Final Remedial Investigation Report
Former Umiat Air Force Station Landfill
Umiat, Alaska

Contract W911KB-08-D-0005, Task Order 0012

Prepared For:

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ACRONYMS AND ABBREVIATIONS

4,4'-DDD	4,4'-dichlorodiphenyldichloroethane
4,4'-DDE	4,4'-dichlorodiphenyldichloroethene
4,4'-DDT	4,4'-dichlorodiphenyltrichloroethane
ADEC	Alaska Department of Environmental Conservation
ADOT&PF	Alaska Department of Transportation and Public Facilities
AFS	air force station
AGRA	AGRA Earth & Environmental, Inc.
ARAR	applicable or relevant and appropriate requirements
ASNA	Arctic Slope Native Association
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
BLM	U.S. Bureau of Land Management
BNA	base-neutral-acid extractible compounds
BTEX	benzene, toluene, ethylbenzene, and xylenes
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfs	cubic feet per second
CHPPM	U.S. Center for Health Promotion and Preventive Medicine
COPC	contaminant of potential concern
CSM	conceptual site model
DERP	Defense Environmental Restoration Program
DoD	U.S. Department of Defense
DoI	U.S. Department of the Interior
DRO	diesel range organics
E&E	Ecology and Environment, Inc.
EM	electromagnetic
EPA	U.S. Environmental Protection Agency
ERA	ecological risk assessment
F	Fahrenheit
FAA	U.S. Federal Aviation Administration
FS	feasibility study
FUDS	Formerly Used Defense Site
g	grams
GPR	ground-penetrating radar
GRO	gasoline range organics
HTRW	hazardous, toxic, and radioactive waste
IRP	Installation Restoration Program
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
NOAA	National Oceanic and Atmospheric Administration
NPR	National Petroleum Reserve
NSB	North Slope Borough

ACRONYMS AND ABBREVIATIONS, CONT'D.

PAH	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyl
PCL	Potential cleanup level
PCDDs	polychlorinated dibenzo-p-dioxins
PDDFs	polychlorinated dibenzofurans
POLs	petroleum, oil, and lubricants
PQL	practical quantitation limit
PRG	preliminary remediation goal
RAO	remedial action objective
RBC	risk-based concentration
RBSL	risk based screening level
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
RRO	residual range organics
SQuiRTs	Screening Quick Reference Tables
SVOC	semivolatile organic compound
TBC	to be considered
UIC	Ukpeaġvik Iñupiat Corporation
USACE	U.S. Army Corps of Engineers
USGS	US Geological Survey
VOC	volatile organic compound
µg/kg	micrograms per kilogram
µg/L	micrograms per liter

EXECUTIVE SUMMARY

The former Umiat Air Force Station (AFS) is located along the Colville River in the arctic foothills north of the Brooks Range, Alaska, approximately 120 miles southwest of Prudhoe Bay, 170 miles southeast of Barrow, and 65 miles southwest of Nuiqsut. Umiat AFS was used by the U.S. Navy from 1945 to 1946 and a major staging area for Department of Defense (DoD) and private oil exploration. Since then, the station has been used as a staging area and base camp by various federal and state agencies to support a variety of activities in the National Petroleum Reserve – Alaska (NPRA) and adjacent areas.

The subject of this remedial investigation (RI) is the approximately 8-acre landfill about one-half mile east of the main station facilities, within an ephemeral slough of the Colville River (see Figure 2-1). Records indicate the landfill may have been used for dumping wastes as early as 1943 and as recently as 1981, including wastes generated during a 1973 site-wide demolition and cleanup effort. The landfill has no surface markers indicating its location or boundaries.

Since 1973, a number of site inspections and investigations have been conducted at the former Umiat AFS and landfill by the United States (US) Environmental Protection Agency (EPA), Alaska Department of Environmental Conservation (ADEC), Alaska Department of Transportation and Public Facilities (ADOT&PF), Federal Aviation Administration (FAA), and US Army Corps of Engineers (USACE). Remedial investigations were performed in 1994, 1996, and 1997. Additional field investigations were performed in 1998 and 1999, and a limited removal action was performed in 2001. Several studies have been conducted to evaluate whether contamination from past activities at the former Umiat AFS may affect human health and ecological receptors. These studies have focused on chemicals detected in fish tissue and their potential effects on recreational and subsistence users.

Environmental media sampled during these investigations included surface and subsurface soil, sediment, groundwater, surface water, and fish tissue. Our evaluation of data generated during those investigations shows the chemicals of potential concern (COPCs) to be total polychlorinated biphenyls (PCBs; specifically Aroclor 1254), 4,4'-dichlorodiphenyl dichloroethane (4,4'-DDD), 4,4'-dichlorodiphenyl dichloroethylene (4,4'-DDE), 4,4'-dichlorodiphenyl trichloroethane (4,4'-DDT), diesel range organics (DRO), naphthalene, methylene chloride, and lead. Based on a cumulative risk evaluation, the carcinogenic risk posed to human health by these contaminants exceeds the risk management standard of 1 x 10^{-5}; the non-carcinogenic hazard index exceeds the risk management standard of 1. In addition, PCBs, DDT, DDD, and DDE have been detected in fish samples in the vicinity of Umiat.

The Colville River floods the seasonal stream and landfill areas annually, typically in spring and fall. Water velocities during these events can be high enough to erode and redeposit sand and gravel that covers the landfill, exposing landfill debris. These flood events have uncovered hazardous materials and inert solid wastes, and transported contamination off-site to downstream sediments.

There is a consensus among various studies that the landfill occupies about 8 acres; however, there is disagreement on the basal depth of debris burial. Two studies (Ecology & Environment in 1994 and GeoTek in 2011) suggest burial depths ranging from approximately 8 feet to 18 feet below ground surface (bgs); the U.S. Geological Survey (USGS); in 2005) and anecdotal evidence from past site users suggest burial depths of 40 feet bgs or more.

Landfill-cover erosion and subsequent exposure of potentially contaminated debris and soil is an on-going process, likely to result in future releases of COPCs to the environment. In 2001, a small transformer and areas containing debris from lead-acid batteries were observed on the surface of the landfill; these objects were subsequently removed by the USACE.

The landfill reportedly contains equipment, scrap metal, and crushed drums. Buried debris is also known to include possible contaminant sources such as lead-acid batteries and transformers, and suspected to include other containers with unknown contents and contaminated soil. Debris observed at the landfill surface during recent site visits included scrap metal, wire, pipe, pipe fittings, drill bits, at least a half-dozen drum carcasses, and drill-rig tracks. The environmental sampling, geophysical assessments, and historical information we reviewed for this RI have provided a depiction of the landfill as a whole. Information yielded by these sources has not identified distinct contaminant sources within the landfill that may be targeted for a limited removal.

Further action at the landfill is recommended. Hazardous materials are known to be present; contaminants have been detected above acceptable risk levels and regulatory limits in soil, sediment, surface water, and fish tissue; and landfill-cover erosion is an on-going process. For these reasons, it is recommended interim and/or permanent remedial actions be undertaken to reduce the potential for contaminant exposure to humans and ecological receptors.

A feasibility (FS) study will be prepared, based on reference materials cited and conclusions presented in this RI, to identify and evaluate a range of remedial alternatives to mitigate risks posed by the landfill to human health and the environment.

FINAL REMEDIAL INVESTIGATION REPORT
FORMER UMIAT AIR FORCE STATION LANDFILL
UMIAT, ALASKA
FUDS F10AK0243

1.0 INTRODUCTION

This RI report presents the results of a review of site-characterization data from the landfill associated with the Umiat AFS, Alaska. Umiat is about 175 miles southeast of Barrow and 65 miles southwest of the Village of Nuiqsut on the north slope of Alaska (Figure 1-1). The Umiat AFS was used by the U.S. Navy or its civilian contractors for petroleum exploration purposes from 1945 to 1954, at which time ownership returned to the Air Force. The station has been used as a staging area and base camp by various federal and state agencies and private entities to support a variety of activities in the NPRA and adjacent areas. Environmental investigations have been performed at several sites at the AFS. The subject of this RI is the facility's former landfill, about one-half mile east of the station's main gravel pad (Figure 1-2).

This RI report was developed using information collected by others during several site investigations and removal actions dating to the mid-1970s; no additional data were collected for this RI. This RI was prepared by Shannon & Wilson, Inc. (Shannon & Wilson) under Hazardous, Toxic, and Radioactive Waste (HTRW) Contract W911KB-08-D-0005, Task Order 0012, and in general accordance with the USACE Revised Statement of Work dated August 29, 2011, and our proposal dated September 15, 2011.

The scope includes preparing an RI report and conducting an FS. The RI report has been submitted in draft, interim final, and final form; the FS report will also be submitted in draft, interim final, and final forms. The draft and interim final versions of the RI were submitted to the USACE, ADEC, and the U.S. Bureau of Land Management (BLM) for review and comment; this final RI report incorporates those comments. Appendix A includes USACE, ADEC, and BLM comments on the draft and interim final RI reports, and Shannon & Wilson responses to those comments.

This RI was prepared in accordance with the USACE Formerly Used Defense Site (FUDS) Program Policy Manual (ER 200-3-1). As proscribed by the FUDS manual, response activities undertaken by the USACE as part of the FUDS program that address hazardous substances, pollutants, or contaminants shall be conducted in accordance with the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The work followed the process outlined in the EPA's Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA, 1988).

1.1 Project Objectives

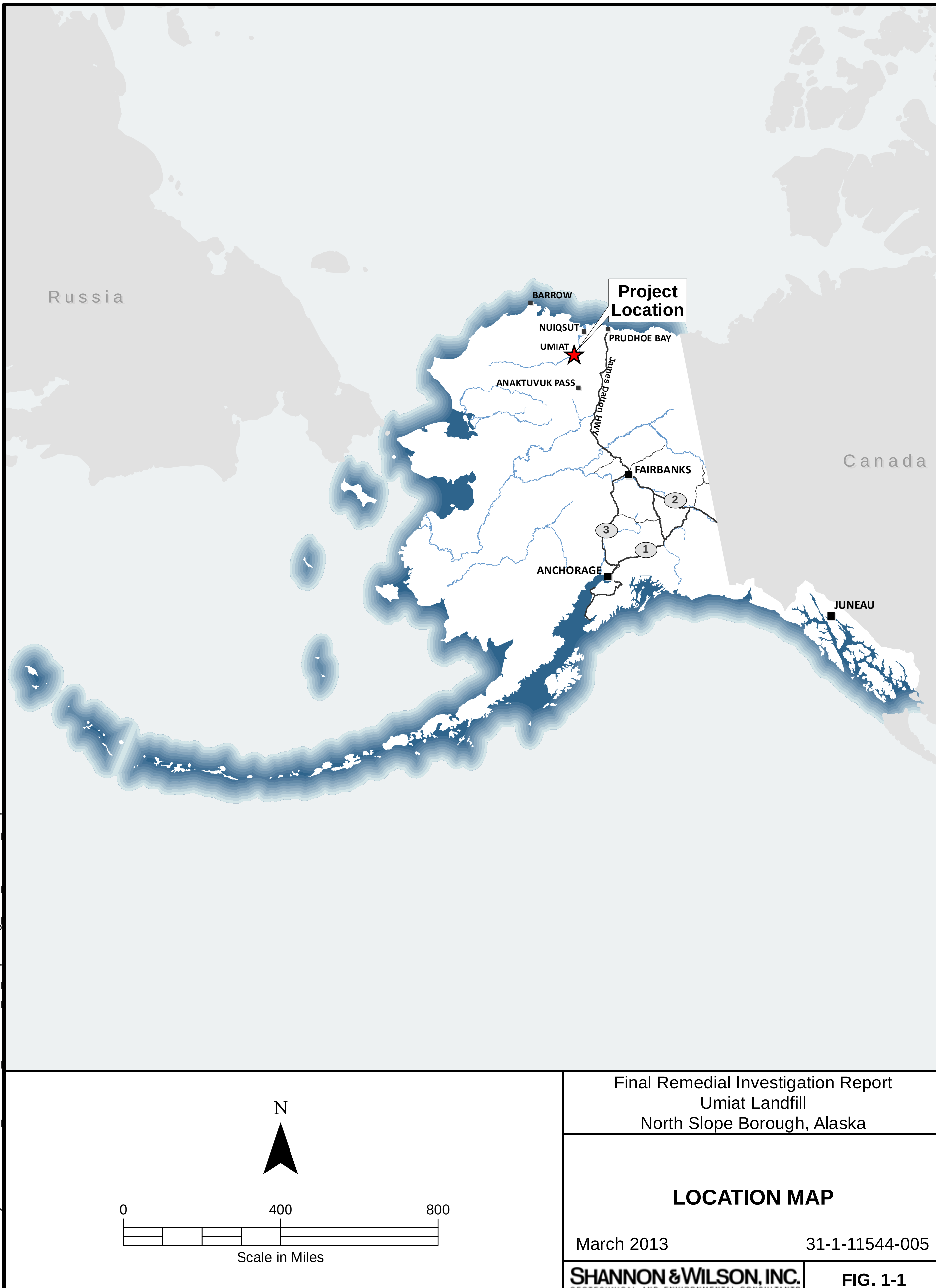
The objectives of this RI are to:

- adequately characterize the site for the purpose of developing and evaluating effective remedial alternatives;
- evaluate the nature and extent of contamination in soil, water, and sediment due to past uses at the Former Umiat AFS landfill; and
- provide information to assess the risks to human health, safety, and the environment.

This RI report describes the nature and extent of chemical contamination in soil, groundwater, surface water, sediment, and fish, and discusses risks to human health and the environment posed by contamination remaining at the landfill. A range of remediation alternatives addressing these risks will be developed and evaluated in the FS.

1.2 RI Report Organization

This RI is based on information and data collected and previously reported by others, obtained by Shannon & Wilson through the USACE and other public sources. The RI report is organized into seven sections, including this introduction. A summary of the site history and environmental setting of the landfill is presented in Section 2.0. The restoration program status and regulatory environment is summarized in Section 3.0. Section 4.0 describes previous investigations and removal actions at the site and summarizes their findings. Section 5.0 describes the methods used to identify COPCs and evaluate cumulative risk. Section 6.0 presents the evaluation of existing data with respect to regulatory levels, results and conclusions of the RI, and qualitative conceptual site models (CSMs) that describe potential exposure routes and receptors. Section 7.0 lists the references cited in this report. Figures and tables follow their corresponding section. Appendices B through G to this report contain supporting information.



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Final Remedial Investigation Report
Umiat Landfill
North Slope Borough, Alaska

LOCATION MAP

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FIG. 1-1

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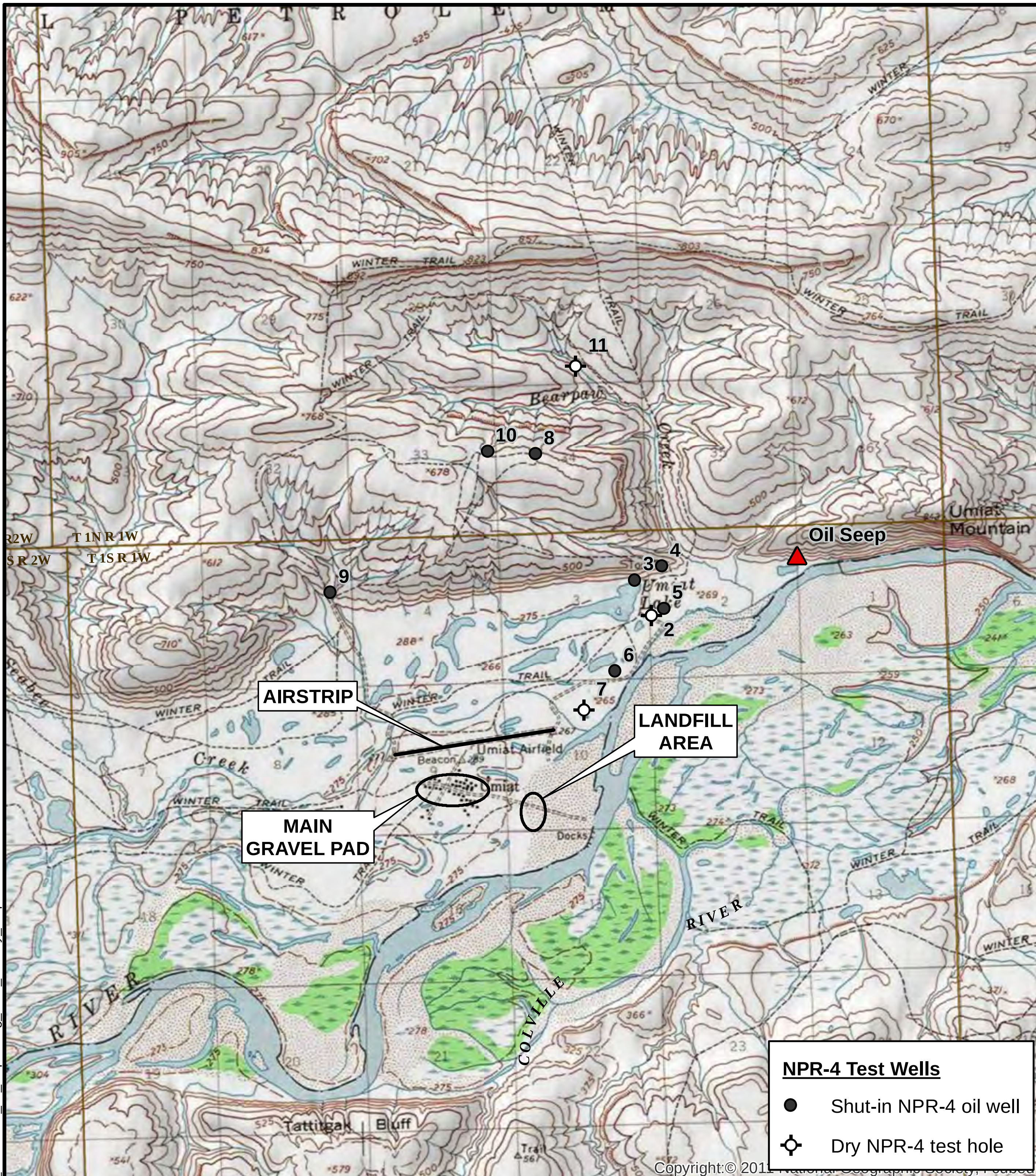

Sample locations are approximate. Sample locations and are based on 1997 RI Report by E&E, dated July 1998.

Basemap from ESRI ArcGIS Online, Copyright: © 2011 National Geographic Society, i-cubed. Basemap includes the National Geographic TOPO! 1:1:250,000 and 1:63,000-scale maps for Alaska. The TOPO! maps are seamless, scanned images of United States Geological Survey (USGS) paper topographic maps, dated 1955.

N

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Scale in Miles

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VICINITY MAP

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FIG. 1-2

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2.0 UMIAT AIR FORCE STATION AND LANDFILL DESCRIPTION

Throughout this report, the former Umiat AFS is referred to as the “station” or “facility” and the landfill as the “site.” The landfill has been variously referred to in other reports as the Unit C Landfill, Area 11, Area of Concern 7, and East Landfill.

2.1 Site Location

The former Umiat AFS is at 69 degrees 22 minutes North Latitude, 152 degrees 08 minutes West Longitude. The geographical location of the station is within Sections 9, 10, and 15, Township 1 South, Range 1 West, Umiat Meridian. The Umiat AFS is shown on the USGS Umiat (B-4) Alaska quadrangle map. Umiat lies within the Colville River valley north of the Brooks Range in northern Alaska, within the NPRA. It is about 120 miles southwest of Prudhoe Bay and 300 miles northwest of Fairbanks, as shown in Figure 1-1. The nearest community is Nuiqsut, approximately 65 overland miles and 85 river miles northeast of the station.

2.2 Umiat AFS Description, History, and Ownership

The Umiat area was designated a part of the 22.8-million-acre Naval Petroleum Reserve (NPR) on February 27, 1923, by Executive Order 3797-A. Umiat was developed in 1945 by the U.S. Navy within Naval Petroleum Reserve Number 4 (NPR-4; now known as the NPRA). A series of land orders issued during World War II (WWII) opened the area to coal mining and oil and gas exploration. The airfield was originally constructed as an emergency airstrip during WWII. In 1945, Umiat became a supply and operation base for petroleum exploration conducted by the Navy in NPR-4. Between 1945 and 1954, the Navy or its contractors installed 11 oil-exploration wells near Umiat; six of the 11 wells were within the U.S. Air Force (USAF) Station boundary and five wells were outside the boundary. The Umiat AFS, comprising 8,000 acres, was obtained by transfer letter from the Department of the Navy to the Department of the Air Force in 1954 (USACE, 2009; Figure 2-1).

The Air Force planned an Aircraft Control and Warning Station at Umiat; however, the facility was never constructed. The USAF used the station intermittently until 1959, when it was transferred back to the Navy. In 1977, the site was transferred to the U.S. Department of the Interior (DOI) as a result of Public Law 94-258, the Naval Petroleum Reserve Act of 1976. The DOI later transferred a portion of the site, including the airfield and buildings, to the State of Alaska.

Ownership and management jurisdiction over Umiat is currently divided between the ADOT&PF and BLM. The ADOT&PF owns 115 acres of the former Umiat military property, including the airfield, and grants leases for buildings and space to the FAA, BLM, and private interests. The BLM manages lands surrounding the former Umiat AFS, including the Colville River (as part of the public lands within the NPRA). The Arctic Slope Regional Corporation also owns land west of the Umiat AFS and has selected other land as part of their regional entitlement.

The Umiat main camp area includes an east/west trending, 5,400-foot gravel airstrip and operations complex. The operations complex has historically comprised a number of Quonset huts and other structures used for housing and dining, material and equipment storage and maintenance, and power generation. Ukpeaġvik Iñupiat Corporation (UIC) UMIAQ leases and operates a seasonal camp (lodge and dining facility), commercial aviation-fueling facilities, and a diesel-powered generator. Other agencies, including the BLM, USGS, Alaska Department of Fish & Game (ADFG), and FAA, operate facilities at Umiat.

Individually-owned diesel-powered generators provide electricity to the Umiat facilities. Since the Umiat camp's establishment, water has been obtained from nearby lakes and the Colville River. The Station is accessible by aircraft year-round, small boats during the summer, and by overland transit in winter.

2.3 Landfill History and Description

The landfill is in a slough of the Colville River; it has no surface features indicating its location or boundaries. The slough runs about a half-mile before rejoining the Colville River. Water may be present in the slough for about four months of the year, mainly after spring ice breakup and during heavy rain events. This is referred to as the seasonal stream (ATSDR, 2003).

From 1944 to 1973, raw sewage was collected in 55-gallon drums for disposal at what was called the "east landfill" along the water haul road east of the camp to the Colville River, and is believed to be the subject landfill. Solid-waste disposal practices prior to 1946 are not known. From 1946 to 1973, the east landfill was used for disposal of solid waste (E&E, 1996).

In 1973, the Naval Petroleum Oil Shale Reserves contracted Pacific Architects and Engineers, Inc., to clean up the Umiat camp. Four-hundred and nine tons of junk equipment and scrap metal and approximately 86,600 crushed drums were reportedly buried in "stable areas of the flood plain." Most of the drums were buried at the east landfill, including 7,091 drums hauled from the surrounding exploratory-well sites (E&E, 1996).

During an inspection of Umiat in 1974, the ADEC identified new waste-management problems created by two Navy geophysical contractors. Each company's camp started its own solid-waste dump on top of the east landfill (E&E, 1996).

The ADEC again inspected Umiat in 1976. Debris buried during the 1973 Navy cleanup was exposed in "isolated locations" as floodwaters of the Colville River receded. ADEC did not identify these locations, which may be the east landfill, a burial location near Umiat Test Well No. 5, or an undocumented burial site (E&E, 1996).

During a 1981 site inspection conducted for the EPA, E&E identified these concerns and noted the Navy Arctic Research Laboratory (NARL) was using a landfill in a dry channel of the Colville River, east of the site (E&E, 1996).

In 1992, the ADEC received reports from Nuiqsut residents, hunting guides, and lessees working in the area that the old landfill was exposed by the Colville River, revealing batteries, transformers, and oil drums. Later that year, the USACE contracted E&E to perform a visual inspection of Umiat to update previous information and document additional areas at the site for further investigation, resulting in the identification of 11 areas of concern. In 1994, E&E performed a remedial investigation that included collecting 143 surface and subsurface soil samples (E&E, 1996). This and other environmental investigations are summarized in Section 4.1

Debris observed at the landfill during recent site visits included scrap metal, wire, pipe, pipe fittings, drill bits, at least a half-dozen drum carcasses, and drill-rig tracks (USACE, 2010). In late May/early June 2011, a representative from the BLM photographed flooding of the Colville River over the Umiat landfill area and observed areas of erosion and exposed debris (USACE, 2011b).

2.4 Aerial Photography

Appendix B includes selected photos of the Umiat landfill and surrounding area. These include photographs taken in August 1974 (black and white), August 1976 (color), and August 2001 (color). The 1974 photograph appears to show the landfill as a roughly rectangular, level cleared area intersected by the access road from the Umiat station to the Colville River. Some objects are present on the ground surface at the landfill, which may be waste materials, and sparse vegetation can be seen. The 1976 color photograph shows conditions similar to those in 1974 but a greater number of items are present at the ground surface atop the landfill, which more clearly shows ongoing use of the landfill. By 2001, no surface debris is apparent and vegetation has grown over much of the landfill area north and south of the access road.

2.5 Environmental Setting

2.5.1 Physical Environment

2.5.1.1 Climate

Umiat is in an area defined as part of the Arctic Climatic Region. Due to the length of daylight hours and extreme northern latitude, summer and winter temperatures vary greatly. The average temperature for July is 53.2 degree Fahrenheit (ºF), and the average temperature in February drops to -24.4 ºF. The average annual temperature is 10.7 ºF.

The average annual precipitation for Umiat is 5.4 inches, about 1 inch of which typically falls in August, classifying the region as arid. Umiat averages 33.7 inches of snowfall annually. Prevailing winds blow from the west November through April, and from the east May to October. The average annual wind speed is 6.9 miles per hour (USACE, 2009).

2.5.1.2 Physiography

Umiat is in the northern foothills of Alaska's Brooks Range. The foothills generally slope to the north, with elevations ranging from 3,500 feet in the south to 400 feet in the north. Regionally, Umiat is located along the Colville River Valley. Major streams and rivers, such as the Colville River, have downcut through the sandstone and shale, creating high vertical bluffs. Umiat AFS is built on alluvial deposits; there are no sandstone or shale outcrops near the landfill.

2.5.1.3 Geology

Unconsolidated deposits of the Colville River floodplain near Umiat primarily consist of interbedded alluvial gravel, sand, and silt of Quaternary Age. These deposits are estimated to be 20 feet to 70 feet thick. In some areas, the Quaternary alluvium is overlain by an organic mat of unknown thickness and underlain by late Cretaceous sandstones, shales, and conglomerates associated with the uplift of the Brooks Range. The active layer (the interval of soil that freezes and thaws each year) is assumed to be approximately 2 feet to 3 feet thick in the undisturbed tundra; however, it is estimated to vary from 4 feet to 6 feet thick in gravel-pad areas. At the former Umiat AFS, permafrost is ubiquitous in the subsurface and believed to extend to depths of 1,000 feet or more bgs. The gravel pad and airstrip at Umiat consist mostly of poorly graded sandy gravels excavated from the river floodplain with a maximum size of about 6 inches. In the undeveloped wetland areas adjacent to the gravel pads and roadways, the main sediment type exposed at the surface is organic-rich silt. This silt occurs in thickness of up to approximately 8 feet and overlies the sandy gravels of the Colville River floodplain (E&E, 1997).

Uplift of the Brooks Range produced east-west-trending anticlinal folds in the strata. Umiat is on a major fold known as the Umiat anticline, where numerous small oil seeps were investigated by the Bureau of Mines in 1943. As a result of the oil seeps, oil exploration began in the former Umiat AFS vicinity along the Umiat anticline. There is an oil seep in the Colville River riverbed upstream of Umiat Mountain, and downstream of the former Umiat AFS Main Gravel Pad, airstrip, and landfill (E&E, 1997).

2.5.1.4 Surface-Water Hydrology

Surface water occurs as rivers, streams, shallow ponds, and lakes near the former Umiat AFS. The major surface-water feature in the Umiat area is the Colville River, which drains the north slope of the Brooks Range and has a drainage area of 13,830 square miles. The river flows to the east (and eventually north), discharging into the Arctic Ocean. Flooding commonly occurs in the lower reaches of the river because of snowmelt, rainfall, and ice jamming. The mean annual surface-water runoff for the Umiat vicinity is about 1 cubic foot per second per square mile of drainage basin above the point of measurement. Runoff into the Colville River is at a minimum during the winter months.

The landfill is on a gravelly inside meander within the active floodplain of the Colville River. During spring snowmelt, the high water of the Colville River overflows into a seasonal stream between the former Umiat AFS and Colville River. The seasonal stream runs across the landfill surface. There is another stream west of the landfill, which merges with the seasonal stream north of the landfill. During high water, the landfill is surrounded by the western stream and Colville River. Except during high-flow periods of spring runoff, the upper end of the seasonal stream is typically cut off from the Colville River, and the lower reaches of this channel act as a backwater. The size of this backwater area expands and contracts throughout the summer in response to changing levels of the Colville River (Jacobs, 2003).

The USGS measured discharge data for the Colville River at Umiat from August 2002-09. The water gauge is on the left bank (facing downstream) of the river, at the upstream end of the landfill and seasonal slough. Peak flows in May and June have been measured from 173,000 to 261,000 cubic feet per second (cfs; USACE, 2011a).

2.5.1.5 Groundwater and Permafrost

Groundwater occurs in three zones in the Umiat area: suprapermafrost, thaw bulbs beneath lakes and rivers, and deep bedrock aquifers beneath permafrost (USACE, 2009). Groundwater occurring in unconsolidated sediments above permafrost is called suprapermafrost, and groundwater that occurs below continuous permafrost is subpermafrost. Shallow suprapermafrost groundwater occurs in the unconsolidated alluvial deposits at Umiat. The thickness of this suprapermafrost alluvial aquifer is variable because of thaw bulbs beneath lakes and rivers that do not freeze to the bottom during winter, and developed areas such as the gravel pad and roadways.

Permafrost was observed in 29 of the 259 soil borings advanced in the Umiat area. Groundwater extends from the water table to the top of permafrost; the top of permafrost is commonly 2 feet to 3 feet bgs in wetlands and undeveloped areas, and as deep as 15 feet bgs, but is highly variable in developed and gravel-pad areas. Based on soil-boring logs from the 1994 and 1996 RIs, E&E determined the top of the shallow suprapermafrost groundwater near Umiat is commonly found between 2 feet and 5 feet bgs.

Deep subpermafrost groundwater at Umiat has been encountered at 3,303 feet and 6,212 feet bgs in deep bedrock aquifers and is brackish or saline (USACE, 2009).The 1996 remedial investigation results indicated the groundwater gradient in the suprapermafrost alluvial aquifer is fairly flat, generally flowing toward the north and east; however, the flow direction is altered locally by depth to permafrost, stratigraphy, surface-water bodies, and water uptake by vegetation. Groundwater likely drains into Seabee Creek (just north of the runway) and the Colville River (Jacobs, 2003).

Suprapermafrost groundwater is assumed to be hydrologically connected to the nearby Colville River. The water-table elevation probably fluctuates in response to the stage of the river and depth of permafrost. River flooding probably has the greatest influence on groundwater elevation, flow direction, and gradient.

At Umiat, no wells are known to have been drilled into suprapermafrost or subpermafrost aquifers to obtain potable water. No evidence was found that groundwater in the Umiat area has been investigated as a potential drinking-water source (E&E, 1997a).

2.5.2 Biological Resources

2.5.2.1 Vegetation

The region surrounding Umiat AFS is mostly treeless and vegetated with grasses and herbaceous plants that tolerate high soil moisture. In general, the area is densely vegetated with 6- to 12-inch-tall dwarf shrubs, dwarf birches, and willows mixed with herbaceous species and, in places, 3- to 8-foot-tall alders and willows. Vegetation is divided between the willow/alder and tundra-plant communities. Willows and alders are found in formerly disturbed areas, surrounding water bodies, on gravel bars, and along the Colville River. Willows dominate the floodplain. The tundra-plant community comprises heath tundra and dwarf shrubs. Sedge-grasses occur in poorly drained areas and around ponds and lakes (USACE, 2009).

2.5.2.2 Wildlife and Fish

Large mammals in the Umiat area or that migrate through the area include moose, caribou, and brown bear. Moose along the Colville River are at the northern extent of the species' range. The Teshekpuk Lake caribou herd migrates through the Umiat area. Brown bears travel along the Colville River corridor and other nearby river corridors and feed in riparian habitats in spring and summer. Furbearing animals in the Umiat vicinity include wolves, arctic and red foxes, and wolverines. Small mammals that may inhabit the area include hares, ground squirrels, collared lemmings, arctic shrews, and mink (USACE, 2009).

The Colville River corridor provides important breeding and brooding habitats for numerous migratory birds, including Canada geese. The willow ptarmigan, rough-legged hawk, peregrine falcon, Savannah sparrow, and Lapland longspur are known to use habitat surrounding Umiat. Peregrine falcons and rough-legged hawks may begin to nest along river bluffs as early as March (USACE, 2009).

The Colville River supports most species of freshwater and anadromous fish found in the Beaufort Sea drainages of Alaska. Pink and chum salmon spawn in the lower river, but are not known to occur in the river stretch adjacent to the Umiat area. Cisco, whitefish, grayling, burbot, arctic char, Dolly Varden, stickleback, and northern pike are among the fish species present in the Colville. Several of these species are important in local subsistence and commercial economies (USACE, 2009).

2.6 Demographics and Land Use

2.6.1 Subsistence Activities

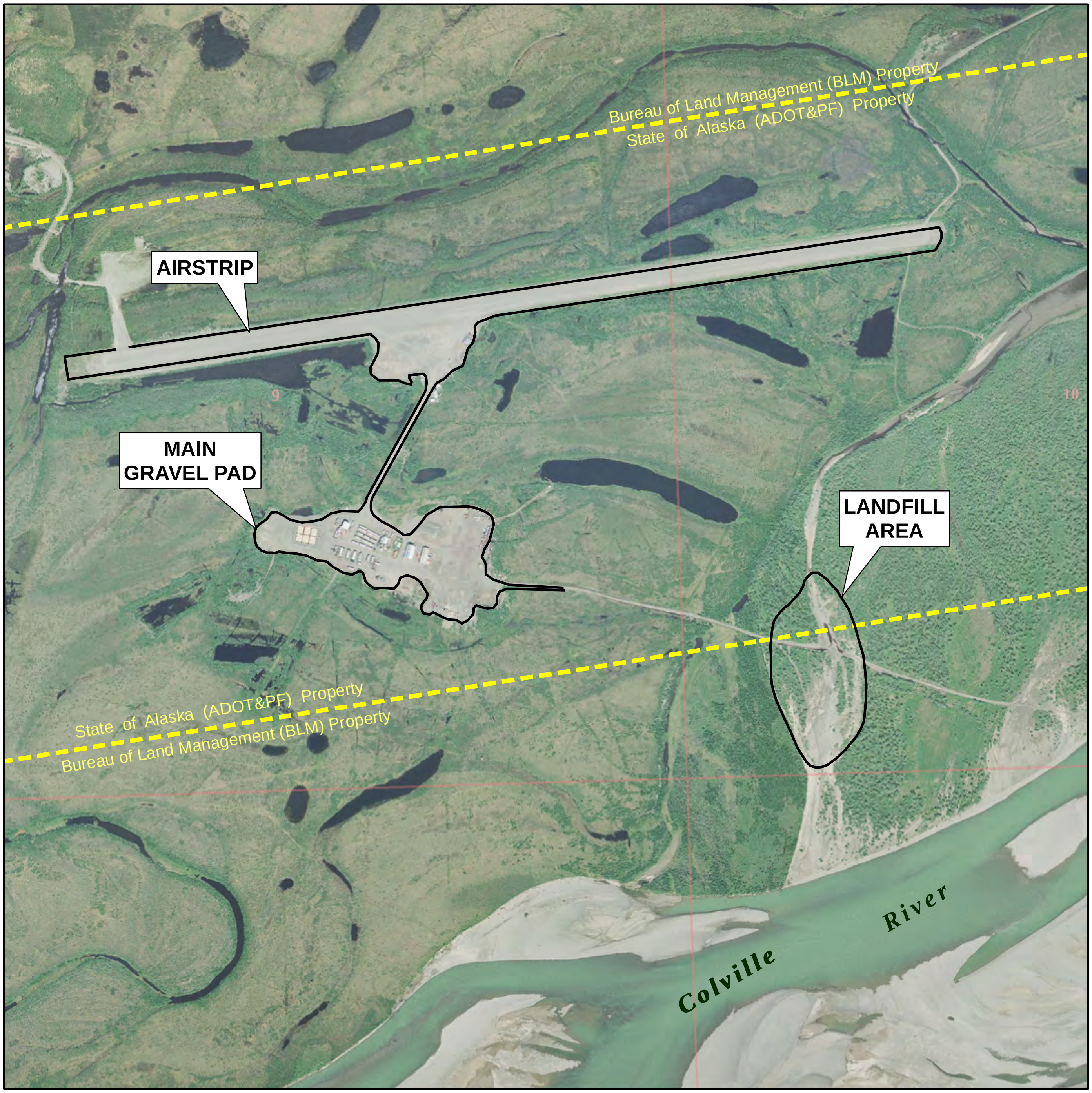
Subsistence can be defined as "hunting, fishing, and gathering for the primary purpose of acquiring traditional food." Mr. Michael Pederson of Arctic Slope Native Association Ltd. (ASNA) noted, "Subsistence hunters use Umiat mostly as an area to pass through during hunting season. Hunters may spend several weeks in the area, but usually spend no more than a week of opportunistic/ recreational fishing in the Colville River. Pederson also stated subsistence hunters probably do not fish within 5 miles of Umiat; therefore, they are not expected to fish in the … (Umiat landfill) seasonal stream and slough. Subsistence hunters may, however, catch broad whitefish, arctic cisco, and arctic grayling in the Colville River outside the immediate Umiat area" (E&E, 1998).

Primary subsistence resources for Nuiqsut residents are bowhead whales, caribou, fish, ptarmigan, and waterfowl and, of lesser importance, seals, musk oxen, and Dall sheep (Hoefler Consulting Group, 2001). The use of these fish as part of a subsistence diet has a high cultural and nutritional significance. The community of Nuiqsut fishes along much of the Colville River, including areas near Umiat, and relies on fish from the Colville River as part of their subsistence lifestyle (ATSDR, 2003).

The primary historic use of the area was subsistence hunting and fishing by the nomadic people of Anaktuvuk Pass, and residents of Wainwright and Barrow. Residents in the villages of Nuiqsut, Wainwright, and Anaktuvuk Pass still subsist on wildlife resources that migrate through the area (AGRA, 1997a). The combined population of these villages in 2011 was 1,331 (Alaska Department of Labor estimate).

