based on the 2006 NE NPR-A SPMD pilot project, passive membrane sampling is feasible within the Arctic environment and is a viable option for contaminants studies. Improved handling of the devices to reduce potential damage and shorter deployment time to reduce sedimentation would significantly improve the probability of obtaining high quality results. The constituents that are analyzed for should also be further examined and revised to identify high-priority constituents that are most applicable for the monitoring of oil and gas activities. Determination of the sources of hydrocarbon content in surface waters—atmospheric deposition versus natural seepage into surface waters from subsurface sources—will also need further study.

The hydrological data collection portion of this inventory has been managed by hydrologist Richard Kemnitz. The stream gages located at the middle reach locations (Judy7, Fish 32, and Ublutuoch 11) of this study were upgraded to year-round data collection devices in 2005 and turned over to U.S. Geological Survey through an Intro-agency agreement for long-term management.

For oil and gas development monitoring purposes, it can be assumed that baseline area wide contaminant levels within the four watersheds are not significant. Point source locations, such as the existing Navy or Husky era well sites are documented and the impacts from these locations can be separated from future developmental activities.

## **Recommendations**

Hydrological data collection should continue at least an additional five years at selected sites to provide a reliable database to allow computation of flood-recurrence statistics and future watershed modeling of potential contaminant pathways. A network of meteorological data collectors is being established within the NE NPR-A. Data needs, including temperature, wind speed and direction, precipitation and snow depth, continue into the far future, but should continue in conjunction with the stream gaging efforts.

Contaminants inventories in vegetative materials, and in benthic organisms, fish and subsistence mammals is recommended to establish baseline conditions in these ecological receptors. Near surface air monitoring studies, including a regional network of monitoring stations is needed to help correlate future ground-based sampling analysis results with atmospheric monitoring results.

National and international arctic contaminant studies are continuing. Recently, expanded research efforts by the international community have commenced in response to the overwhelming observations of contaminants and climate change impacts to the circumpolar arctic. All such research and monitoring will help us understand the complex arctic ecosystem within the National Petroleum Reserve-Alaska.

From the AMAP Acidification and Arctic Haze Report (2006); "The causes and the effects of acidifying air pollutants and arctic haze are closely linked to other environmental problems. It is not clear how climate change will influence future acidification and arctic haze pollution in the Arctic. The effects of haze aerosols on the arctic climate are complicated by feedbacks between aerosols, clouds, radiation, snow and ice cover, and vertical and horizontal transport processes. Whether the pollutant aerosols cause an overall warming or an overall cooling is not yet known. The amount of haze precursors (haze-inducing substances) reaching Alaska and the Canadian Arctic appears to have increased since the late 1990s....The importance of Asian sources to acidification and arctic haze pollution in the Arctic is not yet clear."

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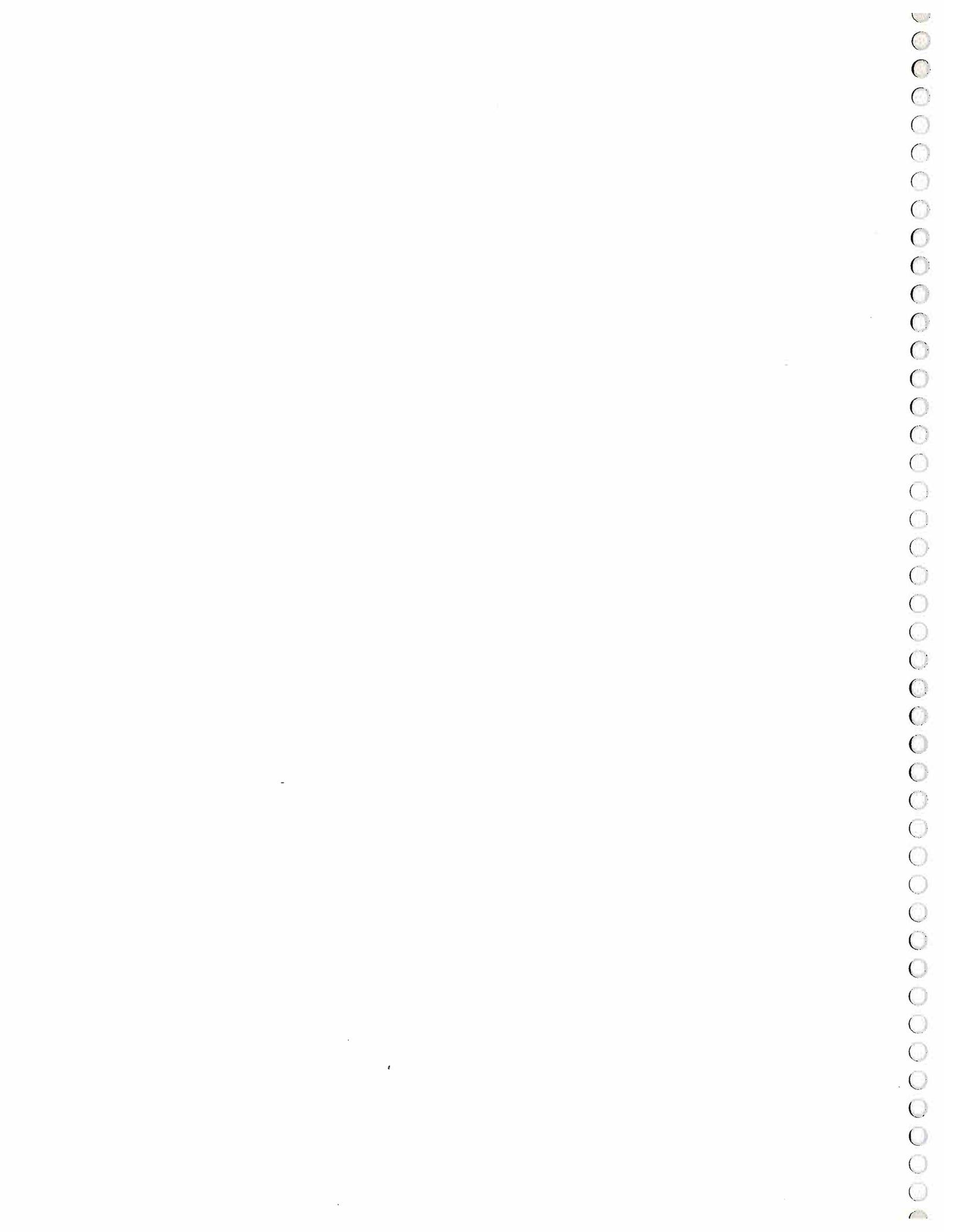
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APPENDIX  
Analytical Results



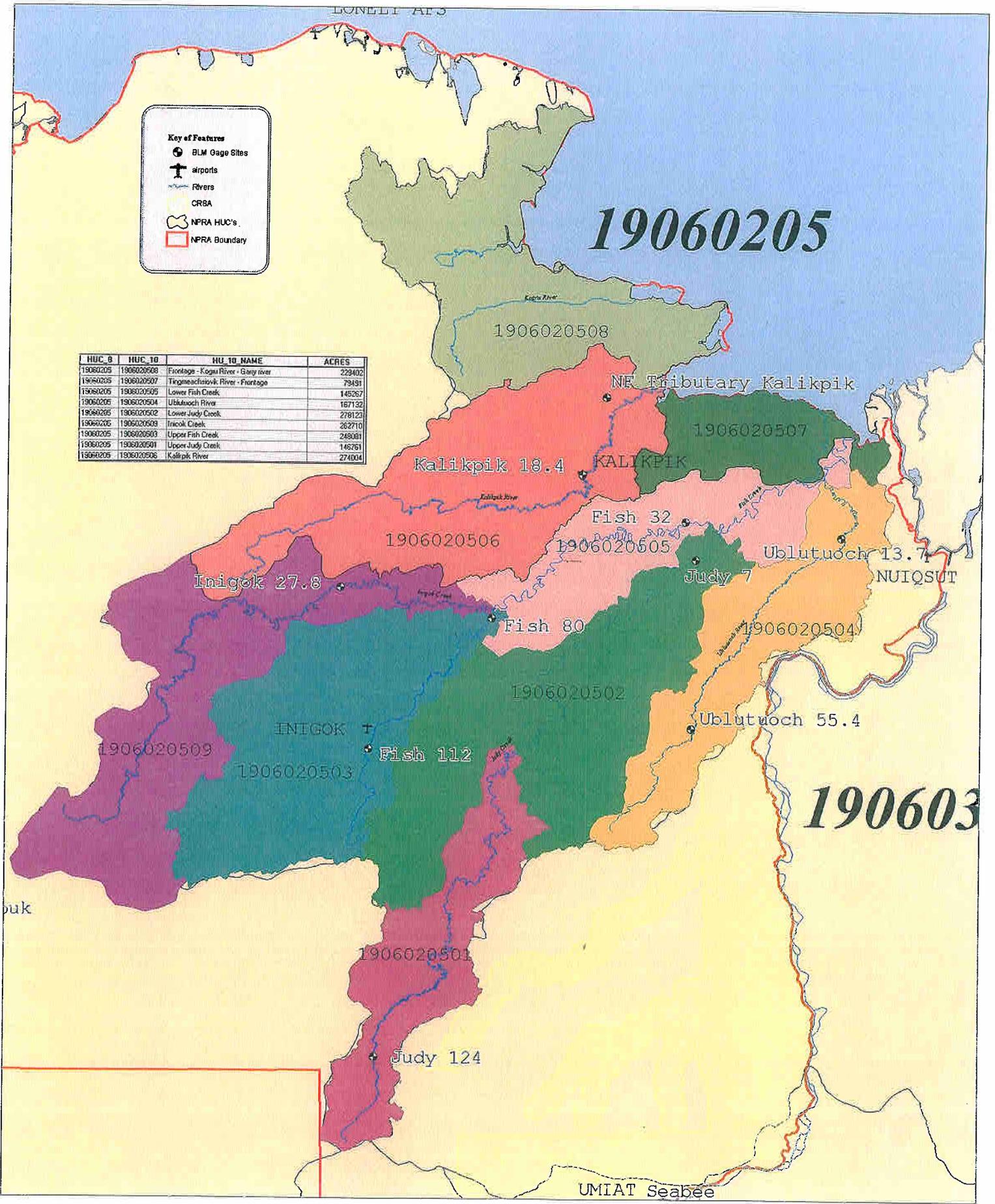
LONELY AFS

**Key of Features**

- BLM Gage Sites
- ✈ airports
- ~ Rivers
- CRBA
- ⬡ NFRA HUC's
- ▭ NFRA Boundary

# 19060205

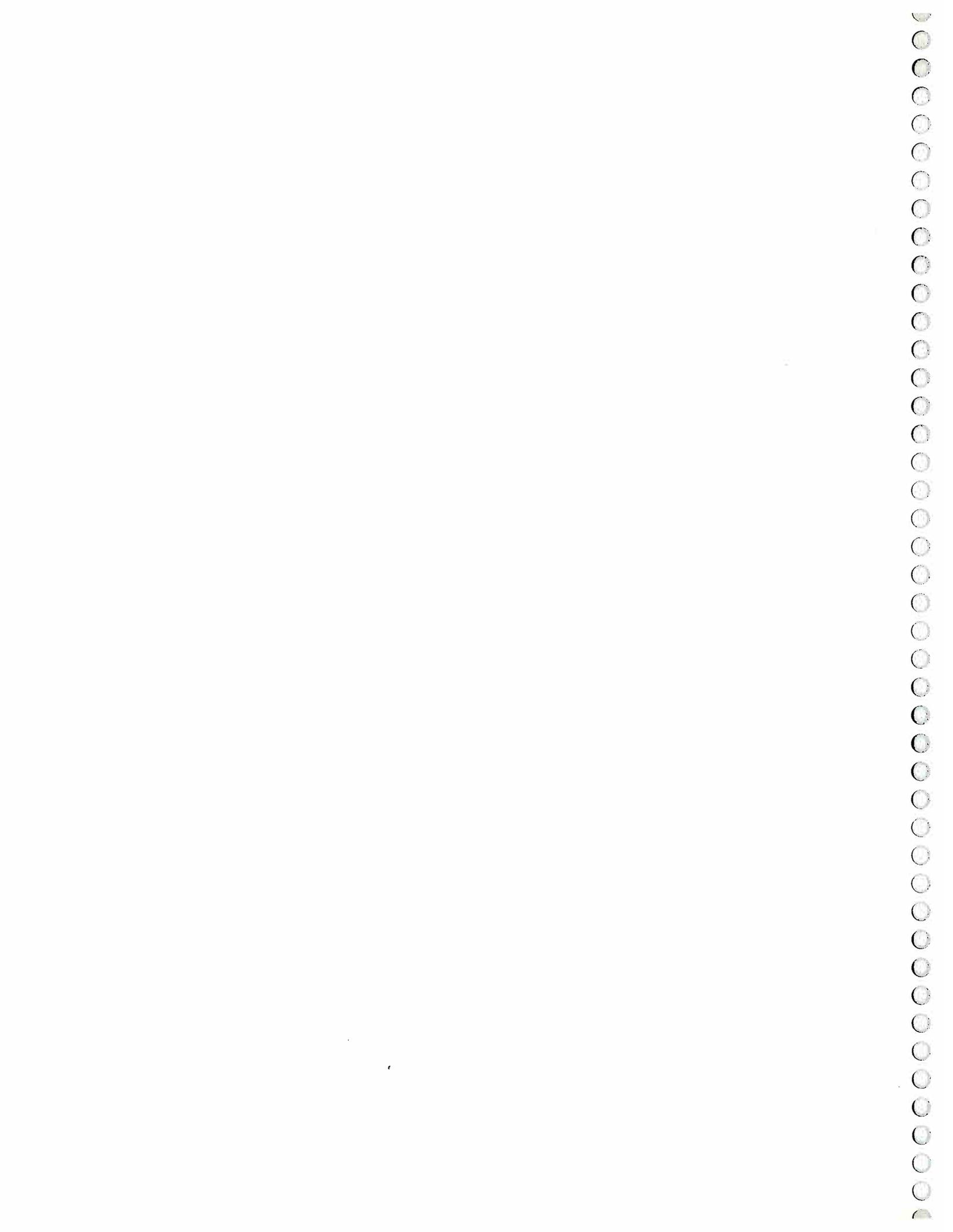
HUC_8	HUC_10	HUC_10 NAME	ACRES
19060205	1906020508	Frontage - Kogva River - Gary river	229402
19060205	1906020507	Tingmeadistivik River - Frontage	79491
19060205	1906020505	Lower Fish Creek	145267
19060205	1906020504	Ublutuoch River	167132
19060205	1906020502	Lower Judy Creek	276123
19060205	1906020503	Inicok Creek	262710
19060205	1906020503	Upper Fish Creek	248081
19060205	1906020501	Upper Judy Creek	146761
19060205	1906020506	Kalikpik River	274004



# 190603

buk

UMIAT Seabee



## NPR-A PAHS 2004

Polynuclear aromatic hydrocarbons sampled from water column via semi-permeable membrane devices.

All devices deployed July 16 and retrieved August 19, 2004.

Units are µg/sample (sample size is approximately 4mL).

Minor damage to membranes deployed at Mig. R and Fish Cr likely due to rough handling by AK Fire Service.

Sedimentation levels higher than preferred, can interfere with analysis.

Compound	MRL	MDL	dialysis		trip blank	Ikpikpuk		Miguakiak		Fish Creek notes	
			(lab)	blank		River	notes	River	notes		
Naphthalene	--	--	ND	Uj	ND	Uj	ND	ND	Uj	ND	Uj
Acenaphthylene	10	0.22	1.9	J	6.9	J	3.1	7.5	J	2.1	J
Acenaphthene	10	0.16	2.5	J	12	--	6.2	8.7	J	3.7	J
Fluorene	10	0.19	6.6	J	28	--	14	21	--	6.7	J
Phenanthrene	10	0.33	19	--	84	--	87	100	--	40	--
Anthracene	10	0.22	0.9	J	10	J	5.0	5.4	J	1.9	J
Fluoranthene	10	0.34	6.2	J	30	--	77	65	--	29	--
Pyrene	10	0.36	4.6	J	26	--	45	47	--	20	--
Benz(a)anthracene	10	0.16	ND	U	1.1	J	4.8	5.2	J	1.0	J
Chrysene	10	0.41	ND	U	4.7	J	28	27	--	12	--
Benzo(b)fluoranthene	10	0.48	ND	U	ND	U	7.0	9.7	J	2.8	--
Benzo(k)fluoranthene	10	0.33	ND	U	ND	U	4.3	ND	U	ND	U
Benzo(a)pyrene	10	0.22	ND	U	ND	U	2.0	ND	U	ND	U
Indeno(1,2,3-cd)pyrene	10	0.24	ND	U	ND	U	3.0	1.5	J	0.6	J
Dibenz(a,h)anthracene	10	0.26	ND	U	ND	U	0.7	0.4	J	ND	U
Benzo(g,h,i)perylene	10	0.23	ND	U	1.7	J	3.7	3.8	J	1.1	J

### Abbreviations

MRL: Method Reporting Limit

MDL: Method Detection Limit

ND: Not Detected

U: The compound was analyzed for, but was not detected at or above the MRL/MDL.

i: The MRL/MDL has been elevated due to a matrix interference.

