

**SUPPLEMENTAL MONITORING REPORT:
2006 SITE CHARACTERIZATION AND BOOM MAINTENANCE
CAMP LONELY LANDFILL, ALASKA
(Final)**



May 2007



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2006 SITE CHARACTERIZATION AND BOOM MAINTENANCE
CAMP LONELY LANDFILL, ALASKA
(Final)**

May 2007

Prepared for:

The Camp Lonely Landfill Potentially Responsible Parties

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ACRONYMS AND ABBREVIATIONS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
ATV	All Terrain Vehicle
AWQS	Alaska Water Quality Standards
bgs	Below Ground Surface
BLM	Bureau of Land Management
BTEX	Benzene, toluene, ethylbenzene and total xylenes
CFR	Code of Federal Regulations
COC	Contaminant of Concern
COPC	Contaminant of Potential Concern
DEW	Distant Early Warning
DGPS	Differential Global Positioning System
DRO	Diesel Range Organics
EC	Electric Conductivity
F	Fahrenheit
GRO	Gasoline Range Organics
HCG	Hoefler Consulting Group
Husky	Husky Oil Operations Limited
HI	Hazard Index
MDL	Method Detection Limit
µg/L	Micrograms per Liter
mg/Kg	Milligram per Kilogram
NOAA	National Oceanic and Atmospheric Administration
NPR	National Petroleum Reserve
PAHs	Polynuclear Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PID	Photoionization Detector
PQL	Practical Quantitation Limit
RBC	Risk Based Cleanup Level
RCRA	Resource Conservation and Recovery Act
RRO	Residual Range Organics
SGS	SGS Environmental Services, Inc.
SQuiRT	Screening Quick Reference Tables
SRRS	Short Range Radar Station
SVOC	Semivolatile organic compounds
TAH	Total Aromatic Hydrocarbons
TAqH	Total Aqueous Hydrocarbons
TCLP	Toxicity Characteristic Leaching Procedure
USAF	U.S. Air Force
USGS	U.S. Geological Survey
VOCs	Volatile Organic Compounds

1 INTRODUCTION

This report presents the results from the Camp Lonely 2006 Site Characterization and Boom Maintenance. Hoefler Consulting Group (HCG) conducted field work at the Camp Lonely Landfill in late August, 2006. The field work was conducted according to the ADEC-approved 2005 Workplan for Camp Lonely (HCG 2005) and the ADEC-approved *Camp Lonely Site Characterization and Interim Action Workplan Addendum* (HCG 2006b) including the Field Sampling Plan (FSP), Quality Assurance Project Plan (QAPP), and Health and Safety Plan (HSP), unless noted.

2 PROJECT OBJECTIVES

The project was performed as a supplement to the 2005 field activities to address data gaps and assist in preparation of a Feasibility Study. The specific objectives of the project were to:

1. Further characterize the tar-like material with elevated chromium at sample location CLSS12, including its lateral and vertical extent;
2. Re-sample surface water at sample location CLSW01 to determine if there are Alaska Water Quality Standard (AWQS) (18 AAC 70) exceedances for mercury (Hg), total aromatic hydrocarbons (TAH), and total aqueous hydrocarbons (TAqH);
3. Re-sample surface water at 2006 sample location CLSW02 for glycols to determine if they are present and a contaminant of potential concern (COPC);
4. Sample soil at the edge of the gravel pad upgradient of sample location CLSW02 for glycols to determine if they are present, and a potential source of surface water contamination;
5. Sample pore water near the edge of the gravel pad for benzene, toluene, ethylbenzene and total xylenes (BTEX) and glycols upgradient of the 2006 surface water sample location CLSW01 and CLSW02 to determine if these contaminants are present in the active zone water and potentially migrating from the landfill;
6. Sample soil at the edge of the gravel pad upgradient of surface water sample location CLSW01 for Diesel Range Organics/Residual Range Organics (DRO/RRO), Gasoline Range Organics/BTEX (GRO/BTEX), Volatile Organic Compounds (VOCs), Polynuclear Aromatic Hydrocarbons (PAHs), glycols, and metals to determine if contaminants are present and potentially migrating from the landfill;
7. Conduct sheen tests using soil with varying levels of petroleum contamination to determine the concentration of DRO in the soil that causes a sheen upon contact with water;
8. Estimate the concentration of DRO that can be left in the soil without causing a future surface water sheen given the site conditions and probable rate of erosion;
9. Inspect and replace the sorbent boom downgradient of the former drainage ditch drum; and
10. Produce a summary report documenting these activities and the associated results.

3 SITE BACKGROUND

Camp Lonely is situated near Pitt Point between Smith and Harrison Bays, on the Beaufort Sea (Figure 1). It is approximately 1.5 miles northwest of the Point Lonely Short Range Radar Station (SRRS), which is managed by the U.S. Air Force (USAF). Camp Lonely is not connected to the Alaska road system. Overland access is possible in the winter, and water access is possible during the summer. The nearest airstrip is located at the Point Lonely SRRS. The road between

Camp Lonely and Point Lonely SRRS is no longer drivable by conventional wheeled vehicles, due to coastal erosion. Figure 2 contains an aerial photograph of Camp Lonely and the USAF installation.

The Camp Lonely Landfill reportedly operated between approximately 1976 and 1986 and received waste from multiple parties. The landfill is located on the edge of a gravel pad which borders brackish and freshwater wetlands. There have been several environmental investigations conducted at the landfill. The most intensive investigation was a site characterization conducted in July and August of 2005 (HCG 2006a). Interim actions consisting of removing several leaking drums with product were also conducted as part of the 2005 field activities. Prior to the 2005 investigation performed by HCG, the last formal investigation was conducted in 1990. The concern regarding the landfill has increased since the 1990s because the landfill is threatened by coastal erosion. The 2006 field activities were intended to fill critical data gaps remaining from the 2005 investigations, and perform maintenance on booms left onsite as part of the 2005 interim actions.

4 SOIL AND SURFACE WATER SAMPLING ACTIVITIES

Soil and water samples were collected in and around the landfill to further characterize the nature and extent of contamination detected during the 2005 investigation (Figure 3). Soil and surface water sampling methods are described in the 2005 Workplan (HCG 2005). Table 1 lists the samples collected and analyses performed. Surface and subsurface soil samples were collected in and around the landfill using a hand auger and/or shovel. Soil samples were collected from auger borings extending down to permafrost or the water table (whichever was encountered first). In some areas landfill debris prevented hand augers from reaching the desired sample depth. In this case, up to eight alternate boring locations were selected to find a location where the desired sample depth could be obtained. Surface water samples were collected from adjacent surface water bodies to evaluate potential contaminant migration. Site photos from sampling activities are contained in Appendix A. Laboratory results are available in Appendix B. Appendix C lists the ADEC Qualified Personnel that worked on this project. The laboratory data was reviewed in accordance with ADEC's Environmental Laboratory Data and Quality Assurance Requirements (ADEC 2006). The corresponding ADEC checklist is contained in Appendix D. There were no significant laboratory errors or quality control issues. All of the sample results met the data quality objectives and were usable.

4.1 CLSS12 CHARACTERIZATION SAMPLES

During the 2005 investigation, surface staining was noted at sample point CLSS12, located in the southwest geophysical anomaly area of the landfill (Figure 3). The stain in this area was caused by a black tar-like (cohesive) material. The 2005 sample results from this material showed relatively low levels of DRO and RRO (94 and 380 mg/Kg, respectively). However, the total chromium concentration was 6,010 mg/Kg, which significantly exceeded the 18 AAC 75 Method Two cleanup level (410 mg/Kg). The chromium concentration of this material was an order of magnitude higher than any other sample concentrations at the site. The material's physical characteristics suggested that the chromium was not due to a release of used oil, which sometimes contains elevated levels of metals.

HCG collected seven additional samples near CLSS12 during August 2006 to further characterize the material and determine its horizontal and vertical extent (Figure 4 and Photo 1, Appendix A). One sample of the tar-like material (CLSS12A-0.5) was collected from its center at 0.5 feet bgs and analyzed for total chrome, hexavalent chrome, and Total Characteristic Leaching Procedure

(TCLP) chrome. Six soil samples were collected from beneath and adjacent to the material at 1.5 to 2.0 feet bgs and analyzed for total chrome.

The 2006 characterization results are shown in Table 2. The maximum total chromium concentration was less than found during 2005. Total chrome concentrations were 199 mg/L in a near-surface sample of the tar-like material (CLSS12A-0.5) and 583 mg/Kg in a soil sample beneath the center of the stain at the product / soil interface (CLSS12A-2.0). Total chromium concentrations rapidly decreased away from the edge of the material (Table 2). Sample CLSS12B-1.5, located approximately 0.5 feet from the edge of the material, contained only 75.7 mg/Kg total chromium. Samples CLSS12C-2.0 and CLSS12E-2.0, each located three feet from the edge of the material, contained 18 and 9.88 mg/Kg total chromium, respectively, which are below 1/10th the ADEC Method Two Cleanup Level (41 mg/Kg).

A split from sample CLSS12A-0.5 was analyzed for hexavalent chromium and TCLP chrome. The concentration of hexavalent chromium in the tar-like material was below method detection limits. Hexavalent chromium is recognized as a human carcinogen by the Environmental Protection Agency (EPA). It is the primary type (valiance) of chromium posing a risk to human or ecological receptors. The ADEC Method Two cleanup level for hexavalent chromium is 410 mg/Kg while the cleanup level for trivalent chromium is 200,000 mg/Kg. The lack of hexavalent chromium in the sample suggests the risk posed by the total chromium concentration is low. TCLP chromium concentrations of this sample and duplicate sample (CLSS92A-0.5) were 14.9 and 15 mg/L, respectively. The toxicity characteristic for chromium under RCRA (40 CFR 261.24) is 5 mg/L. Therefore, this material would be characterized as a RCRA hazardous waste if removed for disposal.