2.6.2 Historical and Cultural Resources

There are 12 historic properties in and around Umiat listed on the Alaska Heritage Resources Survey. They comprise two lithic scatters (surface scatters of cultural artifacts and debris), the 11 nearby Navy test wells, the remains of the post-WW II oil-exploration camp, the camp itself, an engine-generator building, and a non-directional beacon (USACE, 2009). The landfill is not considered an historic property.



ADOT&PF = Alaska Department of Transportation and Public Facilities

Aerial photography dated July 2009. Produced by Kodiak Mapping. Provided by Alaska Department of Transportation and Public Facilities.

Final Remedial Investigation Report
Umiat Landfill
North Slope Borough, Alaska

LAND OWNERSHIP MAP

March 2013 31-1-11544-005

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 2-1

Filename: T:\Project\31-1\11544_Umiat\AV_mxd\Final_RI_Report\Fig_2-01_Land_Ownership.mxd Date: 3/8/2013 beo

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3.0 POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

CERCLA Section 121 (d)(1) requires that remedial actions be protective of human health and the environment. In addition, CERCLA Section 121 (d) requires remedial actions meet federal or state standards, requirements, criteria, or limitations that are legally applicable or relevant and appropriate, unless those requirements are waived pursuant to Section 121 (d)(4) under appropriate site-specific circumstances. These requirements are commonly referred to as Applicable or Relevant and Appropriate Requirements (ARARs).

According to the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) at 40 CFR 300.5, *applicable requirements* means those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those state standards identified by a state in a timely manner and more stringent than federal requirements may be applicable.

Relevant and appropriate requirements means those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards identified in a timely manner and more stringent than federal requirements may be relevant and appropriate.

There are three categories of ARARs: chemical-, location-, and action-specific. These requirements were used in this RI to develop project remedial-action objectives (RAOs) and will be used in the FS to develop appropriate remedial-action alternatives. Potential ARARs include environmental laws such as the State of Alaska Oil and Hazardous Substances Pollution Control Regulations, Water Quality Standards, Drinking Water Standards, and Solid Waste Management regulations, and federal RCRA, Safe Drinking Water Act, Clean Air Act, Clean Water Act, and Solid Waste Disposal Act.

Petroleum, oil, and lubricant (POL)-contaminated sites fall under the CERCLA petroleum exclusion and are therefore addressed under the Defense Environmental Restoration Program (DERP), as authorized in United States Code, Title 10, Section 2701, et seq. The DERP provides authority to clean up petroleum releases that pose an imminent and substantial endangerment to public health, welfare, or the environment. Alaska's Site Cleanup Rules (18 AAC 75 Article 3 Oil and Other Hazardous Substances Pollution Control) are risk-based and indicative of when an imminent and substantial endangerment to the public health or welfare or the environment has been mitigated.

Potential chemical-specific ARARs are identified in this RI and have been used to guide the evaluation of the nature and extent of contamination at the Umiat landfill. Location- and action-specific ARARs will be identified during the FS phase of the project and discussed in the FS report.

3.1.1 Chemical-specific ARARs

Chemical-specific ARARs define acceptable exposure concentrations or water-quality standards and are used in establishing preliminary remediation goals (PRGs). They are medium-specific laws and requirements that regulate the release to the environment of materials possessing certain chemical or physical characteristics. These requirements generally set health- and risk-based concentration limits for hazardous substances. If a chemical is subject to more than one discharge or exposure limit, the more stringent of the requirements is generally applied.

Chemical-specific requirements establish the acceptable concentration of a contaminant that may be found in or discharged to the environment. They form the basis for the development of RAOs. Potential chemical-specific ARARs for the Umiat landfill are found in the Oil and Other Hazardous Substances Pollution Control Regulations in Alaska Administrative Code (18 AAC 75) but may also include Alaska Water Quality Standards (18 AAC 70). Table D-1 (Appendix D) summarizes potential chemical-specific ARARs for the Umiat landfill.

4.0 SUMMARY OF EXISTING DATA

This section summarizes previous site investigations, site visits, and removal actions that included site observations and/or characterization of suspected contaminated environmental media (soil, groundwater, surface water, and sediment). Section 5 presents a discussion of screening and cleanup levels. Section 6 completes the evaluation with a discussion of site data and observations compared to screening and cleanup levels and presents a cumulative risk evaluation. Areas of concern associated with the former Umiat AFS were identified beginning in 1972. Many of those areas were the subject of subsequent investigations and removal actions. This RI focuses on the Umiat landfill.

We refer to the investigations by the year the field work was performed, not the year the associated report was completed, i.e., the “1996 RI” field work was performed in 1996, but the report was dated June 1997. Table 4-1 presents summary information on the documents we reviewed for this RI.

Analytical results were compiled from a number of investigations further discussed in this section. The following sections do not include discussions of sampling or characterization of areas not associated with the landfill and seasonal stream/slough. Table 4-2 summarizes the type (matrix) of environmental samples and corresponding analyses performed on samples from the Umiat landfill and seasonal stream/slough, as well as background locations. The results and observations from these investigations are summarized in the following subsections. Previous investigations included analytical results with flags qualifying the data; in some cases these flags were undefined. Refer to Appendix F results tables for the original flags, and the original reports for definitions of flags, where available.

4.1 Environmental Investigations and Removal Actions

In 1972, the ADEC first identified environmental concerns at the former Umiat AFS with the discovery of a 4,4'-DDT cache in an old Navy warehouse at the site. During a subsequent site visit that year, the ADEC inventoried the quantity of 4,4'-DDT and notified the Naval Petroleum Oil Shale Reserves branch of their concerns. In 1973, the Naval Petroleum Oil Shale Reserves contracted Pacific Architects and Engineers, Inc., to remove and dispose of 5,660 pounds of 4,4'-DDT from the former Umiat AFS. During the same removal action, abandoned equipment, scrap metal, and approximately 85,000 crushed drums were buried in “stable areas of the (Colville River) floodplain.” This area was referred to as the Unit C Landfill by E&E. Shannon & Wilson refers to the Unit C Landfill as “the landfill” in this RI.

Since 1973, a number of site inspections and investigations have been conducted at the former Umiat AFS and landfill by the EPA, ADEC, ADOT&PF, FAA, and USACE. During these investigations, many contaminant sources were identified, including oil-spill sites, several solid-waste dumps, and leaking 55-gallon drums and PCB-containing transformers. Debris buried at the landfill was observed at the ground surface as the area flooded and its gravel cover eroded. Reports on these early investigations were not reviewed for this RI.

In 1992, E&E performed a visual inspection of Umiat and identified 11 areas of concern. The USACE contracted E&E to perform RIs at the Umiat landfill in 1994, 1996, and 1997. These, in addition to their 1998 and 1999 field investigations, and two other investigations in which analytical samples were collected at the landfill, are described in the following subsections. These studies included additional areas of, or related to, the former Umiat AFS; however, only analytical results associated with the landfill are presented in this RI.

4.1.1 1986 USACE Alaska District Hazardous-Waste Sampling and Analysis

The USACE initiated a hazardous-waste sampling and assessment program at Umiat in 1986, under the DERP. Analytical samples were collected from areas of obvious POL contamination and areas suspected to be heavily used, including the landfill east of the site. The USACE collected one sediment and one surface-water sample; the simplified sample location map appears to show the samples downstream (north) of the landfill in the seasonal stream channel. The samples were analyzed for PCBs, pesticides, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and EP Toxicity for metals. The purpose of analyzing samples for EP Toxicity was to determine whether site-sampled media might be considered hazardous waste under the RCRA. 4,4'-DDT was detected in the water sample at 0.0003 milligrams per liter (mg/L). 4,4'-DDD was detected at 0.650 mg/kg and the PCB Aroclor 1254 was detected at 0.680 milligrams per kilogram (mg/kg) in the sediment sample. Diesel-range hydrocarbons were tentatively identified in the sediment sample at 10 mg/kg. EP Toxicity analysis indicated the metals concentrations were below regulatory limits. Figure 4-1 shows the approximate location of the two samples.

4.1.2 1994 Ecology & Environment Phase I Remedial Investigation

E&E performed the first phase of an RI at Umiat Air Force Station in 1994 to determine the horizontal and vertical extent of soil contamination at the 11 areas identified during their 1992 site inspection, of which the landfill was Area 11. E&E estimated the boundaries of the landfill with an electromagnetic (EM) geophysical survey. The EM instrument readings indicated an estimated 67,000 cubic yards (cy) of buried metallic debris at least as deep as 9 feet bgs. Refer to section 4.3.1 for further discussion of the geophysical survey.

They drilled six shallow boreholes at the landfill outside the debris areas (Figure 4-2) and two soil borings at background locations. The landfill borings were drilled to about 9 feet bgs and did not encounter permafrost. They collected six surface and 12 subsurface soil samples at the landfill. The soil samples were tested for fuel constituents, PCBs, pesticides, VOCs, and metals. DRO and total recoverable petroleum hydrocarbons (TRPH) were detected in all the landfill borings. 4,4'-DDT was detected at the surface, 2-foot, and 10-foot depths, ranging from 0.020 mg/kg to 0.050 mg/kg in one borehole (BH 11-6).

4.1.3 1996 E&E Phase II RI

E&E performed the Phase II RI at the former Umiat AFS in 1996. The RI focused on three main areas: the Airstrip Operations Complex and Runway Lake (Unit A), the Main Gravel Pad and Floatplane Lake (Unit B), and the Landfill and associated seasonal stream (Unit C). Their Phase II report incorporated Phase I findings (presented previously in their draft Phase I RI report).

The objectives of the Phase II RI at the landfill were to:

- delineate soil and characterize groundwater contamination (POLs, pesticides, metals, and PCBs);
- collect soil samples from known areas of contamination for risk assessment;
- collect surface-water and sediment samples from the Colville River and two area lakes for risk assessment; and
- define possible contaminant migration pathways (surface water and groundwater) to potential receptors (the Colville River and surface-water bodies).

E&E collected surface- and subsurface-soil, groundwater and surface-water, and sediment samples at the landfill. They also conducted a survey of the site. Figure 4-3 shows E&E’s 1996 RI landfill sample locations.

E&E drilled 12 soil borings at the landfill and completed six of these as monitoring wells (three temporary and three permanent). The borings were drilled to about 9 feet bgs. Permafrost was reported to be discontinuous and variable from 3 feet to 6 feet bgs in the borings south of the road crossing the landfill. Permafrost was not reported in borings north of the road. Detected concentrations of DRO and residual range organics (RRO) in landfill soils ranged from 5.1 mg/kg to 1,300 mg/kg and 15 mg/kg to 4,100 mg/kg, respectively. Monitoring well MW-6 in the northern portion of the landfill was an exception, with DRO (1,300 mg/kg), RRO (4,100 mg/kg), 4,4'-DDT (38.2 mg/kg), and 4,4'-DDD (31.4 mg/kg) detected at the groundwater interface (about 3 feet bgs). PCBs (Aroclor 1254) were also detected in soils at the groundwater interface in MW-8 and SB-47 (0.0418 mg/kg and 0.224 mg/kg, respectively). GRO (0.119 mg/L to 0.761 mg/L), DRO (0.178 mg/L to 76 mg/L), 4,4'-DDD (0.0173 mg/L), and 4,4'-DDT (0.000105 mg/L to an 0.0311 mg/L) were also detected in groundwater samples at the landfill.

Surface-soil samples at the landfill contained lead (598 mg/kg), arsenic (1.8 mg/kg to 8.4 mg/kg), beryllium (0.07 mg/kg to 0.37 mg/kg), and iron (5,590 mg/kg to 27,800 mg/kg). The lead was attributed to lead-acid batteries and believed to be localized.

DRO and/or GRO were detected in groundwater samples from each of the six Phase II monitoring wells. The three wells along the centerline of the seasonal stream flowing through the landfill (MW-4, MW-6, and MW-8) contained higher petroleum concentrations than wells along the perimeter of the landfill (MW-3, MW-5, and MW-7). DRO detections ranged from 0.151 mg/L to 76.1 mg/L and GRO detections ranged from 0.119 mg/L to 0.761 mg/L. Chlorinated pesticides (4,4'-DDT and 4,4'-DDD; 0.0311 mg/L and 0.0173 mg/L, respectively) were detected in groundwater where they were found in subsurface soil (MW-6).

Surface water and sediment samples were collected in the seasonal stream exiting the landfill. Surface-water samples were analyzed for VOCs, PCBs/pesticides, polynuclear aromatic hydrocarbons (PAHs), and metals. No detections of PCBs, pesticides, or PAHs were reported; acetone and metals were detected. The PCB Aroclor 1254 was detected in each of the three sediment samples at 0.156 mg/kg to 17.8 mg/kg (locations LA, LB, and LC, shown on Figure 4-3). The density of sampling points in the Phase II fieldwork did not delineate the extent of contamination, and further delineation was recommended.

4.1.4 1996 AGRA Environmental Site Assessment

AGRA performed an environmental site assessment of Umiat for the North Slope Borough (NSB). AGRA also performed an EM geophysical survey of the landfill area. The effective survey depth of their instrument was approximately 15 feet bgs. The results of their study "essentially confirmed the landfill boundaries as they had been defined by previous investigations … the depth of the buried debris was at least 15 feet." AGRA also prepared a qualitative risk assessment addressing potential health risks to people who use the area, potential impacts to wildlife, and estimates of health risks from identified chemicals. The findings of that risk assessment are summarized in Section 4.2.1.

Based on interviews with knowledgeable sources and geophysical methods, they determined the depth of the landfill to be at least 20 feet, and possibly 40 feet deep (AGRA, 1997a).

Of the 31 samples AGRA collected at the Umiat facility, nine were collected at the landfill: two sediment in the landfill area and one downstream, two soil and a duplicate sample north of the landfill, and three surface-water samples (Figure 4-4). Although surface-water sample *1639-05* was reportedly associated with the landfill area, it was not shown on AGRA's sample location figure and is therefore not shown on Figure 4-4. Samples were analyzed for VOCs, PAHs, PCBs, pesticides, arsenic, and lead.

No VOCs or pesticides were detected in the samples. PAHs were detected in six samples (three sediment and three soil). One sediment sample (*1639-07*) collected from the seasonal stream/slough at 1 foot bgs contained 0.3 mg/kg of the PCB Aroclor 1254. Lead was detected in one sediment sample (*1639-02*) at 22 mg/kg. Detected arsenic concentrations ranged from 3 mg/kg to 8 mg/kg.

4.1.5 1997 E&E Phase III RI

E&E performed the Phase III RI at the former Umiat AFS to fill data gaps at previously investigated areas and assess areas of potential concern that had not yet been investigated.

The Phase III investigation objectives related to the landfill were to:

- delineate the extent of petroleum and PCB contamination in sediment, subsurface soil, and groundwater within and downgradient of the landfill;
- delineate depth to permafrost under the landfill and adjacent areas. These data were required to determine the feasibility and potential design of a remedial alternative under consideration at the landfill: permafrost encapsulation;
- initiate a treatability study at the landfill to test the viability of permafrost encapsulation. For the Phase III field work, this task was to be accomplished by installing a pilot-scale permafrost cap and thermistors arrays. There is no record of the thermistors having been monitored after their installation. The cap was reportedly disassembled in 2001 or 2002; and
- re-evaluate possible ecological and human health risks associated with PCBs in the seasonal stream and slough. Although PCBs were not detected in the seasonal stream and slough surface water, three sediment samples collected during the 1996 Phase II investigation indicated the presence of PCBs. The subsequent risk assessment (E&E, 1997c) used the sediment data to calculate theoretical fish-tissue concentrations and ecological and human health risks. Although the risk assessment concluded risks were elevated above regulatory limits, they were likely overestimated because of the limited sediment sample size and lack of actual fish-tissue data.

E&E completed the following tasks associated with the landfill:

- drilled 21 soil borings to permafrost at the landfill and had subsurface soil samples analyzed for DRO and pesticides;
- completed six of the 21 soil borings as permanent monitoring wells, with laboratory analyses for groundwater including DRO, PCB, and pesticides;
- constructed an 8-foot-thick 50-foot by 50-foot pilot-scale permafrost cap from native sand and gravel at the landfill;
- installed six thermistor arrays and data loggers in and around the gravel cap from 18 feet to 29 feet below the original grade to collect data on the growth of underlying permafrost over approximately one year;
- sampled and analyzed 49 sediment locations in the slough downgradient of the landfill for PCBs, total organic carbon (TOC), and grain-size distribution; and
- collected and analyzed 14 arctic grayling *(Thymallus arcticus)* from the seasonal stream and slough for PCBs and collected six additional grayling approximately 1 mile upstream for background purposes.

Figure 4-5 shows sample locations from E&E's 1997 Phase III RI.

No pesticides were detected above ARARs or risk-based screening levels in surface soils or sediments.

Subsurface soil samples collected at the landfill contained DRO (8.8 mg/kg to 14 mg/kg in five samples), and pesticides 4,4'-DDD and 4,4'-DDT (0.0059 mg/kg and 0.0065 mg/kg, respectively, in one sample).

PCBs and pesticides were not detected in groundwater samples. DRO in monitoring well MW-4 (0.73 mg/L) was the only detected analyte in groundwater samples collected from the six monitoring wells.

Sediment samples were collected at 49 locations in the seasonal stream and analyzed for PCBs. These included unbiased samples from 11 transects, and biased samples from the deposition areas of the seasonal stream and slough. PCBs were detected in 35 of the 48 samples. Consistent with previous RI phases at Umiat AFS, only Aroclor 1254 was detected. The range of reported values for PCBs in the sediment was 0.058 mg/kg to 1.30 mg/kg. The data indicated the absence of areas of PCB "hot spots," and suggested a historical presence rather than a recent release from an upstream source.

PCBs were also detected in the fish collected from the seasonal stream and slough, but not from those taken from the Colville River. PCB detections ranged from 0.019 mg/kg to 1.4 mg/kg. This and subsequent fish-sampling results were reported on a wet-weight basis. PCBs were not detected in background fish samples.

While PCBs were the main focus of the fish-tissue analysis, 4,4'-DDT and its degradation products (4,4'-DDE and 4,4'-DDD) were also tentatively identified but not quantified in fish tissue. These analytes detected in fish may indicate their presence in the sediments of the seasonal stream and slough. It was concluded that 4,4'-DDT and its degradation products are ubiquitous across the Umiat area because of the historical widespread spraying of 4,4'-DDT, and their levels in fish may reflect exposure to these non-point sources of pesticides near the former Umiat AFS.

Risk-assessment calculations for human health and ecological receptors were updated based on the Phase III sediment and fish tissue results, with results detailed in *Technical Memorandum, Human Health and Ecological Risk Assessment, Former Umiat AFS,* dated March 19, 1998. This document is summarized in Section 4.2.3.

Additional sampling was recommended for the seasonal stream and slough and Colville River. Limited sediment sampling was also recommended in these areas to determine the average concentration of pesticides in sediment and whether a link could be made between the sediments and concentrations in fish tissue.

4.1.6 1998 E&E Field Investigation

E&E completed additional field investigations at Umiat in 1998 to fill data gaps at locations previously investigated from 1994 through 1997. E&E performed follow-up tasks at the landfill, the seasonal stream and slough, and the Colville River near Umiat. The objective of the 1998 sampling was to collect sufficient fish-tissue, sediment, surface-water, and groundwater data to better understand and communicate risks associated with human consumption of fish from the Colville River. Figure 4-6 shows sample locations for the 1998 E&E field investigation.

Four existing groundwater wells at the landfill (Figure 4-6) were sampled and analyzed for pesticides, PCBs, and DRO to determine whether previously detected contaminants in the landfill were moving downgradient. The 1998 and previous groundwater results indicated groundwater was not a source of PCBs or 4,4'-DDT and its derivatives to the sediments downstream in the seasonal stream and slough. Petroleum contamination in groundwater was limited to MW-7; no other contaminants found in landfill subsurface soils were detected in groundwater in the northern portion of the landfill.

An additional objective of the 1998 field investigation was to evaluate the presence of pesticides in sediments, surface water, and fish tissue. E&E tested sediments, surface water, and fish for DRO, VOCs, base-neutral-acid extractable compounds (BNA – i.e., SVOCs), PAHs, PCBs, and/or pesticides. 4,4'-DDT was detected in the seasonal stream and slough sediment at 0.0024 mg/kg to 0.0059 mg/kg. 4,4'-DDD (to 0.054 mg/kg), acetone (to 0.13 mg/kg), 2-butanone (0.012 mg/kg), and DRO (to 54 mg/kg) were also detected in sediment samples. Toluene was the only analyte detected in surface water, at 0.001 mg/L.

Whitefish and burbot were collected from the seasonal stream and slough and at upstream and downstream locations in the Colville River and tested for PCBs and pesticides. Both PCBs and pesticides were detected in the fish tissue. Detected PCB levels ranged from 0.00030 mg/kg to 0.87 mg/kg; detected PCBs were primarily Aroclor 1254 and Aroclor 1260, with several detections of Aroclor 1016/1242. Detected pesticides (2,4'-DDD; 2,4'-DDE; 4,4'-DDD; 4,4'-DDE, and 4,4'-DDT) ranged from 0.00003 mg/kg to 0.740 mg/kg. E&E concluded, "Atmospheric transport and biotransport are likely factors contributing to contaminant concentrations in fish tissue in multiple species in the Colville River. A localized source of contamination is likely present in the Unit C slough. Statistical tests on the data indicate that the source does not appear to be significantly affecting the whitefish population in the remainder of the Colville River... analytical data suggest that the burbot population downriver of the Unit C Seasonal Stream and Slough may have higher concentrations of PCBs and pesticides."

4.1.7 1999 E&E Field Investigation

E&E performed another site investigation at Umiat AFS in August 1999, during which they collected surface-water samples from the seasonal slough and groundwater samples from monitoring wells at the landfill. Figure 4-7 shows sample locations at the landfill for E&E's 1999 field investigation.

No pesticides or PCBs were detected in groundwater samples from the landfill monitoring wells or surface-water samples from the seasonal slough. DRO was detected in two of three groundwater samples at 0.0890 mg/L and 0.107 mg/L and at all three surface-water sample locations at 0.111 mg/L to 0.123 mg/L.

4.1.8 2001 Jacobs Removal Action

In July and August 2001, the USACE and Jacobs Engineering (Jacobs) conducted site inspections of the landfill area and found one small transformer and areas containing debris from lead-acid batteries on the surface of the landfill. At USACE direction, Jacobs removed the visible lead debris and excavated surrounding soil until field instrument measurements indicated lead levels in surrounding soil were below cleanup levels. Approximately 1.3 cy of lead-contaminated soil were removed. The cleanup-verification sample collected from the excavation contained 1,170 mg/kg lead. A sample of the soil immediately beneath the transformer was analyzed and found to contain 52,700 mg/kg of the PCB Aroclor 1254. Jacobs containerized and removed the transformer and about one-third cy of contaminated soil for off-site disposal. A cleanup-verification soil sample contained 2.3 mg/kg Aroclor 1254 (Jacobs, 2001). Figure 4-8 shows the sample locations for Jacobs's 2001 removal action.

On August 10, 2001, the Colville River rose about 10 feet due to a storm event in the surrounding foothills. This flood occurred prior to the installation of a river gage at Umiat, so there is no available hydrologic data for this event. The landfill and surrounding area were covered by up to 3 feet of water. The flood water washed away the stakes marking other potentially lead-contaminated debris, and deposited sand and gravel in excavated areas (USACE, 2011b).

4.2 Risk Assessments

Several studies have been done to evaluate whether contamination from past activities at the former Umiat AFS may affect human health and ecological receptors. These are summarized in the following sections. The years listed in the following subsection titles refer to the year the document was published.

4.2.1 1997 AGRA Qualitative Risk Assessment

AGRA performed a Qualitative Risk Assessment (QRA) of Umiat for the ASNA and NSB to review available data and qualitatively evaluate health risks to humans and wildlife that use and subsist on resources in the Umiat area. The QRA was performed by comparing available analytical results to EPA Region III risk-based concentration (RBCs). If the concentration of a chemical exceeded the RBC, it was identified as a "Chemical of Concern" (COC) and the potential health effects presented. For consistency within this RI report, we use the term COPC to include COCs as described in the 1997 AGRA QRA and other reports referenced herein. COPCs in soil identified at Umiat Area of Concern 7 (the landfill location) were PCB and lead.

The focus of previous investigations was on the Umiat camp and did not include potential ecological impacts from oil exploration and drilling activities. AGRA collected limited data during the 1996 reconnaissance to evaluate ecological risks in these surrounding areas. AGRA's QRA did not consider other implications such as the observed continual release of formerly landfilled material (drums, vehicles, batteries, etc.) into the Colville River.

AGRA noted the landfill area "is an intermittent channel along the inner bank of a large meander of the Colville River. The channel is sparsely vegetated with the thriving vegetation located only on small clusters of gravel elevated above the predominant grade. The channel deposits consist of well-rounded coarse gravel, indicating a high-energy source of transport… [b]ecause the gravel cover of this landfill is being eroded by pack ice and intermittent flow in the Colville River, chemicals may migrate into the river consistently over time; there is a potential for river sediments adjacent to the landfill area to act as a sink for contaminants. River sediments impacted by site-related compounds could potentially affect aquatic bottom feeders and terrestrial animals that graze or forage in the river near the landfill."

AGRA concluded, "regardless of the remote nature of the site, these conditions warrant consideration for remediation due to the unquantified potential impact to fish and wildlife and the people who subsist on these natural resources. Several sites with identified contamination, or the potential to contaminate both soil and water in the Umiat area, have not been fully evaluated to determine the amount of risk. These areas include the three known landfills near Umiat, the abandoned oil exploration wells, and areas used as burn pits. Additional investigation and evaluation of the health risks from these areas is warranted prior to any additional risk assessments."

4.2.2 1997 E&E Human Health and Ecological Risk Assessment

E&E conducted a baseline human health risk assessment (HHRA) and baseline ecological risk assessment (ERA) for the USACE under the FUDS program at the former Umiat AFS (E&E, 1997). The objective of the baseline HHRA was to evaluate the potential for risk to human health posed by contaminants at Umiat under current conditions and following completion of a proposed limited removal action.

Site-use factors were considered in three human-health-risk scenarios: current Umiat residents, subsistence hunters, and future residents. Conclusions regarding human health risks include:

- "Potential excess lifetime cancer risks and hazard indices (HIs) for current Umiat residents and subsistence hunters associated with consumption of fish caught from the Colville River near Umiat were within acceptable ADEC and EPA regulatory benchmarks.
- Potential excessive lifetime cancer risks and HIs for future residents were greater than ADEC and EPA criteria. Future residents were assumed to eat a higher proportion of fish from the Unit C seasonal stream and slough, and there were no human health risks associated with eating fish from the Colville River for current Umiat residents and subsistence hunters; therefore, human health risks associated with ingesting fish contaminated with Aroclor 1254 are limited to the Unit C seasonal stream and slough and do not extend to the fish collected from the Colville River.

- Although the study was limited to the analysis of PCBs, 4,4'-DDT and its degradation products (4,4'-DDE and 4,4'-DDD) were tentatively identified in the fish tissue. The additional risks due to pesticides in fish tissue remain unknown."

The report concluded, "PCBs in the Unit C sediments may pose unacceptable ecological and human health risks."

E&E used analytical results from the 1994 and 1996 remedial investigations. The conclusions of the baseline HHRA included:

- No complete exposure pathways were identified for groundwater at the former Umiat AFS; therefore, there are no human health risks associated with exposure to groundwater.
- Potential excess lifetime cancer risks and HIs associated with exposure to soil at Unit C were less than ADEC and the EPA Superfund program regulatory benchmarks under current and future land-use conditions.
- Potential excess lifetime cancer risks and HIs associated with consumption of fish caught in the seasonal stream were much greater than ADEC and EPA regulatory benchmarks; however, these risk estimates are based on extremely conservative exposure assumptions and modeling and are expected to grossly exaggerate site risks.

The objective of the baseline ERA was to evaluate the likelihood adverse effects may occur, or are occurring, to ecological receptors due to exposures to chemicals at the site.

There were numerous exceedances of risk-based screening benchmarks for inorganic contaminants of potential ecological concern (COPECs) for indicator communities and species. Every inorganic COPEC detected, except for mercury, exceeded a benchmark for an indicator community or species in at least one unit of the site. In Unit C, no organic COPECs exceeded screening benchmarks for indicator communities.

The conclusion of the ecological risk assessment was, "PCBs in the Unit C seasonal stream and slough do not pose a risk to ecological receptors." Further sampling for the following study reversed this conclusion.

4.2.3 1998 E&E Technical Memorandum: Human Health and Ecological Risk Assessment

The original *Baseline Human Health Risk Assessment* and *Ecological Risk Assessment* (E&E, 1997) concluded human health risks from eating fish potentially containing Aroclor 1254 from the seasonal stream and ecological risks to piscivorous (fish-eating) organisms are unacceptable according to ADEC and EPA criteria; however, the risk estimates were based on modeled concentrations in fish derived from limited sediment data, not on actual fish-tissue analyses. In August 1997, E&E collected additional fish-tissue and sediment samples to better characterize the risks of Aroclor 1254. E&E's March, 1998 *Technical Memorandum, Human Health and Ecological Risk Assessment* recalculated the hazard quotient using maximum detected concentrations and concluded:

- Potential excess lifetime cancer risks and HIs for current Umiat residents and subsistence hunters associated with consumption of fish caught from the Colville River near Umiat were less than regulatory benchmarks established by ADEC and EPA.
- Potential excess lifetime cancer risks and HIs for future residents were greater than ADEC and EPA criteria. This demonstrates risks associated with ingesting fish contaminated with Aroclor 1254 are limited to the Unit C seasonal stream and risks are not above regulatory guidance values within the Colville River.

4.2.4 2001 ATSDR Health Consultation: Review of Fish Samples

The Agency for Toxic Substances and Disease Registry (ATSDR) released a health consultation that reviewed data from fish sampled near the former Umiat AFS in 1997 and 1998. The health consultation focused on evaluating the potential risk to people who harvest fish at or near the Umiat site. The ATSDR determined human exposures to contaminants in fish at the Umiat site were not occurring at frequencies considered to be a current public-health problem due to the small quantity of fish in the slough and the current lack of harvesting those fish. Therefore, the ATSDR concluded "current Colville River fish contamination data do not indicate the need for public health concerns."

The ATSDR recommended additional sampling to better characterize the nature and extent of downstream contamination in the Colville River.

4.2.5 2003 CHPPM Critical Document Review

The US Army Center for Health Promotion and Preventive Medicine (CHPPM) consolidated information in previous environmental reports on the presence of PCBs in fish tissue and other media of the Colville River Seasonal Slough at the Unit C Landfill. They used the information in conjunction with PCBs-in-fish tissue data from the Alaska region to make a determination of either acceptable or unacceptable health risk for individuals who eat fish from the Colville River.

The CHPPM came to the following conclusions:

- The Umiat AFS Unit C, Area 11 Landfill was a historical source of PCBs to the Unit C Seasonal Slough. Due to years of scouring events, it is doubtful the landfill remains an ongoing source of PCBs to the Seasonal Slough, downstream Colville River sediments, or the Colville River fishery.

- Concentrations of PCBs in the Seasonal Slough fish vary with species. Maximum PCB detections in burbot of the slough exceeded the US Food and Drug Administration (FDA) action limit of 2.0 parts per million (ppm) in only one study. PCB concentrations in two other fish species collected in the slough (Arctic grayling and Broad whitefish) are all well below the FDA action limit and at the lower end of the range of concentrations found in the Colville River and greater Alaska region.
- Despite the occasional exceedances of the FDA action limit for PCBs in burbot of the Seasonal Slough, there are no health risks associated with consuming the slough's fish. The slough supports a very limited fishery, and generally would not allow individuals to consume a sufficient diet of contaminated fish to pose a health concern.

4.2.6 2003 E&E Evaluation of PCBs and DDTs in the Colville River

In response to recommendations in the 2001 ATSDR Health Consultation, in August 2001, E&E studied whether burbot in the Colville River were being adversely affected by contaminants from the slough at the former Umiat AFS. They collected 70 fish samples and up to 35 water samples from the Colville River from about 20 miles upriver of Umiat to near Nuiqsut, about 90 river miles downstream. The samples were analyzed for PCBs and derivatives of the pesticide 4,4'-DDT.

Results indicated:

- The PCBs and DDTs present in the Umiat slough sediment may be affecting nearby downstream locations in the Colville River. Impacts from the Umiat Slough were not noted in the Colville River water at the sample location nearest Nuiqsut.
- Burbot and other fish that migrate into the slough are responsible for higher concentrations in the Colville River fishery upstream and downstream of Umiat.
- Most of the burbot affected by the PCBs and DDTs from the Umiat Slough were found at locations nearest the slough; however, burbot with elevated levels of PCBs and DDTs have migrated from the Umiat Slough approximately 60 miles downstream to the area known as Ocean Point.
- Atmospheric deposition of PCBs and DDTs is also a significant source of total PCBs and DDTs in burbot in the main Colville River.
- The average concentration of PCBs and DDTs in burbot is similar to burbot caught from other areas of the Arctic.
- The highest levels of PCBs and DDTs in tissue are from fish near the Umiat Slough. The Umiat Slough did not affect levels found in burbot caught near Nuiqsut.

4.2.7 2003 ATSDR Health Consultation: Review of Burbot Samples

A Nuiqsut community member requested the ATSDR evaluate E&E's 2001 Colville River fish data and consider specific exposures to the Nuiqsut community. This resulted in the 2003 ATSDR Health Consultation. In response to community concerns contamination might exist in the Colville River, and exposure to contaminants resulting from a subsistence lifestyle could potentially lead to harmful health effects, the ATSDR evaluated four potential exposure scenarios involving eating fish from the Colville River, whole burbot, and burbot livers, including a conservative chronic-exposure scenario of eating a high quantity of fish (up to 390 grams) from the Colville River every day for 70 years.

They concluded, "While PCBs, DDT, and DDT derivatives were detected in fish collected from multiple areas of the Colville River, the levels were very low and exposures to them are not expected to cause harmful health effects. Thus, the ATSDR determined it is safe to eat the fish" (ATSDR, 2003).

4.3 Geophysical Investigations

Various technologies have been used to estimate the extent and depth of buried waste in the Umiat landfill. Years given in the subsection titles indicate the dates of the geophysical investigations.

4.3.1 1994 E&E

As part of their Phase I RI, E&E performed a geophysical survey at Area 11 (the landfill) to screen boring locations for buried debris that could interfere with drilling soil borings. They used a Geonics electromagnetic conductivity instrument (EM-31) to perform the survey. They delineated the horizontal extent of the landfill and estimated the vertical extent of buried metallic debris.

The EM-31 instrument readings (terrain conductivity) were off-scale where measuring within the suspected landfill boundary, indicating a significant volume of buried metallic debris. Readings inside the landfill boundary indicated buried metallic debris as deep as 9 feet bgs. A large volume of metal debris buried potentially as deep as 18 feet bgs was indicated at a few locations in the southern portion of the landfill. E&E's delineation results are shown in Figure 4-10.

4.3.2 2005 USGS Geophysical Report

In 2005, the USGS performed a geophysical survey at several North Slope sites, including the Umiat landfill, using EM induction, total magnetic field, and capacitively coupled resistivity.

The survey identified six cells of buried debris (metallic waste and conductive waste). Figure 4-11 shows the results of the 2005 USGS geophysical investigation.

They estimated the base depths of five of the six cells to be between 40 and 43 feet bgs. Table 4-3 summarizes their findings regarding the areal extent and estimated volume of buried debris and soil within each cell.

4.3.3 2011 GeoTek Geophysical Survey

In April 2011, GeoTek Alaska (GeoTek) performed a geophysical survey of the Umiat Landfill using ground-penetrating radar (GPR), EM, and Global Positioning System (GPS) instrumentation (GeoTek, 2011). The purpose of this survey was to attempt to reconcile the basal depths of debris cells reported by E&E in 1994 (depths to 18 feet bgs) with those reported by the USGS in 2005 (depths to 43 feet bgs). GeoTek planned to acquire data along a grid pattern; however, dense vegetation covered portions of the site, which limited data acquisition to open areas and natural paths through that vegetation. GeoTek confirmed five of the six cell locations previously identified by USGS and interpreted the basal depths of these cells to be between “nine and 18 feet below the surface.” Within the area of geophysical data acquisition, GeoTek identified data anomalies and determined the vertical and lateral extent of the landfill pits or former ground surface prior to burial of debris. They concluded, “There is good correlation of the EM data with the magnetic data anomaly extents as mapped by the USGS” (Figure 4-12).

GeoTek also observed numerous high-value data anomalies (spikes) outside previously indentified debris cells. These data anomalies were interpreted to be associated with surface or shallow-buried scraps of metal. Due to snow cover, these anomalies could not be confirmed as surface metal.

Based on an interpretation of their GPR data, they estimated the basal depths of the debris cells to range from 8 feet to 17 feet bgs. Their area and volume estimates are summarized in Table 4-3.

4.4 2011 USACE Hydrologic Analysis of Umiat Landfill

The landfill is subject to overland flow during flood events. The water velocity during these events can get high enough to erode the sand and gravel covering the landfill. There is a concern a flood event will uncover hazardous material and transport contamination downstream, particularly into areas used for subsistence fishing by the residents of Nuiqsut (USACE, 2011a).

The USACE performed a hydrologic analysis and identified potential interim measures to prevent erosion of landfill-cover materials until a long-term/permanent solution is considered.

The discussion in this report is limited to hydrologic analysis; interim corrective measures will be discussed in the FS.

An analysis was performed to determine the return interval for the maximum peak flow for the 2004 flood event and the flows that would be associated with a range of return intervals. The return period for a maximum peak flow of 261,000 cfs, which corresponds to the maximum peak in 2004, is a 35-year event.

Data from the 2004 flood event was used to estimate the extent of flooding and water velocity over the landfill. Modeling results indicated the landfill area would be inundated during a flood event when flows are between 109,700 cfs and 132,600 cfs. According to USGS records, this has occurred every year since 2003, except in 2008. According to the model, during the flood peak, velocity over the landfill is between 4 feet to 6 feet per second (fps), high enough to mobilize sands and gravels covering the landfill.

