Final Report

Limited Soil Investigation of Project Chariot Test Holes

Cape Thompson, Alaska

December 2010

Prepared for

U.S. Department of Energy

and

U.S. Army Corps of Engineers, Alaska District

Post Office Box 6898
Elmendorf AFB, Alaska 99506-6898

Contract W911KB-08-D-0003

Task Order 12, Mod 001

Prepared by

Fairbanks Environmental Services

3538 International Street
Fairbanks, Alaska 99701 (907) 452-1006
FES Project No. 5012-06

TABLE OF CONTENTS

Page Number

EXECUTIVE SUMMARY

1.0 INTRODUCTION 1-1

1.1 Site Background 1-1
1.2 Site Physical Characteristics 1-2
1.3 Summary of Previous Investigations Associated with Test Holes 1-3
1.4 Site Cleanup Levels 1-3

2.0 FIELD OPERATIONS 2-1

2.1 Mobilization 2-1
2.2 Field Camp 2-1
2.3 Demobilization 2-1

3.0 SAMPLE LOCATION IDENTIFICATION AND COLLECTION 3-1

3.1 Sample Locations 3-1
3.2 Sample Collection 3-1
3.3 GPS Survey 3-2
3.4 Decontamination and Investigative Derived Waste 3-2

4.0 SAMPLE RESULTS 4-1

4.1 Test Hole Able 4-1
4.2 Test Hole Baker 4-2
4.3 Test Hole Charlie 4-2
4.4 Test Hole Dog 4-3
4.5 Test Hole X1 4-4
4.6 Deviations from Work Plan 4-4

5.0 CONCLUSIONS 5-1

6.0 REFERENCES 6-1

TABLE OF CONTENTS (Continued)

Tables

Table 1 - Sample Summary
Table 2 - Analytical Results

Figures

Figure 1 - Regional Site Map
Figure 2 - Project Site Map
Figure 3 – DRO Concentrations in Soil Samples Collected from Test Hole Able Site
Figure 4 – DRO Concentrations in Soil Samples Collected from Test Hole Baker Site
Figure 5 – DRO Concentrations in Soil Samples Collected from Test Hole Charlie Site
Figure 6 – DRO Concentrations in Soil Samples Collected from Test Hole Dog Site
Figure 7 – DRO Concentrations in Soil Samples Collected from Test Hole X1 Site

Appendices

Appendix A – Site Photographs
Appendix B – Field Notes
Appendix C – GPS Data
Appendix D – CDQR and ADEC Checklists
Appendix E – Review Comments and Responses

LIST OF ACRONYMS AND ABBREVIATIONS

ADEC	Alaska Department of Environmental Conservation
AEC	U.S. Atomic Energy Commission
bgs	below ground surface
BLM	Bureau of Land Management
CDQR	Chemical Data Quality Report
DOE	Department of Energy
DRO	diesel range organics
°F	degrees Fahrenheit
FES	Fairbanks Environmental Services
FUDS	Formerly Used Defense Site
GPS	Global Positioning System
ID	Inner diameter
IDW	Investigation Derived Waste
LM	Office of Legacy Management
mg/kg	milligrams per kilogram
NALEMP	Native American Lands Environmental Mitigation Program
OD	Outer diameter
POL	petroleum, oil, lubricants
QAPP	Quality Assurance Program Plan
TOC	Top of casing
USACE	United States Army Corps of Engineers
USGS	U.S. Geological Survey

EXECUTIVE SUMMARY

A limited soil investigation was performed during July 2010 in the vicinity of five test holes near Cape Thompson, Alaska. The test holes were designated as Test Holes Able, Baker, Charlie, Dog, and X1 were installed by the Atomic Energy Commission (AEC) circa 1960. Test Holes Able, Baker, Charlie, and Dog were installed to evaluate subsurface site conditions as part of Project Chariot. Based on the description and location, Test Hole X1 was most likely an emplacement hole for a chemical explosives test that was not performed (U.S. AEC 1961). Project Chariot, an experimental project to create an artificial harbor through the detonation of nuclear devices, was cancelled in 1962 due to lack of public support. Diesel may have been used during the installation of the test holes, as it was commonly used in drilling mud during that time period. Diesel range organics (DRO) were detected in all five surface soil samples collected near Test Hole Baker during a previous 2008 investigation (FES 2008) and DRO concentrations ranged from 10 to 2,000 milligrams per kilogram (mg/kg).

The 2010 investigation was performed to characterize and delineate potentially DRO contaminated soil in the vicinity of the test holes. A total of 19 surface soil samples were collected from within a 50 foot radius of each test hole from pre-determined locations along six equally spaced radii.

In general, 28 of the 95 samples exceeded the ADEC Method 1 soil cleanup level of 500 mg/kg. DRO concentrations exceeded the ADEC Method 1 soil cleanup level at each of the five test hole sites. Two samples exceeded the ADEC Method 2 soil cleanup level. DRO concentrations are summarized by site below:

- Test Hole Able: No pad samples exceeded soil cleanup levels. Five tundra samples exceeded the Method 1 soil cleanup level. The highest DRO concentration at Test Hole Able site was 2,300 mg/kg.
- Test Hole Baker: One pad sample, collected adjacent to the test hole, and seven tundra samples exceeded the Method 1 soil cleanup level. The highest DRO concentration detected at this site was 2,000 mg/kg from the pad sample.
- Test Hole Charlie: Four pad samples exceeded the Method 1 soil cleanup level. The highest DRO concentration (59,000 mg/kg in sample 10CTC03SO) was collected near the edge of the pad 50 feet southwest of Test Hole Charlie. Field observations indicate that highly contaminated soil extends another 25 feet south of sample 10CTC03SO; however, no laboratory samples were collected from this area. The gross contamination on the pad was approximately 5 inches thick and may be confined vertically as visually clean soils were identified at a depth of 6 to 8 inches below ground surface at sample 10CTC03SO location. Pad thickness and depth to permafrost were not measured.

- Test Hole Dog: Seven pad samples and one tundra sample exceeded the Method 1 soil cleanup level. The highest DRO concentration (4,900 mg/kg) was detected adjacent to the test hole.
- Test Hole X1: No pad was constructed at this site because Test Hole X1 was installed on a stable hilltop. Three samples collected near the emplacement hole exceeded the Method 1 soil cleanup level. The highest DRO concentration was detected in the sample collected adjacent to the emplacement hole; at 31,000 mg/kg, the DRO concentration at this location also exceeded the Method 2 soil cleanup level. Petroleum odor was noted to be emanating from soils within the casing. Although not evaluated in this investigation, deeper soil contamination would be expected around the annulus of this test hole, assuming that the source of contamination was diesel-based drilling mud.

Test Hole sites Able, Baker, Charlie, and Dog were underlain by permafrost. Test Hole X1 is underlain by bedrock. Vertical migration of contaminants would be impeded by these confining layers. Lateral movement would also be impeded by frozen soils during the non-summer months (October through May).

1.0 INTRODUCTION

This report details the field activities and analytical results associated with a limited surface soil investigation in the vicinity of five test holes near Cape Thompson, Alaska. The test holes were installed by the U.S. Atomic Energy Commission (AEC) circa 1960 and previous field work has indicated that nearby soils may be contaminated with diesel. The field activities described in this report were performed from July 26th to 31st, 2010 concurrently with a Remedial Assessment of the Cape Thompson Naval Camp Formerly Used Defense Site (FUDS). Fairbanks Environmental Services (FES) is providing this service at the request of the Department of Energy (DOE) Office of Legacy Management (LM) under contract to the U.S. Army Corps of Engineers (USACE) Contract Number W911KB-08-D-0003 (Task Order 12, Modification 001).

1.1 Site Background

The Cape Thompson site lies in the Ogotoruk Creek valley, which is located about 120 miles northwest of Kotzebue along the coast of the Chukchi Sea (Figure 1). There are no roads in the Cape Thompson area and vehicular traffic is limited to the winter, when the river and sea ice are thick enough to permit ice roads. During summer and fall, access to the site is limited to small, fixed-wing aircraft, helicopter, barge, and all-terrain vehicle (from Point Hope, located 30 miles northwest).

The Ogotoruk Creek Valley is approximately three miles wide, seven miles long, and bordered by an 800-foot-high ridge to the west and 500-foot-high rolling hills to the east. Vegetation in the area consists of arctic and mountain tundra in the low regions, and sparse tundra in the high elevations. The flow in Ogotoruk Creek varies greatly, depending on seasonal fluctuations in precipitation and ambient temperatures. Permafrost reportedly underlies most of the area at 2 to 5 feet below ground surface (bgs).

Between 1958 and 1963, the site was evaluated by the AEC under the Plowshare Program, a program to investigate and develop peaceful uses of nuclear devices. The site was the designated location for Project Chariot, an experimental project to create an artificial harbor through the detonation of nuclear devices. The study area consisted of the entire Ogotoruk Creek drainage (approximately 4,700 acres), but most facilities were concentrated near the Chukchi Sea coast. Four test holes (Able, Baker, Charlie, and Dog) were installed within the study area to investigate subsurface conditions (Figure 2). Test Hole X1, also shown in Figure 2, was likely an emplacement hole for a chemical explosives test that was not performed (U.S. AEC 1961). By 1962, scientists had acquired a substantial amount of information, but Project Chariot was cancelled due to lack of public support. The detonation of nuclear explosives was never conducted.

The Department of the Navy assumed control of the site in December 1965 after obtaining a Bureau of Land Management (BLM) permit effective for a 5-year period. In 1972, the surface estate was set aside for review and classification by the BLM. On December 2, 1980, the area was classified as a National Wildlife Refuge, transferring jurisdiction to the U.S. Fish & Wildlife Service. 160 acres of the Cape Thompson site, including the runway and the Test Hole Able site, was included as a native allotment under the Native Claims Act of 1972. The allotment is owned by Mr. Wilfred Lane, a resident of Kotzebue.

A removal action was performed in August 1991 to clean up the Cape Thompson site. The work included demolition and disposal of tanks, structures and other improvements, and the limited excavation and offsite disposal of petroleum, oil, and lubricants (POL) contaminated soils. Debris that could not be burned was disposed in a permitted onsite landfill. In 2009, the Point Hope community performed a follow-up limited debris removal under the Native American Lands Environmental Mitigation Program (NALEMP) and removed remaining debris, equipment, and structures. The Project Chariot test holes were not part of the cleanup work.

1.2 Site Physical Characteristics

Climate

The Cape Thompson site lies north of the Arctic Circle in an area of transitional climate zone, characterized by long, cold winters and cool summers. Average temperatures range from between 40 and 60 degrees Fahrenheit (°F) in the summer, and between -20 and 0 °F in the winter. Typically, July is the warmest month and January is the coldest. Mean maximum air temperature is below freezing about from October to May. The Chukchi Sea is typically ice-free from June through October.

Late summer is the wet season with August being the wettest month. The average annual precipitation at the site is estimated to be about 8 inches. About 60 percent of the precipitation (about 5 inches) occurs as rain between June and September. The site is known for having strong winds. Winds at the site with velocities exceeding 20 knots are common.

Geology and Land Surface

The Cape Thompson site is located within the Ogotoruk Creek valley and is characterized by the following major land-surface types: rock outcrops, rubble (talus and colluvium), tundra vegetation, bare soil, and longshore lagoons [U.S. Geological Survey (USGS) 1961]. Bedrock crops out in sea cliffs, higher ridges, and in scattered streamcuts. Principal types of bedrock include mudstone, siltstone, sandstone, limestone, shale, and conglomerate. Talus is not extensive and occurs only on steep slopes, generally below limestone outcrops. Talus generally ranges from 6 inches to 2 feet at the site. Talus is intermingled with the courser colluvium that has a matrix of grit, sand, and silt. Colluvium is generally located on slopes of intermediate

steepness and essentially void of vegetation. Colluvium at the site is generally no more than a few feet thick.

Lush tundra vegetation at the site typically grows in low gradient, poorly drained areas. In other areas of the site, the vegetal cover (mainly tussock grass) is sparse and occupies all but the steepest and driest slopes. Bare soil is interspersed with the tundra vegetation and is comprised of component material described as sandy to pebbly.

1.3 Summary of Previous Investigations Associated with Test Holes

A site investigation was performed in June 2008 at the Cape Thompson Naval Camp FUDS by FES. As part of that site investigation, which mainly focused on the camp area, five discrete surface soil samples were collected adjacent to Test Hole Baker at the request of a representative of the Native Allotment owner. Because diesel was commonly used in drilling mud during the test hole installation time period, the soils were analyzed for fuel-related compounds. Diesel range organics (DRO) was detected in all five samples. The maximum DRO concentration detected was 2,000 milligrams per kilogram (mg/kg) in a sample collected from approximately 10 feet southwest of the test hole Baker (FES 2008).

1.4 Site Cleanup Levels

The Method 1 cleanup level (Table A2 of 18 AAC 75.341) of 500 mg/kg is the applicable cleanup level for DRO in soil based on the source of contamination (i.e. drilling mud) and the fact that the contamination is primarily within man made gravel pads. The Method 2 Arctic Zone soil cleanup level (Table B2 of 18 AAC 75.341) of 12,500 mg/kg for DRO may be the applicable level for evaluating samples collected from native tundra. The Cape Thompson site lies north of latitude 68 North, which meets one of the criteria of "Arctic Zone" according to 18 AAC 75.990. In addition the site meets the specific requirement of being underlain with a continuous layer of permafrost. All DRO results were compared to both the Method 1 and the Method 2 cleanup levels.

2.0 FIELD OPERATIONS

The following section discusses the planned field logistics that were followed based on the remote nature of the Cape Thompson project site. Sampling and other field activities are presented in Section 3.

2.1 Mobilization

The field crew mobilized to Kotzebue from Anchorage and Fairbanks, Alaska on July 26th 2010. Field gear was shipped via air cargo to Kotzebue several days prior to departure. The field crew and gear was transported via a small fixed wing aircraft from Kotzebue to a landing strip located at the Cape Thompson project site on July 27th. Northwest Aviation, a regional airline located in Kotzebue, provided air transport. Three trips were needed to transport field crew and gear to the site from Kotzebue.

2.2 Field Camp

The field crew was housed in a portable field camp that was transported to the site. The field camp was situated near the runway and included one tent for sleeping. The tent was installed on the southeast corner of the existing structure. The existing structure was also used to store gear and as a staging area for performing field work. The field camp was equipped with a satellite phone to enable communication with the FES offices and to allow for emergency notifications. The field crew contacted the FES Fairbanks office a minimum of once per day during the field operation. The FES Fairbanks office in turn provided status updates to the USACE project team.

2.3 Demobilization

On July 30th, upon completion of the field activities, the field crew demobilized from the site to Kotzebue using the same logistical process used for mobilization. On July 31st, the field crew shipped samples from Kotzebue to Anchorage and returned to their homes in Anchorage and Fairbanks. On August 1st, the samples were repacked and shipped to the project laboratory from Anchorage using Alaska Airlines Goldstreak service.

3.0 SAMPLE LOCATION IDENTIFICATION AND COLLECTION

The following section discusses the procedure used and field activities associated with the limited site investigation of Project Chariot test holes located near Cape Thompson. The assessment was performed to characterize and delineate potentially petroleum-contaminated soil in the vicinity of the test holes. Specific details on sample collection, sample processing, and analyses are presented below. Associated site photographs and field notes are presented in Appendices A and B, respectively.

3.1 Sample Locations

FES performed a limited soil investigation in the vicinity of the five Project Chariot test holes. The five test holes are identified as Test Holes Able, Baker, Charlie, Dog, and X1 (Figure 2). The following table summarizes the coordinates of the test holes.

GPS Coordinates of Test Holes

Test Hole	Latitude	Longitude
Hole Able	5153145.534	1674776.110
Hole Baker	5155117.599	1674205.378
Hole Charlie	5153828.158	1671310.122
Hole Dog	5156535.183	1675810.132
Hole X1	5154588.086	1677143.609

*Coordinates are presented in Alaska State Plane Coordinate System, NAD83, Zone 8, in feet.
NAD83 – North American Datum of 1983.

Eighteen surface soil samples were collected for DRO analysis from predetermined locations surrounding each test hole. Each sampling grid consisted of six lines extending from the test hole at 60° apart. Along each of the six lines three soil samples were collected at distances of 10, 25, and 50 feet from the test hole. In addition, one sample was collected immediately adjacent to each test hole casing.

A hand held global positioning system (GPS) was used to locate the test holes. Sample locations were measured in the field with a tape and temporarily marked with pin flags. Following sample collection and measuring coordinates with a GPS, the flags were removed.

3.2 Sample Collection

Samples were collected using either a 1.25-inch diameter stainless steel probe equipped with a slide hammer or a stainless steel hand auger. Surface soil samples were collected at a depth interval of 0 to 1 foot bgs unless refusal was encountered. Samples collected from tundra areas

were collected 0 to 1 foot below the vegetative mat. The soil probe was driven to depth of 12 inches below the vegetative mat (if present). Alternatively, the auger was used to collect 12 inches of soil using 2 successive attempts with the 6 inch barrel. The entire length of soil contents were then removed from the probe/auger and homogenized in a stainless mixing bowl. A representative sample was then placed into a pre-labeled jar. Observations including soil descriptions, location, and the presence of odor or staining were recorded in a field book. Soil descriptions and analytical results are presented in Section 4.

3.3 GPS Survey

Soil sample locations were surveyed using a GPS with a horizontal accuracy of 5 feet or better. Surveys used the Alaska State Plane Coordinate System, NAD83, Zone 8, in feet. In addition, the gravel pad boundaries were also measured with a GPS. Sample locations and pad boundaries are shown on Figures 3 through 7. Coordinates of sample locations are presented in Appendix C.

3.4 Decontamination and Investigative Derived Waste

All non-disposable sampling equipment was decontaminated between sampling points to prevent cross contamination. Non-disposable equipment consisted of the soil probe, hand auger, and the stainless steel bowls. Disposable sampling equipment, such as stainless steel sampling spoons, were used whenever possible. Water from Ogotoruk Creek was placed in 5-gallon buckets and used for wash water and rinse water.

Investigative derived waste (IDW) associated with this site was limited to the wash water used to decontaminate the soil sampling equipment. After sampling at each site was completed, the decontamination water was discharged onto a vegetated area on site. Miscellaneous solid wastes, such as sampling gloves and field camp wastes were temporarily stored in trash bags. Burnable wastes were incinerated in an onsite campfire. Plastic and other non-burnable wastes were disposed of at the Anchorage Regional Landfill.

4.0 SAMPLE RESULTS

The following section summarizes sample results and field observations. In general, the test holes were located on gravel pads (presumed to be drilling pads) surrounded by tundra. Test Hole X1, however, was located on a hilltop and was surrounded with sparse native vegetation (see Photograph 23, Appendix A). The relative locations of the test holes are shown on Figure 2. Samples collected for this project are summarized in Table 1. Analytical results are summarized in Table 2 and shown on Figures 3 through 7.

A chemical data quality report (CDQR) and ADEC checklists were prepared and are presented as Appendix D. In general, data quality meets the objectives in the Quality Assurance Program Plan (QAPP). All proposed samples were collected. No data were rejected pursuant to the review and all chemical data may be used, as qualified, for intended project purposes.

4.1 Test Hole Able

Test Hole Able was located just above the high tide line of the Chukchi Sea near the mouth of Ogotoruk Creek. Both Ogotoruk Creek and the Chukchi Sea are shown in Photograph 4 in Appendix A. Potential for contaminant migration to surface water is unlikely due to the distance separating the test hole and the surface water sources.

The gravel pad surrounding the Test Hole Able was noted to be significantly thicker than that of the other test holes. Test Hole Able was completed with a 7-inch outer diameter (OD) [6.375-inch inner diameter (ID)] steel casing that measured approximately 3 feet above the pad surface (see Photographs 3 and 4, Appendix A). The total depth was 4.2 feet below top of casing (TOC), and there was approximately 4 inches of standing water inside the casing. It could not be determined whether the casing had been plugged or if it contained ice. Approximately 50 feet of black cable emanated from the casing and was present on the gravel pad.

Samples collected on the pad consisted of mostly angular gravel with some fine sand and silt. Samples collected in the tundra consisted of fine silt and clay-like soil, collected under a 1 to 3 inch thick vegetative mat. No odor or signs of contamination were observed in any of the Test Hole Able samples. Five tundra samples exceeded the Method 1 Soil Cleanup Level of 500 mg/kg; however, no Test Hole Able samples exceeded the Arctic Zone Soil Cleanup Level for DRO. The highest DRO concentrations (2,300 mg/kg, 1,500 mg/kg, and 1,500 mg/kg in samples 10CTA01SO, 10CTA02SO, and 10CTA06SO, respectively) were detected in samples collected in the tundra, north of the gravel pad. No pad samples exceeded the Method 1 Soil Cleanup Level. Sample locations and DRO results are shown on Figure 3.

4.2 Test Hole Baker

Test Hole Baker was located approximately ½ mile inland from the Chukchi Sea and east of Ogotoruk Creek. A narrow gravel road extended northwest of the Test Hole Baker pad. The gravel pad was smaller and thinner than those noted at other test hole sites. Shallow, intermittent surface water was noted on the tundra just south of the gravel pad. Based on topography and proximity, there is potential for contamination to migrate to this area. A tundra pond was noted approximately 500 feet southwest of the site in the Ogotoruk Creek delta; the delta can be seen in Figure 2.

Test Hole Baker was completed with a 3.5-inch OD (3.25-inch ID) steel casing that was threaded on the inside (see Photograph 8, Appendix A). The casing extended about 2.5 feet above the gravel pad and was surrounded by a steel drum protective casing. Approximately 40 feet of black cable emanated from the casing and was present on the gravel pad. Water was measured at a depth of 1 foot below TOC and the total depth of the annulus inside the casing was 1.2 feet. It could not be determined whether the casing had been plugged with soil or if it contained ice.

Gravel pad samples generally consisted of densely packed tan-brown coarse silt with some fine sand and coarse gravel. Soil underlying the 1 to 3 inch tundra mat consisted of partially frozen compacted fine grained sand and silt with brown clay. Refusal at 10" bgs due to frozen soils was noted in several Test Hole Baker sample locations

Six of seven tundra samples, and one pad sample, exceeded the Method 1 Soil Cleanup level for DRO; however, no samples exceeded the ADEC Arctic Zone Soil Cleanup Level. Only one sample collected from the Test Hole Baker site exhibited signs of POL contamination; sample 10CTB19SO, collected directly adjacent the test hole from gray stained soils with a strong petroleum odor, had the highest DRO concentration (2,000 mg/kg). Sample 10CTB19SO location is shown in Photograph 8 in Appendix A. Sample locations and analytical results are shown on Figure 4.

4.3 Test Hole Charlie

Test Hole Charlie was located approximately 100 feet above the high tide line of the Chukchi Sea west of Ogotoruk Creek. The test hole site consisted of a sandy gravel pad connecting to the beach. Photographs 13 and 14 in Appendix A show the vicinity of Test Hole Charlie to the coast line. A dry ditch was noted between the pad and the Chukchi Sea as shown on Figure 5. No other surface water sources were noted to be present during the investigation.

Test Hole Charlie was completed with a 3-inch ID steel casing inside a buried steel drum (see Photograph 10, Appendix A). The casing measured 2 feet 11 inches above the pad surface. The water level was approximately 1 foot below TOC and the total depth of the annulus inside the casing was 4.8 feet. The water had a petroleum odor and sheen. Approximately 10 feet of black

cable attached to a metal cylinder and wooden block were located at the base of the test hole. The metal cylinder was labeled "Thermistor Cable No. 343".

Soil types collected on the pad consisted of angular gravel with some coarse brown sand. Samples in the tundra mostly consisted of compacted fine grained sand and silt with brown clay, located under a 3 to 6 inch vegetative mat.

Samples 10CTC03SO, 10CTC09SO, 10CTC15SO, and 10CTC19SO (adjacent to and southeast of Test Hole Charlie) all exhibited signs of petroleum contamination (staining and moderate to strong odor) and elevated DRO concentrations that exceeded the Method 1 Cleanup Level. Sample 10CTC03SO was collected from gray oily soil at the edge of the pad and had a DRO concentration of 59,000 mg/kg, and was the only sample to exceed ADEC Arctic Zone Cleanup Level at this site. The soil appeared to be visually cleaner at a depth of approximately 6 to 8 inches at this location possibly indicating that the depth of contamination may be limited. Field personnel scraped away a few inches of the sandy gravel pad in various places to determine the extent of the stained soil; pad thickness and depth to permafrost were not measured. Soil staining was observed immediately around Test Hole Charlie, and minor soil staining was noted southeast of the test hole near samples 10CTC09SO and 10CTC15SO. More severe staining was noted at sample location 10CTC03SO to approximately 25' south of the sample location (see Photograph 12, Appendix A). Water that had accumulated inside the Test Hole Charlie casing also had obvious odor and appeared oily. Sample locations and results are shown on Figure 5, as is the area with severe soil staining. Note that the tundra east of the pad contamination was not investigated.

4.4 Test Hole Dog

Test Hole Dog was located approximately 1 mile inland from the Chukchi Sea and east of Ogotoruk Creek. Access to the pad was from a narrow gravel road east of the site. Test Hole Dog consisted of a 3.5-inch OD (3.25-inch ID) steel casing installed in a gravel pad. The steel casing measured approximately 3 feet above ground surface and was threaded on the inside. A partially buried drum was installed as protective casing around the test hole. A 3-foot by 3-foot wooden box was installed outside the drum. The depth to water from TOC was 7.1 feet, and the total depth of the annulus inside the casing was 13 feet. A 20-foot cable was present on the pad next to the casing. The cable had a metal cylinder installed at one end and several colored wires protruded from the other end. The metal cylinder was labeled "Thermistor Cable No. 339". The cable was installed through a block of wood (see Photograph 18 and 19, Appendix A).

Samples collected under the 1 to 3 inch thick tundra mat consisted of densely packed tan-brown coarse silt with some fine sand and coarse gravel. Some samples were underlain by a mostly frozen layer of permafrost. This layer consisted of about half ice and half fine silt and clay particles dark in color. Absolute refusal due to permafrost was met at approximately 10 inches

bgs in these samples. Soil samples collected within the pad area generally consisted of densely packed tan-brown coarse silt with some fine sand and coarse gravel.

Seven pad samples and one tundra sample exceeded the Method 1 Cleanup Level for DRO. However, no samples collected from the Test Hole Dog site exceeded the ADEC Arctic Zone Soil Cleanup Level. Multiple samples exhibited signs of petroleum contamination. All samples collected from within 10 feet of the test hole had petroleum odor and gray soil staining, except 10CTD18SO, the northwest sample. In addition, the southeast (10CTD09SO) and south samples (10CTD10SO), collected from a distance of 25 feet from the test hole also had an obvious petroleum odor, as did the sample collected adjacent to Test Hole Dog (10CTD19SO) which exhibited the highest DRO concentration (4,900 mg/kg) at the Test Hole Dog site. Sample 10CTD19SO was gravelly and wet with water at approximately 6 inches bgs; petroleum sheen was observed on the water. Tundra sample 10CTD04SO, collected 50 feet south of Test Hole Dog, also exceeded the Method 1 Cleanup Level but, possibly due to ice (see Photograph 22 in Appendix A), there was no documented odor or staining from this location. Sample locations and results are shown on Figure 6.

4.5 Test Hole X1

Test Hole X1 was located on top of a hill, approximately 2,000 feet inland from the Chukchi Sea. The site surface consisted mostly of fractured native bedrock, with intermittent vegetation (see Photograph 23 in Appendix A). The nearest tundra was located 150 feet from the test hole. Sample soils were brown in color and consisted of loose fine sand and coarse silt intermixed with angular gravel overlaying fractured bedrock.

The casing was 11-inch OD (10.25-inch ID) and extended approximately 18 inches above the ground surface. The total depth within the annulus of the test hole was 5.9 feet below TOC. Soil could be viewed at the bottom of the test hole as shown in Photograph 24 of Appendix A. No water was present inside the casing, but a petroleum odor was noticable.

Three samples had obvious petroleum odor; 10CTX16SO (10 feet south of the test hole), 10CTX17SO (10 feet southwest of the test hole), and 10CTX19SO (adjacent the test hole). All three of these samples exceeded the Method 1 Cleanup Level for DRO. Sample 10CTX19SO collected adjacent to the test hole, exceeded the ADEC Arctic Zone cleanup level with a DRO concentration of 31,000 mg/kg. Refusal generally occurred at 6 inches bgs, presumably due to the presence of bedrock. Sample locations and DRO results are shown on Figure 7.

4.6 Deviations from Work Plan

The following deviations to the Work Plan were noted. The resulting effect on data usability is also discussed below.

- Individual sample recovery was not measured with a tape as specified in the work plan. However, the sampling devices used to collect soil samples were either 6 inches or 12 inches, so recovery estimates were very close.

- Several samples at Test Hole Dog were only collected from 0′ to 10″ which is a deviation to the sample depth of 0″ to 12″ specified in the work plan. The deviation in sample depth was due to the presence of frozen soils at this test hole. The individual sample locations with non-compliant sample depths were not documented in the field, but Test Hole Dog data was footnoted in Table 1 as having estimated depth intervals due to frozen soils. The effect on Test Hole Dog data quality is negligible due to the uneven terrain at the site. There was more variation in surface topography (due to presence of tussocks) than there was caused by the limited sample recovery in some locations.

- The sample depth from Test Hole X1 was limited due to refusal by shallow bedrock. Samples were collected at approximately 0″ to 6″, which is a deviation to the sample depth of 0″ to 12″ specified in the Work Plan. The effect on Test Hole X1 data likely resulted in a high bias because inclusion of bedrock (from 6″ to 12″ depth) would have diluted sample results.

5.0 CONCLUSIONS

The five Project Chariot test holes were successfully located and soil samples were collected from each of the sites. Each of the test holes had a unique construction with different casing diameters. Black cable, presumably for measuring soil temperatures, was noted extending from four of the test holes (Able, Baker, Charlie, and Dog). The total depth of the casings measured within the annulus of Test Holes Able, Baker, Charlie, Dog were consistent with the permafrost level. It is unknown whether these test holes were backfilled with soil, or if the casings are plugged with ice. Soil could be seen inside the casing at Test Hole X1.

Gravel pads were encountered at the Test Holes Able, Baker, Charlie, and Dog sites. Gravel access roads extended from the pads at Test Holes Baker, Charlie, and Dog sites. The roads and pads at these sites appeared to be constructed directly on top of native tundra. The tundra surrounding these sites generally consisted of 1 to 3 inches of vegetation with uneven surfaces caused by the presence of tussocks and frozen soils at approximately 12 inches bgs. These areas are underlain by permafrost, and any vertical migration of contaminants would likely be impeded by this confining layer. Lateral movement would also be impeded as contaminants would be trapped in frozen soils during the non-summer months (October through May).

Test Hole X1 is located on a hilltop characterized by shallow bedrock and lack of vegetation. Because the location and construction of Test Hole X1 indicate that it is an emplacement hole for a chemical explosives test that was not performed, Test Hole X1 is likely a much shallower hole (tens rather than hundreds of feet deep) (U.S. AEC 1961). As a result, contaminant migration at this site would be limited to lateral surface flow and possible vertical migration through bedrock fractures.