Lab analysis for hexavalent chromium was also conducted on two soil samples (CLSS12A-2.0, and CLSS12B-1.5). Hexavalent chromium was not present above the method detection limits in the soil beneath or next to the tar-like material (Table 2).

Based on the chromium data, the lateral extent of total chromium contamination above the Method Two soil cleanup level (410 mg/Kg) is limited to the tar-like material and a small amount of soil. The tar-like material had a thickness of about 2 feet. A sample of the soil (silty gravel) directly beneath the center of the material had the highest chromium concentration of the 2006 samples (583 mg/Kg). No samples were collected deeper than this depth because active zone water was present at about 2 feet bgs. Therefore, the vertical extent of total chromium contamination above 410 mg/kg is unknown. Based on data from nearby test pits, the depth to permafrost is about 4 feet bgs. Using this depth as an estimate for the vertical extent of chromium contamination, the volume of tar-like material and soil with total chromium above the ADEC Method Two cleanup level is about 35 cubic feet or 1.2 cubic yards. The TCLP sample results indicate that a portion of the material with chromium concentrations less than 410 mg/Kg may still be classified as RCRA hazardous waste. Therefore, a cleanup level less than 410 mg/Kg would be necessary to ensure the remaining material left onsite was not a RCRA hazardous waste. Based on the sample results, the amount of soil which may fall into this category is approximately 4 cubic yards. There are no other locations on the pad where chromium concentrations are a concern based on the 2005 and 2006 sample results.

4.2 CLSW01 CHARACTERIZATION SAMPLES

The surface water at the 2005 CLSW01 sample location was re-sampled (CLSW01-06 and duplicate CLSW91-06) to determine if there is a seasonal or persistent release of benzene or mercury at this location (Figure 5). The sample location is an isolated, shallow, small pond (approximately 5 by 10 feet, and 2 inches deep) (Photo 3, Appendix A). Sample CLSW01-06 was analyzed for glycols, metals, BTEX, and PAHs. The duplicate sample was analyzed for PAHs only. Sample results show that the benzene concentration in August 2006 was 8.15 ug/L (Table 3). The TAH and the TAqH concentrations were 34.08 and 34.46 ug/L, respectively. These concentrations exceed AWQS for benzene, TAH and TAqH.

TAH is the sum of the BTEX compounds. TAqH is the sum of the TAH and the total PAH. The TAqH exceedance is almost entirely due to the TAH component (BTEX compounds). The PAH compounds are almost all below method detection limits, and their contribution to the TAqH exceedance is insignificant. Therefore, the PAH compounds and TAqH exceedance are not considered a concern. However, the BTEX compounds are all COPC in the surface water because they all contribute significantly to the TAH exceedance.

It should be noted that none of the BTEX compounds exceed the National Oceanic & Atmospheric Administration (NOAA) Screening Quick Reference Tables (SQuIRTs) for the protection of aquatic life (Table 3). Therefore, the ecological risk posed by the BTEX compounds may not be as significant as suggested by the AWQS exceedances. The water body where the AWQS exceedances occurred is best classified as a shallow brackish pond. It does not support fish. However, waterfowl and macroinvertebrates were observed in the pond in August of 2005 and 2006.

Surface water glycol and mercury concentrations were below detection limits in 2006 (Table 4). These results suggest that mercury and glycols are not being released from the landfill into adjacent surface-water bodies, nor are they a COPC in the surface water.

A pore water sample (CLPW01) and duplicate sample (CLPW91) were collected from a well point installed near the edge of the landfill, upgradient from CLSW01 (Figure 5 and Photo 4, Appendix A). Both samples were analyzed for BTEX. CLPW01 was also analyzed for glycols. The maximum benzene concentration (CLPW91) detected was 882 ug/L. The maximum TAH concentration was 2,542.7 ug/L (Table 3). Glycol concentrations were below detection limits.

The surface and pore water sample results suggest that dissolved petroleum hydrocarbons are being transported by active zone water from the landfill into adjacent surface-water bodies resulting in the elevated BTEX compounds. The direct migration of non aqueous petroleum hydrocarbons (free product) is not suspected of being the source of the BTEX in the surface water. There are no visible surface seeps, or visible surface water sheening. Dissolved petroleum hydrocarbons do not create surface sheens. Due to the absence of BTEX compounds in other nearby surface water bodies, the source of this contamination is probably a localized, upgradient source within the landfill (such as a buried drum with a small quantity of diesel fuel).

A soil sample (CLSS21-1.0) was collected from the edge of the landfill upgradient from CLSW01 and downgradient of CLPW01 (Figure 4). The sample was collected just above the water table at a depth of 1.0 feet. This sample was analyzed for DRO/RRO, GRO/BTEX, VOCs, PAHs, glycols, and metals. The sample contained detectable levels of GRO, BTEX, DRO, RRO, and some VOCs and metals. Mercury and glycols concentrations were below detection limits. The contaminant concentrations for all of these analytes were below ADEC soil cleanup levels (Table 4). These results support the conclusion that dissolved petroleum hydrocarbons are being

transported by active zone water from the interior of the landfill (through the soil) into the adjacent surface-water body where CLSW01 was collected. The soil along the edge of the landfill has relatively low contaminant concentrations and is unlikely to be the cause of the AWQS exceedances.

4.3 CLSW02 CHARACTERIZATION SAMPLES

Surface water at CLSW02 was re-sampled (CLSW02-06) to determine if ethylene glycol is potentially being released from the landfill into adjacent surface-water bodies. An additional sample (CLSW12-06) was collected from the same surface-water body at the location closest to the edge of the landfill (Figure 5 and Photo 5, Appendix A). Laboratory results from CLSW02 in 2005 detected ethylene glycol at 33,000 ug/L. Glycol concentrations were below detection limits in both surface water samples in 2006 (Table 3).

A pore water sample (CLPW02) was collected from a well point installed near the edge of the landfill, upgradient from CLSW02 (Figure 5). This sample was analyzed for BTEX and glycols. The benzene concentration in August 2006 was 81.6 ug/L and the total BTEX concentration was 1082.6 ug/L (Table 3). These results suggest that petroleum hydrocarbons are present in the pore water within the landfill. Glycol concentrations were below detection limits in CLPW02 (Table 3). These results suggest that glycols are not being released from the landfill into the pore water or adjacent surface water.

Two soil samples (CLSS02-1.0 and CLSS04-1.0) were collected from locations at the edge of the gravel pad immediately upgradient of the surface-water body where CLSW02 was collected (Figure 3). These sample locations approximate 2005 sample locations CLSS02 and CLSS04, and were analyzed for glycols only. No glycol concentrations were above method detection limits (Table 4). These results support the conclusion that glycols are not being released from the landfill into the adjacent soil or surface-water bodies.

5 SHEEN TESTING

Sheen testing was conducted using soil with varying levels of petroleum contamination to determine the concentration of DRO that produces a sheen upon contact with water. The test was performed to help estimate the DRO concentration that can be left in the soil without causing a future surface water sheen given the soil might erode at a later date. A suitable area for sheen testing was selected in the vicinity of the former loading dock, where elevated levels of DRO were detected by ENSR in 2005 (ENSR 2005) (Figure 3). Sheen test samples were collected from a uniform soil type and at a uniform depth (1.0 feet bgs). Screening of the samples was conducted using the headspace method and a Photoionization Detector (PID). Screening results are presented in Table 5, and indicate that the soil contained a range of hydrocarbon concentrations with PID readings varying from 0 to 1,681 ppm.

Eight sheen test samples and one duplicate sample were collected (Photos 7 and 8, Appendix A). Each sample was homogenized and then split. A portion of the split was placed in a sample jar and sent to the laboratory for analysis of DRO by AK Method 102. DRO concentrations in the samples ranged from 28 to 2,620 mg/Kg (Table 5). The sheen test was conducted on the remaining portion of the homogenized soil by placing the soil into a clean stainless steel bowl containing sufficient clean ambient water to ensure adequate mixing by maintaining a soil to water ratio of at least 1:1. The ambient water was collected from nearby tundra ponds, upgradient of the landfill. The water surface in the bowl was observed for changes in reflectivity and color, indicating the presence of a hydrocarbon sheen. The sample was then gently stirred to assist in the disassociation of the petroleum from the soil. Formal observations were made prior to and

after stirring. The presence and intensity of the sheen was recorded on a field log. After the test, the water and soil were spread on the pad surface in the general vicinity of the impacted area.

Most samples produced either no sheen or a slight sheen. Only one sample, CLST04, produced a sheen having color (Table 5). This sample had DRO concentration of 2,620 mg/Kg. These results compare favorably with another sheen test, where the first sheen having color was estimated to occur when Total Petroleum Hydrocarbon (TPH) concentrations were near 500 mg/Kg (MWH 2003) (Appendix E). An evaluation of both data sets, however, reveals that the sample sets may not include sufficient data points within the target range of 500 to 2,000 mg/Kg to obtain a statistically valid correlation. Based solely on these results, the correlation between DRO concentrations and sheens is not well defined. However, extrapolating the available data suggests soil concentrations below 500 mg/Kg DRO are not likely to cause sheen. This suggests that a DRO cleanup level of 500 mg/Kg will prevent noticeable surface sheens if the soil is in direct contact with surface water. This cleanup level could be higher if the soil has sufficient time to naturally attenuate to a concentration of 500 mg/Kg DRO before the soil comes in contact with surface water.