Table 4-1
Documents Reviewed for This RI

Year of Study	Report Date	Author	Document Title
1986	July 1987	USACE	Results of Hazardous Waste Sampling and Analysis for Umiat Air Force Station
1994	January 1995	E&E	(DRAFT) Umiat Remedial Investigation Project Report, Umiat Air Force Station, Umiat, Alaska
1996	January 1997	AGRA	Environmental Site Assessment Final Report, Umiat, Alaska
1996	June 1997	E&E	Final Remedial Investigation Report, Volume 1 Report, Former Umiat Air Force Station, Umiat, Alaska
1996	June 1997	E&E	Remedial Investigation Report, Volume 2 Appendix F Analytical Data, Former Umiat Air Force Station, Umiat, Alaska
(1994 and 1996 samples)	June 1997	E&E	Final Risk Assessment Report, Baseline Human Health Risk Assessment, Baseline Ecological Risk Assessment, Former Umiat Air Force Station, Umiat, Alaska
1997	March 1998	E&E	Technical Memorandum, Human Health and Ecological Risk Assessment, Former Umiat Air Force Station, Umiat, Alaska
1997	July 1998	E&E	1997 Remedial Investigation Report, Umiat, Alaska, Volume 1, Report
1998	October 1999	E&E	Final 1998 Field Investigation Report, Former Umiat Air Force Station, Alaska
1999	January 2000	E&E	1999 Field Investigation Technical Memorandum, Former Umiat Air Force Station, Umiat, Alaska
(1997 and 1998 samples)	June 2001	ATSDR	Health Consultation, Review of Fish Samples, US Army USACE Umiat Air Force Station
2001	October 2001	Jacobs	Technical Memorandum, Hazardous Waste Removal from Unit C Landfill
(1991 to 2002 samples)	February 2003	CHPPM	Critical Document Review No. 39-DA-00QZ-03, Human Health Effects Associated with PCBs at the Colville River Seasonal Slough, Former Umiat Air Force Station, Umiat, Alaska
2001	March 2003	E&E	Evaluation of PCBs and DDTs in the Colville River, Former Umiat Air Force Station, Umiat, Alaska
(2001 samples)	November 2003	ATSDR	Health Consultation, Review of Burbot Samples, US Army USACE Umiat Air Force Station
2005	2006	USGS	Geophysical Investigations of Selected Infrastructure Sites within the National Petroleum Reserve, Alaska. Administrative Report 2006-LAI-05-0015
2011	April 2011	USACE	Hydrologic Analysis of Umiat Landfill, FUDS Project F10AK0243-08
2011	November 2011	GeoTek	Final Technical Memorandum, Umiat Landfill Geophysical Survey, FUDS Project F10AK024308, Umiat, Alaska

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Table 4-2
Summary of Analytical Sampling Associated with Landfill

Event	Sample Location	Matrix	Laboratory Analyses
1986 USACE	Seasonal Stream/Slough	Surface Water	VOC, SVOC, PCB, Metals
		Sediment	VOC, SVOC, PCB, Metals
1994 E&E	Landfill	Soil	GRO, DRO, TRPH, Fuel ID, VOC, PCB, Pesticides, Metals
	Background	Soil	Metals
1996 AGRA	Landfill	Soil	VOC, PAH, Metals
	Seasonal Stream/Slough	Sediment	PAH, PCB, Pesticides, Metals
		Surface Water	VOC, PAH, PCB, Pesticides, Metals
1996 E&E	Landfill	Soil	GRO, DRO, RRO, BTEX, VOC, BNA, PCB, Pesticides, Metals
		Groundwater	GRO, DRO, TRPH, VOC, PAH, PCB, Pesticides
	Seasonal Stream/Slough	Sediment	RRO, VOC, BNA, PCB, Pesticides, Metals
		Surface Water	VOC, PAH, PCB, Pesticides, Metals
1997 E&E	Landfill	Soil	DRO, PCB, Pesticides
		Groundwater	DRO, PCB, Pesticides
	Seasonal Stream/Slough	Sediment	PCB
	Seasonal Stream and Colville River	Fish Tissue	PCB
1998 E&E	Landfill	Groundwater	DRO, PCB, Pesticides
	Seasonal Stream/Slough	Sediment	DRO, VOC, BNA, PCB, Pesticides
		Surface Water	DRO, VOC, PAH, PCB, Pesticides
	Seasonal Stream and Colville River	Fish Tissue	PCB, Pesticides
1999 E&E	Landfill	Groundwater	DRO, PCB, Pesticides
	Seasonal Stream/Slough	Surface Water	DRO, PCB, Pesticides

Notes: This table summarizes only the analytical sampling associated with the landfill and background locations.
Refer to Tables D-1 through D-3 for list of sample numbers, sample locations, more specific analytes, and laboratory analytical methods.

Abbreviations:
BNA Base-neutral-acid extractible compounds
BTEX Benzene, toluene, ethylbenzene, and xylenes
DRO Diesel range organics
Fuel ID Fuel identification
GRO Gasoline range organics
PAH Polynuclear aromatic hydrocarbons
PCB Polychlorinated biphenyls
RRO Residual range organics
SVOC Semivolatile organic compounds
TRPH Total recoverable petroleum compounds
VOC Volatile organic compounds

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Table 4-3
Summary of Geophysical Investigation Results

Name of Anomaly	2005 USGS Area (ft²)	2005 USGS Base depth (ft)	2005 USGS Volume (cy)	2011 GeoTek Base depth (ft)	2011 GeoTek Volume (cy)
Cell 1	12,142	unclear	NA	NA	NA
Cell 2	28,191	40	41,098	14	14,619
Cell 3	34,897	43	55,110	12	15,511
Cell 4	7,287	40	10,626	13	3,509
Cell 5	56,510	43	4,252	8	16,745
Cell 6	99,136	43	156,590	17	62,425
TOTAL	238,163	NA	267,676	NA	112,809

Notes: USGS results were converted from SI to English units.
NA Not applicable
GeoTek verified the areas estimated by USGS and used them in their calculations

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Sample locations are approximate. Sample locations and "State of Alaska 1968 Landfill" area are based on USACE's DERA-5300: Umiat AFS, AK; Sample Location Map; Umiat Air Force Station.

Aerial photography dated July 2009. Produced by Kodiak Mapping. Provided by Alaska Department of Transportation and Public Facilities.

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SAMPLE LOCATIONS
1986 USACE HAZARDOUS WASTE
SAMPLING AND ANALYSIS

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FIG. 4-1

Filename: T:\Project\31-1\11544_Umiat\AV_mxd\Final_RI_Report\Fig_4-01_Sample_Locations_1986_USACE.mxd Date: 3/8/2013 beo

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Approximate Sample Locations

⦿ 1994 Soil Boring

Note: Drums, crushed drums, partially exposed track vehicle were observed in landfill area.

Sample and feature locations are approximate and based on Ecology and Environment, Inc.'s (E&E) Draft Remedial Investigation Figure 3-5, dated December 20, 1993 and AGRA Earth and Environmental's Summary Site Assessment Report, Umiat, Alaska, Figure 9, dated January 1997.

Aerial photography taken July 2009, produced by Kodiak Mapping, recieved from Alaska Department of Transportation and Public Facilities.

N

0 400 800

Scale in Feet

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SAMPLE LOCATIONS
1994 E&E PHASE I
REMEDIAL INVESTIGATION

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FIG. 4-2

Filename: T:\Project\31-1\11544_Umiat\AV_mxd\Final_RI_Report\Fig_4-02_Sample_Locations_1994_E&E_RI.mxd Date: 3/8/2013 beo

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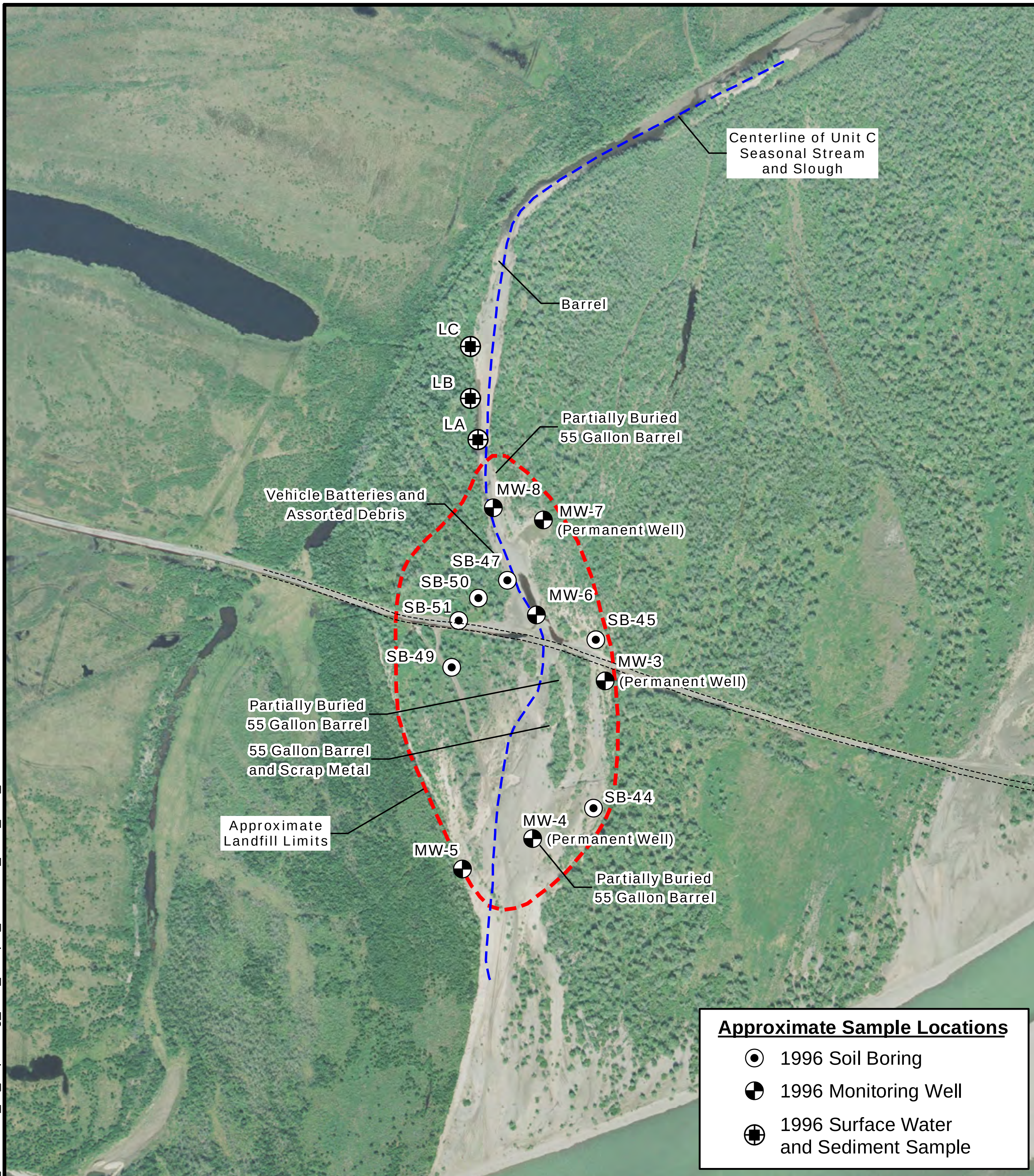

Sample and feature locations are approximate and based on Ecology and Environment, Inc.'s (E&E) 1996 Remedial Investigation Figure 3-7 dated May 1997.

Aerial photography taken July 2009, produced by Kodiak Mapping, recieved from Alaska Department of Transportation and Public Facilities.

N

0 400 800

Scale in Feet

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SAMPLE LOCATIONS
1996 E&E PHASE II
REMEDIAL INVESTIGATION

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FIG. 4-3

Filename: T:\Project\31-1\11544_Umiat\AV_mxd\Final_RI_Report\Fig_4-03_Sample_Locations_1996_E&E_RI.mxd Date: 3/8/2013 beo

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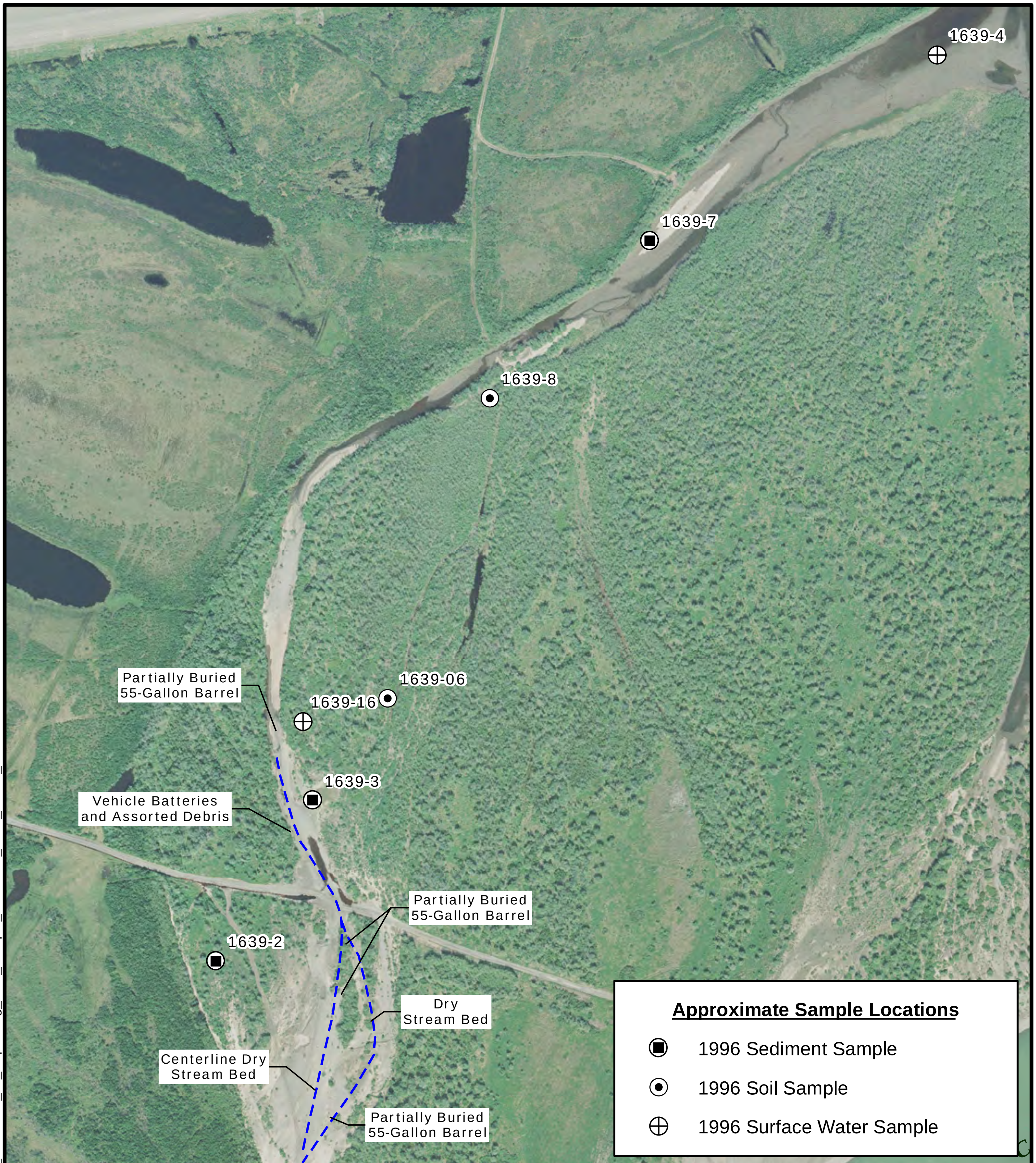

Sample and feature locations are approximate and based on AGRA Earth and Environmental's (AGRA) ESA Figure 9, dated January 1997.

Aerial photography taken July 2009, produced by Kodiak Mapping, recieved from Alaska Department of Transportation and Public Facilities.

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**SAMPLE LOCATIONS
1996 AGRA ENVIRONMENTAL
SITE ASSESSMENT**

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FIG. 4-4

Filename: T:\Project\31-1\11544_Umiat\AV_mxd\Final_RI_Report\Fig_4-04_Sample_Locations_1996_AGRA_ESA.mxd Date: 3/8/2013 beo

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Approximate Sample Locations

- 1997 Soil Borings
- 1997 Sediment Samples
- 1997 Monitoring Wells

Sample and feature locations are approximate and based on Ecology and Environment, Inc.'s (E&E) 1997 Remedial Investigation Figure 2-1 dated May 21, 1998 and Figure 2-2 dated February 18, 1998.

Aerial photography taken July 2009, produced by Kodiak Mapping, recieved from Alaska Department of Transportation and Public Facilities.

N

0 400 800

Scale in Feet

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SAMPLE LOCATIONS
1997 E&E PHASE III
REMEDIAL INVESTIGATION

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FIG. 4-5

Filename: T:\Project\31-1\11544_Umiat\AV_mxd\Final_RI_Report\Fig_4-05_Sample_Locations_1997_E&E RI.mxd Date: 3/8/2013 beo

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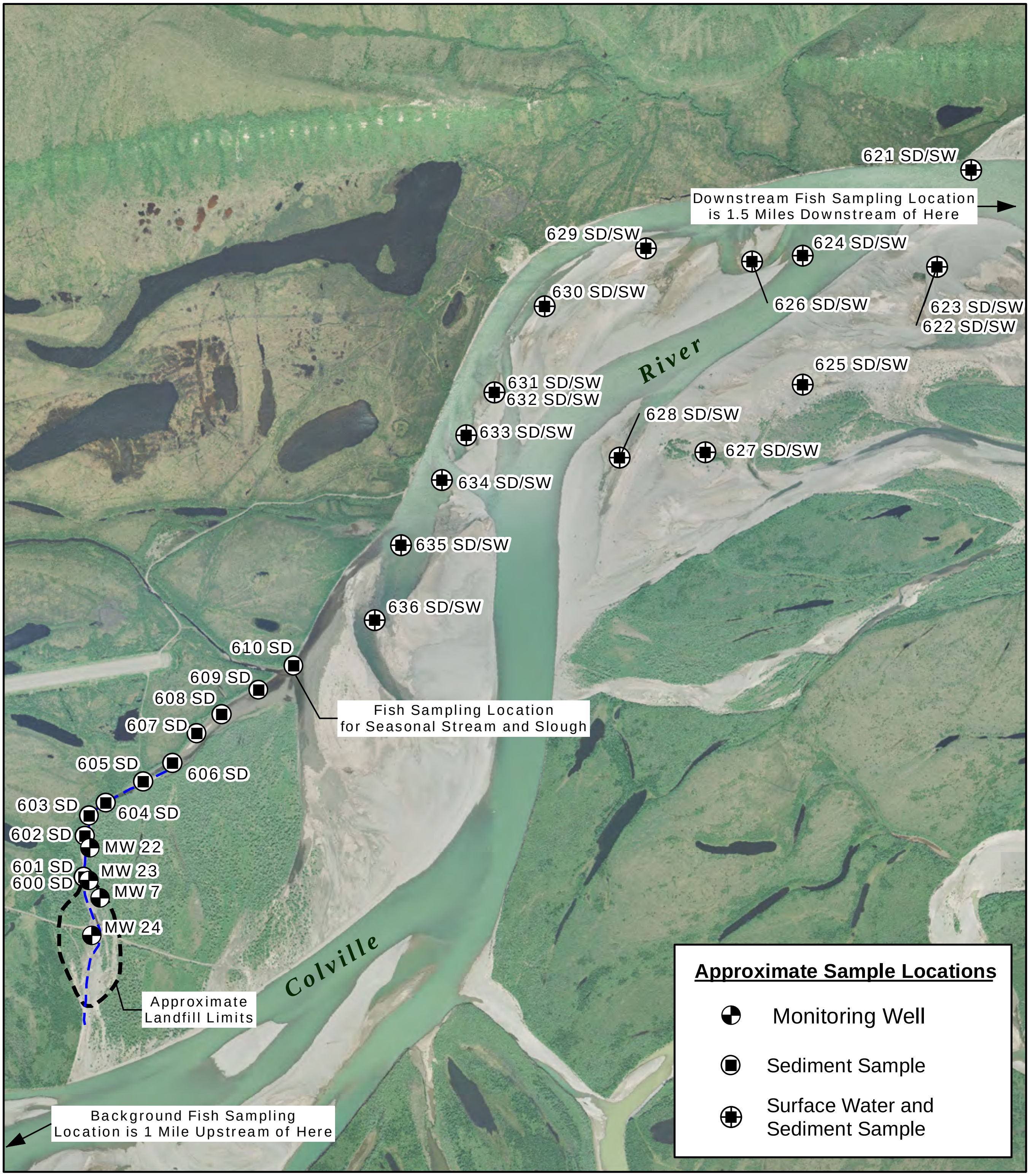

Sediment and surface water sample locations are approximate and based on Ecology and Environment, Inc.'s (E&E) Figure 2-6 Fish, Sediment, and Surface Water Sample Locations, February 16, 1999. Monitoring well locations are based on Shannon & Wilson, Inc site visit on June 15, 2010.

Aerial photography taken July 2009, produced by Kodiak Mapping, recieved from Alaska Department of Transportation and Public Facilities.

N

0 1,500 3,000

Scale in Feet

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SAMPLE LOCATIONS
1998 E&E FIELD INVESTIGATION

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FIG. 4-6

Filename: T:\Project\31-1\11544_Umiat\AV_mxd\Final_RI_Report\Fig_4-06_Sample_Locations_1998_E&E_FI.mxd Date: 3/13/2013 beo

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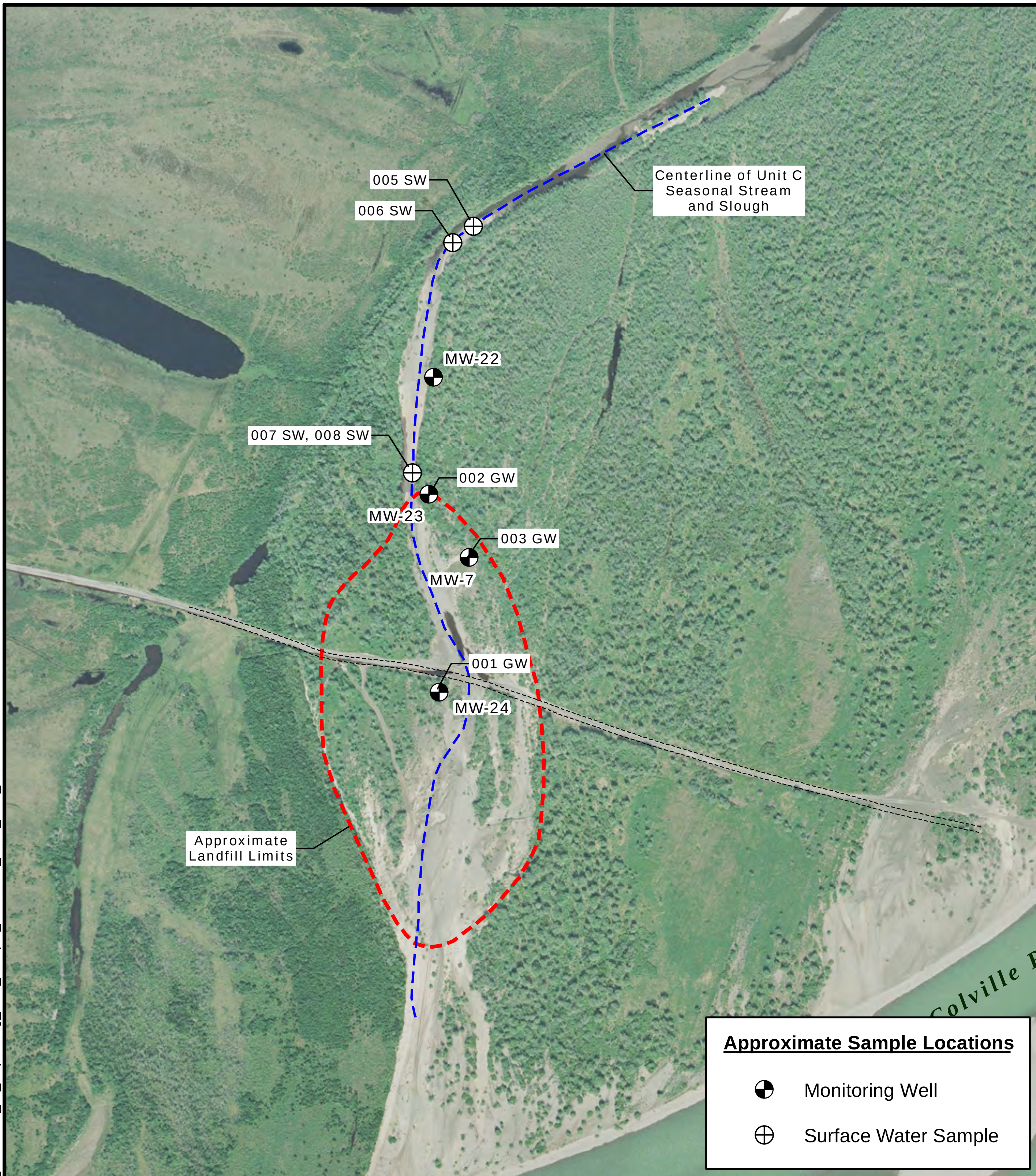

Sample and feature locations are approximate. Monitoring well locations are based on Shannon & Wilson, Inc site visit on June 15, 2010. Transect and feature locations and sample designations are based on Ecology and Environment, Inc.'s (E&E) Groundwater and Surface Water Sample Location Map, Former Umiat Air Force Station, Figure 3-2, dated December 14, 1999.

Aerial photography taken July 2009, produced by Kodiak Mapping, recieved from Alaska Department of Transportation and Public Facilities.

N

0 400 800

Scale in Feet

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SAMPLE LOCATIONS
1999 E&E FIELD INVESTIGATION

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FIG. 4-7

Filename: T:\Project\31-1\11544_Umiat\AV_mxd\Final_RI_Report\Fig_4-07_Sample_Locations_1999_E&E_FI.mxd Date: 3/8/2013 beo

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Information Related to 2001 Work by Jacobs Engineering Group, Inc.

Soil Sample

1 Areas identified by Jacobs Engineering Group, Inc. (see table below)

Background Information from E&E 1994 RI

Drums on Surface

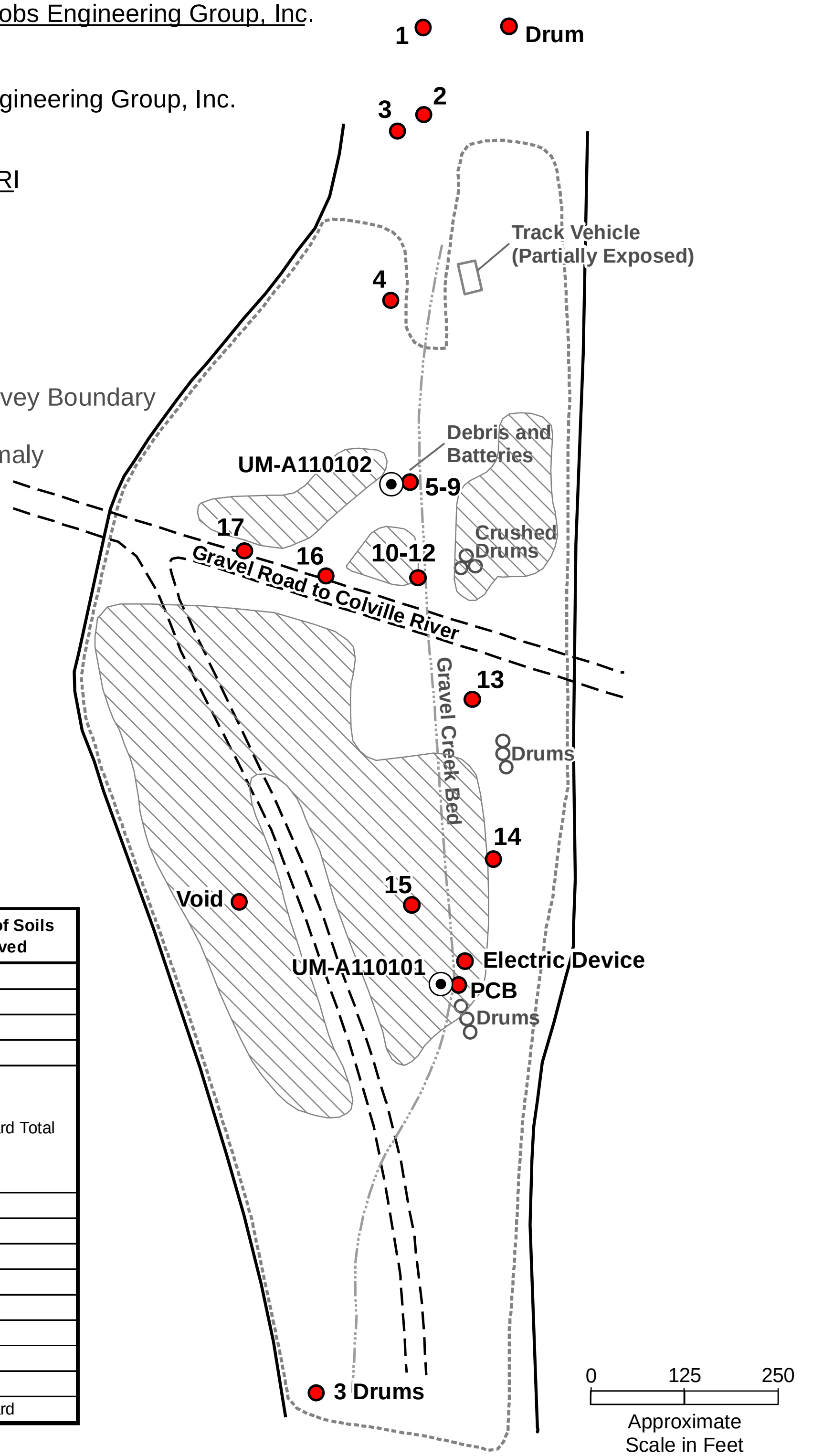
Gravel Creek Bed Boundary

Gravel Road

Seasonal Stream

Approximate Geophysical Survey Boundary

Subsurface Geophysical Anomaly



Area	Source	Amount of Soils Removed
1	Small Alkaline Battery	Battery Only
2	Small Alkaline Battery	Battery Only
3	Small Alkaline Battery	Battery Only
4	Small Alkaline Battery	Battery Only
5	Battery	1/3 Cubic Yard Total
6	Battery	
7	Battery	
8	Battery	
9	Debris from Broken Battery	
10	Small Alkaline Battery	Battery Only
11	Single Sheet of Lead	1 Shovel
12	Single Sheet of Lead	1 Shovel
13	Small Alkaline Battery	Battery Only
14	Small Alkaline Battery	Battery Only
15	Possible Lead Shielded Wire	Debris Only
16	Possible Lead Shielded Wire	Debris Only
17	Possible Lead Shielded Wire	Debris Only
PCB	Transformer	1/3 Cubic Yard

Figure re-created based on Jacobs Engineering Group, Inc. (Jacobs) Figure 2-1, dated September 26, 2001 and Ecology and Environment, Inc.'s (E&E) Draft Remedial Investigation (RI) Figure 3-5, dated December 20, 1993. Attempts to georeference features from Jacob's Figure 2-1 and E&E's Draft RI Figure 3-5 have not been successful without significant distortion. The positional accuracy of features shown here is unknown.

N

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SAMPLE LOCATIONS
2001 JACOBS REMOVAL ACTION

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FIG. 4-8

Filename: T:\Project\31-1\11544_Umiat\AV_mxd\Final_RI_Report\Fig_4-08_Sample_Locations_2001_Jacobs_Removal.mxd Date: 3/13/2013 beo

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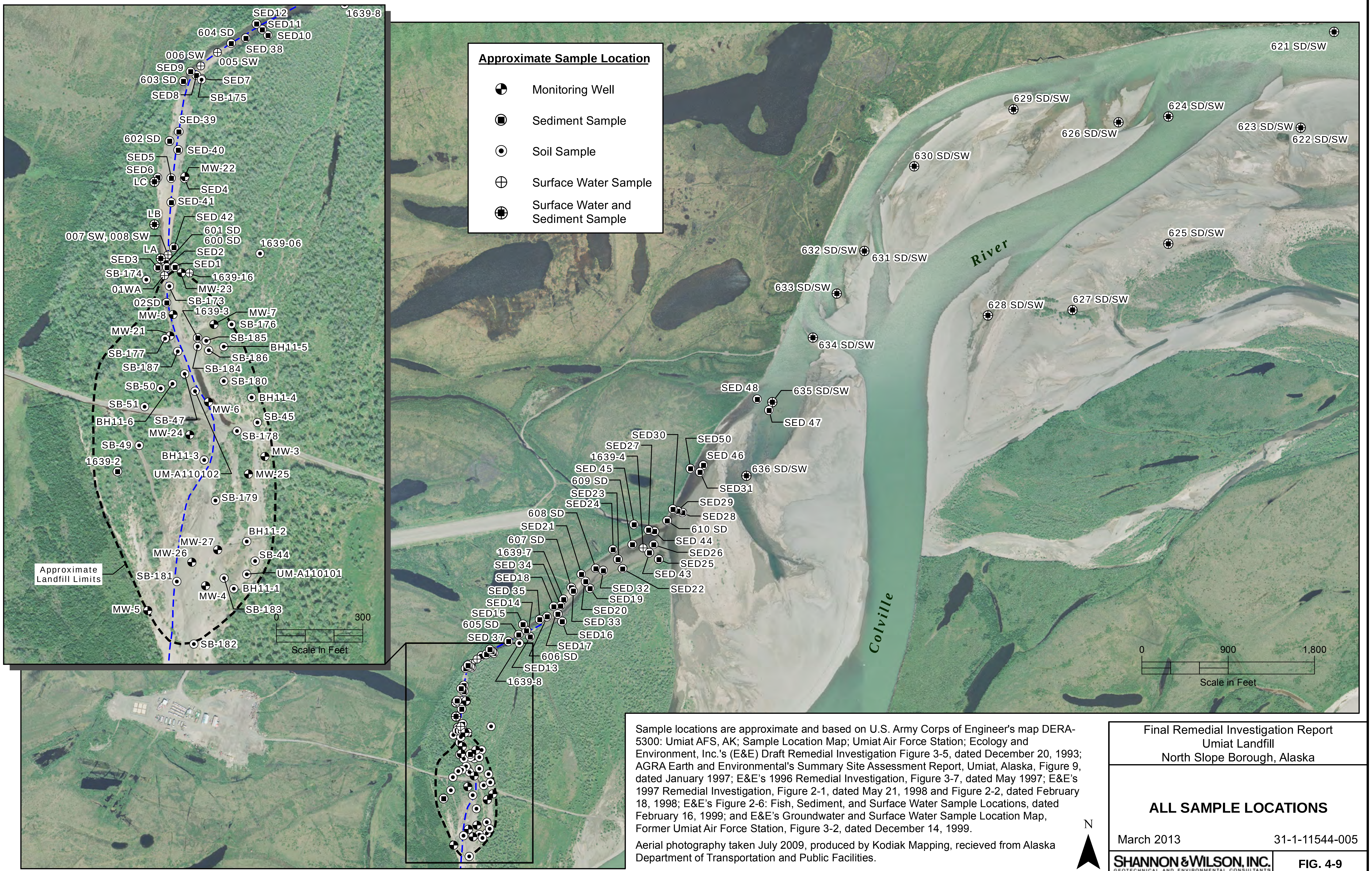

Sample locations are approximate and based on U.S. Army Corps of Engineer's map DERA-5300: Umiat AFS, AK; Sample Location Map; Umiat Air Force Station; Ecology and Environment, Inc.'s (E&E) Draft Remedial Investigation Figure 3-5, dated December 20, 1993; AGRA Earth and Environmental's Summary Site Assessment Report, Umiat, Alaska, Figure 9, dated January 1997; E&E's 1996 Remedial Investigation, Figure 3-7, dated May 1997; E&E's 1997 Remedial Investigation, Figure 2-1, dated May 21, 1998 and Figure 2-2, dated February 18, 1998; E&E's Figure 2-6: Fish, Sediment, and Surface Water Sample Locations, dated February 16, 1999; and E&E's Groundwater and Surface Water Sample Location Map, Former Umiat Air Force Station, Figure 3-2, dated December 14, 1999.

Aerial photography taken July 2009, produced by Kodiak Mapping, recieved from Alaska Department of Transportation and Public Facilities.

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ALL SAMPLE LOCATIONS

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FIG. 4-9

Filename: T:\Project\31-1\11544_Umiat\AV_mxd\Final_RI_Report\Fig_4-09_Sample_Locations_All.mxd Date: 3/13/2013 beo

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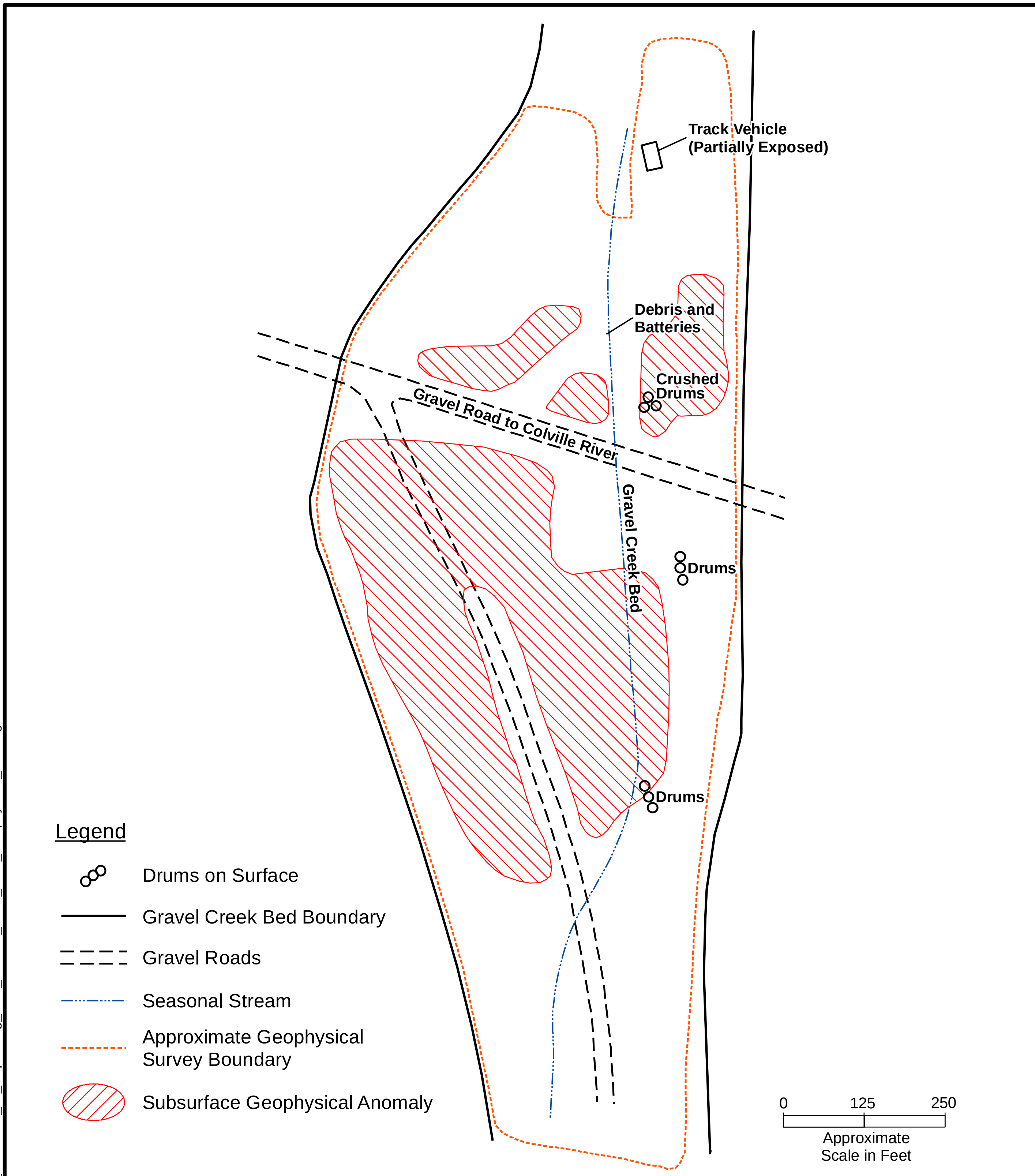

Map is based on Ecology and Environment, Inc.'s (E&E) Draft Remedial Investigation (RI) Figure 3-5, dated December 20, 1993. Attempts to georeference features from E&E's Draft RI Figure 3-5 have not been successful without significant distortion. The positional accuracy of features shown here is unknown.