J: The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.

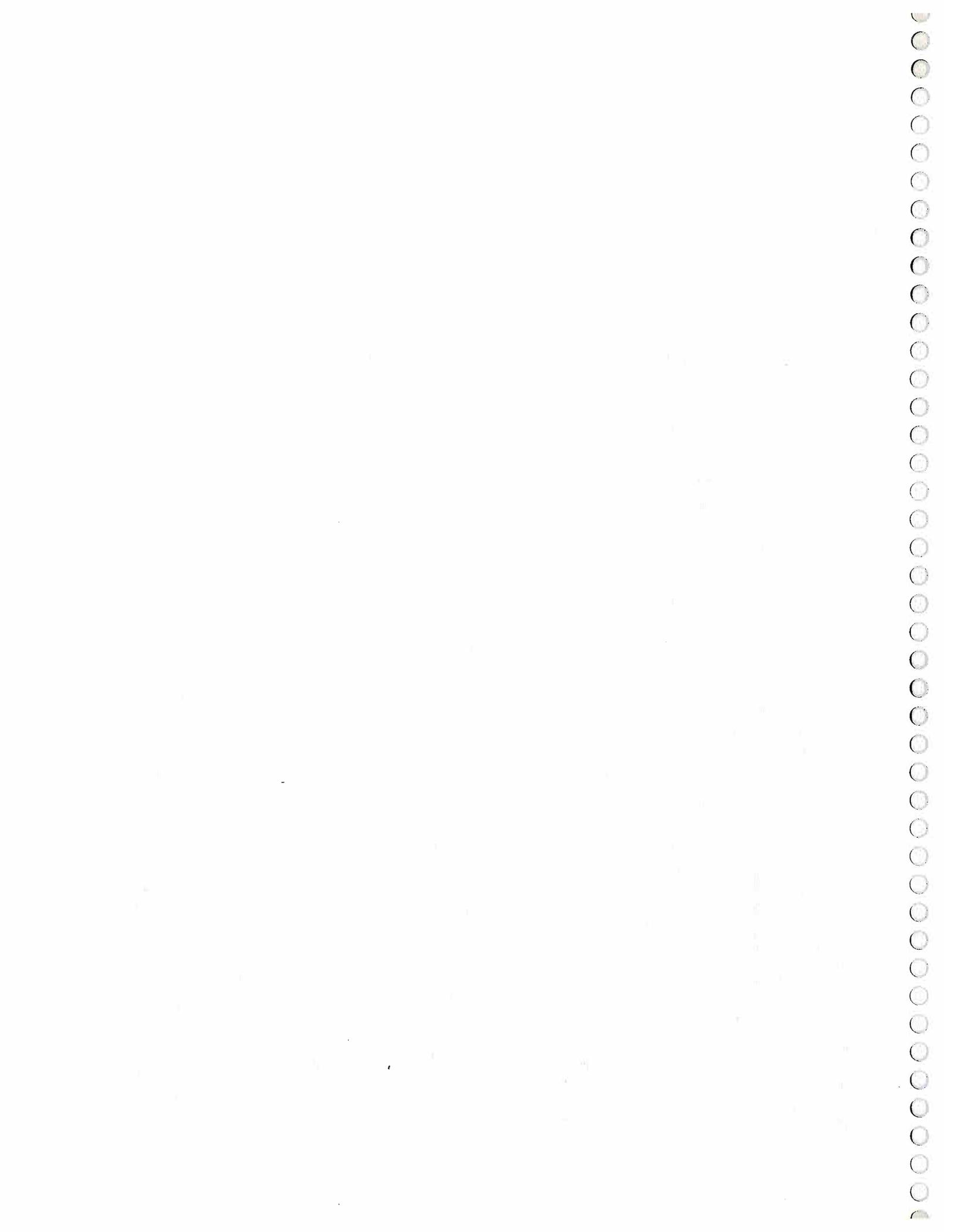
**Site Locations** - selected to be in areas targeted for fish tissue hydrocarbon sampling in 2004.

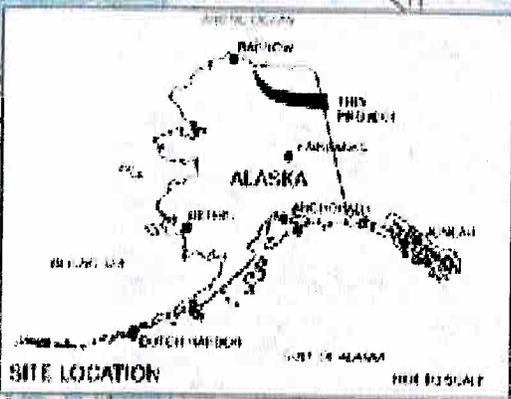
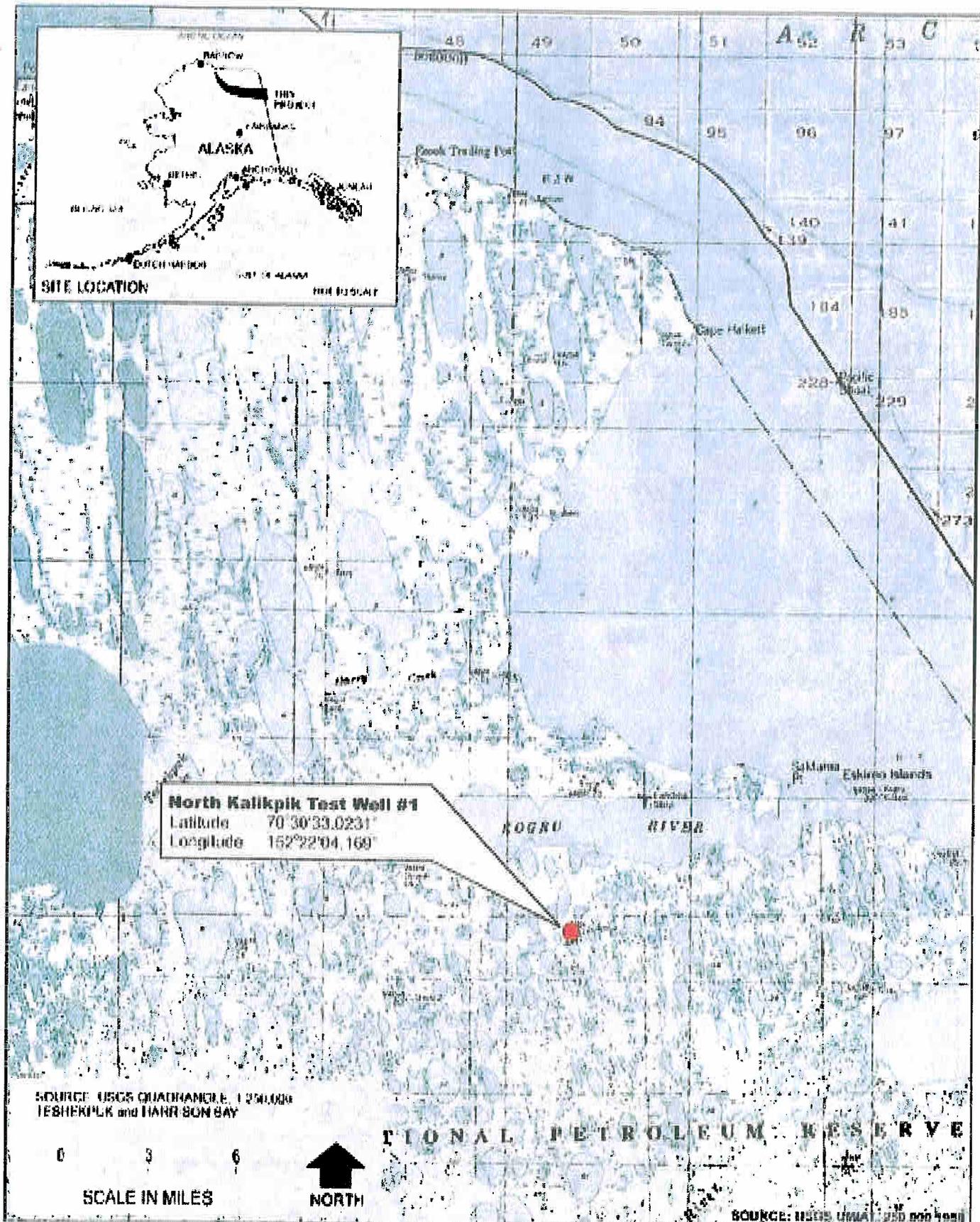
Ikpikpuk River N70 67.174 W154 57.895

Miguakiak River N70 70.283 W154 49.155

Fish Creek N70 31.054 W151 50.747

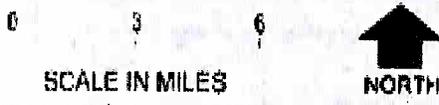
Colville River LOST





**North Kalikpik Test Well #1**  
 Latitude 70°30'33.0231"  
 Longitude 152°22'04.169"

SOURCE: USGS QUADRANGLE 1:250,000  
 TESHEKPIK and HARRISON BAY



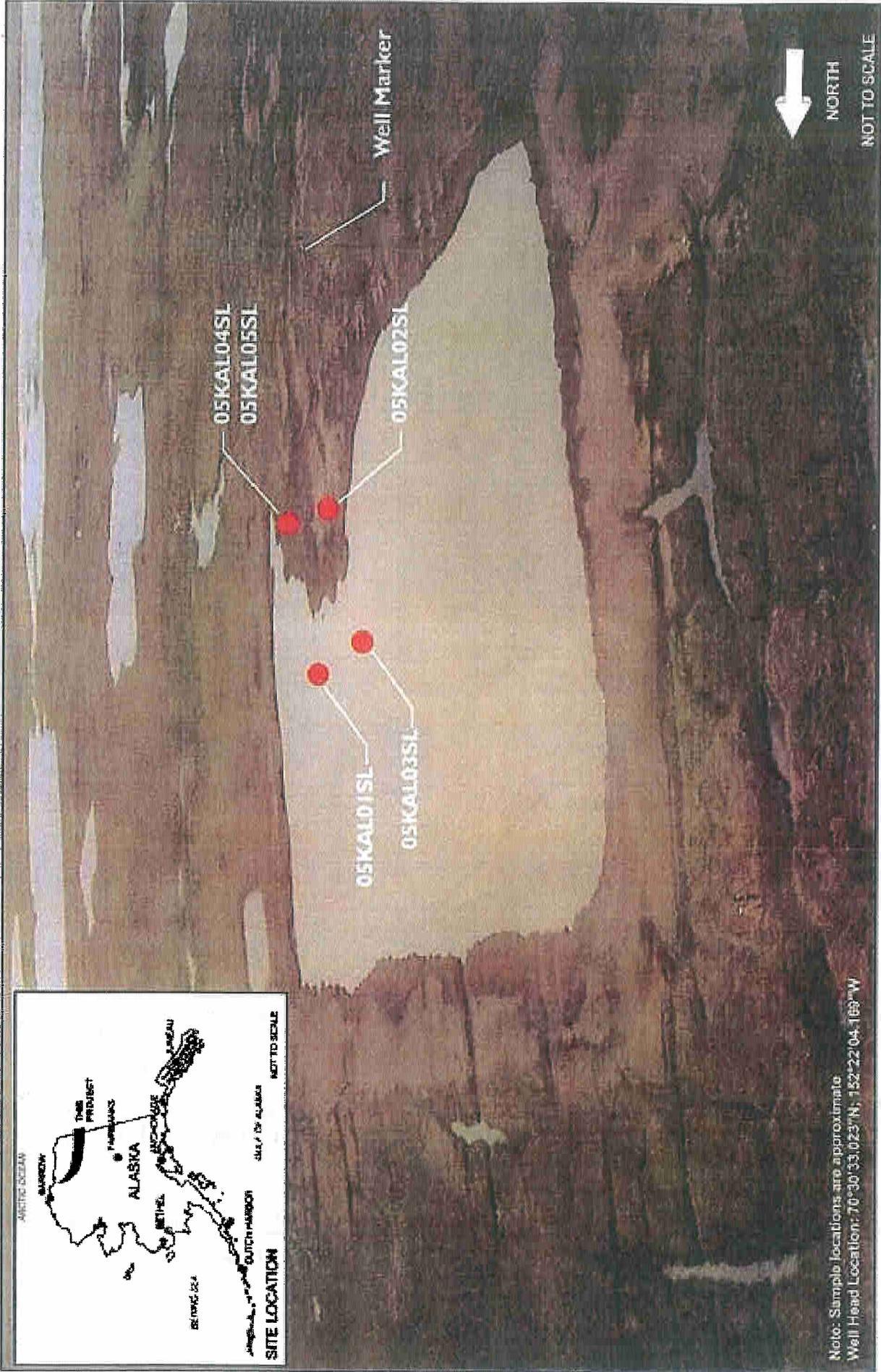
**NATIONAL PETROLEUM RESERVE**

SOURCE: USGS, UTM 1250,000 4900



**Site Location and Vicinity Map**  
**North Kalikpik Test Well**  
 National Petroleum Reserve #1 North Kalikpik Test Well  
 National Petroleum Reserve, Alaska

FIGURE  
**1**



**North Kalikpak Soil Sample Locations**  
 Inactive Reserve Pit - North Kalikpak Test Well  
 National Petroleum Reserve, Alaska

FIGURE  
**2**

**TABLE**



**LABORATORY DATA PACKAGE AND  
DATA QUALITY ASSESSMENT**

**DATA QUALITY ASSESSMENT (Note: Any "No" answer requires a comment)**

Laboratory: North Creek Analytical  
 Batch No.: A5I0008  
 Samples: 05KAL01SL through 05KAL05SL

	Yes	No	Not Required
1. Were samples analyzed for requested parameters?	<u>  X  </u>	<u>          </u>	<u>          </u>
2. Is the Data Deliverables package complete?	<u>  X  </u>	<u>          </u>	<u>          </u>
3. Were samples extracted within holding time acceptance criteria?	<u>  X  </u>	<u>          </u>	<u>          </u>
4. Were samples analyzed within holding time acceptance criteria?	<u>  X  </u>	<u>          </u>	<u>          </u>
5. For soils, were sample results reported on a "dry weight" basis?	<u>  X  </u>	<u>          </u>	<u>          </u>
6. Were method blanks analytes all reported as ND?	<u>  X  </u>	<u>          </u>	<u>          </u>
7. For water, were trip blank analytes all reported as ND?	<u>          </u>	<u>  X<sup>1</sup>  </u>	<u>          </u>
8. For Soil, were methanol blank analytes all reported as ND?	<u>          </u>	<u>  X<sup>1</sup>  </u>	<u>          </u>
9. Are the surrogate percent recoveries within acceptance criteria?	<u>  X  </u>	<u>  X<sup>2</sup>  </u>	<u>          </u>
10. Are the matrix spike percent recoveries within acceptance criteria?	<u>  X  </u>	<u>  X<sup>3</sup>  </u>	<u>          </u>
11. Are the matrix spike relative percent differences within acceptance criteria?	<u>  X  </u>	<u>  X<sup>4</sup>  </u>	<u>          </u>
12. Are the field duplicate relative percent differences less than 50 percent?	<u>  X  </u>	<u>          </u>	<u>          </u>

**Comments:**

- The trip blank provided by the lab was empty, no methanol or sand. No trip blank analytes reported.
- The surrogate recovery (44.7%) for a,a,a-TFT for Method 8021(B) (BTEX) on sample 05KAL02SL was below the acceptable recovery limit (49 – 140%). The sample result was ND, but may be biased low. Data are acceptable.
- Percent recovery for matrix spike (56.5%) and matrix spike duplicate (41.4%) on QC Batch 5I2056 are below the recovery limits (70 – 130%) for Mercury. Percent recover for matrix spike (258%, >300%) and matrix spike duplicate (226%, 183%) on QC Batch 5I6043 exceed the recovery limits (70 – 130%) for Calcium and Magnesium. Results may be biased high for associated samples. Data are acceptable.
- The relative percent difference for matrix spike duplicate (25.4%) on QC Batch 5I16043 exceeds 20%.