6 BOOM MAINTENANCE ACTIVITIES

Maintenance activities were conducted in August 2006 where 2005 interim actions were taken to prevent the migration of petroleum hydrocarbons from a formally leaking drum. In 2005, sorbent boom was installed down gradient of the former drainage course drum (Figure 3 and Photo 9, Appendix A). The boom was anchored by laying several wood logs on top of it. During the August 2006 inspection, the boom was not present. It was presumably removed by wind or water during winter storms. New sorbent boom was installed to replace the missing sorbent boom. These materials were anchored to a large steel pipe and to several wooden and steel posts driven into the ground to prevent dispersion by wind and water (Photo 10, Appendix A).

7 GEOPHYSICAL INVESTIGATIONS

Two geophysical surveys were performed on the Camp Lonely pad in 2005. The first was performed by GAEA Environmental Solutions in July (GAEA 2005). This survey was conducted over the entire pad but was limited to areas not covered by structures, equipment, and stacked salvage and demolition materials (Appendix F, Figure 1). A second geophysical survey was performed by the U.S. Geological Survey (USGS) in August, after all of the facilities and materials had been removed from the pad surface (USGS 2006). The cleared pad enabled survey coverage in areas not available during the July survey. The second survey found a similar pattern of geophysical anomalies in the areas previously surveyed (Western and Northeastern Landfills). It also identified a couple of additional areas near the center of the pad with significant magnetic anomalies (Appendix F, Figure 2). Based on the development history of the pad, these anomalies do not appear to be associated with the Western Landfill. The anomalies in these areas appear to primarily correspond to former building footprints, i.e. the Vehicle Maintenance Shop, Incinerator/Utility Building, Communication shop, and the Loading Dock Area. The anomalies potentially result from steel pilings that were driven through the pad to serve as foundational support for these ground-level buildings. Remnants of these pilings were observed by HCG in the loading dock area during 2005 demolition activities. At that time, the pilings were being excavated and cut off a few feet below the pad surface. Similar piling remnants are expected to exist beneath the other former buildings. Landfill volumes were estimated by the USGS assuming a landfill thickness of seven meters. This value was generated by a computer model and was not ground truthed. This thickness is not considered reasonable based on the known practices of landfilling, which were to place debris on the tundra surface. A more reasonable

value for the approximate overall landfill thickness is five feet, which is based on test pits and site observations.

8 SUMMARY

HCG conducted field work in August 2006 to complete site characterization at Camp Lonely. Environmental samples were collected from three areas:

- Sample location CLSS12 to further characterize the tar-like material with elevated chromium;
- The western edge of the landfill to evaluate the potential for migration of contaminants to the nearby surface water bodies; and
- An area with elevated hydrocarbons used for sheen testing.

Soil samples collected to characterize the black, tar-like material at CLSS12 indicate that the area with total chromium exceeding the Method Two ADEC cleanup level of 410 mg/Kg is about 8 square feet, which corresponds to a volume of approximately 1.2 cubic yards. Hexavalent chromium was not detectable in the material or surrounding soils, suggesting the risk posed by chromium at this location is low. The total chromium concentrations did not exceed the ADEC Method Two cleanup level for trivalent chromium (200,000 mg/Kg). However, TCLP analysis of the material indicated it would be classified as a RCRA hazardous waste if removed for disposal.

Results from soil, surface water, and pore water samples collected near the western edge of the landfill indicate elevated levels of BTEX in the pore water and surface water in one isolated pond adjacent to the landfill. Contaminants in the surface water at this location exceeded AWQS for benzene, TAH and TAqH. The TAqH exceedance was almost entirely due to the TAH (or BTEX) component. PAH concentrations were very low or non-detectable.

These results suggest that dissolved petroleum hydrocarbons are being transported by the pore water to the edge of the landfill where they are released to the surface water. The source of the elevated BTEX compounds appears to be localized and located within the interior of the landfill as opposed to the soils around its perimeter. The BTEX may be originating from a release from a drum with residual product.

Based on the 2006 sampling effort, the current contaminants of concern (COCs) for water appear to be: Benzene, toluene, ethylbenzene and total xylenes.

Based on the 2006 sampling effort, the COCs for soil remain the same as identified in 2005 (HCG 2005), and appear to be: GRO, DRO, RRO, and xylenes; and Chromium.

Based on data collected in 2006, human health and ecological conceptual site models (CSMs) for the Camp Lonely Landfill were revised (Figures 6 and 7). The CSMs now include surface and active zone water as current contaminated media. No other revisions to the CSMs appear necessary based on the new data.

Based on the sheen test results, the gravel on the pad appears to be capable of generating a sheen on surface water if it contains DRO at a concentration of around 500 mg/Kg or greater. However, the correlation between DRO soil concentration and sheen is not well established, and probably is subject to localized variability.

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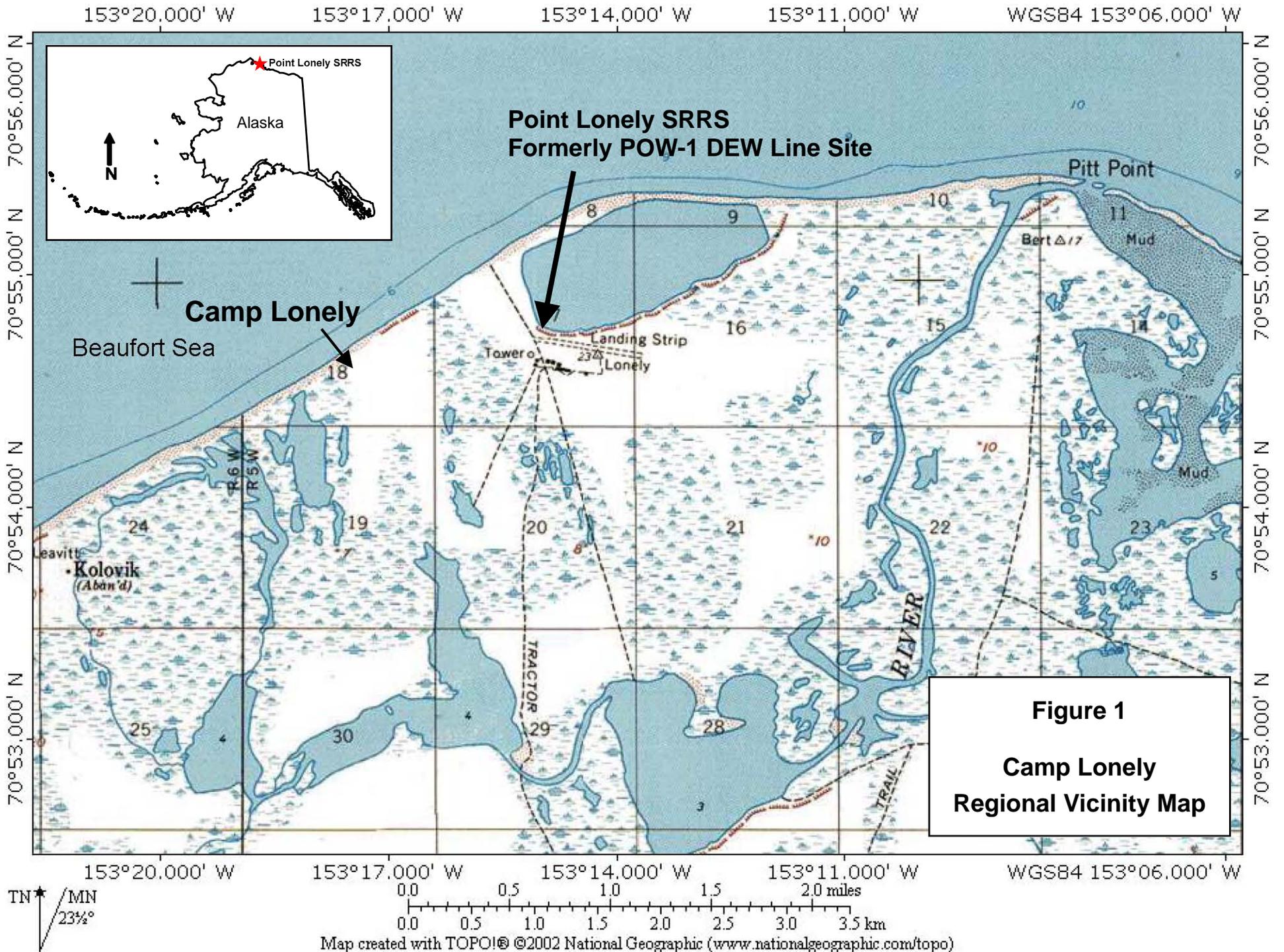