Test Hole Baker was the only site with potential for migration of contaminants to surface water. Shallow, intermittent surface water was noted immediately south of the Test Hole Baker pad.

DRO concentrations exceeding the Method 1 cleanup level of 500 mg/kg were identified in samples collected from all five sites. In general, pad samples with elevated results (greater than 1,000 mg/kg) were at locations documented as having petroleum odor and/or soil staining. Petroleum odor and/or staining were not identified in tundra samples although DRO results in several tundra samples exceeded 1,000 mg/kg. DRO results are summarized for each test hole below:

- Test Hole Able: Five tundra samples exceeded the Method 1 cleanup level for DRO. The highest DRO concentration was 2,300 mg/kg in the tundra sample 50 foot north of the test hole. No odor or signs of contamination were noted in any of the Test Hole Able soil samples.

- Test Hole Baker: Seven tundra and one pad sample exceeded the Method 1 cleanup level for DRO. The highest DRO concentration was 2,000 mg/kg in the pad sample which was collected adjacent to the test hole. This soil sample was documented as having gray staining and strong petroleum odor and was the only sample at the site exhibiting signs of contamination.
- Test Hole Charlie: Based on field observations, Test Hole Charlie appeared to be the most contaminated site. Petroleum staining and odor were noted in the sample adjacent to the test hole and in the three sample locations southeast of the test hole; DRO concentrations in all four of these samples exceeded the Method 1 cleanup level. The highest DRO concentration at this site (59,000 mg/kg in sample 10CTC03SO) was detected 50 foot southeast of the test hole at the edge of the pad. Heavily stained oily soils were noted at 10CTC03SO and extended 25 feet south as shown in Figure 5. The soil contamination in the Test Hole Charlie pad may be confined vertically as visually cleaner soils were identified under stained soil at an approximate depth of 6 to 8 inches bgs. The site is located approximately 100 feet above the high tide line of the Chukchi Sea, so contaminant migration to surface water is not a concern at this site. It should be noted that tundra east of the contaminated pad was not investigated.
- Test Hole Dog: Seven pad samples and one tundra sample exceeded the Method 1 cleanup level for DRO in soil. The DRO exceedences were generally located within 10 feet of the test hole or were south/southeast of the test hole. Field observations (odor and staining) support laboratory results. The highest DRO concentration (4,900 mg/kg) was detected in the sample collected adjacent to the test hole. One tundra sample, located 50 feet south of Test Hole Dog, also exceeded the Method 1 cleanup level. Frozen soils were identified in several samples at Test Hole Dog and ice limited sample depths to 10 inches in some locations.
- Test Hole X1: This emplacement hole was constructed on a hilltop and the site is underlain by bedrock at a depth of approximately 6 inches bgs. Three DRO samples exceeded the Method 1 cleanup level; these samples are located adjacent to, 10 feet south, and 10 feet southwest of the test hole. Sample 10CTX19SO, collected adjacent to Test Hole X1, also exceeded the ADEC Method 2 cleanup level with a DRO concentration of 31,000 mg/kg. Petroleum odor was noted in all three sample locations that exceeded the cleanup level, and it was also noted inside the casing. Although not evaluated in this investigation, deeper soil contamination would be expected around the annulus of this test hole, assuming that the source of contamination was diesel based drilling mud.

The most significant soil contamination was identified southeast of Test Hole Charlie. Gray, oily soil approximately five inches thick was noted and appeared to be confined to the gravel pad. It extended at least 25 south of sample 10CTC03SO.

6.0 REFERENCES

Alaska Department of Environmental Conservation (ADEC), 2009. *Oil and Other Hazardous Substances Pollution Control (18 AAC 75).* January.

Fairbanks Environmental Services, Inc. (FES), 2008. *Final Investigation Report, Cape Thompson Alaska, Formerly Used Defense Site, Cape Thompson, Alaska.* September.

U.S. Army Corps of Engineers (USACE), 2010*. Scope of Work, Modification 001, Cape Thompson Naval Camp Formerly Used Defense Site (F10AK000103), Cape Thompson, Alaska, Site Investigation*. March 1.

U.S. Atomic Energy Commission (U.S. AEC), 1961. *Engineering and Construction Support Plan, Project Chariot, Phase IV, Plowshare Program, Addendum 1, Chemical Explosives Experiment.* May 8.

U.S. Geological Survey (USGS), 1961. *Potential Effects of Project Chariot on Local Water Supplies*, by Arthur M. Piper. November

Table 1 - Sample Summary
Project Chariot Test Holes
Cape Thompson, Alaska

Sample ID	Cooler ID	Location ID	Type	Sampler	Date	Time	Depth	Matrix	DRO (Soil) 3550B/AK102	DRO (Water) 3510C/AK102	Sample Data Group
Test Hole Able											
10CTA01SO	ABLE	AN50	Primary/MS/MSD	MJ/CB/MB	7/28/2010	2025	0" - 12"	Soil	x		K1008033
10CTA02SO	ABLE	ANE50	Primary	MJ/CB/MB	7/28/2010	2030	0" - 12"	Soil	x		K1008033
10CTA03SO	ABLE	ASE50	Primary	MJ/CB/MB	7/28/2010	2055	0" - 12"	Soil	x		K1008033
10CTA04SO	ABLE	AS50	Primary	MJ/CB/MB	7/28/2010	2100	0" - 12"	Soil	x		K1008033
10CTA05SO	ABLE	ASW50	Primary	MJ/CB/MB	7/28/2010	2110	0" - 12"	Soil	x		K1008033
10CTA06SO	ABLE	ANW50	Primary	MJ/CB/MB	7/28/2010	2115	0" - 12"	Soil	x		K1008033
10CTA07SO	ABLE	AN25	Primary	MJ/CB/MB	7/28/2010	2120	0" - 12"	Soil	x		K1008033
10CTA08SO	ABLE	ANE25	Primary	MJ/CB/MB	7/28/2010	2125	0" - 12"	Soil	x		K1008033
10CTA09SO	ABLE	ASE25	Primary	MJ/CB/MB	7/28/2010	2130	0" - 12"	Soil	x		K1008033
10CTA10SO	ABLE	AS25	Primary	MJ/CB/MB	7/28/2010	2135	0" - 12"	Soil	x		K1008033
10CTA11SO	ABLE	ASW25	Primary	MJ/CB/MB	7/28/2010	2140	0" - 12"	Soil	x		K1008033
10CTA12SO	ABLE	ANW25	Primary	MJ/CB/MB	7/28/2010	2145	0" - 12"	Soil	x		K1008033
10CTA13SO	ABLE	AN10	Primary	MJ/CB/MB	7/28/2010	2200	0" - 12"	Soil	x		K1008033
10CTA14SO	ABLE	ANE10	Primary	MJ/CB/MB	7/28/2010	2205	0" - 12"	Soil	x		K1008033
10CTA15SO	ABLE	ASE10	Primary	MJ/CB/MB	7/28/2010	2210	0" - 12"	Soil	x		K1008033
10CTA16SO	ABLE	AS10	Primary	MJ/CB/MB	7/28/2010	2215	0" - 12"	Soil	x		K1008033
10CTA17SO	ABLE	ASW10	Primary	MJ/CB/MB	7/28/2010	2220	0" - 12"	Soil	x		K1008033
10CTA18SO	ABLE	ANW10	Primary	MJ/CB/MB	7/28/2010	2155	0" - 12"	Soil	x		K1008033
10CTA19SO	ABLE	ABLE	Primary	MJ/CB/MB	7/28/2010	2125	0" - 12"	Soil	x		K1008033
10CTA20SO	ABLE	ABLE	Duplicate	MJ/CB/MB	7/28/2010	2135	0" - 12"	Soil	x		K1008033
10CTA21SO	ABLE	ANW25A	Duplicate	MJ/CB/MB	7/28/2010	2150	0" - 12"	Soil	x		K1008033
10CTA22WG	ABLE	RINSATE	Primary	MJ	7/28/2010	2245	NA	Water		x	K1008033
Test Hole Baker											
10CTB01SO	BAKER	BN50	Primary	MJ/CB/MB	7/30/2010	1015	0" - 12"	Soil	x		K1008039
10CTB02SO	BAKER	BNE50	Primary	MJ/CB/MB	7/30/2010	1020	0" - 12"	Soil	x		K1008039
10CTB03SO	BAKER	BSE50	Primary	MJ/CB/MB	7/30/2010	1025	0" - 12"	Soil	x		K1008039
10CTB04SO	BAKER	BS50	Primary	MJ/CB/MB	7/30/2010	1030	0" - 12"	Soil	x		K1008039
10CTB05SO	BAKER	BSW50	Primary	MJ/CB/MB	7/30/2010	1035	0" - 12"	Soil	x		K1008039
10CTB06SO	BAKER	BNW50	Primary	MJ/CB/MB	7/30/2010	1040	0" - 12"	Soil	x		K1008039
10CTB07SO	BAKER	BN25	Primary	MJ/CB/MB	7/30/2010	1045	0" - 12"	Soil	x		K1008039
10CTB08SO	BAKER	BNE25	Primary	MJ/CB/MB	7/30/2010	1050	0" - 12"	Soil	x		K1008039
10CTB09SO	BAKER	BSE25	Primary	MJ/CB/MB	7/30/2010	1100	0" - 12"	Soil	x		K1008039
10CTB10SO	BAKER	BS25	Primary	MJ/CB/MB	7/30/2010	1105	0" - 12"	Soil	x		K1008039
10CTB11SO	BAKER	BSW25	Primary	MJ/CB/MB	7/30/2010	1110	0" - 12"	Soil	x		K1008039
10CTB12SO	BAKER	BNW25	Primary	MJ/CB/MB	7/30/2010	1115	0" - 12"	Soil	x		K1008039
10CTB13SO	BAKER	BN10	Primary/MS/MSD	MJ/CB/MB	7/30/2010	1120	0" - 12"	Soil	x		K1008039
10CTB14SO	BAKER	BNE10	Primary	MJ/CB/MB	7/30/2010	1130	0" - 12"	Soil	x		K1008039
10CTB15SO	BAKER	BSE10	Primary	MJ/CB/MB	7/30/2010	1135	0" - 12"	Soil	x		K1008039
10CTB16SO	BAKER	BS10	Primary	MJ/CB/MB	7/30/2010	1140	0" - 12"	Soil	x		K1008039
10CTB17SO	BAKER	BSW10	Primary	MJ/CB/MB	7/30/2010	1145	0" - 12"	Soil	x		K1008039
10CTB18SO	BAKER	BNW10	Primary	MJ/CB/MB	7/30/2010	1150	0" - 12"	Soil	x		K1008039
10CTB19SO	BAKER	BAKER	Primary	MJ/CB/MB	7/30/2010	1155	0" - 12"	Soil	x		K1008039
10CTB20SO	BAKER	BNE25A	Duplicate	MJ/CB/MB	7/30/2010	1055	0" - 12"	Soil	x		K1008039
10CTB21SO	BAKER	BN10A	Duplicate	MJ/CB/MB	7/30/2010	1125	0" - 12"	Soil	x		K1008039
10CTB22WG	BAKER	RINSATE	Primary	MJ	7/30/2010	1205	NA	Water		x	K1008039
Test Hole Charlie											
10CTC01SO	CHARLIE	CN50	Primary/MS/MSD	MJ/CB/MB	7/28/2010	1520	0" - 12"	Soil	x		K1008036
10CTC02SO	CHARLIE	CNE50	Primary	MJ/CB/MB	7/28/2010	1540	0" - 12"	Soil	x		K1008036
10CTC03SO	CHARLIE	CSE50	Primary	MJ/CB/MB	7/28/2010	1555	0" - 6"	Soil	x		K1008036
10CTC04SO	CHARLIE	CS50	Primary	MJ/CB/MB	7/28/2010	1600	0" - 12"	Soil	x		K1008036
10CTC05SO	CHARLIE	CSW50	Primary	MJ/CB/MB	7/28/2010	1610	0" - 12"	Soil	x		K1008036
10CTC06SO	CHARLIE	CNW50	Primary	MJ/CB/MB	7/28/2010	1615	0" - 12"	Soil	x		K1008036
10CTC07SO	CHARLIE	CN25	Primary	MJ/CB/MB	7/28/2010	1620	0" - 12"	Soil	x		K1008036
10CTC08SO	CHARLIE	CNE25	Primary	MJ/CB/MB	7/28/2010	1625	0" - 12"	Soil	x		K1008036
10CTC09SO	CHARLIE	CSE25	Primary	MJ/CB/MB	7/28/2010	1630	0" - 12"	Soil	x		K1008036
10CTC10SO	CHARLIE	CS25	Primary	MJ/CB/MB	7/28/2010	1645	0" - 12"	Soil	x		K1008036
10CTC11SO	CHARLIE	CSW25	Primary	MJ/CB/MB	7/28/2010	1720	0" - 12"	Soil	x		K1008036
10CTC12SO	CHARLIE	CNW25	Primary	MJ/CB/MB	7/28/2010	1730	0" - 12"	Soil	x		K1008036
10CTC13SO	CHARLIE	CN10	Primary	MJ/CB/MB	7/28/2010	1700	0" - 12"	Soil	x		K1008036
10CTC14SO	CHARLIE	CNE10	Primary	MJ/CB/MB	7/28/2010	1705	0" - 12"	Soil	x		K1008036
10CTC15SO	CHARLIE	CSE10	Primary	MJ/CB/MB	7/28/2010	1710	0" - 12"	Soil	x		K1008036
10CTC16SO	CHARLIE	CS10	Primary	MJ/CB/MB	7/28/2010	1715	0" - 12"	Soil	x		K1008036
10CTC17SO	CHARLIE	CSW10	Primary	MJ/CB/MB	7/28/2010	1650	0" - 12"	Soil	x		K1008036
10CTC18SO	CHARLIE	CNW10	Primary	MJ/CB/MB	7/28/2010	1655	0" - 12"	Soil	x		K1008036
10CTC19SO	CHARLIE	CHARLIE	Primary	MJ/CB/MB	7/28/2010	1735	0" - 12"	Soil	x		K1008036
10CTC20SO	CHARLIE	CN50A	Duplicate	MJ/CB/MB	7/28/2010	1525	0" - 12"	Soil	x		K1008036
10CTC21SO	CHARLIE	CSW25A	Duplicate	MJ/CB/MB	7/28/2010	1725	0" - 12"	Soil	x		K1008036
10CTC22WG	CHARLIE	RINSATE	Primary	MJ	7/28/2010	1815	NA	Water		x	K1008036
Test Hole Dog											
10CTD01SO	DOG	DN50	Primary/MS/MSD	MJ/CB/MB	7/29/2010	1300	0" - 12" [1]	Soil	x		K1008043
10CTD02SO	DOG	DNE50	Primary	MJ/CB/MB	7/29/2010	1310	0" - 12" [1]	Soil	x		K1008043

Table 1 - Sample Summary
Project Chariot Test Holes
Cape Thompson, Alaska

Sample ID	Cooler ID	Location ID	Type	Sampler	Date	Time	Depth	Matrix	DRO (Soil) 3550B/AK102	DRO (Water) 3510C/AK102	Sample Data Group
10CTD03SO	DOG	DSE50	Primary	MJ/CB/MB	7/29/2010	1320	0" - 12" [1]	Soil	x		K1008043
10CTC0DSO	DOG	DS50	Primary	MJ/CB/MB	7/29/2010	1325	0" - 12" [1]	Soil	x		K1008043
10CTD05SO	DOG	DSW50	Primary	MJ/CB/MB	7/29/2010	1330	0" - 12" [1]	Soil	x		K1008043
10CTD06SO	DOG	DNW50	Primary	MJ/CB/MB	7/29/2010	1335	0" - 12" [1]	Soil	x		K1008043
10CTD07SO	DOG	DN25	Primary	MJ/CB/MB	7/29/2010	1340	0" - 12" [1]	Soil	x		K1008043
10CTD08SO	DOG	DNE25	Primary	MJ/CB/MB	7/29/2010	1345	0" - 12" [1]	Soil	x		K1008043
10CTD09SO	DOG	DSE25	Primary	MJ/CB/MB	7/29/2010	1350	0" - 12" [1]	Soil	x		K1008043
10CTD10SO	DOG	DS25	Primary	MJ/CB/MB	7/29/2010	1400	0" - 12" [1]	Soil	x		K1008043
10CTD11SO	DOG	DSW25	Primary	MJ/CB/MB	7/29/2010	1405	0" - 12" [1]	Soil	x		K1008043
10CTD12SO	DOG	DNW25	Primary	MJ/CB/MB	7/29/2010	1420	0" - 12" [1]	Soil	x		K1008043
10CTD13SO	DOG	DN10	Primary	MJ/CB/MB	7/29/2010	1425	0" - 12" [1]	Soil	x		K1008043
10CTD14SO	DOG	DNE10	Primary	MJ/CB/MB	7/29/2010	1430	0" - 12" [1]	Soil	x		K1008043
10CTD15SO	DOG	DSE10	Primary	MJ/CB/MB	7/29/2010	1435	0" - 12" [1]	Soil	x		K1008043
10CTD16SO	DOG	DS10	Primary	MJ/CB/MB	7/29/2010	1440	0" - 12" [1]	Soil	x		K1008043
10CTD17SO	DOG	DSW10	Primary	MJ/CB/MB	7/29/2010	1445	0" - 12" [1]	Soil	x		K1008043
10CTD18SO	DOG	DW10	Primary	MJ/CB/MB	7/29/2010	1450	0" - 12" [1]	Soil	x		K1008043
10CTD19SO	DOG	Dog	Primary	MJ/CB/MB	7/29/2010	1455	0" - 12" [1]	Soil	x		K1008043
10CTD20SO	DOG	DN50A	Duplicate	MJ/CB/MB	7/29/2010	1305	0" - 12" [1]	Soil	x		K1008043
10CTD21SO	DOG	DOGA	Duplicate	MJ/CB/MB	7/29/2010	1500	0" - 12" [1]	Soil	x		K1008043
10CTD22WG	DOG	RINSATE	Primary	MJ	7/29/2010	1510	NA	Water		x	K1008043
Test Hole X1											
10CTX01SO	X1	XN50	Primary/MS/MSD	MJ/CB/MB	7/29/2010	1605	0" - 6" [2]	Soil	x		K1008042
10CTX02SO	X1	XNE50	Primary	MJ/CB/MB	7/29/2010	1615	0" - 6" [2]	Soil	x		K1008042
10CTX03SO	X1	XSE50	Primary	MJ/CB/MB	7/29/2010	1625	0" - 6" [2]	Soil	x		K1008042
10CTX0DSO	X1	XS50	Primary	MJ/CB/MB	7/29/2010	1630	0" - 6" [2]	Soil	x		K1008042
10CTX05SO	X1	XSW50	Primary	MJ/CB/MB	7/29/2010	1635	0" - 6" [2]	Soil	x		K1008042
10CTX06SO	X1	XNW50	Primary	MJ/CB/MB	7/29/2010	1640	0" - 6" [2]	Soil	x		K1008042
10CTX07SO	X1	XN25	Primary	MJ/CB/MB	7/29/2010	1645	0" - 6" [2]	Soil	x		K1008042
10CTX08SO	X1	XNE25	Primary	MJ/CB/MB	7/29/2010	1650	0" - 6" [2]	Soil	x		K1008042
10CTX09SO	X1	XSE25	Primary	MJ/CB/MB	7/29/2010	1655	0" - 6" [2]	Soil	x		K1008042
10CTX10SO	X1	XS25	Primary	MJ/CB/MB	7/29/2010	1700	0" - 6" [2]	Soil	x		K1008042
10CTX11SO	X1	XSW25	Primary	MJ/CB/MB	7/29/2010	1705	0" - 6" [2]	Soil	x		K1008042
10CTX12SO	X1	XNW25	Primary	MJ/CB/MB	7/29/2010	1710	0" - 6" [2]	Soil	x		K1008042
10CTX13SO	X1	XN10	Primary	MJ/CB/MB	7/29/2010	1715	0" - 6" [2]	Soil	x		K1008042
10CTX14SO	X1	XNE10	Primary	MJ/CB/MB	7/29/2010	1720	0" - 6" [2]	Soil	x		K1008042
10CTX15SO	X1	XSE10	Primary	MJ/CB/MB	7/29/2010	1725	0" - 6" [2]	Soil	x		K1008042
10CTX16SO	X1	XS10	Primary	MJ/CB/MB	7/29/2010	1730	0" - 6" [2]	Soil	x		K1008042
10CTX17SO	X1	XSW10	Primary	MJ/CB/MB	7/29/2010	1735	0" - 6" [2]	Soil	x		K1008042
10CTX18SO	X1	XNW10	Primary	MJ/CB/MB	7/29/2010	1740	0" - 6" [2]	Soil	x		K1008042
10CTX19SO	X1	X1	Primary	MJ/CB/MB	7/29/2010	1750	0" - 6" [2]	Soil	x		K1008042
10CTX20SO	X1	XNE50A	Duplicate	MJ/CB/MB	7/29/2010	1620	0" - 6" [2]	Soil	x		K1008042
10CTX21SO	X1	X1A	Duplicate	MJ/CB/MB	7/29/2010	1755	0" - 6" [2]	Soil	x		K1008042
10CTX22WG	X1	RINSATE	Primary	MJ	7/29/2010	1810	NA	Water		x	K1008042

All samples were shipped to Columbia Analytical Services (CAS) with a 21-day Turn around Time (TAT).
All soil samples were collected in either a 4 or 8-oz amber jar and were field preserved at 4° C.
All water samples (equipment rinsates) were collected in 500-ml amber jars and were field preserved with HCl at 4° C.
[1] - Depth intervals in several Test Hole Dog samples are estimated because refusal was met due to frozen soils at depths of 10 to 12 inches.
[2] - Sample depth at most Test Hole X1 samples was limited due to bedrock.
MJ=Makenzie Jorgansen, CB=Chris Boese, MB=Mike Boese

Table 2 - Analytical Results
Project Chariot Test Holes
Cape Thompson, Alaska

			Sample ID	10CTA01SO		10CTA02SO		10CTA03SO		10CTA04SO		10CTA05SO		10CTA06SO		10CTA07SO		10CTA08SO		10CTA09SO	
			Lab Sample ID	K1008033-001		K1008033-002		K1008033-003		K1008033-004		K1008033-005		K1008033-006		K1008033-007		K1008033-008		K1008033-009	
			Location	AN50		ANE50		ASE50		AS50		ASW50		ANW50		AN25		ANE25		ASE25	
			Collection Date	7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010	
			Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
			Sample Type	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
Analyte	**Method**	**Units**	**ADEC[1]**																		
Diesel Range Organics	AK102	mg/kg	500	2300	[210]	1500	[150]	290	[120]	650	[170]	610	[150]	1500	[190]	1.6	[21] J	ND	[21]	1.4	[21] J
Diesel Range Organics	AK102	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

			Sample ID	10CTA10SO		10CTA11SO		10CTA12SO		10CTA13SO		10CTA14SO		10CTA15SO		10CTA16SO		10CTA17SO		10CTA18SO	
			Lab Sample ID	K1008033-010		K1008033-011		K1008033-012		K1008033-013		K1008033-014		K1008033-015		K1008033-016		K1008033-017		K1008033-018	
			Location	AS25		ASW25		ANW25		AN10		ANE10		ASE10		AS10		ASW10		ANW10	
			Collection Date	7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010	
			Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
			Sample Type	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
Analyte	**Method**	**Units**	**ADEC[1]**																		
Diesel Range Organics	AK102	mg/kg	500	1.8	[21] J	79	[24]	1.6	[21] J	1.9	[21] J	9	[21] J	1.7	[21] J	2	[21] J	1.6	[21] J	1.6	[21] J
Diesel Range Organics	AK102	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

			Sample ID	10CTA19SO		10CTA20SO		10CTA21SO		10CTA22WG	
			Lab Sample ID	K1008033-019		K1008033-020		K1008033-021		K1008033-022	
			Location	ABLE		ABLE		ANW25		RINSATE A	
			Collection Date	7/28/2010		7/28/2010		7/28/2010		7/28/2010	
			Matrix	Soil		Soil		Soil		Water	
			Sample Type	Primary		Field Duplicate		Field Duplicate		Rinsate	
Analyte	**Method**	**Units**	**ADEC[1]**								
Diesel Range Organics	AK102	mg/kg	500	7.4	[21] J	10	[21] J	2.6	[21] J,B	-	-
Diesel Range Organics	AK102	ug/L	-	-	-	-	-	-	-	49	[800] J,B

Notes:
[1] = ADEC Method 1 Soil Cleanup Level (from 18 AAC 75.341 Table A2).
Highlighted concentrations exceed ADEC Method 1 Soil Cleanup Level.
B = Possible cross-contamination (similar concentration detected in blank).
J = Estimated because concentration was reported below the LOQ.
[LOQ] = [Limit of quantification].
ND = Not detected at the [LOQ].
mg/kg = Milligrams per killogram.
ug/L = Micrograms per liter.

Table 2 - Analytical Results
Project Chariot Test Holes
Cape Thompson, Alaska

			Sample ID	10CTB01SO		10CTB02SO		10CTB03SO		10CTB04SO		10CTB05SO		10CTB06SO		10CTB07SO		10CTB08SO		10CTB09SO	
			Lab Sample ID	K1008039-001		K1008039-002		K1008039-003		K1008039-004		K1008039-005		K1008039-006		K1008039-007		K1008039-008		K1008039-009	
			Location	BN50		BNE50		BSE50		BS50		BSW50		BNW50		BN25		BNE25		BSE25	
			Collection Date	7/30/2010		7/30/2010		7/30/2010		7/30/2010		7/30/2010		7/30/2010		7/30/2010		7/30/2010		7/30/2010	
			Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
			Sample Type	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
Analyte	**Method**	**Units**	**ADEC[1]**																		
Diesel Range Organics	AK102	mg/kg	500	910	[170]	940	[150]	1000	[180]	940	[180]	760	[170]	8.8	[23] J	12	[23] J	20	[23] J	660	[210]
Diesel Range Organics	AK102	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

			Sample ID	10CTB10SO		10CTB11SO		10CTB12SO		10CTB13SO		10CTB14SO		10CTB15SO		10CTB16SO		10CTB17SO		10CTB18SO	
			Lab Sample ID	K1008039-010		K1008039-011		K1008039-012		K1008039-013		K1008039-014		K1008039-015		K1008039-016		K1008039-017		K1008039-018	
			Location	BS25		BSW25		BNW25		BN10		BNE10		BSE10		BS10		BSW10		BNW10	
			Collection Date	7/30/2010		7/30/2010		7/30/2010		7/30/2010		7/30/2010		7/30/2010		7/30/2010		7/30/2010		7/30/2010	
			Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
			Sample Type	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
Analyte	**Method**	**Units**	**ADEC[1]**																		
Diesel Range Organics	AK102	mg/kg	500	540	[140]	16	[23] J	5	[22] J	3.9	[21] J	15	[22] J	34	[22]	35	[22]	39	[23]	15	[24] J
Diesel Range Organics	AK102	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

			Sample ID	10CTB19SO		10CTB20SO		10CTB21SO		10CTB22WG	
			Lab Sample ID	K1008039-019		K1008039-020		K1008039-021		K1008039-022	
			Location	BAKER		BNE25A		BN10A		RINSATE B	
			Collection Date	7/30/2010		7/30/2010		7/30/2010		7/30/2010	
			Matrix	Soil		Soil		Soil		Water	
			Sample Type	Primary		Field Duplicate		Field Duplicate		Rinsate	
Analyte	**Method**	**Units**	**ADEC[1]**								
Diesel Range Organics	AK102	mg/kg	500	2000	[25]	6.8	[24] J	8.2	[21] J,B	-	-
Diesel Range Organics	AK102	ug/L	-	-	-	-	-	-	-	140	[800] J,B

Notes:
[1] = ADEC Method 1 Soil Cleanup Level (from 18 AAC 75.341 Table A2).
Highlighted concentrations exceed ADEC Method 1 Soil Cleanup Level.
B = Possible cross-contamination (similar concentration detected in blank).
J = Estimated because concentration was reported below the LOQ.
LOQ = Limit of quantification.
ND = Not detected at the [LOQ].
mg/kg = Milligrams per killogram.
ug/L = Micrograms per liter.

Table 2 - Analytical Results
Project Chariot Test Holes
Cape Thompson, Alaska

			Sample ID	10CTC01SO		10CTC02SO		10CTC03SO		10CTC04SO		10CTC05SO		10CTC06SO		10CTC07SO		10CTC08SO		10CTC09SO	
			Lab Sample ID	K1008036-001		K1008036-002		K1008036-003		K1008036-004		K1008036-005		K1008036-006		K1008036-007		K1008036-008		K1008036-009	
			Location	CN50		CNE50		CSE50		CS50		CSW50		CNW50		CN25		CNE25		CSE25	
			Collection Date	7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010	
			Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
			Sample Type	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
Analyte	**Method**	**Units**	**ADEC[1]**																		
Diesel Range Organics	AK102	mg/kg	500	220	[130] MH	310	[130]	59000	[2900]	100	[23]	190	[32]	210	[29] QH	2	[21] J	1.9	[21] J	1200	[110]
Diesel Range Organics	AK102	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

			Sample ID	10CTC10SO		10CTC11SO		10CTC12SO		10CTC13SO		10CTC14SO		10CTC15SO		10CTC16SO		10CTC17SO		10CTC18SO	
			Lab Sample ID	K1008036-010		K1008036-011		K1008036-012		K1008036-013		K1008036-014		K1008036-015		K1008036-016		K1008036-017		K1008036-018	
			Location	CS25		CSW25		CNW25		CN10		CNE10		CSE10		CS10		CSW10		CNW10	
			Collection Date	7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010	
			Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
			Sample Type	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
Analyte	**Method**	**Units**	**ADEC[1]**																		
Diesel Range Organics	AK102	mg/kg	500	14	[21] J	21	[21] J	3.3	[21] J	2.3	[21] J	49	[21]	1800	[110]	350	[110]	9.2	[21] J	44	[21]
Diesel Range Organics	AK102	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

			Sample ID	10CTC19SO		10CTC20SO		10CTC21SO		10CTC22WG	
			Lab Sample ID	K1008036-019		K1008036-020		K1008036-021		K1008036-022	
			Location	CHARLIE		CN50		CSW25		RINSATE C	
			Collection Date	7/28/2010		7/28/2010		7/28/2010		7/28/2010	
			Matrix	Soil		Soil		Soil		Water	
			Sample Type	Primary		Field Duplicate		Field Duplicate		Rinsate	
Analyte	**Method**	**Units**	**ADEC[1]**								
Diesel Range Organics	AK102	mg/kg	500	2400	[110]	370	[130]	28	[22]	-	-
Diesel Range Organics	AK102	ug/L	-	-	-	-	-	-	-	110	[800] J,B

Notes:
[1] = ADEC Method 1 Soil Cleanup Level (from 18 AAC 75.341 Table A2).
Highlighted concentrations exceed ADEC Method 1 Soil Cleanup Level.
B = Possible cross-contamination (similar concentration detected in blank).
J = Estimated because concentration was reported below the LOQ.
MH = Result is biased high due to matrix issues.
LOQ = Limit of quantification.
QH = Result is biased high due to one or more quality control failures.
ND = Not detected at the [LOQ].
mg/kg = Milligrams per killogram.
ug/L = Micrograms per liter.