Date: 12/15/2005  
 Reviewer: E. Miller



MACTEC Engineering and Consulting, Inc.  
601 East 57th Place, Anchorage, Alaska, 99518  
(907) 563-8102 / FAX (907) 561-4574

**CHAIN OF CUSTODY**

# KAL -001

NO # ASI 0008

**Shoreline Erosion Project, Reserve Pit Characterization**

Project Name:

Project Location: North Kaiikpik Test Well #1

Samplers: BD

Laboratory: North Creek

Project Manager: Jason Ditsworth

Recorder: BD

Turnaround Time: Standard

MATRIX	# Containers & Preservative	IDENTIFIER	DATE AND TIME				TARED CONTAINER #'s	ANALYSIS REQUESTED					
			YR	MO	DY	TIME							
S	1	4-oz glass (methanol preservative)	05	08	27	12:10	EPA 8021 (BTEX)	AK 102 (DRO)	EPA 6010B/200.8 (Metals)				
S	2	4-oz glass	05	08	27	12:10							
S	1		05	08	27	12:15							
S	2		05	08	27	12:25							
S	1		05	08	27	12:25							
S	2		05	08	27	12:25							
S	1	TRIP BLANK											
S	1												
S	1												
S	1												
S	1												

**NOTES:**

Temperature Blank Included TRIP BLANK  
 BTEX Trip Blank Included TRIP BLANK PROVIDED WAS EMPTY  
NO METALS  
NO SAND

RELEASUED BY: (Signature)	DATE	TIME	RECEIVED BY	DATE	TIME
<u>BD</u>	9-2-05	0930	Jason Ditsworth	9/2/05	9:30
RELEASUED BY: (Signature)	DATE	TIME		DATE	TIME
Jason Ditsworth	9/2	12:05	Holly Mast	9/2/05	12:05
RELEASUED BY: (Signature)	DATE	TIME		DATE	TIME
DISPATCHED BY: (Signature)	DATE	TIME		DATE	TIME
METHOD OF SHIPMENT					

Co. 0°C



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**Amended Report**

September 27, 2005

Jason Ditsworth  
MACTEC Engineering and Consulting  
601 East 57th Place  
Anchorage, AK/USA 99518

RE: Shoreline Erosion Project

Enclosed are the results of analyses for samples received by the laboratory on 09/02/05 12:05.  
The following list is a summary of the NCA Work Orders contained in this report.  
If you have any questions concerning this report, please feel free to contact me.

**Amended Report: All results reported here supercede any previously reported results.**

<u>Work</u>	<u>Project</u>	<u>ProjectNumber</u>
A5I0008	Shoreline Erosion Project	[none]

Thank You,

Stephen Wilson, Laboratory Manager

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Environmental Laboratory Network*



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**Amended Report**

<b>MACTEC Engineering and Consulting</b> 601 East 57th Place Anchorage, AK/USA 99518	Project Name: <b>Shoreline Erosion Project</b> Project Number: [none] Project Manager: Jason Ditsworth	<u>Report Created:</u> 09/27/05 18:48
--	--	--

**ANALYTICAL REPORT FOR SAMPLES**

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
05KAL 01 SL	A5I0008-01	Soil	08/27/05 12:10	09/02/05 12:05
05KAL 02 SL	A5I0008-02	Soil	08/27/05 12:15	09/02/05 12:05
05KAL 03 SL	A5I0008-03	Soil	08/27/05 12:20	09/02/05 12:05
05KAL 04 SL	A5I0008-04	Soil	08/27/05 12:25	09/02/05 12:05
05KAL 05 SL	A5I0008-05	Soil	08/27/05 12:25	09/02/05 12:05

North Creek Analytical - Alaska

**Amended Report**

Stephen Wilson, Laboratory Manager

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**Amended Report**

**MACTEC Engineering and Consulting**

601 East 57th Place  
Anchorage, AK/USA 99518

Project Name: **Shoreline Erosion Project**  
 Project Number: [none]  
 Project Manager: Jason Ditsworth

Report Created:  
 09/27/05 18:48

**Diesel Range Organics (C10-C25) per AK102**

North Creek Analytical - Alaska

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
<b>A5I0008-01</b>	<b>Soil</b>	<b>05KAL 01 SL</b>	<b>Sampled: 08/27/05 12:10</b>							
Diesel Range Organics	AK 102	33.7	----	25.0	mg/kg dry	1x	5090024	09/07/05	09/08/05 14:57	
Surrogate(s): 1-Chlorooctadecane		Recovery: 85.3%		Limits: 50 - 150 %		"		"		
<b>A5I0008-02</b>	<b>Soil</b>	<b>05KAL 02 SL</b>	<b>Sampled: 08/27/05 12:15</b>							
Diesel Range Organics	AK 102	ND	----	100	mg/kg dry	4x	5090026	09/08/05	09/09/05 14:19	
Surrogate(s): 1-Chlorooctadecane		Recovery: 74.5%		Limits: 50 - 150 %		"		"		
<b>A5I0008-03</b>	<b>Soil</b>	<b>05KAL 03 SL</b>	<b>Sampled: 08/27/05 12:20</b>							
Diesel Range Organics	AK 102	ND	----	210	mg/kg dry	4x	5090026	09/08/05	09/09/05 13:39	
Surrogate(s): 1-Chlorooctadecane		Recovery: 74.0%		Limits: 50 - 150 %		"		"		
<b>A5I0008-04</b>	<b>Soil</b>	<b>05KAL 04 SL</b>	<b>Sampled: 08/27/05 12:25</b>							
Diesel Range Organics	AK 102	ND	----	100	mg/kg dry	4x	5090026	09/08/05	09/09/05 14:19	
Surrogate(s): 1-Chlorooctadecane		Recovery: 88.4%		Limits: 50 - 150 %		"		"		
<b>A5I0008-05</b>	<b>Soil</b>	<b>05KAL 05 SL</b>	<b>Sampled: 08/27/05 12:25</b>							
Diesel Range Organics	AK 102	ND	----	100	mg/kg dry	4x	5090026	09/08/05	09/09/05 15:00	
Surrogate(s): 1-Chlorooctadecane		Recovery: 97.3%		Limits: 50 - 150 %		"		"		

North Creek Analytical - Alaska

Stephen Wilson, Laboratory Manager

**Amended Report**

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Environmental Laboratory Network



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**Amended Report**

**MACTEC Engineering and Consulting**

601 East 57th Place  
 Anchorage, AK/USA 99518

Project Name: **Shoreline Erosion Project**  
 Project Number: [none]  
 Project Manager: Jason Ditsworth

Report Created:  
 09/27/05 18:48

**BTEX by EPA Method 8021B**  
 North Creek Analytical - Alaska

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
<b>A5I0008-01</b>	<b>Soil</b>	<b>05KAL 01 SL</b>	<b>Sampled: 08/27/05 12:10</b>							
Benzene	EPA 8021B	ND	----	0.0154	mg/kg dry	1.88x	5090011	09/02/05	09/06/05 00:44	
Toluene	"	ND	----	0.0309	"	"	"	"	"	
Ethylbenzene	"	ND	----	0.0309	"	"	"	"	"	
Xylenes (total)	"	ND	----	0.0463	"	"	"	"	"	
Surrogate(s): a,a,a-TFT (PID)		Recovery: 52.9%		Limits: 49 - 140 %						
<b>A5I0008-02</b>	<b>Soil</b>	<b>05KAL 02 SL</b>	<b>Sampled: 08/27/05 12:15</b>							
Benzene	EPA 8021B	ND	----	0.0153	mg/kg dry	1.25x	5090011	09/02/05	09/08/05 07:39	
Toluene	"	ND	----	0.0306	"	"	"	"	"	
Ethylbenzene	"	ND	----	0.0306	"	"	"	"	"	
Xylenes (total)	"	ND	----	0.0459	"	"	"	"	"	
Surrogate(s): a,a,a-TFT (PID)		Recovery: 44.7%		Limits: 49 - 140 %						
<b>A5I0008-03</b>	<b>Soil</b>	<b>05KAL 03 SL</b>	<b>Sampled: 08/27/05 12:20</b>							
Benzene	EPA 8021B	0.0537	----	0.0382	mg/kg dry	1.88x	5090011	09/02/05	09/08/05 12:25	J, P-03
Toluene	"	1.17	----	0.0764	"	"	"	"	"	
Ethylbenzene	"	ND	----	0.0764	"	"	"	"	"	J, P-03
Xylenes (total)	"	12.2	----	0.115	"	"	"	"	"	
Surrogate(s): a,a,a-TFT (PID)		Recovery: 95.1%		Limits: 49 - 140 %						

North Creek Analytical - Alaska

Stephen Wilson, Laboratory Manager

**Amended Report**

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 Environmental Laboratory Network



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**Amended Report**

**MACTEC Engineering and Consulting**

601 East 57th Place  
Anchorage, AK/USA 99518

Project Name: **Shoreline Erosion Project**  
 Project Number: [none]  
 Project Manager: Jason Ditsworth

Report Created:  
 09/27/05 18:48

**BTEX by EPA Method 8021B**  
North Creek Analytical - Alaska

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
<b>A5I0008-04</b>	<b>Soil</b>	<b>05KAL 04 SL</b>	<b>Sampled: 08/27/05 12:25</b>							
Benzene	EPA 8021B	ND	----	0.0168	mg/kg dry	2.25x	5090011	09/02/05	09/06/05 02:23	
Toluene	"	ND	----	0.0335	"	"	"	"	"	
Ethylbenzene	"	ND	----	0.0335	"	"	"	"	"	
Xylenes (total)	"	ND	----	0.0503	"	"	"	"	"	
<i>Surrogate(s): a,a,a-TFT (PID)</i>		<i>Recovery: 63.4%</i>		<i>Limits: 49 - 140 %</i>						
<b>A5I0008-05</b>	<b>Soil</b>	<b>05KAL 05 SL</b>	<b>Sampled: 08/27/05 12:25</b>							
Benzene	EPA 8021B	ND	----	0.0144	mg/kg dry	1.88x	5090011	09/02/05	09/06/05 02:56	
Toluene	"	ND	----	0.0288	"	"	"	"	"	
Ethylbenzene	"	ND	----	0.0288	"	"	"	"	"	
Xylenes (total)	"	ND	----	0.0432	"	"	"	"	"	
<i>Surrogate(s): a,a,a-TFT (PID)</i>		<i>Recovery: 59.0%</i>		<i>Limits: 49 - 140 %</i>						

North Creek Analytical - Alaska

Stephen Wilson, Laboratory Manager

**Amended Report**

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North Creek Analytical, Inc.  
Environmental Laboratory, Healy, Alaska



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**Amended Report**

<b>MACTEC Engineering and Consulting</b> 601 East 57th Place Anchorage, AK/USA 99518	Project Name: <b>Shoreline Erosion Project</b> Project Number: [none] Project Manager: Jason Ditsworth	<b>Report Created:</b> 09/27/05 18:48
--	--	--

**Physical Parameters by APHA/ASTM/EPA Methods**  
North Creek Analytical - Alaska

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
<b>A5I0008-01</b>	<b>Soil</b>	<b>05KAL 01 SL</b>	<b>Sampled: 08/27/05 12:10</b>							
Dry Weight	BSOPSPL003R0	78.5	----	1.00	%	1x	5090025	09/07/05	09/08/05 06:47	
<b>A5I0008-02</b>	<b>Soil</b>	<b>05KAL 02 SL</b>	<b>Sampled: 08/27/05 12:15</b>							
Dry Weight	BSOPSPL003R0	67.7	----	1.00	%	1x	5090027	09/08/05	09/09/05 07:28	
<b>A5I0008-03</b>	<b>Soil</b>	<b>05KAL 03 SL</b>	<b>Sampled: 08/27/05 12:20</b>							
Dry Weight	BSOPSPL003R0	47.7	----	1.00	%	1x	5090027	09/08/05	09/09/05 07:28	
<b>A5I0008-04</b>	<b>Soil</b>	<b>05KAL 04 SL</b>	<b>Sampled: 08/27/05 12:25</b>							
Dry Weight	BSOPSPL003R0	73.0	----	1.00	%	1x	5090027	09/08/05	09/09/05 07:28	
<b>A5I0008-05</b>	<b>Soil</b>	<b>05KAL 05 SL</b>	<b>Sampled: 08/27/05 12:25</b>							
Dry Weight	BSOPSPL003R0	68.9	----	1.00	%	1x	5090027	09/08/05	09/09/05 07:28	

North Creek Analytical - Alaska

**Amended Report**

Stephen Wilson, Laboratory Manager

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North Creek Analytical, Inc.  
Environmental Laboratory Network



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**Amended Report**

**MACTEC Engineering and Consulting**

601 East 57th Place  
Anchorage, AK/USA 99518

Project Name: **Shoreline Erosion Project**

Project Number: [none]

Project Manager: Jason Ditsworth

Report Created:  
09/27/05 18:48

**Total Metals by EPA 6000/7000 Series Methods**

North Creek Analytical - Bothell

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
<b>A5I0008-01</b>	<b>Soil</b>	<b>05KAL 01 SL</b>	<b>Sampled: 08/27/05 12:10</b>							
Arsenic	EPA 6020	3.62	----	0.376	mg/kg dry	1x	5108072	09/08/05	09/12/05 10:18	
Barium	"	151	----	3.76	"	"	"	"	"	
Cadmium	"	ND	----	0.376	"	"	"	"	"	
Calcium	EPA 6010B	7100	----	11.3	"	"	5116043	09/16/05	09/26/05 18:22	
Chromium	EPA 6020	9.49	----	0.376	"	"	5108072	09/08/05	09/12/05 10:18	
Lead	"	4.00	----	0.376	"	"	"	"	"	
Magnesium	EPA 6010B	2500	----	7.52	"	"	5116043	09/16/05	09/23/05 17:55	
Mercury	EPA 7471A	ND	----	0.0694	"	"	5112056	09/12/05	09/12/05 15:34	
Nickel	EPA 6020	13.7	----	0.376	"	"	5108072	09/08/05	09/12/05 10:18	
Selenium	"	0.505	----	0.376	"	"	"	"	"	
Silver	"	ND	----	0.376	"	"	"	"	"	
Sodium	EPA 6010B	151	----	11.3	"	"	5116043	09/16/05	09/23/05 17:55	
Zinc	EPA 6020	26.6	----	4.20	"	"	5115075	09/15/05	09/16/05 20:19	
<b>A5I0008-02</b>	<b>Soil</b>	<b>05KAL 02 SL</b>	<b>Sampled: 08/27/05 12:15</b>							
Arsenic	EPA 6020	4.40	----	0.450	mg/kg dry	1x	5108072	09/08/05	09/12/05 10:23	
Cadmium	"	ND	----	0.450	"	"	"	"	"	
Chromium	"	11.3	----	0.450	"	"	"	"	"	
Lead	"	6.23	----	0.450	"	"	"	"	"	
Mercury	EPA 7471A	ND	----	0.0781	"	"	5112056	09/12/05	09/12/05 15:37	
Selenium	EPA 6020	0.561	----	0.450	"	"	5108072	09/08/05	09/12/05 10:23	
Silver	"	ND	----	0.450	"	"	"	"	"	

North Creek Analytical - Alaska

Stephen Wilson, Laboratory Manager

**Amended Report**

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Environmental Laboratory Network



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**Amended Report**

<b>MACTEC Engineering and Consulting</b> 601 East 57th Place Anchorage, AK/USA 99518	Project Name:	<b>Shoreline Erosion Project</b>	<b>Report Created:</b> 09/27/05 18:48
	Project Number:	[none]	
	Project Manager:	Jason Ditsworth	

**Total Metals by EPA 6000/7000 Series Methods**  
 North Creek Analytical - Bothell

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
<b>ASI0008-02RE1</b>	<b>Soil</b>	<b>05KAL 02 SL</b>	<b>Sampled: 08/27/05 12:15</b>							
<b>Barium</b>	EPA 6020	238	----	9.01	mg/kg dry	2x	5I08072	09/08/05	09/12/05 16:44	
<b>ASI0008-03</b>	<b>Soil</b>	<b>05KAL 03 SL</b>	<b>Sampled: 08/27/05 12:20</b>							
<b>Arsenic</b>	EPA 6020	4.75	----	0.500	mg/kg dry	1x	5I08072	09/08/05	09/12/05 10:29	
<b>Cadmium</b>	"	ND	----	0.500	"	"	"	"	"	
<b>Chromium</b>	"	18.4	----	0.500	"	"	"	"	"	
<b>Lead</b>	"	7.83	----	0.500	"	"	"	"	"	
<b>Mercury</b>	EPA 7471A	ND	----	0.0758	"	"	5I12056	09/12/05	09/12/05 15:39	
<b>Selenium</b>	EPA 6020	0.655	----	0.500	"	"	5I08072	09/08/05	09/12/05 10:29	
<b>Silver</b>	"	ND	----	0.500	"	"	"	"	"	
<b>ASI0008-03RE1</b>	<b>Soil</b>	<b>05KAL 03 SL</b>	<b>Sampled: 08/27/05 12:20</b>							
<b>Barium</b>	EPA 6020	803	----	25.0	mg/kg dry	5x	5I08072	09/08/05	09/12/05 16:50	
<b>ASI0008-04</b>	<b>Soil</b>	<b>05KAL 04 SL</b>	<b>Sampled: 08/27/05 12:25</b>							
<b>Arsenic</b>	EPA 6020	4.69	----	0.500	mg/kg dry	1x	5I08072	09/08/05	09/12/05 10:35	
<b>Barium</b>	"	199	----	5.00	"	"	"	"	"	
<b>Cadmium</b>	"	ND	----	0.500	"	"	"	"	"	
<b>Chromium</b>	"	11.7	----	0.500	"	"	"	"	"	
<b>Lead</b>	"	5.55	----	0.500	"	"	"	"	"	
<b>Mercury</b>	EPA 7471A	ND	----	0.0893	"	"	5I12056	09/12/05	09/12/05 15:41	
<b>Selenium</b>	EPA 6020	0.509	----	0.500	"	"	5I08072	09/08/05	09/12/05 10:35	
<b>Silver</b>	"	ND	----	0.500	"	"	"	"	"	