Figure 1
Camp Lonely
Regional Vicinity Map

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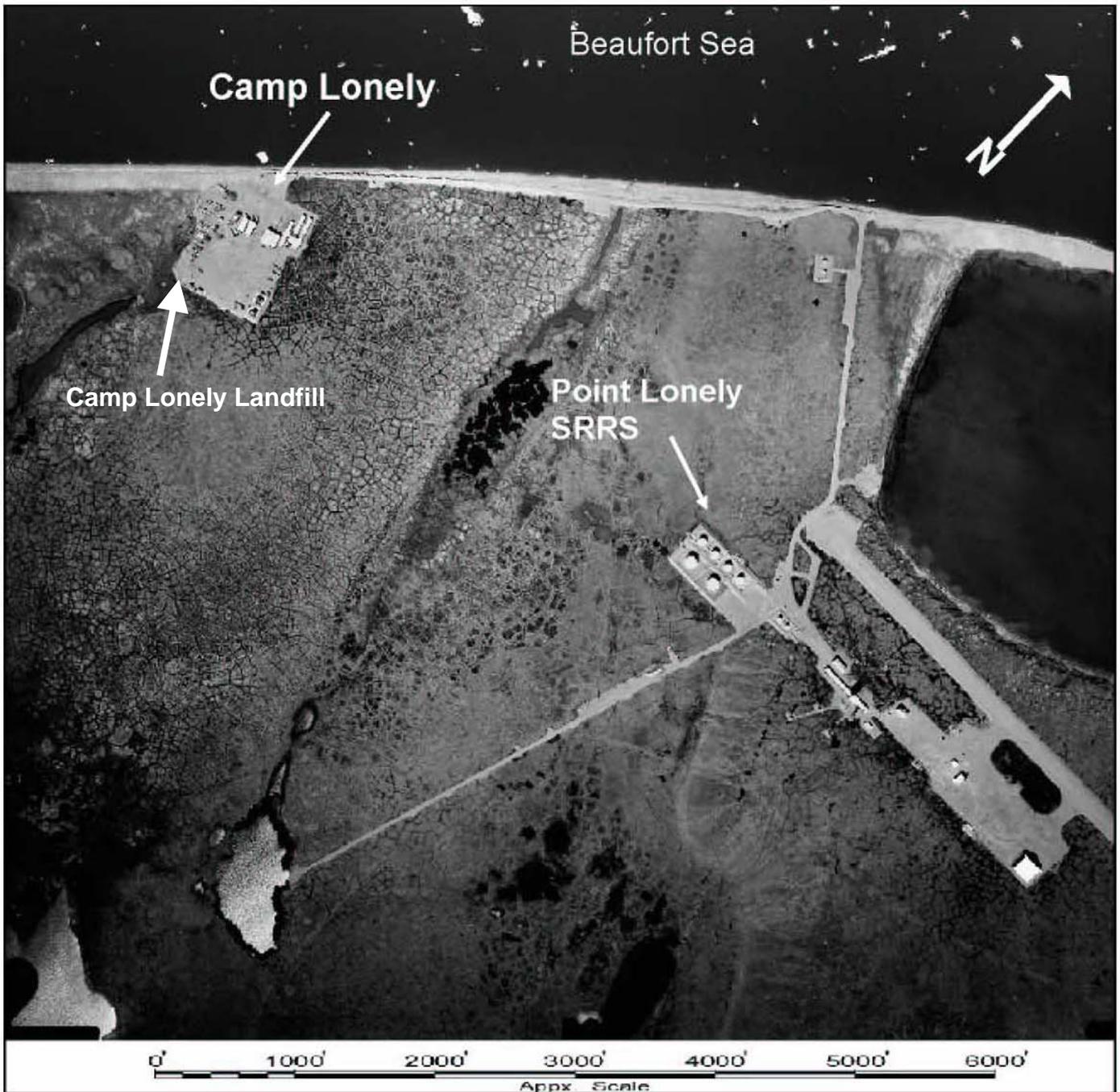


Figure 2

Camp Lonely with Respect to Point Lonely SRRS

Photo Date: 1992

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KEY

SITE NUMBER
 TP=TEST PIT/SS=SOIL/PW=POREWATER
 SW=SURFACE WATER/SV=SOIL VAPOR
 SAMPLE LOCATION
 DEPTH

- SOIL SAMPLE
- △ TEST PIT
- WATER SAMPLE
- ◇ SOIL VAPOR
- ⊗ WATER SAMPLE WITH FIELD SCREENING ONLY
- 2006 SAMPLES
- NOTE 1 - 2005 INTERIM REMEDIAL ACTION - DRAINAGE COURSE DRUM
- ENSR SAMPLES (2005)
- ⊕ POREWATER SAMPLE

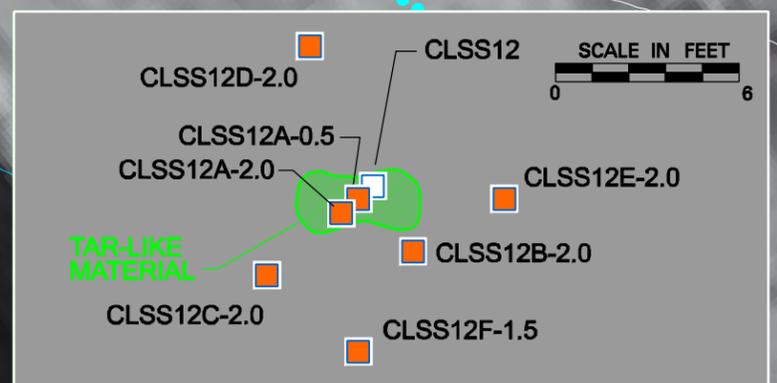


SHEEN TEST AREA

FORMER LOADING DOCK AREA

TAR-LIKE MATERIAL AREA (SEE INSET)

NOTE 1



INTERPRETED WESTERN LANDFILL EXTENT BASED ON GEOPHYSICAL ANOMALIES, TEST PITS, AND SITE OBSERVATIONS

INSET - TAR-LIKE MATERIAL INVESTIGATION AREA



CAMP LONELY
 SITE PLAN & SAMPLE LOCATIONS

CAMP LONELY, ALASKA

PROJECT NO:	1323-004
DATE:	12-5-06
FIGURE NO:	3

AERIAL PHOTO (AEROMAP U.S. NPRA-JULY 17, 2002)

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KEY

SITE NUMBER
 TP=TEST PIT/SS=SOIL/PW=POREWATER
 SW=SURFACE WATER/SV=SOIL VAPOR
 SAMPLE LOCATION
 DEPTH

CLSS09-1.5

ALL SOIL SAMPLES ARE IN mg/Kg
 U=COMPOUND NOT DETECTED
 NA=NOT ANALYZED

DRO CONCENTRATIONS BELOW ADEC METHOD ONE SOIL CLEANUP LEVELS ARE IN WHITE
 DRO CONCENTRATIONS ABOVE ADEC METHOD ONE AND BELOW METHOD TWO SOIL CLEANUP LEVELS ARE IN **YELLOW** (DRO>500 mg/Kg)
 DRO CONCENTRATIONS ABOVE ADEC METHOD TWO SOIL CLEANUP LEVELS ARE IN **RED** (DRO>12,500 mg/Kg)

SOIL SAMPLE TEST PIT ENSR SAMPLE (2005)

INTERPRETED LANDFILL AREA

SHEEN TEST AREA

001 DRO 14,700

CLST08 DRO 28

CLST07 DRO 363

CLST06 DRO 201

CLST05 DRO 132

CLST04 DRO 2620

CLST03 DRO 285

CLST02 DRO 69

CLST01 DRO 72.7



FORMER LOADING DOCK AREA

TAR-LIKE MATERIAL AREA (SEE INSET)

021/024 DRO 714

CLSS21-1.0 DRO 133 GLYCOL U

CLSS02-1.0 GLYCOL U

CLSS04-1.0 GLYCOL U

CLSS12D-2.0 CHROM 10.4

CLSS12A-0.5 CHROM 199

CLSS12A-2.0 CHROM 583

CLSS12C-2.0 CHROM 18

CLSS12 CHROM 6,010

CLSS12E-2.0 CHROM 9.88

CLSS12B-1.5 CHROM 75.7

CLSS12F-1.5 CHROM NA

SCALE IN FEET 0 6

TAR-LIKE MATERIAL

INTERPRETED WESTERN LANDFILL EXTENT BASED ON GEOPHYSICAL ANOMALIES, TEST PITS, AND SITE OBSERVATIONS

INSET - TAR-LIKE MATERIAL INVESTIGATION AREA



CAMP LONELY
 2006 SOIL SAMPLE, SHEEN TEST, AND
 TAR-LIKE MATERIAL CHARACTERIZATION RESULTS
 CAMP LONELY, ALASKA

PROJECT NO:	1323-004
DATE:	5-10-07
FIGURE NO:	4

AERIAL PHOTO (AEROMAP U.S. NPRA-JULY 17, 2002)

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INTERPRETED WESTERN LANDFILL EXTENT
BASED ON GEOPHYSICAL ANOMALIES, TEST
PITS, AND SITE OBSERVATIONS

LBKSW03R

LBKSW01
LBKSW01R

LBKSW02
LBKSW02R

CLPW01 (2006)
TAH 2427.3
BENZENE 846
GLYCOL U

CLPW02 (2006)
TAH 1082.6
BENZENE 81.6
GLYCOL U

CLSW01 (2005)
TAH 14.33
BENZENE 7.34
MERCURY 5.16
CLSW01Resample
TAH 1.02
BENZENE 0.281
MERCURY 0.062
CLSW01-06 (2006)
TAH 34.08
BENZENE 8.15
MERCURY 0.062

CLSW02 (2005)
GLYCOL 33,000
CLSW02-06 (2006)
GLYCOL U

CLSW12-06 (2006)
GLYCOL U

KEY

- SITE NUMBER
- SW=SURFACE WATER/PW=POREWATER
- SAMPLE LOCATION
- YEAR

CLSW02-06

ALL WATER SAMPLES ARE IN ug/L
U COMPOUND NOT DETECTED

CONCENTRATIONS ABOVE ALASKA WATER
QUALITY STANDARDS (18AAC70)
CLEANUP LEVELS ARE IN **YELLOW**

⊕ PORE WATER SAMPLE ○ WATER SAMPLE

AERIAL PHOTO (AEROMAP U.S. NPRA-JULY 17, 2002)