Table 2 - Analytical Results
Project Chariot Test Holes
Cape Thompson, Alaska

			Sample ID	10CTD01SO		10CTD02SO		10CTD03SO		10CTD04SO		10CTD05SO		10CTD06SO		10CTD07SO		10CTD08SO		10CTD09SO	
			Lab Sample ID	K1008043-001		K1008043-002		K1008043-003		K1008043-004		K1008043-005		K1008043-006		K1008043-007		K1008043-008		K1008043-009	
			Location	DN50		DNE50		DSE50		DS50		DSW50		DNW50		DN25		DNE25		DSE25	
			Collection Date	7/29/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010	
			Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
			Sample Type	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
Analyte	**Method**	**Units**	**ADEC[1]**																		
Diesel Range Organics	AK102	mg/kg	500	100	[29]	140	[31]	120	[34]	3300	[35]	290	[25]	230	[34]	12	[23] J	12	[23] J	3000	[23]
Diesel Range Organics	AK102	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

			Sample ID	10CTD10SO		10CTD11SO		10CTD12SO		10CTD13SO		10CTD14SO		10CTD15SO		10CTD16SO		10CTD17SO		10CTD18SO	
			Lab Sample ID	K1008043-010		K1008043-011		K1008043-012		K1008043-013		K1008043-014		K1008043-015		K1008043-016		K1008043-017		K1008043-018	
			Location	DS25		DSW25		DNW25		DN10		DNE10		DSE10		DS10		DSW10		DNW10	
			Collection Date	7/29/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010	
			Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
			Sample Type	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
Analyte	**Method**	**Units**	**ADEC[1]**																		
Diesel Range Organics	AK102	mg/kg	500	4300	[22]	190	[22]	11	[22] J	210	[22]	3200	[22]	560	[22]	2800	[22]	1200	[22]	20	[22] J
Diesel Range Organics	AK102	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

			Sample ID	10CTD19SO		10CTD20SO		10CTD21SO		10CTD22WG	
			Lab Sample ID	K1008043-019		K1008043-020		K1008043-021		K1008043-022	
			Location	DOG		DN50		DOG		RINSATE D	
			Collection Date	7/29/2010		7/29/2010		7/29/2010		7/29/2010	
			Matrix	Soil		Soil		Soil		Water	
			Sample Type	Primary		Field Duplicate		Field Duplicate		Rinsate	
Analyte	**Method**	**Units**	**ADEC[1]**								
Diesel Range Organics	AK102	mg/kg	500	4900	[24]	110	[31]	6700	[25]	-	-
Diesel Range Organics	AK102	ug/L	-	-	-	-	-	-	-	160	[800] J,B

Notes:
[1] = ADEC Method 1 Soil Cleanup Level (from 18 AAC 75.341 Table A2).
Highlighted concentrations exceed ADEC Method 1 Soil Cleanup Level.
B = Possible cross-contamination (similar concentration detected in blank).
J = Estimated because concentration was reported below the LOQ.
LOQ = Limit of quantification.
ND = Not detected at the [LOQ].
mg/kg = Milligrams per killogram.
ug/L = Micrograms per liter.

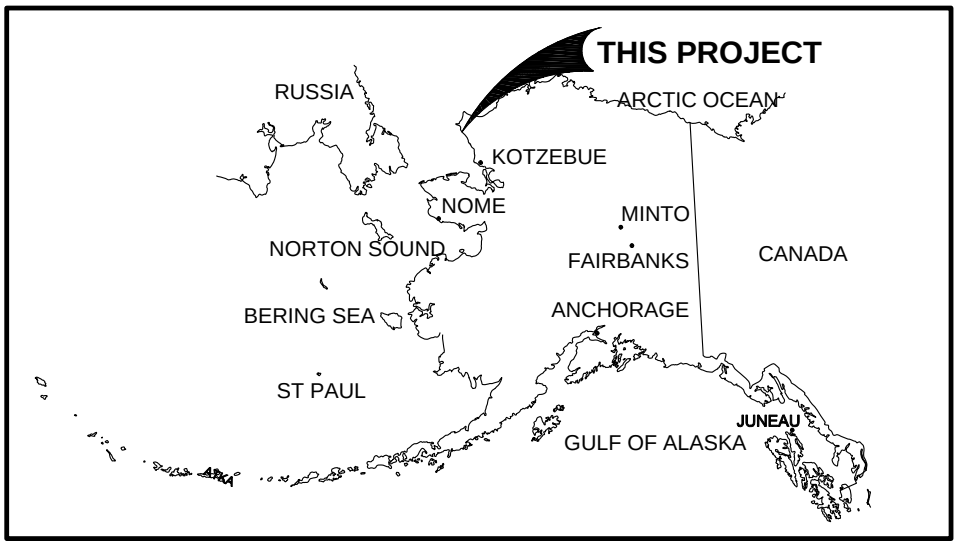
Table 2 - Analytical Results
Project Chariot Test Holes
Cape Thompson, Alaska

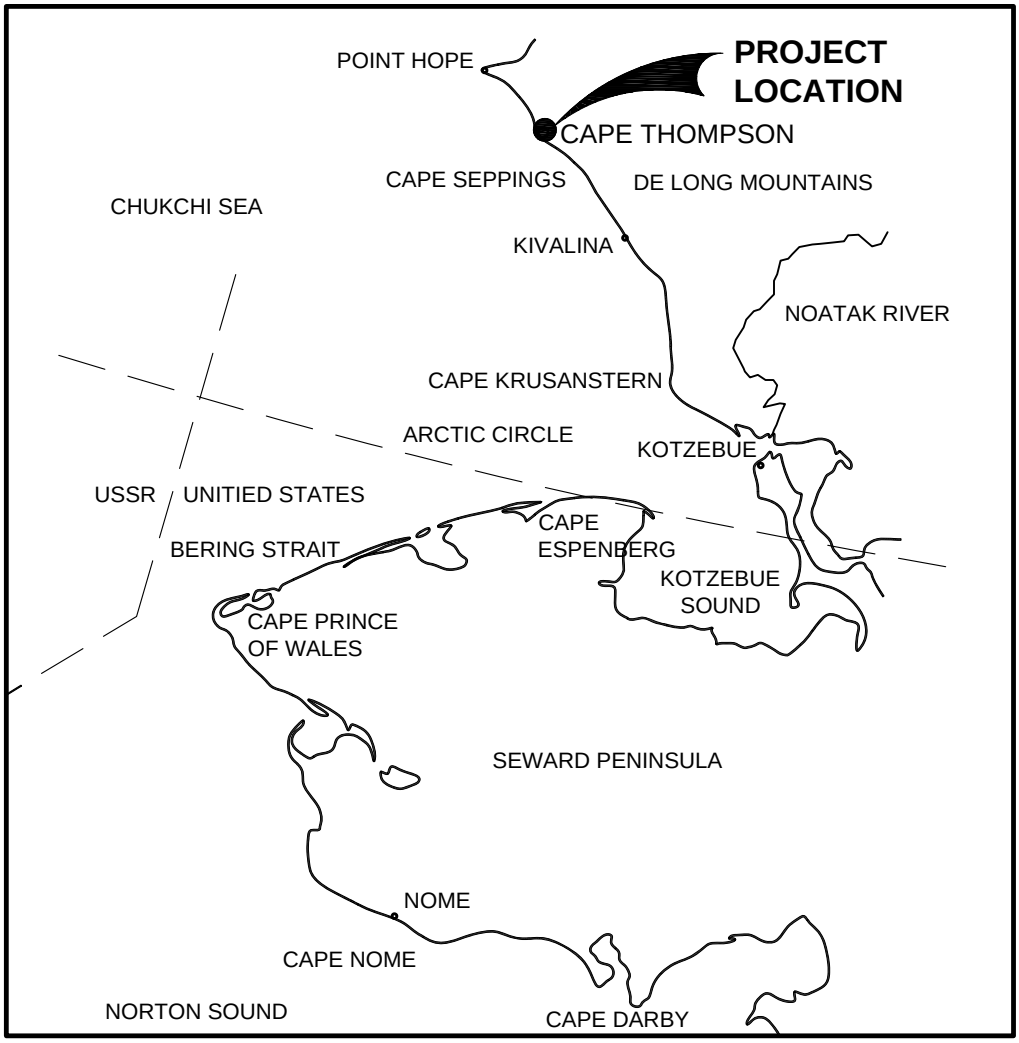
			Sample ID	10CTX01SO		10CTX02SO		10CTX03SO		10CTX04SO		10CTX05SO		10CTX06SO		10CTX07SO		10CTX08SO		10CTX09SO	
			Lab Sample ID	K1008042-001		K1008042-002		K1008042-003		K1008042-004		K1008042-005		K1008042-006		K1008042-007		K1008042-008		K1008042-009	
			Location	XN50		XNE50		XSE50		XS50		XSW50		XNW50		XN25		XNE25		XSE25	
			Collection Date	7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010	
			Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
			Sample Type	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
Analyte	**Method**	**Units**	**ADEC[1]**																		
Diesel Range Organics	AK102	mg/kg	500	4.7	[22] J,B	6	[23] J,B	8.1	[23] J,B	4.4	[22] J, B	18	[24] J	8	[23] J,B	7.7	[22] J,B	6	[23] J,B	6.9	[22] J,B
Diesel Range Organics	AK102	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

			Sample ID	10CTX10SO		10CTX11SO		10CTX12SO		10CTX13SO		10CTX14SO		10CTX15SO		10CTX16SO		10CTX17SO		10CTX18SO	
			Lab Sample ID	K1008042-010		K1008042-011		K1008042-012		K1008042-013		K1008042-014		K1008042-015		K1008042-016		K1008042-017		K1008042-018	
			Location	XS25		XSW25		XNW25		XN10		XNE10		XSE10		XS10		XSW10		XNW10	
			Collection Date	7/28/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010	
			Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
			Sample Type	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
Analyte	**Method**	**Units**	**ADEC[1]**																		
Diesel Range Organics	AK102	mg/kg	500	51	[22]	19	[23] J	24	[23]	79	[23]	25	[22]	230	[22]	730	[22]	8,700	[22]	300	[23]
Diesel Range Organics	AK102	ug/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

			Sample ID	10CTX19SO		10CTX20SO		10CTX21SO		10CTX22WG	
			Lab Sample ID	K1008042-019		K1008042-020		K1008042-021		K1008042-022	
			Location	X1		XNE50		X1		RINSATE X	
			Collection Date	7/29/2010		7/29/2010		7/29/2010		7/29/2010	
			Matrix	Soil		Soil		Soil		Water	
			Sample Type	Primary		Field Duplicate		Field Duplicate		Rinsate	
Analyte	**Method**	**Units**	**ADEC[1]**								
Diesel Range Organics	AK102	mg/kg	500	31,000	[130]	5	[22] J,B	34,000	[120]	-	-
Diesel Range Organics	AK102	ug/L	-	-	-	-	-	-	-	250	[800] J,B

Notes:
[1] = ADEC Method 1 Soil Cleanup Level (from 18 AAC 75.341 Table A2).
Highlighted concentrations exceed ADEC Method 1 Soil Cleanup Level.
B = Possible cross-contamination (similar concentration detected in blank).
J = Estimated because concentration was reported below the LOQ.
LOQ = Limit of quantification.
ND = Not detected at the [LOQ].
mg/kg = Milligrams per killogram.
ug/L = Micrograms per liter.





NORTH

0 30 60 120
SCALE IN MILES

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

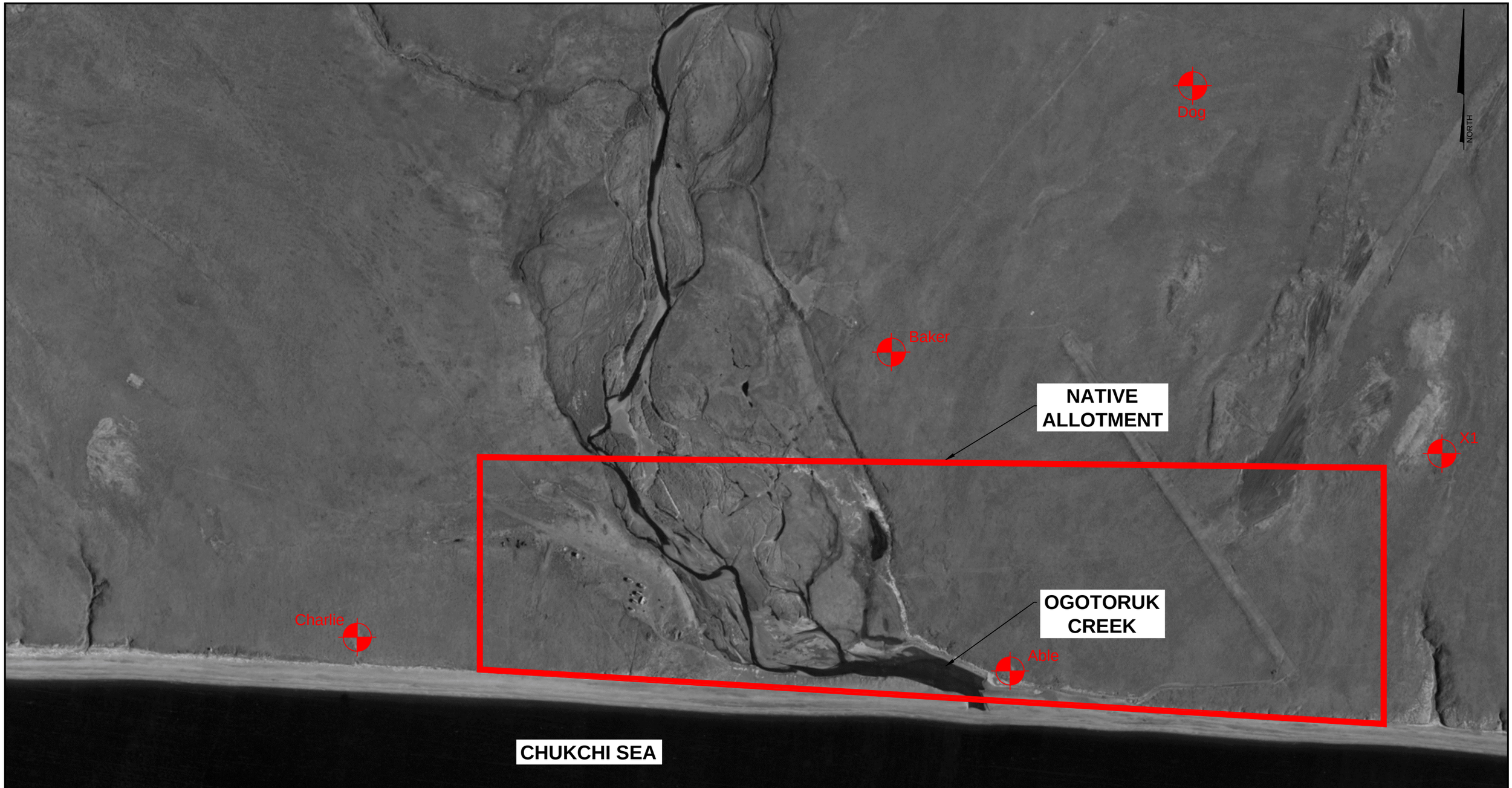
ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Regional Site Map

Limited Soil Investigation of Project Chariot Test Holes
Cape Thompson, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-08-D-0003	1	12/10

1644AF



SOURCE OF NATIVE ALLOTMENT BOUNDARY WAS ESTIMATED FROM FIGURE 3 OF DEBRIS REMOVAL AND SAMPLING ACTIVITIES REPORT, NATIVE VILLAGE OF POINT HOPE, FIDOLFI INC., DECEMBER 2009

SOURCE OF BASEMAP

AERO-METRIC IMAGE JULY 28, 1992

LEGEND

Dog — TEST HOLE AREA

0 250 500 1000

SCALE IN FEET

FAIRBANKS ENVIRONMENTAL SERVICES
3538 INTERNATIONAL STREET
FAIRBANKS, ALASKA

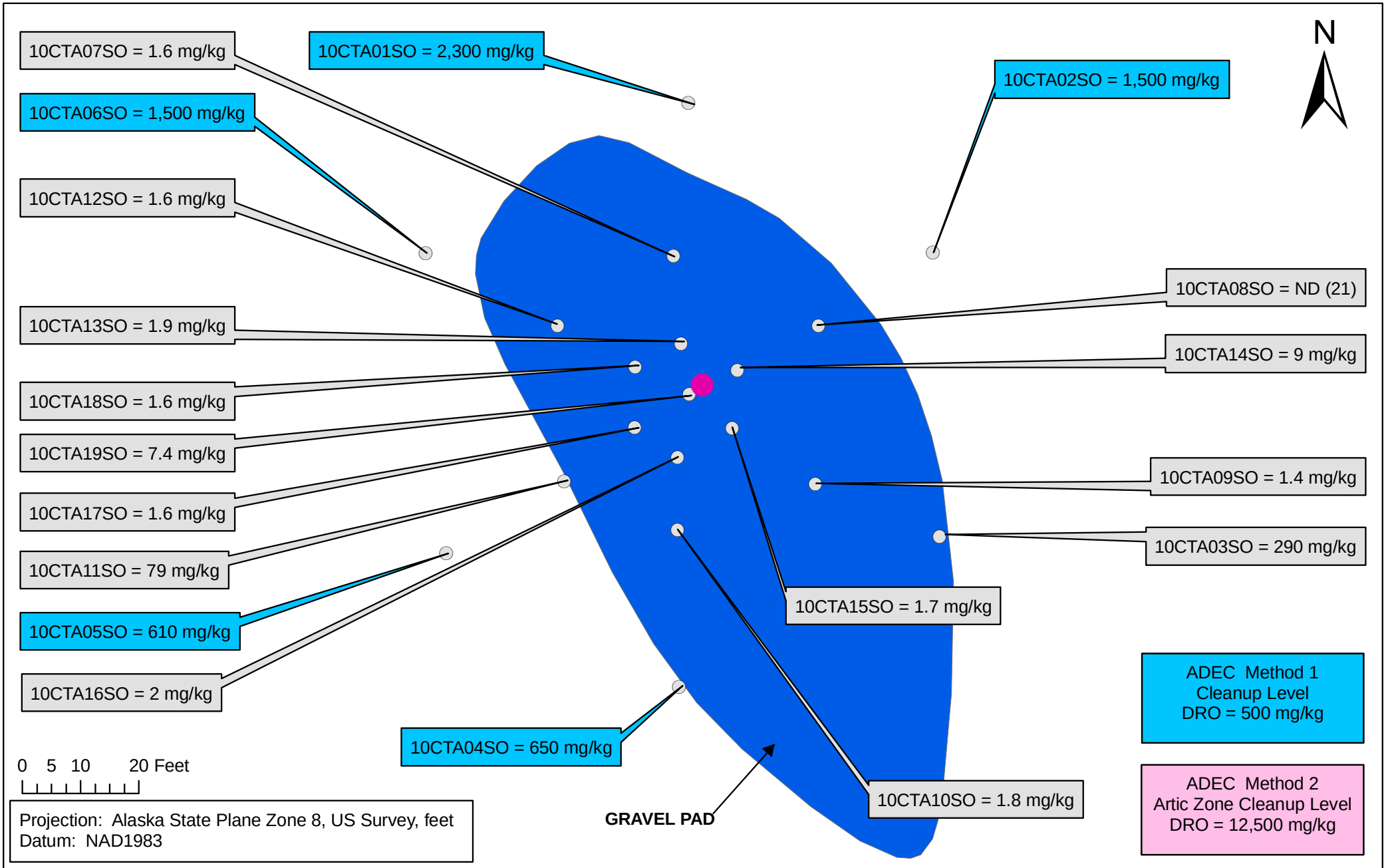
ALASKA DISTRICT
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Project Site Map

Limited Soil Investigation of Project Chariot Test Holes
Cape Thompson, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-08-D-0003	2	12/10

1645AF



LEGEND:

Sample Identification Number

Concentration in mg/kg

Sample Location

10CTA016SO = 2 mg/kg

10CTA04SO = 650 mg/kg

Concentrations Exceeding ADEC Method 1 Cleanup Levels are shown in BLUE box

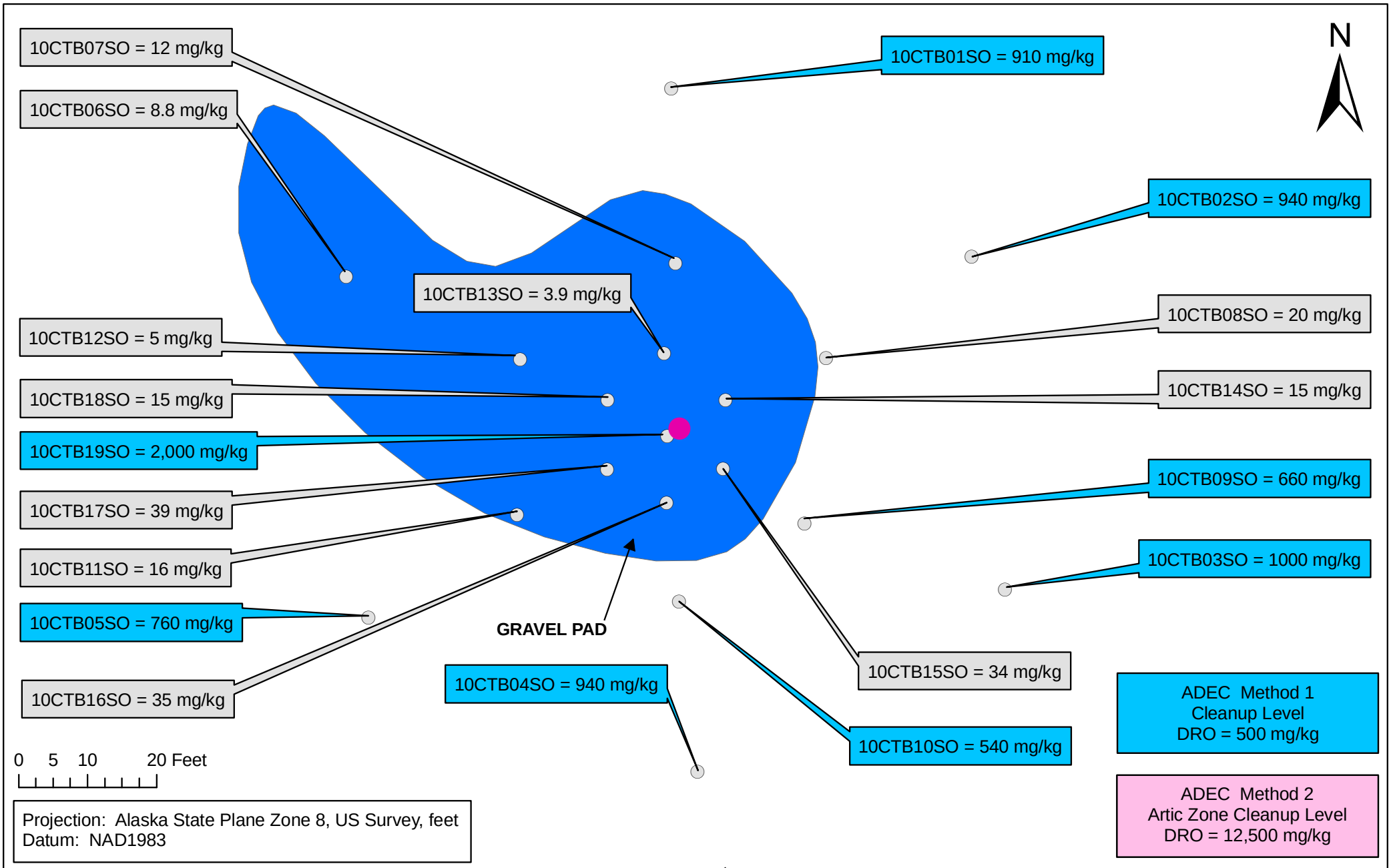
Test Hole Able

Fairbanks Environmental Services
3538 International Street
Fairbanks, AK 99701

Alaska District
U.S. Army Corps of Engineers
Anchorage, AK

DRO Concentrations in Soil Samples Collected from Test Hole Able Site
Limited Soil Investigation of Project Chariot Test Holes
Cape Thompson, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-08-D-0003	3	12/10



LEGEND:

Sample Identification Number

Concentration in mg/kg

10CTB016SO = 35 mg/kg

Sample Location

10CTB04SO = 940 mg/kg

Concentrations Exceeding ADEC Method 1 Cleanup Level are shown in BLUE box

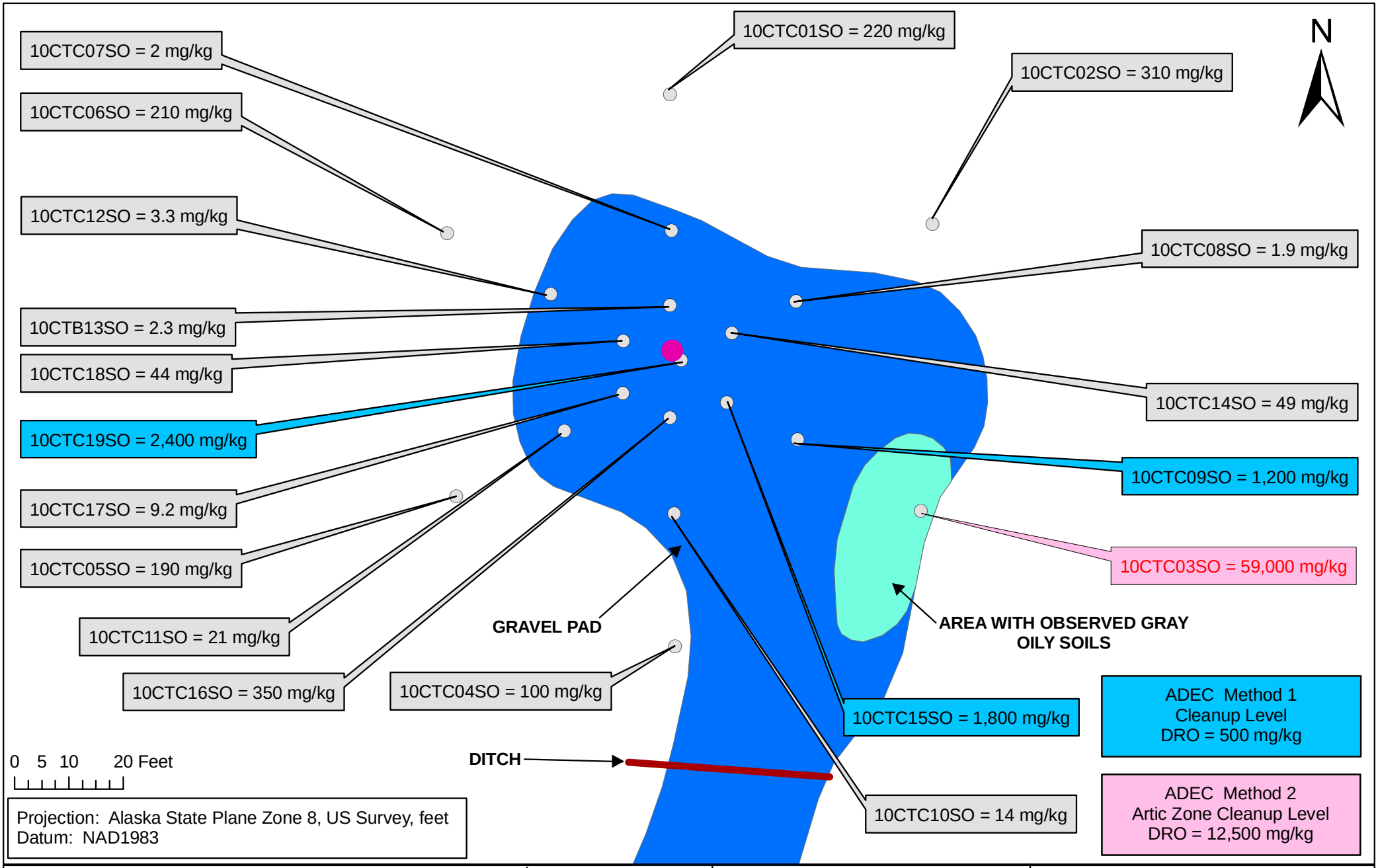
Test Hole Baker

Fairbanks Environmental Services
3538 International Street
Fairbanks, AK 99701

Alaska District
U.S. Army Corps of Engineers
Anchorage, AK

DRO Concentrations in Soil Samples Collected from Test Hole Baker Site
Limited Soil Investigation of Project Chariot Test Holes
Cape Thompson, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-08-D-0003	4	12/10



LEGEND:

Sample Identification Number

Concentration in mg/kg

10CTC16SO = 350 mg/kg

Sample Location

Test Hole Charlie

Concentrations Exceeding ADEC Method 1 Cleanup Levels are shown in BLUE box

10CTC19SO = 2,400 mg/kg

Concentrations Exceeding ADEC Method 2 Arctic Level Cleanup Levels shown in PINK box