North Creek Analytical - Alaska

**Amended Report**

Stephen Wilson, Laboratory Manager

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 Environmental Laboratory Network



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**Amended Report**

**MACTEC Engineering and Consulting**

601 East 57th Place  
Anchorage, AK/USA 99518

Project Name: **Shoreline Erosion Project**  
 Project Number: [none]  
 Project Manager: Jason Ditsworth

Report Created:  
 09/27/05 18:48

**Total Metals by EPA 6000/7000 Series Methods**

North Creek Analytical - Bothell

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
<b>A5I0008-05</b>	Soil	<b>05KAL 05 SL</b>	<b>Sampled: 08/27/05 12:25</b>							
Arsenic	EPA 6020	4.35	----	0.376	mg/kg dry	1x	5108072	09/08/05	09/12/05 10:41	
Cadmium	"	ND	----	0.376	"	"	"	"	"	
Chromium	"	11.9	----	0.376	"	"	"	"	"	
Lead	"	6.61	----	0.376	"	"	"	"	"	
Mercury	EPA 7471A	ND	----	0.0714	"	"	5112056	09/12/05	09/12/05 15:44	
Selenium	EPA 6020	0.502	----	0.376	"	"	5108072	09/08/05	09/12/05 10:41	
Silver	"	ND	----	0.376	"	"	"	"	"	
<b>A5I0008-05RE1</b>	Soil	<b>05KAL 05 SL</b>	<b>Sampled: 08/27/05 12:25</b>							
Barium	EPA 6020	200	----	18.8	mg/kg dry	5x	5108072	09/08/05	09/12/05 10:58	

North Creek Analytical - Alaska

Stephen Wilson, Laboratory Manager

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**Amended Report**

<b>MACTEC Engineering and Consulting</b> 601 East 57th Place Anchorage, AK/USA 99518	Project Name:	<b>Shoreline Erosion Project</b>	
	Project Number:	[none]	Report Created:
	Project Manager:	Jason Ditsworth	09/27/05 18:48

**Physical Parameters by APHA/ASTM/EPA Methods**  
 North Creek Analytical - Bothell

Analyte	Method	Result	MDL*	MRL	Units	Dil	Batch	Prepared	Analyzed	Notes
<b>A5I0008-01</b>	<b>Soil</b>	<b>05KAL 01 SL</b>	<b>Sampled: 08/27/05 12:10</b>							
Dry Weight	BSOPSPL003R0	75.9	----	1.00	%	1x	5I12064	09/12/05	09/13/05 00:00	
<b>A5I0008-02</b>	<b>Soil</b>	<b>05KAL 02 SL</b>	<b>Sampled: 08/27/05 12:15</b>							
Dry Weight	BSOPSPL003R0	68.2	----	1.00	%	1x	5I12064	09/12/05	09/13/05 00:00	
<b>A5I0008-03</b>	<b>Soil</b>	<b>05KAL 03 SL</b>	<b>Sampled: 08/27/05 12:20</b>							
Dry Weight	BSOPSPL003R0	50.4	----	1.00	%	1x	5I12064	09/12/05	09/13/05 00:00	
<b>A5I0008-04</b>	<b>Soil</b>	<b>05KAL 04 SL</b>	<b>Sampled: 08/27/05 12:25</b>							
Dry Weight	BSOPSPL003R0	72.5	----	1.00	%	1x	5I12065	09/12/05	09/13/05 00:00	
<b>A5I0008-05</b>	<b>Soil</b>	<b>05KAL 05 SL</b>	<b>Sampled: 08/27/05 12:25</b>							
Dry Weight	BSOPSPL003R0	74.2	----	1.00	%	1x	5I12065	09/12/05	09/13/05 00:00	

North Creek Analytical - Alaska

Stephen Wilson, Laboratory Manager

**Amended Report**

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**Amended Report**

**MACTEC Engineering and Consulting**

601 East 57th Place  
Anchorage, AK/USA 99518

Project Name: **Shoreline Erosion Project**  
 Project Number: [none]  
 Project Manager: Jason Ditsworth

Report Created:  
09/27/05 18:48

**Diesel Range Organics (C10-C25) per AK102 - Laboratory Quality Control Results**  
North Creek Analytical - Alaska

QC Batch: 5090024 Soil Preparation Method: EPA 3545

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes		
<b>Blank (5090024-BLK1)</b>													Extracted: 09/07/05 16:49			
Diesel Range Organics	AK 102	ND	---	25.0	mg/kg	1x	--	--	--	--	--	--	09/09/05 09:54			
Surrogate(s): 1-Chlorooctadecane		Recovery: 88.9%		Limits: 50-150%		"						09/09/05 09:54				
<b>LCS (5090024-BS1)</b>													Extracted: 09/07/05 16:49			
Diesel Range Organics	AK 102	126	---	25.0	mg/kg	1x	--	126	100%	(75-125)	--	--	09/09/05 09:54			
Surrogate(s): 1-Chlorooctadecane		Recovery: 94.4%		Limits: 50-150%		"						09/09/05 09:54				
<b>LCS Dup (5090024-BSD1)</b>													Extracted: 09/07/05 16:49			
Diesel Range Organics	AK 102	124	---	25.0	mg/kg	1x	--	126	98.4%	(75-125)	1.60%	(20)	09/09/05 09:54			
Surrogate(s): 1-Chlorooctadecane		Recovery: 95.2%		Limits: 50-150%		"						09/09/05 09:54				
<b>Duplicate (5090024-DUP1)</b>													QC Source: A510015-03		Extracted: 09/07/05 16:49	
Diesel Range Organics	AK 102	ND	---	25.0	mg/kg dry	1x	ND	--	--	--	10.9%	(50)	09/09/05 09:54			
Surrogate(s): 1-Chlorooctadecane		Recovery: 93.1%		Limits: 50-150%		"						09/09/05 09:54				
<b>Matrix Spike (5090024-MS1)</b>													QC Source: A510015-04		Extracted: 09/07/05 16:49	
Diesel Range Organics	AK 102	119	---	25.0	mg/kg dry	1x	ND	129	92.2%	(75-125)	--	--	09/09/05 09:54			
Surrogate(s): 1-Chlorooctadecane		Recovery: 93.8%		Limits: 50-150%		"						09/09/05 09:54				
<b>Matrix Spike Dup (5090024-MSD1)</b>													QC Source: A510015-04		Extracted: 09/07/05 16:49	
Diesel Range Organics	AK 102	114	---	25.0	mg/kg dry	1x	ND	122	93.4%	(75-125)	4.29%	(25)	09/09/05 09:54			
Surrogate(s): 1-Chlorooctadecane		Recovery: 93.4%		Limits: 50-150%		"						09/09/05 09:54				

North Creek Analytical - Alaska

Stephen Wilson, Laboratory Manager

**Amended Report**

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**Amended Report**

**MACTEC Engineering and Consulting**

601 East 57th Place  
Anchorage, AK/USA 99518

Project Name: **Shoreline Erosion Project**  
 Project Number: [none]  
 Project Manager: Jason Ditsworth

**Report Created:**  
 09/27/05 18:48

**Diesel Range Organics (C10-C25) per AK102 - Laboratory Quality Control Results**

North Creek Analytical - Alaska

QC Batch: 5090026 Soil Preparation Method: EPA 3545

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes		
<b>Blank (5090026-BLK1)</b>													Extracted: 09/08/05 08:41			
Diesel Range Organics	AK 102	ND	---	25.0	mg/kg	1x	--	--	--	--	--	--	09/09/05 11:04			
Surrogate(s): 1-Chlorooctadecane		Recovery: 103%		Limits: 50-150%		"						09/09/05 11:04				
<b>LCS (5090026-BS1)</b>													Extracted: 09/08/05 08:41			
Diesel Range Organics	AK 102	122	---	25.0	mg/kg	1x	--	126	96.8%	(75-125)	--	--	09/09/05 11:36			
Surrogate(s): 1-Chlorooctadecane		Recovery: 106%		Limits: 50-150%		"						09/09/05 11:36				
<b>LCS Dup (5090026-BSD1)</b>													Extracted: 09/08/05 08:41			
Diesel Range Organics	AK 102	127	---	25.0	mg/kg	1x	--	126	101%	(75-125)	4.02%	(20)	09/09/05 12:08			
Surrogate(s): 1-Chlorooctadecane		Recovery: 106%		Limits: 50-150%		"						09/09/05 12:08				
<b>Duplicate (5090026-DUP1)</b>													QC Source: A5I0008-02		Extracted: 09/08/05 08:41	
Diesel Range Organics	AK 102	ND	---	100	mg/kg dry	4x	ND	--	--	--	7.70%	(50)	09/09/05 13:39			
Surrogate(s): 1-Chlorooctadecane		Recovery: 91.1%		Limits: 50-150%		"						09/09/05 13:39				
<b>Matrix Spike (5090026-MS1)</b>													QC Source: A5I0014-03		Extracted: 09/08/05 08:41	
Diesel Range Organics	AK 102	175	---	25.0	mg/kg dry	1x	16.9	156	101%	(75-125)	--	--	09/09/05 11:36			
Surrogate(s): 1-Chlorooctadecane		Recovery: 104%		Limits: 50-150%		"						09/09/05 11:36				
<b>Matrix Spike Dup (5090026-MSD1)</b>													QC Source: A5I0014-03		Extracted: 09/08/05 08:41	
Diesel Range Organics	AK 102	171	---	25.0	mg/kg dry	1x	16.9	154	100%	(75-125)	2.31%	(25)	09/09/05 11:04			
Surrogate(s): 1-Chlorooctadecane		Recovery: 98.1%		Limits: 50-150%		"						09/09/05 11:04				

North Creek Analytical - Alaska

Stephen Wilson, Laboratory Manager

**Amended Report**

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**Amended Report**

**MACTEC Engineering and Consulting**

601 East 57th Place  
 Anchorage, AK/USA 99518

Project Name: **Shoreline Erosion Project**  
 Project Number: [none]  
 Project Manager: Jason Ditsworth

Report Created:  
 09/27/05 18:48

**BTEX by EPA Method 8021B - Laboratory Quality Control Results**

North Creek Analytical - Alaska

QC Batch: 5090011

Soil Preparation Method: AK101 Field Prep

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes		
<b>Blank (5090011-BLK1)</b>													Extracted: 09/02/05 14:49			
Benzene	EPA 8021B	ND	---	0.0166	mg/kg	0.83x	--	--	--	--	--	--	09/05/05 12:40			
Toluene	"	ND	---	0.0333	"	"	--	--	--	--	--	--	"			
Ethylbenzene	"	ND	---	0.0333	"	"	--	--	--	--	--	--	"			
Xylenes (total)	"	ND	---	0.0500	"	"	--	--	--	--	--	--	"			
Surrogate(s): a,a,a-TFT (PID)		Recovery: 75.4%		Limits: 49-140%								09/05/05 12:40				
<b>LCS (5090011-BS2)</b>													Extracted: 09/02/05 14:49			
Benzene	EPA 8021B	0.759	---	0.0166	mg/kg	0.83x	--	0.796	95.4%	(79.1-149)	--	--	09/05/05 11:34			
Toluene	"	0.708	---	0.0333	"	"	--	0.792	89.4%	(77.1-120)	--	--	"			
Ethylbenzene	"	0.702	---	0.0333	"	"	--	0.804	87.3%	(72.3-128)	--	--	"			
Xylenes (total)	"	2.16	---	0.0500	"	"	--	2.36	91.5%	(79.3-125)	--	--	"			
Surrogate(s): a,a,a-TFT (PID)		Recovery: 81.2%		Limits: 49-140%								09/05/05 11:34				
<b>LCS Dup (5090011-BSD2)</b>													Extracted: 09/02/05 14:49			
Benzene	EPA 8021B	0.779	---	0.0166	mg/kg	0.83x	--	0.796	97.9%	(79.1-149)	2.60%	(15.4)	09/05/05 12:07			
Toluene	"	0.722	---	0.0333	"	"	--	0.792	91.2%	(77.1-120)	1.96%	(14.6)	"			
Ethylbenzene	"	0.730	---	0.0333	"	"	--	0.804	90.8%	(72.3-128)	3.91%	(14.2)	"			
Xylenes (total)	"	2.22	---	0.0500	"	"	--	2.36	94.1%	(79.3-125)	2.74%	(15.9)	"			
Surrogate(s): a,a,a-TFT (PID)		Recovery: 82.5%		Limits: 49-140%								09/05/05 12:07				
<b>Matrix Spike (5090011-MS1)</b>													QC Source: A5I0002-04		Extracted: 09/02/05 14:49	
Benzene	EPA 8021B	0.566	---	0.0136	mg/kg dry	2.5x	ND	0.621	91.1%	(46.5-156)	--	--	09/05/05 17:36			
Toluene	"	0.534	---	0.0273	"	"	ND	0.618	86.4%	(60.3-135)	--	--	"			
Ethylbenzene	"	0.537	---	0.0273	"	"	ND	0.627	85.6%	(52.6-138)	--	--	"			
Xylenes (total)	"	1.67	---	0.0409	"	"	ND	1.84	90.8%	(51.9-143)	--	--	"			
Surrogate(s): a,a,a-TFT (PID)		Recovery: 52.6%		Limits: 49-140%								09/05/05 17:36				
<b>Matrix Spike Dup (5090011-MSD1)</b>													QC Source: A5I0002-04		Extracted: 09/02/05 14:49	
Benzene	EPA 8021B	0.558	---	0.0136	mg/kg dry	2.5x	ND	0.621	89.9%	(46.5-156)	1.42%	(14.9)	09/05/05 18:09			
Toluene	"	0.523	---	0.0273	"	"	ND	0.618	84.6%	(60.3-135)	2.08%	(16.2)	"			
Ethylbenzene	"	0.524	---	0.0273	"	"	ND	0.627	83.6%	(52.6-138)	2.45%	(14)	"			
Xylenes (total)	"	1.62	---	0.0409	"	"	ND	1.84	88.0%	(51.9-143)	3.04%	(13.5)	"			
Surrogate(s): a,a,a-TFT (PID)		Recovery: 49.5%		Limits: 49-140%								09/05/05 18:09				

North Creek Analytical - Alaska

Stephen Wilson, Laboratory Manager

**Amended Report**

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 Environmental Laboratory Network



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**Amended Report**

**MACTEC Engineering and Consulting**

601 East 57th Place  
 Anchorage, AK/USA 99518

Project Name: **Shoreline Erosion Project**  
 Project Number: [none]  
 Project Manager: Jason Ditsworth

**Report Created:**  
 09/27/05 18:48

**Physical Parameters by APHA/ASTM/EPA Methods - Laboratory Quality Control Results**

North Creek Analytical - Alaska

QC Batch: 5090025 Soil Preparation Method: General Preparation

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
---------	--------	--------	------	-----	-------	-----	---------------	-----------	-------	----------	-------	----------	----------	-------

Duplicate (5090025-DUP1)

QC Source: ASI0015-03

Extracted: 09/07/05 16:56

Dry Weight	BSOPSPLO03R0 7	96.6	---	1.00	%	1x	96.5	--	--	--	0.104% (25)		09/08/05 06:47	
------------	-------------------	------	-----	------	---	----	------	----	----	----	-------------	--	----------------	--

QC Batch: 5090027 Soil Preparation Method: General Preparation

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
---------	--------	--------	------	-----	-------	-----	---------------	-----------	-------	----------	-------	----------	----------	-------

Duplicate (5090027-DUP1)

QC Source: ASI0008-02

Extracted: 09/08/05 10:05

Dry Weight	BSOPSPLO03R0 7	72.1	---	1.00	%	1x	67.7	--	--	--	6.29% (25)		09/09/05 07:28	
------------	-------------------	------	-----	------	---	----	------	----	----	----	------------	--	----------------	--

North Creek Analytical - Alaska

**Amended Report**

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Stephen Wilson, Laboratory Manager

North Creek Analytical, Inc.  
 Environmental Laboratory Network



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**Amended Report**

**MACTEC Engineering and Consulting**

601 East 57th Place  
 Anchorage, AK/USA 99518

Project Name: **Shoreline Erosion Project**  
 Project Number: [none]  
 Project Manager: Jason Ditsworth

Report Created:  
 09/27/05 18:48

**Total Metals by EPA 6000/7000 Series Methods - Laboratory Quality Control Results**  
 North Creek Analytical - Bothell