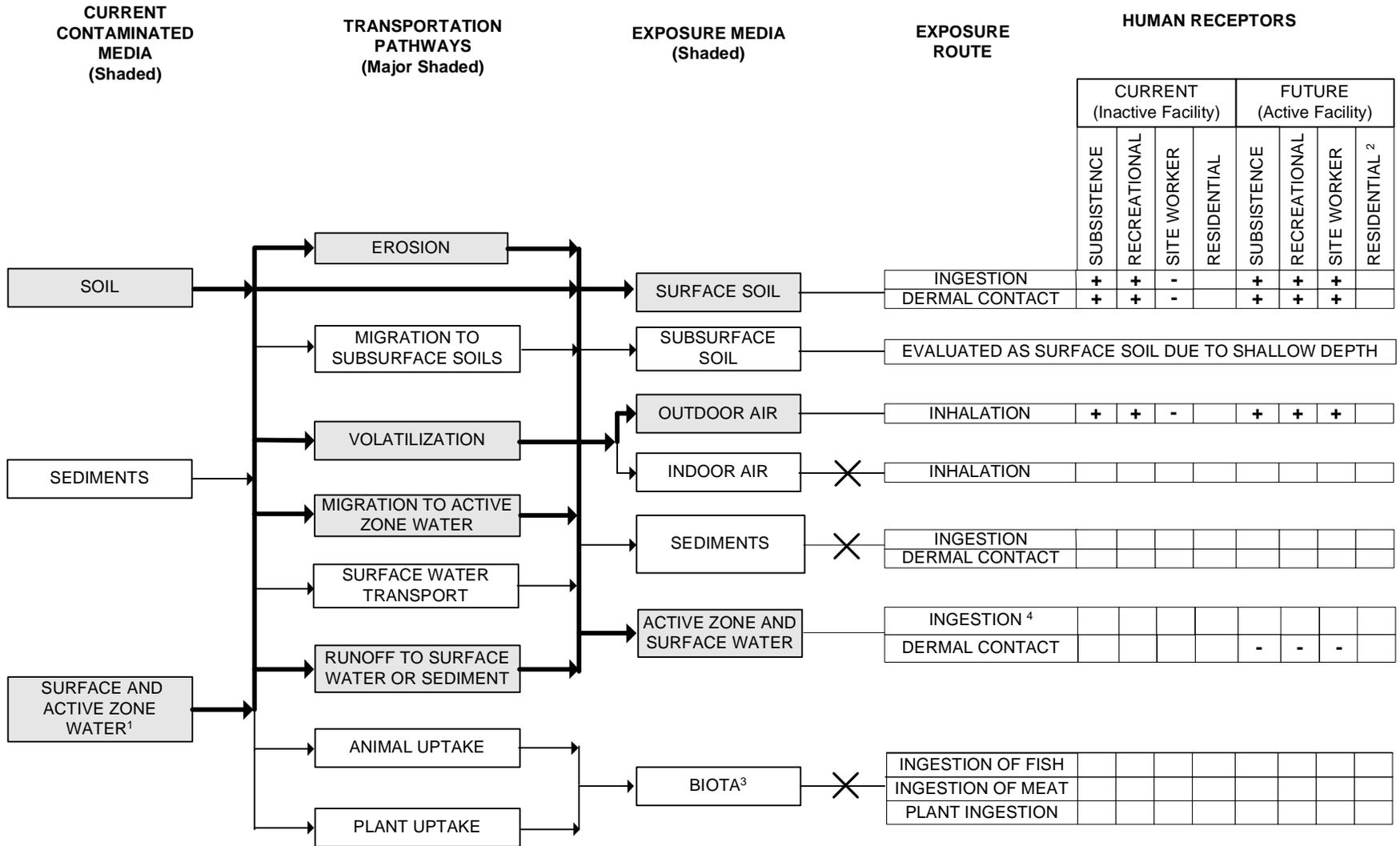
**CAMP LONELY
SURFACE WATER &
POREWATER SAMPLE RESULTS**

CAMP LONELY, ALASKA

PROJECT NO:	1323-004
DATE:	12-5-06
FIGURE NO:	5

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Figure 6 Human Health Conceptual Site Model for Camp Lonely Landfill



X Not a Complete Pathway

+ Complete Exposure Pathway

- Negligible Effect

➡ Primary Pathways

¹ Surface water includes active zone water located in subsurface soils above the permafrost. There is no "groundwater" at the site.

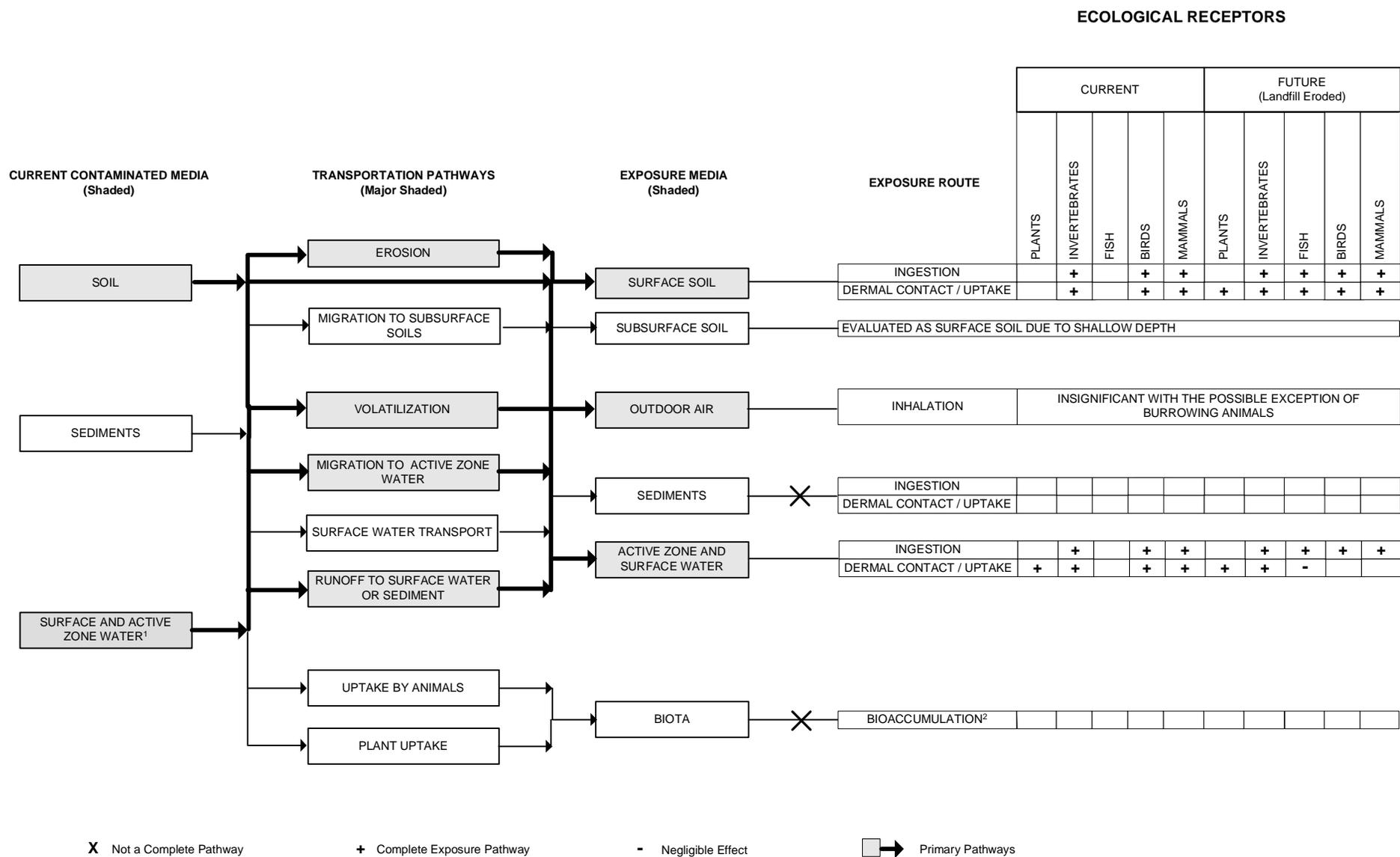
² There are no current plans for residential use of the site. There is the potential the site will be used in the future as a staging area for the oil and gas industry.

³ There are no anthropogenic bioaccumulative compounds at the site.

⁴ The surface water at the site is subject to saltwater intrusion (flooding). Therefore, it is not considered a potential drinking water source.

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Figure 7 Ecological Conceptual Site Model for Camp Lonely Landfill



¹ Surface water includes active zone water located in subsurface soils above the permafrost. There is no "groundwater" at the site.

² There are no anthropogenic bioaccumulative compounds at the site.