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RESULTS OF 1994 E&E GEOPHYSICAL INVESTIGATION

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FIG. 4-10

Filename: T:\Project\31-1\11544_Umiat\AV_mxd\Final_RI_Report\Fig_4-10_Results_1994_E&E_Geophysical_Investigation.mxd Date: 3/8/2013 beo

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Major Waste Cells

Major waste cells based on USGS, 2006, Geophysical Investigations of Selected Infrastructure Sites within the National Petroleum Reserve, Alaska.

Aerial photography taken July 2009, produced by Kodiak Mapping, recieved from Alaska Department of Transportation & Public Facilities.

N

0 400 800
Scale in Feet

Final Remedial Investigation Report
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RESULTS OF 2005 USGS GEOPHYSICAL INVESTIGATION

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FIG. 4-11

Filename: T:\Project\31-1\11544_Umiat\AV_mxd\Final_RI_Report\Fig_4-11_Results_2005_USGS_Geophysical.mxd Date: 3/8/2013 beo

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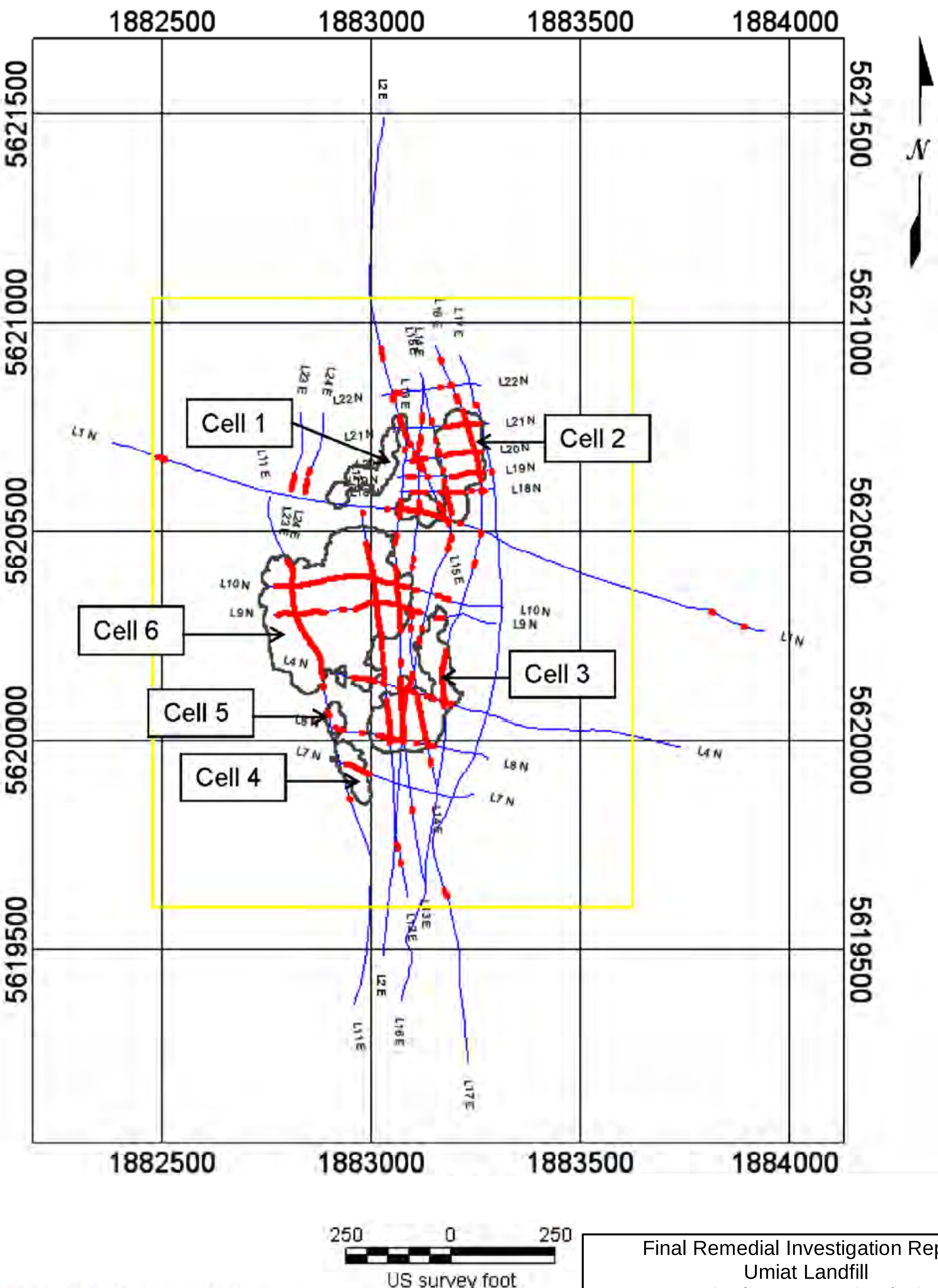

GPR / EM Profile Lines - 2011

EM Anomaly Extent - 2011

Debris Cell Outline - from USGS Report (2005)

Proposed Boundary of Data Acquisition (2011)

Figure from GeoTek Alaska, Inc.'s Figure 26: Marsh Creek, Umiat, Alaska, Geophysical Data Location, dated October 25, 2011.

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RESULTS OF 2011 GEOTEK GEOPHYSICAL INVESTIGATION

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GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 4-12

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5.0 METHODOLOGY FOR IDENTIFYING COPCS AND ESTIMATING CUMULATIVE RISK

Historic analytical results were evaluated and COPCs identified using two basic approaches. Soil, sediment, surface-water, and groundwater results were compared to potential cleanup levels (PCLs) from Alaska statutes (Table 5-1). Additionally, we compared the highest results for soil and sediment to one-tenth the Method Two Table B1 soil cleanup levels for the Arctic Zone, and surface-water and groundwater results to one-tenth the Table C groundwater cleanup levels, in accordance with the ADEC's 2008 *Cumulative Risk Guidance*. Fish-sample results were compared to calculated site-specific risk-based fish-screening levels (see Section 5.3).

Results are also presented in comparison to "to-be-considered" (TBC) criteria, namely the National Oceanic and Atmospheric Administration (NOAA) Screening and Quick Reference Table (SQuiRT) values. While TBCs don't hold the weight of regulation, they may be relevant for consideration by stakeholders or other interested parties reviewing the accumulated chemical data. The PCLs and risk-based screening levels used to identify COPCs are listed in Table 5-1, with the highest detected analyte concentrations for each media. Table F-1 (in Appendix F) lists PCL and TBC concentrations.

5.1 Soil and Sediment

Soil and sediment were considered in the same manner for purposes of comparing to PCLs and incorporating the results into the cumulative risk evaluation. Given that the landfill is within a hyporheic zone (the interface between groundwater and surface water) and is periodically flooded during spring snowmelt events, soil may be considered sediment and sediment considered soil depending on the time of year. For purposes of assessing the potential for exposure to contaminants, sediment is conservatively compared to soil PCLs and risk-based screening levels.

The primary soil/sediment PCLs are derived from 18 AAC 75, specifically Method Two cleanup levels for the Arctic Zone and migration to groundwater. Method Two cleanup levels are risk-based cleanup levels based on a cancer risk-management standard of 1 in 100,000 (1×10^{-5}) and a noncarcinogenic risk standard or HI of 1.0, set forth in 18 AAC 75.325(h). ADEC Method Two cleanup levels for the Arctic Zone are based on exposure frequency values of 200 days (160 days non-exposure time per year). The remaining exposure parameters used to develop Method Two cleanup levels are standardized default values developed by the EPA (ADEC, 2002). The exposure scenarios are essentially residential scenarios for children or adults involving exposure duration of six and 30 years, respectively.

Organic and inorganic analyte results were compared to the more stringent of the Method Two direct-contact and outdoor-air inhalation pathway Arctic-Zone cleanup levels and migration-to-groundwater cleanup levels. Method Two soil-cleanup levels are considered to be protective of human health with respect to the carcinogenic risk standard and non-carcinogenic HI for individual analytes in a residential setting under long-term exposure. Migration-to-groundwater soil-cleanup levels are considered protective of groundwater as a drinking-water source. Analytical results were also screened for potential contributions to cumulative risk by comparing the highest result to one-tenth the relevant human-health based cleanup level, or in the case of fish-tissue results, the calculated risk-based screening level (see Section 5.4).

Groundwater is present in the landfill area. The ADEC considers sites north of Latitude 68° North to be in the Arctic Zone, where groundwater is not typically considered an exposure medium of concern. It is assumed groundwater and surface water at Umiat are closely connected; during the summer, it is likely the majority of the groundwater in the landfill originates from surface water from the river, to re-emerge into the seasonal slough. Because of the close hydrologic connection between surface and groundwater at this site, the groundwater is protected for use as drinking water, and migration-to-groundwater soil cleanup levels apply.

For the same reason (interrelatedness of groundwater and surface water), suprapermafrost groundwater is considered a transport medium for contaminant migration from soil in the landfill to the adjacent slough.

The use of the Method Two cleanup levels is considered a conservative and protective screening tool to assess the need for actions at the site. Method Two soil-cleanup levels were used when appropriate for petroleum hydrocarbons (GRO, DRO, and RRO). The approval of Method Two cleanup levels in the Arctic Zone for petroleum hydrocarbons requires the responsible party to demonstrate levels will be protective of migration-to-surface water (18 AAC 75.340 [4][b]).

The NOAA SQuiRTs include medium-specific screening values for soil and sediment. Soil results were also compared to the NOAA SQuiRT values for soil, and sediment results compared to the NOAA SQuiRT values for freshwater sediment, using the most stringent screening criteria available for a given analyte. The SQuiRTs were developed for internal use by the Coastal Protection and Restoration Division of NOAA. The Division identifies potential impacts to coastal resources and habitats likely to be affected by hazardous waste sites. The SQuiRT values are TBCs intended for preliminary screening purposes only; they do not represent official NOAA policy and do not constitute cleanup levels.

The NOAA SQuiRTs' preface notes:

> This set of NOAA Screening Quick Reference Tables, or SQuiRTs, presents screening concentrations for inorganic and organic contaminants in various environmental media….NOAA identifies potential impacts to coastal resources and habitats likely to be affected by hazardous waste. To screen for substances which may threaten natural resources of concern to NOAA, environmental concentrations are compared to these screening levels. These tables are intended for preliminary screening purposes only. NOAA does not endorse their use for any other purposes.

SQuiRT data are not ARARs, as they have not been promulgated as laws or requirements. They were, however, included in the screening effort as TBC criteria that may be relevant for consideration by stakeholders or other interested parties reviewing accumulated chemical data.

5.2 Surface Water and Groundwater

As noted in Section 5.1, surface water and groundwater are closely connected hydrologically at the site. The landfill is, at certain times of the year, within the hyporheic zone of the seasonal stream. 18 AAC 75.345(f) requires, "groundwater that is closely connected hydrologically to nearby surface water may not cause a violation of the water quality standards in 18 AAC 70 for surface water or sediment." Likewise, surface water may not exceed Table C Groundwater cleanup levels, as surface water in Alaska is protected for all uses (including drinking water). Therefore, 18 AAC 75.345 Table C groundwater and 18 AAC 70 Water Quality Standards apply to both surface water and groundwater.

To screen water-sample data and identify COPCs, surface-water and groundwater-sample results were compared to the most stringent values (where available) of:

- 18 AAC 75.345 Table C groundwater cleanup levels;
- 18 AAC 70 Water Quality Standards (May 2011) for fresh-water uses; and
- *Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances* (December 2008), Water Quality Criteria for Toxics and Other Deleterious Substances (Aquatic Life Criteria for Fresh Water), which also includes criteria for pesticides and inorganic analytes.

The water-quality standards regulate human activities that result in alterations to waters within the state's jurisdiction. The water data were compared with standards provided for "Petroleum Hydrocarbons, Oils and Grease, for Fresh Water Uses." The water-quality standards further state surface waters and adjoining shorelines must be virtually free from floating oil, film, sheen, or discolorations.

The NOAA SQuiRTs include media-specific screening values for surface water and groundwater. Surface-water results were also compared to the NOAA SQuiRT values for freshwater, and groundwater results compared to the NOAA SQuiRT values for groundwater, using the most stringent screening criteria available for a given analyte. As noted in Section 5.1, SQuiRT values are not regulatory limits but were included in the screening effort as TBC criteria that may be relevant for consideration by stakeholders or other interested parties reviewing the accumulated chemical data.

5.3 Background Evaluation

Arsenic was detected in 21 soil samples at concentrations exceeding the ADEC migration-to-groundwater soil-cleanup level of 3.9 mg/kg. Aluminum was detected in one unfiltered water sample at 0.136 mg/L, above the ADEC water-quality standard of 0.087 mg/L. In both cases, the concentrations observed were fairly consistent across the data set and within the range of background-sample concentrations from the 1996 E&E RI.

In order to statistically compare site concentrations to background concentrations, we conducted a Wilcoxon-Mann-Whitney rank-sum site vs. background comparison using ProUCL 4.1, a statistical software package produced by the EPA. Tabulated data used for this comparison, as well as statistical output, is provided in Appendix G. While the background data sets were small, the conclusion (at a 95-percent confidence level) in each case was that the site concentrations were not significantly different than background concentrations. This finding for arsenic is consistent with our experience at numerous arctic sites where arsenic is present at uniformly high levels throughout the soil. Also, the aluminum result exceeding the WQS was from an unfiltered water sample; the corresponding filtered sample was well below the WQS, suggesting the high aluminum concentrations were due to disturbed natural sediment, not dissolved aluminum in the water column.

5.4 Fish Tissue

Fish tissue results were screened against risk-based screening levels calculated with the EPA “Regional Screening Levels for Chemical Contaminants at Superfund Sites” online calculator (see reference in Section 7.0), using a cancer-risk management level of 1 in 1,000,000 (1×10^{-6}), a hazard index of 0.1, and fish-consumption rates estimated for subsistence users (390 g/day; 2003 ATSDR citing ADFG 2000 Community Profile Database for Nuiqsut). Analytes exceeding risk-based screening levels were included in the cumulative risk evaluation and considered COPCs.

5.5 Cumulative-Risk Evaluation

Cumulative risk is defined as the sum of risks resulting from multiple sources and pathways to which humans are exposed. When applying Method Two cleanup levels to a site, 18 AAC 75.325(g) states risk from hazardous substances must not exceed a cumulative carcinogenic risk standard of 1 in 100,000, and a cumulative noncarcinogenic risk standard at a HI of 1.0 across all exposure pathways. Cumulative risk evaluation (CRE) is a means of determining whether the risk to human health from multiple contaminants at a given site exceed these risk standards, and is typically conducted following site cleanup. Given that multiple analytes were present at greater than one-tenth the Method Two cleanup levels, we conducted a CRE to assess baseline (pre-cleanup) cumulative risk at the site. The CRE will be used to help develop preliminary remediation goals that are protective of exposure to multiple contaminants as part of the FS.

Some chemicals may pose exposure risks through more than one pathway (e.g., PCBs in soil via direct contact and inhalation). When more than one exposure pathway was possible for a given analyte found at the site, each pathway was included in the CRE to evaluate the incremental risk associated with that contaminant and its exposure routes.

In accordance with the ADEC's 2008 *Cumulative Risk Guidance*, we compared the highest analytical results for soil/sediment to one-tenth the Method Two cleanup levels for the Arctic Zone, and maximum analytical results for water (surface water and groundwater) to one-tenth the Table C groundwater cleanup levels. As noted above, fish-sample results were compared to site-specific fish risk-based screening levels to determine which analytes to include in the CRE. Petroleum hydrocarbons (i.e. GRO, DRO, and RRO) and lead were not included in the CRE, in accordance with ADEC regulations and the *Cumulative Risk Guidance*.

Once analytes were selected for inclusion in the CRE, pathway-specific carcinogenic and non-carcinogenic risk was calculated for each analyte using the procedures specified in the ADEC's 2008 *Cumulative Risk Guidance*. Carcinogenic risk is calculated by dividing the highest site concentration by the RBC, then multiplying by the risk-management standard of $1x10^{-5}$. Non-carcinogenic risk is calculated by dividing the highest site concentration by the appropriate RBC and multiplying by the hazard index of 1.0. The CRE is included as Table 5-7.

Soil RBCs in the *Cumulative Risk Guidance* were used for calculating risk from soil and sediment, and groundwater RBCs (also listed in the *Guidance*) for calculating risk from surface water and groundwater. Fish-tissue RBCs were calculated using the EPA calculator referenced in Section 5.3 using a cancer risk-management level of $1x10^{-5}$, a hazard index of 1, and fish-consumption rates estimated for subsistence users (390 g/day). Certain analytes present risk through a limited number of exposure pathways (for example, inhalation of arsenic is not considered a potential exposure pathway); the CRE includes only those pathways for which an RBC is listed or calculable for a given analyte.

A list of COPCs, including the highest result and frequency of exceedance, are provided in Table 5-8. Arsenic and aluminum are not considered COPCs and were not included in the CRE as there were no statistically significant differences between project- and background-sample results.

In the draft RI, PRGs based solely on chemical-specific PCLs were presented, not accounting for cumulative risk from multiple contaminants. PRGs are typically presented during the FS phase of the RI/FS process. PRGs will be developed as part of the FS that will account for cumulative risk for contaminants for which cumulative risk is addressed. PRGs for petroleum hydrocarbons and lead will still be based solely on chemical-specific ARARs.

Applying cleanup levels and calculating cumulative risk based on residential exposure scenarios overestimates current, and potentially future, risks. There are no people residing at the site for 200 days in a year. The CRE calculations are based on readily available RBCs that assume residential exposure scenarios, and therefore overestimate the risk for the site. PRGs may be developed that take into account cumulative risk for site-specific exposure scenarios. The final CRE following site remediation or mitigations should be based on site-specific exposure scenarios to accurately re-evaluate cumulative risk for the Umiat landfill.

Table 5-1
Chemical-Specific PCLs and TBCs Used to Evaluate Analytical Results
and Identify Contaminants of Potential Concern

Medium	Chemical-Specific PCL	Chemical-Specific TBC
Soil	<u>Petroleum Hydrocarbons</u> • 18 AAC 75.341, Table B2, Over-40-inch Migration to Groundwater petroleum hydrocarbon soil-cleanup levels <u>Other</u> Most stringent of: • 18 AAC 75.341, Table B1, Arctic Zone Direct Contact soil-cleanup levels • 18 AAC 75.341, Table B1, Arctic Zone Outdoor Inhalation soil-cleanup levels • 18 AAC 75.341, Table B1, Migration to Groundwater soil-cleanup levels	• Most stringent NOAA SQuiRT value for soil.[1]
Sediment	<u>Petroleum Hydrocarbons</u> • 18 AAC 75.341, Table B2, Over-40-inch Migration to Groundwater petroleum hydrocarbon soil-cleanup levels <u>Other</u> Most stringent of: • 18 AAC 75.341, Table B1, Arctic Zone Direct Contact soil-cleanup levels • 18 AAC 75.341, Table B1, Arctic Zone Outdoor Inhalation soil-cleanup levels • 18 AAC 75.341, Table B1, Migration to Groundwater soil-cleanup levels	• Most stringent NOAA SQuiRT value for freshwater sediment.
Groundwater	More stringent of: • 18 AAC 75.345, Table C groundwater-cleanup levels • 18 AAC 70 Water Quality Standards including: Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances; most stringent criteria for fresh water	• Most stringent NOAA SQuiRT value for groundwater.
Surface Water	More stringent of: • 18 AAC 75.345, Table C groundwater-cleanup levels • 18 AAC 70 Water Quality Standards including: Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances; most stringent criteria for fresh water	• Most stringent NOAA SQuiRT value for fresh surface water.[2]
Fish Tissue	—	• EPA Fish Tissue Risk-Based Screening Levels, modified for site-specific consumption rates.[3] See Table F-1C for a full list of assumptions.

Notes:

[1] Soil SQuiRTs include values for: Invertebrates, Mammals, Plants, and Other

[2] Surface water SQuiRTs include: Acute and Chronic levels

[3] Fish consumption rate is 390 g/day, carcinogenic target risk is 10^{-6}, hazard index is 1

Abbreviations:

AAC Alaska Administrative Code
ADEC Alaska Department of Environmental Conservation
NOAA National Oceanic and Atmospheric Administration
PCL Potential cleanup level
SQuiRT Screening Quick Reference Table (NOAA 2008)
TBC To Be Considered criteria

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Table 5-2
Highest Detected Analyte and PQL Concentrations in Soil Samples

Analytical Method	Analyte	PCL	PCL Source	TBC	RBSL	Units	1994 E&E		1996 AGRA		1996 E&E		1997 E&E		2001 Jacobs	
							Result	[PQL]	Result	[PQL]	Result	[PQL]	Result	[PQL]	Result	[PQL]
AK 101	Gasoline range organics	260	OFMTG	—	—	mg/kg	—	—	—	—	19	[6.2]	—	—	—	—
	Toluene	6.5	MTG	0.01	22	mg/kg	—	—	—	—	0.5	[0.15]	—	—	—	—
	Xylenes (total)	63	MTG	0.1	6.3	mg/kg	—	—	—	—	0.22	[0.31]	—	—	—	—
AK 102	Diesel range organics	230	OFMTG	—	—	mg/kg	—	—	—	—	**1300**	[4.6]	14	[4.6]	—	—
AK M 8100	Diesel range organics	230	OFMTG	—	—	mg/kg	44	[13]	—	—	—	—	—	—	—	—
AK 103	Residual range organics	8,300	OFIG	—	—	mg/kg	—	—	—	—	4100	[120]	—	—	—	—
SW8260	Acetone	88	MTG	2.5	10,200	mg/kg	—	[0.05]	—	[2]	0.0199	[0.0519]	—	—	—	—
	Methylene chloride	0.016	MTG	0.4	24	mg/kg	**0.019**	[0.01]	—	[0.1]	0.0135	[0.00555]	—	—	—	—
	Toluene	6.5	MTG	0.01	22	mg/kg	0.008	[0.0062]	—	[0.1]	0.0045	[0.026]	—	—	—	—
	Xylenes (total)	63	MTG	0.1	6.3	mg/kg	0.005	[0.0062]	—	—	0.00859	[0.00619]	—	—	—	—
	m,p-Xylene	63	MTG	0.1	6.3	mg/kg	—	—	—	[0.1]	0.00572	[0.00619]	—	—	—	—
	o-Xylene	63	MTG	0.1		mg/kg	—	—	—	[0.1]	0.00288	[0.00619]	—	—	—	—
PAH SIM	2-Methylnaphthalene	6.1	MTG	3.24	38	mg/kg	—	—	0.024	[0.005]	—	—	—	—	—	—
	Benzo(b)fluoranthene	6.6	AZDC	59.8	0.66	mg/kg	—	—	0.01	[0.005]	—	—	—	—	—	—
	Benzo(g,h,i)perylene	1,900	AZDC	119	190	mg/kg	—	—	0.007	[0.005]	—	—	—	—	—	—
	Chrysene	360	MTG	4.73	66	mg/kg	—	—	0.017	[0.005]	—	—	—	—	—	—
	Dibenzofuran	11	MTG	—	27	mg/kg	—	—	0.007	[0.005]	—	—	—	—	—	—
	Naphthalene	20	MTG	0.0994	4.2	mg/kg	—	—	0.014	[0.005]	—	—	—	—	—	—
	Phenanthrene	3,000	MTG	45.7	2,780	mg/kg	—	—	0.039	[0.005]	—	—	—	—	—	—
	Pyrene	1,000	MTG	78.5	190	mg/kg	—	—	0.005	[0.005]	—	—	—	—	—	—
SW8270	2-Methylnaphthalene	6.1	MTG	3.24	38	mg/kg	—	—	—	—	0.0753	[3.43]	—	—	—	—
	Benzoic acid	410	MTG	—	42,800	mg/kg	—	—	—	—	0.0585	[17.1]	—	—	—	—
	bis(2-Ethylhexyl)phthalate	13	MTG	0.1	30	mg/kg	—	—	—	—	0.118	[3.43]	—	—	—	—
	Di-n-octyl phthalate	3,800	MTG	0.1	420	mg/kg	—	—	—	—	0.159	[3.43]	—	—	—	—
	Phenanthrene	3,000	MTG	45.7	2,780	mg/kg	—	—	—	—	0.0691	[3.43]	—	—	—	—
	Pyrene	1,000	MTG	78.5	190	mg/kg	—	—	—	—	0.616	[0.409]	—	—	—	—
SW8080 Series	4,4'-DDD	7.2	MTG	0.01	4.1	mg/kg	0.026	[0.1]	—	—	**31.4**	[0.00231]	0.0059	[0.0037]	—	—
	4,4'-DDE	5.1	MTG	0.01	2.9	mg/kg	—	[0.1]	—	—	0.00062	**[4.15]**	—	—	—	—
	4,4'-DDT	7.3	MTG	0.01	2.9	mg/kg	0.05	[0.01]	—	—	**38.2**	[0.00579]	0.0065	[0.0037]	—	—
	Aroclor 1254	1	AZDC	0.00033	0.1	mg/kg	—	[0.105]	—	—	0.224	**[41.5]**	—	—	**2.3**	[0.11]

Table 5-2
Highest Detected Analyte and PQL Concentrations in Soil Samples

Analytical Method	Analyte	PCL	PCL Source	TBC	RBSL	Units	1994 E&E		1996 AGRA		1996 E&E		1997 E&E		2001 Jacobs	
							Result	[PQL]	Result	[PQL]	Result	[PQL]	Result	[PQL]	Result	[PQL]
SW6000/ 7000 Series	Aluminum	—	—	50	—	mg/kg	—	—	—	—	9,280	—	—	—	—	—
	Antimony	3.6	MTG	0.142	5.5	mg/kg	—	—	—	—	0.95	**[7.1]**	—	—	—	—
	Arsenic	3.9	MTG	5.7	0.61	mg/kg	**7**	—	**8**	**[1]**	**8.4**	—	—	—	—	—
	Barium	1100	MTG	1.04	2,740	mg/kg	430	—	—	—	552	—	—	—	—	—
	Beryllium	42	MTG	1.06	27	mg/kg	—	—	—	—	0.37	—	—	—	—	—
	Calcium	—	—	—	—	mg/kg	—	—	—	—	4,290	—	—	—	—	—
	Chromium	25	MTG	—	41	mg/kg	23	—	—	—	19.2	—	—	—	—	—
	Cobalt	—	—	0.14	—	mg/kg	—	—	—	—	13.8	—	—	—	—	—
	Copper	460	MTG	5.4	550	mg/kg	—	—	—	—	31.4	—	—	—	—	—
	Iron	—	—	200	—	mg/kg	—	—	—	—	27,800	—	—	—	—	—
	Lead	400	AZDC	0.0537	—	mg/kg	10	—	—	[20]	**598**	—	—	—	**1170**	[18.7]
	Magnesium	—	—	—	—	mg/kg	—	—	—	—	5170	—	—	—	—	—
	Manganese	—	—	100	—	mg/kg	—	—	—	—	805	—	—	—	—	—
	Mercury	1.4	MTG	0.1	2.6	mg/kg	—	[0.2]	—	—	0.06	[0.02]	—	—	—	—
	Nickel	86	MTG	13.6	270	mg/kg	—	—	—	—	38.5	—	—	—	—	—
	Potassium	—	—	—	—	mg/kg	—	—	—	—	912	—	—	—	—	—
	Selenium	3.4	MTG	0.52	68	mg/kg	3	[1]	—	—	0.45	[0.5]	—	—	—	—
	Sodium	—	—	—	—	mg/kg	—	—	—	—	61.4	[85.5]	—	—	—	—
	Vanadium	960	AZDC	1.59	96	mg/kg	—	—	—	—	30.7	—	—	—	—	—
	Zinc	4100	MTG	6.62	4,110	mg/kg	—	—	—	—	121	—	—	—	—	—

Notes:

mg/kg	milligrams per kilogram
PCL	Potential cleanup level
TBC	To Be Considered, non-promulgated advisories, guidance, or proposed standards
RBSL	Risk-based screening level (Hazard Quotient = 0.1 or Cancer Risk = 10^{-6}) - more stringent of Direct Contact or Inhalation Pathways for the Arctic Zone
PQL	practical quantitation limit (also known as reporting limit)
bold	result or PQL exceeds the ARAR
shaded	result exceeds the RBSL, and analyte is included in the CRE (Table 6-2)
—	not applicable, analysis not performed, or ARAR/TBC/RBSL does not exist
AZDC	18 AAC 75.341 (April 2012) - Method Two Tables B1 and B2 Soil Cleanup Levels: Arctic Zone Direct Contact
MTG	18 AAC 75.341 (April 2012) - Method Two Tables B1 and B2 Soil Cleanup Levels: Migration to Groundwater
OFIG	18 AAC 75.341 (April 2012) - Method Two Tables B1 and B2 Soil Cleanup Levels: Over 40 Inch Zone, Ingestion
OFMTG	18 AAC 75.341 (April 2012) - Method Two Tables B1 and B2 Soil Cleanup Levels: Over 40 Inch Zone, Migration to Groundwater

Results and PQLs listed where available from tabulated results in historic remedial investigations; data flags not listed, see Appendix F tables for data flags.

Table 5-3
Highest Detected Analyte and PQL Concentrations in Sediment Samples

Analytical Method	Analyte	PCL	PCL Source	TBC	RBSL	Units	1986 USACE		1996 AGRA		1996 E&E		1997 E&E		1998 E&E	
							Result	[PQL]	Result	[PQL]	Result	[PQL]	Result	[PQL]	Result	[PQL]
AK 102	Diesel range organics	230	OFMTG	—	—	mg/kg	10	—	—	—	—	—	—	—	54	[3.1]
AK 103	Residual range organics	8300	OFIG	—	—	mg/kg	—	—	—	—	48	[50]	—	—	—	—
SW8260	2-Butanone	59	MTG	89.6	2,330	mg/kg	—	—	—	—	0.0118	[0.0125]	—	—	0.012	[0.0055]
	Acetone	88	MTG	2.5	10,200	mg/kg	—	—	—	—	0.0443	—	—	—	0.13	[0.0052]
	Methylene chloride	0.016	MTG	0.4	24	mg/kg	—	—	—	—	0.00267	0.00629	—	—	—	[0.00093]
	2-Methylnaphthalene	6.1	MTG	3.24	38	mg/kg	—	[0.04]	—	—	0.0523	[0.41]	—	—	—	[0.33]
	bis(2-Ethylhexyl)phthalate	13	MTG	0.1	30	mg/kg	—	[0.04]	—	—	0.135	[0.385]	—	—	—	[0.43]
PAH SIM	2-Methylnaphthalene	6.1	MTG	3.24	38	mg/kg	—	—	0.075	[0.005]	—	—	—	—	—	—
	Benzo(b)fluoranthene	6.6	AZDC	59.8	0.66	mg/kg	—	—	0.011	[0.005]	—	—	—	—	—	—
	Benzo(g,h,i)perylene	1900	AZDC	119	190	mg/kg	—	—	0.008	[0.005]	—	—	—	—	—	—
	Chrysene	360	MTG	4.73	66	mg/kg	—	—	0.019	[0.005]	—	—	—	—	—	—
	Dibenzofuran	11	MTG	—	27	mg/kg	—	—	0.021	[0.005]	—	—	—	—	—	—
	Fluoranthene	1400	MTG	122	250	mg/kg	—	—	0.009	[0.005]	—	—	—	—	—	—
	Naphthalene	20	MTG	0.0994	4.2	mg/kg	—	—	0.042	[0.005]	—	—	—	—	—	—
	Phenanthrene	3000	MTG	45.7	2,780	mg/kg	—	—	0.075	[0.005]	—	—	—	—	—	—
	Pyrene	1000	MTG	78.5	190	mg/kg	—	—	0.008	[0.005]	—	—	—	—	—	—
SW8080 Series	4,4'-DDD	7.2	MTG	0.01	4.1	mg/kg	0.65	—	—	[0.01]	0.00838	[0.124]	—	—	0.054	[0.0021]
	4,4'-DDT	7.3	MTG	0.01	2.9	mg/kg	—	[0.043]	—	[0.01]	0.0325	[0.311]	—	—	0.059	[0.0025]
	Aroclor 1254	1	AZDC	0.00033	0.1	mg/kg	0.68	—	0.3	[0.1]	**17.8**	—	**1.3**	[0.059]	—	[0.0098]

Table 5-3
Highest Detected Analyte and PQL Concentrations in Sediment Samples

Analytical Method	Analyte	PCL	PCL Source	TBC	RBSL	Units	1986 USACE		1996 AGRA		1996 E&E		1997 E&E		1998 E&E	
							Result	[PQL]	Result	[PQL]	Result	[PQL]	Result	[PQL]	Result	[PQL]
SW6000/ 7000 Series	Aluminum	—	—	50	—	mg/kg	—	—	—	—	6250	—	—	—	—	—
	Arsenic	3.9	MTG	5.7	0.61	mg/kg	—	—	**7**	[1]	**5**	—	—	—	—	—
	Barium	1100	MTG	1.04	2,740	mg/kg	—	—	—	—	309	—	—	—	—	—
	Beryllium	42	MTG	1.06	27	mg/kg	—	—	—	—	0.22	—	—	—	—	—
	Calcium	—	—	—	—	mg/kg	—	—	—	—	2030	—	—	—	—	—
	Chromium	25	MTG	—	41	mg/kg	—	—	—	—	12.1	—	—	—	—	—
	Cobalt	—	—	0.14	—	mg/kg	—	—	—	—	8.7	—	—	—	—	—
	Copper	460	MTG	5.4	550	mg/kg	—	—	—	—	19.4	—	—	—	—	—
	Iron	—	—	200	—	mg/kg	—	—	—	—	18,800	—	—	—	—	—
	Lead	400	AZDC	0.0537	—	mg/kg	—	—	22	[20]	9.7	—	—	—	—	—
	Magnesium	—	—	—	—	mg/kg	—	—	—	—	3270	—	—	—	—	—
	Manganese	—	—	100	—	mg/kg	—	—	—	—	608	—	—	—	—	—
	Mercury	1.4	MTG	0.1	2.6	mg/kg	—	—	—	—	0.05	[0.02]	—	—	—	—
	Nickel	86	MTG	13.6	270	mg/kg	—	—	—	—	25	—	—	—	—	—
	Potassium	—	—	—	—	mg/kg	—	—	—	—	695	—	—	—	—	—
	Sodium	—	—	—	—	mg/kg	—	—	—	—	64.3	[95.4]	—	—	—	—
	Vanadium	960	AZDC	1.59	96	mg/kg	—	—	—	—	19.5	—	—	—	—	—
	Zinc	4100	MTG	6.62	4,110	mg/kg	—	—	—	—	164	—	—	—	—	—

Notes:

mg/kg milligrams per kilogram
PCL Potential cleanup level
TBC To Be Considered, non-promulgated advisories, guidance, or proposed standards
RBSL Risk-based screening level (Hazard Quotient = 0.1 or Cancer Risk = 10^{-6}) - more stringent of Direct Contact or Inhalation Pathways for the Arctic Zone
PQL practical quantitation limit (also known as reporting limit)
bold result or PQL exceeds the ARAR
shaded result exceeds the RBSL, and analyte is included in the CRE (Table 6-2)
— not applicable, analysis not performed, or ARAR/TBC/RBSL does not exist
AZDC 18 AAC 75.341 (April 2012) - Method Two Tables B1 and B2 Soil Cleanup Levels: Arctic Zone Direct Contact
MTG 18 AAC 75.341 (April 2012) - Method Two Tables B1 and B2 Soil Cleanup Levels: Migration to Groundwater
OFIG 18 AAC 75.341 (April 2012) - Method Two Tables B1 and B2 Soil Cleanup Levels: Over 40 Inch Zone, Ingestion
OFMTG 18 AAC 75.341 (April 2012) - Method Two Tables B1 and B2 Soil Cleanup Levels: Over 40 Inch Zone, Migration to Groundwater
Results and PQLs listed where available from tabulated results in historic remedial investigations; data flags not listed, see Appendix F tables for data flags.

Table 5-4
Highest Detected Analyte and PQL Concentrations in Surface-Water Samples

Analytical Method	Analyte	PCL	PCL Source	TBC	RBSL	Units	1986 USACE		1996 AGRA		1996 E&E		1998 E&E		1999 E&E	
							Result	[PQL]	Result	[PQL]	Result	[PQL]	Result	[PQL]	Result	[PQL]
AK 102	Diesel range organics	1.5	C	—	—	mg/L			—	—	—	—	—	[0.12]	0.123	—
SW8080 Series	4,4'-DDT	1E-06	A	5E-07	0.00025	mg/L	**0.0003**	—	—	—	—	—	—	—	—	—
SW6000/ 7000 Series	Aluminum	0.087	A	0.087	—	mg/L			—	—	**0.136**	[0.0239]	—	—	—	—
	Barium	2	C	0.0039	0.2	mg/L			—	—	0.192	—	—	—	—	—
	Calcium	—	—	—	—	mg/L			—	—	20.6	—	—	—	—	—
	Iron	1	A	1	—	mg/L			—	—	0.39	[0.0053]	—	—	—	—
	Lead	0.001	A[4]	0.0025	—	mg/L			—	**[0.002]**	**0.003**	**[0.0028]**	—	—	—	—
	Magnesium	—	—	—	—	mg/L			—	—	8.2	—	—	—	—	—
	Manganese	0.05	A	0.08	—	mg/L			—	—	0.0355	—	—	—	—	—
	Potassium	—	—	373	—	mg/L			—	—	1.1	—	—	—	—	—
	Sodium	—	—	—	—	mg/L			—	—	1.93	—	—	—	—	—
	Zinc	0.07	A[4]	0.12	0.5	mg/L			—	—	0.0206	[0.0038]	—	—	—	—
SW8260	Acetone	33	C	1.5	3.3	mg/L			—	[0.02]	0.00135	[0.010]	—	[0.0050]	—	—
	Toluene	1	C	0.0098	0.1	mg/L			—	[0.001]	—	—	0.0010	[0.00013]	—	—

Notes:

mg/L	milligrams per liter
PCL	Potential cleanup level
TBC	To Be Considered, non-promulgated advisories, guidance, or proposed standards
A	ARAR - 18 AAC 70.020 - Alaska Water Quality Criteria Manual (December 2008) - Fresh Water, most stringent criteria
A4	18 AAC 70.020 - Alaska Water Quality Criteria Manual (December 2008) - Hardness Dependant Water Quality - Reference Appendix A
C	18 AAC 75.345 (April 2012) - Table C Groundwater Cleanup Levels
[4]	ARAR is hardness dependent; a hardness value of 50 mg/L was assumed for calculations.
PQL	practical quantitation limit (also known as reporting limit)
bold	result or PQL exceeds the ARAR
shaded	result exceeds the RBSL, and analyte is included in the CRE (Table 6-2)
—	not applicable, analysis not performed, or ARAR/TBC/RBSL does not exist
RBSL	Risk-based screening level (Hazard Quotient = 0.1 or Cancer Risk = 10^{-6}) - more stringent of Direct Contact or Inhalation Pathways for the Arctic Zone

Results and PQLs listed where available from tabulated results in historic remedial investigations; data flags not listed, see Appendix F tables for data flags.