QC Batch: 5I08072 Soil Preparation Method: EPA 3050B

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes		
<b>Blank (5I08072-BLK1)</b>													Extracted: 09/08/05 16:08			
Cadmium	EPA 6020	ND	---	0.500	mg/kg	1x	--	--	--	--	--	--	09/12/05 09:03			
Arsenic	"	ND	---	0.500	"	"	--	--	--	--	--	--	"			
Silver	"	ND	---	0.500	"	"	--	--	--	--	--	--	"			
Nickel	"	ND	---	0.500	"	"	--	--	--	--	--	--	"			
Selenium	"	ND	---	0.500	"	"	--	--	--	--	--	--	"			
Chromium	"	ND	---	0.500	"	"	--	--	--	--	--	--	"			
Barium	"	ND	---	5.00	"	"	--	--	--	--	--	--	"			
Lead	"	ND	---	0.500	"	"	--	--	--	--	--	--	"			
<b>LCS (5I08072-BS1)</b>													Extracted: 09/08/05 16:08			
Selenium	EPA 6020	41.1	---	0.500	mg/kg	1x	--	40.0	103%	(80-120)	--	--	09/12/05 09:09			
Nickel	"	40.2	---	0.500	"	"	--	"	100%	"	--	--	"			
Chromium	"	42.1	---	0.500	"	"	--	"	105%	"	--	--	"			
Cadmium	"	41.0	---	0.500	"	"	--	"	102%	"	--	--	"			
Barium	"	41.0	---	5.00	"	"	--	"	102%	"	--	--	"			
Silver	"	40.5	---	0.500	"	"	--	"	101%	"	--	--	"			
Lead	"	41.2	---	0.500	"	"	--	"	103%	"	--	--	"			
Arsenic	"	41.0	---	0.500	"	"	--	"	102%	"	--	--	"			
<b>LCS Dup (5I08072-BSD1)</b>													Extracted: 09/08/05 16:08			
Cadmium	EPA 6020	40.8	---	0.500	mg/kg	1x	--	40.0	102%	(80-120)	0.489% (20)	--	09/12/05 09:15			
Selenium	"	41.3	---	0.500	"	"	--	"	103%	"	0.485%	"	"			
Nickel	"	41.3	---	0.500	"	"	--	"	103%	"	2.70%	"	"			
Chromium	"	41.9	---	0.500	"	"	--	"	105%	"	0.476%	"	"			
Barium	"	41.2	---	5.00	"	"	--	"	103%	"	0.487%	"	"			
Arsenic	"	41.3	---	0.500	"	"	--	"	103%	"	0.729%	"	"			
Silver	"	40.4	---	0.500	"	"	--	"	101%	"	0.247%	"	"			
Lead	"	41.5	---	0.500	"	"	--	"	104%	"	0.726%	"	"			
<b>Matrix Spike (5I08072-MS1)</b>													QC Source: B5I0109-03		Extracted: 09/08/05 16:08	
Nickel	EPA 6020	54.8	---	0.500	mg/kg dry	1x	14.6	41.2	97.6%	(56-135)	--	--	09/12/05 09:20			
Silver	"	40.4	---	0.500	"	"	0.280	"	97.4%	(56-124)	--	--	"			
Barium	"	102	---	5.00	"	"	56.2	"	111%	(20-160)	--	--	"			
Cadmium	"	42.5	---	0.500	"	"	0.130	"	103%	(78-125)	--	--	"			
Chromium	"	57.7	---	0.500	"	"	16.0	"	101%	(29-127)	--	--	"			
Arsenic	"	43.1	---	0.500	"	"	2.81	"	97.8%	(57-125)	--	--	"			
Selenium	"	41.0	---	0.500	"	"	0.235	"	98.9%	(65-121)	--	--	"			
Lead	"	44.8	---	0.500	"	"	2.53	"	103%	(29-162)	--	--	"			

North Creek Analytical - Alaska

Stephen Wilson, Laboratory Manager

**Amended Report**

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**Amended Report**

<b>MACTEC Engineering and Consulting</b>	Project Name: <b>Shoreline Erosion Project</b>
601 East 57th Place	Project Number: [none]
Anchorage, AK/USA 99518	Project Manager: Jason Ditsworth
	Report Created: 09/27/05 18:48

**Total Metals by EPA 6000/7000 Series Methods - Laboratory Quality Control Results**  
 North Creek Analytical - Bothell

QC Batch: 5I08072      Soil Preparation Method: EPA 3050B

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes	
<b>Matrix Spike Dup (5I08072-MSD1)</b>		QC Source: B5I0109-03					Extracted: 09/08/05 16:08								
Selenium	EPA 6020	42.7	---	0.500	mg/kg dry	1x	0.235	41.2	103%	(65-121)	4.06%	(30)	09/12/05 09:26		
Arsenic	"	44.6	---	0.500	"	"	2.81	"	101%	(57-125)	3.42%	"	"		
Barium	"	108	---	5.00	"	"	56.2	"	126%	(20-160)	5.71%	"	"		
Cadmium	"	43.6	---	0.500	"	"	0.130	"	106%	(78-125)	2.56%	"	"		
Lead	"	46.2	---	0.500	"	"	2.53	"	106%	(29-162)	3.08%	"	"		
Nickel	"	57.1	---	0.500	"	"	14.6	"	103%	(56-135)	4.11%	"	"		
Chromium	"	60.2	---	0.500	"	"	16.0	"	107%	(29-127)	4.24%	"	"		
Silver	"	41.7	---	0.500	"	"	0.280	"	101%	(56-124)	3.17%	(50)	"		
<b>Post Spike (5I08072-PS1)</b>		QC Source: B5I0109-03					Extracted: 09/08/05 16:08								
Chromium	EPA 6020	0.134	---		ug/ml	1x	0.0311	0.100	103%	(75-125)	--	--	09/12/05 09:49		
Nickel	"	0.126	---		"	"	0.0284	"	97.6%	"	--	--	"		
Lead	"	0.106	---		"	"	0.00492	"	101%	"	--	--	"		
Cadmium	"	0.102	---		"	"	0.000253	"	102%	"	--	--	"		
Barium	"	0.210	---		"	"	0.109	"	101%	"	--	--	"		
Arsenic	"	0.110	---		"	"	0.00546	"	105%	"	--	--	"		
Silver	"	0.0966	---		"	"	0.000544	"	96.1%	"	--	--	"		
Selenium	"	0.101	---		"	"	0.000457	"	101%	"	--	--	"		

North Creek Analytical - Alaska

Stephen Wilson, Laboratory Manager

**Amended Report**

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Environmental Laboratory Network



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**Amended Report**

**MACTEC Engineering and Consulting**

601 East 57th Place  
 Anchorage, AK/USA 99518

Project Name: **Shoreline Erosion Project**  
 Project Number: [none]  
 Project Manager: Jason Ditsworth

Report Created:  
 09/27/05 18:48

**Total Metals by EPA 6000/7000 Series Methods - Laboratory Quality Control Results**  
 North Creek Analytical - Bothell

QC Batch: 5I12056 Soil Preparation Method: EPA 7471A

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
<b>Blank (5I12056-BLK1)</b>														Extracted: 09/12/05 13:56
Mercury	EPA 7471A	ND	---	0.100	mg/kg	1x	--	--	--	--	--	--	09/12/05 14:26	
<b>LCS (5I12056-BS1)</b>														Extracted: 09/12/05 13:56
Mercury	EPA 7471A	0.499	---	0.100	mg/kg	1x	--	0.500	99.8%	(80-120)	--	--	09/12/05 14:29	
<b>LCS Dup (5I12056-BSD1)</b>														Extracted: 09/12/05 13:56
Mercury	EPA 7471A	0.486	---	0.100	mg/kg	1x	--	0.500	97.2%	(80-120)	2.64%	(20)	09/12/05 14:31	
<b>Matrix Spike (5I12056-MS1)</b>														QC Source: B5I0174-01 Extracted: 09/12/05 13:56
Mercury	EPA 7471A	2.80	---	0.500	mg/kg dry	5x	2.50	0.531	56.5%	(70-130)	--	--	09/12/05 14:44	Q-03
<b>Matrix Spike Dup (5I12056-MSD1)</b>														QC Source: B5I0174-01 Extracted: 09/12/05 13:56
Mercury	EPA 7471A	2.72	---	0.500	mg/kg dry	5x	2.50	0.531	41.4%	(70-130)	2.90%	(30)	09/12/05 14:46	Q-03

QC Batch: 5I15075 Soil Preparation Method: EPA 3050B

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
<b>Blank (5I15075-BLK1)</b>														Extracted: 09/15/05 16:12
Zinc	EPA 6020	ND	---	5.00	mg/kg	1x	--	--	--	--	--	--	09/16/05 19:33	
<b>LCS (5I15075-BS1)</b>														Extracted: 09/15/05 16:12
Zinc	EPA 6020	39.8	---	5.00	mg/kg	1x	--	40.4	98.5%	(80-120)	--	--	09/16/05 19:38	
<b>LCS Dup (5I15075-BSD1)</b>														Extracted: 09/15/05 16:12
Zinc	EPA 6020	39.1	---	5.00	mg/kg	1x	--	40.0	97.8%	(80-120)	1.77%	(20)	09/16/05 19:44	
<b>Matrix Spike (5I15075-MS1)</b>														QC Source: A5I0008-01 Extracted: 09/15/05 16:12
Zinc	EPA 6020	63.4	---	3.65	mg/kg dry	1x	26.6	38.5	95.6%	(20-160)	--	--	09/16/05 20:07	
<b>Matrix Spike Dup (5I15075-MSD1)</b>														QC Source: A5I0008-01 Extracted: 09/15/05 16:12
Zinc	EPA 6020	70.1	---	4.24	mg/kg dry	1x	26.6	44.7	97.3%	(20-160)	10.0%	(30)	09/16/05 20:13	
<b>Post Spike (5I15075-PS1)</b>														QC Source: A5I0008-01 Extracted: 09/15/05 16:12
Zinc	EPA 6020	0.146	---		ug/ml	1x	0.0481	0.100	97.9%	(75-125)	--	--	09/16/05 20:01	

North Creek Analytical - Alaska

Stephen Wilson, Laboratory Manager

**Amended Report**

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**Amended Report**

<b>MACTEC Engineering and Consulting</b> 601 East 57th Place Anchorage, AK/USA 99518	Project Name:	<b>Shoreline Erosion Project</b>	<b>Report Created:</b> 09/27/05 18:48
	Project Number:	[none]	
	Project Manager:	Jason Ditsworth	

**Total Metals by EPA 6000/7000 Series Methods - Laboratory Quality Control Results**

North Creek Analytical - Bothell

QC Batch: 5I16043 Soil Preparation Method: EPA 3050B

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes		
<b>Blank (5I16043-BLK1)</b>													Extracted: 09/16/05 14:03			
Calcium	EPA 6010B	ND	---	15.0	mg/kg	1x	--	--	--	--	--	--	09/26/05 17:48			
Magnesium	"	ND	---	10.0	"	"	--	--	--	--	--	--	09/23/05 17:10			
Sodium	"	ND	---	15.0	"	"	--	--	--	--	--	--	"			
<b>LCS (5I16043-BS1)</b>													Extracted: 09/16/05 14:03			
Magnesium	EPA 6010B	278	---	10.0	mg/kg	1x	--	250	111%	(70-130)	--	--	09/23/05 17:27			
Calcium	"	261	---	15.0	"	"	--	"	104%	(80-120)	--	--	09/26/05 17:54			
Sodium	"	283	---	15.0	"	"	--	"	113%	"	--	--	09/23/05 17:27			
<b>LCS Dup (5I16043-BSD1)</b>													Extracted: 09/16/05 14:03			
Sodium	EPA 6010B	283	---	15.0	mg/kg	1x	--	250	113%	(80-120)	0.00%	(20)	09/23/05 17:32			
Magnesium	"	272	---	10.0	"	"	--	"	109%	(70-130)	2.18%	"	"			
Calcium	"	258	---	15.0	"	"	--	"	103%	(80-120)	1.16%	"	09/26/05 18:00			
<b>Matrix Spike (5I16043-MS1)</b>													QC Source: B510190-01		Extracted: 09/16/05 14:03	
Calcium	EPA 6010B	1840	---	15.0	mg/kg dry	1x	1110	283	258%	(70-130)	--	--	09/26/05 18:05	Q-03		
Magnesium	"	1730	---	10.0	"	"	822	"	>300%	"	--	--	09/23/05 17:38	Q-03		
Sodium	"	505	---	15.0	"	"	230	"	97.2%	"	--	--	"			
<b>Matrix Spike Dup (5I16043-MSD1)</b>													QC Source: B510190-01		Extracted: 09/16/05 14:03	
Calcium	EPA 6010B	1750	---	15.0	mg/kg dry	1x	1110	283	226%	(70-130)	5.01%	(30)	09/26/05 18:11	Q-03		
Magnesium	"	1340	---	10.0	"	"	822	"	183%	"	25.4%	(20)	09/23/05 17:44	Q-03		
Sodium	"	520	---	15.0	"	"	230	"	102%	"	2.93%	(30)	"			
<b>Post Spike (5I16043-PS1)</b>													QC Source: B510190-01		Extracted: 09/16/05 14:03	
Calcium	EPA 6010B	23.9	---		ug/ml	1x	19.6	5.00	86.0%	(75-125)	--	--	09/27/05 10:10			
Magnesium	"	19.3	---		"	"	14.5	"	96.0%	"	--	--	09/23/05 17:49			
Sodium	"	9.44	---		"	"	4.06	"	108%	"	--	--	"			

North Creek Analytical - Alaska

**Amended Report**

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Stephen Wilson, Laboratory Manager

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**Amended Report**

**MACTEC Engineering and Consulting**

601 East 57th Place  
Anchorage, AK/USA 99518

Project Name: **Shoreline Erosion Project**  
 Project Number: [none]  
 Project Manager: Jason Ditsworth

Report Created:  
 09/27/05 18:48

**Physical Parameters by APHA/ASTM/EPA Methods - Laboratory Quality Control Results**  
 North Creek Analytical - Bothell

QC Batch: 5I12064      Soil Preparation Method: Dry Weight

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
<b>Blank (5I12064-BLK1)</b>										Extracted: 09/12/05 15:00				
Dry Weight	BSOPSPLO03R0 8	99.8	---	1.00	%	1x	--	--	--	--	--	--	09/13/05 00:00	

QC Batch: 5I12065      Soil Preparation Method: Dry Weight

Analyte	Method	Result	MDL*	MRL	Units	Dil	Source Result	Spike Amt	% REC	(Limits)	% RPD	(Limits)	Analyzed	Notes
<b>Blank (5I12065-BLK1)</b>										Extracted: 09/12/05 15:01				
Dry Weight	BSOPSPLO03R0 8	99.8	---	1.00	%	1x	--	--	--	--	--	--	09/13/05 00:00	

North Creek Analytical - Alaska

Stephen Wilson, Laboratory Manager

**Amended Report**

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**Amended Report**

<b>MACTEC Engineering and Consulting</b> 601 East 57th Place Anchorage, AK/USA 99518	Project Name:	<b>Shoreline Erosion Project</b>	<b>Report Created:</b> 09/27/05 18:48
	Project Number:	[none]	
	Project Manager:	Jason Ditsworth	

**Notes and Definitions**

Report Specific Notes:

- A-01 - Low surrogate recovery confirmed by rerun.
- J - Estimated value.
- P-03 - Greater than 40% difference between two dissimilar columns. After evaluation, the lower result has been reported.
- Q-03 - The percent recovery for this QC spike sample cannot be accurately calculated due to the high concentration of analyte already present in the sample.

Laboratory Reporting Conventions:

- DET** - Analyte DETECTED at or above the Reporting Limit. Qualitative Analyses only.
- ND** - Analyte NOT DETECTED at or above the reporting limit (MDL or MRL, as appropriate).
- NR / NA** - Not Reported / Not Available
- dry** - Sample results reported on a dry weight basis. Reporting Limits are corrected for %Solids when %Solids are <50%.
- wet** - Sample results and reporting limits reported on a wet weight basis (as received).
- RPD** - Relative Percent Difference. (RPDs calculated using Results, not Percent Recoveries).
- MRL** - METHOD REPORTING LIMIT. Reporting Level at, or above, the lowest level standard of the Calibration Table.
- MDL\*** - METHOD DETECTION LIMIT. Reporting Level at, or above, the statistically derived limit based on 40CFR, Part 136, Appendix B. \*MDLs are listed on the report only if the data has been evaluated below the MRL. Results between the MDL and MRL are reported as Estimated results.
- Dil** - Dilutions are calculated based on deviations from the standard dilution performed for an analysis, and may not represent the dilution found on the analytical raw data.
- Reporting limits** - Reporting limits (MDLs and MRLs) are adjusted based on variations in sample preparation amounts, analytical dilutions and percent solids, where applicable.