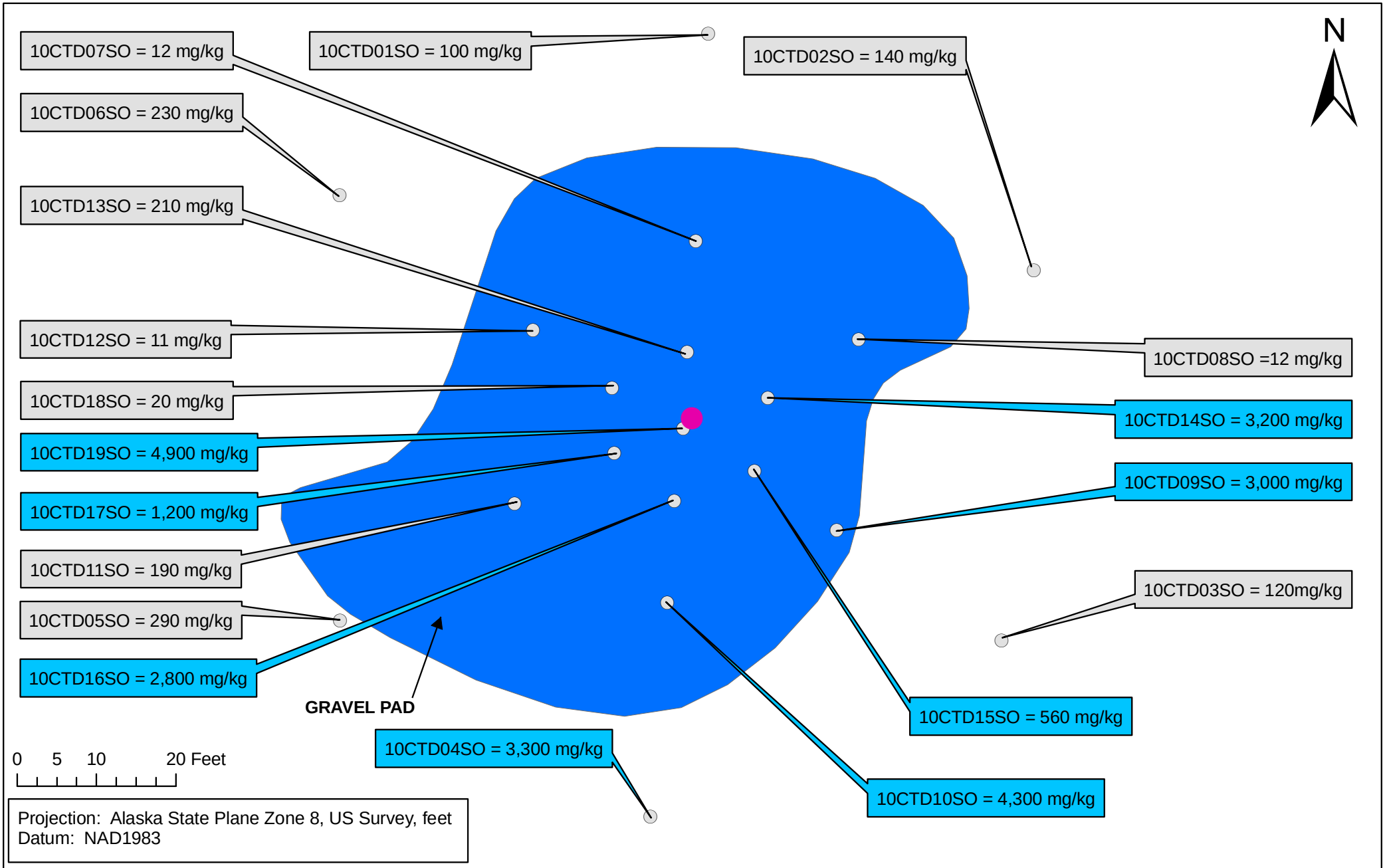
10CTC03SO = 59,000 mg/kg

Fairbanks Environmental Services
3538 International Street
Fairbanks, AK 99701

Alaska District
U.S. Army Corps of Engineers
Anchorage, AK

DRO Concentrations in Soil Samples Collected from Test Hole Charlie Site
Limited Soil Investigation of Project Chariot Test Holes
Cape Thompson, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-08-D-0003	5	12/10



LEGEND:

Sample Identification Number

Concentration in mg/kg

Sample Location

10CTD05SO = 290 mg/kg

10CTD16SO = 2,800 mg/kg

Concentrations Exceeding ADEC Method 1 Cleanup Levels are shown in BLUE

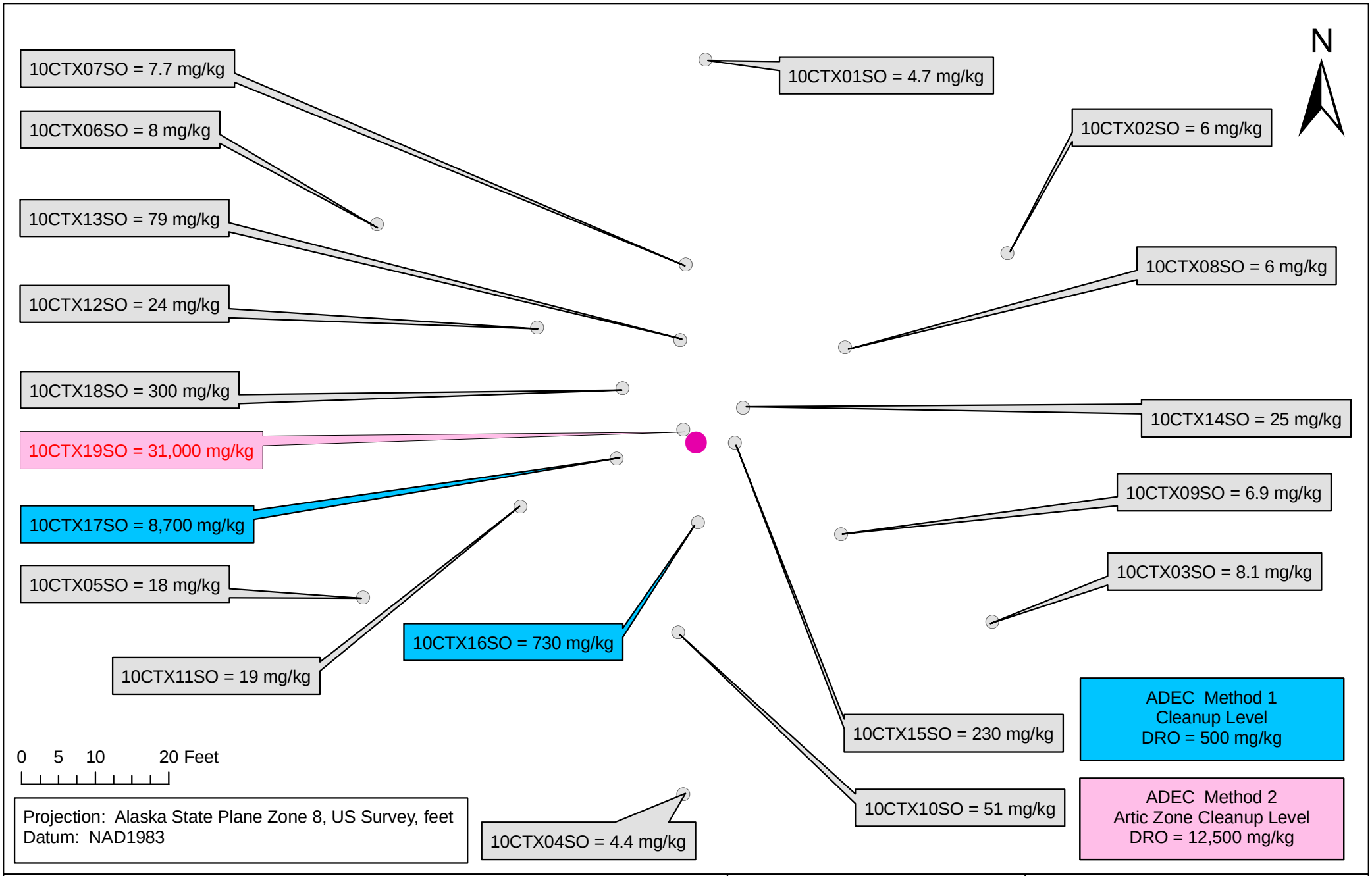
Test Hole Dog

Fairbanks Environmental Services
3538 International Street
Fairbanks, AK 99701

Alaska District
U.S. Army Corps of Engineers
Anchorage, AK

DRO Concentrations in Soil Samples Collected from Test Hole Dog Site
Limited Soil Investigation of Project Chariot Test Holes
Cape Thompson, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-08-D-0003	6	12/10



LEGEND:

10CTX11SO = 19 mg/kg — Sample Identification Number; Sample Location

10CTX16SO = 730 mg/kg — Concentrations Exceeding ADEC Method 1 Cleanup Levels are shown in BLUE

10CTX19SO = 31,000 mg/kg — Concentrations Exceeding ADEC Method 2 Arctic Level Cleanup Levels shown in Red

Test Hole X1

Fairbanks Environmental Services
3538 International Street
Fairbanks, AK 99701

Alaska District
U.S. Army Corps of Engineers
Anchorage, AK

DRO Concentrations in Soil Samples Collected from Test Hole X1 Site
Limited Soil Investigation of Project Chariot Test Holes
Cape Thompson, Alaska

CONTRACT:	FIGURE:	DATE:
W911KB-08-D-0003	7	12/10

Appendix A
Site Photographs

Photograph 1 - Plane Landing at Cape Thompson (View to NW).

Photograph 2 – Field gear temporarily stored next to existing structure (View to NW).

Photograph 3 - Test Hole Able and thermistor cable. Ogotoruk Creek in BG (View to W).

Photograph 4 – Test Hole Able with Ogotoruk Creek and Chukchi Sea in BG (View to SW).

Photograph 5 – Removing soil sample hand auger near Test Hole Able (View to S).

Photograph 6 – Example of soil sample collected from tundra near Test Hole Able.

Photograph 7 – Test Hole Baker, thermistor cable, auger, decon water, and pin flags (View to NE).

Photograph 8 – Pin flag marking sample location adjacent Test Hole Baker.

Photograph 9 – Collecting GPS coordinates of sample locations near Test Hole Baker (View to S).

Photograph 10 – Test Hole Charlie with thermistor cable, block of wood, and cylinder on ground.

Photograph 11 – View of Test Hole Charlie pad with stained soils in lower right (View to NW).

Photograph 12 – Petroleum staining of pad soils near Test Hole Charlie.

Photograph 13 – Subterranean house with Test Hole Charlie (red arrow) in BG (View to E).

Photograph 14 – Same photograph with a closeup of Test Hole Charlie (red arrow)

Photograph 15 – Sampling with driven probe in tundra near Test Hole Charlie (View to N).

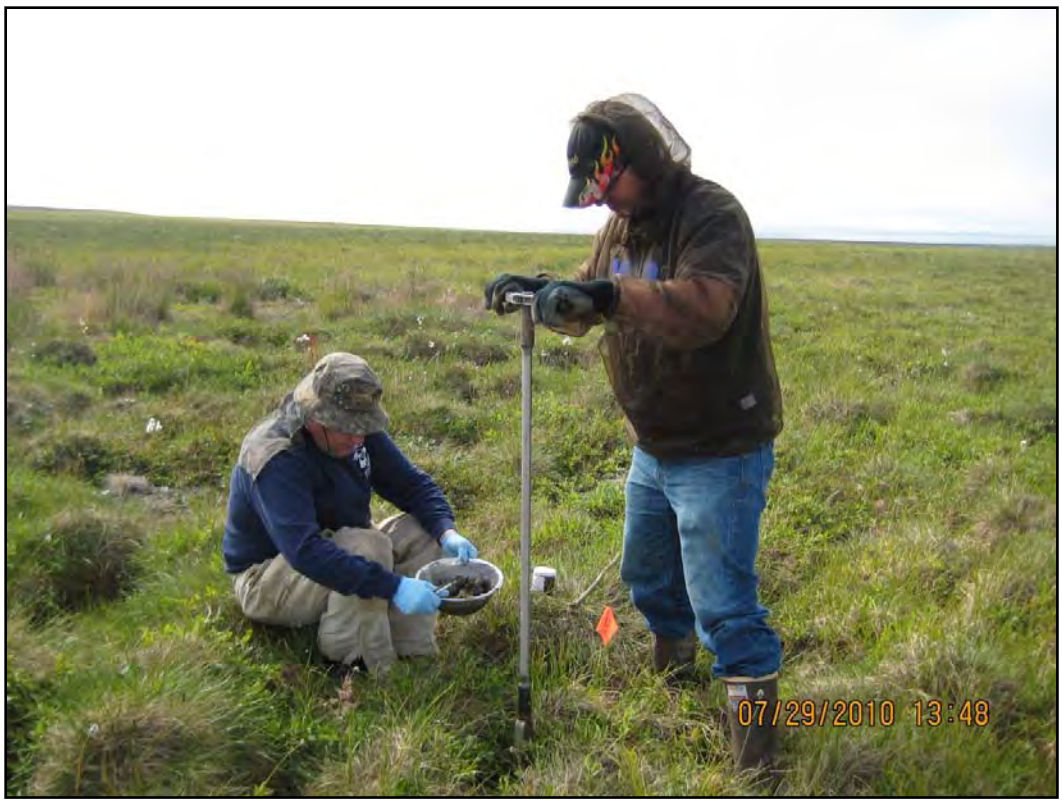
Photograph 16 – Example of sample core collected from tundra near Test Hole Charlie.

Photograph 17 – Test Hole Dog with steel drum protective casing and wood structure.

Photograph 18 – Thermistor cable installed through wood block near Test Hole Dog.

Photograph 19 – Closeup of thermistor cylinder found on pad near Test Hole Dog.

Photograph 20 – Test Hole Dog with pin flags marking sample locations (View to NW).



Photograph 21 – Sampling with hand auger near Test Hole Dog (View to S).

Photograph 22 – Ice in tundra sample near Test Hole Dog.

Photograph 23 – Test Hole X1 and flags marking sample locations (View to SW).

Photograph 24 – View inside Test Hole X1 casing.

Appendix B
Field Notes

"Rite in the Rain"®

ALL-WEATHER

FIELD

No. 351

CAPE THOMPSON - 2010
FAIRBANKS ENVIRONMENTAL SERV.
2700 SPENARD RD., SUITE 300
MIKE BOESE - 907-441-1346

"Rite in the Rain"®
ALL-WEATHER WRITING PAPER

Name MIKE BOESE

Address

Phone 907-441-1346

Project CAPE THOMPSON - 2010

Clear Vinyl Protective Slipcovers (Item No. 30) are available for this style of notebook.
Helps protect your notebook from wear & tear. Contact your dealer or the J. L. Darling Corporation.

BIBBERS 442-2693
SUE'S B&B 442-3770
NULLAGVIK 442-3331
TAXI 442-4444

CONTENTS

PAGE REFERENCE DATE

CRAIG 452-1006, 388-4631, 488-2705

MANILAQ MEDFLIGHT 442-7595

NORTHWESTERN AVIATION 442-3525, 442-8692
cell 412-1482

MANILAQ MEDICAL CENTER 442-3321

POINT HOPE CLINIC 368-2234

NEIL FOLCIK 753-5657

REX TUZROYLUK 368-2667

JIM TWEETO 624-3595, 350-6922
HAGELAND

TIKIGAQ CORP 365-6299 (ANCH)
368-2235 PH

EMERALD (BRENDA) 258-1558 EXT 109

RAY (TRIBE) 368-2330
Native Village of Pt Hope

✓ SAMPLE KIT - GOLD STREAK
027-2724-0253
1 PIECES 140 lbs

✓ ANCH GEAR - 027-7806-8012

✓ XRF - GOLD STREAK
027-7807-5001

FAIRBANKS GEAR
602 lbs
4 pieces
ALASKA AIR CARGO 027-7671-7793
✓ NAC 345-2080-3215

7/14 ORDER SAMPLE KIT - HAVE CAS SHIP DIRECTLY TO KOTZEBUE

7/21 SHIP GEAR (ANCH) USING AK AIR CARGO PRIORITY.

7/23 ~~7/24~~ MB RENT XRF FROM TTT.
7/24 ~~7/25~~ MB SHIP XRF USING GOLD STREAK.

7/25 PACK PERSONAL GEAR.

Michael Boes

7/26/10

4AM RAINY + DARK. CALL CAB
430 ARRIVE AT AIRPORT.
440 CHECKED IN & THROUGH SECURITY
525 BOARDING
605-740 FLIGHT TO KOTZEBUE
800 WAIT FOR PLANE TO LEAVE
830 PICK UP XRF
HAVE CARGO DROPPED OFF @ NW
GET GENERATOR/PID FROM NAC
TAKE TAXI W/ BAGS TO NW.
PUT ALL GEAR ON PALLETS.
STILL MISSING FAIRBANKS SHIPMENT
CALL CRAIG — CRAIG CALLED AK
AIR CARGO — WILL BE ON FLT 153 TODAY
BUT CAN'T PICK UP TO TOMORROW
MORNING — ALTERNATIVE IS TO
DO SITE VISIT @ KRUSENSTERN
TODAY & FLY TO CAPE THOMPSON
TOMORROW. DISCUSS W/ JIM @ NW.
— PRINT OUT MAP. — COME BACK AFTER
LUNCH — HEAD OUT ~1-2 PM.
11-12 LUNCH
12-1 AC STORE. BUY PROPANE

Mike Bower

7/26/10

1320 — WAITS FOR JIM TO CLEAN & PREP. PLANE — DISCUSS Safety
MIKE PHOTOGRAPH SITE
CHRIS - GPS SITE FEATURES
MAKENZIE - BEAR GUARD.
1415 — FLY TO CAPE KRUSENSTERN.
TAKE AERIALS PRIOR TO LANDING. 1450 — LAND
SOIL IS ARCTIC BROWN (SILT)
WITH SOME ANGULAR ROCKS @ SURFACE
& BEDROCK @ Higher Elevations.
WALK UP ROADS & LOOK FOR
SITE FEATURES & SAMPLE AREAS.
HILL IS VERY STEEP - GETS WINDY
AT TOP. ~65°F. LOCATE ROADS
& BUILDING FOUNDATION (GROUNDING
ROD, CEMENT PAD, & REBAR in 2'x2'
CEMENT SQUARE. ALSO FOUND
PIECE OF REBAR INSERTED INTO GROUND
IN ANOTHER AREA NEAR N. DRUM AREA —
SURVEY ~~POINT~~ MARKER?
1600 RETURN TO KOTZEBUE
1630 LAND IN KOTZEBUE
1700 CHECK IN @ BIBBERS B&B.

Mike Bower

7/26/10

1730-1830 DINNER

1830-1930 AK AIRLINES AIR CARGO - GEAR HAS ARRIVED! SIGN FOR IT & HAVE THEM TAKE IT TO NORTHWESTERN AVIATION.

Mike Boese

7/27/10

Breakfast

PARTLY SUNNY 60°F

0800 PACK FOR CAPE THOMPSON. WEIGHT ALL GEAR + PEOPLE. BUY ICE @ AC STORE. LOAD 2 PLANES

10-11 MB ~~9-10~~ FLY TO CAPE THOMSON. GOOD WEATHER & VISIBILITY.

UNLOAD PLANES - ONE BUILDING REMAINS ONSITE. PLACE CAMP NEAR BUILDING

1115 CALL REX TUZROYLUK - NO ANSWER - NO ANSWERING MACHINE. CALLED CRAIG TO LET HIM KNOW WE MADE IT SAFELY. HE INDICATED THAT I SHOULD CALL RAY & REX - REX IS MAD - HE CAME TO SITE YESTERDAY - CALLED RAY - "NOT IN TOWN" - LEFT MESSAGE THAT "FES GUYS ARE AT CAPE THOMPSON"

NOTE 2'x2' SURFACE STAIN 10' SOUTH OF BUILDING THAT WAS NOT THERE PREVIOUSLY

SET UP TENT & CLEAN/ORGANIZE AREA.

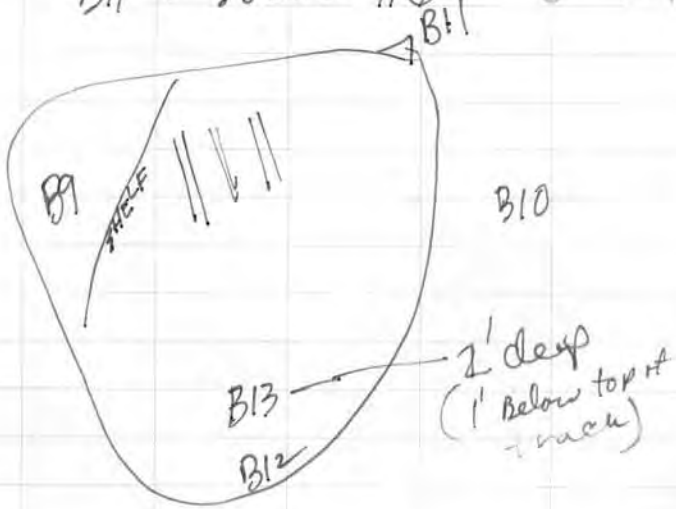
1200-1230 SAFETY MEETING

Mike Boese

7/27/10

note that tracked vehicle has ran over battery area since 2008 (See photo)

B10 = 113.8 ± 21.3 6" Depth
B11 = 3822 ± 116 6" Depth



B12 = 269.1 ± 31.3

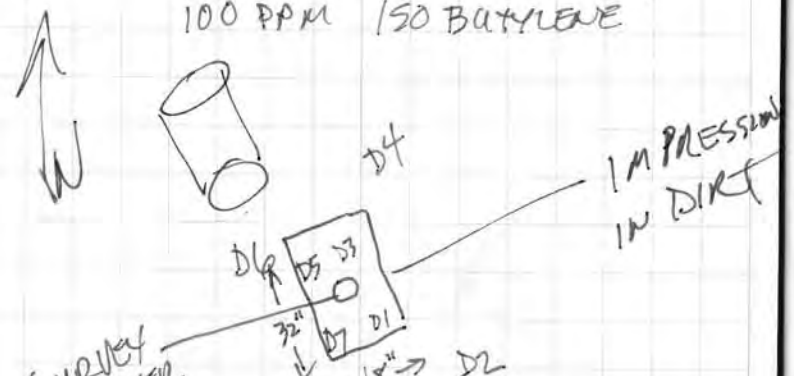
1715 30 gallon Drum is already 2/3 full. Decide to use 55 gallon drum - 250#

Mike Boese

7/27/10

1735 move over to Drum site
- looks like it is a 15 gall drum - not 30.

CALIBRATED MINIRAE w/
100 PPM 150 BUTYLENE



LOCATION	PID	Depth
D1	0.0	6"
D2	0.0	↓
D3	0.2	↓
D4	0.0	↓
D5	0.0	↓
D6	0.0	↓
D7		↓
D8	0.0	↓

NO ODOR OR SIGN OF CONTAMINATION (SUCH AS STAINING)

Mike Boese

7/27/10

1810 Collect 10CT0150 + DUPLICATE
1815 10CT0250 FROM DRUM AREA
LOCATION ~~D3~~ MB D3.

1825 Transfer soil from 30 gallon drum to 55 gallon drum.
1835 REX arrived
1845 Collect B13 after removing some more soil

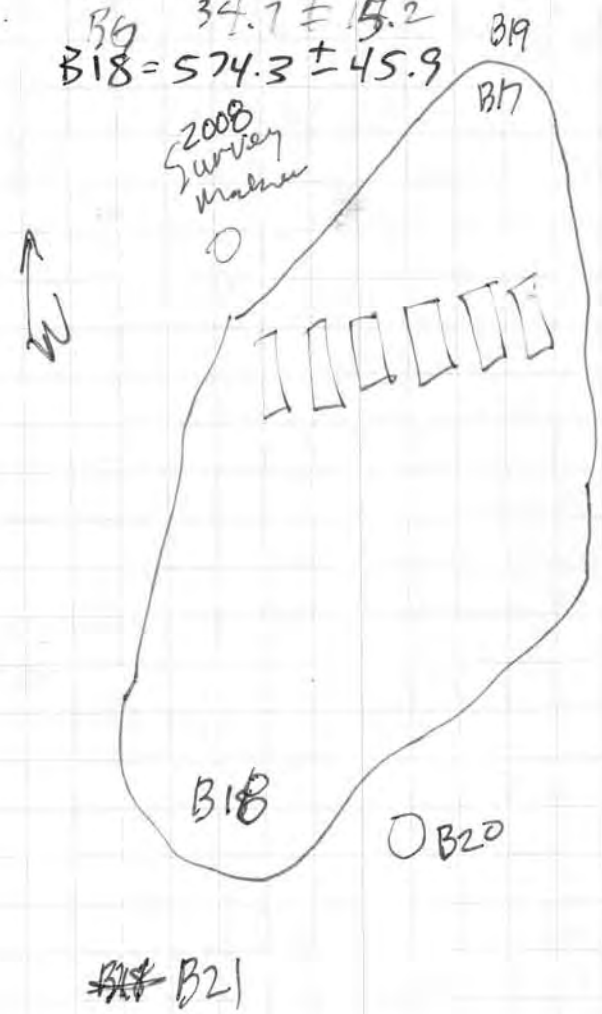
B13 = 125.7 ± 28.1
B14 = 1488 ± 73

B15 = 1203 ± 60

Mike Boese

7/27/10

B16 = 893.5 ± 54.2
B17 = 920.9 ± 60.7
B19 34.7 ± 15.2
B18 = 574.3 ± 45.9



Mike Boese

7/27/10

B19 = 2186 ± 86
B20 = 1051 ± 60
B21 = 2440 ± 92

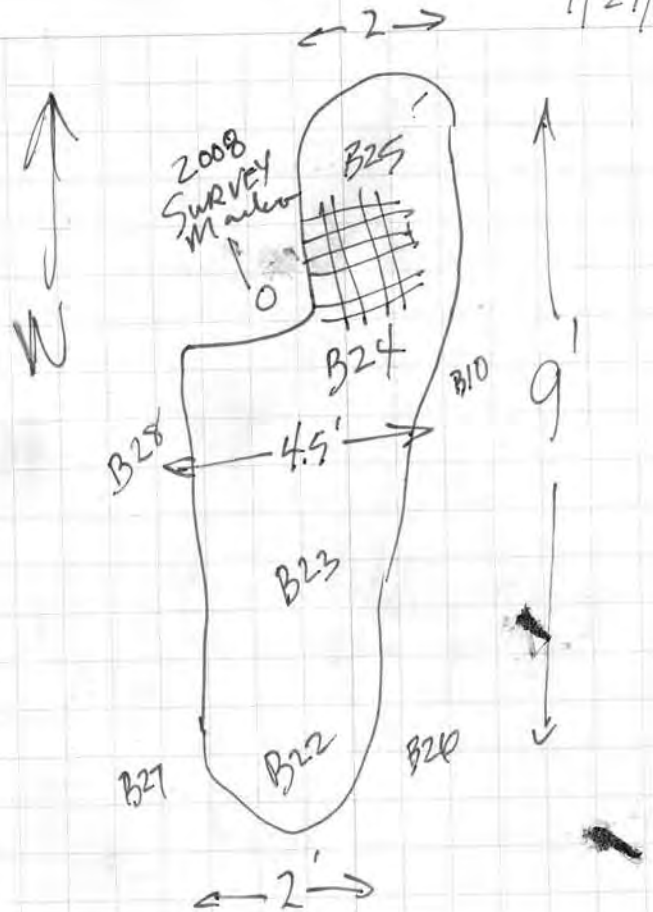
2030 locate test hole
Charlie. PAD w/
~~spot Brow Bear on~~
~~Beach~~ NOPE

2100 Dinner
2135 call Craig – "we will exceed 1000 lb Limit for lead" we have excavated ~650 lbs so far.
2130 excavate up to 1000 lbs (55 + 30 gallon drum) & try to delineate extent w/ XRF

			Depth
Bottom	B22	= 187.1 ± 32.6	~~18"~~ 12"
	B23	880.5 ± 75.2	~~18"~~ 12"
	B24	599.0 ± 48.5	~~18"~~ 12"
	B25	1668 ± 88	~~24"~~

Mike Bates

7/27/10



B26 42.9 ± 14.3
B27 1374 ± 68
B28 459 ± 43.1

2315 clean up site for Night
2320 DONE

Mike Bates

7/28/10

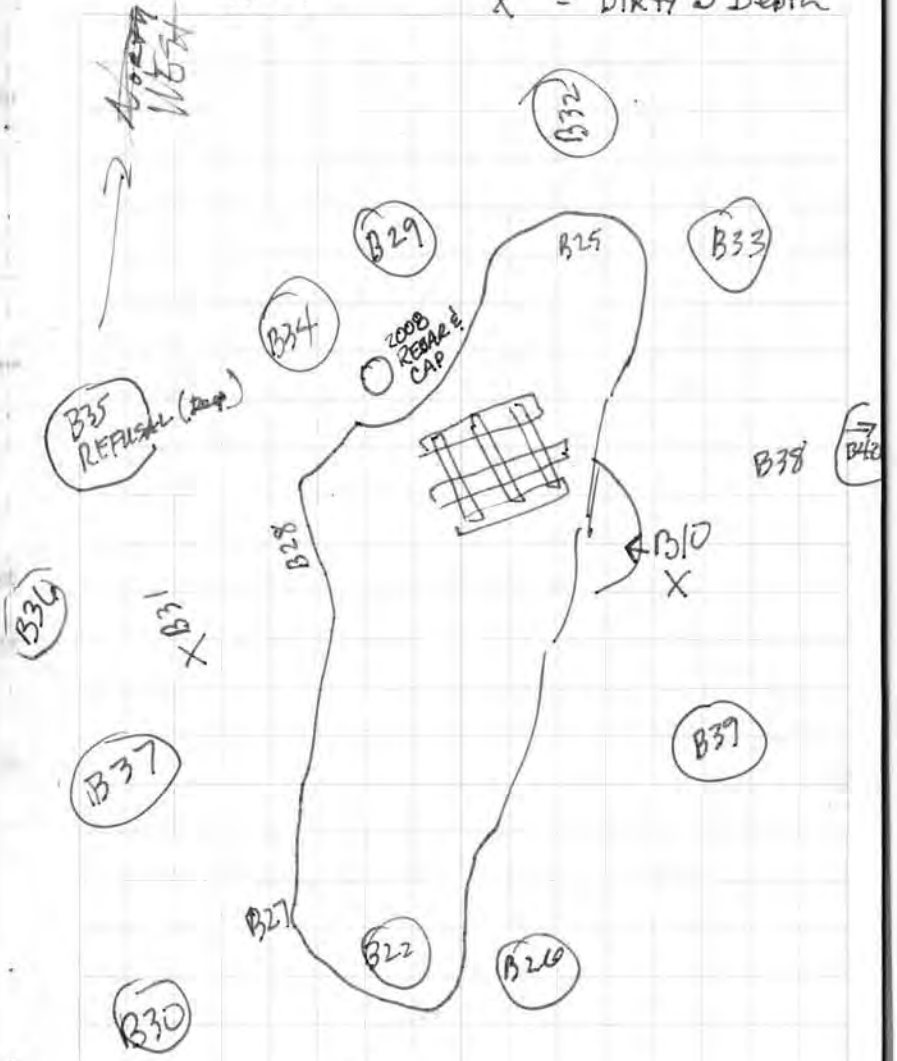
9AM talk w/ Craig regarding Pb soil delineation – USACE needs to be notified to change generator status – we need more drums – we need new manifests and they need to be signed by Ron Brasles
usace needs EPA ID #.
Craig wants us to further delineate
930 onsite (Pb area)
Calibrate Check XRF
50 ppm Std = 44.8 ± 19.6 ✓
2700 ppm Std = 2694 ± 109 ✓
500 ppm Std = 540.6 ± 57.1 ✓
Blank = ND < 13 ✓

Sample	xrf result	Depth
B29	47.8 ± 16.9	8-10"
B30	28.8 ± 15.1	8-10" ~~6-8"~~
B31	76.9 ± 18.6	6-8"
B32	55.9 ± 17.2	6-8"
B33	36.1 ± 15.5	6-8"
B34	194.3 ± 27.0	2'
B33D*	38.7 ± 17.7	1.5' *
B32D*	63.8 ± 19.0	1.75' *
B31D*	270.0 ± 35.1	1.75' *

* DRIVEN SOIL PROBE USED
Mike Boone

7/28/10

○ = Below 200 ppm
X = DIRTY 2 Depth



Sample	xrf result	Depth
B26D	83.9 ± 16.1	2'
B10D	4734 ± 125	2'

Mike Boone

7/28/10

Sample	XRF RESULT	Depth
B35	24.2 ± 13.8	6-8"
B36	36.4 ± 15.4	6-8"
B37	30.4 ± 14.7	6-8"
B35D*	REFUSAL - METAL DEBRIS	
WET - USED TORCH to DRY - B36D*	57.6 ± 17.9	2.25'
B37D*	ND < 20	1.75'
B38D*	3992 ± 141	2'
B39D*	94.9 ± 21.4	2'
B40D*	27.6 ± 15.1	2'

Check ND = < 13 ppm

SIZE OF EXCAV.
B30 → B32 = 13'
B36 → B38 + 1.5' = 13'
B22 → B34 = 8'
B37 → B40 = 14'

1200 Called Craig - "we delineated every direction except ~~east~~ North of B38" - Oval shape with ~13' diameter - we need 3x 30 gallon drums to remove 1000 lbs

1200-1230 lunch

* Collected w/ DRIVEN Soil probe
Mike Boren

7/28/10

1230
Return to Pb battery site - step out from B38 - take B40 @ 2' depth - delineation finished
GPS (Chris) petroleum + Pb sites

1340 Rex arrives - explain our progress - show him our delineation boundaries.
- He asks if we can sample landfill, I indicated we would ask USACE.