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Table 5-5
Highest Detected Analyte and PQL Concentrations in Groundwater Samples

Analytical Method	Analyte	PCL	PCL Source	TBC	RBSL	Units	1996 E&E Result	1996 E&E [PQL]	1997 E&E Result	1997 E&E [PQL]	1998 E&E Result	1998 E&E [PQL]	1999 E&E Result	1999 E&E [PQL]
AK 101	Gasoline range organics	2.2	C	—	—	mg/L	0.761	[0.100]	—	—	—	—	—	—
AK 102	Diesel range organics	1.5	C	—	—	mg/L	**76.1**	—	0.73	[0.27]	0.15	[0.11]	0.107	[0.105]
SW8260	Acetone	33	C	—	3.3	mg/L	0.00183	—	—	—	—	—	—	—
	2-Butanone	22	C	6	2.2	mg/L	0.00612	—	—	—	—	—	—	—
SW8310	Anthracene	9.6	A	7E-07	1.1	mg/L	0.00110	—	—	—	—	—	—	—
	Fluorene	1.3	A	—	0.15	mg/L	0.00532	—	—	—	—	—	—	—
	Naphthalene	0.73	C	0.00001	0.073	mg/L	0.350	—	—	—	—	—	—	—
	Phenanthrene	11	C	0.000003	1.1	mg/L	0.00417	—	—	—	—	—	—	—
SW8080 Series	4,4'-DDD	0.0035	C	0.000004	0.00035	mg/L	**0.0173**	—	—	[0.0010]	—	**[0.0071]**	—	**[0.0530]**
	4,4'-DDT	0.000001	A	0.000004	0.00025	mg/L	**0.0311**	—	—	**[0.0010]**	—	**[0.0087]**	—	**[0.0530]**

Notes:

mg/L	milligrams per liter
PCL	Potential cleanup level
TBC	To Be Considered, non-promulgated advisories, guidance, or proposed standards
A	18 AAC 70.020 - Alaska Water Quality Criteria Manual (December 2008) - Fresh Water, most stringent criteria
C	18 AAC 75.345 (April 2012) - Table C Groundwater Cleanup Levels
PQL	practical quantitation limit (also known as reporting limit)
bold	result or PQL exceeds the ARAR
shaded	result exceeds the RBSL, and analyte is included in the CRE (Table 6-2)
—	not applicable, analysis not performed, or ARAR/TBC/RBSL does not exist
RBSL	Risk-based screening level (Hazard Quotient = 0.1 or Cancer Risk = 10^{-6}) - more stringent of Direct Contact or Inhalation Pathways for the Arctic Zone

Results and PQLs listed where available from tabulated results in historic remedial investigations; data flags not listed, see Appendix F tables for data flags.

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Table 5-6
Highest Detected Analyte and PQL Concentrations in Fish-Tissue Samples

Analytical Method	Analyte	RBSL	Source	Units	1997 E&E		1998 E&E	
					Result	[PQL]	Result	[PQL]
SW8080 Series	Aroclor 1254	0.218	F	µg/kg	**1400**	**[10]**	**870**	**[26]**
	Aroclor 1260	0.218	F	µg/kg	—	**[10]**	**190**	**[12]**
	4,4'-DDD	1.82	F	µg/kg	—	—	**480**	[0.57]
	4,4'-DDE	1.28	F	µg/kg	—	—	**740**	[0.75]
	4,4'-DDT	1.28	F	µg/kg	—	—	**79**	[0.06]
	2,4'-DDD	—	—	µg/kg	—	—	62	[0.11]
	2,4'-DDE	—	—	µg/kg	—	—	15	[0.05]
	Aroclor 1016/1242	0.218†	F	µg/kg	—	—	**6.1**	**[3.5]**

Notes:

µg/kg micrograms per kilogram

F EPA Region 3 Fish Tissue Risk-Based Screening Levels with a target hazard quotient of 0.1 and cancer risk of 1.0E-06, modified for site-specific consumption rates. See Table F-1c for a full list of assumptions.

PQL Practical Quantitation Limit

bold result or PQL exceeds the RBSL

shaded result exceeds the RBSL, and analyte is included in the CRE (Table 6-2)

— not applicable, analysis not performed, or RBSL does not exist

† more stringent RBSL of individual Aroclors listed

Results and PQLs listed where available from tabulated results in historic remedial investigations; data flags not listed, see Appendix F tables for data flags.

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Table 5-7
Cumulative Risk Evaluation

COPC	Highest Detected Site Concentration	RBC[2,6]	Units	Site Concentration/RBC	Risk at Site Concentration [3,4]
Carcinogens; Soil/Sediment; Direct contact pathway[1]					
Aroclor 1254	17.8	3.8	mg/kg	4.68E+00	4.7E-05
4,4'-DDT	38.2	29	mg/kg	1.32E+00	1.3E-05
4,4'-DDE	0.00062	29	mg/kg	2.14E-05	2.1E-10
4,4'-DDD	31.4	41	mg/kg	7.66E-01	7.7E-06
				Total	**6.8E-05**
Carcinogens; Soil/Sediment; Inhalation pathway[1]					
Aroclor 1254	17.8	25	mg/kg	7.12E-01	7.1E-06
4,4'-DDT	38.2	2200	mg/kg	1.74E-02	1.7E-07
Naphthalene	0.042	42	mg/kg	1.00E-03	1.0E-08
				Total	**7.3E-06**
Carcinogens; Groundwater/Surface Water[1]					
4,4'-DDT	0.0311	0.0025	mg/L	1.24E+01	1.2E-04
4,4'-DDD	0.0173	0.0035	mg/L	4.94E+00	4.9E-05
				Total	**1.7E-04**
Carcinogens; Fish Tissue[1]					
Aroclor 1254	1.4	0.00218	mg/kg	6.42E+02	6.4E-03
Aroclor 1260	0.19	0.00218	mg/kg	8.72E+01	8.7E-04
Aroclor 1016/1242[7]	0.0061	0.00218	mg/kg	2.80E+00	2.8E-05
4,4'-DDT	0.079	0.0128	mg/kg	6.17E+00	6.2E-05
4,4'-DDE	0.74	0.0128	mg/kg	5.78E+01	5.8E-04
4,4'-DDD	0.48	0.0182	mg/kg	2.64E+01	2.6E-04
				Total	**8.2E-03**
				Carcinogenic Cumulative Risk	**8E-03**

Table 5-7
Cumulative Risk Evaluation

COPC	Highest Detected Site Concentration	RBC[2,6]	Units	Site Concentration/RBC	Risk at Site Concentration [3,4]
Non-carcinogens; Soil/Sediment; Direct contact pathway[1]					
4,4'-DDT	38.2	61	mg/kg	6.26E-01	6.3E-01
4,4'-DDD	31.4	240	mg/kg	1.31E-01	1.3E-01
Naphthalene	0.042	1900	mg/kg	2.21E-05	2.2E-05
				Total	**7.6E-01**
Non-carcinogens; Soil/Sediment; Inhalation pathway[1]					
Naphthalene	0.042	180	mg/kg	2.33E-04	2.3E-04
				Total	**2.3E-04**
Non-carcinogens; Groundwater/Surface Water[1]					
4,4'-DDT	0.0311	0.018	mg/L	1.73E+00	1.7E+00
4,4'-DDD	0.0173	0.073	mg/L	2.37E-01	2.4E-01
Naphthalene	0.350	0.73	mg/L	4.79E-01	4.8E-01
				Total	**2.4E+00**
Non-carcinogens; Fish Tissue[1]					
Aroclor 1254	1.4	3.74	mg/kg	3.74E-01	3.7E-01
Aroclor 1016/1242[7]	0.0061	13.1	mg/kg	4.66E-04	4.7E-04
4,4'-DDD	0.48	93.6	mg/kg	5.13E-03	5.1E-03
				Total	**3.8E-01**
				Non-carcinogenic Cumulative Risk	**3.6**

Notes:

[1] Methodology and risk-based concentration (RBC) followed Cumulative Risk Guidance (ADEC 2008)

[2] RBC is for Arctic Zone; data from Cumulative Risk Guidance (ADEC 2008)

[3] Risk at site concentration = (site concentration/RBC) x 10^{-5}

[4] Carcinogenic cumulative risk and cumulative Hazard Index are rounded to one significant figure; individual carcinogenic risks and hazard indices are rounded to two significant figures (ADEC 2008, page 11)

[5] HQ at site concentration = (site concentration/RBC) x 1

[6] RBC for more stringent Aroclor used for Aroclor 1016/1242

Abbreviations:

COPC	Contaminant of Potential Concern
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
HI	Hazard Index for noncarcinogenic risk
HQ	Hazard Quotient for noncarcinogenic risk
RBC	risk-based concentration

Conclusions:

- **Calculated carcinogenic cumulative risk exceeds screening criterion (1 x 10^{-5}) for soil.**
- **Calculated risk exceeds noncarcinogenic Hazard Index screening criterion (1) for soil.**

Note: In accordance with the ADEC Cumulative Risk Guidance (June 9, 2008), DRO and lead are not included in the CRE.

Table 5-8
Summary of Contaminants of Potential Concern

Contaminant of Potential Concern	Affected media	Date and media of highest-concentration sample	Highest Concentration (No. of Samples Exceeding PCL or RBSL out of Total Samples*)	COPC Basis	
				PCL Exceeded	Substantial contribution to cumulative risk
Diesel Range Organics	Soil & sediment	1996; SL	1,300 mg/kg (2/70)	✓	
	Surface water & groundwater	1996; GW	76.1 mg/L (2/46)	✓	
Naphthalene	Surface water & groundwater	1996; GW	0.350 mg/L (1/29)		✓
Methylene Chloride	Soil & sediment	1994; SL	0.019 mg/kg (1/58)	✓	
4,4'-DDD	Soil & sediment	1996; SL	31.4 mg/kg (2/81)	✓	✓
	Surface water & groundwater	1996; GW	0.0173 mg/L (1/51)	✓	✓
	Fish	1998; FT	0.480 mg/kg (8/29)		✓
4,4'-DDE	Fish	1998; FT	0.740 mg/kg (10/29)		✓
4,4'-DDT	Soil & sediment	1996; SL	38.2 mg/kg (2/81)	✓	✓
	Surface water & groundwater	1996; GW	0.0311 mg/L (3/51)	✓	
	Fish	1998; FT	0.079 mg/kg (7/29)		✓
Aroclor 1254	Soil & sediment	1996; SD	17.8 mg/kg (33/112)	✓	✓
	Fish	1997; FT	1.4 mg/kg (35/49)		✓
Aroclor 1260	Fish	1998; FT	0.190 mg/kg (22/49)		✓
Aroclor 1016/1242	Fish	1998; FT	0.0061 mg/kg (3/49)		✓
Lead	Soil & sediment	2001; SL	1,170 mg/kg (2/46)	✓	
	Surface water & groundwater	1996; SW	0.003 mg/L (2/12)	✓	

Notes:

Media considered affected where the COPC was detected above PCLs or RBSLs

mg/kg milligrams per kilogram
mg/L milligrams per liter
SL soil
SD sediment
SW surface water
GW groundwater
FT fish tissue
* Total number of samples analyzed for COPC; includes QA/QC duplicates/triplicates; does not include background samples

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6.0 DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

This section includes a discussion of the nature and extent of contamination, potential migration pathways, potential risks, and recommendations.

6.1 Nature and Extent of Contamination

The highest levels of analytes detected in the soil, sediment, surface-water, groundwater and fish-tissue samples in the sampling events are summarized in the previous section, Tables 5-2 through 5-6. The following sections summarize the results in the context of PCLs and risk-based screening levels (RBSLs), and draw conclusions regarding the nature and extent of contamination in various media at the site. Figure 6-1 depicts sample locations that exceed PCLs for one or more COPC.

6.1.1 Buried Debris

Debris that may have been buried at the Umiat landfill during site-demolition activities in 1973 includes demolition wastes, drums, and heavy equipment. Types of debris observed on the surface include 55-gallon drums, oil drums, lead-acid batteries, transformers, cable, pipe, and equipment tracks. Examples of these materials are shown in photographs in Appendix C. We assume wastes remaining in the landfill consist of a heterogeneous mix of inert solid waste, potentially contaminated soil, and potential contaminant sources such as drums and other containers, batteries, and transformers.

The presence of permafrost would have limited the possible depth of excavation and waste burial at the landfill. The 1997 RI soil borings measured the active layer to be between 5.5 feet and 17.5 feet bgs in the landfill area. The active layer refers to ground that freezes in winter and thaws during summer, the base of which usually coincides with the top of permafrost.

The USGS geophysical investigation estimated the horizontal extent of buried debris to be about 5.5 acres. If the areas between cells are included, the overall extent is about 8 acres. This estimate is generally confirmed by other geophysical investigations.

The geophysical investigation during the 1994 E&E RI estimated the landfill depth to be about 9 feet bgs, and potentially as deep as 18 feet bgs. The USGS estimated the depth of burial to be as deep as 13 meters (43 feet) bgs. GeoTek's estimate of burial depth ranged from 8 feet to 17 feet bgs. The debris burial-depth estimates are an uncertainty, as the various geophysical studies and reported observations of persons involved in the 1973 landfill creation provide widely varying estimates. The 2011 GeoTek geophysical investigation was designed to assess the basal depths of debris burial at the landfill, whereas the USGS data were collected as part of a multi-site investigation designed to enhance the BLM's ability to characterize subsurface conditions using geophysical methods in a permafrost environment. Because of the focused purpose of the GeoTek investigation, their conclusions could be considered more reliable than those of the USGS. Nonetheless, the variations in landfill debris burial depth estimates results in a degree of uncertainty.

6.1.2 Soil

Soil ARARs, TBCs, RBSLs, and highest detected concentrations of analytes in soil samples are summarized in Table 5-2. GRO, RRO, PAHs, and SVOCs were not detected in soil above ARARs or RBSLs.

DRO was detected above its PCL (230 mg/kg) in one soil sample and field duplicate at 3 feet bgs during the installation of MW-6 in 1996. The highest concentration of DRO detected in sediment was 54 mg/kg, well below the PCL.

Methylene chloride (at 0.019 mg/kg) was the only VOC detected above its ADEC migration-to-groundwater soil cleanup level (0.016 mg/kg) in one 1994 soil-boring sample. Methylene chloride was detected at similar levels in 13 other soil samples and seven sediment samples, but none exceeded the cleanup level and all but two detections were flagged (most likely as estimated values, though flags were not defined). Methylene chloride is considered a COPC at the Umiat landfill; however, given that methylene chloride is a common laboratory contaminant, additional sampling may be warranted to determine whether the analyte is in fact present.

The highest detection of PCBs (specifically Aroclor 1254) in soil was 2.3 mg/kg, which exceeds the PCL of 1 mg/kg, in a sample from 1.5 feet bgs at the base of the excavation where a PCB-containing transformer and PCB-contaminated soil were removed in 2001. There does not appear to be a continuous or widespread area of PCB-contaminated soil; Aroclor 1254 was only detected in two other soil samples, at levels below the PCL of 1 mg/kg. PCBs are presumed to be associated with transformers and electrical equipment at the landfill. PCBs are a COPC at the Umiat landfill.

One soil sample and its field duplicate exceeded the ADEC soil-cleanup level for the pesticides 4,4'-DDD (7.2 mg/kg) and 4,4'-DDT (7.3 mg/kg). They were detected at 31.4 mg/kg and 38.2 mg/kg, respectively, in the sample and duplicate collected at a depth of 3 feet bgs in the boring for MW-6 during the 1996 RI. While this was the only location where 4,4'-DDD and 4,4'-DDT were detected above PCLs, they were detected at lower levels in soil samples from the following locations: BH 11-6 (in 1994); MW-3, MW-4, MW-6, SB-44, SB-45, SB-47, SB-49, SB-50, and SB-51 (in 1996); SB-182 (in 1997); and background samples collected away from the landfill. The low-level detections in these widespread locations and background samples is more indicative of widespread spraying of DDT than a localized region of contaminated soil originating from a point source (with the exception of MW-6). 4,4'-DDD and 4,4'-DDT are COPCs at the Umiat landfill.

Arsenic was detected above its ADEC soil-cleanup level (3.9 mg/kg) in 23 soil samples. Detected levels of arsenic in soil ranged from 1.0 mg/kg to 8.4 mg/kg. Arsenic results for the project-sample set are not significantly different from background-sample set (see Section 5.4). This suggests arsenic probably occurs naturally in the soils at a concentration range spanning the Method Two soil cleanup level. Based on our statistical comparison of project-sample results to background results, and the natural abundance of this element in arctic soils, it is not considered a COPC at the Umiat AFS landfill. Arsenic is not considered an analyte of concern requiring further evaluation in the FS process, and a PRG will not be recommended for this element.

Lead was detected in soil at 598 mg/kg in sample *96-UMT-401-SS*, collected from soil-boring SB-47 in 1996 (Figure 4-3), where "vehicle batteries and assorted debris" were identified. It was also detected at 1,170 mg/kg at the base of an excavation where lead-contaminated soil was removed in 2001. The ADEC Method Two cleanup level for lead in the Arctic Zone is 400 mg/kg. Lead is presumed to be associated, at least in part, with lead-acid batteries in the landfill. Lead is a COPC at the Umiat landfill.

Soil contamination exceeding PCLs or RBSLs appears to be associated with discrete items of buried debris (such as transformers or lead-acid batteries). This suggests contaminated soil may be present at random locations throughout the landfill; additional site characterization (i.e., drilling and sampling) is unlikely to identify all such locations. This will affect the nature of response action targeting soil contamination; response actions should target the landfill as a whole unit rather than isolated pockets of contamination.

6.1.3 Sediment

Highest detected concentrations of analytes in sediment samples are summarized in Table 5-3. GRO, DRO, RRO, PAHs, and SVOCs were not detected in sediment above PCLs or RBSLs.

PCBs were more widely distributed in sediment than in soil. Aroclor 1254 was detected in 38 sediment samples (out of a total of 69 samples, including duplicates/triplicates), at or above the RBSL of 0.1 mg/kg in 32 samples, and above the PCL of 1 mg/kg in two samples. No other Aroclors were detected in sediment. The wider distribution in sediment is likely due to leaching from point sources in the landfill followed by downgradient sorption to sediment, though the highest detection in sediment (17.8 mg/kg, sample *96-UMT-232-SD* at location LB) is likely a point source as well.

Pesticides 4,4'-DDD and 4,4'-DDT were widely distributed in sediment samples, though they were not detected above the PCLs of 7.2 mg/kg and 7.3 mg/kg, respectively. 4,4'-DDD was detected in 10 sediment samples, ranging from 0.0036 mg/kg to 0.65 mg/kg, and 4,4'-DDT was also detected in 10 sediment samples, ranging from 0.0024 mg/kg to 0.059 mg/kg. 4,4'-DDE was not detected in sediment or soil at the site. As with PCBs, the wider distribution in sediment is likely due to leaching from point sources in the landfill followed by downgradient sorption to sediment, though the highest detection of 4,4'-DDD in sediment (0.65 mg/kg, sample *-02SD* from the 1986 USACE sampling event) may indicate a point-source.

Arsenic was detected above its ADEC soil-cleanup level (3.9 mg/kg) in two sediment samples. Detected levels of arsenic in sediment ranged from 2.8 mg/kg to 7.1 mg/kg. As with arsenic in soil, the arsenic results for the project-sample set are not significantly different from the background-sample set (see Section 6.1.2), and arsenic is not considered a COPC at the Umiat landfill.

Lead was detected in sediment samples ranging from 4.50 mg/kg to 22 mg/kg, below the PCL of 400 mg/kg. Lead was also detected in background sediment samples ranging from 4.70 mg/kg to 16.6 mg/kg. While lead is considered a COPC for the site (see Section 6.1.2), sediment is not considered to be affected by lead contamination based on these results.

As with contaminated soil, the presence of PCBs and pesticides in sediment is presumed to be related to wastes buried in or eroding out of the landfill. Sediment PCB and pesticide contamination exceeding PCLs or RBSLs appears to be more widespread than in soil, likely due to leaching, sorption, and deposition of contaminants in sediment originating from point sources within the landfill, or due to historic area-wide spraying of pesticides, in the case of 4,4’-DDD and 4,4’-DDT. Response actions targeting the landfill should consider contaminants in sediment downstream of the landfill.

6.1.4 Surface Water

Surface-water criteria and highest detected concentrations of analytes in surface-water samples are summarized in Table 5-4. The results of sampling in the seasonal stream indicate petroleum hydrocarbons, VOCs, SVOCs (including PAHs), PCBs, and pesticides were not present above reporting limits in surface water; however, reporting limits for PCBs and 4,4’-DDT were above the 18 AAC 70 Water Quality Criteria (PCL) of 0.000014 mg/L and 0.000001 mg/L, respectively, which constitutes a data gap for the site (see Section 6.4.3).

Lead and aluminum concentrations in 1996 exceeded 18 AAC 70 Water Quality Criteria. Lead in surface water may be attributed to the elevated lead concentrations in soil at the landfill; lead is considered a COPC in surface water (also groundwater due to the close hydrological connection). As noted in Section 5.4, there was no statistically significant difference between aluminum concentrations in project samples vs. background samples. Aluminum is not considered a COPC at the Umiat landfill.

6.1.5 Groundwater

Groundwater is in close hydrological connection with surface water at the site, and as described in Section 5, groundwater results were compared to the same PCL, TBCs, and RBSLs as surface water. DRO was detected at 76 mg/L in MW-4 and at 4.0 mg/L in MW-6 in 1996; remaining detections of DRO and other petroleum hydrocarbons were below PCLs. Naphthalene (a PAH commonly associated with petroleum-related contamination) was detected above the RBSL but below the PCL in MW-4 in 1996, and thus included in the CRE and listed as a COPC in groundwater (and by connection, surface water) for the site.

Pesticides were also detected in two wells at the landfill. 4,4'-DDD was detected at 0.0173 mg/L in MW-6, above the ADEC Table C groundwater cleanup level (PCL) of 0.0035 mg/L. 4,4'-DDT was detected at 0.0311 mg/L in MW-6, and 0.000105 mg/L in MW-4, above the Water Quality Criteria (ARAR) of 0.000001 mg/L. 4,4'-DDT was not detected in any other wells; however, the reporting limit for 4,4'-DDT was above the PCL in each case. 4,4'-DDD and 4,4'-DDT are considered COPCs in groundwater (and by connection, surface water) for the Umiat landfill.

PCBs were not detected in groundwater at the site; however, reporting limits for PCBs were above PCLs. We cannot state with certainty if PCBs are present above the PCL of 0.000014 mg/L in surface water or groundwater at the site (see Section 6.4.3). Given the concentrations of PCBs detected in fish tissue (summarized below), the presence of PCBs at low levels in surface water seems likely, though contact with sediment may be the more significant exposure pathway between contaminated media and fish in the seasonal stream.

6.1.6 Fish Tissue

Fish tissue RBSLs, RBCs, and the highest detected concentrations of analytes in fish-tissue samples are summarized in Table 5-6. The PCBs Aroclor 1254, Aroclor 1260, and Aroclor 1016/1242 were detected in fish tissue above RBSLs. Detected concentrations ranged from 0.00074 mg/kg to 1.4 mg/kg for Aroclor 1254, 0.0003 mg/kg to 0.190 mg/kg for Aroclor 1260, and 0.0021 mg/kg to 0.0061 mg/kg for Aroclor 1016/1242. Aroclor 1260 and Aroclor 1016/1242 were not detected in soil, sediment, surface water, or groundwater at the Umiat landfill; this suggests fish may be impacted by contaminant sources other than the landfill.

The pesticides 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT were detected in fish-tissue samples in excess of their RBSLs. Detected concentrations ranged from 0.00007 mg/kg to 0.480 mg/kg for 4,4'-DDD, 0.00012 mg/kg to 0.740 mg/kg for 4,4'-DDE, and 0.00004 mg/kg to 0.079 mg/kg for 4,4'-DDT. Each of the three analytes was detected in every fish sample, and there were no apparent differences between results for fish caught in the seasonal stream, upstream of the slough in the Colville River, or downstream of the slough. Additionally, 2,4'-DDD and 2,4'-DDE were detected in fish, though no RBSLs were available for these isomers; in each case they were detected in association with the 4,4'- parent compound, and are likely degradation products of the primary pesticide. The ubiquitous nature and relatively even distribution of these contaminants in fish implies the source may be from long-range atmospheric transport or historic spraying of pesticides in the area, and is less indicative of contamination from point sources within the landfill, though these sources may contribute to the concentrations in fish. It should be noted the fish can only be present in the landfill stream for a fraction of the year, when surface water is present.

Additional discussion of fish-sampling results can be found in the various risk assessments conducted for the site, summarized in Section 4.0 and referenced in Section 7.0.

6.2 Conceptual Site Model

We prepared a CSM depicting potential sources of chemicals, release mechanisms, means of retention in or migration to exposure media, exposure routes, and receptors. The CSM describes contaminant fate-and-transport mechanisms. A complete pathway from the source of chemicals to the receptor is necessary for chemical exposure to occur. Required elements for a complete exposure pathway are:

- a source of potentially toxic chemicals (e.g., primary sources, such as contents of drums or tanks, or a secondary source, such as contaminated soil);
- a mechanism of chemical release to the environment (e.g., spillage to the ground);
- a mechanism of retention in, or transport to, an exposure medium (e.g., adsorption to soil or leaching from soil to shallow subsurface water and subsequent transport as a dissolved constituent to a nearby surface-water body);
- a point of contact between receptor and exposure medium (e.g., a person digging or an animal burrowing in contaminated soil); and/or
- an intake route for the receptor (e.g., ingestion of impacted soil or water).

Human health and ecological CSMs are depicted in Figures 6-2 and 6-3.

6.2.1 Sources and Release Mechanisms

The sources of contamination at the Umiat landfill are contaminated soil and buried debris, which is presumed to contain residual amounts of fuels, PCBs, and other chemicals.

6.2.2 Exposure Media

Impacted media at the Umiat landfill include soil, sediment, surface water, groundwater, and fish tissue.

6.2.3 Migration and Retention Mechanisms

The primary physical processes affecting contaminant concentrations and migration include dispersion, dilution, and sorption. Volatilization of organic contaminants and airborne transport of contaminated soil may also occur. Also, debris items such as transformers and batteries may be transported downstream during floods.

Based on the types of contaminants detected at the landfill and their distribution, the greatest potential for contaminant migration in the landfill area is soil/sediment transport during flood events that overwash and erode the landfill. PCBs, pesticides, metals, and petroleum hydrocarbons may bind with the soil and sediment and be redistributed. The sediments may move toward the lower reaches of the stream and be carried toward the Colville River. Chemicals have been detected in sediment samples in the seasonal stream, some in excess of TBC concentrations, indicating contaminant migration has occurred.

Migration of contaminants through the subsurface could occur through the active zone during thaw periods. The top of permafrost at the landfill is estimated to be between 5.5 feet and 17.5 feet bgs. The groundwater gradient, generally toward the northeast, may fluctuate and the resulting flow direction may vary depending on the elevation of water in the river. Flooding of the river will raise the water table in the slough, and may result in flow in the seasonal stream.

Erosion of the landfill is a migration pathway that could produce releases of COPCs to the Colville River.

The low volatility of DRO and RRO, the low detected concentrations of fuels and VOCs, and the low ambient temperatures make significant volatilization unlikely. Microbial degradation of DRO, and especially RRO, is likely to be slow due to low temperatures and subsurface distribution of the contaminants; therefore, petroleum hydrocarbons in the soils are not anticipated to naturally attenuate prior to the landfill eroding.

Given the low volatility of residual concentrations of volatile compounds detected in the soil, air transport of contaminants is not expected to be a significant mode of contaminant migration at the landfill.

The pesticide DDT and PCBs have very low migration potentials in surface water, groundwater, and air because of the low solubility of the compounds in water and low volatility (vapor pressure); however, they are readily sorbed to soil and sediment, the primary media of concern at the Umiat landfill. DDT and PCBs are persistent in the environment because they are not degraded by microbial action and do not readily oxidize. Furthermore, they have the potential to bioaccumulate and biomagnify in the food chain, which causes their concentrations to increase in higher trophic levels (particularly dominant predators, including humans).

6.2.4 Exposure Routes/Receptors

The human receptors and associated intake routes evaluated in the CSM are based on a limited evaluation of likely current and future uses of the site. As depicted in the human health CSM, receptors are residents of Umiat, site visitors, site workers, and subsistence users. Complete exposure pathways are incidental ingestion of surface soil, inhalation of particulates, ingestion of fish and game, and dermal contact with surface water and sediment. As shown in the ecological CSM, receptors are terrestrial and aquatic species. Exposure routes are ingestion of and direct contact with surface soil, surface water, and sediment, and plant uptake of surface soil.

6.3 Risk Evaluation

The highest detected concentrations from historic sampling events are summarized in Tables 5-2 through 5-6, and were compared to RBSLs as well as PCLs and TBCs. The highest detected concentrations exceeding the RBSLs were included in the CRE, as described in Section 5.4. The following chemicals are considered carcinogenic by one or more exposure pathways and contributed to cumulative cancer risk for the site: arsenic; Aroclor 1254; Aroclor 1260; Aroclor 1016/1242; 4,4'-DDD; 4,4'-DDE; 4,4'-DDT; and naphthalene. The following chemicals also have non-carcinogenic toxic effects, and contributed to the cumulative HI for the site: arsenic; Aroclor 1254; Aroclor 1016/1242; 4,4'-DDD; 4,4'-DDT; and naphthalene. As noted previously, arsenic in soil is likely attributable to natural (background) presence of the element in Arctic soil, and Aroclor 1260 and Aroclor 1016/1242 are not necessarily associated with site-specific contaminant sources; however, they were included in the CRE to evaluate cumulative risk from all known risk-contributors detected in various media at the site.

Cumulative risk calculations indicate a human cancer risk of 8×10^{-3} and a non-cancer HI of 4. Consumption of fish had the largest single contribution to the cancer risk, while direct contact with contaminated soil/sediment had the largest single contribution to the non-cancer HI. Both the cancer risk and HI exceed the risk thresholds of 1×10^{-5} and 1, respectively.

For the CRE, soil and sediment were considered a single exposure medium due to the seasonal nature of these matrices at the site and the potential for soil to become sediment from ongoing erosion of the landfill. Similarly, groundwater and surface water were considered as a single exposure medium due to their close hydrological connection. This approach conservatively and accurately evaluates cumulative risk for the site not only for current conditions but also considering potential future erosion or migration of contaminants.

Petroleum hydrocarbons and lead are not included in cumulative risk calculations, consistent with ADEC regulations and the June 2008 *Cumulative Risk Guidance*; however, DRO exceeded the most stringent soil-cleanup level (over-40-inch migration-to-groundwater; 230 mg/kg) in one location, and lead exceeded the Arctic zone direct-contact soil cleanup level (400 mg/kg) in two locations. Lead was also detected above the ADEC Water Quality Criteria of 0.001 mg/L in one surface-water sample. These two contaminants are considered COPCs.

The CRE is based on the highest results from a limited number of samples collected from a highly heterogeneous landfill. Given that sources of contamination are likely to be scattered in isolated pockets throughout the landfill, the CRE may not fully account for the potential risk caused by future erosion of the landfill. Due to the heterogeneity of contamination, this risk is not easily quantified and may require a site-specific risk assessment or additional remedial actions to ensure residual soil contamination and containers of fuel or other product in the landfill will not pose a risk to the environment if the soil or containers erode into the river. This uncertainty should be taken into account when evaluating remedial alternatives for the site, and regardless of the option implemented, cumulative risk should be re-evaluated following implementation.

6.4 Data Gaps

Potential gaps in the data set fall into three general categories: where analyses were not performed, where the data set is not sufficient to draw conclusions or where no data were collected, and “non-detected” compounds whose practical quantitation limits (PQLs) were greater than their corresponding comparison criteria.

6.4.1 Analyses Not Performed

Analyses for dioxins and asbestos at the landfill have not been performed. Dioxins are commonly present where PCB-containing soils or PCB-contaminated soil were subject to burning, and have been detected at one of the Umiat exploratory wells about 2 miles from the landfill. Asbestos was a common component of building materials prior to 1978 and may be present in demolition debris disposed at the landfill.

6.4.2 Limited Data Sets

The Umiat landfill has a limited data set that prevents a thorough assessment of the extent of debris and soil contamination. The data set is not large enough to determine the extent of contaminated soil with certainty, which introduces a degree of uncertainty about the evaluation of remedial alternatives for the landfill; however, given the likelihood of soil contamination associated with point sources in the landfill, the heterogeneity of contamination would make further delineation difficult and costly, and may not be warranted. Conflicting historical information exists regarding the depth of buried debris. In 2011, the USACE conducted a geophysical survey to resolve the depth discrepancies between two previous surveys (1994, 2006) and verify the lateral extent of debris. The 2011 survey concluded the bottom depth of metal debris ranged from 8 to 17 feet bgs and will be utilized as the basis for future volume estimates.

6.4.3 PQL Evaluation

To assess analytical sensitivity and evaluate potential data gaps, we compared PQLs from sampling events to the various comparison criteria discussed in Section 5.0 (PCL, TBC, and RBSL concentrations, see Table F-1). Some of the source reports do include PQL data; however, the bulk of the data includes only PQLs for non-detected analytes where detections were also present in that event’s data set. Except for the 1996 RI, only summary tables of detected analytes from the various reports were available, i.e., complete laboratory data packages were not. We did not perform an evaluation of all the PQLs for each analyte; however, some general conclusions can be drawn regarding analytical sensitivity for datasets for which PQLs were available.

In general, analyses were adequately sensitive to quantify individual analytes below PCLs and RBSLs. PQLs for petroleum hydrocarbons and associated VOCs and PAHs were generally below PCLs and RBSLs.

Soil and sediment PQLs for metals were generally below cleanup levels, with the exception of antimony. Antimony PQLs exceeded the cleanup level for two of four sediment samples and a majority of soil samples. Antimony was detected in one soil sample (*96-UMT-401-SS*) at 0.950 mg/kg, below the cleanup level of 3.6 mg/kg. Antimony is commonly used as a plating agent in lead-acid batteries and alloys for bullets. While antimony may be present in soil associated with lead-acid batteries, it is likely collocated with lead contamination in soil.

Additional sampling to delineate soil contamination (including potential antimony contamination), as noted in Section 6.4.2, is not likely to be beneficial.

VOC analytes 1,2-dibromoethane and 1,2,3-trichloropropane had soil and sediment PQLs exceeding the ADEC migration-to-groundwater soil-cleanup level, as well as surface-water and groundwater PQLs exceeding the ADEC groundwater-cleanup level. Standard analytical techniques are not sufficiently sensitive to detect these analytes at concentrations below the cleanup levels. There are no suspected sources of these compounds at the landfill, so this data gap is not considered significant.

Multiple SVOC analytes had elevated soil and sediment PQLs (Tables F-2C and F-3C); these analytes have not been detected at the landfill, and there are no suspected sources of these analytes at the landfill, so this data gap is not considered significant.

With the exception of a couple of isolated samples, soil and sediment PQLs for PCBs and pesticides were below the most stringent ADEC soil cleanup levels (PCLs); however, surface-water and groundwater PQLs for PCBs, 4,4'-DDT, and a number of other pesticides (detected at the site) exceeded the relevant Water Quality Criteria (PCLs). The PCL for PCBs is 14 nanograms per liter (ng/L), the ARAR for 4,4'-DDT is 1 ng/L. Standard analytical techniques are not sufficiently sensitive to detect or quantify these analytes in the ng/L range. While PQLs are elevated for 4,4'-DDT, the analyte was detected in groundwater (MW-5 and MW-6) as high as 0.0311 mg/L, and in surface water as high as 0.0003 mg/L.

Elevated PQLs prevent delineation of DDT in the seasonal stream, but they are less significant because DDT has been identified above cleanup levels in surface-water and groundwater. Due to the elevated PQLs for PCBs in surface water and groundwater, we cannot determine if PCBs are present above the most stringent water-quality standard. The significant levels of PCBs in soil, sediment, and fish suggest PCBs may be present in the water, but confirmation of its presence is not likely to be warranted. If the point sources of PCBs and 4,4'-DDT within the landfill and associated sediment are removed or contained, groundwater and surface-water concentrations of these contaminants will quickly attenuate due to their hydrophobic nature and affinity for solid surfaces.

Overall, data gaps presented by elevated PQLs are either not significant or not likely to affect the feasibility or selection of remedial alternatives for the site.