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**Table 1 Sample Analyses Summary
Camp Lonely 2006 Site Characterization**

Sample ID	Gasoline Range Organics (Method AK101)	Diesel Range Organics (Method AK102)	Residual Range Organics (Method AK103)	BTEX (Method 8021B)	VOCs (Method 8260B)	PAHs (Method 8270C SIM)	RCRA Metals (Method 6020/SW7471A) (Total)	RCRA Chrome (Method 6020) (Total)	RCRA Chrome Hexavalent Chrome (Method SW7196)	TCLP Chrome (Method SW 1311/6000/7000)	Glycols (Method 8015)	Conductivity ²
Surface and Subsurface Soil												
CLSS12A-0.5*								X	X	X		
CLSS92A-0.5*										X		
CLSS12A-2.0								X	X			
CLSS12B-1.5								X	X			
CLSS12C-2.0								X				
CLSS12D-2.0								X				
CLSS12E-2.0								X				
CLSS12F-1.5												
CLSS02-1.0											X	
CLSS04-1.0											X	
CLSS21-1.0*	X	X	X	X	X	X	X				X	
CLSS91-1.0*					X							
Sheen Test Soil												
CLST01		X	X									
CLST02		X	X									
CLST03		X	X									
CLST04*		X	X									
CLST94*		X	X									
CLST05		X	X									
CLST06		X	X									
CLST07		X	X									
CLST08		X	X									
Surface Water												
CLSW01-06*				X		X	X				X	X
CLSW91-06*						X	X					X
CLSW02-06											X	X
CLSW12-06											X	X
Pore Water												
CLPW01*				X							X	X
CLPW91*				X								X
CLPW02				X							X	X
Sample Analyses Planned	1	10	10	5	2	3	3	6	1	2	8	7

Notes

* - Sample Duplicate Pair

1 - Conductivity was measured in the field using a portable meter.

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**Table 2 Sample Results of Tar-Like Material and Surrounding Soil
Camp Lonely 2006 Site Characterization**

Compound milligrams per kilogram mg/Kg	Screening Criteria		Sample Locations (Sample depth in feet is listed after the hyphen at the end of the sample number). ³																Maximum Concentration ⁴		Frequency of Detection	Frequency Above Primary Screening Criteria ⁵	Contaminant of Potential Concern ⁶ (COPC)						
	AK State Soil Cleanup Level ¹	1/10 AK State Soil Cleanup Level ²	Product Characterization ¹¹						Soil Sampling (near product)																				
			CLSS12 (July, 2005)		CLSS12A-0.5 ⁷		CLSS92A-0.5 (duplicate of CLSS12A-0.5)		CLSS12A-2.0		CLSS12B-1.5		CLSS12C-2.0		CLSS12D-2.0		CLSS12E-2.0		CLSS12F-1.5		Conc	Flag							
Fuels																													
Gasoline Range Organics (Method AK 101)	1,400 (100)	--	6.39	=																					6.39	=	1/1	0/1	No
Diesel Range Organics (Method AK 102)	12,500 (500)	--	94	=																					94	=	1/1	0/1	No
Residual Range Organics (Method AK 103)	13,700 (2,000)	--	380	=																					380	=	1/1	0/1	No
BTEX (Method 8021B)																													
Benzene	13	1.3	0.0108	J																					0.0108	=	1/1	0/1	No
Toluene	180	18	0.102	J																					0.102	=	1/1	0/1	No
Ethylbenzene	89	8.9	0.0394	J																					0.0394	=	1/1	0/1	No
o-xylene	--	--	0.113	=																					--	--	--	--	--
m&p-xylene	--	--	0.0957	J																					--	--	--	--	--
Total Xylenes	81	8.1	0.2087	J																					0.2087	=	1/1	0/1	No
PAHS (Method 8270SIM) (detected analytes only)																													
1-Methylnaphthalene	5,500	550	0.0513	=																					0.0513	=	1/1	0/1	No
2-Methylnaphthalene	5,500	550	0.0475	=																					0.0475	=	1/1	0/1	No
Anthracene	41,000	4,100	0.00581	J																					0.00581	J	1/1	0/1	No
Benzo(a)Anthracene	15	1.5	0.00376	J																					0.00376	J	1/1	0/1	No
Benzo(b)Fluoranthene	15	1.5	0.0564	=																					0.0564	=	1/1	0/1	No
Benzo(g,h,i)perylene	4,100	410	0.00451	J																					0.00451	J	1/1	0/1	No
Chrysene	1,500	150	0.0116	=																					0.0116	=	1/1	0/1	No
Dibenzo(a,h)anthracene	1.5	0.15	0.00243	J																					0.00243	J	1/1	0/1	No
Fluoranthene	5,500	550	0.00599	J																					0.00599	J	1/1	0/1	No
Fluorene	5,500	550	0.00316	J																					0.00316	J	1/1	0/1	No
Indeno[1,2,3-c,d]pyrene	15	1.5	0.0124	=																					0.0124	=	1/1	0/1	No
Naphthalene	180	18	0.0583	=																					0.0583	=	1/1	0/1	No
Phenanthrene	41,000	4,100	0.0111	=																					0.0111	=	1/1	0/1	No
Pyrene	4,100	410	0.00616	J																					0.00616	J	1/1	0/1	No
RCRA Metals (Method 6020/7470A)																													
Arsenic (see note 8)	8	0.8	5.47	=																					5.47	=	1/1	0/1	No
Barium	9,600	960	695	=																					695	=	1/1	0/1	No
Cadmium	140	14.0	0.404	=																					0.404	=	1/1	0/1	No
Chromium -Total, (see note 9)	410	41.0	6,010	=	199	=			583	B	75.7	B	18	B	10.4	B	9.88	B	NA	NA					6,010	=	7/7	4/7	Yes
Lead	400	NA	22.8	=																					22.8	=	1/1	0/1	No
Selenium	680	68.0	1.19	=																					1.19	=	1/1	0/1	No
Silver	680	68.0	0.0489	U																					0.0489	U	0/1	0/1	No
Mercury by Cold Vapor	26	2.6	0.0547	J																					0.0547	J	1/1	0/1	No
RCRA Hexavalent Chrome (Method SW7196)																													
Chromium +6 (see note 9)	410	--			55.2	U			2.68	U	0.124	U													55.2	U	0/3	0/3	No
TCLP Chrome (Method SW6010B TCLP) (mg/L)																													
Chromium (see note 10)	5	--			14.9	=	15	=																	15	=	1/1	1/1	Yes

Notes

- The cleanup level corresponds to the lowest value for ingestion or inhalation as listed in 18 AAC 75, Tables B1 and B2 Method Two - Soil Cleanup Levels for the Arctic Zone. The cleanup levels for GRO, DRO and RRO are in parentheses as listed in 18 AAC 75, Table A2. Method One - Petroleum Hydrocarbon Clean Up Level in the Arctic Zone. A 200mg/Kg DRO value is also applicable.
- For cleanups conducted under Method Two, cumulative risk must be calculated for applicable compounds exceeding one-tenth (1/10) of the Method Two Table B1 Cleanup Level.
- Sample depth in feet is listed after the hyphen at the end of the sample number. If a number is not listed, then sample is a surface sample.
- Maximum concentration is the maximum detection or highest MDL if all samples were not detected.
- The primary screening criteria is the Method One or Two cleanup Level (which ever is less). A parent and replicate (duplicate) sample are counted as one sample. The higher of the two values is used for counting purposes.
- Contaminant considered COPC if it exceeds: the primary screening criteria (Method One or Two Cleanup Level), or is >1/10 Method Two Cleanup Levels. However, compounds exceeding screening criteria not retained as COPC if subsequent sampling alleviated concern or other mitigating circumstances exist.
- The concentrations for TCLP chromium are reported in mg/L due to the analysis as a liquid.
- Arsenic is not considered a COC because arsenic was present in all three soil background samples collected in 2005 and had concentrations ranging from 11.5 to 17.5 mg/Kg.
- The 18 AAC 75 Method Two cleanup level for total chromium is 410 mg/Kg. However, the cleanup level for trivalent chromium (+3) is 200,000 mg/Kg. The cleanup level for hexavalent chromium (+6) is 410 mg/Kg. The analysis indicated hexavalent chromium was not present. Therefore, the chromium may pose little risk to receptors. However, it is retained as a COPC due to its exceedance of the regulatory criteria for total chromium, and its classification as a hazardous waste (see TCLP analysis below).
- The toxicity characteristic for total chromium is 5 mg/L under RCRA (40 CFR 261.24). Wastes above this level are classified as hazardous waste.
- Sample consisted of black, tar-like material.

Data Flags

- U Compound not detected (MDL listed in column to the left)
- J Estimated quantity below the PQL
- B Compound detected in blank

Abbreviations

- NA Not Analyzed
- Screening Criteria does not exist for this compound
- TCLP Toxicity characteristic Leaching Procedure

Shaded cell indicates concentration >1/10 Method Two cleanup level or Method One Cleanup level for GRO, DRO or RRO.
Bold and shaded items indicate an exceedance of the primary applicable criteria (Soil = ADEC Method Two Cleanup Level.)