1345 Guys get ready to sample Test Hole Charlie

1400 Move to Test hole charlie with gear + sample jars

- Water level ~1.0 (Stinky) from TOC
- Depth to bottom 4' 9 1/2"

Chris uses GPS to find & mark sample locations - well coordinates are off about 5' east

Rex asks us to sample water in ~~well~~ CASING. I indicated that it was out of scope but I would ask the USACE.
Mike Boren

7/28/10

We forced some water out of "well" trying to measure total depth with a stick. The only water stained the soils (rocks) adjacent to well casing. MEASURE WITH TAPE weighted @ end.

Charlie – 2'10' stickup steel casing w/ 3" inner diameter inside buried steel drum – black cord approx 10' in length hooked up to block of wood and a thermistor "Thermistor cable NO. 343"

have Chris shift all sample pts 5' to West.

10CTC2050
#20 is a dup of 10CTC0150
10CTC2150 is a dup of 10CTC1150

Sample # 03 STINKY – MOVED IT 2' SW to SAMPLE OILY SOIL @ EDGE OF PAD (NOTE SOIL STINKY 25' EXTENDS 25' South OF #03

Mike Boen

7/28/10

#09 SLIGHTLY STINKY
#15 SLIGHTLY STINKY
#19 VERY OILY ALL AROUND WELL

have Chris GPS Gravel Pad and Ditch located South of pad. note that there was no odor or sheen on standing water in the Down gradient ditch.

1730
1745 finished Sampling – pack
1745 return to Camp. w/ gear
1800 Call Craig | MW taken Rinsate Sample
USACE wants us to remove another 1000lbs of Pb Contaminated soil. Emerald is sending Drums + new manifest to Northwestern in Kotz. Jim will bring to us tomorrow or Friday
1830 prepare for ABLE after collecting Rinsate
1915 Make to test hole ABLE
1930 @ ABLE – GPS COORDINATE IS 14' West of actual local
ABLE IS A 7" OD (6 7/8" ID) Steel well – 3' stickup, – 50ft of black

Mike Boen

7/28/10

Cable - depth to water
= 3' 10"
total depth = 4' 2"

2050 Call Craig. Discuss Rex's Requests from earlier today:
① - Sample landfill for petrolu
② - Sample water in wells
Also, let Craig know that we only have 70 minutes of call time remaining on sat. phone.

10CTA2150 is a duplicate of
10CTA1250
10CTA2050 is dup of 10CTA1950

2000-2235 Collect 19 "able" samples plus 2 dups.
2245 Collect Rinsate - ABLE
CB FILLS OUT SAMPLE LOG.
[NO Sign of contamination @ ABLE]

Weather was great today 60-65°F and Breezy - just enough to keep bugs away till late in day
winds shifted from SE to from NW
2300 Done for Day Mike Brea

7/29/10
0900 - START PREPARING TO SAMPLE DOG/X1. WEATHER = OVERCAST W/ NO WIND ~ 48°F. 1045 - LEFT ~~SITE~~ CAMP SITE

1145 MOVING TO TEST HOLE DOG
CHRIS GPS'ED MONUMENT WE FOUND ALONG WAY

1215 arrive at test hole dog
3½" OD well, water depth is 13" from TOC, 3¼" ID Steel with thread on inside
thermistor w/ 20' of black cord laying on ground
55 gallon drum outer casing and 2"x8" board 3' square
Total depth 7' 1" from TOC
"Thermistor Cable No. 339"

GPS Coordinates are off by 8' to ~~Neart~~ NE.
Lay out Sample location grid

Mike Brea

7/29/10

site Dog sloped to SW Direction with many high/low anomalies

DS25

LOCATION DSE25 ~~HAS~~ HAVE HYDROCARBON ODOR.

SAMPLES IN TUNDRA-
VEG. MAT 1"-3" THEN
STILL FROZEN LAYER
40-50% ICE / 40-50%
FINE SILT TO CLAY
PARTICLES COLOR = DARK
TAN. PERMAFROST
BEGINS AT 10"-12".

SAMPLES IN GRAVEL PAD-
70% densely packed fine silt w/ 30%
fine sand/course gravel, tan/brown
color

- LOCATION DN10 has hydrocarbon odor and gray staining
DNE10 has odor

Mike Boera

7/29/10

found 2x6" board with "TP 3 7/8/09" scratched into it near DNE10

DSE10 has odor and gray staining
DS10 has odor and gray staining
DSW10 has slight odor and gray staining
- all samples @ DOG were collected w/ S.S. 1.5" hand auger
- Location DOG (near test hole DOG) was gravelly, wet with water approx 6" BGS - sheen on water - soil had petroleum odor.
Decontaminated between each sample. Collected Rinsate from SS auger and the S.S. bowl. @ 1510
"10CTDZZW6"

1515 Moved to X1.
1530 11" OD, 10 1/4" ID - Bottom @ 5'11' Below top of casing

Weather 50°F winds from South foggy low / partly sunny

Mike Boera

7/29/10

GPS coordinates were shifted 4' to SW.
located on top of hill fractured bedrock, intermittent vegetation - no tundra within 150'
Slight gradient slopes to NE
COLLECTED ALL SAMPLES w/ 1 1/8" HAND AUGER.
~~Geology~~ Soil type fine sand to cause silt w/ angular gravel, brown in color, loose - refusal 6-12" Varies with location

XS10 has hydrocarbon odor.
XSW10 " strong " "
X1 " " "

1810 Decon Auger & SS Bowl [illegible] Rinsate. "10C7X.22WS"
Dump Rinse water @ site (NO Sheen/odor)
1815 ~~Return to~~ Make back to camp
1845 fill out Sample Tracking log
rearrange sample in coolers
Ice is still good ~2/3 Remaining
Mike Boese

7/29/10

1830 - Rex arrives, discuss work we have done today (X1 + Dog)
Let Rex know that we will remove another 2000 lbs of Pb contaminated soil for a total of 2000 lbs - and that we will take 4 samples from the highest field screen location (we will take 10 field screen XRF samples from limits of excavation)
also discussed that we will not take samples from landfill it was installed properly with crushed drums (no liquids) and we can't sample subsurface. also we don't have authority + funding to take water samples from Test Holes - (water is only a couple feet max)
USACE can provide # to DOE to discuss - Rex was OK with us not sampling.

Mike Boese

7/29/10

Call Craig. Manifests Goldstocked.
8 Drums shipped on NAC - arrive tonight
Call NW - Jim will fly Drums tonight or in morning
2045 go to Baker. Decide to mark out Sample locations tonight - GPS locations are ~6' too far North
Casing 3½" OD 3¼" ID - Water 1' from TOC - Casing ~2' above ground surface - total depth is 12" below TOC.

This is the buggiest area so far - we will return to Sample in early AM
Chris GPS each sample pt. and pad + access road
Standing water SW of site
Very Wet
~2200 Rex leaves site
McKenzie fills out Sample Labels for Baker (for tomorrow)

Mike Boere

7/29/10

- Organize screening results for Pb excavation
- Chris organized gear for possible flight out tomorrow when drums arrive
- Chris shows MB how to log a pt on Trimble GPS.

2300 done for night

Mike Boere

7/30/10

9AM pack and make to site Baker
10/0 arrive @ Baker
no bugs! too cold + windy

BNE25 - 10CTB0850 is primary for 10CTB2050

BN10 - 10CTB2150 is a dup of 10CTB1350

weather 45°F, Overcast, wind from South 5-15 mph

petroleum odor and gray staining @ Location Baker - Directly NE of 55 gallon drum protecting 3" stickup.
Collect Soil Samples 1015 - 1155
Collect Groundwater 1205
Return to camp after surface discharge of purge water (no sheen or odor)
Called Craig - NW tried to bring drums out @ 2AM But Visibility was bad - they

Mike Beese

7/30/10

will try to bring @ ~1PM TODAY - el indicated, NO Because fog is @ 300' (POOR visibility)

ice is about 1/2 melted - requested more from NW (JIM) on 7/29/10

fill out COC forms and organize samples in coolers

3PM Weather clears - sun burns off fog - Call Craig → NW

5PM plane arrives w/ eight 30 gallon drums fill plane for Backhaul - make arrangement to pick us up @ end of day

Mike Beese

7/30/10

530 Calibration Check XRT
50 ppm = 47.4 ppm ± 19.6 ✓
Blank = ND < 13 ppm ✓
500 ppm = 540.9 ± 56.8 ppm ✓
2700 ppm = 2736 ± 110 ✓

goal is to put existing 1000 lbs and another 1000 lbs in 9-30 gallon drums = 222 lb each. 3 x 222 = 666
x3 trips out
1998 lbs
+ max cap on C185 = 650 lbs

Step 1
transfer contaminated Pb soil into 4,5-30 gallon drums
Place HAZ WASTE + CLASS 9 Stickers on first 3: Manifest tracking 002949531 FLE

Next 3: Manifest tracking 002949532 FLE - place HAZ WASTE + CLASS 9 LABELS

Mike Baer

7/30/10

Remove soil from near B38 (Screening Locations) B27 and the bottom

Last 3: Manifest tracking 002949533 FLE - place HAZ WASTE + CLASS 9 Labels

first 3 weighed 220-225 lb
Last drum weight 230 lb (Spot check)
finished closing drums 2/940

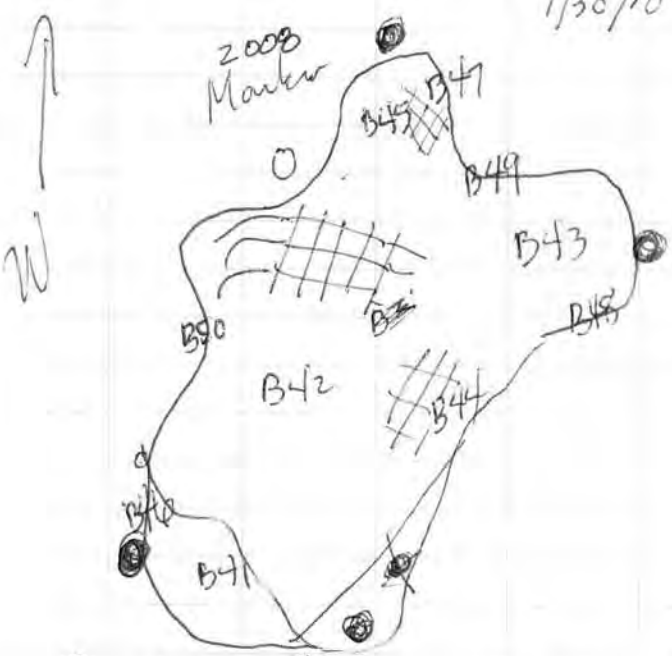
Collect field screen samples at limits of excavation

B41, 42, 43, 44 from bottom
See next page for details & figures

glass, wood, metal + other debris in excavation

Mike Baer

7/30/10



	Sample	XRF Result	depth	Locatn
*	B41 =	649.5 ± 52.3	1.5'	bottom
	B42	448.6 ± 47.4	2.5'	Bottom
	B43	178.5 ± 35.1	2'	Bottom
	B44	540.2 ± 45.4	1'	Bottom
*	B45	1454. ± 81	2½	~~Sidewall~~ Bottom
	B46	492.6 ± 41.7	8"	Sidewall
*	B47	758.6 ± 70.1	10"-12"	Sidewall
	B48	ND < 21	1'	Sidewall
	B49	~~ND~~ 72.7 ± 18.8	1'	Sidewall
*	B50	619.9 ± 54.2	1'	Sidewall

Mike Boese

7/30/10

2015
* Collect Lab Samples from 4 ~~hottes~~ highest XRF readings

10CT0350 from B44 2020
10CT0450 from B45 2025
10CT0550 from B47 2030
10CT0650 from B50 2035
10CT0750 from B50A 2040

10CT0750 is Duplicate of 10CT0650

Samples were collected w/ disposable SS. spoons — no rinsate collected and samples were not screened

Lab Sample locations were marked and GPS coordinates collected

Rebar + caps inserted + GPSed

Weather got nice @ 3PM — Sunny, wind from SE

Mike Boese

7/30/10

pack up camp - flight arrives @ -1000. load plane and fly out of Cape T to Kotzebue

(2330) ~~1130~~ arrive in Kotzebue unload plane - grab clothes for night - check ~~in~~ at Bibbers B+B @ 1200 AM

(1230 AM) walk back to NWestern talk with Jim Kincaid
- send bill to Craig
- arrange to access gear tomorrow (they are closed on Saturdays)
done for day

Mike Boese

7/31/10

0830 Wake up - eat Breakfast check out of Bibbers

0930 Call Rex - let him know that we have left Cape T and will be back to get drums (in a couple weeks)

1000 @ NWestern pack gear ~~leave~~ pulletop and inventory gear we are leaving in Kotz. for Cape Krusenstern project repack/reice coolers of samples.

1300 Check in for flight 152. Goldstreak 16 sample coolers and rental equipment. flight is late

1500 board plane for Anchorage

8/1/10

1030 Chris and Mike
Re pack samples - add
new (frozen ice)
Fred meyers for tape
and 1-gallon zip locks
1300 Alaska air Cargo -
gold streak samples to
Portland Oregon (CAS -
hold for pick up) way
027 - 7771 3322

C BOESE
2010
CAPE THOMPSON

"Rite in the Rain"®
ALL-WEATHER
FIELD
No. 351

7/26/10
815 - 1100
FLY FROM FAIRBANKS TO KOTZ
11 - ~12
LUNCH w/ MB/MJ. DISCUSS PROJECT.
12 - 1415
WALK TO STORE. BUY PROPANE.
WALK TO NORTHWEST AVIATION, PREP. FOR SITE VISIT TO CAPE KRUSENTERN SITE VISIT. WAIT FOR PLANE PREP. HAVE SAFETY MEETING WHILE WE WAIT FOR PLANE.
1415 -
LEAVE KOTZ FOR C.K.
1452 -
LAND AT C.K. SEE PICS MB CAMERA. SOIL IS BROWN SILT/CLAY TO 1' BGS. LITTLE VEGETATION. GRAVEL ONTOP 1-4" ANGULAR. TOOK GPS OF ROAD UP TO RADIO SITE. GPS'ed 2 BUILDING FOOTPRINTS. WIND BLEW → WILL HAVE

TO LOCATE GOOD CAMP SITE. FEW SMALL TREES. RIVER APPROX. 1/2 - 3/4 MILE FROM SITE. ALSO GPS'ed 2 GROUNDING RODS / 2'x2' CONCRETE PAD / MOUND AT BASE OF HILL → DIMENSIONS APPROX. 12'x12'x 7'. WILDLIFE SCAT THROUGHOUT SITE. RECOMMEND AUGER FOR SOIL COLLECTION DEEPER THAN 1' BGS. TEMP = 50's STRONG WIND
1604 - LEFT C.K., RETURN TO KOTZ.
1630 - LAND IN KOTZ. CONSOLIDATE GEAR.
1707 - LEAVE NW AVIA, CHECK IN AT BIBBERS B & B.
1730 - 1830
DINNER
1830 - 1930
WALKED TO AK AIRLINES, HAD THEM TAKE AIR CARGO TO NORTHWEST AVIATION.

Chi Bolze

7/27/10
0800 - N.W. AVIATION. SEGREGATE GEAR FOR FLIGHTS TO C.T. PICK UP ICE. 3 FLIGHTS 800 LBS/FLT. MAX
1002 - FLY TO C.T.
(AIRCRAFT = 206) MB/CB W/ JUN
1058 - LAND IN CAPE T. MJ
TO 1245 W/
SET UP CAMP. HEALTH JIM
AND SAFETY MEETING
TOPICS :- RUSTY GLASS NAILS EVERYWHERE ON SITE. - GUNS SAFETY. - SAT. PHONE #S NW AVIATION 442-3525 / 442-8692.
MEDIVAC # 4427595. SLIPS TRIPS FALLS. DISCUSS PROJECT LOGISTICS (PLAN). WEATHER = SUNNY W/ WIND. NO ICE ON OCEAN. CALIBRATED XRF NITON XLP PB DETECTOR WALKED SITE.
1400 - 3RD PLANE ARRIVED → SENT BACK W/ GEAR.
1500 -

7/27/10 CONT.
SAMPLE LEAD SITE. /→ SEE MB NOTES FOR LEAD SCREEN DATA
~1730 - SAMPLED DRUM SITE → SEE MB NOTES FOR MEASUREMENTS.
~1830 - REX ARRIVED
WE ARE GOING TO EXCEED 1000 LBS OF LEAD CONTAM. SOIL. MB IN CONTACT W/ CM.
~~2B~~ CLEAN UP. END OF DAY 2330.

7/28/10

0900 - PREP FOR DAY. PB SITE
→ SEE MB NOTES FOR ~~PB~~ PB
CONC. 1330 - REX ARRIVES.
PREP TO SAMPLE CHARLIE.
GPS ALL POINTS. GPS POINTS
~ 5' OFF EAST
2000 - 2300 SAMPLE MBLE

7/29/10

0900 - PREP FOR TRIPS TO
X AND DOG. FINISH DOG
BY 1500. MOBE TO X1
FINISH ~1800. 1830 -
BACK AT CAMP SITE.
CLEAN UP. PACK SAMPLES
REX ARRIVES. GPS BAKER.
ORGANIZE GEAR FOR FLIGHT
BACK. SHOW MB GPS
MOBE GEAR TO BAKER.
END OF DAY 2300.

7/30/10
0900 - PREP FOR BAKER
1010 - 1230 SAMPLE BAKER.
CAMP SITE - MB WRITE
COC'S. MJ/CK WRAP/PACK
SAMPLES. FINISH Lead
SAMPLETING. PACK CAMP.
AIRPLANE ARRIVE AT 2200
ARRIVE AT KOTZ ~2330.
UNPACK. GO TO BIBBERS.
END OF DAY 2400

7/31/10

Appendix C
GPS Data

Appendix C - GPS Data
Limited Soil Investigation of Project Chariot Test Holes

Site ID	Date	Sample Number	Sample Location	Narrative	X	Y
Cape Thompson	7/28/2010	10CTA19SO, 10CTA20SO	Able	Test Hole Able	1674776.11	5153145.534
Cape Thompson	7/28/2010	10CTA01SO	Able 1	N50	1674775.94	5153195.535
Cape Thompson	7/28/2010	10CTA02SO	Able 2	NE50	1674817.916	5153169.798
Cape Thompson	7/28/2010	10CTA03SO	Able 3	SE50	1674819.052	5153121.107
Cape Thompson	7/28/2010	10CTA04SO	Able 4	S50	1674774.304	5153095.31
Cape Thompson	7/28/2010	10CTA05SO	Able 5	SW50	1674734.376	5153118.306
Cape Thompson	7/28/2010	10CTA06SO	Able 6	NW50	1674730.873	5153169.777
Cape Thompson	7/28/2010	10CTA07SO	Able 7	N25	1674773.332	5153169.286
Cape Thompson	7/28/2010	10CTA08SO	Able 8	NE25	1674798.255	5153157.36
Cape Thompson	7/28/2010	10CTA09SO	Able 9	SE25	1674797.758	5153130.232
Cape Thompson	7/28/2010	10CTA10SO	Able 10	S25	1674774.108	5153122.195
Cape Thompson	7/28/2010	10CTA11SO	Able 11	SW25	1674754.62	5153130.639
Cape Thompson	7/28/2010	10CTA12SO, 10CTA21SO	Able 12	NW25	1674753.462	5153157.29
Cape Thompson	7/28/2010	10CTA13SO	Able 13	N10	1674774.653	5153154.2
Cape Thompson	7/28/2010	10CTA14SO	Able 14	NE10	1674784.293	5153149.669
Cape Thompson	7/28/2010	10CTA15SO	Able 15	SE10	1674783.482	5153139.768
Cape Thompson	7/28/2010	10CTA16SO	Able 16	S10	1674774.091	5153134.806
Cape Thompson	7/28/2010	10CTA17SO	Able 17	SW10	1674766.719	5153139.874
Cape Thompson	7/28/2010	10CTA18SO	Able 18	NW10	1674766.763	5153150.302
Cape Thompson	7/29/2010	10CTB19SO	Baker	Test Hole Baker	1674205.378	5155117.599
Cape Thompson	7/29/2010	10CTB01SO	Baker 1	N50	1674205.933	5155168.033
Cape Thompson	7/29/2010	10CTB02SO	Baker 2	NE50	1674249.471	5155143.607
Cape Thompson	7/29/2010	10CTB03SO	Baker 3	SE50	1674254.324	5155095.354
Cape Thompson	7/29/2010	10CTB04SO	Baker 4	S50	1674209.772	5155068.903
Cape Thompson	7/29/2010	10CTB05SO	Baker 5	SW50	1674162.041	5155091.254
Cape Thompson	7/29/2010	10CTB06SO	Baker 6	NW50	1674158.902	5155140.785
Cape Thompson	7/29/2010	10CTB07SO	Baker 7	N25	1674206.528	5155142.645
Cape Thompson	7/29/2010	10CTB08SO, 10CTB20SO	Baker 8	NE25	1674228.393	5155128.879
Cape Thompson	7/29/2010	10CTB09SO	Baker 9	SE25	1674225.313	5155104.928
Cape Thompson	7/29/2010	10CTB10SO	Baker 10	S25	1674207.05	5155093.573
Cape Thompson	7/29/2010	10CTB11SO	Baker 11	SW25	1674183.628	5155106.18
Cape Thompson	7/29/2010	10CTB12SO	Baker 12	NW25	1674184.096	5155128.713
Cape Thompson	7/29/2010	10CTB13SO, 10CTB21SO	Baker 13	N10	1674204.922	5155129.586
Cape Thompson	7/29/2010	10CTB14SO	Baker 14	NE10	1674213.831	5155122.87
Cape Thompson	7/29/2010	10CTB15SO	Baker 15	SE10	1674213.474	5155112.789
Cape Thompson	7/29/2010	10CTB16SO	Baker 16	S10	1674205.33	5155107.893
Cape Thompson	7/29/2010	10CTB17SO	Baker 17	SW10	1674196.677	5155112.721
Cape Thompson	7/29/2010	10CTB18SO	Baker 18	NW10	1674196.733	5155122.777
Cape Thompson	7/28/2010	10CTC19SO	Charlie	Test Hole Charlie	1671310.122	5153828.158
Cape Thompson	7/28/2010	10CTC01SO, 10CTC20SO	Charlie 1	N50	1671308.112	5153877.154
Cape Thompson	7/28/2010	10CTC02SO	Charlie 2	NE50	1671356.458	5153853.292
Cape Thompson	7/28/2010	10CTC03SO	Charlie 3	SE50	1671354.317	5153800.412
Cape Thompson	7/28/2010	10CTC04SO	Charlie 4	S50	1671309.012	5153775.352
Cape Thompson	7/28/2010	10CTC05SO	Charlie 5	SW50	1671268.673	5153803.089
Cape Thompson	7/28/2010	10CTC06SO	Charlie 6	NW50	1671266.948	5153851.617
Cape Thompson	7/28/2010	10CTC07SO	Charlie 7	N25	1671308.384	5153852.042
Cape Thompson	7/28/2010	10CTC08SO	Charlie 8	NE25	1671331.288	5153839.026
Cape Thompson	7/28/2010	10CTC09SO	Charlie 9	SE25	1671331.553	5153813.528
Cape Thompson	7/28/2010	10CTC10SO	Charlie 10	S25	1671308.801	5153799.8
Cape Thompson	7/28/2010	10CTC11SO, 10CTC21SO	Charlie 11	SW25	1671288.562	5153815.107
Cape Thompson	7/28/2010	10CTC12SO	Charlie 12	NW25	1671286.084	5153840.324
Cape Thompson	7/28/2010	10CTC13SO	Charlie 13	N10	1671308.053	5153838.316
Cape Thompson	7/28/2010	10CTC14SO	Charlie 14	NE10	1671319.47	5153833.123
Cape Thompson	7/28/2010	10CTC15SO	Charlie 15	SE10	1671318.583	5153820.393
Cape Thompson	7/28/2010	10CTC16SO	Charlie 16	S10	1671308.099	5153817.581
Cape Thompson	7/28/2010	10CTC17SO	Charlie 17	SW10	1671299.333	5153822.061
Cape Thompson	7/28/2010	10CTC18SO	Charlie 18	NW10	1671299.501	5153831.783
Cape Thompson	7/29/2010	10CTD19SO, 10CTD21SO	Dog	Test Hole Dog	1675810.132	5156535.183
Cape Thompson	7/29/2010	10CTD01SO, 10CTD20SO	Dog 1	N50	1675813.299	5156584.999
Cape Thompson	7/29/2010	10CTD02SO	Dog 2	NE50	1675854.355	5156555.123
Cape Thompson	7/29/2010	10CTD03SO	Dog 3	SE50	1675850.32	5156508.503
Cape Thompson	7/29/2010	10CTD04SO	Dog 4	S50	1675806.018	5156486.329
Cape Thompson	7/29/2010	10CTD05SO	Dog 5	SW50	1675766.943	5156511.005
Cape Thompson	7/29/2010	10CTD06SO	Dog 6	NW50	1675766.861	5156564.637

Appendix C - GPS Data
Limited Soil Investigation of Project Chariot Test Holes

Site ID	Date	Sample Number	Sample Location	Narrative	X	Y
Cape Thompson	7/29/2010	10CTD07SO	Dog 7	N25	1675811.751	5156558.852
Cape Thompson	7/29/2010	10CTD08SO	Dog 8	NE25	1675832.27	5156546.449
Cape Thompson	7/29/2010	10CTD09SO	Dog 9	SE25	1675829.508	5156522.395
Cape Thompson	7/29/2010	10CTD10SO	Dog 10	S25	1675808.149	5156513.268
Cape Thompson	7/29/2010	10CTD11SO	Dog 11	SW25	1675788.947	5156525.738
Cape Thompson	7/29/2010	10CTD12SO	Dog 12	NW25	1675791.247	5156547.597
Cape Thompson	7/29/2010	10CTD13SO	Dog 13	N10	1675810.701	5156544.848
Cape Thompson	7/29/2010	10CTD14SO	Dog 14	NE10	1675820.837	5156539.096
Cape Thompson	7/29/2010	10CTD15SO	Dog 15	SE10	1675819.187	5156529.891
Cape Thompson	7/29/2010	10CTD16SO	Dog 16	S10	1675809.034	5156526.118
Cape Thompson	7/29/2010	10CTD17SO	Dog 17	SW10	1675801.486	5156532.157
Cape Thompson	7/29/2010	10CTD18SO	Dog 18	NW10	1675801.245	5156540.317
Cape Thompson	7/29/2010	10CTX19SO, 10CTX21SO	X1	Test Hole X1	1677143.609	5154588.086
Cape Thompson	7/29/2010	10CTX01SO	X1-1	N50	1677146.57	5154638.494
Cape Thompson	7/29/2010	10CTX02SO, 10CTX20SO	X1-2	NE50	1677187.641	5154612.156
Cape Thompson	7/29/2010	10CTX03SO	X1-3	SE50	1677185.619	5154562.066
Cape Thompson	7/29/2010	10CTX04SO	X1-4	S50	1677143.595	5154538.552
Cape Thompson	7/29/2010	10CTX05SO	X1-5	SW50	1677100.06	5154565.347
Cape Thompson	7/29/2010	10CTX06SO	X1-6	NW50	1677101.909	5154616.078
Cape Thompson	7/29/2010	10CTX07SO	X1-7	N25	1677143.923	5154610.639
Cape Thompson	7/29/2010	10CTX08SO	X1-8	NE25	1677165.603	5154599.285
Cape Thompson	7/29/2010	10CTX09SO	X1-9	SE25	1677165.069	5154573.961
Cape Thompson	7/29/2010	10CTX10SO	X1-10	S25	1677142.884	5154560.593
Cape Thompson	7/29/2010	10CTX11SO	X1-11	SW25	1677121.439	5154577.644
Cape Thompson	7/29/2010	10CTX12SO	X1-12	NW25	1677123.686	5154602.048
Cape Thompson	7/29/2010	10CTX13SO	X1-13	N10	1677143.153	5154600.366
Cape Thompson	7/29/2010	10CTX14SO	X1-14	NE10	1677151.676	5154591.057
Cape Thompson	7/29/2010	10CTX15SO	X1-15	SE10	1677150.597	5154586.368
Cape Thompson	7/29/2010	10CTX16SO	X1-16	S10	1677145.545	5154575.503
Cape Thompson	7/29/2010	10CTX17SO	X1-17	SW10	1677134.53	5154584.276
Cape Thompson	7/29/2010	10CTX18SO	X1-18	NW10	1677135.3	5154593.81
Cape Thompson	7/28/2010	BLM U.S. Dept of Interior	Monument	year 1987 c2 s8998	1671715.14	5154237.359
Cape Thompson	7/29/2010	monument 3	Monument	h and n ray 1959	1676951.727	5155255.495
Cape Thompson	7/28/2010	monument 2 near able	Monument	US Coast&Geodetic 1950	1674899.605	5153117.398
Cape Thompson	7/28/2010	South Corner	Structure	Remaining Building	1672825.417	5153893.038
Cape Thompson	7/28/2010	West Corner	Structure	Remaining Building	1672804.59	5153907.985
Cape Thompson	7/28/2010	East Corner	Structure	Remaining Building	1672842.942	5153924.64
Cape Thompson	7/28/2010	North Corner	Structure	Remaining Building	1672815.229	5153921.676

Coordinates are in NAD83, Alaska State Plane Coordinatate System, Zone 8, in feet.
NAD83 - North American Datum of 1983.

Appendix D
CDQR and ADEC Checklists

APPENDIX D

FINAL CHEMICAL DATA QUALITY REVIEW

Project Chariot Test Holes Limited Investigation

NPDL # 10-060

Prepared: December 13, 2010

Prepared for

Army Corps of Engineers- Alaska Division

Prepared by

Fairbanks Environmental Services, Inc.

I certify that all data quality review criteria described in Section 1.2 were assessed, and that qualifications were made according to the criteria outlined the site-specific QAPP.