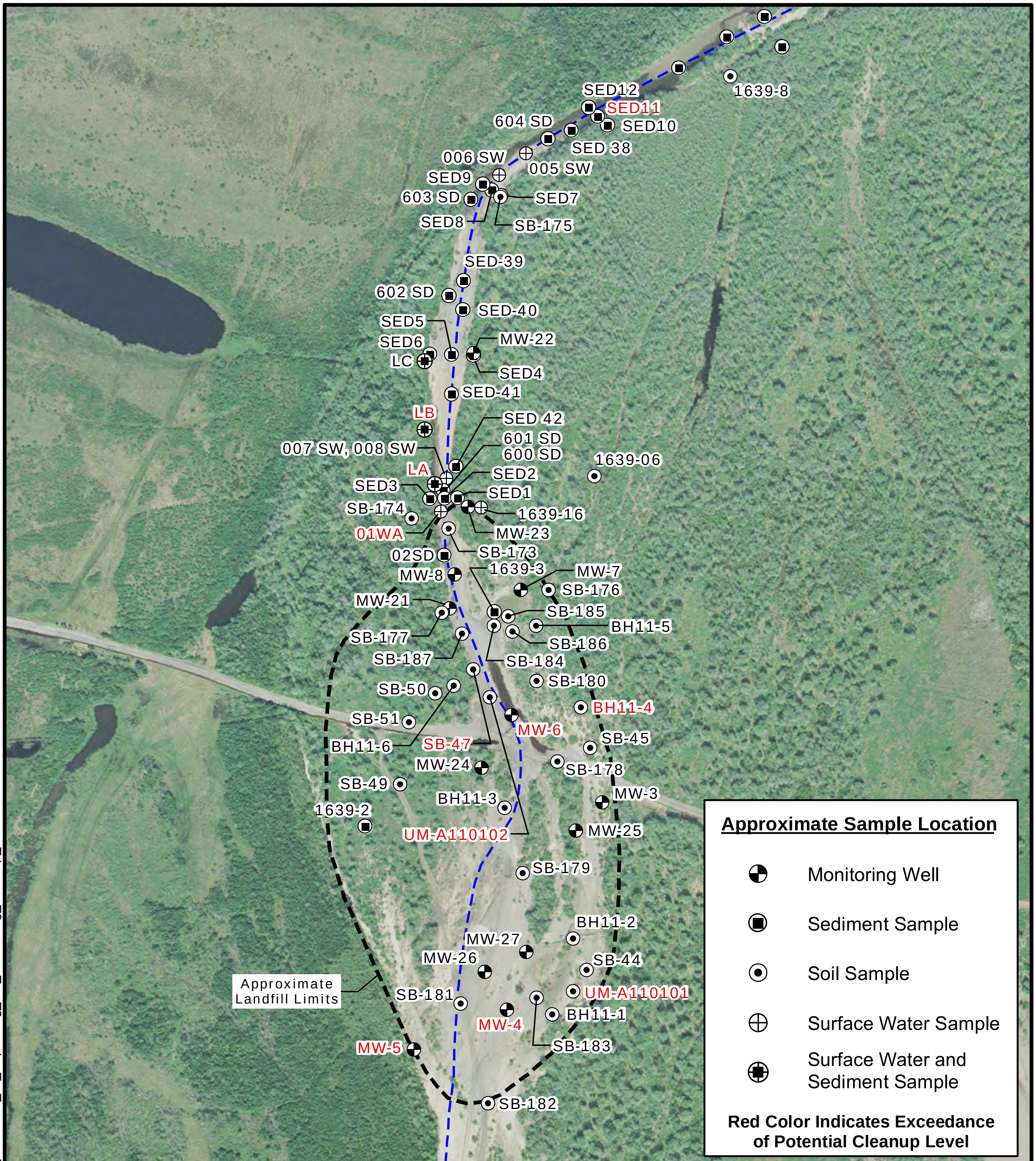
6.5 Conclusions

Based on our evaluation of existing data on the Umiat landfill, we make the following conclusions:

- Based on our evaluation of data generated during previous investigations, COPCs at the site are PCBs (specifically Aroclor 1254); 4,4'-DDD; 4,4'-DDE; 4,4'-DDT; DRO; naphthalene; methylene chloride; and lead.
- PCB Aroclors 1260 and 1016/1242 have been detected in fish tissue.
- Based on a CRE, the carcinogenic risk posed to human health by these COPCs exceeds the risk management standard of 1×10^{-5} and the non-carcinogenic hazard index exceeds the risk management standard of 1. Furthermore, the contents of the landfill are unknown and likely contain other contaminants that would become COPCs if released to the environment.
- The landfill area is adequately defined (about 8 acres).
- Landfill depth estimates vary, hence volume calculations vary.
- Buried debris is known to include contaminant sources such as lead-acid batteries and transformers. The landfill is suspected to contain drums and other containers with unknown contents and may include contaminated soil.
- Contaminants have migrated from the landfill to surface soil, sediment, surface water, and groundwater.
- Contaminants are present in fish tissue.
- Data do not suggest defined contaminant sources in the landfill that can be targeted for removal.
- Episodic channel flooding with water velocities high enough to cause surface erosion and contaminant transport occurs annually.

Uncertainty exists concerning the exact nature, distribution, and volume of the contaminants in the landfill. The heterogeneous distribution of wastes in a landfill makes it unfeasible to identify all discrete contaminant sources within the landfill. No amount of sampling, short of complete excavation of the contents, would reveal whether there is another small transformer filled with PCB oil that is, or may become, a point source for release of highly concentrated contaminants. If the landfill is removed, the sampling and waste characterization can be performed in conjunction with the removal effort.

We recommend the USACE proceed with preparation of the draft FS report. Additional sampling to identify limits of contamination in sediment may be warranted if the proposed remedial alternative involves dredging or cleanup of contaminated sediment.



Sample locations are approximate and based on U.S. Army Corps of Engineer's map DERA-5300: Umiat AFS, AK; Sample Location Map; Umiat Air Force Station; Ecology and Environment, Inc.'s (E&E) Draft Remedial Investigation Figure 3-5, dated December 20, 1993; AGRA Earth and Environmental's Summary Site Assessment Report, Umiat, Alaska, Figure 9, dated January 1997; E&E's 1996 Remedial Investigation, Figure 3-7, dated May 1997; E&E's 1997 Remedial Investigation, Figure 2-1, dated May 21, 1998 and Figure 2-2, dated February 18, 1998; E&E's Figure 2-6: Fish, Sediment, and Surface Water Sample Locations, dated February 16, 1999; and E&E's Groundwater

Aerial photography taken July 2009, produced by Kodiak Mapping, recieved from Alaska Department of Transportation and Public Facilities.

N

0 300

Scale in Feet

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SAMPLES EXCEEDING POTENTIAL CLEANUP LEVELS

March 2013 31-1-11544-005

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FIG. 6-1

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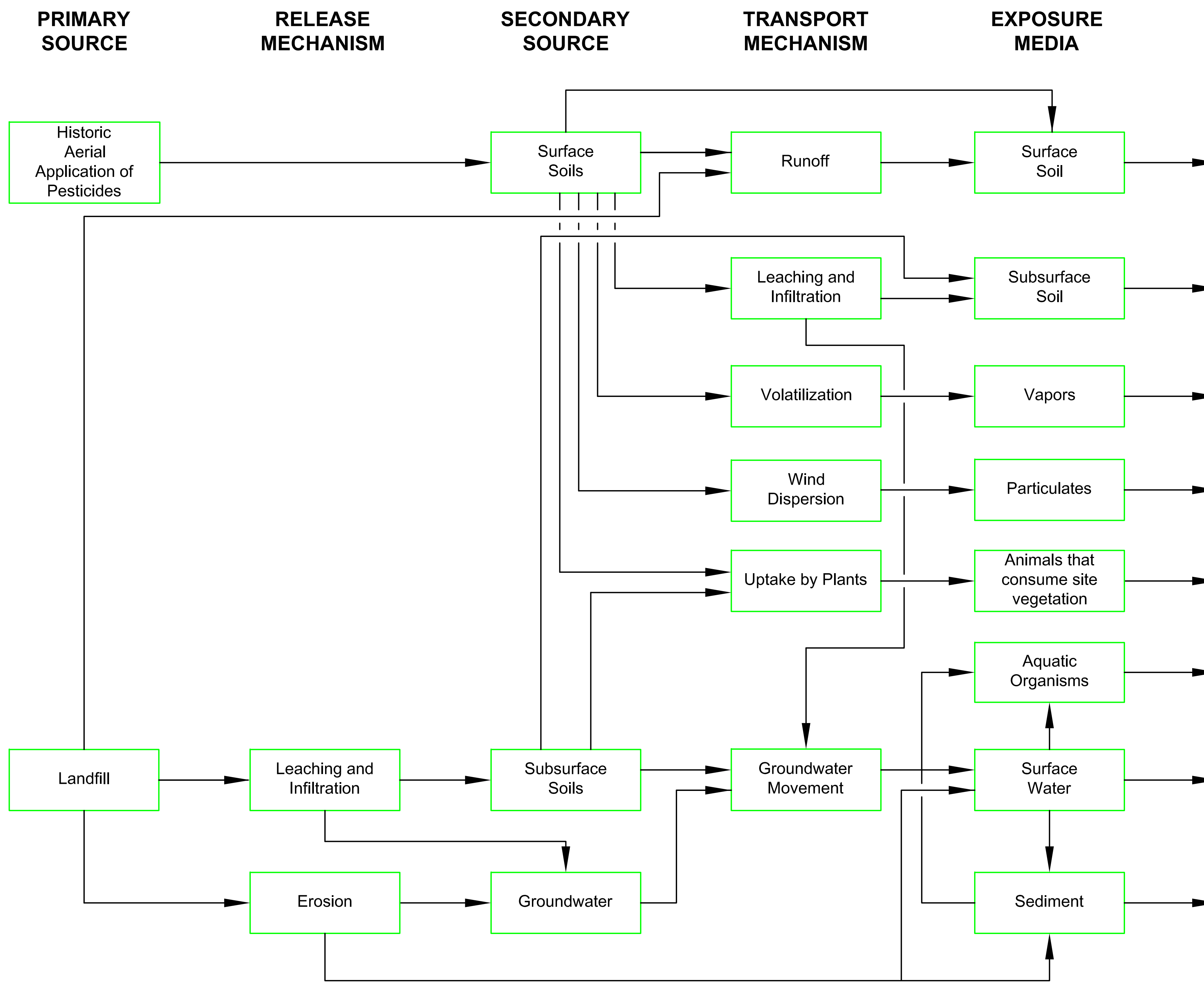

RECEPTORS AND ROUTES OF EXPOSURE

	SITE RESIDENTS	SITE VISITORS	SUBSISTENCE USERS	CONSTRUCTION WORKER
Incidental Ingestion	●	●	●	●
Dermal Contact	—	—	—	●
Incidental Ingestion	—	—	—	●
Dermal Contact	—	—	—	●
Inhalation [a]	—	—	—	—
Inhalation	●	●	●	●
Ingestion of Game	●	●	●	●
Ingestion of Fish	●	●	●	●
Incidental Ingestion	●	●	●	●
Dermal Contact	●	●	●	●
Incidental Ingestion	●	●	●	●
Dermal Contact	●	●	●	●

KEY

a This exposure pathway is incomplete for the landfill because no volatile COPCs were identified.

→ Complete Contaminant Migration Pathway

● Complete Exposure Pathway

— Incomplete Exposure Pathway

NOTE

Adapted from Ecology & Environment, 1997. Final Risk Assessment Report, Former Umiat Air Force Station, Umiat, Alaska. June.

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HUMAN HEALTH CONCEPTUAL SITE MODEL

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FIG. 6-2

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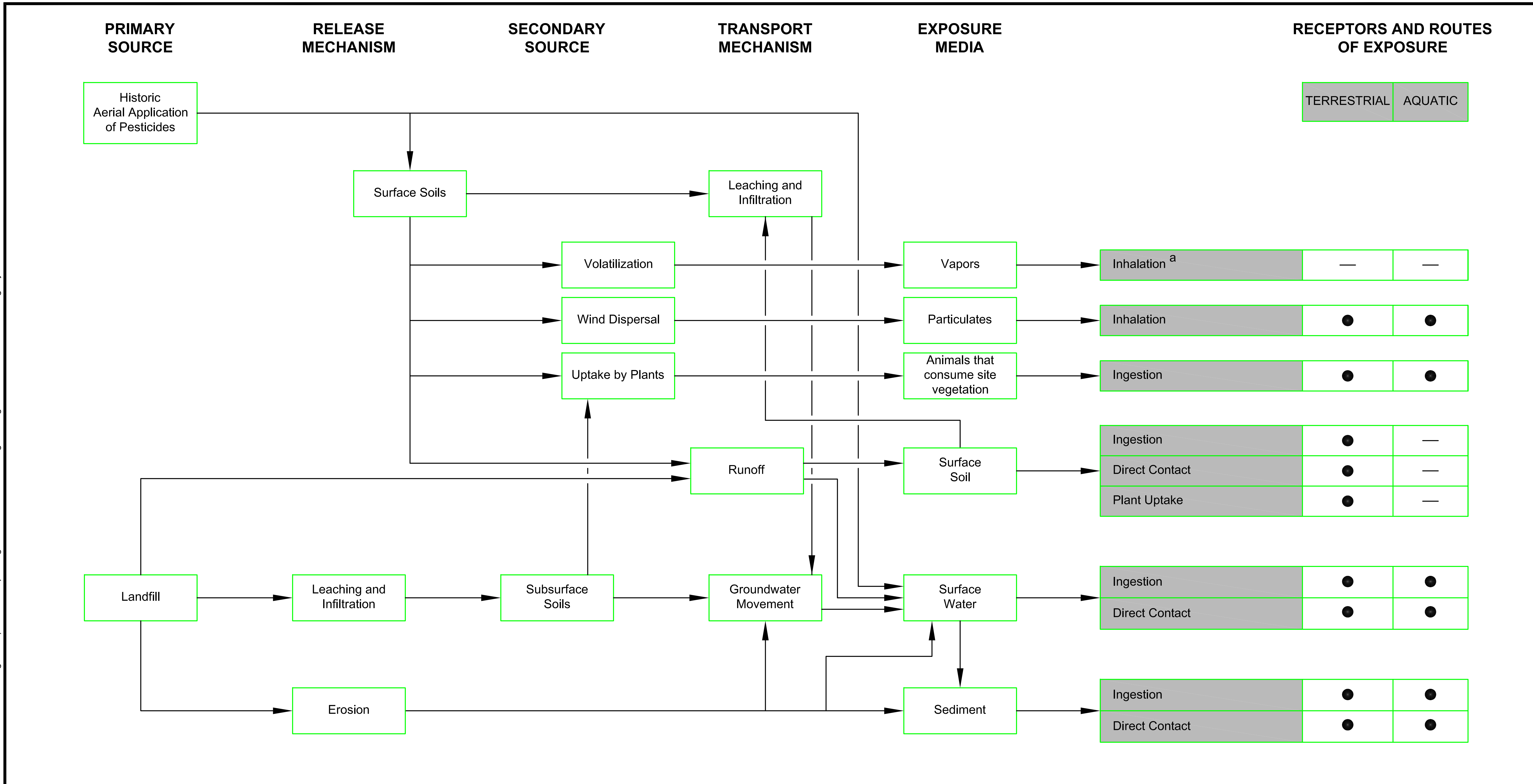

KEY

● Complete Exposure Pathway

— Incomplete Exposure Pathway

a This exposure pathway is incomplete for the landfill because no volatile COPCs were identified.

NOTE

Adapted from Ecology & Environment, 1997. Final Risk Assessment Report, Former Umiat Air Force Station, Umiat, Alaska. June.

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ECOLOGICAL CONCEPTUAL SITE MODEL

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FIG. 6-3

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APPENDIX A

AGENCY COMMENTS AND CONTRACTOR RESPONSES

REVIEW COMMENTS | **PROJECT: Umiat Landfill**

DOCUMENT: Draft Remedial Investigation Report - Feb 2012 | **Location: Umiat, Alaska**

U.S. ARMY CORPS OF ENGINEERS	**DATE: 3/30/2012** **REVIEWER: Aaron Shewman** **PHONE: 753-5558**	**Action taken on comment by: Shannon & Wilson, Inc.**

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
1.	Page 1	Paragraph 1, sentence 3. Insert “was” between “Umiat” and “AFS”. Also, the dates in this sentence do not appear to be consistent with the dates stated on page 7, section 2.2, paragraph 1, please correct as necessary. Paragraph 1, last sentence. Insert “located” between “landfill,” and “about”.		Agreed. We will correct the sentence. We will make the dates consistent in the two sections. Agreed. We will correct the sentence.	
2.	Page 2	Section 1.1, sentence 1 following the bullet list. Chemical contamination of fish in this context is not only attributable to the military, but also “atmospheric transport and biotransport” on a global scale. Please revise this statement to be more correct.		We will address this issue in the summary of the fish studies and indicate the contribution from atmospheric transport and biotransport is an uncertainty.	
3.	Page 7	Paragraph 1, last sentence. Please add “east landfill” to the list of historic names for the Umiat landfill (based on Page 9, Section 2.3, paragraph 2.)		Agreed. We will revise the statement to read “The landfill has been variously referred to in other reports as the Unit C Landfill, Area 11, Area of Concern 7 and east landfill.”	
4.	Page 8	Section 2.2, paragraph 3, last sentence. It seems appropriate to add a sentence to indicate the AFS is also accessible via overland travel in winter.		Agreed. We will revise the statement.	
5.	Page 11	Section 2.4.1.4, paragraph 1, sentence 5. “…is about 1 cubic foot per square mile.” Would a more accurate statement be “…per square mile of drainage basin above the point of measurement”? If so, please correct. Paragraph 2, sentence 3. The sentence reads, “The seasonal stream runs through the landfill”. Options for more correct statements would be “The seasonal stream runs across the landfill cap”, or “The seasonal stream runs over the landfill cap”. Paragraph 3, sentence 1. Strike the third “the”. Also, this sentence implies gauge data is being collected through today, is this true? Either way, please correct to avoid contradiction with sentence 3. Paragraph 3, sentence 2. Insert “(facing downstream) between		Agreed. We will revise the statement. Agreed. We will clarify the statement. Agreed. We will correct the sentence and state that discharge data has been collected through 2009.	

U.S. ARMY CORPS OF ENGINEERS	**DATE: 3/30/2012** **REVIEWER: Aaron Shewman** **PHONE: 753-5558**	**Action taken on comment by: Shannon & Wilson, Inc.**

Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**REVIEW CONFERENCE** A - comment accepted W - comment withdrawn (if neither, explain)	**CONTRACTOR RESPONSE**	**USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
		"bank" and "of". Paragraph 3, sentence 3. Revise the sentence to read, "The USGS measured..."		Agreed. We will clarify the statement. We will revise the statement.	
6.	Page 12	Section 2.4.1.5, paragraph 2, sentence 6. Currently, the sentence reads, "Groundwater extends to the top of permafrost…" Where does groundwater extend from? Please clarify.		Agreed. We will clarify that groundwater extends from the water table (the top of groundwater) to the permafrost. We will report the measured range of water table depths.	
7.	Page 13	Section 2.4.2.2, sentence 4. A more correct statement would be, "Brown bears travel along the Colville River corridor and other nearby river corridors…" Paragraph 2. It seems the Spectacled Eider is also periodically present. If so, please add it here.		Agreed. We will clarify the statement as you suggest. According to Mr. Ted Swem of US Fish & Wildlife Service, "Specs generally occur and nest much nearer to the coast, and I am aware of no observations of spectacled eiders near Umiat." Please let us know if you have information to the contrary.	
8.	Page 21	Section 4.1.3, last paragraph on page, sentence 1. Please state where permafrost was generally encountered in these borings.		Agreed. We will describe the areal distribution of borings in which permafrost was encountered.	
9.	Page 22	Section 4.1.3, complete paragraph 1 on this page, last sentence. Please provide the "bottom values" of the concentration range. Complete paragraph 3, sentence 4. PCB concentrations in sediment samples are described, but where are the sample locations on the map? Are they "LA", "LB", and "LC" shown on Figure 4-3? Please clarify.		Agreed. We will add the information. Agreed. We will clarify in the text and figure that surface water and sediment samples were collected at locations LA, LB, and LC.	
10.	Page 24	Partial paragraph on page, first sentence. Change "steam" to "stream".		Agreed. We will correct the misspelling.	
11.	Page 26	First complete paragraph (comment also relates to Figure 4-6). Is it possible to show the 4 MWs described in this paragraph on Figure 4-6 despite the large map scale? If so, please add the 4 MWs to the figure.		We will add the monitoring well locations to Figure 4-6.	
12.	Page 31	Section 4.2.4, paragraph 2, last sentence. This information		We will revise the statement as suggested.	

U.S. ARMY CORPS OF ENGINEERS	**DATE: 3/30/2012** **REVIEWER: Aaron Shewman** **PHONE: 753-5558**	**Action taken on comment by: Shannon & Wilson, Inc.**

Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**REVIEW CONFERENCE** A - comment accepted W - comment withdrawn (if neither, explain)	**CONTRACTOR RESPONSE**	**USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
		also appears in Section 4.2.3, so recommend adding to the provided reference by modifying to read "(E&E, 2003, see Section 4.2.3)			
13.	Page 32	Section 4.3.1, paragraph 1, sentence 1. Delete "No." for consistency with an earlier report section. Section 4.3.2, sentence 1. Delete the second "a".		We will revise the statement. We will correct this typographic error.	
14.	Page 33	First partial sentence at top of page. Correct "994" to read "1994". Complete sentence 3. Delete the second "of". Complete paragraph 2, sentence 1. Delete "be". Section 4.4, paragraph 2, sentence 1. Replace "is in place" with "is considered". Sentence 2. Consider modifying sentence to read, "The discussion in this report is limited to the hydrologic…" Paragraph 4, sentence 2. Considering modifying to read, "Modeling results indicated the entire landfill area would be…"		Agreed. We will correct the omission. Sentence 3: We will rewrite the sentence to read "GeoTek confirmed five of the six cell locations previously identified by USGS…" We will make the other suggested changes.	
15.	Page 34	Partial sentence on page. Consider modifying to read, "According to the model, during the flood peak, the velocity over the landfill would be between 4 to 6 feet per second (fps), which would be high enough…"		Agreed. We will make this addition.	
16.	Table C-3	Other Federal Waste Transport Regulations, NPDES, Comments and Analysis/Rationale for Decision. It seems this cell (associated with NPDES) should read the same as "NPDES" on Table C-1. Please correct as necessary.		We will make the cells read the same.	
		----- End of Comments ----			

REVIEW COMMENTS

PROJECT: Umiat Landfill

DOCUMENT: Draft Remedial Investigation Report - Feb 2012 Location: Umiat, Alaska

U.S. ARMY CORPS OF ENGINEERS	**DATE: April 4, 2012** **REVIEWER: Lisa Geist** **PHONE: 753-5742**	**Action taken on comment by: Shannon & Wilson, Inc.**

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
1.	Cover Page	Formatting – larger font for report title. Include FUDS property/project number in title. Remove Prepared by Shannon & Wilson, Inc, address, project number, and deliver order manager. Put details on inside cover page instead.		Agreed. We will make the changes.	
2.	Cover Page	Native file should be provided. Word document file of report does not include a cover page.		Agreed. We will submit the revised RI report following MED requirements.	
3.	General	One COMPLETE pdf document must be submitted, that includes ALL the attachments, appendices, figures, tables, etc. PDF must comply with all general and FUDS-specific formatting requirements, checklist must be filled out and submitted.		Agreed. We will submit the revised RI report following MED requirements.	
4.	General	Please remove the Contractor Name from the top right header of each page, including appendices.		Agreed.	
5.	General	Please correct the duplicative page numbering between the Executive Summary and Main text. Intentionally blank pages should also be identified as such and/or numbered (e.g., inserted figures with no page number and blank page afterwards).		Agreed. We will correct this. Agreed. We will make this change.	
6.	Acronyms	Spell out in text upon first use. Example, NPRA in Executive Summary. Air Force Station. EPA, ADEC, ADOT&PF, FAA, USACE, PCBs, DDT.		Agreed. We will correct this.	
7.	Exec Sum, Page 1	What is basis for stating “ecological risks are present”?		We will add the following clarification in the Risk Assessment section, and remove the statement that ecological risks are present. “The original baseline Ecological Risk Assessment (E&E, 1997) determined that the ecological risks to piscivorous (fish-eating) organisms are unacceptable according to ADEC and EPA criteria. However, these risks	

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Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**REVIEW CONFERENCE** A - comment accepted W - comment withdrawn (if neither, explain)	**CONTRACTOR RESPONSE**	**USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
				estimates were based on modeled concentrations in fish derived from limited sediment data, not on actual fish tissue analyses. In August 1997, E&E collected additional fish tissue and sediment samples to better characterize the risks of Aroclor 1254. E&E's March, 1998 *Technical Memorandum, Human Health and Ecological Risk Assessment* recalculated hazard quotient using maximum detected concentrations and concluded that Aroclor 1254 in the Unit C seasonal stream does not pose a risk to ecological receptors."	
8.	Exec Sum, Page 1	Text states that the landfill "…was apparently constructed and closed in 1973…". How does that correlate with the aerial photos in Appendix A which show bare ground in 1974 and rows of equipment and/or drums in 1976, and vegetation/bare ground again in 2001?		E&E's 1996 Historical Site Uses Technical Memorandum states, "In 1973, the Naval Petroleum Oil Shale Reserves contracted Pacific Architects and Engineers, Inc., to clean up the Umiat camp…Most of the drums were buried at the east landfill (Area 11)… During an inspection of Umiat in 1974,… [e]ach company's camp had started its own solid waste dump on top of the east dump (Area 11)" The bare ground in the 1974 and 1976 photos presumably represent the time for vegetation to regrow following construction of the landfill in 1973.	
9.	Page 9	What is source document or reference for ADEC 1974 and 1976 inspections of Umiat?		We will supply the reference for both paragraphs, which is "E&E, 1996."	
10.	Page 9	What is reference for E&E site inspection for EPA in 1981?		Agreed. We will provide the reference, which is "E&E, 1996."	
11.	Page 14,	Please use updated census information for combined village		Agreed. We will use the 2011 Alaska	

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
	Section 2.5.1	populations. According to Alaska Community Database Community Information Summaries, populations are Anaktuvuk Pass 325, Nuiqsut 434, and Wainwright 572, total 1,331. Or should Barrow with pop. 4,309 also be included in the total?		Department of Labor estimate, which is a total of 1,331 for Nuiqsut, Wainwright, and Anaktuvuk Pass.	
12.	Page 19, Section 4.0	Regarding the statement: "Note that cleanup levels and screening levels that the report authors used to evaluate their data were those they considered applicable at the time and may not be current." This assumption needs to be reiterated when discussing particular data, otherwise later comparisons are misleading. I believe all data should be compared to most current standards.		Agreed. We will remove the references to screening, guidance, and regulatory levels in Section 4. We will evaluate the previous results in Section 6.1 using the screening criteria (ARARs and TBCs) described in Section 5.	
13.	Page 20, Section 4.1.1	Suggest rephrasing first sentence into active tense. USACE initiated a hazardous waste sampling and assessment program at Umiat in 1986, under the Defense Environmental Restoration Program (DERP).		Agreed. We will rephrase this sentence to read as suggested.	
14.	Page 20, Section 4.1.1	Please explain EPA toxicity analysis (e.g., media sampled for leachate testing and why) and corresponding regulatory limits (e.g., characteristic waste or not).		Agreed. We will include the 1986 report's explanatory paragraph included in its "Explanation of Analytical Methods" section, as well as the RCRA limits. The reference does not state the rationale for analyzing the samples for EP Toxicity?	
15.	Page 20, Section 4.1.2	Are the 11 areas indentified during the 1992 site inspection all pertaining to the landfill? Please clarify. The summary should only pertain to the landfill.		Agreed. We will clarify that the landfill was one of the 11 areas at Umiat, and limit the discussion to the landfill results.	
16.	Page 21, Section 4.1.2	Please clarify statement – analyte concentrations did not exceed regulatory (whose?) or guidance (screening?) levels.		Agreed. See our response to Item 12.	
17.	Page 21, Section 4.1.3	Please clarify – were the 187 soil borings and 20 monitoring wells installed throughout Umiat, and not just related to the landfill/Unit C?		We will change the sentence to read: "They drilled 12 soil borings and installed 6 monitoring wells (three temporary and 3	

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				permanent) at the landfill."	
18.	Page 22	EPA Region 3 RBC is defined for PCBs, but not for other comparisons made later in this section. ADEC North Slope soil cleanup levels are referred to, but comparison levels are not presented. Other samples are compared to screening levels, with no source given. DRO and GRO in groundwater at 3 MWs are compared to EPA Region 3 RBCs, and then other 3 MWs are compared to screening levels – are these the same levels? Chlorinated pesticides were detected in groundwater, but no comparison made? Was the concentration detected in subsurface soil also above a regulatory or screening level? Which 2 sediment samples had the PCB exceedances?		Agreed. See our response to Item 12. Agreed. Our responses to Tamar Stephen's comments list the appropriate cleanup levels. We will compare detected pesticide concentrations to applicable surface water cleanup levels. We will state whether subsurface soil concentrations exceeded the applicable soil cleanup levels. Agreed. We will state which samples exceeded applicable PCB cleanup levels.	
19.	Page 23, Section 4.1.4	Even though AGRA did not compare their data to regulatory or screening levels, shouldn't that be done now?		Agreed. See our response to Item 12.	
20.	Page 23	Text indicates sample *1639-05* is not shown on figure, but Figure 4-4 includes a sample *1639-5*, is this the correct sample number/location? Perhaps the missing sample is 1639-6? Or the location on your figure is mislabeled. Figure 4-4 would be more useful if the type of sample location was identified (soil, sediment, water). Which sample contained PCBs at 0.3 mg/kg? Which 6 samples contained PAHs, the sediment, soil, or water? Which sediment sample had lead at 22 mg/kg? Please review the AGRA report. According to the original report, 3 sediment, 3 water, and 3 soil samples were collected by AGRA.		AGRA's text and tables include a zero in the last two digits of the sample numbers, but their figure omits the zero in the sample number. Sample *1639-5* on Figure 4-4 should actually be labeled *1639-06*. We will correct this error by making the labels on the figures consistent with AGRA's text. We will identify the sample matrix in Figure 4-4. We will change the text to read "Of the 31 samples AGRA collected, nine were at the landfill."	
21.	General	Please be consistent and refer to regulatory levels or		Agreed. See our response to Item 12.	

U.S. ARMY CORPS OF ENGINEERS	DATE: April 4, 2012 REVIEWER: Lisa Geist PHONE: 753-5742	Action taken on comment by: Shannon & Wilson, Inc.

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		screening levels, not guidance levels.			
22.	Page 24	Please clarify/streamline presentation of sampling results. Distinguish between soil, sediment, and groundwater results. For example: Text indicates subsurface soil was analyzed for DRO, pesticides and PCBs. Then later text states GRO was not detected in any samples – does that include subsurface soil? Text states no pesticides, VOCs, or SVOCs were detected in surface soils or sediments – where were surface soil samples collected? Bulleted text indicates sediment samples were analyzed for PCBs only, but later text states no pesticides, VOCs, or SVOCs were detected… Why are geometric means reported? What comparison value was used for sediment?		We will clarify the data presentation and indicate which analyses were run on which media. Geometric means were reported in the reference documents and summarized in this RI. In order to clarify this discussion, we will remove the geometric mean information.	
23.	Page 26, Section 4.1.7	Please remove references to work conducted at the other Test Wells, in particular all text related to dioxins and PCBs at TW 9, as this is not related to the landfill.		Agreed. We will remove these references.	
24.	Page 28, Section 4.2.1	Were PCDFs and benzo(a)pyrene really identified as a COC for the landfill area? Were the burn pits associated with the landfill area?		They were not. We will remove the reference to these analytes and the burn pits, which were not associated with the landfill.	
25.	Page 30, Section 4.2.2	Where are Units A and B? These conclusions don't appear to apply to the Landfill, which is Unit C.		Agreed. Unit A refers to the Airstrip Operations Complex and Runway Lake, and Unit B refers to the Main Gravel Pad and Floatplane Lake. We will remove conclusions that reference those areas, which do not apply to the landfill.	
26.	Page 31, Section 4.2.3	The bullet: "Burbot and other fish that migrate into the slough are responsible for higher concentrations in the Colville River fishery upstream and downstream of Umiat." seem to be contradicted by other text which indicates the Slough does not affect levels found in burbot caught near Nuiqsut, and that atmospheric deposition is also a significant		We will revisit this conclusion to define the extent (i.e., distance) of upstream and downstream effects, if possible.	

Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**REVIEW CONFERENCE** A - comment accepted W - comment withdrawn (if neither, explain)	**CONTRACTOR RESPONSE**	**USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
		source.			
27.	Page 31, Section 4.2.4	What do you mean by the ATSDR 2001 health consultation not being available for review for this RI?		We have since received a copy of this report and will include it in the revised draft RI. The 1997 E&E HH and Eco RA concluded that PCBs in the Unit C sediments may pose unacceptable ecological and human health risks. The Tech Memo also recalculated the human health risk and concluded: • Potential excess lifetime cancer risks and HIs for current Umiat residents and subsistence hunters associated with consumption of fish caught from the Colville River near Umiat were less than regulatory benchmarks established by ADEC and EPA; • Potential excess lifetime cancer risks and HIs for the future residents were greater than ADEC and EPA criteria. This demonstrates that risks associated with ingesting fish contaminated with Aroclor 1254 are limited to the Unit C seasonal stream and that risks are not above regulatory guidance values within the Colville River.	
28.	Page 77, Section 6.1.1	The purpose of conducting an additional geophysical survey in 2011 was to resolve the data gap regarding debris burial depth. The survey information will never match, so why is this still considered a potential data gap? Maybe an uncertainty?		We will clarify that this is an uncertainty rather than a data gap.	
29.	Page 79,	How can PCBs not be considered a COPC for sediment? At		See response to Ms. Stephen's Item No. 10. We	

U.S. ARMY CORPS OF ENGINEERS	DATE: April 4, 2012 REVIEWER: Lisa Geist PHONE: 753-5742	Action taken on comment by: Shannon & Wilson, Inc.

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	Section 6.1.3	a minimum, the maximum value detected does exceed the ADEC cleanup level for soil. Why are no PRGs proposed for sediment?		will evaluate sediment results using ADEC migration-to-groundwater (MTG) soil cleanup levels. PCBs exceed these cleanup levels and will be identified as a COPC. We will use ADEC MTG soil cleanup levels as PRGs for sediment.	
30.	Page 83, Section 6.4.2	Text indicates that further geophysical investigations to define the depth of debris would be beneficial. Please be more specific about the limitations of the most recent 2011 geophysical investigation and why that effort did not minimize uncertainty or reduce perceived data gaps.		We will clarify that the 2011 geophysical investigation was specifically designed to assess basal depth of the Umiat landfill, and could be considered more reliable than the USGS data, which was collected as part of a multi-site investigation. We will discuss the limitations of the 2011 geophysical investigation, which were primarily related to the contractor's inability to collect data in a grid pattern after they were denied permission to cut vegetation during the field investigation.	
31.	References 7.0	The most recent citation for ADEC regulations 18 AAC 75 is dated October 1, 2011.		Agreed. We will update the date of this reference.	
32.	References 7.0	Please include FRMD file numbers for all FUDS-specific documents.		Agreed. We will provide this information in the list of references.	
33.	Appendix A	Although there are multiple aerial photo images provided herein, they are not referred to anywhere in the RI report. It appears the original size photo and a zoomed-in version of each of the 3 years of aerials are provided. What observations can be made from these aerial photos?		We will reference the aerial photos and present our observations on the photos in the text of the RI.	
34.	Appendix A, B, C, D, E	Individual PDFs of the files are not necessary, but should rather be included in the complete PDF of the report.		Agreed.	
35.	Appendix D	How were points plotted on the various figures – do you have lat/long information to create a table of historical		Coordinates for the samples were not provided in the available reports. We relied upon the	

U.S. ARMY CORPS OF ENGINEERS	**DATE: April 4, 2012** **REVIEWER: Lisa Geist** **PHONE: 753-5742**	**Action taken on comment by: Shannon & Wilson, Inc.**

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
		sample locations?		report figures and lined up features on the figures with georeferenced air photos. All samples except for the red "Areas" on Figure 4-8 were georeferenced using aerial photography.	
36.	Figure 2-1	Land ownership map. Please remove the white FUDS polygon indicating the Property boundary from the 1954 land transfer. Zoom into a better scale for the landfill/airstrip only.		Agreed. We will make the requested changes.	
37.	Figures 4-1 through 4-10	Please include a comprehensive figure which depicts ALL the sampling locations by media. It would helpful to also graphically show exceedances across the various phases of the RI, instead of just a location.		We will include figures with the requested information.	
38.	Figure 4-3	What do the solid black points labeled LA, LB, and LC refer to? They are not depicted in the legend.		They refer to the 1996 RI sediment sample locations. We will add this symbol to the legend.	
39.	Figure 4-6	Make legend consistent with previous figures. Title <u>Approximate Sampling Locations.</u> Do not need the example sample number designation shown in legend.		Agreed. We will make the requested changes.	
40.	Figure 4-5, 4-7	What are the transects for? Fish samples, sediment, water depth?		We will add this information to the text and/or figure.	
41.	Figure 4-7	Add sample points for surface water samples?		We will provide these, where they are available.	
42.	Figure 4-8	Add red point to legend. Create one legend. Can this information be overlain on the aerial photo like previous figures?		We will make the first two requested changes. Jacobs' sketch of the sample locations does not line up with the air photos. Regarding the red points ("Areas") on Figure 4-8, attempts at georeferencing the source figure were not successful. The source figure did not have an aerial background and did not have reference features that would allow us to position it in real coordinate space with any reliability.	

U.S. ARMY CORPS OF ENGINEERS	**DATE: April 4, 2012** **REVIEWER: Lisa Geist** **PHONE: 753-5742**	**Action taken on comment by: Shannon & Wilson, Inc.**

Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**REVIEW CONFERENCE** **A - comment accepted** **W - comment withdrawn** **(if neither, explain)**	**CONTRACTOR RESPONSE**	**USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
43.	Figures	Why is there no figure depicting the geophysical investigation results from 2011?		GeoTek reported their results correlated well with the USGS results. Their figure used red dots to indicate “hits”, was overlain on the USGS results. We will include a copy of GeoTek’s figure.	
		----- End of Comments ----			

REVIEW COMMENTS

PROJECT: Umiat Landfill

DOCUMENT: Draft Remedial Investigation Report - Feb 2012 Location: Umiat, Alaska

U.S. ARMY CORPS OF ENGINEERS	**DATE: 3/21/2012** **REVIEWER: Will Mangano** **PHONE: 753-5689**	**Action taken on comment by: Shannon & Wilson, Inc.**

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
1.	Executive Summary and throughout	Please review and spell out the first use of each acronym. This comment applies to the Executive Summary and throughout the document. There are also multiple instances where acronyms are spelled out several times throughout the document.		Agreed. We will correct this.	
2.	Sec.1.0, 1st paragraph	Grammatical error for sentence “The Umiat AFS used by the …”		Agreed. We will correct it to read “Umiat AFS was used by the …”.	
3.	Sec.2.0, 1st paragraph	Grammatical error for sentence “Throughout this report, to the former…”		Agreed. We will correct this.	
4.	Section 4.0, General Comment	This entire section could benefit by grouping all information for a given investigation and/or year into one subsection (i.e., sampling, risk assessment, geophysical, associated figure). As it is currently structured, the reader must flip back and forth between subsections to gather a complete picture from each investigation/year. Grouping the information could make this section more user-friendly.		We would like to avoid reformatting Section 4 in this manner. We will be more clear in how we present the information in the existing format, so that it is more easily understood.	
5.	Section 4.0, General Comment	Beginning in Subsection 4.1.3 and throughout the rest of Section 4.0, references to sample results and groundwater wells become extremely vague. Statements like “PAHs were detected in six of the samples.” and “DRO in monitoring well MW-4 was the only detected analyte in the 10 monitoring wells sampled at the landfill.” Which samples had PAHs? Which wells were sampled? References to this type of data should be more specific, so the reader could refer to the respective figure from the text.		Agreed. We will clarify the presentation of results, stating which analytes were detected where, and indicate the sample matrix. We will present this information. See response above.	
6.	Section 5.1, 1st paragraph	Grammatical error for sentence “…, specifically Methods Two cleanup…”		Agreed. We will correct this.	