North Creek Analytical - Alaska

**Amended Report**

Stephen Wilson, Laboratory Manager

*The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.*

North Creek Analytical, Inc.  
 Environmental Laboratory Network



MACIEC Engineering and Consulting, Inc.  
601 East 57th Place, Anchorage, Alaska, 99518  
(907) 563-8102 / FAX (907) 561-4574

CHAIN OF CUSTODY

# KAL -001

NO # ASI 0008

Project Name: Shoreline Erosion Project, Reserve Pit Characterization

Project Location: North Kaikpik Test Well #1

Project Manager: Jason Ditsworth

Samplers: BD

Recorder: BD

Laboratory: North Creek

Turnaround Time: Standard

MATRIX	# Containers & Preservative	IDENTIFIER	DATE AND TIME				TARED CONTAINER #'s	ANALYSIS REQUESTED			
		Sample Number	YR	MO	DY	TIME					
S	1	05KAL 01 SL	0	5	0	12:10	EPA 8021 (BTEX)	AK 102 (DRO)	EPA 6010B/200.8 (Metals)		
S	1	05KAL 02 SL	0	5	0	12:15					
S	1	05KAL 03 SL	0	5	0	12:25					
S	1	05KAL 04 SL	0	5	0	12:25					
S	1	05KAL 05 SL	0	5	0	12:25					
S	1	TRIP BLANK									
S	1										
S	1										
S	1										
S	1										
S	1										

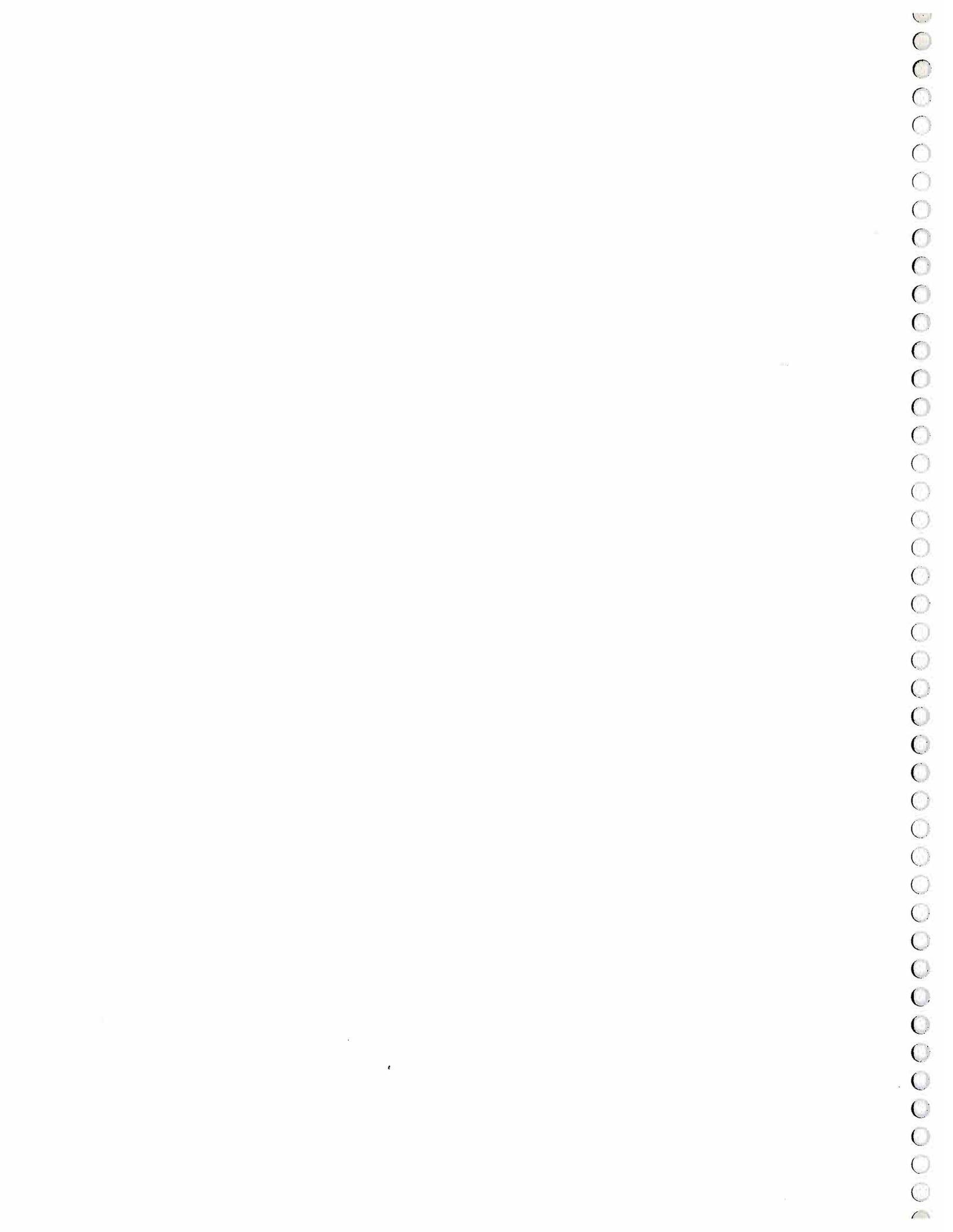
NOTES:

Temperature Blank Included (TRIP BLANK)  
 BTEX Trip Blank Included (PROVIDED WAS EMPTY)  
 NO METALS  
 NO SAND

REQUISITIONED BY (Signature)	DATE	TIME	RECEIVED BY (Signature)	DATE	TIME
<u>BD</u>	9-2-05	0930	<u>Jason Ditsworth</u>	9/2/05	9:30
RELENGISHED BY (Signature)	DATE	TIME	RECEIVED BY (Signature)	DATE	TIME
<u>Jason Ditsworth</u>	9/2	12:05	<u>Holly Mast</u>	9/2/05	12:05
RELENGISHED BY (Signature)	DATE	TIME	DISPATCHED BY (Signature)	DATE	TIME
METHOD OF SHIPMENT					

Co. Opc







Analytica International, Inc. - Fairbanks  
3330 Industrial Avenue  
Fairbanks, AK 99701  
907-456-3116  
Fax: 907-456-3125

---

10/1/2004

BLM Northern Field Office  
1150 University Avenue  
Fairbanks, AK 99709  
Attn: Susan Flora

Work Order #: F0409056  
Date: 10/1/2004  
Work ID: Wolf Creek Well-Arctic  
Date Received: 9/3/2004

### Sample Identification

<u>Lab Sample Number</u>	<u>Client Description</u>	<u>Lab Sample Number</u>	<u>Client Description</u>
F0409056-01	WCW3-1-804	F0409056-02	WCW3-2-804
F0409056-03	WCW3-3-804		

Enclosed are the analytical results for the submitted sample(s). Please review the CASE NARRATIVE for a discussion of any data and/or quality control issues. Listings of data qualifiers, analytical codes, key dates, and QC relationships are provided at the end of the report.

Sincerely,

Ellen Williams  
Project Manager

*"The Science of Analysis, The Art of Service"*

## Case Narrative

*Analytica International - Fairbanks*

*Work Order: F0409056*

Samples were prepared and analyzed according to EPA or equivalent methods outlined in the following references:

Test Methods for Evaluating Solid Waste, USEPA SW-846, Third Edition, Revision 4, December 1996.

Standard Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures, ASTM D 2216-80, July 1980.

### REVIEW FOR COMPLIANCE WITH ANALYTICA QA PLAN

A summary of our review is shown below, organized by test:

#### SAMPLE RECEIPT:

Three (3) samples were received at a temperature of 6.0°C at Analytica International - Fairbanks on 9/3/2004 4:00:00 PM. The samples were received in good condition and in order per chain of custody.

The samples were transferred for PCB analysis at Analytica Environmental Laboratories (AEL); 12189 Pennsylvania St. Thornton, CO 80241 where they were received at a temperature of 0.9°C in good condition and in order per chain of custody.

Test Method: ASTM D2216 - Pmoist - Solid

All method criteria was met for this test.

Test Method: SW8082 - PCBs by GC/ECD - PCB - Solid

#### HOLDING TIMES:

The samples were received by the laboratory with insufficient time to process the samples within holding time.

#### HOLD TIMES MISSED:

Sample WCW3-1-804, F0409056-01B

Sampled: 8/21/2004 3:00:00 PM, Prepped: 9/9/2004

Regulatory hold time: 14 Days

Sample WCW3-2-804, F0409056-02B

Sampled: 8/21/2004 2:30:00 PM, Prepped: 9/9/2004

Regulatory hold time: 14 Days

Sample WCW3-3-804, F0409056-03B

Sampled: 8/21/2004 3:35:00 PM, Prepped: 9/9/2004

Regulatory hold time: 14 Days

Sample MS, F0409056-01B-MS

Sampled: 8/21/2004 3:00:00 PM, Prepped: 9/9/2004

Regulatory hold time: 14 Days

Sample MSD, F0409056-01B-MSD

Sampled: 8/21/2004 3:00:00 PM, Prepped: 9/9/2004

Regulatory hold time: 14 Days

#### SAMPLE PREPARATION ISSUES AND OBSERVATIONS:

The sample extracts were processed through an Acid Wash Cleanup procedure to remove

# Case Narrative

Analytica International - Fairbanks

Work Order: F0409056

(continued)

organic interferences.

## INSTRUMENT PERFORMANCE CHECKS:

Instrument checks were within method criteria.

## INITIAL CALIBRATIONS:

Initial calibrations were within method criteria.

## OPENING CONTINUING CALIBRATIONS:

Opening continuing calibrations were within method criteria.

## CLOSING CONTINUING CALIBRATIONS:

Closing continuing calibrations were within method criteria.

## SURROGATE RECOVERIES:

The matrix spike duplicate shown below has one surrogate outside of control windows. This result was verified by the confirmation column. The parent sample has normal surrogate recoveries.

Sample	LabID	Surrogate	Recovery	LCL	UCL
MSD	F0409056-01B-MSD	Tetrachlorometaxylen	30.	32	129 Complete
MSD	F0409056-01B-MSD	Tetrachlorometaxylen	24.	32	129 Confirm

## METHOD BLANK OUTLIERS:

There are no method blank outliers.

## LCS OUTLIERS:

There are no LCS outliers.

## MS/MSD and DUP OUTLIERS:

The matrix spike and matrix spike duplicate recoveries shown below indicates a possible matrix effect.

Type	Client Sample	LabSample	Analyte	Recovery	LCL	UCL	Parent	Spike
MS	WCW3-1-804	F0409056-01B	Aroclor-1260	435	46	135	0.00	122
MSD	WCW3-1-804	F0409056-01B	Aroclor-1260	637	46	135	0.00	123



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BLM Northern Field Office  
 Attn: Susan Flora  
 1150 University Avenue  
 Fairbanks, AK 99709  
 907-474-2353  
 Fax:

Report Date: 10/1/2004  
 Receipt Date: 9/3/2004  
 Sample Date: 8/21/2004  
 Sample Time: 3:00:00PM  
 Collected By: SF

Client Sample ID: **WCW3-1-804**  
 Client Project: Wolf Creek Well Arctic  
 Location:  
 Sample Matrix: Solid  
 COC #: 38051  
 PWS#:  
 Comments:

Flag Definitions:  
 MRL = Method Reporting Limit  
 MCL = Maximum Contaminant Limit  
 B = Present also in Method Blank  
 H = Exceeds Regulatory Limit  
 M = Matrix Interference  
 J = Estimated Value  
 D = Lost to Dilution  
 \*\* = RL higher than MCL; target not detected

Sample Comment:

Lab#: F0409056-01B

**Analysis Method**

Parameter	Result	Units	Flags	MRL	Prep Method	Prep Date	Analysis Date	Analyst
8082/3550B (Solid) - PCB (dry wt.)					<i>Test was conducted by: Analytica - Thornton</i>			
Aroclor-1016	<MRL	ug/Kg		12	3550B	9/9/2004	9/16/2004	PS
Aroclor-1221	<MRL	ug/Kg		13	3550B	9/9/2004	9/16/2004	PS
Aroclor-1232	<MRL	ug/Kg		12	3550B	9/9/2004	9/16/2004	PS
Aroclor-1242	<MRL	ug/Kg		12	3550B	9/9/2004	9/16/2004	PS
Aroclor-1248	<MRL	ug/Kg		12	3550B	9/9/2004	9/16/2004	PS
Aroclor-1254	<MRL	ug/Kg		12	3550B	9/9/2004	9/16/2004	PS
Aroclor-1260	<MRL	ug/Kg		12	3550B	9/9/2004	9/16/2004	PS

**Surrogate Recoveries**

Decachlorobiphenyl	<b>88.0</b>	% Recov		0.74	3550B	9/9/2004	9/16/2004	PS
Tetrachlorometaxylene	<b>39.3</b>	% Recov		0.74	3550B	9/9/2004	9/16/2004	PS



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 Fax:

Report Date: 10/1/2004  
 Receipt Date: 9/3/2004  
 Sample Date: 8/21/2004  
 Sample Time: 2:30:00PM  
 Collected By: SF

Client Sample ID: **WCW3-2-804**  
 Client Project: Wolf Creek Well Arctic  
 Location:  
 Sample Matrix: Solid  
 COC #: 38051  
 PWS#:  
 Comments:

Flag Definitions:  
 MRL = Method Reporting Limit  
 MCL = Maximum Contaminant Limit  
 B = Present also in Method Blank  
 H = Exceeds Regulatory Limit  
 M = Matrix Interference  
 J = Estimated Value  
 D = Lost to Dilution  
 \*\* = RL higher than MCL; target not detected

Sample Comment:

Lab#: F0409056-02B

**Analysis Method**

Parameter	Result	Units	Flags	MRL	Prep Method	Prep Date	Analysis Date	Analyst
8082/3550B (Solid) - PCB (dry wt.)					<i>Test was conducted by: Analytica - Thornton</i>			
Aroclor-1016	<MRL	ug/Kg		12	3550B	9/9/2004	9/16/2004	PS
Aroclor-1221	<MRL	ug/Kg		13	3550B	9/9/2004	9/16/2004	PS
Aroclor-1232	<MRL	ug/Kg		12	3550B	9/9/2004	9/16/2004	PS
Aroclor-1242	<MRL	ug/Kg		12	3550B	9/9/2004	9/16/2004	PS
Aroclor-1248	<MRL	ug/Kg		12	3550B	9/9/2004	9/16/2004	PS
Aroclor-1254	<MRL	ug/Kg		12	3550B	9/9/2004	9/16/2004	PS
Aroclor-1260	<MRL	ug/Kg		12	3550B	9/9/2004	9/16/2004	PS
<b>Surrogate Recoveries</b>								
Decachlorobiphenyl	<b>48.3</b>	% Recov		0.70	3550B	9/9/2004	9/16/2004	PS
Tetrachlorometaxylene	<b>33.0</b>	% Recov		0.70	3550B	9/9/2004	9/16/2004	PS



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 Fax:

Report Date: 10/1/2004  
 Receipt Date: 9/3/2004  
 Sample Date: 8/21/2004  
 Sample Time: 3:35:00PM  
 Collected By: SF

Client Sample ID: **WCW3-3-804**  
 Client Project: Wolf Creek Well Arctic  
 Location:  
 Sample Matrix: Solid  
 COC #: 38051  
 PWS#:  
 Comments:

Flag Definitions:  
 MRL = Method Reporting Limit  
 MCL = Maximum Contaminant Limit  
 B = Present also in Method Blank  
 H = Exceeds Regulatory Limit  
 M = Matrix Interference  
 J = Estimated Value  
 D = Lost to Dilution  
 \*\* = RL higher than MCL; target not detected

Sample Comment:

Lab#: F0409056-03B

**Analysis Method**

Parameter	Result	Units	Flags	MRL	Prep Method	Prep Date	Analysis Date	Analyst
8082/3550B (Solid) - PCB (dry wt.)								
<i>Test was conducted by: Analytica - Thornton</i>								
Aroclor-1016	<MRL	ug/Kg		11	3550B	9/9/2004	9/16/2004	PS
Aroclor-1221	<MRL	ug/Kg		12	3550B	9/9/2004	9/16/2004	PS
Aroclor-1232	<MRL	ug/Kg		11	3550B	9/9/2004	9/16/2004	PS
Aroclor-1242	<MRL	ug/Kg		11	3550B	9/9/2004	9/16/2004	PS
Aroclor-1248	<MRL	ug/Kg		11	3550B	9/9/2004	9/16/2004	PS
Aroclor-1254	<MRL	ug/Kg		11	3550B	9/9/2004	9/16/2004	PS
Aroclor-1260	<MRL	ug/Kg		11	3550B	9/9/2004	9/16/2004	PS

**Surrogate Recoveries**

Decachlorobiphenyl	<b>46.4</b>	% Recov		0.69	3550B	9/9/2004	9/16/2004	PS
Tetrachlorometaxylene	<b>45.1</b>	% Recov		0.69	3550B	9/9/2004	9/16/2004	PS



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 Fax: 907-474-2282

Report Date: 11/10/2004  
 Receipt Date: 9/16/2004  
 Sample Date: 9/7/2004  
 Sample Time: 1:10:00PM  
 Collected By: SF

Client Sample ID: **WCW3-1-904**  
 Client Project: Wolf Creek Well-Arctic  
 Location:  
 Sample Matrix: Solid  
 COC #: 38059  
 PWS#:  
 Comments:

Flag Definitions:  
 MRL = Method Reporting Limit  
 MCL = Maximum Contaminant Limit  
 B = Present also in Method Blank  
 H = Exceeds Regulatory Limit  
 M = Matrix Interference  
 J = Estimated Value  
 D = Lost to Dilution  
 \*\* = RL higher than MCL; target not detected

Sample Comment:

Lab#: F0409252-01A

**Analysis Method**

Parameter	Result	Units	Flags	MRL	Prep Method	Prep Date	Analysis Date	Analyst
7471A/7471A (Solid) - Mercury, Total (dry wt.)					<i>Test was conducted by: Analytica - Fairbanks</i>			
Mercury	<MRL	mg/Kg		0.063	7471A	9/23/2004	9/23/2004	JDP