Michael L. Boese
Senior Chemist

1.0 INTRODUCTION

This appendix presents the data quality review of soil samples collected from the Project Chariot test holes by Fairbanks Environmental Services (FES) during July 2010 at Cape Thompson, Alaska. FES performed a data quality review of project and quality control (QC) data in order to assess whether analytical data met data quality objectives and were acceptable for use. The project data were reviewed for deviations to the requirements presented in the Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP), the ADEC Technical Memo 06-002, and the Department of Defense (DoD) Quality Systems Manual (QSM). The review included evaluation of the following: sample collection and handling, holding times, blanks (to assess contamination), sample duplicates (to assess precision), laboratory control samples and sample surrogate recoveries (to assess accuracy), and matrix spike recoveries and relative percent difference (RPDs; to assess matrix effects). Reporting limits (limits of quantitation [LOQs]) were compared to the established alternative cleanup level for the site. Calibration curves and continuing calibration verification recoveries were not reviewed. Quality control deviations which do not impact data quality (e.g. method blank detections associated with non-detect project results) are not discussed.

1.1 Summary of Soil Samples

A total of 105 soil samples, including 95 primary samples and 10 field duplicate samples were collected from around five Project Chariot test holes at Cape Thompson. In addition, five rinsate samples were collected from the decontaminated soil sampling equipment, one from each test hole. Each sample was analyzed by the following analytical method:

- Diesel range organics (DRO) by Alaska Method AK102

All project and quality control samples were analyzed by Columbia Analytical Services (CAS) of Kelso, Washington. The laboratory is validated by the State of Alaska through the Contaminated Sites Program and is certified through the Department of Defense Environmental Laboratory Accreditation Program (ELAP) for the methods employed for this project.

All samples were included in five Sample Delivery Groups (SDGs), CAS report numbers K1008033, K1008036, K1008039, K1008042, and K1008043. Table 1, sample tracking table, and Tables 2, analytical result table, summarize the samples and the analytical results.

1.2 Data Quality Objectives

Data quality objectives (DQO) used for this review were presented in Work Plan (FES 2010). They represent the minimum acceptable QC limits and goals for analytical measurements and are used as comparison criteria during data quality review to determine both the quality and usability of the analytical data. The following table summarizes the DQO goals.

Summary of Data Quality Objectives for Soil Samples

Parameter	Preparation Method	Analytical Method	LOQ[a] (mg/kg)	Precision (%RPD)	Accuracy (%)	Completeness (%)
Diesel-Range Organics (DRO)	3550B	AK 102	20[b]	20	75-125	90

[a] Limit of Quantification.

[b] The LOQ is below ADEC 18 AAC 75 Table B2 Arctic Zone Cleanup Level of 12,500 mg/kg.

The six DQO used for this review were accuracy, precision, representativeness, comparability, completeness, and sensitivity. The completeness goal for this project was set at 90 percent. Accuracy measures the correctness, or the closeness, between the true value and the quantity detected. A measurement is accurate when the reported value is within a set percentage from the true value or known concentration of a spike or a standard. It is measured by calculating the percent recovery of known levels of spiked compounds that were introduced into the appropriate sample matrix. Surrogate recoveries, laboratory control samples (LCS), and matrix spike samples (MS) were used to measure accuracy for this project. Precision measures the reproducibility of repetitive measurements. It is measured by calculating the RPD between duplicate samples. Field duplicate samples, LCS pairs, and MS sample pairs were used to measure precision for this project.

Representativeness measures the degree to which data accurately and precisely represent site characteristics, and comparability measures the confidence with which one data set can be compared to another. Completeness measures the amount of valid data obtained from a measurement system compared to the amount of valid data that was expected under normal conditions; it is measured as the percentage of valid measurements compared to the total number of measurements.

Analytical sensitivity was evaluated to verify that the detected results and/or reporting limits met the applicable cleanup levels. LOQs were compared to the ADEC Method 1 cleanup level of 500 mg/kg and the Method 2 Arctic Zone cleanup level of 12,500 mg/kg.

In addition to these criteria for the six DQOs described above sample collection procedures, blank sample results, and sample handling procedures were reviewed to ensure overall data quality. Sample collection data were reviewed to verify that representative samples were collected. Blank samples were analyzed to detect potential field or laboratory cross-contamination. Sample handling was reviewed to assess parameters such as chain-of-custody documentation, the use of appropriate sample containers and preservatives, shipment cooler temperature, and sample holding times. Each of these parameters contributes to the general representativeness and comparability of the project data. The combination of evaluations of the above-mentioned parameters will lead to a determination of the overall project data completeness.

The following qualifiers, listed below in increasing severity, are used in the data tables to indicate quality control deficiencies.

Data Qualifiers

Qualifier	Definition
J	Analytical result is considered an estimated value because the level is below the laboratory limit of quantification but above the method detection limit.
M, MH, ML	Analytical result is considered and estimated value biased (high, low) due to matrix effects.
B	Analytical result is considered a high estimated value due to contamination present in the blank samples.
Q, QH, QL	Analytical result is considered an estimated value biased (high, low) due to a quality control failure
R	Analytical result is rejected – result is not usable.

2.0 DATA QUALITY REVIEW

This section presents the findings of the data quality review and the resulting data qualifications. All samples were included in five SDGs (K1008033, K1008036, K1008039, K1008042, and K1008043), and all were reviewed. The findings are summarized below.

2.1 Sample Collection

All samples were collected according to the procedures outlined in the approved work plan.

2.2 Sample Handling and Documentation

Sample handling procedures include correct COC documentation, the use of appropriate sample containers and preservatives, a cooler temperature of 4 degrees Celsius (4±2 °C), and sample analysis within method specified holding times. The following discrepancy was noted in the data packages:

- The sample cooler associated with report K1008033 arrived at the project laboratory with a temperature blank of 0.7° C, which is below the acceptable range of 4±2 °C. No data were impacted or qualified because the cooler interior temperature was an acceptable 3.8° C.

- The sample coolers associated with reports K1008036 and K1008043 arrived at the project laboratory with the temperature blank and cooler interior below the acceptable temperature range. Both the temperature blank and cooler interior were 1.7° C for K1008036. The temperature blank and cooler interior was at 0.2° C and 0.7° C respectively for K1008043. Since all the samples were received in good condition and the only analysis was a semi-volatile analysis (DRO by AK102), data quality was not significantly impacted.

- The sample cooler associated with report K1008039 arrived at the project laboratory with a temperature blank of 6.7° C, which is slightly above the acceptable range of 4±2 °C. No data were impacted or qualified because the cooler interior temperature was an acceptable 3.5° C.

- The Loc ID of duplicate sample 10CTA20SO was incorrectly listed as AN50 (Test Hole Able, North, 50 feet) on the Chain of Custody form (report K1008033). The sample location was changed in the field and the correct Loc ID (ABLE) was documented in the field book, and the field duplicate data were compared to the correct sample, and no data were adversely impacted.

2.3 Blanks

Method blanks were utilized to detect potential cross-contamination of project samples. Method blanks detect laboratory cross-contamination. No analytes were detected above the Limit of

Quantification (LOQ) in method blank samples. However, the following analytes were detected in project samples within five times the concentration detected in the blank:

- DRO was detected in the method blank associated with batch KWG1008160. This batch contained one sample from each of the five reports. The DRO results in samples 10CTA21SO and 10CTB21SO were qualified as possible blank contamination with a B because the DRO concentrations in these samples were within 5 times the concentration detected in the method blank. However any potential cross-contamination in 10CTA21SO and 10CTB21SO was determined to be negligible because DRO concentrations in these samples were two orders of magnitude below the Method 1 ADEC cleanup level (500 mg/kg).

- DRO was detected in the method blank associated with batch KWG1008163 associated with report K1008042 at the method detection limit. The DRO results in samples 10CTX01SO through 10CTX04SO, 10CTX06SO through 10CTX09SO, and 10CTX20SO were qualified as possible blank contamination with a B because the DRO concentrations in these samples were within 5 times the concentration detected in the method blank. However any potential cross-contamination in these samples was determined to be negligible because DRO concentrations in these project samples were two orders of magnitude below the Method 1 ADEC cleanup level (500 mg/kg).

- DRO was detected in the method blank associated with water matrix batch KWG1008524. This batch contained one equipment rinsate sample from each of the five reports. The DRO result in sample 10CTA22WG, 10CTB22WG, 10CTC22WG, 10CTD22WG, and 10CTX22WG were qualified as possible blank contamination with a B because the DRO concentrations in these samples were within 5 times the concentration detected in the method blank. However, DRO cross-contamination in these rinsate samples was determined to be negligible because they did not affect soil data (see Section 2.9).

2.4 Surrogate Recovery

Surrogate compounds were added to each project sample by the laboratory prior to analysis. Surrogate recoveries were then calculated as percentages and reported with the sample result. One surrogate compound, o-terphenyl, was added to each DRO project sample by the project laboratory. The DRO surrogate recoveries met QC criteria for all project samples with two exceptions:

- DRO surrogate recovery was not calculated for sample 10CTC03SO from report K1008036 due to elevated DRO concentrations in the sample. Recovery criteria were deemed not applicable because the sample required at least a 10 times dilution, and the surrogate was diluted beyond the capability of quantitative recovery. Since the DRO result in this sample far exceeded the ADEC soil cleanup level, impact to data was minor.
- The surrogate for DRO sample 10CTC06SO from report K1008036 was out of range at 152% due to matrix interference. This sample was potentially biased high and flagged QH. The

DRO result for this sample was below the ADEC Method 1 cleanup level and 2 orders of magnitude below the Arctic Zone cleanup level (Arctic Zone should apply since this is a tundra sample), therefore there was minimal impact to the data.

2.5 Laboratory Control Samples

Spike compounds were added to blank samples to assess laboratory extraction and instrumentation performance and precision. The recoveries of analytes in LCSs were all within the established accuracy and precision limits.

2.6 Matrix Spike Samples and Duplicates

Spike compounds were added to project samples to assess potential matrix interference. MS/MSDs were performed at the proper frequency (maximum of 1 MS/MSD per 20 samples) and for each analytical batch except for two batches noted below. Matrix spike sample recoveries and RPDs between the MS and MSD were all within established accuracy and precision limits for this project with two exceptions

- DRO recovery was above acceptance criteria (75-125%) in the MS/MSD (272%/274%) sample analysis performed on 10CTA01SO (Extraction Batch KWG1008238) and analyzed with report K1008033. However, the control criteria were deemed not applicable due to elevated DRO concentrations in the parent sample. All DRO concentrations associated with this batch (KWG1008238) were well below the ADEC cleanup level, therefore there was minimal impact to the data.
- DRO recovery was above acceptance criteria (75-125%) in the MS/MSD (128%/101%) sample analysis performed on 10CTC01SO (Extraction Batch KWG1008237) and analyzed with report K1008036. DRO recovery in the LCS and LCSD were acceptable, which indicated the analytical batch was in control. The parent sample (10CTC01SO) was qualified as high biased with MH.
- MS/MSD analyses for Extraction Batches KWG1008524 and KWG1008160 were <u>not</u> performed on samples associated with this project as required by the QSM. Data were not adversely impacted because Extraction Batch KWG1008524 included only equipment rinsate samples, and Extraction Batch KWG1008160 included five field duplicate samples (sample number "21" from each of the respective Test Hole sites). Note that all affected field duplicate samples from Extraction Batch KWG1008160 (10CTA21SO, 10CTB21SO, 10CTC21SO, 10CTD21SO, and 10CTX21SO) were comparable to the primary samples (with one acceptable exception described in Section 2.7), and that all non-QC project samples were extracted concurrently with MS/MSD spiked project samples.

2.7 Field Duplicates

Field duplicate sample results are summarized in the table below. A total of 10 field duplicates were collected and analyzed with 95 project samples. The overall duplicate frequency exceeded the 10 percent project requirement in the Work Plan.

All but two field duplicate pair results were within the ADEC precision requirements for soil matrix samples. RPD for sample pairs 10CTB08SOSO/10CTB20SO and 10CTB13SO/10CTB21SO were above 50 percent. However, primary and duplicate results for both pairs are low level estimates (J flagged), and well below DRO cleanup level. Note that data reported below the LOQ is considered estimated and has unknown accuracy and precision. Therefore, there is no affect on data quality or usability

Summary of Soil Sample Field Duplicates

Sample/Duplicate	Lab Report	DRO (Primary)	DRO (Field Duplicate)	RPD	Comparable Criteria Met?[1]
10CTA19SO/10CTA20SO	K1008033	7.4 J	10 J	30	Yes
10CTA12SO/10CTA21SO	K1008033	1.6 J	2.6 J	48	Yes
10CTB08SO/10CTB20SO	K1008039	20 J	6.8 J	99	**No**
10CTB13SO/10CTB21SO	K1008039	3.9 J	8.2 J	71	**No**
10CTC01SO/10CTC20SO	K1008036	220	370	50	Yes
10CTC11SO/10CTC21SO	K1008036	21 J	28 J	29	Yes
10CTD01SO/10CTD20SO	K1008043	100	110	10	Yes
10CTD19SO/10CTD21SO	K1008043	4,900	6,700	31	Yes
10CTX02SO/10CTX20SO	K1008042	6 J	5 J	18	Yes
10CTX19SO/10CTX21SO	K1008042	31,000	34,000	9	Yes

All results are in mg/kg.
RPD – Relative percent difference.
[1] – RPD of 50 percent was used for evaluating soil-matrix file duplicate samples.

2.8 Sensitivity

Several project data reported analytes were identified as estimations by the laboratory because they were reported below the LOQ. Results reported above the MDL but below the LOQ are qualified as estimates due to the unknown accuracy of the analytical method at those concentrations. Note that non-detected analytical results are reported to the LOQ, and LOQs are presented for each DRO result. All reported LOQs are adequate and are below the Method 1 Cleanup Level of 500 mg/kg for DRO except for sample 10CTC03SO, which was grossly contaminated and the corresponding DRO result exceeded the Arctic Zone cleanup level by 2 orders of magnitude.

2.9 Equipment Rinsate

Five equipment rinsate samples were collected and submitted of DRO analysis, one for each of the five test holes. All DRO results in rinsate samples were considered estimates (J flagged) and were several orders of magnitude less than detected soil concentrations (on a parts per billion basis). In addition, DRO results from all five rinsates were qualified as potential blank contamination.

Therefore any cross contamination associated with equipment decontamination is considered negligible because it does not affect soil data quality.

2.10 Summary of Qualified Results

Overall, the review process deemed the soil analytical data acceptable for use. Several results were qualified; however, no data were rejected pursuant to the data quality review. The following table provides a summary of soil sample results qualified pursuant to FES's review, including the associated sample numbers and the reason for qualification.

Summary of FES Qualified Soil Results

Data Package	Sample Numbers	Analyte	Qualification	Explanation
K1008033	10CTA21SO	DRO	B	Blank Contamination
K1008036	10CTC06SO	DRO	QH	Elevated Surrogate Recovery
	10CTC01SO	DRO	MH	Elevated MS Recovery
K1008039	10CTB21SO	DRO	B	Blank Contamination
K1008042	10CTX01SO 10CTX02SO 10CTX03SO 10CTX04SO 10CTX06SO 10CTX07SO 10CTX08SO 10CTX09SO 10CTX20SO	DRO	B	Blank Contamination

In addition to the project soil samples identified above, the reported DRO concentrations in Equipment Rinsate samples 10CTA22WG, 10CTB22WG, 10CTC22WG, 10CTD22WG, and 10CTX22WG were qualified with a B due to method blank contamination. Project soil data were not impacted by the negligible DRO concentrations detected in the rinsates.

2.10 Completeness

All proposed project samples were collected, and no data was rejected, so a completeness score of 100 percent was calculated for this project. Therefore, the 90 percent completeness criterion was met for the project.

CDQR Table
Project Chariot Test Holes
Cape Thompson, Alaska

			Sample ID	10CTA01SO		10CTA02SO		10CTA03SO		10CTA04SO		10CTA05SO		10CTA06SO		10CTA07SO		10CTA08SO		10CTA09SO	
			Lab Sample ID	K1008033-001		K1008033-002		K1008033-003		K1008033-004		K1008033-005		K1008033-006		K1008033-007		K1008033-008		K1008033-009	
			Location	AN50		ANE50		ASE50		AS50		ASW50		ANW50		AN25		ANE25		ASE25	
			Collection Date	7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010	
			Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
			Sample Type	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
Analyte	**Method**	**Units**	**ADEC[1]**																		
DRO Result / [Actual LOQ]	AK102	mg/kg	500	2300	[210]	1500	[150]	290	[120]	650	[170]	610	[150]	1500	[190]	1.6	[21] J	ND	[21]	1.4	[21] J
Dilution Factor	-	-	-	5		5		5		5		5		5		1		1		1	
Percent Solid/Percent Moisture	160.3	Percent	-	49.2	50.8	68.4	31.6	84.7	15.3	60.7	39.3	71.1	28.9	54.3	45.7	97.5	2.5	97.5	2.5	97.3	2.7
PQL specified in QAPP	AK102	mg/kg	-	20		20		20		20		20		20		20		20		20	
Reported MDL	AK102	mg/kg	-	14		9.4		7.6		11		9.2		12		1.4		1.4		1.4	

			Sample ID	10CTA10SO		10CTA11SO		10CTA12SO		10CTA13SO		10CTA14SO		10CTA15SO		10CTA16SO		10CTA17SO		10CTA18SO	
			Lab Sample ID	K1008033-010		K1008033-011		K1008033-012		K1008033-013		K1008033-014		K1008033-015		K1008033-016		K1008033-017		K1008033-018	
			Location	AS25		ASW25		ANW25		AN10		ANE10		ASE10		AS10		ASW10		ANW10	
			Collection Date	7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010	
			Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
			Sample Type	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
Analyte	**Method**	**Units**	**ADEC[1]**																		
DRO Result / [Actual LOQ]	AK102	mg/kg	500	1.8	[21] J	79	[24]	1.6	[21] J	1.9	[21] J	9	[21] J	1.7	[21] J	2	[21] J	1.6	[21] J	1.6	[21] J
Dilution Factor	-	-	-	1		1		1		1		1		1		1		1		1	
Percent Solid/Percent Moisture	160.3	Percent	-	96.7	3.3	84.1	15.9	97.8	2.2	97.6	2.4	97.1	2.9	97.1	2.9	97.9	2.1	98.0	2.0	97.6	2.4
PQL specified in QAPP	AK102	mg/kg	-	20		20		20		20		20		20		20		20		20	
MDL	AK102	mg/kg	-	1.4		1.6		1.4		1.4		1.4		1.4		1.4		1.4		1.4	

			Sample ID	10CTA19SO		10CTA20SO		10CTA21SO		10CTA22WG	
			Lab Sample ID	K1008033-019		K1008033-020		K1008033-021		K1008033-022	
			Location	ABLE		ABLE		ANW25		RINSATE A	
			Collection Date	7/28/2010		7/28/2010		7/28/2010		7/28/2010	
			Matrix	Soil		Soil		Soil		Water	
			Sample Type	Primary		Field Duplicate		Field Duplicate		Primary	
Analyte	**Method**	**Units**	**ADEC[1]**								
DRO Result / [Actual LOQ]	AK102	mg/kg	500	7.4	[21] J	10	[21] J	2.6	[21] J,B	-	-
DRO Result / [Actual LOQ]	AK102	ug/L	-	-	-	-	-	-	-	49	[800] J,B
Dilution Factor	-	-	-	1		1		1		1	
Percent Solid/Percent Moisture	160.3	Percent	-	97.2	2.8	96.8	3.2	97.5	2.5	0	100
PQL specified in QAPP	AK102	mg/kg	-	20		20		20		800 ug/L	
MDL	AK102	mg/kg	-	1.4		1.4		1.4		11 ug/L	

Notes:
[1] = ADEC Method 1 Soil Cleanup Level (from 18 AAC 75.341 Table A2).
Highlighted concentration exceeds ADEC Soil Cleanup Level.
B = Possible cross-contamination (similar concentration detected in blank).
DRO = Diesel range organics.
J = Estimated because concentration was reported below the LOQ.
[LOQ] = [Limit of quantification].
MDL = Method Detection Limit.
mg/kg = Milligrams per killogram.
ug/L = Micrograms per liter.
ND = Not detected at the [LOQ].
PQL = Practical Quantitation Limit.
QAPP = Quality Assurance Program Plan.

CDQR Table
Project Chariot Test Holes
Cape Thompson, Alaska

			Sample ID	10CTB01SO		10CTB02SO		10CTB03SO		10CTB04SO		10CTB05SO		10CTB06SO		10CTB07SO		10CTB08SO		10CTB09SO	
			Lab Sample ID	K1008039-001		K1008039-002		K1008039-003		K1008039-004		K1008039-005		K1008039-006		K1008039-007		K1008039-008		K1008039-009	
			Location	BN50		BNE50		BSE50		BS50		BSW50		BNW50		BN25		BNE25		BSE25	
			Collection Date	7/30/2010		7/30/2010		7/30/2010		7/30/2010		7/30/2010		7/30/2010		7/30/2010		7/30/2010		7/30/2010	
			Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
			Sample Type	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
Analyte	**Method**	**Units**	**ADEC[1]**																		
DRO Result / [Actual LOQ]	AK102	mg/kg	500	910	[170]	940	[150]	1000	[180]	940	[180]	760	[170]	8.8	[23] J	12	[23] J	20	[23] J	660	[210]
Dilution Factor	-	-	-	5		5		5		5		5		1		1		1		5	
Percent Solid/Percent Moisture	160.3	Percent	-	59.4	40.6	68.2	31.8	58.0	42.0	58.1	41.9	60.5	39.5	89.0	11.0	88.4	11.6	88.6	11.4	48.4	51.6
PQL specified in QAPP	AK102	mg/kg	-	20		20		20		20		20		20		20		20		20	
Reported MDL	AK102	mg/kg	-	11		9.6		12		12		11		1.5		1.5		1.5		14	

			Sample ID	10CTB10SO		10CTB11SO		10CTB12SO		10CTB13SO		10CTB14SO		10CTB15SO		10CTB16SO		10CTB17SO		10CTB18SO	
			Lab Sample ID	K1008039-010		K1008039-011		K1008039-012		K1008039-013		K1008039-014		K1008039-015		K1008039-016		K1008039-017		K1008039-018	
			Location	BS25		BSW25		BNW25		BN10		BNE10		BSE10		BS10		BSW10		BNW10	
			Collection Date	7/30/2010		7/30/2010		7/30/2010		7/30/2010		7/30/2010		7/30/2010		7/30/2010		7/30/2010		7/30/2010	
			Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
			Sample Type	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
Analyte	**Method**	**Units**	**ADEC[1]**																		
DRO Result / [Actual LOQ]	AK102	mg/kg	500	540	[140]	16	[23] J	5	[22] J	3.9	[21] J	15	[22] J	34	[22]	35	[22]	39	[23]	15	[24] J
Dilution Factor	-	-	-	5		1		1		1		1		1		1		1		1	
Percent Solid/Percent Moisture	160.3	Percent	-	73.9	26.1	90.0	10.0	91.0	9.0	95.4	4.6	91.3	8.7	90.6	9.4	92.8	7.2	89.6	10.4	86.7	13.3
PQL specified in QAPP	AK102	mg/kg	-	20		20		20		20		20		20		20		20		20	
MDL	AK102	mg/kg	-	8.8		1.5		1.5		1.4		1.5		1.5		1.4		1.5		1.5	

			Sample ID	10CTB19SO		10CTB20SO		10CTB21SO		10CTB22WG	
			Lab Sample ID	K1008039-019		K1008039-020		K1008039-021		K1008039-022	
			Location	BAKER		BNE25		BN10		RINSATE B	
			Collection Date	7/30/2010		7/30/2010		7/30/2010		7/30/2010	
			Matrix	Soil		Soil		Soil		Water	
			Sample Type	Primary		Field Duplicate		Field Duplicate		Primary	
Analyte	**Method**	**Units**	**ADEC[1]**								
DRO Result / [Actual LOQ]	AK102	mg/kg	500	2000	[25]	6.8	[24] J	8.2	[21] J,B	-	-
DRO Result / [Actual LOQ]	AK102	ug/L	-	-	-	-	-	-	-	140	[800] J,B
Dilution Factor	-	-	-	1		1		1		1	
Percent Solid/Percent Moisture	160.3	Percent	-	79.2	20.8	85.3	14.7	96.1	3.9		
PQL specified in QAPP	AK102	mg/kg	-	20		20		20		800 ug/L	
MDL	AK102	mg/kg	-	1.7		1.6		1.4		11 ug/L	

Notes:
[1] = ADEC Method 1 Soil Cleanup Level (from 18 AAC 75.341 Table A2).
Highlighted concentration exceeds ADEC Soil Cleanup Level.
B = Possible cross-contamination (similar concentration detected in blank).
DRO = Diesel range organics.
J = Estimated because concentration was reported below the LOQ.
[LOQ] = [Limit of quantification].
MDL = Method Detection Limit.
mg/kg = Milligrams per killogram.
ug/L = Micrograms per liter.
ND = Not detected at the [LOQ].
PQL = Practical Quantitation Limit.
QAPP = Quality Assurance Program Plan.

CDQR Table
Project Chariot Test Holes
Cape Thompson, Alaska

			Sample ID	10CTC01SO		10CTC02SO		10CTC03SO		10CTC04SO		10CTC05SO		10CTC06SO		10CTC07SO		10CTC08SO		10CTC09SO	
			Lab Sample ID	K1008036-001		K1008036-002		K1008036-003		K1008036-004		K1008036-005		K1008036-006		K1008036-007		K1008036-008		K1008036-009	
			Location	CN50		CNE50		CSE50		CS50		CSW50		CNW50		CN25		CNE25		CSE25	
			Collection Date	7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010	
			Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
			Sample Type	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
Analyte	**Method**	**Units**	**ADEC[1]**																		
DRO Result / [Actual LOQ]	AK102	mg/kg	500	220	[130] MH	310	[130]	59000	[2900]	100	[23]	190	[32]	210	[29] QH	2	[21] J	1.9	[21] J	1200	[110]
Dilution Factor	-	-	-	5		5		100		1		1		1		1		1		5	
Percent Solid/Percent Moisture	160.3	Percent	-	78.2	21.8	76.6	23.4	70.9	29.1	89.2	10.8	61.7	38.3	70.0	30.0	96.3	3.7	97.5	2.5	97.6	2.4
PQL specified in QAPP	AK102	mg/kg	-	20		20		20		20		20		20		20		20		20	
Reported MDL	AK102	mg/kg	-	8.2		8.5		150		1.5		2.1		1.9		1.4		1.4		6.7	

			Sample ID	10CTC10SO		10CTC11SO		10CTC12SO		10CTC13SO		10CTC14SO		10CTC15SO		10CTC16SO		10CTC17SO		10CTC18SO	
			Lab Sample ID	K1008036-010		K1008036-011		K1008036-012		K1008036-013		K1008036-014		K1008036-015		K1008036-016		K1008036-017		K1008036-018	
			Location	CS25		CSW25		CNW25		CN10		CNE10		CSE10		CS10		CSW10		CNW10	
			Collection Date	7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010	
			Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
			Sample Type	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
Analyte	**Method**	**Units**	**ADEC[1]**																		
DRO Result / [Actual LOQ]	AK102	mg/kg	500	14	[21] J	21	[21] J	3.3	[21] J	2.3	[21] J	49	[21]	1800	[110]	350	[110]	9.2	[21] J	44	[21]
Dilution Factor	-	-	-	1		1		1		1		1		5		5		1		1	
Percent Solid/Percent Moisture	160.3	Percent	-	96.4	3.6	95.8	4.2	96.7	3.3	96.5	3.5	97.9	2.1	95.5	4.5	97.6	2.4	96.9	3.1	97.0	3.0
PQL specified in QAPP	AK102	mg/kg	-	20		20		20		20		20		20		20		20		20	
MDL	AK102	mg/kg	-	1.4		1.4		1.4		1.4		1.4		6.8		6.6		1.4		1.4	

			Sample ID	10CTC19SO		10CTC20SO		10CTC21SO		10CTC22WG	
			Lab Sample ID	K1008036-019		K1008036-020		K1008036-021		K1008036-022	
			Location	CHARLIE		CN50		CSW25		RINSATE C	
			Collection Date	7/28/2010		7/28/2010		7/28/2010		7/28/2010	
			Matrix	Soil		Soil		Soil		Water	
			Sample Type	Primary		Field Duplicate		Field Duplicate		Primary	
Analyte	**Method**	**Units**	**ADEC[1]**								
DRO Result / [Actual LOQ]	AK102	mg/kg	500	2400	[110]	370	[130]	28	[22]	-	-
DRO Result / [Actual LOQ]	AK102	ug/L	-	-	-	-	-	-	-	110	[800] J,B
Dilution Factor	-	-	-	5		5		1		1	
Percent Solid/Percent Moisture	160.3	Percent	-	95.8	4.2	79.6	20.4	94.8	5.2	0.0	100.0
PQL specified in QAPP	AK102	mg/kg	-	20		20		20		800 ug/L	
MDL	AK102	mg/kg	-	6.8		8.2		1.4		11 ug/L	

Notes:
[1] = ADEC Method 1 Soil Cleanup Level (from 18 AAC 75.341 Table A2).
Highlighted concentration exceeds ADEC Soil Cleanup Level.
B = Possible cross-contamination (similar concentration detected in blank).
DRO = Diesel range organics.
J = Estimated because concentration was reported below the LOQ.
[LOQ] = [Limit of quantification].
MDL = Method Detection Limit.
MH = Results is biased high due to matrix issues.
mg/kg = Milligrams per killogram.
ug/L = Micrograms per liter.
ND = Not detected at the [LOQ].
PQL = Practical Quantitation Limit.
QAPP = Quality Assurance Program Plan.
QH = Result is biased high due to one or more quality control failures.