REVIEW COMMENTS

PROJECT: Umiat Landfill

DOCUMENT: Draft Remedial Investigation Report - Feb 2012 Location: Umiat, Alaska

U.S. ARMY CORPS OF ENGINEERS	**DATE: 3/21/2012** **REVIEWER: Will Mangano** **PHONE: 753-5689**	**Action taken on comment by: Shannon & Wilson, Inc.**

Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**REVIEW CONFERENCE** A - comment accepted W - comment withdrawn (if neither, explain)	**CONTRACTOR RESPONSE**	**USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
7.	Section 6.1.3, 1st paragraph	Is the statement "No COPCs exist for sediment" accurate? There are no promulgated ADEC cleanup levels for sediment; however, the presence of PAHs, PCBs, and pesticides in sediment still indicate contaminants of potential concern, correct? Would PRGs for soil be applicable to the contaminants present in sediment?		We will apply the more stringent of ADEC Arctic Zone and migration to groundwater soil cleanup levels to sediment.	
8.	Section 6.1.5	Please list the analytes that exceeded the cleanup levels for groundwater under a COPCs list. I recognize that groundwater does not apply to "Arctic Zone", but the effort was made to sample groundwater, so the data should be specified.		Following a review of ADEC's comments on the first draft, we agree that ADEC groundwater cleanup levels are applicable to this site. We will evaluate groundwater results using the cleanup levels.	
9.	Section 6.1.6	Same as comment 6, wouldn't the presence of PCBs, DDD, DDE, and DDT indicate COPCs in fish tissue?		We note that the discussion of the fish tissue as an affected medium will be substantially revised as a result of our review of additional reference sources.	
10.	Section 6.2.2	We have data that groundwater is contaminated. The CSM should not have this data excluded. Although regulations do not currently recognize groundwater in the "Arctic Zone", we know that contaminated groundwater does exist at the landfill. This information should be incorporated into the CSM.		Agreed. We will revise the CSM to reflect this.	
11.	Section 6.5, 4th bullet	Groundwater should also be included here.		Agreed. We will correct this.	
		----- End of Comments ----			

REVIEW COMMENTS **PROJECT: Former Umiat Air Force Station Landfill**
DOCUMENT: First Draft Remedial Investigation Report

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-ES-M	**DATE:** May 7, 2012 **REVIEWER: Tamar Stephens, ADEC** **PHONE: 907-451-2131**	**Action taken on comment by: Shannon & Wilson, Inc.**

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	4.1.7, pg 26-27	This section should clarify the relevance of the investigation at Test Well 9 to the discussion of the landfill. Is there a migration pathway for PCBs from Test Well 9 to the landfill area?		Agreed. We will remove the reference to Test Well 9 and dioxins, which were detected elsewhere on site.	
2	4.1.8, pg 27	The “small transformer” and “electrical device” are two different terms that have been used in the past to describe the same item, not two separate items as implied by the wording of this section.		Agreed. We will remove the reference to an electrical device.	
3	4.2.4, pg 31	I have a copy of the Agency for Toxic Substances and Disease Registry (ATSDR) 2001 Health Consultation and can provide a copy if it will be helpful to finalizing this report.		We have requested this document from ADEC and will review it for the second draft of the RI.	
4	4.3.3, pg 32	DEC has not received a copy of the 2011 GeoTek report: Final Technical Memorandum, Umiat Landfill Geophysical Survey, FUDS Project F10AK0243-08. Please provide a copy to DEC.		This comment is directed at USACE, not Shannon & Wilson.	
5	4.4, pg 33	DEC has not received a copy of the 2011 Hydrologic Analysis of Umiat Landfill, FUDS Project F10AK0243-08. Please provide a copy to DEC.		This comment is directed at USACE, not Shannon & Wilson.	
6	5.1, pg 61	This section relies on Method Two soil cleanup levels; however, at Umiat there are other exposure pathways and receptors that need to be considered that may not be protected by Method Two soil cleanup levels. A construction worker would have direct contact with surface and subsurface contaminants. Subsistence users, particularly for ingestion of fish, need to be considered.		We will revise the CSM to include these exposure pathways and receptors.	

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-ES-M	DATE: May 7, 2012 REVIEWER: Tamar Stephens, ADEC PHONE: 907-451-2131	Action taken on comment by: Shannon & Wilson, Inc.

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)
7	5.1, pg 63	This section discusses identification of compounds of potential concern (COPCs) in soil. a. It is not clear from this section how compounds were retained for evaluation of cumulative risk. The second paragraph states that chemicals at concentrations less than Method Two soil cleanup levels are considered to be protective of human health. However, chemicals present at one-tenth the Method Two soil cleanup levels should be retained to evaluate for cumulative risk effects. Later in the report, in section 5.6, there is discussion of retaining compounds for cumulative risk evaluation if they exceed 1/10 of the Method 2 cleanup level, but this information also should be provided in section 5.1 so that the two sections are consistent with each other.		a. We will clarify how compounds were retained for the CRE (i.e., those that exceeded 1/10 of the Method 2 cleanup level) and make the sections consistent.	
7	5.1, pg 63	b. In the fourth paragraph in this section, the conclusion that the migration to groundwater exposure pathway soil cleanup levels do not apply is incorrect for this site. DEC policy, as described in “Policy for Establishing Cleanup Levels for Sites in the Arctic Zone in Accordance with 18 AAC 75, Article 3” (Guidance No. SPAR 99-3), states: “The department has made a general determination that the presence of continuous permafrost in the arctic zone acts as a barrier for soil contaminant migration to a groundwater zone of saturation. Therefore the migration to groundwater pathway does not naturally exist for sites located in the Arctic zone.” However, groundwater in the landfill is not typical suprapermafrost active zone water. In the summertime, and perhaps to a lesser extent during the rest of the year, the landfill is within a		b. Agreed. We will revise the CSM to reflect that groundwater is a transport pathway and affected medium. We will apply the more stringent of direct contact and outdoor inhalation Arctic Zone cleanup levels and migration-to-groundwater (MTG) cleanup levels to soil samples.	

REVIEW COMMENTS — PROJECT: Former Umiat Air Force Station Landfill
DOCUMENT: First Draft Remedial Investigation Report

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-ES-M	DATE: May 7, 2012 REVIEWER: Tamar Stephens, ADEC PHONE: 907-451-2131	Action taken on comment by: Shannon & Wilson, Inc.

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)
		hyporheic zone, that is, a zone where there is mixing of shallow groundwater and surface flow. During the summer it is likely that the majority of the groundwater in the landfill originates from surface water from the river, to re-emerge into the seasonal slough. Thus, a very close connection is present between groundwater and surface water at this site. 18 AAC 75.345(f) requires that “groundwater that is closely connected hydrologically to nearby surface water may not cause a violation of the water quality standards in 18 AAC 70 for surface water or sediment.” Since surface water is protected for all uses in Alaska, including drinking water, both 18 AAC 75.345 Table C groundwater and 18 AAC 70 Water Quality Standards apply to this water. Because of the close hydrologic connection between surface and groundwater at this site, the groundwater is protected for use as drinking water, and migration to groundwater soil cleanup levels do apply.			

REVIEW COMMENTS — PROJECT: Former Umiat Air Force Station Landfill
DOCUMENT: First Draft Remedial Investigation Report

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-ES-M	DATE: May 7, 2012 REVIEWER: Tamar Stephens, ADEC PHONE: 907-451-2131	Action taken on comment by: Shannon & Wilson, Inc.

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)
8	5.4, pg 63	This section states that groundwater results are compared to Table C cleanup levels, but are not enforceable at this site. Please see previous comment. Groundwater in the landfill is closely hydrologically connected to surface water, so groundwater from the landfill needs to meet water quality criteria at some point of compliance established to prevent adverse impacts to both sediments and surface water. Since one of the protected uses of surface water under 18 AAC 70 is for drinking water, the more stringent of 18 AAC 75.345 Table C groundwater cleanup levels and the water quality standards in 18 AAC 70. For a more detailed discussion of how the regulations apply in this situation, please see the "Regulatory Approach to Managing Contamination in Hydrologically Connected Groundwater and Surface Water" (Technical Memorandum 01-005, Updated April 13, 2011), which can be found on the Contaminated Sites Program webpage at: http://dec.alaska.gov/spar/csp/guidance/gw_sw.pdf.		Agreed. We will include groundwater cleanup levels and surface water quality criteria as regulatory ARARs applicable to groundwater. We will evaluate groundwater results using the more stringent of 18 AAC 75.345 Table C or 18 AAC 70 water quality standards.	

REVIEW COMMENTS — **PROJECT: Former Umiat Air Force Station Landfill**
DOCUMENT: First Draft Remedial Investigation Report

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-ES-M	DATE: May 7, 2012 REVIEWER: Tamar Stephens, ADEC PHONE: 907-451-2131	Action taken on comment by: Shannon & Wilson, Inc.

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	5.5, pg 63	Please discuss the assumptions about the quantities of fish consumed in the EPA Region 3 Fish Tissue Screening Levels with respect to quantities consumed by subsistence users. What risk levels do these screening levels represent? A lot of work went into the fish tissue study reported in the *Evaluation of PCBs and DDTs in the Colville River, Former Umiat Air Force Station, Umiat, Alaska* (E&E, 2003), and in the subsequent development of the 2003 ATSDR *Health Consultation, Review of Burbot Samples, US Army USACE Umiat Air Force Station*. The RI should discuss these two important documents in more detail and use the information and conclusions from these documents in discussion of risks associated with fish consumption. The ATSDR document will provide more applicable information on typical consumption rates. Another significant document that is not referenced in this report is the 2003 *DRAFT CRITICAL DOCUMENT REVIEW REPORT NO. 39-EJ-XXXX-02* *HUMAN HEALTH EFFECTS ASSOCIATED WITH PCBs IN THE UNIT C SEASONAL STREAM (SLOUGH) AT THE UMIAT AIR FORCE STATION, COLVILLE RIVER, ALASKA (US Army Center for Health Promotion and Preventive Medicine (USACHPPM))*		We will review and discuss the fish studies more closely and provide further discussion of risk from fish consumption. Agreed. We have reviewed and will include a summary of this reference.	

REVIEW COMMENTS — PROJECT: Former Umiat Air Force Station Landfill

DOCUMENT: First Draft Remedial Investigation Report

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-ES-M	DATE: May 7, 2012 REVIEWER: Tamar Stephens, ADEC PHONE: 907-451-2131	Action taken on comment by: Shannon & Wilson, Inc.

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)
10	5.6, pg 63	The second paragraph concludes by saying that a cumulative risk evaluation (CRE) "was not conducted on sediment data because ADEC does not include sediment-cleanup levels in its regulations, and the NOAA SQuiRT data are not promulgated cleanup criteria." However, sediment data cannot be disregarded. There is the potential for direct contact with the sediment by residents, construction workers, or subsistence fishers. Soil cleanup levels can be used to represent direct contact risks. Additionally, 18 AAC 75.354(d) states that "toxic substances in sediment may not cause, and may not reasonably be expected to cause, a toxic or other deleterious effect on aquatic life."		We will apply soil cleanup levels to sediment sample concentrations. We will include sediment in the CRE and revise the CSM.	
11	6.6, pg 84	The third paragraph, second sentence, states: "It would take a rigorous sampling effort to provide an accurate estimate of the landfill contents due to probable special variation." This paragraph understates the importance of understanding that the heterogeneity of a landfill makes it impossible to sample sufficiently to identify contaminant sources within the landfill. No amount of sampling, short of complete excavation of the contents, would tell you whether there is another small transformer filled with PCB oil that is, or may become, a point source for release of highly concentrated contaminants.		Agreed. We will reword the paragraph and include text similar to your statements.	
		Comments from Ted Wu:			
1	5.0, pg 61	EPA Region 3 Fish Tissue Screening Levels are based on a default fish consumption rate set at 54 g/day. An appropriate adjustment to the fish consumption rate (and subsequent generation of site-specific screening levels by the calculator) based on subsistence fishers in the area is warranted. In addition current screening hazard index (HI) for fish tissue is equal to 1 based on Table 5-1 footnote 3. The screening HI should = 0.1.		We will access the formulas used to calculate Region 3 screening levels and apply the actual fish consumption rate to obtain site-specific screening levels.	

REVIEW COMMENTS **PROJECT: Former Umiat Air Force Station Landfill**
DOCUMENT: First Draft Remedial Investigation Report

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-ES-M	DATE: May 7, 2012 REVIEWER: Tamar Stephens, ADEC PHONE: 907-451-2131	Action taken on comment by: Shannon & Wilson, Inc.

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	5.1, pg 61	There is strong evidence that the contaminated soil will have direct contact with surface water or contaminants will migrate to the nearby surface water through the suprapermafrost groundwater; thus the screening levels used in soil (direct contact or inhalation pathway) [are] not appropriate in evaluating protection to the receiving surface water or sediment.		Agreed. Refer to our response to Ms. Stephen's Item No. 7b.	
		For sites with an adjacent surface water body, regulations under 18 AAC 75.340(c) require soil cleanup levels developed under method two, three or four to be protective of surface water quality standards. In addition, regulations under 18 AAC 75.345(f) require that groundwater closely connected hydrologically to nearby surface water not cause a violation of water quality standards in 18 AAC 70.020 for the receiving surface water or sediment. Therefore, suprapermafrost groundwater should be evaluated as a transport medium for contaminant migration from soil to a receiving surface water body. The proposed soil cleanup levels and the cleanup action taken at the site must result in reducing or eliminating this transport pathway so water quality standards are met in the receiving surface water and sediment.		Agreed. Refer to our response to Ms. Stephen's Item No. 8.	
		If suprapermafrost groundwater is a potential transport medium for soil contamination to a groundwater zone of saturation, the proposed soil cleanup levels and the cleanup action taken at the site must result in reducing or eliminating this transport pathway so the receiving groundwater is not adversely impacted. This may occur where drinking water wells that access a subpermafrost aquifer are located in the vicinity of contaminated suprapermafrost groundwater.		Agreed. We will include a statement to this effect.	

REVIEW COMMENTS	PROJECT: Former Umiat Air Force Station Landfill DOCUMENT: First Draft Remedial Investigation Report	
U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-ES-M	**DATE:** May 7, 2012 **REVIEWER: Tamar Stephens, ADEC** **PHONE: 907-451-2131**	**Action taken on comment by: Shannon & Wilson, Inc.**

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	5.2, pg 62	The NOAA SQuiRT's values are based upon effects reported for benthic organisms (organisms that inhabit the bottom of an aquatic environment). They do not address or apply to bioaccumulation, adverse effects in higher trophic level organisms (biomagnification), and/or human health. As such, compounds that are known (or suspected) to bioaccumulate and biomagnify may warrant further investigation. Wild food consumption pathway is of particular concern to residents, subsistence users, and recreational users at a site. The parts of animals and plants consumed by subsistence harvesters vary greatly across Alaska. Consultation with subsistence users to determine relevant pathways, is strongly recommended. Contaminants from soil, sediment, surface water, or other plant and animal life can accumulate in plants and animals that are eaten by people. Although there are many ways to determine a chemical's ability to bioaccumulate or biomagnify in the food chain, EPA considers a compound with a BCF greater than 1,000 to bioaccumulate in tissue (EPA 2004) "August 2004b, *Persistent, Bioaccumulative, and Toxic (PBT) Profiler*, Office of Pollution Prevention and Toxics". Thus any COPCs that are known to bioaccumulate and biomagnify should be assessed regardless of the screening levels in the mediums.		We will include a discussion of which compounds will bioaccumulate and biomagnify. We will apply MTG soil cleanup levels to sediment results and include sediment in the CRE. We will provide a more comprehensive review of the fish studies and discuss their conclusions. We will add determination of risk from plant and animal consumption to the list of data gaps.	
4	5.5, pg 63	Please note comment 1 for the introduction section regarding fish screening levels.		We will make the requested changes.	
5	5.4, pg 63	Please note comment 2 regarding the ground water.		We will make the requested changes.	

REVIEW COMMENTS	PROJECT: Former Umiat Air Force Station Landfill DOCUMENT: First Draft Remedial Investigation Report	
U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-ES-M	DATE: May 7, 2012 REVIEWER: Tamar Stephens, ADEC PHONE: 907-451-2131	Action taken on comment by: Shannon & Wilson, Inc.

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)
6	5.6, pg 63	The section on cumulative risk states a CRE was performed, then PRGs developed is confusing. No result of the CRE was noted in the section. Plus PRGs were based solely on soil cleanup levels and water quality standards. A calculated cumulative risk should be performed after cleanup of method 2 and chemical detected at 1/10 must be included when calculating cumulative risk under 18AAC 75.325(g).		We will discuss the results of the CRE in this section, and will clarify the discussion of PRGs.	
7	5.6, pg 63	In addition to sediment not being included in the cumulative risk calculation, the exposure pathway from the consumption of fish also is not included. This results in underestimating the cumulative risk, especially, when subsistence users are known to be consuming fish from the surface water in the area.		We will use the carcinogenic and non-carcinogenic fish tissue screening levels from the EPA Region 3 Fish Tissue screening level calculator as RBCs in the CRE.	
8	Table 6-1	There are some inconsistencies in Table 6-1. Soil samples for aluminum, cobalt, iron, and manganese also exceeded the PRG based on Table 5-2 and were not included in Table 6-1.		Table 5-2 presents a comparison of analytes detected in soil to applicable ARARs or TBCs. Aluminum, cobalt, iron, and manganese concentrations were compared to NOAA SQuiRTs because they do not have soil-cleanup levels. Table 6-1 presents those analytes identified as contaminants of potential concern based on their exceeding PRGs, which for soil are based on Method 2 soil-cleanup levels.	
9	Fig 6-1	Construction workers are a missing receptor on the CSM. Disagree that dermal contact of surface soil is an incomplete exposure pathway for all 3 receptors, as well as construction workers. Disagree that incidental ingestion of sediment is a minor pathway for all 3 receptors when PCB were detected at a maximum of 17.8 mg/kg and screening is set at 0.0003 mg/kg.		We will revise the CSM to include construction workers as receptors and dermal contact as an exposure pathway. We will remove the minor/major pathway differentiation to be consistent with ADEC guidance. We will change ingestion of sediment to a complete pathway.	

REVIEW COMMENTS **PROJECT: Former Umiat Air Force Station Landfill**
DOCUMENT: First Draft Remedial Investigation Report

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-ES-M	DATE: May 7, 2012 REVIEWER: Tamar Stephens, ADEC PHONE: 907-451-2131	Action taken on comment by: Shannon & Wilson, Inc.

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)
10	Fig. 6-2	Disagree that sediment ingestion and direct contact for terrestrial pathway is incomplete.		We will change the ingestion and contact pathway to be complete.	
11	6.1.6, pg 79	Disagree with the statement there are no COPC for fish tissue at the Umiat landfill. DDT and Aroclor 1254 were detected in soil and sediment samples. These compounds also bioaccumulate and table 5-6 shows contaminants above screening levels that are detected in the landfill.		We will include DDT and Aroclor 1254 as COPCs for fish tissue if the concentrations exceed screening levels calculated using an adjustment to the fish consumption rate (and subsequent generation of site-specific screening levels by the calculator) based on subsistence fishers.	
12	6.2.2, pg 80	Please note 2nd comment above.		We will include groundwater as a transport medium through its connection to surface water.	
13	6.4.1, pg 83	Suggested including TCE as the chemical has been used extensively in the past at military facilities.		We disagree. A total of 89 samples in soil, sediment, surface water, and groundwater have been tested for volatile organic compounds (including TCE). TCE was not detected in any of the samples.	
14	6.6, pg 84	Disagree with the statement the current risks from the COPCs are low. Levels in fish tissues far exceeded the screening criteria set forth in Table 5-6.		We will revisit the CRE and risk evaluation. We will screen concentrations in fish tissue, sediment, and groundwater against the screening and cleanup levels discussed in these review comments.	
15	Table 6-2	Soil samples for aluminum, cobalt, iron, and manganese also exceeded the PRG based on Table 5-2 and were not included in the CRE. It should also be noted that the cumulative risk evaluation doesn't include exposure pathways from surface water, wild food consumption, and sediments.		See also our response to Item 8: soil cleanup levels have not been established for the referenced compounds, and they were therefore not included in the CRE. We will note that exposure to surface water, wild food consumption, and sediments, while not included in the CRE, are other factors to consider.	

REVIEW COMMENTS — **PROJECT: Former Umiat Air Force Station Landfill**
DOCUMENT: First Draft Remedial Investigation Report

U.S. ARMY CORPS OF ENGINEERS CEPOA-EN-ES-M	**DATE:** 2012 **REVIEWER: Jake Sweet** **PHONE: 907-753-2694**	**Action taken on comment by: Shannon & Wilson, Inc.**

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	Figures 4-1 through 4-8	It would be helpful is sample results were placed on the figures.		We do not plan to present the results on the figures.	
2	Figure 4-3	There are three features marked “LA, LB and LC” that are not described on the legend. Please clarify what these locations are.		Agreed. We will clarify that these are the 1996 surface water and sediment sample locations.	
3	Tables 5-1 through 5-4	Many of these tables have data in the PQL column without a corresponding primary result. Where are the PQL numbers coming from? Having a PQL reported suggests there should be a primary result associated.		We included PQLs in these tables when that information was available from the source reference documents. A PQL without a corresponding primary result indicated the analyte was not detected. This information allows us to assess the absence of a contaminant with more confidence.	
4	Table 5-6	This table is the only one that uses µg/kg. Please use mg/kg to be consistent with the rest of the data.		Agreed. We will use consistent units (mg/kg in all the applicable tables).	

REVIEW COMMENTS | **PROJECT: Umiat Landfill**

DOCUMENT: Interim Final Remedial Investigation Report - Oct 2012 | **Location: Umiat, Alaska**

U.S. ARMY CORPS OF ENGINEERS	**DATE: 11/02/2012** **REVIEWER: Sam Bass, Geology, EMCX** **PHONE: 402-697-2654**	**Action taken on comment by:**

Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**REVIEW CONFERENCE** A - comment accepted W - comment withdrawn (if neither, explain)	**CONTRACTOR RESPONSE**	**USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
1.	Page 7, Section 2.2	The Navy apparently owned the site from 1959 to 1977. Please provide additional detail regarding the types of activities/operations performed at the site (if available) during this time frame. What was the last date of DOD activities at the site? Are there other potentially responsible parties (including other government agencies) whose operations may be responsible for contamination at the site?		In response to this comment and comments from other reviewers, we have revised Section 2.2 for clarity.	
2.	Page 12, Section 2.5.1.5, second paragraph	The text states “Groundwater extends from the water table to the top of permafrost, which is commonly 2 feet to 3 feet bgs”. Which is 2 to 3 feet bgs, the water table or the permafrost? This makes a difference when considering potential remedial actions.		We will clarify the text to indicate that 2 to 3 feet bgs is the depth to permafrost. We will state the depths to both suprapermafrost groundwater and the underlying permafrost at the main site and in the landfill area.	
3.	General comment	Separately I emailed Aaron Shewman, the Innovative Technology Advocate for Alaska District, information on a new technology that may apply at the site, if not at the landfill possibly to other areas at Umiat (such as Test Well 9). It is a self-contained mobile steam stripping device that according to the vendor and their literature has been used to remediate VOCs, SVOC, PAHs, and PCBs in soil to unrestricted use levels. You may wish to consider it during the Feasibility Study for the site.		We will take this information into consideration for the FS.	
		----- End of Comments ----			

REVIEW COMMENTS

PROJECT: Umiat Landfill

DOCUMENT: Interim Final Remedial Investigation Report - Oct 2012 Location: Umiat, Alaska

U.S. ARMY CORPS OF ENGINEERS	**DATE: 12/18/2012** **REVIEWER: Ed Bave, Compliance (EMCX)** **PHONE: 402-697-2634**	**Action taken on comment by:**

Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**REVIEW CONFERENCE** A - comment accepted W - comment withdrawn (if neither, explain)	**CONTRACTOR RESPONSE**	**USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
1.	Section 3.0, last paragraph	Insert “potential” before …..list of ARARs have……since we are evaluating tentative ARARs during the RI. The FS will define ARARs for the proposed alternatives.		We will make the requested changes.	
2.	Section 3.1.1	Recommend staying away from POL-related ARAR discussions (i.e. 18 AAC 75) unless there is strong evidence the USTs held hazardous substances. POL is specifically excluded from the definition of a CERCLA hazardous substance.		We concur that the Underground Storage Tanks (18 AAC 78) regulations do not likely apply to the site, since we have found no mention of USTs, or UST-related contamination, on the site. We will clarify that 18 AAC 78 does not likely apply to the Umiat landfill. In addition, we will add the following text: “Petroleum, oil, and lubricants (POL) contaminated sites fall under the CERCLA petroleum exclusion and are therefore being addressed under the authority of the Defense Environmental Restoration Program (DERP), United States Code (USC), Title 10, Section 2701, et seq.. The DERP provides authority to clean up petroleum contamination when it may pose an imminent and substantial endangerment to public health, welfare or the environment. Alaska’s Site Cleanup Rules (18 AAC 75 Article 3 Oil and Other Hazardous Substances Pollution Control) are risk-based and indicative of when an imminent and substantial endangerment to the public health or welfare or the environment has been mitigated.”	
3.	Significant	Tables D-1 – D-3 lists ~ 52 potential ARARs which is an overly		We will make the requested changes.	

U.S. ARMY CORPS OF ENGINEERS	**DATE: 12/18/2012** **REVIEWER: Ed Bave, Compliance (EMCX)** **PHONE: 402-697-2634**	**Action taken on comment by:**

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
	Comment, Appendix D	excessive amount and needs to be substantially reevaluated and reassembled. As examples, ACGIH is a worker protection standard (not promulgated) and does not meet the definition of an ARAR. The NESHAP for asbestos is for demolition and renovation and would not be applicable or relevant and appropriate for remediation activities unless there is some sort of demolition. The 40 CFR 301 – 307 references are invalid (likely 400 series) and should all be eliminated. For on-site treatment, the provisions in 40 CFR 445 might be relevant to on-site discharges. Generically referencing non-enforceable secondary MCLs is incorrect. This list should be boiled down to a listing of ARARs that meet the definition on an ARAR and are reasonably expected as potentially coming into play during the FS alternatives evaluation. As this list stands now, we are potentially listing an inordinate amount of Environmental Laws (and regulations) with no basis. Anything listed associated with permitting should be evaluated for substantive requirements only and off-site management items listed should be removed.			
		----- End of Comments ----			

REVIEW COMMENTS	PROJECT: Umiat Landfill DOCUMENT: Interim Final Remedial Investigation Report - Oct 2012	Location: Umiat, Alaska
U.S. ARMY CORPS OF ENGINEERS	**DATE: 11/28/2012** **REVIEWER: Susan Flora, BLM** **PHONE: (907) 474-2303**	**Action taken on comment by:**

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
1.	General	Thank you for the opportunity to comment on the draft final RI for the Umiat Landfill. Overall, the document is an excellent summary/compilation of past site characterization data for the site, but does not delve into remedial issues. Missing from the document is any result of the circa 1997 cap experiment where gravel was compacted into a square-topped pyramid with one or two monitoring wells. What were the thermistor results? The pyramid was disassembled by ACOE contractor Jacobs Engineering in 2001 or 2002 when additional gravel was needed for the soil burning operation on the main camp pad. Specific text review comments follow:		We have not found documentation of results of E&E's permafrost cap pilot study. We will add a sentence to that effect to the paragraph, and add the information you provided on the decommissioning of the cap.	
2.	Page vii, Exec. Sum., para. 2	Last sentence is inaccurate. The northern portion of the landfill is within the ADOT&PF airport property, and thus is correctly identified as existing on State of Alaska lands. The southern portion of the landfill, however, exists on mixed ownership: the gravel only portions of the landfill are annually a channel of the Colville River, which is designated as navigable by the State at this location. Thus, the State of Alaska (DNR) would be the landowner. The higher elevation, vegetated portions of the landfill (above the mean high water mark) would be part of the National Petroleum Reserve-Alaska, and thus, federal land.		Acknowledged. We recognize the nature of land ownership and management at the former Umiat AFS, landfill, surrounding area, and the Colville River is complex. It is beyond the scope of this RI to present a detailed discussion of the issues raised in the comment. We will delete the last sentence regarding the landfill land ownership status.	
3.	General	The report lacks a map depicting land ownership or land survey. Land ownership is a major issue for this site. Since multiple land owners are mentioned in the map, including the Arctic Slope Regional Corporation, a map depicting land ownership and navigable vs non-navigable Colville River designations would greatly advance understanding of these complex issues.		Acknowledged (see also our response to Comment 2).	
4.	Page 7, Section 2.2,	The last 2 sentences are incorrect. In 1967, the Umiat airfield property (including approximately 115 acres of gravel pads		See also Lisa Geist (USACE) Comment 6; we have re-written Section 2.2 for clarity.	

REVIEW COMMENTS

PROJECT: Umiat Landfill
DOCUMENT: Interim Final Remedial Investigation Report - Oct 2012 Location: Umiat, Alaska

U.S. ARMY CORPS OF ENGINEERS	**DATE: 11/28/2012** **REVIEWER: Susan Flora, BLM** **PHONE: (907) 474-2303**	**Action taken on comment by:**

Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**REVIEW CONFERENCE** **A - comment accepted** **W - comment withdrawn** **(if neither, explain)**	**CONTRACTOR RESPONSE**	**USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
	para. 2	and airstrip) were conveyed from federal ownership to the State of Alaska. The lands surrounding the airport property were the Naval Petroleum Reserve #4. In 1977 these lands were transferred to the U.S. Department of Interior (DOI) as a result of Public Law 94-258, the Naval Petroleum Reserves Production Act of 1976. (Note: the draft refers to the "Naval Petroleum Reserve Act" which is incorrect).			
5.	Page 7, Section 2.2, para. 3	The first sentence is not accurate in that the ADOT&PF owns the airfield which includes 115 acres of gravel pads, roads, and airstrip.		See response to comment 4.	
6.	Page 7, Section 2.2, para. 3	The second sentence is incorrect. BLM has no jurisdiction on State lands and therefore has no management of the Umiat airfield. Only the State (specifically ADOT&PF) has ownership management here.		See response to comment 4.	
7.	Pages 7 and 8, Section 2.2, para. 3	The third sentence is inaccurate. The Colville River is designated as navigable from the Umiat area to the mouth. Upriver of Umiat is non-navigable and is managed by BLM as part of the NPR-A. The State owns the beds of navigable rivers.		See response to comment 4.	
8.	Page 8, Section 2.2, top para., third full sentence	Note that the ASRC owns the lands to the east of the Colville River, across from Umiat.		See response to comment 4.	
		----- End of Comments ----			

REVIEW COMMENTS

PROJECT: Umiat Landfill
DOCUMENT: Interim Final Remedial Investigation Report - Oct 2012 Location: Umiat, Alaska

U.S. ARMY CORPS OF ENGINEERS	DATE: 11/26/2012 REVIEWER: Tamar Stephens, ADEC PHONE: (907) 451-2131	Action taken on comment by:

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
1.	General	This report compiles and evaluates information from multiple environmental and geophysical investigations that have been performed at the Umiat landfill, evaluates risks posed to human health and the environment, and recommends that the U.S. Army Corps of Engineers should implement short-term remedies to prevent further erosion and contaminant migration due to flooding of the landfill, and should assess and implement long-term measures to eliminate the potential for release of contaminants. Our review of this second draft report finds that the revisions requested in our comments on the first draft report have been adequately incorporated into the second draft report. We have the following comments on the second draft report.		Acknowledged.	
2.	Page 68, Section 5.1	The third paragraph of this section (first full paragraph on page 68) says that analytic results were compared to the Method Two soil cleanup levels; it does not say they were compared to 1/10 of the cleanup levels. This paragraph needs to be consistent with section 5.4, which does a good job of explaining the determination of cumulative risk. It is confusing to have one section say contaminants were compared to the Method Two soil cleanup levels, and another say that they were screened against one-tenth of the Method Two soil cleanup level. The fifth paragraph in Section 4.1.8 also refers to using the Method Two soil cleanup levels as a screening tool, but does not clarify that screening is actually performed by comparison to one-tenth of the cleanup levels. Please revise these sections for consistency with Section 5.4.		Analytical results were compared to both the Method Two soil cleanup levels to identify regulatory exceedances, as well as 1/10th human-health-based cleanup levels (risk-based screening levels) to identify contributors to cumulative risk. We will clarify in the text by adding the following sentence to the noted paragraph: "Analytical results were also screened for potential contributions to cumulative risk by comparing the highest result to one-tenth the relevant human-health based cleanup level, or in the case of fish-tissue results, the calculated risk-based screening level (see Section 5.4)."	
3.	Page 71,	The partial paragraph at the top of the page refers to the Method Two Table C groundwater cleanup levels. Please		We will delete the words "Method Two" from	

REVIEW COMMENTS **PROJECT: Umiat Landfill**
DOCUMENT: Interim Final Remedial Investigation Report - Oct 2012 **Location: Umiat, Alaska**

U.S. ARMY CORPS OF ENGINEERS	**DATE: 11/26/2012** **REVIEWER: Tamar Stephens, ADEC** **PHONE: (907) 451-2131**	**Action taken on comment by:**

Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**REVIEW CONFERENCE** **A - comment accepted** **W - comment withdrawn** **(if neither, explain)**	**CONTRACTOR RESPONSE**	**USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
	Section 5.4	delete the words "Method Two" from this paragraph. The Table C groundwater cleanup levels are not part of Method Two, and apply regardless which soil cleanup method is used at a site. "Method Two" is used in the regulations only for designation of one of the methods for determining soil cleanup levels.		this paragraph.	
		--End of comments--			

REVIEW COMMENTS

PROJECT: Umiat Landfill

DOCUMENT: Interim Final Remedial Investigation Report - Oct 2012 Location: Umiat, Alaska

U.S. ARMY CORPS OF ENGINEERS	DATE: 11/26/2012 and 1/7/2013 REVIEWER: Lisa Geist PHONE: 753-5742	Action taken on comment by:

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
1.	Executive Summary, 2nd para.	Add "approximate" before 8-acre. Is it appropriate to reference a Figure which shows the landownership distinction for the southern versus northern portion of the landfill?		We will add "approximate." We will reference Figure 2-1, which shows land ownership at the landfill.	
2.	Executive Summary, p. viii	Please be more specific regarding the two studies that suggest a maximum burial depth or about 20 feet. The most recent GeoTek Alaska report interprets the depth at ranging from 8 to 17 feet.		We will change the text to read "Two studies (Ecology & Environment in 1994 and GeoTek in 2011) suggest burial depths ranging from approximately 8 feet to 18 feet bgs; the USGS (in 2005) and anecdotal evidence from past site users suggest burial depths of 40 feet or more."	
3.	Page 1	Spell out NPRA on 1st use. Delete sentence "The State of Alaska owns 115 acres of the former station." This is out of context here, otherwise need to include other landowner such as BLM.		We will define "NPRA," and will delete the sentence as requested.	
4.	Page 1	The scope actually specifies submitted of draft, interim final, and final versions of the RI report. Please clarify that the FS will also be submitted in draft, interim final, and final versions. Please clarify the draft RI was submitted to USACE and ADEC for review and comment.		Acknowledged. We will add text to state the FS will be submitted in draft, interim final, and final versions. We will also add text to note ADEC reviewed and commented on the draft RI. We will add another reference in the Final RI to identify which agencies reviewed this interim final RI.	
5.	Page 2	Please clarify that the RI report describes contamination associated with the landfill and discusses the risks to human health and the environment. I don't think the contamination in fish is necessarily related to past military uses. Also, wasn't ecological risk evaluated from at least a screening Suggested text: "This RI report describes the nature and extent of chemical contamination in soil, groundwater, surface water,		Acknowledged. We will make the suggested changes.	

REVIEW COMMENTS

PROJECT: Umiat Landfill

DOCUMENT: Interim Final Remedial Investigation Report - Oct 2012 Location: Umiat, Alaska

U.S. ARMY CORPS OF ENGINEERS	**DATE: 11/26/2012 and 1/7/2013** **REVIEWER: Lisa Geist** **PHONE: 753-5742**	**Action taken on comment by:**

Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**REVIEW CONFERENCE** A - comment accepted W - comment withdrawn (if neither, explain)	**CONTRACTOR RESPONSE**	**USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
		sediment, and fish ~~due to past military uses~~, and discusses risks to human health and the environment posed by contamination remaining at the landfill. ~~from exposure to contamination remaining at the site.~~			
6.	Page 7, Section 2.2	Suggest reviewing some good summaries online for the history of the Umiat area. As written, this section is a bit disjointed and mixes sources of information.		Acknowledged. We wrote this section using information from various sources (mainly previous Umiat environmental reports). We will re-write this section for improved clarity.	
7.	Page 7, Section 2.2	Please delete “airstrip” from 1st sentence, and insert part of the 22.8 million acres before Naval Petroleum Reservation.		Acknowledged. See our response to Comment 6.	
8.	Page 8, 1st para.	Please revise text: “The ~~AFS~~ Umiat area is also accessible by overland transport in winter.”		Acknowledged. See our response to Comment 6.	
9.	Page 8, 2nd para.	I don’t think it’s entirely accurate to say the State of Alaska operates the public airstrip, fuel tank and vehicle shop.		Acknowledged. See our response to Comment 6.	
10.	Page 8, 3rd para.	Again, I don’t think it’s necessarily accurate to say the BLM, USGS and ADFG have both their own housing and dining facilities. While the ADOT&PF has leased UMIAQ’s camp in recent years, for their operations is perhaps the wrong term.		Acknowledged. See our response to Comment 6.	
11.	Page 8, 4th para.	Please delete the 1st two sentences.		Acknowledged. See our response to Comment 6.	
12.	Page 8, 5th para.	Please move the text about elevation of the gravel pad to a more appropriate section. Also, I disagree the landfill would be considered developed or an exception for being undeveloped.		Acknowledged. See our response to Comment 6.	

U.S. ARMY CORPS OF ENGINEERS	DATE: 11/26/2012 and 1/7/2013 REVIEWER: Lisa Geist PHONE: 753-5742	Action taken on comment by:

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13.	Page 10, Section 2.4	Regarding the aerial photos in Appendix B - Why is the general landfill area not pointed out with at least an arrow or other indicator (polygon) on the zoomed-in aerial photos?		We will identify the landfill area on the Appendix aerial photographs.	
14.	Page 11, Section 2.5.1.4	The first paragraph describes the site based on a 1997 reference. However, it seems we have more current information on the Colville River hydrology presented in the USACE Hydrologic Analysis Report, based on USGS river gage information, which then appears later in this section.		We will retain the more recent hydrologic information and remove the 1997 reference.	
15.	Page 11, Section 2.5.1.4	Second paragraph mentions the seasonal stream runs across the landfill cap, since the cap is not a formal cap. Change term to surface.		We will make the recommended change.	
16.	Page 14, Section 2.6.1	Please delete the text "Before the creation of NPR No. 4 in 1923,…" I don't think the primary used changed significantly based on that one point in time. Also, does the local community agree that current use by Inupiats on the North Slope is "minimal"?		We will revise the text as recommended. The reference to minimal use of Umiat by Inupiats, we will delete that portion of the sentence, which will now begin with "residents in the villages of Nuiqsut…"	
17.	Page 14, Section 2.6.2	Shouldn't text refer to 11 nearby Navy test wells, not just seven?		Correct. We will change the text to refer to 11 wells.	
18.	Page 19, Section 3.0	ARARs. Based on recent comments on other projects, this section should be verified as consistent with FUDS interpretation of ARARs. See also Tables in Appendix D – ARARs shouldn't be an entire list of laws/statutes.		We will revise Section 3.0 to clarify the discussion of ARARs. We will focus on chemical-specific ARARs relevant to cleanup criteria. We will clarify that, in the context of this RI, these are proposed chemical-specific ARARs and not final cleanup levels. The discussion of location- and action-specific ARARs will be deleted; these will be included in the FS report.	