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**Table 3 Sample Results of Surface Water and Pore Water
Camp Lonely 2006 Site Characterization**

Compound micrograms per Liter ug/L	Screening Criteria			Surface Water Sampling Locations ¹³												Maximum Concentration ²	Frequency of Detection	Frequency above Primary Screening Criteria ³	Contaminant of Potential Concern ⁴ (COPC)	Pore Water Sampling Locations ¹¹							
	18 AAC 70 (MCL) ⁹	NOAA SQUIRT ¹ Aquatic Life		CLSW01 ⁵		CLSW01R (Resample of CLSW01) ⁵		CLSW01-06 (Resample of CLSW01) ⁵		CLSW91-06 (Duplicate of CLSW01-06) ⁵		CLSW02 ⁶		CLSW02-06 (Resample of CLSW02) ⁶						CLSW12-06		CLPW01 ¹²		CLPW91 (Duplicate of CLPW01)		CLPW02	
		Freshwater	Marine	Conc	Flag	Conc	Flag	Conc	Flag	Conc	Flag	Conc	Flag	Conc	Flag					Conc	Flag	Conc	Flag	Conc	Flag	Conc	Flag
Sample Date				7/17/2005		8/16/2005		8/28/2006		8/28/2006		7/17/2005		8/28/2006		8/28/2006		8/28/2006		8/28/2006		8/28/2006					
BTEX (Method 8021B for 2006 results and Method 8260B for 2005 results)¹⁰																											
Benzene	5	5,300 ^{CMC}	700	7.34	=	0.281	J	8.15	=			0.12	U			8.15	=	3/4	2/4	Yes							
Ethylbenzene	700	32,000 ^{CMC}	430 ^{CMC}	0.35	J	0.62	U	2.86	=			0.31	U			2.86	=	2/4	0/4	No	846	=	882	=	81.6	=	
o-Xylene	--	--	--	2.01	=	0.62	U	7.59	=			0.31	U			7.59	=	2/4	0/4	No	83.3	=	89.7	=	109	=	
p & m-Xylene	--	--	--	2.01	=	0.742	J	9.52	=			0.62	U			9.52	=	3/4	0/4	No	170	=	183	=	212	=	
Total Xylenes	10,000	--	--	4.02	=	0.742	J	17.11	=			0.62	U			17.11	=	3/4	0/4	No	238	=	258	=	406	=	
Toluene	1,000	17,500 ^{CMC}	5,000	2.62	=	0.62	J	5.96	=			0.31	U			5.96	=	2/4	0/4	No	408	=	441	=	618	=	
Total BTEX = TAH ⁸	10.0	--	--	14.33	J	1.02	J	34.08	=			0.62	U			34.08	=	3/4	2/4	Yes	1090	=	1130	=	274	=	
Glycols (Method 8015)																											
Ethylene glycol	--	--	--									2000	U			33,000	=	1/4	0/4	No	2000	U			2000	U	
Propylene glycol	--	--	--									2000	U			5,000	U	0/4	0/4	No	2000	U			2000	U	
di-Ethylene glycol	--	--	--									2000	U			5,000	U	0/4	0/4	No	2000	U			2000	U	
tri-Ethylene glycol	--	--	--									2000	U			5,000	U	0/4	0/4	No	2000	U			2000	U	
PAHs (Method 8270C SIM) - Only detected compounds listed																											
1-Methylnaphthalene	--	--	--	0.18	=	0.0614	=	0.203	=	0.213	=	0.018	J			0.213	=	4/4	0/4	No							
2-Methylnaphthalene	--	--	--	0.114	=	0.028	J	0.0437	J	0.0418	J	0.015	U			0.114	=	3/4	0/4	No							
Acenaphthylene	--	--	300 ^{CMC}	0.015	U	0.015	U	0.015	U	0.0154	U	0.0427	J			0.043	J	1/4	0/4	No							
Anthracene	--	--	300 ^{CMC}	0.0213	J	0.015	U	0.015	U	0.0154	U	0.015	U			0.021	J	1/4	0/4	No							
Benzo(a)Anthracene	--	--	300 ^{CMC}	0.0288	J	0.015	U	0.015	U	0.0154	U	0.015	U			0.029	J	1/4	0/4	No							
Benzo(a)pyrene	--	--	300 ^{CMC}	0.015	U	0.015	U	0.015	U	0.0154	U	0.015	U			0.015	U	0/3	0/4	No							
Benzo(b)Fluoranthene	--	--	300 ^{CMC}	0.0372	J	0.015	U	0.015	U	0.0154	U	0.015	U			0.037	J	1/4	0/4	No							
Benzo(g,h,i)perylene	--	--	300 ^{CMC}	0.0206	J	0.015	U	0.015	U	0.0154	U	0.015	U			0.021	J	1/4	0/4	No							
Benzo(k)fluoranthene	--	--	300 ^{CMC}	0.015	U	0.015	U	0.015	U	0.0154	U	0.015	U			0.015	U	0/3	0/4	No							
Chrysene	--	--	300 ^{CMC}	0.0271	J	0.015	U	0.015	U	0.0154	U	0.015	U			0.027	J	1/4	0/4	No							
Fluoranthene	--	3,980 ^{CMC}	16	0.0758	J	0.015	U	0.015	U	0.0154	U	0.015	U			0.076	=	1/4	0/4	No							
Indeno[1,2,3-c,d]pyrene	--	--	300 ^{CMC}	0.0166	J	0.015	U	0.015	U	0.0154	U	0.015	U			0.017	J	1/4	0/4	No							
Naphthalene	--	620	2,350 ^{CMC}	0.242	=	0.054	J	0.133	=	0.13	=	0.031	U			0.242	=	3/4	0/4	No							
Phenanthrene	--	6.3	4.6	0.0657	=	0.015	U	0.031	U	0.0318	U	0.0172	J			0.066	=	2/4	0/4	No							
Pyrene	--	--	300 ^{CMC}	0.0616	=	0.015	U	0.015	U	0.0154	U	0.015	U			0.062	=	1/4	0/4	No							
Total PAH ⁹	--	--	--	0.8149	=	0.1434	J	0.3797	J	0.3848	J	0.0779	J			0.815	=	4/4	0/4	No							
TAqH = TAH + TPAH ⁹	15.0	--	--	15.1	=	1.17	J	34.46	J			0.0779	J			34.46	J	4/4	2/4	Yes							
RCRA Metals (Method 6020/7471A)																											
Total																											
Arsenic	50	850 ^{CMC}	2319 ^{CMC}	12.4	U	12.2	=	5	U	7.32	J	12.4	U			7.32	J	2/4	0/4	No							
Barium	2,000	--	--	353	=	341	=	274	=	293	=	176	=			353	=	4/4	0/4	No							
Cadmium	5	2.2 ^{HD}	9.3	2.48	U	0.62	U	1	U	1	U	2.48	U			2.48	U	0/4	0/4	No							
Chromium	100 (total)	11(Cr6), 74 ^{HD} (Cr3)	50 (Cr6), 10300 (Cr3) ^{CMC}	4.8	U	4.53	=	10.2	=	17.8	=	4.8	U			17.8	=	3/4	0/4	No							
Lead	--	2.5 ^{HD}	8.1	6.05	=	2.2	=	0.879	J	1.2	=	1.86	J			6.05	=	4/4	0/4	No							
Selenium	50	5	71	12.4	U	4.39	J	7.99	J	12	=	12.4	U			7.99	J	2/4	0/4	No							
Silver	--	0.12	0.95 ^{CMC}	2.48	U	0.62	U	0.62	U	0.62	U	2.48	U			2.48	U	0/4	0/4	No							
Mercury by Cold Vapor	2	0.77	0.94	5.16	=	0.062	U	0.062	U	0.062	U	0.062	U			5.16	=	1/4	1/4	No							
pH (field data)				7.37	=			8.36	=	8.36	=	9.35	=	9.13	=	9.3	=				7.74	=	7.74	=	8.0	=	
Conductivity (field data)⁷				1.46	=			1.775	=	1.775	=	1.08	=	1.69	=	1.706	=				1.709	=	1.709	=	1.328	=	

Notes

- NOAA SQUIRT values shown for freshwater and marine criteria continuous concentration (CCC) unless otherwise indicated. Criteria maximum concentration (CMC) shown if CCC is not available. HD annotation means that the screening criteria is hardness dependent. The marine standard is considered most applicable because the surface water sample was near the coast and brackish.
- Maximum concentration is the maximum detection or highest MDL if all compounds were not detected. Results from sample CLSSW01 not retained (see note 5).
- A parent and replicate sample are counted as one sample. The higher of the two values was used for the purpose of counting exceedances.
- Contaminant considered a COPC if it exceeds the NOAA SQUIRT screening criteria for water or the Alaska groundwater cleanup standard. Compounds exceeding screening criteria were not retained as COPC if subsequent sampling alleviated concern and potentially appropriate, or other concerns exist.
- These samples were all collected at the same location at different time periods as indicated.
- These samples were collected at the same location at different time periods as indicated.
- Conductivity reported in millisiemens per centimeter.
- Screening criteria values are from 18 AAC 70.020b. TAH = Total of BTEX compounds. Value is zero (-) if all compounds are non detectable. TAqH = Total PAH + TAH. Total PAH value is zero (-) if all values are non detectable.
- Screening criteria values in 18 AAC 70.020b are adopted by reference from *Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances*, dated May 15, 2003.
- Samples collected on 7/17/05 (CLSW01 and CLSW02) were analyzed by Method 8260b. All other samples were analyzed for BTEX compounds by Method 8021b.
- There are no promulgated cleanup levels or water quality standards for pore water in 18 AAC 70 and 18 AAC 75. NOAA SQUIRTs are for surface water, and not applicable to pore water. Therefore, screening criteria were not applied to the pore water results. The pore water results are used to assess the potential for contaminant migration. The point of compliance is the surface water.
- This sample was collected from a drive point installed in the landfill, adjacent to and upgradient of the CLSW01 surface water samples.
- Samples with an -06 extension at the end of the sample number were collected in 2006.