CDQR Table
Project Chariot Test Holes
Cape Thompson, Alaska

			Sample ID	10CTD01SO		10CTD02SO		10CTD03SO		10CTD04SO		10CTD05SO		10CTD06SO		10CTD07SO		10CTD08SO		10CTD09SO	
			Lab Sample ID	K1008043-001		K1008043-002		K1008043-003		K1008043-004		K1008043-005		K1008043-006		K1008043-007		K1008043-008		K1008043-009	
			Location	DN50		DNE50		DSE50		DS50		DSW50		DNW50		DN25		DNE25		DSE25	
			Collection Date	7/29/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010	
			Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
			Sample Type	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
Analyte	**Method**	**Units**	**ADEC[1]**																		
DRO Result / [Actual LOQ]	AK102	mg/kg	500	100	[29]	140	[31]	120	[34]	3300	[35]	290	[25]	230	[34]	12	[23] J	12	[23] J	3000	[23]
Dilution Factor	-	-	-	1		1		1		1		1		1		1		1		1	
Percent Solid/Percent Moisture	160.3	Percent	-	68.2	31.8	65.2	34.8	59.2	40.8	57.3	42.7	78.8	21.2	58.9	41.1	89.3	10.7	88.9	11.1	88.3	11.7
PQL specified in QAPP	AK102	mg/kg	-	20		20		20		20		20		20		20		20		20	
Reported MDL	AK102	mg/kg	-	1.9		2.0		2.2		2.3		1.7		2.2		1.5		1.5		1.5	

			Sample ID	10CTD10SO		10CTD11SO		10CTD12SO		10CTD13SO		10CTD14SO		10CTD15SO		10CTD16SO		10CTD17SO		10CTD18SO	
			Lab Sample ID	K1008043-010		K1008043-011		K1008043-012		K1008043-013		K1008043-014		K1008043-015		K1008043-016		K1008043-017		K1008043-018	
			Location	DS25		DSW25		DNW25		DN10		DNE10		DSE10		DS10		DSW10		DNW10	
			Collection Date	7/29/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010	
			Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
			Sample Type	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
Analyte	**Method**	**Units**	**ADEC[1]**																		
DRO Result / [Actual LOQ]	AK102	mg/kg	500	4300	[22]	190	[22]	11	[22] J	210	[22]	3200	[22]	560	[22]	2800	[22]	1200	[22]	20	[22] J
Dilution Factor	-	-	-	1		1		1		1		1		1		1		1		1	
Percent Solid/Percent Moisture	160.3	Percent	-	93.0	7.0	93.8	6.2	91.2	8.8	91.0	9.0	92.1	7.9	92.9	7.1	92.1	7.9	91.3	8.7	93.2	6.8
PQL specified in QAPP	AK102	mg/kg	-	20		20		20		20		20		20		20		20		20	
MDL	AK102	mg/kg	-	1.4		1.4		1.5		1.5		1.5		1.4		1.5		1.4		1.4	

			Sample ID	10CTD19SO		10CTD20SO		10CTD21SO		10CTD22WG	
			Lab Sample ID	K1008043-019		K1008043-020		K1008043-021		K1008043-022	
			Location	DOG		DN50		DOG		RINSATE D	
			Collection Date	7/29/2010		7/29/2010		7/29/2010		7/29/2010	
			Matrix	Soil		Soil		Soil		Water	
			Sample Type	Primary		Field Duplicate		Field Duplicate		Primary	
Analyte	**Method**	**Units**	**ADEC[1]**								
DRO Result / [Actual LOQ]	AK102	mg/kg	500	4900	[24]	110	[31]	6700	[25]	-	-
DRO Result / [Actual LOQ]	AK102	ug/L	-	-	-	-	-	-	-	160	[800] J,B
Dilution Factor	-	-	-	1		1		1		1	
Percent Solid/Percent Moisture	160.3	Percent	-	83.6	16.4	66.1	33.9	79.9	20.1		
PQL specified in QAPP	AK102	mg/kg	-	20		20		20		800 ug/L	
MDL	AK102	mg/kg	-	1.6		2.0		1.7		11 ug/L	

Notes:
[1] = ADEC Method 1 Soil Cleanup Level (from 18 AAC 75.341 Table A2).
Highlighted concentration exceeds ADEC Soil Cleanup Level.
B = Possible cross-contamination (similar concentration detected in blank).
DRO = Diesel range organics.
J = Estimated because concentration was reported below the LOQ.
[LOQ] = [Limit of quantification].
MDL = Method Detection Limit.
mg/kg = Milligrams per killogram.
ug/L = Micrograms per liter.
ND = Not detected at the [LOQ].
PQL = Practical Quantitation Limit.
QAPP = Quality Assurance Program Plan.

CDQR Table
Project Chariot Test Holes
Cape Thompson, Alaska

			Sample ID	10CTX01SO		10CTX02SO		10CTX03SO		10CTX04SO		10CTX05SO		10CTX06SO		10CTX07SO		10CTX08SO		10CTX09SO	
			Lab Sample ID	K1008042-001		K1008042-002		K1008042-003		K1008042-004		K1008042-005		K1008042-006		K1008042-007		K1008042-008		K1008042-009	
			Location	XN50		XNE50		XSE50		XS50		XSW50		XNW50		XN25		XNE25		XSE25	
			Collection Date	7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010		7/28/2010	
			Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
			Sample Type	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
Analyte	**Method**	**Units**	**ADEC[1]**																		
DRO Result / [Actual LOQ]	AK102	mg/kg	500	4.7	[22] J,B	6	[23] J,B	8.1	[23] J,B	4.4	[22] J, B	18	[24] J	8	[23] J,B	7.7	[22] J,B	6	[23] J,B	6.9	[22] J,B
Dilution Factor	-	-	-	1		1		1		1		1		1		1		1		1	
Percent Solid/Percent Moisture	160.3	Percent	-	92.6	7.4	90.3	9.7	89.4	10.6	92.7	7.3	83.1	16.9	88.6	11.4	90.0	10.0	89.0	11.0	91.1	8.9
PQL specified in QAPP	AK102	mg/kg	-	20		20		20		20		20		20		20		20		20	
Reported MDL	AK102	mg/kg	-	1.4		1.5		1.5		1.5		1.6		1.5		1.5		1.5		1.5	

			Sample ID	10CTX10SO		10CTX11SO		10CTX12SO		10CTX13SO		10CTX14SO		10CTX15SO		10CTX16SO		10CTX17SO		10CTX18SO	
			Lab Sample ID	K1008042-010		K1008042-011		K1008042-012		K1008042-013		K1008042-014		K1008042-015		K1008042-016		K1008042-017		K1008042-018	
			Location	XS25		XSW25		XNW25		XN10		XNE10		XSE10		XS10		XSW10		XNW10	
			Collection Date	7/28/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010		7/29/2010	
			Matrix	Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil		Soil	
			Sample Type	Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary		Primary	
Analyte	**Method**	**Units**	**ADEC[1]**																		
DRO Result / [Actual LOQ]	AK102	mg/kg	500	51	[22]	19	[23] J	24	[23]	79	[23]	25	[22]	230	[22]	730	[22]	8,700	[22]	300	[23]
Dilution Factor	-	-	-	1		1		1		1		1		1		1		1		1	
Percent Solid/Percent Moisture	160.3	Percent	-	91.6	8.4	88.7	11.3	86.0	14.0	87.7	12.3	92.8	7.2	91.7	8.3	92.6	7.4	90.8	9.2	88.1	11.9
PQL specified in QAPP	AK102	mg/kg	-	20		20		20		20		20		20		20		20		20	
MDL	AK102	mg/kg	-	1.5		1.5		1.5		1.5		1.4		1.5		1.4		1.5		1.5	

			Sample ID	10CTX19SO		10CTX20SO		10CTX21SO		10CTX22WG	
			Lab Sample ID	K1008042-019		K1008042-020		K1008042-021		K1008042-022	
			Location	X1		XNE50		X1		RINSATE X	
			Collection Date	7/29/2010		7/29/2010		7/29/2010		7/29/2010	
			Matrix	Soil		Soil		Soil		Water	
			Sample Type	Primary		Field Duplicate		Field Duplicate		Primary	
Analyte	**Method**	**Units**	**ADEC[1]**								
DRO Result / [Actual LOQ]	AK102	mg/kg	500	31,000	[130]	5	[22] J,B	34,000	[120]	-	-
DRO Result / [Actual LOQ]	AK102	ug/L	-	-	-	-	-	-	-	250	[800] J,B
Dilution Factor	-	-	-	1		1		1		1	
Percent Solid/Percent Moisture	160.3	Percent	-	81.1	18.9	94.7	5.3	83.7	16.3	0.0	100.0
PQL specified in QAPP	AK102	mg/kg	-	20		20		20		800 ug/L	
MDL	AK102	mg/kg	-	8.0		1.4		7.8		11 ug/L	

Notes:
[1] = ADEC Method 1 Soil Cleanup Level (from 18 AAC 75.341 Table A2).
Highlighted concentration exceeds ADEC Soil Cleanup Level.
B = Possible cross-contamination (similar concentration detected in blank).
DRO = Diesel range organics.
J = Estimated because concentration was reported below the LOQ.
[LOQ] = [Limit of quantification].
MDL = Method Detection Limit.
mg/kg = Milligrams per killogram.
ug/L = Micrograms per liter.
ND = Not detected at the [LOQ].
PQL = Practical Quantitation Limit.
QAPP = Quality Assurance Program Plan.

Laboratory Data Review Checklist

Completed by: Makenzie Jorgensen

Title: Environmental Scientist Date: 9/13/10

CS Report Name: Project Chariot Test Hole Limited Site Investigation Report Report Date: December 2010

Consultant Firm: Fairbanks Environmental Services

Laboratory Name: Columbia Analytical Services Laboratory Report Number: K1008033

ADEC File Number: 475.38.019 ADEC RecKey Number:

1. Laboratory
   a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

      Yes

   b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CS approved?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

      NA, Samples were not transferred

2. Chain of Custody (COC)
   a. COC information completed, signed, and dated (including released/received by)?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

      Yes

   b. Correct analyses requested?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

      Yes,

3. Laboratory Sample Receipt Documentation
   a. Sample/cooler temperature documented and within range at receipt (4° ± 2° C)?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

      Yes

   b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

      Yes

☐Yes ☐ No ☐NA (Please explain.) Comments:

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes, all samples were in good condition

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA – all samples were in good condition.

The Loc ID for field duplicate sample 10CTA20SO was incorrectly listed as "AN50" (Test Hole Able North 50 feet) on the COC form. The LocID was correctly identified as "ABLE" in the field book, and the results were compared to the correct primary sample results, so no data were adversely impacted.

e. Data quality or usability affected? (Please explain.)
Comments:

No. All sample documented in good condition. LocID discrepancy was identified and adequately addressed.

4. Case Narrative
a. Present and understandable?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

b. Discrepancies, errors or QC failures identified by the lab?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes. The control criteria for matrix spike recovery for sample lOCTAO1SO was not met.

c. Were all corrective actions documented?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes. The analyte concentration in the sample lOCTAO1SO was significantly higher than the added spike concentration, preventing accurate evaluation of the spike recovery.

d. What is the effect on data quality/usability according to the case narrative?
Comments:

The case narrative only discusses deviations and does not discuss the effect on the data.

5. Samples Results
   a. Correct analyses performed/reported as requested on COC?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

NO, Although it was specified on the COC form, MS/MSD samples were not extracted with the following field duplicate samples (10CTA21SO, 10CTB21SO, 10CTC21SO, 10CTD21SO, and 10CTX21SO). Impact to data was insignificant as all data were comparable to primary samples with on acceptable exception (see checksheet for K1008039).

   b. All applicable holding times met?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

   c. All soils reported on a dry weight basis?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

   d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes, and so are the LOQs

   e. Data quality or usability affected?
      Comments:

No. Sample results were reported correctly and with adequate sensitivity. See 5a for discussion on impact due to lack of MS/MSD in batch KWG1008160.

6. QC Samples
   a. Method Blank
      i. One method blank reported per matrix, analysis and 20 samples?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

      ii. All method blank results less than PQL?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

No. However, DRO detected above the MDL.

      iii. If above PQL, what samples are affected?

DRO in 10CTA21SO was within 5 times the method blank concentration in batch KWG1008160. DRO in 10CTA22WG was within 5 times method blank concentrations in batch KWG1008524.

Comments:

iv. Do the affected sample(s) have data flags and if so, are the data flags clearly defined?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes. Sample 10CTA21SO and rinsate sample 10CTA22WG concentrations were within 5 times the lab blank concentration and was flagged with a "B"

v. Data quality or usability affected? (Please explain.)
Comments:

No. The DRO concentration in sample 10CTA21SO was 2 orders of magnitude below Method 1 cleanup level, resulting in negligible impact. The cross contamination identified in rinsate sample 10CTA22WG was insignificant and did not affect associated soil data (see 6f below).

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No metals/inorganics analyzed, DRO only

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

v. If %R or RPD is outside of acceptable limits, what samples are affected?
Comments:

NA

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. All samples were within %R and RPD control limits.

vii. Data quality or usability affected? (Use comment box to explain.)
Comments:

Data quality or usability not affected. All samples were within %R and RPD control limits

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No failed surrogate recoveries.

iv. Data quality or usability affected? (Use the comment box to explain.)
Comments:

Data quality or usability not affected, no failed surrogate recoveries.

d. Trip blank – Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): <u>Water and Soil</u>

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples? (If not, enter explanation below.)
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No volatiles, DRO only.

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No volatiles, DRO only.

iii. All results less than PQL?
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No volatiles, DRO only.

iv. If above PQL, what samples are affected?
Comments:

NA. No volatiles, DRO only.

v. Data quality or usability affected? (Please explain.)
Comments:

NA. No volatiles, DRO only.

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes. Sample 10CTA21SO is dup of CTA12SO, and CTA20SO is a dup of CTA19SO

ii. Submitted blind to lab?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

iii. Precision – All relative percent differences (RPD) less than specified DQOs? (Recommended: 30% water, 50% soil)

RPD (%) = Absolute value of: $\frac{(R_1-R_2)}{((R_1+R_2)/2)} \times 100$

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

No, field duplicate results indicated adequate precision.

Comments:

f. Decontamination or Equipment Blank (If not used explain why).

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

i. All results less than PQL?

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

ii. If above PQL, what samples are affected?

Comments:

NA.

iii. Data quality or usability affected? (Please explain.)

No. Rinsate blank had insignificant detections of DRO and did not affect soil data quality.

Comments:

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)
   a. Defined and appropriate?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes, see CDQR

Laboratory Data Review Checklist

Completed by: Makenzie Jorgensen

Title: Environmental Scientist Date: 9/14/10

CS Report Name: Project Chariot Test Hole Limited Site Investigation Report Date: December 2010

Consultant Firm: Fairbanks Environmental Services

Laboratory Name: Columbia Analytical Services Laboratory Report Number: K1008036

ADEC File Number: 475.38.019 ADEC RecKey Number:

1. Laboratory
   a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

      Yes

   b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CS approved?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

      NA. Samples were not transferred

2. Chain of Custody (COC)
   a. COC information completed, signed, and dated (including released/received by)?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

      Yes

   b. Correct analyses requested?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

      Yes

3. Laboratory Sample Receipt Documentation
   a. Sample/cooler temperature documented and within range at receipt (4° ± 2° C)?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

      No, Samples were below acceptable temp range (1.7 C), but all samples were documented to be in good condition.

   b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

      Yes

☐Yes ☐ No ☐NA (Please explain.) Comments:

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes. All samples were documented to be in good condition

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No discrepancies other than temperature, which was documented.

e. Data quality or usability affected? (Please explain.)
Comments:

No. Data were not affected by the minor temperature discrepancy since all samples documented in good condition.

4. Case Narrative
a. Present and understandable?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

b. Discrepancies, errors or QC failures identified by the lab?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes. 1. The matrix spike recovery for sample lOCTCO1S0 was outside control criteria.
2. Two surrogate recoveries were outside control criteria.

c. Were all corrective actions documented?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes. 1. Recovery in the Laboratory Control Sample (LCS) was acceptable, which indicated the analytical batch was in control.
2. No further action was required for surrogates (see section 6 ii thru iv).

d. What is the effect on data quality/usability according to the case narrative?
Comments:

The case narrative only discusses deviations and does not discuss the effect on the data.

5. Samples Results
a. Correct analyses performed/reported as requested on COC?
☐Yes ☐ No ☐NA (Please explain.) Comments:

NO, Although it was specified on the COC form, MS/MSD samples were not extracted with the following field duplicate samples (10CTA21SO, 10CTB21SO, 10CTC21SO, 10CTD21SO, and 10CTX21SO). Impact to data was insignificant as all data were comparable to primary samples with on acceptable exception (see checksheet for K1008039).

b. All applicable holding times met?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

c. All soils reported on a dry weight basis?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes, except for 10CTC03SO. This sample was grossly contaminated and required dilution to quantitate the result. Consequently the LOQ was above the Method 1 cleanup level (but below the more applicable Arctic Zone level as it was a tundra sample); however, the result was above cleanup levels, so the elevated LOQ is not an issue.

e. Data quality or usability affected?
Comments:

Data quality/usability not affected since all samples were reported correctly and with adequate sensitivity. See 5a for discussion on impact due to lack of MS/MSD in batch KWG1008160.

6. <u>QC Samples</u>
   a. Method Blank
      i. One method blank reported per matrix, analysis and 20 samples?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

      ii. All method blank results less than PQL?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

No. DRO detected above the PQL.

      iii. If above PQL, what samples are affected?
      Comments:

Rinsate Sample 10CTC22WG was within 5 times the method blank concentration and was affected.

      iv. Do the affected sample(s) have data flags and if so, are the data flags clearly defined?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes, rinsate sample10CTC22WG was flagged B.

v. Data quality or usability affected? (Please explain.)

Comments:

Overall, only rinsate data were impacted. No project soil sample data were affected by the insignificant DRO concentrations detected in the affected rinsate sample (see 6f below).

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?

☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No metals/inorganics, DRO only

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

NA

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No affected samples

vii. Data quality or usability affected? (Use comment box to explain.)

Comments:

Data quality/usability not affected, %R and RPD were within the acceptable ranges.

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)
☐Yes ☐ No ☐NA (Please explain.) Comments:

No. The surrogate for sample 10CTC06SO was out of range at 152%. Also the control criteria for 10CTC03SO was not applicable because it required a dilution which resulted in a surrogate concentration beyond the capability of quantification.

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes. Sample 10CTC06SO was biased high due to matrix interference and flagged QH. Criteria was not applicable for sample 10CTC03SO, so this sample was not qualified.

iv. Data quality or usability affected? (Use the comment box to explain.)
Comments:

The sample concentration for 10CTC06SO is biased high and below Method 1 and Arctic Zone cleanup levels, so any impact is negligible. The DRO concentration for sample 10CTC03SO far exceeded cleanup levels, resulting in a negligible impact to data quality or usability.

d. Trip blank – Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): <u>Water and Soil</u>

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples? (If not, enter explanation below.)
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No volatiles, DRO only

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No volatiles, DRO only

iii. All results less than PQL?
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No volatiles, DRO only

iv. If above PQL, what samples are affected?

Comments:

NA. No volatiles, DRO only

v. Data quality or usability affected? (Please explain.)

Comments:

Data quality/usability not affected by lack of TB since there were no volatile analyses.

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes. The following were primary/field duplicate pairs (10CTC01SO/10CTC20SO and 10CTC11SO/10CTC21SO)

ii. Submitted blind to lab?

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

iii. Precision – All relative percent differences (RPD) less than specified DQOs? (Recommended: 30% water, 50% soil)

RPD (%) = Absolute value of: $\frac{(R_1-R_2)}{((R_1+R_2)/2)} \times 100$

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes.

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

Comments:

No. Field duplicate results indicated adequate precision.

f. Decontamination or Equipment Blank (If not used explain why).

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

i. All results less than PQL?

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes, however there were detections between the MDL and the LOQ.

ii. If above PQL, what samples are affected?

Comments:

The DRO result in the rinsate blank was low (3 orders of magnitude less than the Method 1 cleanup level on a ppb basis) and did not impact any of the soil data.

iii. Data quality or usability affected? (Please explain.)

Comments:

No. Rinsate blank had insignificant detections of DRO and did not affect soil data quality.

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)
   a. Defined and appropriate?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes, see CDQR

Laboratory Data Review Checklist

Completed by: Makenzie Jorgensen

Title: Environmental Scientist Date: 9/14/10

CS Report Name: Project Chariot Test Hole Limited Investigation Report Report Date: December 2010

Consultant Firm: Fairbanks Environmental Services

Laboratory Name: Columbia Analytical Services Laboratory Report Number: K1008039

ADEC File Number: 475.38.019 ADEC RecKey Number:

1. Laboratory
   a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

      Yes

   b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CS approved?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

      NA. Samples were not transferred

2. Chain of Custody (COC)
   a. COC information completed, signed, and dated (including released/received by)?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

      Yes

   b. Correct analyses requested?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

      Yes

3. Laboratory Sample Receipt Documentation
   a. Sample/cooler temperature documented and within range at receipt (4° ± 2° C)?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

      No. Temp Blank was 6.7 C, however, cooler interior was an acceptable 3.8 C.

   b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

      Yes

☐Yes ☐ No ☐NA (Please explain.) Comments:

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes. All samples were documented to be in good condition.

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No discrepancies other than temperature of temp blank (which was documented).

e. Data quality or usability affected? (Please explain.)
Comments:

Data quality/usability was not affected by temperature blank discrepancy since the cooler temperature was acceptable.

4. Case Narrative
a. Present and understandable?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

b. Discrepancies, errors or QC failures identified by the lab?
☐Yes ☐ No ☐NA (Please explain.) Comments:

No discrepancies

c. Were all corrective actions documented?
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No discrepancies

d. What is the effect on data quality/usability according to the case narrative?
Comments:

Case narrative only discusses anomalies and subsequent corrective actions taken.

5. Samples Results
a. Correct analyses performed/reported as requested on COC?
☐Yes ☐ No ☐NA (Please explain.) Comments:

NO, Although it was specified on the COC form, MS/MSD samples were not extracted with the following field duplicate samples (10CTA21SO, 10CTB21SO, 10CTC21SO, 10CTD21SO, and 10CTX21SO). Impact to data was insignificant as all data were comparable to primary samples with on acceptable exception (RPD for field duplicate pair 10CTB13SO/10CTB21SO were above 50 percent. However, primary and duplicate results for both pairs are low level estimates (J flagged), and well below DRO cleanup level).

b. All applicable holding times met?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

c. All soils reported on a dry weight basis?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

e. Data quality or usability affected?
Comments:

Data quality/usability not affected. Holding times were met and results were reported correctly with adequate sensitivity. See 5a for discussion on impact due to lack of MS/MSD in batch KWG1008160.

6. <u>QC Samples</u>
   a. Method Blank
      i. One method blank reported per matrix, analysis and 20 samples?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

      ii. All method blank results less than PQL?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

No. DRO was not detected above the PQL; however, it was detected between the MDL and the LOQ.

      iii. If above PQL, what samples are affected?
      Comments:

Sample 10CTB21SO and rinsate sample 10CTB22WG were within 5 times the DRO concentration detected in the method blanks, and were affected.

      iv. Do the affected sample(s) have data flags and if so, are the data flags clearly defined?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes. Samples 10CTB21SO and rinsate sample 10CTB22WG concentration was within 5 times the lab blank concentration and was flagged with a “B”

v. Data quality or usability affected? (Please explain.)

Comments:

The sample 10CTB21SO DRO result was well below cleanup level resulting in negligible impact. Cross contamination detected in rinsate sample 10CTB22WG was insignificant and did not affect associated soil data (see 6f).

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?

☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. DRO only

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

NA

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No affected samples

vii. Data quality or usability affected? (Use comment box to explain.)

Comments:

Data quality/usability not affected since batch accuracy and precision were acceptable.

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No failed surrogates

iv. Data quality or usability affected? (Use the comment box to explain.)
Comments:

Data quality/usability not affected since all surrogates recoveries were acceptable.

d. Trip blank – Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): <u>Water and Soil</u>

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples? (If not, enter explanation below.)
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. DRO only

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. DRO only

iii. All results less than PQL?
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA

iv. If above PQL, what samples are affected?
Comments:

NA

v. Data quality or usability affected? (Please explain.)

Comments:

Data quality/usability not affected since no volatile analyses were requested.

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes The following are primary/field duplicate pairs (10CTB08SO/10CTB20SO and 10CTB13SO/10CTB21SO)

ii. Submitted blind to lab?

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

iii. Precision – All relative percent differences (RPD) less than specified DQOs? (Recommended: 30% water, 50% soil)

RPD (%) = Absolute value of: $\frac{(R_1-R_2)}{((R_1+R_2)/2)} \times 100$

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

☐Yes ☐ No ☐NA (Please explain.) Comments:

No. RPD was not met for either duplicate pair, however RPD criterion of less than 50% is not applicable because all sample pair concentrations were low level detections (J flagged).

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

Comments:

No. Both sets of field duplicates were reported below the LOD and precision is unreliable at those levels. Batch precision was adequate based on acceptable LCS/LCSD and MS/MSD results.

f. Decontamination or Equipment Blank (If not used explain why).

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

i. All results less than PQL?

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes, however DRO was detected between the MDL and LOQ.

ii. If above PQL, what samples are affected?

Comments:

DRO result in Rinsate was 3 orders of magnitude below the Method 1 cleanup level (on a ppb basis) and consequently, it did not affect any of the soil data.

iii. Data quality or usability affected? (Please explain.)

Comments:

No. Rinsate blank had insignificant detections of DRO and did not affect data quality.

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)
   a. Defined and appropriate?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes, see CDQR

Laboratory Data Review Checklist

Completed by: Makenzie Jorgensen

Title: Environmental Scientist Date: 9/15/10

CS Report Name: Project Chariot Test Hole Limited Site Investigation Report Date: December 2010

Consultant Firm: Fairbanks Environmental Services

Laboratory Name: Columbia Analytical Services Laboratory Report Number: K1008042

ADEC File Number: 475.38.019 ADEC RecKey Number:

1. Laboratory
   a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

      Yes

   b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CS approved?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

      NA. Samples were not transferred

2. Chain of Custody (COC)
   a. COC information completed, signed, and dated (including released/received by)?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

      Yes

   b. Correct analyses requested?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

      Yes

3. Laboratory Sample Receipt Documentation
   a. Sample/cooler temperature documented and within range at receipt (4° ± 2° C)?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

      Yes

   b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

      Yes

☐Yes ☐ No ☐NA (Please explain.) Comments:

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes. No broken containers, samples were documented in good condition.

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No discrepancies

e. Data quality or usability affected? (Please explain.)
Comments:

No discrepancies or broken containers, data quality/usability was not affected.

4. Case Narrative
a. Present and understandable?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

b. Discrepancies, errors or QC failures identified by the lab?
☐Yes ☐ No ☐NA (Please explain.) Comments:

No discrepancies

c. Were all corrective actions documented?
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No discrepancies

d. What is the effect on data quality/usability according to the case narrative?
Comments:

Case narrative does not discuss effect on data, it only discusses anomalies and subsequent corrective actions.

5. Samples Results
a. Correct analyses performed/reported as requested on COC?
☐Yes ☐ No ☐NA (Please explain.) Comments:

NO, Although it was specified on the COC form, MS/MSD samples were not extracted with the following field duplicate samples (10CTA21SO, 10CTB21SO, 10CTC21SO, 10CTD21SO, and 10CTX21SO). Impact to data was insignificant as all data were comparable to primary samples with on acceptable exception (see checksheet for K1008039).

b. All applicable holding times met?

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

c. All soils reported on a dry weight basis?

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

e. Data quality or usability affected?

Comments:

Data quality/usability not affected. Holding times were met and all results were reported correctly and with adequate sensitivity. See 5a for discussion on impact due to lack of MS/MSD in batch KWG1008160.

6. <u>QC Samples</u>

a. Method Blank

i. One method blank reported per matrix, analysis and 20 samples?

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

ii. All method blank results less than PQL?

☐Yes ☐ No ☐NA (Please explain.) Comments:

No. DRO was not detected above the PQL. However, it was detected between the MDL and the LOQ.

iii. If above PQL, what samples are affected?

Comments:

Rinsate Sample 10CTX22WG is affected because it was within 5 times the lab blank concentration. Soil samples 10CTX01SO, 10CTX02SO, 10CTX03SO, 10CTX04SO, 10CTX06SO, 10CTX07SO, 10CTX08SO, 10CTX09SO, 10CTX20SO were also affected because DRO concentrations in these samples were within 5 times the method blank concentration.

iv. Do the affected sample(s) have data flags and if so, are the data flags clearly defined?

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes, Rinsate Sample 10CTX22WG and soil samples 10CTX01SO, 10CTX02SO, 10CTX03SO, 10CTX04SO, 10CTX06SO, 10CTX07SO, 10CTX08SO, 10CTX09SO, 10CTX20SO were qualified with a B.

v. Data quality or usability affected? (Please explain.)

Comments:

Cross contamination identified in rinsate sample 10CTX22WG was negligible and did not affect associated project soil data (see 6f below). Therefore, there was no impact to project data. The DRO concentrations reported in soil samples 10CTX01SO, 10CTX02SO, 10CTX03SO, 10CTX04SO, 10CTX06SO, 10CTX07SO, 10CTX08SO, 10CTX09SO, 10CTX20SO were two orders of magnitude below the Method 1 ADEC cleanup level (500 mg/kg), so any impact to these data is negligible.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?

☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No metals/inorganics, DRO only

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

NA

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No affected samples

vii. Data quality or usability affected? (Use comment box to explain.)
Comments:

Data quality/usability not affected, all LCS/LCSD were with %R and RPD limits.

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No failed surrogates

iv. Data quality or usability affected? (Use the comment box to explain.)
Comments:

Data quality/usability not affected, no failed surrogates indicates data are acceptable.

d. Trip blank – Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): <u>Water and Soil</u>

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples? (If not, enter explanation below.)
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No volatiles, DRO only.

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No volatiles, DRO only.

iii. All results less than PQL?
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No volatiles, DRO only.

iv. If above PQL, what samples are affected?

Comments:

NA. No volatiles, DRO only.

v. Data quality or usability affected? (Please explain.)

Comments:

Data quality/usability not affected by lack of Trip Blank since there were no volatile analyses.

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes Two field duplicate pairs were submitted (10CTX02SO/10CTX20SO and 10CTX19SO/10CTX21SO)

ii. Submitted blind to lab?

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

iii. Precision – All relative percent differences (RPD) less than specified DQOs? (Recommended: 30% water, 50% soil)

RPD (%) = Absolute value of: $\frac{(R_1-R_2)}{((R_1+R_2)/2)} \times 100$

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes.

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

Comments:

No. Field duplicate results indicated adequate precision.

f. Decontamination or Equipment Blank (If not used explain why).

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

i. All results less than PQL?

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes. However, DRO was detected between the MDL and LOQ.

ii. If above PQL, what samples are affected?

Comments:

The DRO detections in the Rinsate were 3 orders of magnitude less than the cleanup level (on a ppb basis) and consequently did not impact any of the project soil data.

iii. Data quality or usability affected? (Please explain.)

Comments:

No. Rinsate blank had insignificant detections of DRO and did not affect project data quality.

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)
   a. Defined and appropriate?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes, see CDQR

Laboratory Data Review Checklist

Completed by: Makenzie Jorgensen

Title: Environmental Scientist Date: 9/15/10

CS Report Name: Project Chariot Test Hole Limited Site Investigation Report Date: December 2010

Consultant Firm: Fairbanks Environmental Services

Laboratory Name: Columbia Analytical Services Laboratory Report Number: K1008043

ADEC File Number: 475.38.019 ADEC RecKey Number:

1. Laboratory
   a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

      Yes

   b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CS approved?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

      NA. Samples were not transferred

2. Chain of Custody (COC)
   a. COC information completed, signed, and dated (including released/received by)?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

      Yes

   b. Correct analyses requested?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

      Yes

3. Laboratory Sample Receipt Documentation
   a. Sample/cooler temperature documented and within range at receipt (4° ± 2° C)?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

      No. Samples were below acceptable temp range (Temp Blank=0.2 C and cooler=0.7 C), but all samples were documented to be in good condition.

   b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

Yes

☐Yes ☐ No ☐NA (Please explain.) Comments:

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes. No broken containers, samples were documented in good condition.

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No discrepancies other than temperature (which was documented)

e. Data quality or usability affected? (Please explain.)
Comments:

Impact to data quality/usability due to the temperature discrepancies was minor because the samples were reportedly in good condition.

4. Case Narrative
a. Present and understandable?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

b. Discrepancies, errors or QC failures identified by the lab?
☐Yes ☐ No ☐NA (Please explain.) Comments:

No discrepancies

c. Were all corrective actions documented?
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No discrepancies

d. What is the effect on data quality/usability according to the case narrative?
Comments:

The case narrative does not discuss data usability, it only lists anomalies and subsequent corrective actions.