Lab#: F0409252-01B

**Analysis Method**

Parameter	Result	Units	Flags	MRL	Prep Method	Prep Date	Analysis Date	Analyst
8082/3550B (Solid) - PCB (dry wt.)					<i>Test was conducted by: Analytica - Thornton</i>			
Aroclor-1016	<MRL	ug/Kg		13	3550B	9/21/2004	10/13/2004	PS
Aroclor-1221	<MRL	ug/Kg		14	3550B	9/21/2004	10/13/2004	PS
Aroclor-1232	<MRL	ug/Kg		13	3550B	9/21/2004	10/13/2004	PS
Aroclor-1242	<MRL	ug/Kg		13	3550B	9/21/2004	10/13/2004	PS
Aroclor-1248	<MRL	ug/Kg		13	3550B	9/21/2004	10/13/2004	PS
Aroclor-1254	<MRL	ug/Kg		13	3550B	9/21/2004	10/13/2004	PS
Aroclor-1260	<MRL	ug/Kg		13	3550B	9/21/2004	10/13/2004	PS

**Surrogate Recoveries**

Decachlorobiphenyl	123	% Recov		0.77	3550B	9/21/2004	10/13/2004	PS
Tetrachlorometaxylene	36.4	% Recov		0.77	3550B	9/21/2004	10/13/2004	PS

*Ellen Williams*

Reported by: Ellen Williams,  
 Laboratory Project Manager



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 Fax: 907-474-2282

Report Date: 11/10/2004  
 Receipt Date: 9/16/2004  
 Sample Date: 9/7/2004  
 Sample Time: 1:10:00PM  
 Collected By: SF

Client Sample ID: **WCW3-1-904**  
 Client Project: Wolf Creek Well- Arctic  
 Location:  
 Sample Matrix: Solid  
 COC #: 38059  
 PWS#:  
 Comments:

Flag Definitions:  
 MRL = Method Reporting Limit  
 MCL = Maximum Contaminant Limit  
 B = Present also in Method Blank  
 H = Exceeds Regulatory Limit  
 M = Matrix Interference  
 J = Estimated Value  
 D = Lost to Dilution  
 \*\* = RL higher than MCL; target not detected

Sample Comment:

Lab#: F0409252-01C

**Analysis Method**

Parameter	Result	Units	Flags	MRL	Prep Method	Prep Date	Analysis Date	Analyst
6010B/3050B (Solid) - RCRA (dry wt.)					<i>Test was conducted by: Analytica - Thornton</i>			
Arsenic	9.0	mg/Kg		8.0	3050B	11/4/2004	11/8/2004	KB
Barium	6800	mg/Kg		0.25	3050B	11/4/2004	11/8/2004	KB
Cadmium	1.4	mg/Kg		0.49	3050B	11/4/2004	11/8/2004	KB
Chromium	26	mg/Kg		1.2	3050B	11/4/2004	11/8/2004	KB
Lead	430	mg/Kg		3.7	3050B	11/4/2004	11/8/2004	KB
Selenium	<MRL	mg/Kg		6.1	3050B	11/4/2004	11/8/2004	KB
Silver	<MRL	mg/Kg		0.92	3050B	11/4/2004	11/8/2004	KB

*Ellen Williams*

Reported by: Ellen Williams,  
 Laboratory Project Manager



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Report Date: 11/10/2004  
 Receipt Date: 9/16/2004  
 Sample Date: 9/7/2004  
 Sample Time: 1:15:00PM  
 Collected By: SF

Client Sample ID: **WCW3-2-904**  
 Client Project : Wolf Creek Well-Arctic  
 Location:  
 Sample Matrix: Solid  
 COC #: 38059  
 PWS#:  
 Comments:

Flag Definitions:  
 MRL = Method Reporting Limit  
 MCL = Maximum Contaminant Limit  
 B = Present also in Method Blank  
 H = Exceeds Regulatory Limit  
 M = Matrix Interference  
 J = Estimated Value  
 D = Lost to Dilution  
 \*\* = RL higher than MCL; target not detected

Sample Comment:

Lab#: F0409252-02A

**Analysis Method**

Parameter	Result	Units	Flags	MRL	Prep Method	Prep Date	Analysis Date	Analyst
7471A/7471A (Solid) - Mercury, Total (dry wt.)					<i>Test was conducted by: Analytica - Fairbanks</i>			
Mercury	<MRL	mg/Kg		0.056	7471A	9/23/2004	9/23/2004	JDP

Lab#: F0409252-02B

**Analysis Method**

Parameter	Result	Units	Flags	MRL	Prep Method	Prep Date	Analysis Date	Analyst
8082/3550B (Solid) - PCB (dry wt.)					<i>Test was conducted by: Analytica - Thornton</i>			
Aroclor-1016	<MRL	ug/Kg		11	3550B	9/21/2004	10/13/2004	PS
Aroclor-1221	<MRL	ug/Kg		12	3550B	9/21/2004	10/13/2004	PS
Aroclor-1232	<MRL	ug/Kg		11	3550B	9/21/2004	10/13/2004	PS
Aroclor-1242	<MRL	ug/Kg		11	3550B	9/21/2004	10/13/2004	PS
Aroclor-1248	<MRL	ug/Kg		11	3550B	9/21/2004	10/13/2004	PS
Aroclor-1254	<MRL	ug/Kg		11	3550B	9/21/2004	10/13/2004	PS
Aroclor-1260	<MRL	ug/Kg		11	3550B	9/21/2004	10/13/2004	PS

**Surrogate Recoveries**

Decachlorobiphenyl	62.7	% Recov		0.69	3550B	9/21/2004	10/13/2004	PS
Tetrachlorometaxylene	35.7	% Recov		0.69	3550B	9/21/2004	10/13/2004	PS

*Ellen Williams*

Reported by: Ellen Williams,  
 Laboratory Project Manager



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 Fax: 907-474-2282

Report Date: 11/10/2004  
 Receipt Date: 9/16/2004  
 Sample Date: 9/7/2004  
 Sample Time: 1:15:00PM  
 Collected By: SF

Client Sample ID: **WCW3-2-904**  
 Client Project: Wolf Creek Well-Arctic  
 Location:  
 Sample Matrix: Solid  
 COC #: 38059  
 PWS#:  
 Comments:

Flag Definitions:  
 MRL = Method Reporting Limit  
 MCL = Maximum Contaminant Limit  
 B = Present also in Method Blank  
 H = Exceeds Regulatory Limit  
 M = Matrix Interference  
 J = Estimated Value  
 D = Lost to Dilution  
 \*\* = RL higher than MCL; target not detected

Sample Comment:

Lab#: F0409252-02C

**Analysis Method**

Parameter	Result	Units	Flags	MRL	Prep Method	Prep Date	Analysis Date	Analyst
6010B/3050B (Solid) - RCRA (dry wt.)					<i>Test was conducted by: Analytica - Thornton</i>			
Arsenic	<MRL	mg/Kg		6.6	3050B	11/4/2004	11/8/2004	KB
Barium	5400	mg/Kg		0.20	3050B	11/4/2004	11/8/2004	KB
Cadmium	0.84	mg/Kg		0.41	3050B	11/4/2004	11/8/2004	KB
Chromium	20	mg/Kg		1.0	3050B	11/4/2004	11/8/2004	KB
Lead	140	mg/Kg		3.0	3050B	11/4/2004	11/8/2004	KB
Selenium	<MRL	mg/Kg		5.1	3050B	11/4/2004	11/8/2004	KB
Silver	<MRL	mg/Kg		0.76	3050B	11/4/2004	11/8/2004	KB

*Ellen Williams*

Reported by: Ellen Williams,  
 Laboratory Project Manager



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 907-474-2353  
 Fax: 907-474-2282

Report Date: 11/10/2004  
 Receipt Date: 9/16/2004  
 Sample Date: 9/7/2004  
 Sample Time: 1:20:00PM  
 Collected By: SF

Client Sample ID: **WCW3-3-904**  
 Client Project: Wolf Creek Well-Arctic  
 Location:  
 Sample Matrix: Solid  
 COC #: 38059  
 PWS#:  
 Comments:

Flag Definitions:  
 MRL = Method Reporting Limit  
 MCL = Maximum Contaminant Limit  
 B = Present also in Method Blank  
 H = Exceeds Regulatory Limit  
 M = Matrix Interference  
 J = Estimated Value  
 D = Lost to Dilution  
 \*\* = RL higher than MCL; target not detected

Sample Comment:

Lab#: F0409252-03A

**Analysis Method**

Parameter	Result	Units	Flags	MRL	Prep Method	Prep Date	Analysis Date	Analyst
7471A/7471A (Solid) - Mercury, Total (dry wt.)					<i>Test was conducted by: Analytica - Fairbanks</i>			
Mercury	<MRL	mg/Kg		0.063	7471A	9/23/2004	9/23/2004	JDP

Lab#: F0409252-03B

**Analysis Method**

Parameter	Result	Units	Flags	MRL	Prep Method	Prep Date	Analysis Date	Analyst
8082/3550B (Solid) - PCB (dry wt.)					<i>Test was conducted by: Analytica - Thornton</i>			
Aroclor-1016	<MRL	ug/Kg		13	3550B	9/21/2004	10/13/2004	PS
Aroclor-1221	<MRL	ug/Kg		14	3550B	9/21/2004	10/13/2004	PS
Aroclor-1232	<MRL	ug/Kg		13	3550B	9/21/2004	10/13/2004	PS
Aroclor-1242	<MRL	ug/Kg		13	3550B	9/21/2004	10/13/2004	PS
Aroclor-1248	<MRL	ug/Kg		13	3550B	9/21/2004	10/13/2004	PS
Aroclor-1254	<MRL	ug/Kg		13	3550B	9/21/2004	10/13/2004	PS
Aroclor-1260	<MRL	ug/Kg		13	3550B	9/21/2004	10/13/2004	PS
<b>Surrogate Recoveries</b>								
Decachlorobiphenyl	78.8	% Recov		0.78	3550B	9/21/2004	10/13/2004	PS
Tetrachlorometaxylene	70.2	% Recov		0.78	3550B	9/21/2004	10/13/2004	PS

*Ellen Williams*

Reported by: Ellen Williams,  
 Laboratory Project Manager



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 Fax: 907-456-3125

BLM Northern Field Office  
 Attn: Susan Flora  
 1150 University Avenue  
 Fairbanks, AK 99709  
 907-474-2353  
 Fax: 907-474-2282

Report Date: 11/10/2004  
 Receipt Date: 9/16/2004  
 Sample Date: 9/7/2004  
 Sample Time: 1:20:00PM  
 Collected By: SF

Client Sample ID: **WCW3-3-904**  
 Client Project: Wolf Creek Well-Arctic  
 Location:  
 Sample Matrix: Solid  
 COC #: 38059  
 PWS#:  
 Comments:

Flag Definitions:  
 MRL = Method Reporting Limit  
 MCL = Maximum Contaminant Limit  
 B = Present also in Method Blank  
 H = Exceeds Regulatory Limit  
 M = Matrix Interference  
 J = Estimated Value  
 D = Lost to Dilution  
 \*\* = RL higher than MCL; target not detected

Sample Comment:

Lab#: F0409252-03C

**Analysis Method**

Parameter	Result	Units	Flags	MRL	Prep Method	Prep Date	Analysis Date	Analyst
6010B/3050B (Solid) - RCRA (dry wt.)					<i>Test was conducted by: Analytica - Thornton</i>			
Arsenic	11	mg/Kg		8.0	3050B	11/4/2004	11/8/2004	KB
Barium	520	mg/Kg		0.25	3050B	11/4/2004	11/8/2004	KB
Cadmium	0.72	mg/Kg		0.49	3050B	11/4/2004	11/8/2004	KB
Chromium	27	mg/Kg		1.2	3050B	11/4/2004	11/8/2004	KB
Lead	11	mg/Kg		3.7	3050B	11/4/2004	11/8/2004	KB
Selenium	<MRL	mg/Kg		6.1	3050B	11/4/2004	11/8/2004	KB
Silver	<MRL	mg/Kg		0.92	3050B	11/4/2004	11/8/2004	KB

*Ellen Williams*

Reported by: Ellen Williams,  
 Laboratory Project Manager



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 907-474-2353  
 Fax: 907-474-2282

Report Date: 11/10/2004  
 Receipt Date: 9/16/2004  
 Sample Date: 9/7/2004  
 Sample Time: 1:25:00PM  
 Collected By: SF

Client Sample ID: **WCW3-W01**  
 Client Project: Wolf Creek Well-Arctic  
 Location:  
 Sample Matrix: Waste Water  
 COC #: 38059  
 PWS#:  
 Comments:

Flag Definitions:  
 MRL = Method Reporting Limit  
 MCL = Maximum Contaminant Limit  
 B = Present also in Method Blank  
 H = Exceeds Regulatory Limit  
 M = Matrix Interference  
 J = Estimated Value  
 D = Lost to Dilution  
 \*\* = RL higher than MCL; target not detected

Sample Comment:

Lab#: F0409252-04A

**Analysis Method**

Parameter	Result	Units	Flags	MRL	Prep Method	Prep Date	Analysis Date	Analyst
7470A/7470A (Aqueous) - Mercury, total					<i>Test was conducted by: Analytica - Fairbanks</i>			
Mercury	<MRL	mg/L		0.0020	7470A	9/29/2004	9/29/2004	JDP

Lab#: F0409252-04B

**Analysis Method**

Parameter	Result	Units	Flags	MRL	Prep Method	Prep Date	Analysis Date	Analyst
8082/3520C (Aqueous) - PCB					<i>Test was conducted by: Analytica - Thornton</i>			
Aroclor-1016	<MRL	ug/L		0.56	3520C	9/21/2004	10/12/2004	PS
Aroclor-1221	<MRL	ug/L		0.56	3520C	9/21/2004	10/12/2004	PS
Aroclor-1232	<MRL	ug/L		0.56	3520C	9/21/2004	10/12/2004	PS
Aroclor-1242	<MRL	ug/L		0.56	3520C	9/21/2004	10/12/2004	PS
Aroclor-1248	<MRL	ug/L		0.56	3520C	9/21/2004	10/12/2004	PS
Aroclor-1254	<MRL	ug/L		0.56	3520C	9/21/2004	10/12/2004	PS
Aroclor-1260	<MRL	ug/L		0.56	3520C	9/21/2004	10/12/2004	PS

**Surrogate Recoveries**

Decachlorobiphenyl	99.9	% Recov		0.026	3520C	9/21/2004	10/12/2004	PS
Tetrachlorometaxylene	33.7	% Recov		0.033	3520C	9/21/2004	10/12/2004	PS

*Ellen Williams*

Reported by: Ellen Williams,  
 Laboratory Project Manager



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 1150 University Avenue  
 Fairbanks, AK 99709  
 907-474-2353  
 Fax: 907-474-2282

Report Date: 11/10/2004  
 Receipt Date: 9/16/2004  
 Sample Date: 9/7/2004  
 Sample Time: 1:25:00PM  
 Collected By: SF

Client Sample ID: **WCW3-W01**  
 Client Project: Wolf Creek Well-Arctic  
 Location:  
 Sample Matrix: Waste Water  
 COC #: 38059  
 PWS#:  
 Comments:

Flag Definitions:  
 MRL = Method Reporting Limit  
 MCL = Maximum Contaminant Limit  
 B = Present also in Method Blank  
 H = Exceeds Regulatory Limit  
 M = Matrix Interference  
 J = Estimated Value  
 D = Lost to Dilution  
 \*\* = RL higher than MCL; target not detected

Sample Comment:

Lab#: F0409252-04C

**Analysis Method**

Parameter	Result	Units	Flags	MRL	Prep Method	Prep Date	Analysis Date	Analyst
6010B/3010A (Aqueous) - RCRA					<i>Test was conducted by: Analytica - Thornton</i>			
Arsenic	<MRL	mg/L		0.10	3010A	11/3/2004	11/8/2004	KB
Barium	1.4	mg/L		0.0100	3010A	11/3/2004	11/8/2004	KB
Cadmium	<MRL	mg/L		0.0060	3010A	11/3/2004	11/5/2004	KB
Chromium	<MRL	mg/L		0.0100	3010A	11/3/2004	11/5/2004	KB
Lead	<MRL	mg/L		0.050	3010A	11/3/2004	11/5/2004	KB
Selenium	<MRL	mg/L		0.10	3010A	11/3/2004	11/8/2004	KB
Silver	<MRL	mg/L		0.015	3010A	11/3/2004	11/5/2004	KB

*Ellen Williams*

Reported by: Ellen Williams,  
 Laboratory Project Manager





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US Bureau of Land Management  
1150 University Avenue  
Fairbanks, Alaska 99709-3844

Report Date: 10/1/03  
Date Arrived: 9/15/03  
Date Sampled: 9/10/03  
Time Sampled: 10:00  
Collected By:

Attn:  
Phone: (907) 474-2303  
Fax: (907) 474-2282

NTL Lab#: F314897  
Client Sample ID: Ublutuoch 55  
Client Project: NPRA  
Location:  
Sample Matrix: Water  
COC #: 38952

### Flag Definitions

MRL = Method Reporting Limit  
MCL = Maximum Contaminant Level  
B = Present in Blank  
H = Exceeds Regulatory Limit  
M = Matrix Interference  
J = Estimated Value  
D = Lost to Dilution  
U = Less Than Reporting Limit

Comments:

### Analysis Method

Parameter	Result	Units	Flag	MRL	MCL	Prep Method	Prep Date	Analysis Date
<b>EPA 200.7</b>								
Calcium	10	mg/L		0.083		SM 3030K	9/22/03	9/24/03
Iron	0.29	mg/L		0.11		SM 3030K	9/22/03	9/24/03
Magnesium	1.8	mg/L		0.056		SM 3030K	9/22/03	9/24/03
Potassium	< MRL	mg/L	U	0.42		SM 3030K	9/22/03	10/1/03
Silicon	0.15	mg/L		0.056		SM 3030K	9/22/03	9/30/03
Sodium	2.4	mg/L		0.56		SM 3030K	9/22/03	10/1/03
<b>EPA 300.0</b>								
Chloride	5.2	mg/L		1.3				9/17/03
Sulfate	< MRL	mg/L	U	2.5				9/17/03

Reported by Jorma Kuusisto  
Fairbanks Chemistry Supervisor

00/00-01 9/10/03



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1150 University Avenue  
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Attn:  
Phone: (907) 474-2303  
Fax: (907) 474-2282

NTL Lab#: F314896  
Client Sample ID: Fish 112  
Client Project: NPRA  
Location:  
Sample Matrix: Water  
COC #: 38952

Report Date: 10/1/03  
Date Arrived: 9/15/03  
Date Sampled: 9/10/03  
Time Sampled: 14:15  
Collected By:

### Flag Definitions

MRL = Method Reporting Limit  
MCL = Maximum Contaminant Level  
B = Present in Blank  
H = Exceeds Regulatory Limit  
M = Matrix Interference  
J = Estimated Value  
D = Lost to Dilution  
U = Less Than Reporting Limit

Comments:

### Analysis Method

Parameter	Result	Units	Flag	MRL	MCL	Prep Method	Prep Date	Analysis Date
<b>EPA 200.7</b>								
Calcium	16	mg/L		0.083		SM 3030K	9/22/03	9/24/03
Iron	0.43	mg/L		0.11		SM 3030K	9/22/03	9/24/03
Magnesium	1.4	mg/L		0.056		SM 3030K	9/22/03	9/24/03
Potassium	< MRL	mg/L	U	0.42		SM 3030K	9/22/03	10/1/03
Silicon	0.61	mg/L		0.056		SM 3030K	9/22/03	9/30/03
Sodium	1.3	mg/L		0.56		SM 3030K	9/22/03	10/1/03
<b>EPA 300.0</b>								
Chloride	2.7	mg/L		1.3				9/17/03
Sulfate	< MRL	mg/L	U	2.5				9/17/03

Reported by Jorma Kuusisto  
Fairbanks Chemistry Supervisor

2020/01/09 10:02:03



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1150 University Avenue  
Fairbanks, Alaska 99709-3844

Attn:  
Phone: (907) 474-2303  
Fax: (907) 474-2282

NTL Lab#: F314895  
Client Sample ID: Inigok Ck  
Client Project: NPRA  
Location:  
Sample Matrix: Water  
COC #: 38952

Report Date: 10/1/03  
Date Arrived: 9/15/03  
Date Sampled: 9/9/03  
Time Sampled: 16:40  
Collected By:

### Flag Definitions

MRL = Method Reporting Limit  
MCL = Maximum Contaminant Level  
B = Present in Blank  
H = Exceeds Regulatory Limit  
M = Matrix Interference  
J = Estimated Value  
D = Lost to Dilution  
U = Less Than Reporting Limit

Comments:

### Analysis Method

Parameter	Result	Units	Flag	MRL	MCL	Prep Method	Prep Date	Analysis Date
<b>EPA 200.7</b>								
Calcium	18	mg/L		0.083		SM 3030K	9/22/03	9/24/03
Iron	0.22	mg/L		0.11		SM 3030K	9/22/03	9/24/03
Magnesium	1.8	mg/L		0.056		SM 3030K	9/22/03	9/24/03
Potassium	< MRL	mg/L	U	0.42		SM 3030K	9/22/03	10/1/03
Silicon	0.20	mg/L		0.056		SM 3030K	9/22/03	9/30/03
Sodium	1.9	mg/L		0.56		SM 3030K	9/22/03	10/1/03
<b>EPA 300.0</b>								
Chloride	3.8	mg/L		1.3				9/17/03
Sulfate	< MRL	mg/L	U	2.5				9/17/03

Reported by Jorma Kuusisto  
Fairbanks Chemistry Supervisor

RM 10:44 10/03/03



# NORTHERN TESTING LABORATORIES, INC.

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US Bureau of Land Management  
1150 University Avenue  
Fairbanks, Alaska 99709-3844

Attn:  
Phone: (907) 474-2303  
Fax: (907) 474-2282

NTL Lab#: F314894  
Client Sample ID: Judy 124  
Client Project: NPRA  
Location:  
Sample Matrix: Water  
COC #: 38952

Report Date: 10/1/03  
Date Arrived: 9/15/03  
Date Sampled: 8/20/03  
Time Sampled: 16:50  
Collected By:

### Flag Definitions

MRL = Method Reporting Limit  
MCL = Maximum Contaminant Level  
B = Present in Blank  
H = Exceeds Regulatory Limit  
M = Matrix Interference  
J = Estimated Value  
D = Lost to Dilution  
U = Less Than Reporting Limit

Comments: Metals were preserved past 14 day method hold time.

### Analysis Method

Parameter	Result	Units	Flag	MRL	MCL	Prep Method	Prep Date	Analysis Date
<b>EPA 200.7</b>								
Calcium	9.5	mg/L		0.083		SM 3030K	9/22/03	9/24/03
Iron	0.49	mg/L		0.11		SM 3030K	9/22/03	9/24/03
Magnesium	2.0	mg/L		0.056		SM 3030K	9/22/03	9/24/03
Potassium	< MRL	mg/L	U	0.42		SM 3030K	9/22/03	10/1/03
Silicon	2.5	mg/L		0.056		SM 3030K	9/22/03	9/30/03
Sodium	1.4	mg/L		0.56		SM 3030K	9/22/03	10/1/03
<b>EPA 300.0</b>								
Chloride	< MRL	mg/L	U	1.3				9/17/03
Sulfate	2.7	mg/L		2.5				9/17/03

Reported by Jorma Kuusisto  
Fairbanks Chemistry Supervisor

03/20/03 14:01:44



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1150 University Avenue  
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Report Date: 10/1/03  
Date Arrived: 9/15/03  
Date Sampled: 9/10/03  
Time Sampled: 17:45  
Collected By:

Attn:  
Phone: (907) 474-2303  
Fax: (907) 474-2282

### Flag Definitions

MRL = Method Reporting Limit  
MCL = Maximum Contaminant Level  
B = Present in Blank  
H = Exceeds Regulatory Limit  
M = Matrix Interference  
J = Estimated Value  
D = Lost to Dilution  
U = Less Than Reporting Limit

NTL Lab#: F314893  
Client Sample ID: Judy NR Sq Lake  
Client Project: NPRA  
Location:  
Sample Matrix: Water  
COC #: 38952

Comments:

### Analysis Method

Parameter	Result	Units	Flag	MRL	MCL	Prep Method	Prep Date	Analysis Date
<b>EPA 200.7</b>								
Calcium	12	mg/L		0.083		SM 3030K	9/22/03	9/24/03
Iron	0.33	mg/L		0.11		SM 3030K	9/22/03	9/24/03
Magnesium	2.4	mg/L		0.056		SM 3030K	9/22/03	9/24/03
Potassium	< MRL	mg/L	U	0.42		SM 3030K	9/22/03	10/1/03
Silicon	2.8	mg/L		0.056		SM 3030K	9/22/03	9/30/03
Sodium	< MRL	mg/L	U	0.56		SM 3030K	9/22/03	10/1/03
<b>EPA 300.0</b>								
Chloride	< MRL	mg/L	U	1.3				9/17/03
Sulfate	< MRL	mg/L	U	2.5				9/17/03

Reported by Jorma Kuusisto  
Fairbanks Chemistry Supervisor

010-00100000



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Attn:  
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NTL Lab#: F314892  
Client Sample ID: Fish 80  
Client Project: NPRA  
Location:  
Sample Matrix: Water  
COC #: 38952

Report Date: 10/1/03  
Date Arrived: 9/15/03  
Date Sampled: 9/9/03  
Time Sampled: 17:30  
Collected By:

### Flag Definitions

MRL = Method Reporting Limit  
MCL = Maximum Contaminant Level  
B = Present in Blank  
H = Exceeds Regulatory Limit  
M = Matrix Interference  
J = Estimated Value  
D = Lost to Dilution  
U = Less Than Reporting Limit

Comments:

### Analysis Method

Parameter	Result	Units	Flag	MRL	MCL	Prep Method	Prep Date	Analysis Date
<b>EPA 200.7</b>								
Calcium	21	mg/L		0.083		SM 3030K	9/22/03	9/24/03
Iron	0.37	mg/L		0.11		SM 3030K	9/22/03	9/24/03
Magnesium	1.9	mg/L		0.056		SM 3030K	9/22/03	9/24/03
Potassium	< MRL	mg/L	U	0.42		SM 3030K	9/22/03	10/1/03
Silicon	0.39	mg/L		0.056		SM 3030K	9/22/03	9/30/03
Sodium	1.9	mg/L		0.56		SM 3030K	9/22/03	10/1/03
<b>EPA 300.0</b>								
Chloride	3.6	mg/L		1.3				9/17/03
Sulfate	< MRL	mg/L	U	2.5				9/17/03

Reported by Jorma Kuusisto  
Fairbanks Chemistry Supervisor

2003/01/07 09:15



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1150 University Avenue  
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Attn:  
Phone: (907) 474-2303  
Fax: (907) 474-2282

NTL Lab#: F314891  
Client Sample ID: Kalikpik  
Client Project: NPRA  
Location:  
Sample Matrix: Water  
COC #: 38952

Report Date: 10/1/03  
Date Arrived: 9/15/03  
Date Sampled: 9/9/03  
Time Sampled: 13:05  
Collected By:

### Flag Definitions

MRL = Method Reporting Limit  
MCL = Maximum Contaminant Level  
B = Present in Blank  
H = Exceeds Regulatory Limit  
M = Matrix Interference  
J = Estimated Value  
D = Lost to Dilution  
U = Less Than Reporting Limit

Comments:

### Analysis Method

Parameter	Result	Units	Flag	MRL	MCL	Prep Method	Prep Date	Analysis Date
<b>EPA 200.7</b>								
Calcium	27	mg/L		0.083		SM 3030K	9/22/03	9/24/03
Iron	0.31	mg/L		0.11		SM 3030K	9/22/03	9/24/03
Magnesium	3.0	mg/L		0.056		SM 3030K	9/22/03	9/24/03
Potassium	0.49	mg/L		0.42		SM 3030K	9/22/03	10/1/03
Silicon	0.28	mg/L		0.056		SM 3030K	9/22/03	9/30/03
Sodium	4.8	mg/L		0.56		SM 3030K	9/22/03	10/1/03
<b>EPA 300.0</b>								
Chloride	11	mg/L		1.3				9/17/03
Sulfate	< MRL	mg/L	U	2.5				9/17/03

Reported by Jorma Kuusisto  
Fairbanks Chemistry Supervisor

03-00-01 20-00 10/01/03



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Attn:  
Phone: (907) 474-2303  
Fax: (907) 474-2282

NTL Lab#: F314890  
Client Sample ID: N. Fork Kalikpik  
Client Project: NPRA  
Location:  
Sample Matrix: Water  
COC #: 38952

Report Date: 10/1/03  
Date Arrived: 9/15/03  
Date Sampled: 9/9/03  
Time Sampled: 12:00  
Collected By:

### Flag Definitions

MRL = Method Reporting Limit  
MCL = Maximum Contaminant Level  
B = Present in Blank  
H = Exceeds Regulatory Limit  
M = Matrix Interference  
J = Estimated Value  
D = Lost to Dilution  
U = Less Than Reporting Limit

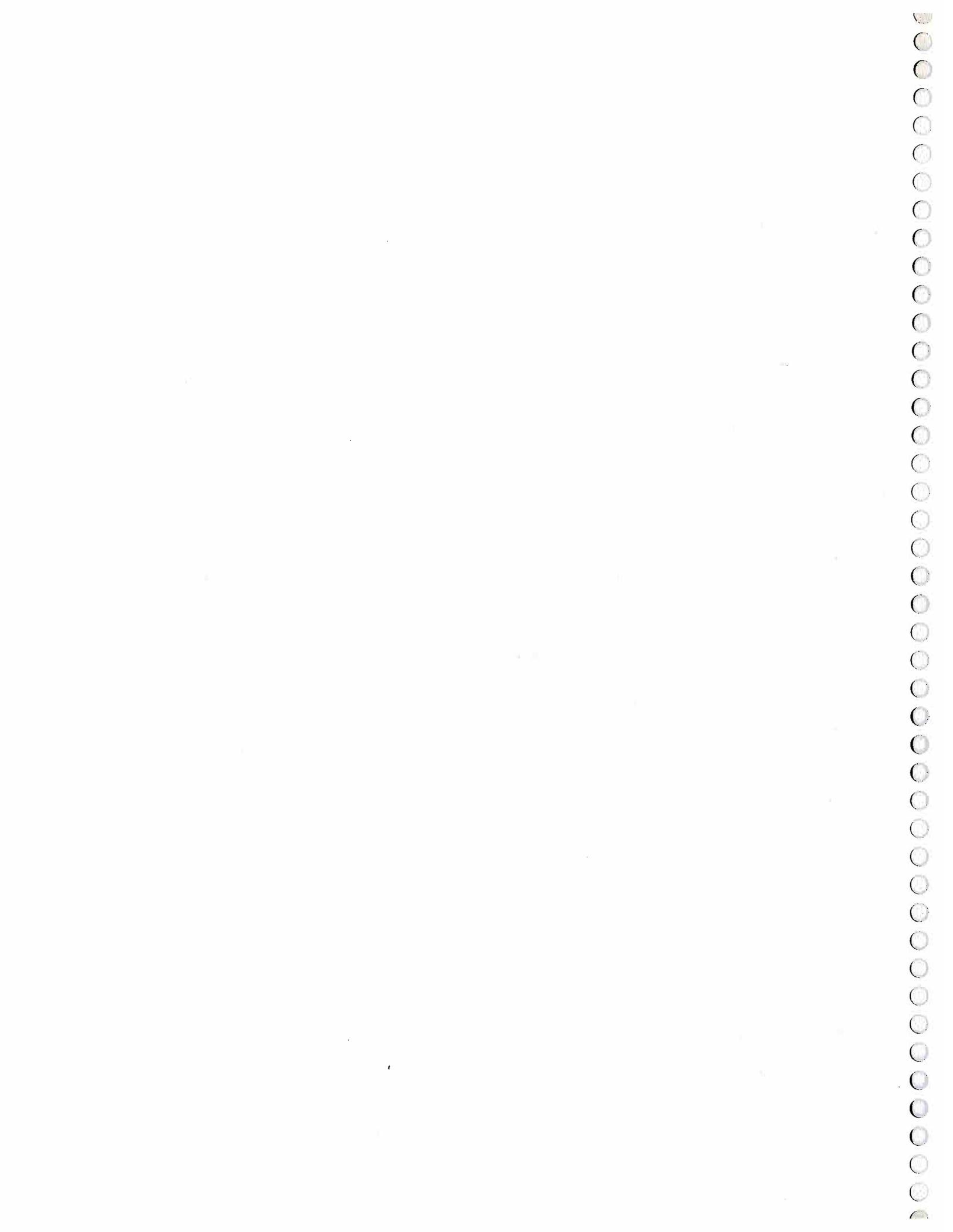
Comments:

### Analysis Method

Parameter	Result	Units	Flag	MRL	MCL	Prep Method	Prep Date	Analysis Date
<b>EPA 200.7</b>								
Calcium	27	mg/L		0.083		SM 3030K	9/22/03	9/24/03
Iron	0.72	mg/L		0.11		SM 3030K	9/22/03	9/24/03
Magnesium	3.9	mg/L		0.056		SM 3030K	9/22/03	9/24/03
Potassium	0.43	mg/L		0.42		SM 3030K	9/22/03	10/1/03
Silicon	0.43	mg/L		0.056		SM 3030K	9/22/03	9/30/03
Sodium	8.1	mg/L		0.56		SM 3030K	9/22/03	10/1/03
<b>EPA 300.0</b>								
Chloride	20	mg/L		12				9/17/03
Sulfate	< MRL	mg/L	U	25				9/17/03

Reported by Jorma Kuusisto  
Fairbanks Chemistry Supervisor

03/03/03 10:00 AM





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