Data Flags

- * = * A detected compound
- F Estimated quantity below the PQL.
- U Compound not detected (with MDL in adjacent parentheses)
- J Estimated value
- M Matrix effect

Abbreviations

- * - * Screening criteria did not exist for this compound.
- COC Contaminant of Concern
- P Potential Contaminant of Concern
- HD Hardness Dependent
- MDL Method Detection Limit
- TAH Total Aromatic Hydrocarbons (total BTEX)
- TAqH Total Aqueous Hydrocarbons
- TPAH Total Polynuclear Aromatic Hydrocarbons
- Cr6 Hexavalent Chromium
- Cr3 Trivalent Chromium

Bold and shaded items indicate an exceedance of the primary applicable criteria.

Shaded items indicate an exceedance of the secondary applicable criteria.

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**Table 4 Sample Results of Surface and Subsurface Soil
Camp Lonely 2006 Site Characterization**

Compound milligrams per kilogram mg/Kg	Screening Criteria		Sample Locations (Sample depth in feet is listed after the hyphen at the end of the sample number). ³								Maximum Concentration ⁴		Frequency of Detection	Frequency Above Primary Screening Criteria ⁵	Contaminant of Potential Concern ⁶ (COPC)				
	AK State Soil Cleanup Level ¹	1/10 AK State Soil Cleanup Level ²	CLSS02-1.0		CLSS04-1.0		CLSS21-1.0		CLSS91A-1.0 (duplicate of CLSS21-1.0)		Conc	Flag							
			Conc	Flag	Conc	Flag	Conc	Flag	Conc	Flag									
Fuels																			
Gasoline Range Organics (Method AK 101)	1,400 (100)	--							11.10	=					11.1	=	1/1	0/1	No
Diesel Range Organics (Method AK 102)	12,500 (500)	--							133	=					133	=	1/1	0/1	No
Residual Range Organics (Method AK 103)	13,700 (2,000)	--							166	=					166	=	1/1	0/1	No
BTEX (Method 8021B)																			
Benzene	13	1.3							0.334	=					0.334	=	1/1	0/1	No
Toluene	180	18							1.01	=					1.01	=	1/1	0/1	No
Ethylbenzene	89	8.9							0.205	=					0.205	=	1/1	0/1	No
o-xylene	--	--							0.488	=					--	=	--	--	--
m&p-xylene	--	--							1	=					--	=	--	--	--
Total Xylenes	81	8.1							1.488	=					1.488	=	1/1	0/1	No
PAHS (Method 8270SIM) (detected analytes only)																			
1-Methylnaphthalene	5,500	550							0.106	=					0.106	=	1/1	0/1	No
Fluoranthene	5,500	550							0.0016	J					0.00156	J	1/1	0/1	No
Fluorene	5,500	550							0.0024	J					0.00237	J	1/1	0/1	No
Naphthalene	180	18							0.0451	=					0.0451	=	1/1	0/1	No
Phenanthrene	41,000	4,100							0.0014	J					0.00141	J	1/1	0/1	No
VOCs (Method 8260B) (detected analytes only)																			
1,2,4-Trimethylbenzene	138	13.8							0.687	=	0.703	=	0.703	=	0.703	=	1/1	0/1	No
1,3,5-Trimethylbenzene	48.8	4.88							0.231	=	0.243	=	0.243	=	0.243	=	1/1	0/1	No
1,4-Dichlorobenzene	--	--							0.0274	U	0.0127	J	0.0127	J	0.0127	J	1/1	0/1	No
2-Butanone (MEK)	28,100	2,810							0.274	U	0.0862	J	0.0862	J	0.0862	J	1/1	0/1	No
4-Isopropyltoluene	--	--							0.0806	=	0.0875	=	0.0875	=	0.0875	=	1/1	0/1	No
Benzene	13	1.3							0.289	=	0.267	=	0.289	=	0.289	=	1/1	0/1	No
Ethylbenzene	89	8.9							0.118	=	0.119	=	0.119	=	0.119	=	1/1	0/1	No
Isopropylbenzene (Cumene)	585	58.5							0.0247	J	0.0236	J	0.0247	J	0.0247	J	1/1	0/1	No
Methylene chloride	--	--							0.11	U	0.0916	J	0.0916	J	0.0916	J	1/1	0/1	No
Naphthalene	180	18.0							0.644	=	0.677	=	0.677	=	0.677	=	1/1	0/1	No
n-Butylbenzene	--	--							0.111	=	0.111	=	0.111	=	0.111	=	1/1	0/1	No
n-Propylbenzene	--	--							0.0496	=	0.0531	=	0.0531	=	0.0531	=	1/1	0/1	No
o-Xylene	--	--							0.264	=	0.251	=	0.264	=	0.264	=	1/1	0/1	No
P & M -Xylene	--	--							0.432	=	0.424	=	0.432	=	0.432	=	1/1	0/1	No
Xylenes (total)	81	8.1							0.696	=	0.675	=	0.696	=	0.696	=	1/1	0/1	No
sec-Butylbenzene	--	--							0.0592	=	0.0607	=	0.0607	=	0.0607	=	1/1	0/1	No
Toluene	180	18							0.672	=	0.683	=	0.683	=	0.683	=	1/1	0/1	No
Glycols (Method 8015)⁷																			
Ethylene glycol	--	--	2	J,U	2	J,U	2	J,U					2	J,U	0/3		--	No	
Propylene glycol	--	--	2	J,U	2	J,U	2	J,U					2	J,U	0/3		--	No	
di-Ethylene glycol	--	--	2	J,U	2	J,U	2	J,U					2	J,U	0/3		--	No	
tri-Ethylene glycol	--	--	2	J,U	2	J,U	2	J,U					2	J,U	0/3		--	No	
RCRA Metals (Method 6020/7470A)																			
Arsenic (see note 8)	8	0.8							4.23	=				4.23	=	1/1	0/1	No	
Barium	9,600	960							159	=				159	=	1/1	0/1	No	
Cadmium	140	14.0							0.2	J				0.2	J	1/1	0/1	No	
Chromium	410	41.0							4.28	B				4.28	B	1/1	0/1	No	
Lead	400	--							5.05	=				5.05	=	1/1	0/1	No	
Selenium	680	68.0							0.162	U				0.162	U	0/1	0/1	No	
Silver	680	68.0							0.0335	U				0.0335	U	0/1	0/1	No	
Mercury by Cold Vapor	26	2.6							0.013	U				0.013	U	0/1	0/1	No	

Notes

- The cleanup level corresponds to the lowest value for ingestion or inhalation as listed in 18 AAC 75, Tables B1 and B2 Method Two - Soil Cleanup Levels for the Arctic Zone. The cleanup levels for GRO, DRO and RRO are in parentheses as listed in 18 AAC 75, Table A2. Method One - Petroleum Hydrocarbon Clean Up Level in the Arctic Zone. A 200mg/Kg DRO value is also applicable.
- For cleanups conducted under Method Two, cumulative risk must be calculated for applicable compounds exceeding one-tenth (1/10) of the Method Two Table B1 Cleanup Level.
- Sample depth in feet is listed after the hyphen at the end of the sample number. If a number is not listed, then sample is a surface sample.
- Maximum concentration is the maximum detection or highest MDL if all samples were not detected.
- The primary screening criteria is the Method One or Two cleanup Level (which ever is less). A parent and replicate (duplicate) sample are counted as one sample. The higher of the two values is used for counting purposes.
- Contaminant considered COPC if it exceeds: the primary screening criteria (Method One or Two Cleanup Level), or is >1/10 Method Two Cleanup Levels. However, compounds exceeding screening criteria not retained as COPC if subsequent sampling alleviated concern or other mitigating circumstances exist.
- Glycol samples were analyzed 19 days beyond the holding time. However, because glycols are relatively non-volatile, the data was considered usable, and it was given J flags.
- Arsenic is not considered a COC because arsenic was present in all three soil background samples collected in 2005 and had concentrations ranging from 11.5 to 17.5 mg/Kg.

Data Flags

- U Compound not detected (MDL listed in column to the left)
- J Estimated quantity below the PQL
- " = " A detected compound (concentration listed in column to the left)
- B Compound detected in blank analysis

Abbreviations

- Screening Criteria does not exist for this compound
- NA Not Analyzed

Shaded cell indicates concentration >1/10 Method Two cleanup level or Method One Cleanup level for GRO, DRO or RRO.
Bold and shaded items indicate an exceedance of the primary applicable criteria (Soil = ADEC Method Two Cleanup Level.)

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**Table 5 Sample Results of Sheen Test
Camp Lonely 2006 Site Characterization**

Sample ID	Sample Date	Field Screening Results			Lab Results	
		PID (ppm)	Sheen ¹	Odor ²	DRO (AK 102) (mg/Kg)	
					Conc	Flag
CLST08	8/26/2006	14.6	0	1	28	M
CLST02	8/26/2006	0	0	0	69	M
CLST01	8/26/2006	2.2	0	0	72.7	M
CLST05	8/26/2006	46.1	0	2	132	M
CLST06	8/26/2006	542	2	3	201	M
CLST03	8/26/2006	44	0	2	285	M
CLST07	8/26/2006	1681	2	3	363	M
CLST04	8/26/2006	273	3	3	2620	M

Notes

1 - Reference scale used for sheen evaluation consists of 6 grades, where 0=No Sheen / Clear Film, 1= Visible Sheen, 2= Silver Sheen, 3= First Color, 4= Dull Color, and 5= Bright Color.

2 - Reference scale used for odor evaluation consists of 4 grades, where 0=No Odor, 1=Faint Odor, 2=Moderate Odor, and 3=Strong Odor.

Data Flags

M Matrix effect

U Compound not detected (with MDL in column to the left)

Abbreviations

PID - Photoionization Detector

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9 REFERENCES

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