5. Samples Results
a. Correct analyses performed/reported as requested on COC?
☐Yes ☐ No ☐NA (Please explain.) Comments:

NO, Although it was specified on the COC form, MS/MSD samples were not extracted with the following field duplicate samples (10CTA21SO, 10CTB21SO, 10CTC21SO, 10CTD21SO, and 10CTX21SO). Impact to data was insignificant as all data were comparable to primary samples with on acceptable exception (see checksheet for K1008039).

b. All applicable holding times met?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

c. All soils reported on a dry weight basis?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

e. Data quality or usability affected?
Comments:

Data quality/usability not affected. Samples were analyzed within holding time, and reported correctly with adequate sensitivity. See 5a for discussion on impact due to lack of MS/MSD in batch KWG1008160.

6. <u>QC Samples</u>
   a. Method Blank
      i. One method blank reported per matrix, analysis and 20 samples?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

      ii. All method blank results less than PQL?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

No. DRO was not detected above the PQL. However, it was detected between the MDL and the LOQ in the water extraction batch.

      iii. If above PQL, what samples are affected?
      Comments:

The DRO concentration in Rinsate sample 10CTD22WG was within five times the DRO concentration in the method blank, and was therefore affected.

      iv. Do the affected sample(s) have data flags and if so, are the data flags clearly defined?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes, Rinsate sample 10CTD22WG was qualified with a B

v. Data quality or usability affected? (Please explain.)
Comments:

Overall, only rinsate data were impacted. No project soil sample data were affected by the insignificant DRO concentrations detected in the affected rinsate sample (see 6f below).

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No metals/inorganics, DRO only

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

v. If %R or RPD is outside of acceptable limits, what samples are affected?
Comments:

NA

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No affected samples

vii. Data quality or usability affected? (Use comment box to explain.)
Comments:

Data quality/usability not adversely impacted. Batch accuracy and precision were acceptable.

c. Surrogates – Organics Only

i. Are surrogate recoveries reported for organic analyses – field, QC and laboratory samples?
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)
☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No failed surrogates

iv. Data quality or usability affected? (Use the comment box to explain.)
Comments:

Data quality/usability not adversely impacted as there were no failed surrogate recoveries.

d. Trip blank – Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): <u>Water and Soil</u>

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples? (If not, enter explanation below.)
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No volatiles, DRO only.

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No volatiles, DRO only.

iii. All results less than PQL?
☐Yes ☐ No ☐NA (Please explain.) Comments:

NA. No volatiles, DRO only.

iv. If above PQL, what samples are affected?
Comments:

NA. No volatiles, DRO only.

v. Data quality or usability affected? (Please explain.)

Comments:

Data quality/usability not affected by lack of Trip Blank since there were no volatile analyses.

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes 2 field duplicate pairs were submitted (10CTD01SO/10CTD20SO and 10CTD19SO/10CTD21SO)

ii. Submitted blind to lab?

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

iii. Precision – All relative percent differences (RPD) less than specified DQOs? (Recommended: 30% water, 50% soil)

RPD (%) = Absolute value of: $\frac{(R_1-R_2)}{((R_1+R_2)/2)} \times 100$

Where R_1 = Sample Concentration
R_2 = Field Duplicate Concentration

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes.

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

Comments:

No. Field duplicate results indicated adequate precision.

f. Decontamination or Equipment Blank (If not used explain why).

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes

i. All results less than PQL?

☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes, however DRO was detected between the MDL and LOQ.

ii. If above PQL, what samples are affected?

No samples were affected since rinsate concentration was 3 orders of magnitude less than the Method 1 cleanup level.

Comments:

iii. Data quality or usability affected? (Please explain.)

Comments:

No. Rinsate blank had insignificant detections of DRO and did not affect data quality.

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)
   a. Defined and appropriate?
      ☐Yes ☐ No ☐NA (Please explain.) Comments:

Yes, see CDQR

Appendix E
Review Comments and Responses

REVIEW COMMENTS

PROJECT: Limited Soil Investigation of Project Chariot Test Holes
DOCUMENT: Draft Report
LOCATION: Cape Thompson, Alaska

Alaska Department of Environmental Conservation	DATE: October 13, 2010 REVIEWER: Jonathan Schick PHONE: (907) 269-3077	Action taken on comment by:

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	CONTRACTOR RESPONSE (Responses by USACE as noted)	USAED RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)	Back Check by: (Initials)
1	Executive Summary	In this summary and throughout the document the DRO results are compared to the Method Two Arctic Zone Cleanup level of 12,500 mg/kg. Because the source of the contamination and the majority of the impacts are contained within man made gravel pad the Method One cleanup level of 500 mg/kg is the applicable cleanup level. The elevated Method Two cleanup level may be applicable for soils that are off the gravel pad as the state typically will evaluate the damage to the native tundra versus the value of cleaning up the impacted media. Please make this change in the executive summary and throughout the document. Section 1.4 and the focused site figures note a cleanup level of 12,500 mg/kg.	A - DOE recognizes the issues associated with contamination levels on man-made gravel pads. The document will be revised as appropriate to address the ADEC concerns. Text will be modified to indicate that the Method One cleanup level of 500 mg/kg is the applicable cleanup level for gravel pads, and that the Method Two Arctic Zone Cleanup level of 12,500 mg/kg *may* be applicable to areas of native tundra.		
2	Page 3-1, Section 3.1	In the last sentence in the second paragraph of this section, please remove the word "the" so that the sentence reads, In addition, one sample was collected immediately adjacent to each test hole."	A - The word “the” will be removed.		
3	Page 4-1, Section 4.1	The statement that the elevated DRO concentrations in the samples may be a result of biogenic interference from naturally occurring organic matter may not be appropriate without running the samples through a silica gel cleanup to determine the percentage of the DRO result that can be	A - The sentence indicating that the elevated DRO concentrations in samples 10CTA01SO and 10CTA02SO may be the results of biogenic interference will be deleted. The issue of biogenic interference will be resolved when developing a strategy for addressing the issues at Chariot, as stated in DOE comment (item) 10		

REVIEW COMMENTS

PROJECT: Limited Soil Investigation of Project Chariot Test Holes
DOCUMENT: Draft Report
LOCATION: Cape Thompson, Alaska

Alaska Department of Environmental Conservation	DATE: October 13, 2010 REVIEWER: Jonathan Schick PHONE: (907) 269-3077	Action taken on comment by:

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	CONTRACTOR RESPONSE (Responses by USACE as noted)	USAED RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)	Back Check by: (Initials)
		attributed to biogenic interference. Also based on comment #1, the concentrations from this site are not an order of magnitude below the cleanup level but are above the Method One cleanup level until it can be determined what the extent of the man made gravel pads at the site. It appears based on the Figure that the sample results that exceed the Method One cleanup level are just off the gravel pad, but we will need to discuss the future plans for site remediation for the site and how best to proceed.	below. It will be noted that these samples exceeded the Method 1 cleanup level but not the Method 2 cleanup level.		
4	Page 4-2, Section 4.3	The State is concerned about the potential for coastal erosion of the impacted soils at Test Hole Charlie which is reported to be located just above the high tide line of the Chukchi Sea. Additionally we are concerned about the presence of surface water in the vicinity of any of the test hole sites. Please provide additional photographs that show the vicinity of Test Hole Charlie to the coast line and any other photos that depict the closest surface water body or tundra pond as the potential impacts to surface water is of great concern to both ADEC and the land manager, the USF&WS. Please include the USF&WS on future planning and remediation documents as they are a main stakeholder for the lands that the	A - Test Hole Charlie is located well above the high tide line and there were no other surface water sources identified in the area. A photograph from our 2008 fieldwork (IMG_0451.JPG) shows the location of the pad and the gradient in regards to the Chukchi Sea. The photo will be included in the final report. With respect to interaction with the USF&WS, DOE acknowledges the comment and DOE will manage interactions with the USF&WS.		

REVIEW COMMENTS

PROJECT: Limited Soil Investigation of Project Chariot Test Holes
DOCUMENT: Draft Report
LOCATION: Cape Thompson, Alaska

Alaska Department of Environmental Conservation	**DATE:** October 13, 2010 **REVIEWER:** Jonathan Schick **PHONE:** (907) 269-3077	**Action taken on comment by:**

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	CONTRACTOR RESPONSE (Responses by USACE as noted)	USAED RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)	Back Check by: (Initials)
		test holes are located on.			
5	Page 5-1, Section 5.0	Please replace the word successful in the first sentence with the word successfully.	A – The word will be changed to “successfully” as suggested.		
6	Page 5-1, Section 5.0	This section is entitled Conclusions and Recommendations, but there are no recommendations for future site work included. ADEC and the project management staff for the USACE and the Department of Energy should come together with all of the stakeholder's input to come up with a strategy for dealing with the residual contamination from the test holes at the site. The agreed upon recommendations should be included in the Final version of this report.	A - The section will be re-titled “Conclusions.” DOE in cooperation with ADEC and affected stakeholders will develop a strategy to address the issues at Chariot. These actions are outside the scope for this project.		
7	Appendix A	Please provide a photo depicting the proximity of the coastline to the Test Hole Charlie site. Additionally, please provide any photos that show any surface water bodies/tundra ponds that are located near any of the sites that were investigated and discuss the potential for the petroleum impacts migrating to impact the surface water. Method One or Method Two cleanup levels may not be applicable if there has been any impact or potential future impact to surface water.	A - A photograph from FES’ 2008 fieldwork (IMG_0451.JPG) shows the location of the Test Hole Charlie pad and the gradient in relation to the Chukchi Sea and it will be included in the final report. Also, photographs showing the location of surface water will be included, if available, in the final report. Note that surface water was also noted near Test Hole Able (Ogotoruk Creek and Chukchi Sea) and south of Test Hole Baker (ponded water).		
8					

REVIEW COMMENTS

PROJECT: Limited Soil Investigation of Project Chariot Test Holes
DOCUMENT: Draft Report
LOCATION: Cape Thompson, Alaska

US Department of Energy	DATE: 11-1-2010 REVIEWER: Mark Kautsky, LM PHONE: 970-248-6018	Action taken on comment by:

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	CONTRACTOR RESPONSE (Responses by USACE as noted)	USAED RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)	Back Check by: (Initials)
1	Executive Summary	In the Executive Summary and elsewhere in the report: Based on its description and location, hole X1 was most likely an emplacement hole for a chemical explosives test (that was not carried out), rather than a subsurface investigation hole like Able, Baker, Charlie, and Dog. For accuracy X1 should be referred to as such (Ref. *Engineering and Construction Support Plan, Project Chariot, Phase IV, Plowshare Program, Addendum 1, Chemical Explosive Experiment*, U.S. AEC, May 8, 1961). These means that hole X1 is on the order of 20 feet deep rather than hundreds of feet deep.	A – The description for Test Hole X1 will be changed, as suggested.		
2	Executive Summary	Executive summary last paragraph and Section 5.0 last paragraph. Need to add a sentence or clause to the effect that permafrost would contain the lateral and vertical spreading of DRO.	A - The area is underlain by permafrost, and vertical migration of contaminants would be impeded by this confining layer. Further, lateral movement would also be impeded by frozen soils during the non-summer months (October through May). This discussion will be added to Executive Summary and Section 5.0		
3	Executive Summary	Typo in first paragraph of executive summary – add “s” to end of word “sample” in next to last sentence.	A – Text will be corrected, as suggested (sample will be changed to “samples”)		
4	Section 4, Paragraph 1	Typo - photo # is 21	A – Text will be corrected, as suggested (see Photograph 21, Appendix A)		
5	Page 4-2 Paragraph 1	Typo – emanated “from”	A – Text will be corrected, as suggested (Word “for” will be changed to “from”)		

REVIEW COMMENTS

PROJECT: Limited Soil Investigation of Project Chariot Test Holes
DOCUMENT: Draft Report
LOCATION: Cape Thompson, Alaska

US Department of Energy	DATE: 11-1-2010 REVIEWER: Mark Kautsky, LM PHONE: 970-248-6018	Action taken on comment by:

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	CONTRACTOR RESPONSE (Responses by USACE as noted)	USAED RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)	Back Check by: (Initials)
6	Page 4-3, Paragraphs 3 and4	Typo - Paragraph 3 “1- to 3-inch” Typo - Paragraph 4 “gravelly”	A – Text will be corrected (“1 to3-inch” will be changed to “1 to 3 inch” and “gravely” will be changed to “gravelly”)		
7	1st sentence in section 1.4	delete word “one” (or add the word “of”).	A – Text will be corrected. The word “of” will be added to the sentence		
8	last sentence of second paragraph, section 3.1	delete word “the”.	A – Text will be corrected, as suggested		
9	Section 5.0	add space between second and third sentences of third paragraph, section 5.0.	A – Text will be corrected, as suggested		
10	Section 5.0, Conclusions and Recommendations	Suggest that this section be titled “Conclusions” since there are no recommendations. DOE in cooperation with ADEC and affected stakeholders will develop a strategy to address the issues at Chariot. These actions are outside the scope of this report.	A – The title of Section 5 will be changed to “Conclusions.”		
11	Section 5, paragraph 1 and 3	Typo - “successfully”, paragraph 3, “…pad. It”	A – Text will be corrected, as suggested (“successful” will be changed to “successfully”) and space will be added to separate sentences in paragraph 3.		
12	Appendix B	The scanned field notes in Appendix B from Mike Boese are practically illegible in some cases. Please try making a better scanned copy of his notes.	A – the notes will be rescanned/printed at a higher resolution.		

REVIEW COMMENTS

PROJECT: Limited Soil Investigation of Project Chariot Test Holes
DOCUMENT: Draft Report
LOCATION: Cape Thompson, Alaska

US Department of Energy	DATE: 11-1-2010 REVIEWER: Mark Kautsky, LM PHONE: 970-248-6018	Action taken on comment by:

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	CONTRACTOR RESPONSE (Responses by USACE as noted)	USAED RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)	Back Check by: (Initials)
13	General	If water samples were acquired from the standing water in the boreholes, please provide those results too.	Noted – No groundwater samples were collected.		

REVIEW COMMENTS

PROJECT: Limited Soil Investigation of Project Chariot Test Holes
DOCUMENT: Draft Report
LOCATION: Cape Thompson, Alaska

U.S. ARMY CORPS OF ENGINEERS CEPOA-ESP-EE	**DATE:** October 14, 2010 **REVIEWER:** Neil Folcik **PHONE:** (907) 753-5657	**Action taken on comment by:**

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	CONTRACTOR RESPONSE (Responses by USACE as noted)	USAED RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)	Back Check by: (Initials)
1	Cover	Please indicate on the cover that this is a DOE project	A – The cover will be modified to indicate that the work was performed for the U.S. Department of Energy.		
2	Executive Summary	The text indicates that the contamination at test hole Charlie is only a few inches thick. The text then states that migration would be limited by permafrost. Was the intent to state that the gravel pad is only a few inches thick? Or is the permafrost only a few inches below the surface at this location?	A – The text will be changed to indicate that the gross contamination identified on the gravel pad appeared to be only 4 or 5 inches thick, and that pad soils identified underneath this layer appeared to be cleaner. Pad thickness and depth to permafrost were not measured.		
3	Section 1.4	Please correct the second sentence to read "In addition the site meets the….."	A – The word "that" will be removed, as suggested.		
4	Section 3.1	Please update the GPS coordinates in the table to match the coordinate system in Appendix C. Please verify that the well coordinates in the table match Appendix C and Figures 2 through 7.	A – The coordinates in Section 3.1 will be changed to Alaska State Plane Coordinate System, NAD 83, Zone 8, in feet, as suggested. Test Hole locations will be cross-referenced and verified, as requested.		
5	Section 4.1	The fourth sentence identifies the sample results for samples 01SO and 02SO. Sample 06SO may be worth including in the discussion (same result as 01SO).	A - Sample 06SO had similar concentrations and will be included in the discussion. Note that the discussion will be further expanded with the use of the lower Method One Cleanup Level of 500 mg/kg.		
6	Table 1	Section 4.4 indicates that refusal was encountered at 10" bgs at some sample locations yet the sample interval in Table 1 is 0" to 12" for all samples.	A - The sample locations with refusal were not documented. A footnote will be added to Table 1 to indicate that several Test Hole Dog locations were collected 0" to10" inches due to refusal (ice).		
7	Table 1	Section 4.5 indicates that refusal was encountered at 6" bgs at some sample locations yet the sample interval in Table 1 is 0" to 12" for all samples.	A – The sample locations with refusal were not documented. The depth interval in Table 1 will be changed to 0-6" for all Test Hole X1 locations. A footnote will be added to Table 1 to indicate sample depths at this site were less than the proposed in the work plan due to refusal (bedrock).		

REVIEW COMMENTS

PROJECT: Limited Soil Investigation of Project Chariot Test Holes
DOCUMENT: Draft Report
LOCATION: Cape Thompson, Alaska

U.S. ARMY CORPS OF ENGINEERS CEPOA-ESP-EE	**DATE:** October 14, 2010 **REVIEWER:** Neil Folcik **PHONE:** (907) 753-5657	**Action taken on comment by:**

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	CONTRACTOR RESPONSE (Responses by USACE as noted)	USAED RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)	Back Check by: (Initials)
	MED review	The Manual for Electronic Deliverables is part of this contract. The FUDS specific requirements (FIIP) do not apply.			
1	Figures	Figure 2 did not provide the XREF.	A – XREF will be provided with the final submittal.		
2	Figures	Native Files not named by Figure Number.	A – Native Figure File names will be changed to the figure number for clarity.		
3	Figures	Able.mxd – failed to provide XREFS, or use relative paths. None of the data is linked. Without regenerating the MXD files can not determine if correct survey data was used.	A – The relative path will be used for each of the figures in the final submittal.		
4	Appendix B	Log Books were not OCRed	A – Log Books will be OCRed for final.		
5	Appendix B	Quality of the logbook scan is such that the preprinted page numbers are barely readable	A – Logbooks will be rescanned and printed with better quality.		
6	Appendix B	Right hand edge of odd number pages are cut off.	A – Logbooks will be centered and rescanned.		
7	Appendix B	Please include a copy of the cover of the second field log book. This will allow for identification of the author, site, etc.	A – A copy of the cover of second logbook will be included in final.		
8	MED check sheet	1.2.4 – did not provide all referenced files. 1.3.4 – what data is provided that documents accuracy? 1.4.2 – NPDL WQO# is missing so not error free. 1.4.3 – Not Instructional Set compliance per a visual screen. No documentation of passing Savvy or EPA checker or other software.	A – All referenced files will be provided with final. A – Box 1.3.4 will be unchecked. There were no survey monuments with known coordinates at the site for verifying accuracy. A – NPDL WO# will be added to COELT. A – SEDD file has been evaluated by FES using SAVVY software and corrections have been requested from the project laboratory. The corrected (passing) SEDD will be included with the final report.		

REVIEW COMMENTS

PROJECT: Limited Soil Investigation of Project Chariot Test Holes
DOCUMENT: Draft Report
LOCATION: Cape Thompson, Alaska

U.S. ARMY CORPS OF ENGINEERS CEPOA-ESP-EE	**DATE:** October 14, 2010 **REVIEWER:** Neil Folcik **PHONE:** (907) 753-5657	**Action taken on comment by:**

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	CONTRACTOR RESPONSE (Responses by USACE as noted)	USAED RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)	Back Check by: (Initials)
		1.4.4 – did not follow requirements. 1.4.5 – no COC seals provided. How document custody? 3. Fast Web View not set. 4.1 – not followed.	A - Lab Sample # will be added. A – Two custody seals were noted for each cooler (signed & intact) on the Cooler Receipt Form. There is no requirement to provide copies of custody seals. CAS has provided copies of the custody seals that were secured to a page of paper and stored in their archive file. These copies will be included with the laboratory data on CD for the final report. A – Fast Web View will be set for final submittal. Noted – FIIP requirements are not applicable (see statement above: "The Manual for Electronic Deliverables is part of this contract. The FUDS specific requirements (FIIP) do not apply.")		

REVIEW COMMENTS **PROJECT: Limited Soil Investigation of Project Chariot Test Holes**
DOCUMENT: Draft Report

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-ES-M	**DATE:** 11-AUG-2010 **REVIEWER: Teresa Lee** **PHONE: 907-753-2788**	**Action taken on comment by:**

Item No.	Drawing Sht. No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
1.	Draft Report	First off, a few minor typos: Executive Summary, 4th paragraph In the second sentence of the paragraph, a reference is made to 25 south. Please include the unit of measurement. Page 1-2, Section 1.2 3rd paragraph Reads "Talus in not extensive". Perhaps it should read Talus *is* not extensive"? Page 1-3, Section 1.4 In the second sentence, omit "that". Page 4-2, Section 4.3, 2nd paragraph Soil types collected on the pad consisted *of* angular gravel…..	A	The word "feet" will be added to sentence. Text will be changed as suggested to "is" Text will be modified as suggested (omit "that") Text will be modified as suggested ("of" will be added)	

REVIEW COMMENTS **PROJECT: Limited Soil Investigation of Project Chariot Test Holes**
DOCUMENT: Draft Report

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-ES-M	DATE: 11-AUG-2010 REVIEWER: Teresa Lee PHONE: 907-753-2788	Action taken on comment by:

Item No.	Drawing Sht. No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
2.	Draft Report Page 4-3 Section 4.4 2nd paragraph	It is mentioned that in areas, sample depth was limited to 10" bgs, however, this was not documented on the sample summary table where every sample was listed as taken from a depth of 0-12". So then I looked in the field notes. Per the QAPP, bore holes were to be measured with a tape measure. I saw no measurements recorded. If this information is on a field sample form, please provide in the field notes section and include specific boring depths on the sample summary table. If said measurements were not recorded and merely estimated, please note the deviation from the QAPP, the effect on data quality if any, and indicate on the sample summary table that the depth is estimated. Information such as this is critical for estimating quantities for possible removal. In addition, the field notes lack sample description, time sampled, analysis, and most importantly sample location associated with each sample ID.	A	Depth measurements for individual samples were estimated. Note that the soil probe was 12 inches and the auger was 6 inches, so our estimates were very close. The fact that individual samples were not measured with a tape measure will be noted as a deviation from the QAPP. Also, Test Hole Dog data will be footnoted as having estimated depth intervals on the sample summary table. The effect on Test Hole Dog data quality was minor as the there was more variation in surface topography (due to tussocks) than there was caused by the limited sample depth in some locations. Field Notes: Soil types within each site were similar – adequate soil descriptions were documented for each pad and surrounding tundra, as applicable, for each test hole site. Specific samples exhibiting odor or discoloration were also noted. For simplicity, consistency, and to avoid confusion with sample location, all primary samples were collected using the same sample number/location combination (For example, sample "01" was always collected from 50' North of test hole, as shown in Figures 3 through 7). Locations of field duplicate samples were documented in the field book.	

REVIEW COMMENTS **PROJECT: Limited Soil Investigation of Project Chariot Test Holes**
DOCUMENT: Draft Report

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-ES-M	DATE: 11-AUG-2010 REVIEWER: Teresa Lee PHONE: 907-753-2788	Action taken on comment by:

Item No.	Drawing Sht. No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
3.	Draft Report Page 4-4 Section 4.5 2nd paragraph	Again, it states that refusal was hit between 6-12"….where? See comment 5.	A	The Sample Depth at Test Hole X1 in Table 1 will be changed form 0"-12" to 0"-6" because it is more accurate. Also, a footnote will be added indicating sample depth was different than specified in the work plan due to refusal (shallow bedrock). This deviation will also be document in the report text.	
4.	COC's CDQR Table 1 Table 2	The COC for Able indicates sample 10CTA20SO as location AN50. However in the tables, the location is described as ABLE, indicating this may have been treated throughout this report as a duplicate of the Loc ID ABLE's sample. Which is it? AN50's or ABLE's duplicate? Either way, confirm and amend throughout as needed. If the chain is wrong, state so in the CDQR and the affect it has on the data, if any. In addition, typically a copy of the custody seals are provided by the laboratory. Why has the lab not provided them in this instance?	A	Based on the logbook and the sample time, sample 10CTA20SO was correctly treated as a duplicate to ABLE. The Loc ID was incorrect on the COC form, and this anomaly will be stated in the CDQR and ADEC checklist. Custody seals: The fact that custody seals were present on the sample coolers, intact, and signed is documented on the Cooler Receipt Forms. CAS has provided copies of the custody seals that were secured to a page of paper and stored in their archive file. These copies will be included with the laboratory data in the final submittal. We have requested that the lab include copies in future data packages.	

REVIEW COMMENTS **PROJECT: Limited Soil Investigation of Project Chariot Test Holes**
DOCUMENT: Draft Report

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-ES-M	DATE: 11-AUG-2010 REVIEWER: Teresa Lee PHONE: 907-753-2788	Action taken on comment by:

Item No.	Drawing Sht. No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
5.	Table 2	Please provide the laboratory sample ID. In addition, define *all* qualifiers used per page in the legend. Also, please indicate what your field duplicates are duplicates of. I can tell that that magical "A" behind the location indicates who it is a duplicate of (not very blind by the way…), however, to the untrained eye, it could be mistaken as a second depth at that location. Also, in the legend, put your brackets around LOQ so that is clear. Lastly, include the regulatory limit for the rinsate.	A W	Lab Sample ID will be added to Table 2. The "A" will be removed from all field duplicate locations. Brackets will be added to LOQ in legend for clarity, as suggested. All qualifiers used will be defined. There are no regulatory limits for rinsate samples. However, any detections of analytes in rinsate samples are compared to associated sample data and flagged accordingly. In this case, cross contamination associated with equipment decontamination was considered negligible and no primary sample data were flagged because the DRO concentrations in rinsates were at least an order of magnitude less than the lowest soil sample result (on a parts per billion basis).	
6.	Table 2 Page 1 0f 5	Sample 10CTA08SO has a qualifier of Q. Q is not a valid qualifier per your CDQR, nor is it defined in the legend. If it is there in error, please remove. If it indeed requires qualification, please use a symbol from the defined set in the CDQR.	A	The DRO result for sample 10CTA08SO was qualified with a U (not detected). The U flag will be removed. The result is listed as ND, and ND is defined in legend.	
7.	Appendix C GPS data	The SOW requires the recording of each *sample* location. Please add a column to this table for sample ID, to include duplicates.	A	Sample IDs, including duplicates, will be added to GPS Data Table in Appendix C.	
8.	CDQR Page D-4	According to the lab reports, the preparation method used was 3550B, not 3550C.	A	Preparation Method in Table on page D-4 will be changed to 3550B.	

REVIEW COMMENTS **PROJECT: Limited Soil Investigation of Project Chariot Test Holes**
DOCUMENT: Draft Report

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-ES-M	DATE: 11-AUG-2010 REVIEWER: Teresa Lee PHONE: 907-753-2788	Action taken on comment by:

Item No.	Drawing Sht. No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
9.	CDQR Page D-4	In paragraph 3, it states that all reported LOQ's met the cleanup level. However, there is one instance where this is not the case (10CTC03SO). Please amend.	A	This topic will have to be re-evaluated because the cleanup level was changed to 500 mg/kg per ADEC comment 1. The text will be amended accordingly.	
10.	CDQR Page D-6	See comment 7. If the COC was incorrect, please include this discrepancy in section 2.2.	A	The Loc ID of duplicate sample 10CTA20SO was incorrect on the COC form, and this anomaly will be stated in section 2.2 of the CDQR and in section 3d of the ADEC checklist.	
11.	CDQR Page D-8 Section 2.6 ADEC check sheets	Although your COC's clearly states for the lab to perform a MS/MSD w/ each extraction batch, it was noted during the review of the analytical packages that this did not occur. Having 21 soil samples per submittal, an MS/MSD was reported for 1-20, but not the 21st sample. Thus MS/MSD's were not performed at the proper frequency. I suggest taking up this issue with your laboratory. Either way, this deviation needs to be stated in this section, and the impact to the data elaborated on, if any. Also, amend the ADEC check sheets accordingly on page 2 of 7, #5.a, Correct analyses performed/reported as requested on COC?	A	Page D-8, Section 2.6 states that MS/MSD samples were not performed for a batch including 5 rinsate water samples and the batch including 5 field duplicate soil samples. This deviation will also be documented in the ADEC checklist (section 5a). Since the affected samples were all QC samples and no data were impacted by these associated QC results, impact on primary sample data is negligible.	

REVIEW COMMENTS **PROJECT: Limited Soil Investigation of Project Chariot Test Holes**
DOCUMENT: Draft Report

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-ES-M	DATE: 11-AUG-2010 REVIEWER: Teresa Lee PHONE: 907-753-2788	Action taken on comment by:

Item No.	Drawing Sht. No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
12.	CDQR Section 2.8 Page D-9 ADEC Check sheet	In the last sentence, it states that all reported LOQ's are several orders below the cleanup level. However, there is one instance where this is not the case (10CTC03SO). Please document this here and on the ADEC check sheet as well as the effect it has on the data, if any.	A	Note that the LOQs for all samples were less than the cleanup level (10CTC03SO is an order of magnitude below the 12,500 mg/kg arctic zone cleanup level). However, per ADEC comment #1, we will be re-evaluating the data against 500 mg/kg, so section 2.8 and ADEC checklists will require revision. Please note that there was no impact to data quality because LOQs for soil samples were all below 500 mg/kg except for sample 10CTC03SO, which was grossly contaminated and exceeded this cleanup level by 2 orders of magnitude. This discussion will be included in the CDQR and ADEC checklist.	
13.	CDQR	Per the scope of work, task 7 of which this modification requires compliance with for data evaluation, a table shall be provided within the CDQR to include: Field ID number, Lab ID number, matrix, analytical method, dilution factors, percent moisture, concentration units, result, MDL, PQL specified in the QAPP and actual LOQs, and data qualifier flags. Please add aforementioned table to CDQR.	A	The specified table has been prepared and will be included with CDQR in the final.	
14.	ADEC Check Sheets	On every entry asking if data quality or usability is affected, it always states no. However, there is qualified data, thus data quality is affected in these cases. Data quality can be affected but still be usable as qualified. Please amend the corresponding sections with qualified data.	A	ADEC checklists will be modified, as suggested, for all data requiring qualification.	

REVIEW COMMENTS **PROJECT: Limited Soil Investigation of Project Chariot Test Holes**
DOCUMENT: Draft Report

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-ES-M	**DATE:** 11-AUG-2010 **REVIEWER: Teresa Lee** **PHONE: 907-753-2788**	**Action taken on comment by:**

Item No.	Drawing Sht. No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
15.	Analytical reports and COELT deliverable	Your chain of custody clearly states the NPDL number, however, none of these deliverables have the NPDL number associated with it. Rather they are referring to your project number. Please contact your lab to remedy this and resubmit, error free, and in compliance with the MED.	A	Analytical reports, COELT, and SEDD will be resubmitted with the NPDL number. Lab deliverables will be MED compliant.	
16.	SEDD	Per the Scope of Work section 5.4, all electronic submittals shall conform to the requirements identified in the MED. As such, your SEDD checker indicates multiple errors, in addition, it is not POA_instructional set compliant. Please remedy and resubmit.	A	SEDD will be repaired (MED compliant) and resubmitted with the final report.	