U.S. ARMY CORPS OF ENGINEERS	**DATE: 11/26/2012 and 1/7/2013** **REVIEWER: Lisa Geist** **PHONE: 753-5742**	**Action taken on comment by:**

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19.	Page 29, Section 4.2.1	Last sentence – should DDT be included as a COPC identified in soil?		The AGRA report refers only to lead and PCBs as soil COPCs detected at the landfill. The DDT occurrences described in that report are attributed to other areas around Umiat. We will delete the two sentences in this section that refer to DDT as a COPC (p. 30, 1st paragraph, 3rd sentence; and 3rd paragraph).	
20.	Page 32, 1st para.	What is meant by “some unit” of the site? Please clarify.		We will replace “some” with “at least one.”	
21.	Page 32, Section 4.2.3 and Page 70, Section 5.4	Verify that the use of maximum detected concentrations is an appropriate method for calculating risk. I know the ADEC guidance recommends using the maximum, but this is not in accordance with CERCLA/EPA guidance that is based on reasonable exposure. Furthermore, ADEC guidance allows the department to approve an appropriate statistical method, in which case compliance will be based on the mean soil concentration at the 95th percent upper confidence limit (UCL), under 18 AAC 75.380(c)(1).		The ADEC risk assessor, Dr. Ted Wu, considered the use of maximum detected concentrations to be an appropriate method for calculating risk for this project. We acknowledge there are multiple methods available for evaluating site risks.	
22.	Page 32, Section 4.2.4	Delete stray “)” after consultation in first sentence.		We will correct the text.	
23.	Page 67, Section 5.0	Why are you using a HI of 0.2 for cumulative risk?		The original intent of this criterion was to eliminate compounds that were required to be included in the CRE but may have had a negligible contribution to cumulative risk. Since no compounds met this criterion, and all that	

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				were included in the CRE are considered COPCs (except arsenic, which is eliminated for other reasons) we will delete this sentence.	
24.	Section 5.0, General	Cumulative risk evaluation. Verify whether or not we should be including chemicals of concern that may be considered background (such as arsenic). However, I believe based on recent comments from Region 10 on a different project, EPA guidance recommends that any contaminant be carried through the risk analysis and then the impact of elevated concentration of contaminants in background can be addressed in the uncertainty discussion of a risk management section. Note that text on Page 71 states: “Arsenic and aluminum are not considered COPCs as there were no statistically significant differences between project-sample and background-sample results.”		Acknowledged. The ADEC CRE guidance cites CERCLA guidance on this subject. We consider arsenic to be a naturally occurring substance in its unaltered form and, consistent with CERCLA guidance, are not including it in the CRE. We will also revise CRE table 5-7.	
25.	Page 70-71, Section 5.3 and 5.4	In Section 5.3 the text indicates the EPA online calculator was used to calculate fish tissue screening levels at a risk-management level of 1x10-6 and a HI of 0.1. However, on the following page, the text in the 3rd paragraph states fish tissue RBCs were calculated using the EPA calculator and a cancer risk-management level of 1x10-5 and HI of 1. Please clarify.		Risk-based *screening levels* (calculated at $1x10^{-6}$ and 0.1) were used to identify which results to include in the CRE, much as $1/10^{th}$ the soil or water cleanup levels are used to screen soil or water results. However, the actual calculations in the CRE are done using risk-based *concentrations*, which are calculated at $1x10^{-5}$ cancer risk and a HI of 1, consistent with CRE guidelines.	
26.	Page 89, Section 6.1.1	Is it really <u>known</u> what debris was buried at the Umiat landfill during site demolitions activities in 1973? Please clarify with		We will replace “known to” with “may have been” to the questionable items.	

U.S. ARMY CORPS OF ENGINEERS	**DATE: 11/26/2012 and 1/7/2013** **REVIEWER: Lisa Geist** **PHONE: 753-5742**	**Action taken on comment by:**

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		"may have been" or provide citation.			
27.	Pages 92-93, Section 6.1.4	18 AAC 70 is mentioned as the surface water criteria and ARAR. However, you cannot apply a 24 hour average criteria for DDT or PCBs to a discrete sample result, even if results were available. Also, the cited value for PCBs is not readily attainable by standard laboratory methods. I disagree based on Section 6.4.3 this should be considered a data gap for the site. Also, look into Lead and Aluminum assumptions – lead criteria are based on 1-hr avg and 4-day avg, dissolved. Where is discussion regarding aluminum background concentrations/statistical evaluation for surface water?		Time-weighted average concentrations of DDT and PCBs can be quantitated below the WQS using semi-permeable membrane devices, though their use at arctic sites has yet to be thoroughly tested. Filling the data gap is not worthwhile, however, as it would not significantly affect selection of site remedies. We will delete the reference to DDT as a data gap in Section 6.1.5 (2^{nd} paragraph, 3^{rd} sentence). We will add a section (Section 5.3) to specifically discuss statistical comparison of background data, including aluminum in surface water.	
28.	Page 93, Section 6.1.5	Verify groundwater comparison to surface water ARARs, TBCs, and RBSLs! Need to clarify what is appropriate as an ARAR at this point in the investigation. I disagree we really have a data gap for PCBs in groundwater, based on reporting limits for PCBs being above "ARARs". The cited level is practically unattainable in water samples.		Acknowledged. We will delete references to PCBs as a data gap in Section 6.1.5 (3^{rd} paragraph, last part of 1^{st} sentence and all of 2^{nd} sentence).	
29.	Page 97, 4^{th} para.	The statement: "…the individual exceedance of ARARs indicates an unacceptable level of risk for each COPC individually." - does not appear consistent with CERCLA risk guidance which recommends evaluation based on a reasonable maximum exposure point concentration.		We will revise the statement to read "These two contaminants are considered COPCs."	
30.	Page 98, Section 6.4.2	I disagree that further investigation to define the depth of debris is warranted, unless you are implying actually digging		We will remove the recommendation for further investigation.	

U.S. ARMY CORPS OF ENGINEERS	**DATE: 11/26/2012 and 1/7/2013** **REVIEWER: Lisa Geist** **PHONE: 753-5742**	**Action taken on comment by:**

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		test pits or some sort of limited removal action. Our geophysical data will always be conflicting because we believe one of the geophysical surveys is wrong. *Updated comment 1/7/2013:* Please delete the sentence "Further investigation to define the depth of debris would be beneficial for the purpose of reducing uncertainty in the remedial alternative evaluations and cost estimations to be conducted in the FS." Update text with: Conflicting historical information exists regarding the depth of buried debris. In 2011, USACE conducted a geophysical survey to resolve the depth discrepancies between two previous surveys (1994, 2006) and verify the lateral extent of debris. The 2011 survey concluded the bottom depth of metal debris ranged from 8 to 17 feet and will be utilized as the basis for future volume estimates. Please provide a reference for "…and interview statements made by a contractor involved in the 1973 site demolition and burial suggest a maximum burial depth of about 40 feet bgs." If a reference is not available, please strike this statement.		We will make the recommended changes to the text. The 1997 AGRA ESA; F10AK024203_01.09_0003 is the basis for this reference. However, we will strike this statement and replace it with the recommended change described above.	
31.	Page 99	You state that "Standard analytical techniques are not sufficiently sensitive to detect or quantify these analytes in the ng/L range." However, this contradicts earlier text in Section 6.1.5 where you say the elevated reporting limits constitute a data gap for the groundwater and surface water.		See response to comment 27. These levels are achievable but not necessarily practical, and filling this data gap does not significantly affect the selection of site remedies.	
32.	Page 99, last para.	Which analyte are you referring to in the first sentence of the last paragraph – DDT or PCBs? Please clarify, since this entire paragraph seems to mix both together.		This sentence was referring to DDT; we will clarify by revising to: "Elevated PQLs prevent delineation of DDT in the seasonal stream, but they are less significant because DDT has been	

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		I agree with the overall conclusion that confirmation of PCBs in water is not warranted.		identified above cleanup levels in surface-water and groundwater. Due to the elevated PQLs for PCBs in surface water and groundwater, we cannot determine if PCBs are present above the most stringent water quality standard."	
33.	Page 100	I disagree that we can definitively conclude contaminants have migrated from the landfill to fish tissue.		We agree with this comment; no direct evidence exists to prove the connection. We will delete "fish tissue" from this bullet item.	
34.	Appendix D	Please remove references to location-specific and action-specific ARARs. These types of ARARs should be evaluated in the Feasibility Study, once potential alternatives and actions are identified. The chemical-specific ARARs should only include those that are relevant to screening for COPCs.		Acknowledged. We will remove references to location- and action-specific ARARs.	
35.	Appendix D	In order to be considered an ARAR, the requirements must be related to a federal or state environmental law, be a cleanup standard or other requirement that specifically addresses a CERCLA hazardous substance or remedial action, and it must be substantive rather than administrative/procedural, and applicable to the project or site (not a general requirement for any actions).		Acknowledged. We will revise the ARAR tables.	
36.	References	Please correct the FRMD# for E&E, 1996. *Historical Site Uses Technical Memorandum*, F10AK024303_01.06_0001_p		We will correct the FRMD number.	
		----- End of Comments ----			

REVIEW COMMENTS **PROJECT: Umiat Landfill**
DOCUMENT: Interim Final Remedial Investigation Report - Oct 2012 **Location: Umiat, Alaska**

U.S. ARMY CORPS OF ENGINEERS	**DATE: 11/20/2012** **REVIEWER: Jeremy Craner** **PHONE: 753-2628**	**Action taken on comment by:**

Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**REVIEW CONFERENCE** **A - comment accepted** **W - comment withdrawn** **(if neither, explain)**	**CONTRACTOR RESPONSE**	**USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
1.	General	The report is structurally well organized and easy to follow. Discussions of risk, media contamination, and final discussions/conclusions/recommendations were also good.		Acknowledged.	
2.	General	Scope of Work refers to this version as the Interim Final RI Report.		Acknowledged. We will refer to this document as the Interim Final RI Report.	
3.	General	Add FRMD/ARIMS numbers on title page.		Acknowledged. We will make the suggested change.	
4.	Page iv	Table F-1a is listed twice, I believe the second one should be "Figure 1-b."		Table of Contents and Appendix F cover page will be revised to correctly represent table titles, as follows (note that "ARAR" has been replaced with "PCL": Table F-1a Summary of PCL and TBC Concentrations for Soil and Sediment Table F-1b Summary of PCL and TBC Concentrations for Surface Water and Groundwater Table F-1c Summary of Risk-Based Screening Levels and Risk-Based Concentrations for Fish Tissue Also, table headers are inconsistently shaded. This will be fixed for final.	
5.	Page vii, 4th paragraph	Second sentence lists all COPCs. One COPC listed is PCBs, including associated specific Aroclors. ADEC Method Two		Executive summary text: "polychlorinated biphenyls (PCBs; specifically Aroclor 1254,	

REVIEW COMMENTS | **PROJECT: Umiat Landfill**
DOCUMENT: Interim Final Remedial Investigation Report - Oct 2012 **Location: Umiat, Alaska**

U.S. ARMY CORPS OF ENGINEERS	**DATE: 11/20/2012** **REVIEWER: Jeremy Craner** **PHONE: 753-2628**	**Action taken on comment by:**

Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**REVIEW CONFERENCE** **A - comment accepted** **W - comment withdrawn** **(if neither, explain)**	**CONTRACTOR RESPONSE**	**USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
		Cleanup Level is 1 mg/kg for total PCBs. I believe that "total PCBs" should be listed as one COPC. Please clarify throughout the rest of the report.		Aroclor 1260, and Aroclor 1016/1242)" will be revised to "total polychlorinated biphenyls (PCBs; including Aroclor 1254)" and similarly clarified throughout the RI.	
6.	Page viii	Last paragraph: For clarification, please mention that Shannon & Wilson, Inc. will be preparing a FS based on past work and conclusions determined in the Interim Final RI.		Acknowledged. We will make the suggested change.	
7.	Page 2, Section 1.1	First word of bullet list items should be capitalized, please capitalize all first words (also capitalized in Section 6.5) in bullet lists throughout the rest of the report for consistency. Last paragraph, first sentence states: "This RI report describes the nature and extent of chemical contamination in soil, groundwater, surface water, sediment, and fish due to past military uses,..." There has not been just past military use of the landfill. Please list other users and clarify.		Acknowledged. We will make this change. Acknowledged.	
8.	Page 7, Section 2.0	"Former Umiat AFS" and "former Umiat AFS" are both used on this page, please be consistent." Suggest taking another look at Section 2.0 as a whole. It is lacking in overall continuity and is at times difficult to follow along. Suggest making an effort to couple topics/information from the various references. Make sure a person who has never been to the site and has no background knowledge can follow along with the text/figures and gain pertinent site info.		Acknowledged. We will use consistent terminology. We have rewritten Section 2.2 for clarity.	
9.	Page 7, Section 2.1	Please add detail to last sentence: "The nearest community is Nuiqsut, which is located downstream along the Colville River 65 miles to the northeast of the station." How many river miles		We will add the river miles to Nuiqsut to the sentence.	

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		is Nuiqsut located downstream from the Umiat landfill? Would be good to add this info as well.			
10.	Page 7, Section 2.2	First paragraph, 6th sentence states: "…6 of the 11 wells were within the boundary and five wells were outside the U.S. Air Force (USAF) Station." What boundary is being discussed? The next sentence mentions the Umiat AFS and references Figure 2-1. Please clarify and clearly label these features on Figure 2-1.		We have rewritten Section 2.2 for clarity.	
11.	Page 8, 3rd paragraph	"UIC UMIAQ" is mentioned for the first time. Please define acronym UIC.		We will define the acronym UIC (Ukpeaġvik Iñupiat Corporation).	
12.	Page 10, Section 2.5	All of a sudden start to indent the first paragraph of each subsection. Please be consistent throughout report. Suggest no indentation of any paragraph within the report.		We will modify the formatting to be consistent within the report.	
13.	Page 11, 2nd paragraph	Last sentence states: "An oil seep is located in the Colville River riverbed upstream of Umiat Mountain, and downstream of the former Umiat AFS Main Gravel Pad, airstrip, and landfill." This is confusing since Umiat Mtn is located immediately downstream from Umiat AFS. Please clarify…suggest adding Umiat Mtn label to a figure for reference. Label figures with names as mentioned in text.		We will identify Umiat Mountain and the oil seep location on Figure ___.	
14.	Page 11, Section 2.5.1.4	Title is named "Surface-Water Hydrology", then in the first sentence it is stated "Surface water occurs…" Please be consistent with the hyphen.		We do not hyphenate "surface water" when it is used as a stand-alone term. However, when part of a two-word modifier, we will hyphenate those words.	
15.	Page 11, last paragraph	First sentence: Add info and reword to: "The landfill is located on a gravelly inside meander within the active		We will make the requested changes.	

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		floodplain of the Colville River." Remaining paragraph: Difficult to follow. Since this is the "Surface-Water Hydrology" section, please mention the two local Colville River tributary streams named Seabee Creek and Bearpaw Creek, reference a figure with these features, and also label the no-name seasonal stream mentioned on a figure and reference accordingly.			
16.	Page 12, Section 2.5.1.5	First paragraph: It is noted that three types of groundwater exists in the Umiat area: suprapermafrost, thaw bulbs beneath lakes and rivers, and deep subpermafrost groundwater beneath permafrost. Second paragraph: The first few sentences basically re-states the same thing as the first paragraph, and then defines suprapermafrost (not defined in first paragraph). Please couple these paragraphs/info together so that is makes sense. This is very important site specific hydrogeology directly related to the Umiat landfill site.		We will revise Section 2.5.1.5 for clarity.	
17.	Page 12, Section 2.5.1.5	Last paragraph, last sentence does not make sense. Please rework. Currently states: "No evidence was found the Umiat area groundwater has been investigated for the purpose of potable-water supplies."		We will reword the sentence to state, "No evidence was found that groundwater in the Umiat area has been investigated as a potential source of drinking water."	
18.	Figures 1-2 and 2-1	Please label these figures with ALL the specific features as they are named in the text so things are consistent. Vice versa, in the text, please be consistent with names of site features. At times it is unclear what exactly is being discussed and where important features are located. Reference these introductory figures accordingly so the reader		We will make the requested changes.	

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		can orient oneself with the site.			
19.	Page 23, Section 4.1.3	“Surface-water” and “surfacewater”; “sub-surface” and “subsurface”		See also response to Comment 14. We will ensure consistency throughout the report.	
20.	Page 24, Section 4.1.4	First mention of acronym “AGRA”, please define.		We don’t believe this is an acronym or abbreviation. AGRA is the shortened form of AGRA Earth & Environmental.	
21.	Page 35, Sections 4.3.1, 4.3.2, and 4.3.3	Figures 4-9, 4-10, and 4-11 are referenced in three separate sections on this page. These references are all incorrect. Please re-reference to Figures 4-10, 4-11, and 4-12, respectively.		We will correct the references to the figures.	
22.	Page 90, Section 6.1.2	Third paragraph: Discusses methylene chloride as a COPC. I agree, this likely a lab contaminant…no other hits soil, sediment, groundwater, or surface water…it may be worthwhile to have a chemist review the laboratory data packages (if available) to see if methylene chloride was detected in any associated lab blanks, etc. May be able to rule out MC as a COPC completely.		Original laboratory reports were not available (result reported from 1994 E&E investigation). Not having direct evidence that it was lab-related contamination, additional sampling seems the best way to rule out the compound as a COPC.	
23.	Page 91, First paragraph	States 4,4’-DDD and 4,4’-DDT are COPCs in soil. Source likely widespread spraying of DDT for insect control (non-point source). Are there any other sample results from other areas around Umiat that indicate similar concentrations? What are the landfill cleanup implications for this contaminant? If cleanup occurs, how will you know when “cleanup levels” have been achieved if source is non-point? Is it truly a landfill COPC or should it be considered an area wide COPC?		Reference documents we reviewed for this RI suggest pesticides were used throughout the Umiat site: 1996 RI background soil samples: “4,4'-DDE; and 4,4'-DDT were detected well below the regulatory guidance or screening levels. Chlorinated pesticides were sprayed as insect control over much of Umiat, and low concentrations of DDT and DDD in soil are	

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				common.” Sediment samples: “Low levels of RRO and DDT are considered background conditions.” And: “chlorinated pesticide (DDT and DDD) contamination of surface soil, subsurface soil, and groundwater across Unit B is the result of aerial and ground spraying of DDT for mosquito control in the late 1940s, and possibly later (E & E 1996b)… Contamination was detected across fairly broad areas, which is likely a result of aerial spraying.”	
24.	Page 91, Third paragraph	Appears arsenic is within range of background concentrations. Fourth sentence: States “Based on our statistical comparison of project sample results to background results, and the natural abundance of this element in arctic soils, it is not considered a COPC at the Umiat AFS landfill.” Where are the statistical analysis results? There is no discussion in this report. Please cite the statistical comparison made in the text and include in an appendix the raw data, statistical analysis, and a synopsis of your results. Need to justify the conclusion that arsenic is not a COPC.		We will add a section (Section 5.3) specifically discussing the statistical comparison, and an appendix (Appendix G) presenting the background data set and the statistical output files.	
25.	Pages 92-93, Section 6.1.4	18 AAC 70 is mentioned as the screening tool used for surface water. Is 18 AAC 70 the most stringent when compared to other regulations? Please clarify in this section.		18 AAC 70 levels may be more stringent than 18 AAC 75 on an analyte-specific basis. The comparison basis is specified in Table F-1b, ARAR source column.	
26.	Page 93, Section 6.1.5	First paragraph: States that groundwater is being compared to surface water screening criteria based on its hyporheic connection with surface water. This is OK, then results are discussed and mentioned to either be above or below		Same as for surface water; see response to comment 25, above.	

REVIEW COMMENTS	PROJECT: Umiat Landfill DOCUMENT: Interim Final Remedial Investigation Report - Oct 2012	Location: Umiat, Alaska
U.S. ARMY CORPS OF ENGINEERS	DATE: 11/20/2012 REVIEWER: Jeremy Craner PHONE: 753-2628	Action taken on comment by:

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
		ARARs/RBSLs. So, concentrations are being compared to 18 AAC 70…are these the most stringent levels? Then, for the rest of the section, the remaining groundwater analytical results are compared to 18 AAC 75.345 (Table C GW Cleanup Levels). Why the flip-flop? Are these levels most conservative? Overall, it is unclear what set of regulations the groundwater results are being compared to. Please clarify.			
27.	Page 94, Section 6.1.6	First paragraph, last sentence states: "Aroclor 1260 and Aroclor 1016/1242 were not detected in soil, sediment, surface water, or groundwater at the Umiat landfill." But, as mentioned above, these Aroclors were detected in fish tissue. This data suggests that the local fish are being impacted by contaminant sources other than those identified at the Umiat landfill. This is important to state and elaborate on. At what river/stream locations were these fish samples collected? Can this contaminant signature be linked to a global atmospheric source? I like the detailed summary in the following paragraph for 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT…please do something similar in this paragraph for PCBs in fish.		We will add that the fish may be impacted by contaminant sources other than the landfill. However, there's no evidence for an area-wide source of PCBs, as there is for pesticides. We will note the sample locations for the fish, and emphasize that the fish could only be present in the landfill stream a few months of the year (when surface water is present).	
28.	Page 97	Fourth paragraph, second sentence states: "Lead was also detected above the ADEC Water Quality Criteria of 0.001 mg/L in surface-water sample." Was this the most stringent level?		Yes. The 18 AAC 70 water-quality standard was used, with an assumed hardness of 50 mg/L as this standard is hardness-dependent. The Table C cleanup level is 0.015 mg/L, substantially higher than the WQS.	
29.	Page 97, Last paragraph	I agree. The heterogeneous nature of the landfill, the samples likely collected from "pockets" of contamination, and the highest of these samples being used to determine overall risk will heavily bias risk on the high side.		Acknowledged.	

REVIEW COMMENTS

PROJECT: Umiat Landfill

DOCUMENT: Interim Final Remedial Investigation Report - Oct 2012 Location: Umiat, Alaska

U.S. ARMY CORPS OF ENGINEERS	**DATE: 11/20/2012** **REVIEWER: Jeremy Craner** **PHONE: 753-2628**	**Action taken on comment by:**

Item No.	Drawing Sheet No., Spec. Para.	COMMENTS	REVIEW CONFERENCE A - comment accepted W - comment withdrawn (if neither, explain)	CONTRACTOR RESPONSE	USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)
30.	Page 100, Section 6.5	First bullet: Lists all COPCs, including "PCBs, specifically Aroclor 1254, Aroclor 1260, and Aroclor 1016/1242;" Shouldn't this be just "total PCBs" since this is what the cleanup levels are set for? Also, I would argue that since Aroclor 1260 and Aroclor 1016/1242 have never been detected in soil, sediment, surface water, or groundwater at the site that these are not site COPCs. Shouldn't base all conclusions on purely transient fish data. Methylene chloride is also suspicious (as mentioned in Comment 22) and may be a lab contaminant. Would any of the above mentioned modifications alter the final risk calculations?		See comments 5 and 27. Considering total PCBs instead of individual Aroclors in the CRE would result in lower cumulative risk numbers, though only slightly. Methylene chloride, while above the MTG cleanup level, was below the risk-based screening level of 24 mg/kg, and was therefore not included in the CRE.	
		----- End of Comments ----			

REVIEW COMMENTS

PROJECT: Umiat Landfill

DOCUMENT: Interim Final Remedial Investigation Report - Oct 2012 Location: Umiat, Alaska

U.S. ARMY CORPS OF ENGINEERS	**DATE: 11/02/2012** **REVIEWER: Craig Scola** **PHONE: 753-5769**	**Action taken on comment by:**

Item No.	**Drawing Sheet No., Spec. Para.**	**COMMENTS**	**REVIEW CONFERENCE** **A - comment accepted** **W - comment withdrawn** **(if neither, explain)**	**CONTRACTOR RESPONSE**	**USAED/ADEC RESPONSE ACCEPTANCE (A-AGREE) (D-DISAGREE)**
1.	General	Scope of Work refers to this version as the Interim Final RI Report.		Acknowledged.	
2.	MED Doc Review Check list	Seems you can check off 1.1.1, 1.1.2, 1.1.3, 1.1.4 and 1.1.5. Try to include direction in photos taken by S&W.		Acknowledged. We will include a photo log, note the photo direction in captions, and check the appropriate boxes on the MED document review checklist.	
3.	Lisa Geist's Comment #5	Blank pages on hard copies don't have "(This page intentionally blank)" printed on them.		We will add "(This page intentionally blank)" to the appropriate pages.	
4.	Lisa Geist's Comment #37	How does one determine which sampling locations contained results exceeding respective Cleanup levels on any of the figures?		We will create a figure in Section 6 similar to Figure 4-9 showing samples that exceed PCLs.	
5.	PDF Report Document properties	Remember to add FRMD number in front of title for final version of RI submittal.		Acknowledged. We will add the FRMD number to the document properties.	
6.	App F - Summaries	Many of the tables have a green tab in the upper left corner of the cell. What do they represent? Are they needed for these tables? ID in Notes if necessary.		The green tabs are an indication of numbers formatted as text. They are kept this way to preserve significant figures. This only shows in the raw excel files and is not worth noting in the notes on the tables of the hard copy report.	
		----- End of Comments ----			

APPENDIX B

AERIAL PHOTOGRAPHS

PHOTO LOG

Umiat Landfill Area – Aerial Photographs

Page		
B-1	Photo 1	August 1, 1974
B-2	Photo 2	August 1, 1974
B-3	Photo 3	August 1, 1976
B-4	Photo 4	August 1, 1976
B-5	Photo 5	August 30, 2001
B-6	Photo 6	August 30, 2001

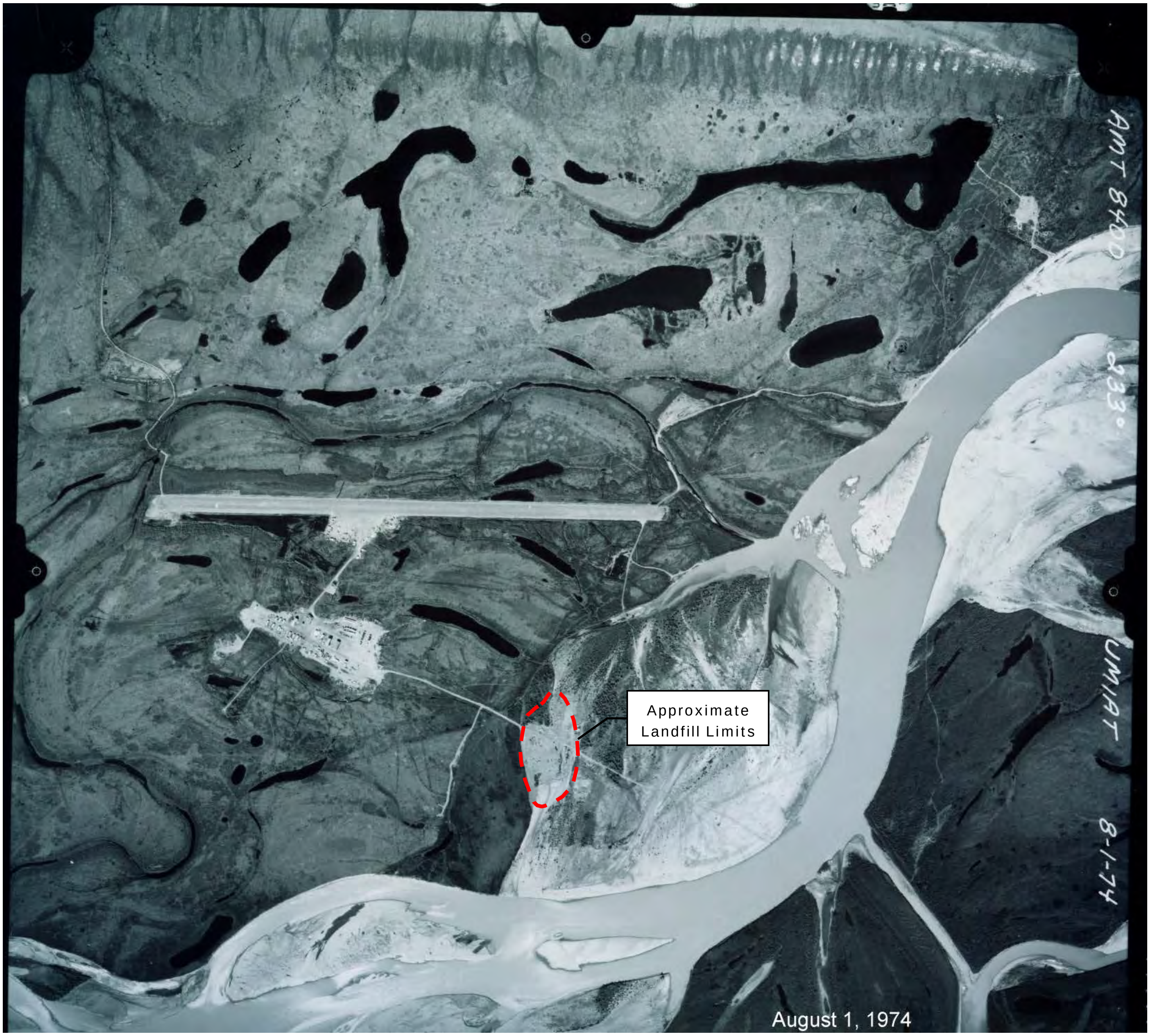

Photo 1: August 1, 1974.

Photo 2: Landfill area. August 1, 1974.

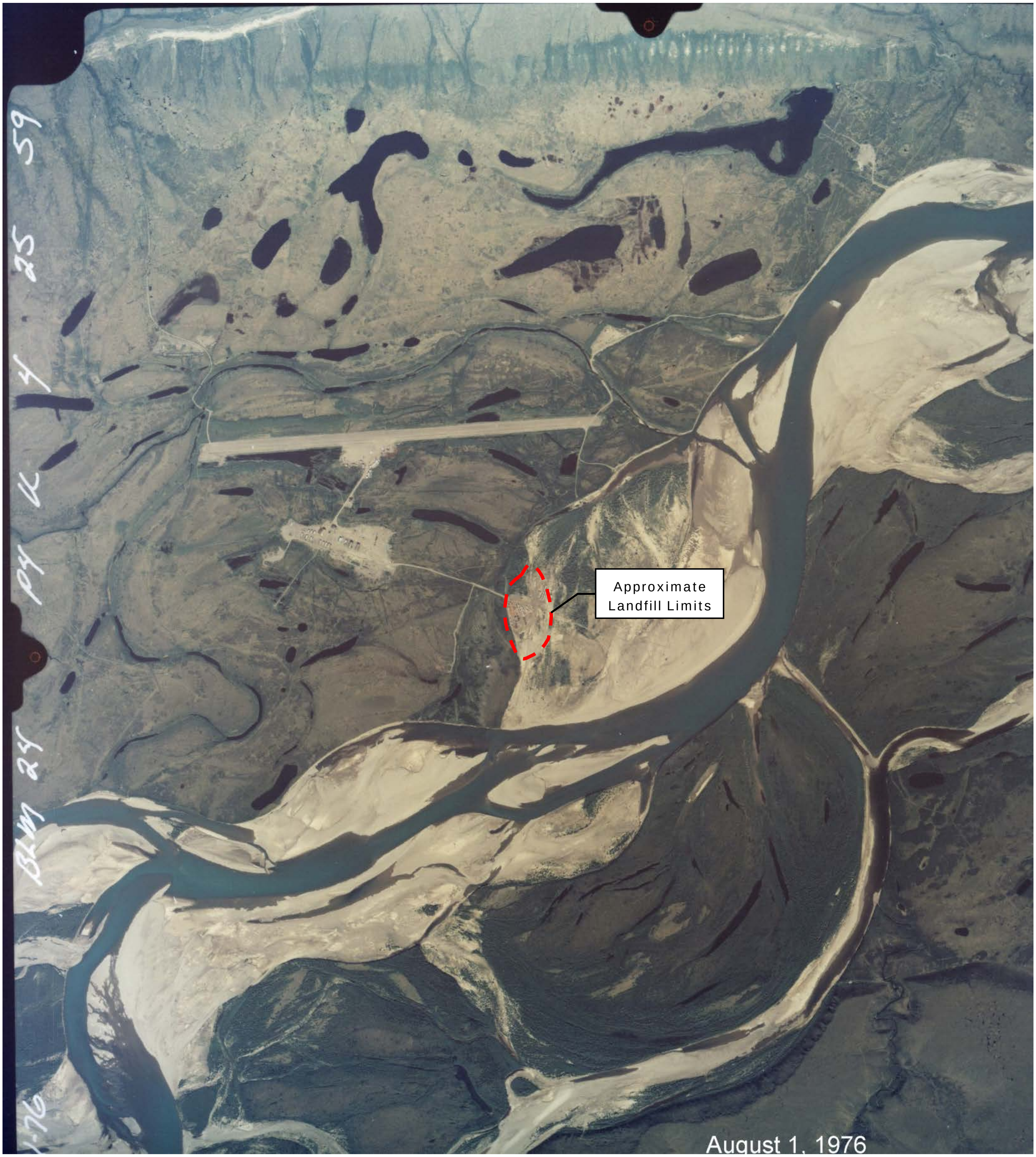

Photo 3: August 1, 1976.

Photo 4: Landfill area. August 1, 1976.

Photo 5: August 30, 2001.

Photo 6: Landfill area. August 30, 2001.

APPENDIX C

SELECTED PHOTOGRAPHS

PHOTO LOG

Selected Site Photographs

Page		
C-1	Photo 1	Debris eroding from landfill area. June 9, 2010 (BLM)
	Photo 2	Drums and pipe eroded from landfill area. June 9, 2010 (BLM)
C-2	Photo 3	Equipment tracks, cable and other debris from landfill area. June 9, 2010 (BLM)
	Photo 4	Drill bits inside drum eroded from landfill area. June 10, 2010 (BLM)
C-3	Photo 5	Upstream end of the Slough and the Colville River interface. June 15, 2012 (2010 USACE Trip Report)
	Photo 6	Flow over landfill, facing North. May 30, 2011 (BLM)
C-4	Photo 7	Crushed drums in seasonal stream at landfill. June 2, 2011 (BLM)
	Photo 8	Drums in seasonal stream at landfill area. June 2, 2011 (BLM)
C-5	Photo 9	Debris and new erosion at landfill area. June 2, 2011 (BLM)
	Photo 10	Debris and new erosion... June 2, 2011 (BLM)
C-6	Photo 11	Debris eroded from landfill area. June 2, 2011 (BLM)
	Photo 12	Tracked vehicle eroding from landfill area. June 2, 2011 (BLM
C-7	Photo 13	Example of debris eroding out of landfill area near Cell 6. July 28, 2011 (2011 USACE Trip Report)
	Photo 14	Exposed debris at landfill. July 28, 2011 (2011 USACE Trip Report)
C-8	Photo 15	Exposed drums at landfill. July 28, 2011 (2011 USACE Trip Report)
	Photo 16	Debris at landfill. July 28, 2011 (2011 USACE Trip Report)
C-9	Photo 17	Debris at landfill. July 28, 2011 (2011 USACE Trip Report)
	Photo 18	Debris at landfill (close-up). July 28, 2011 (2011 USACE Trip Report)
C-10	Photo 19	Bank erosion on Colville river upstream (West) of landfill. July 28, 2011 (Shannon & Wilson)
	Photo 20	Debris along eroding West side of landfill slough channel. July 28, 2011 (Shannon & Wilson)
C-11	Photo 21	Equipment tracks in slough channel north of access road. July 28, 2011 (Shannon & Wilson)
	Photo 22	Landfill above upstream end of landfill slough. July 28, 2011 (Shannon & Wilson)
C-12	Photo 23	Landfill with debris visible along West side of landfill slough channel (Shannon & Wilson)
	Photo 24	Landfill with erosion at left, view to North. July 28, 2011 (Shannon & Wilson)
C-13	Photo 25	Landfill area facing South. July 28, 2011 (Shannon & Wilson)
	Photo 26	Pipe at Colville River downstream of landfill. July 28, 2011(Shannon & Wilson)

Photo 1: Debris eroding from landfill area. June 9, 2010 (BLM).

Photo 2: Drums and pipe eroded from landfill area. June 9, 2010 (BLM).

Photo 3: Equipment tracks, cable, and other debris eroded from landfill area. June 9, 2010 (BLM).

Photo 4: Drill bits inside drum eroded from landfill area. June 10, 2010 (BLM).

Photo 5: Upstream end of the Slough and the Colville River interface. Note damp muddy channel on left, unvegetated mid tier, and vegetated upper bank areas. Also note bank erosion upstream of the slough bank. June 15, 2010 (2010 USACE Trip Report).

Photo 6: Flow over landfill, facing north. May 30, 2011 (BLM).


Photo 7: Crushed drums in seasonal stream at landfill. June 2, 2011 (BLM).


Photo 8: Drums in seasonal stream at landfill area. June 2, 2011 (BLM).

Photo 9: Debris and new erosion at landfill area. June 2, 2011 (BLM).

Photo 10: Debris and new erosion at landfill. Note monitoring well at right. June 2, 2011 (BLM).

Photo 11: Debris eroded from landfill area. June 2, 2011 (BLM).

Photo 12: Tracked vehicle eroding from landfill area. June 2, 2011 (BLM).

Photo 13: An example of some of the debris eroding out of the landfill near Cell 6. July 28, 2011 (2011 USACE Trip Report).

Photo 14: Exposed debris at landfill. July 28, 2011 (2011 USACE Trip Report).

Photo 15: Exposed drums at landfill. July 28, 2011 (2011 USACE Trip Report).

Photo 16: Debris at landfill. July 28, 2011 (2011 USACE Trip Report).

Photo 17: Debris at landfill. July 28, 2011 (2011 USACE Trip Report).

Photo 18: Close up of debris at landfill. July 28, 2011 (2011 USACE Trip Report).

Photo 19: Bank erosion on Colville River upstream (west) of landfill. July 28, 2011 (Shannon & Wilson).

Photo 20: Debris along eroding west side of landfill slough channel, south of access road. July 28, 2011 (Shannon & Wilson).

Photo 21: Equipment tracks in slough channel north of access road. July 28, 2011 (Shannon & Wilson).

Photo 22: Landfill above upstream end of landfill slough. July 28, 2011 (Shannon & Wilson).

Photo 23: Landfill with debris visible along west side of landfill slough channel, south of access road. July 28, 2011 (Shannon & Wilson).

Photo 24: Landfill with erosion at left, view to north. July 28, 2011 (Shannon & Wilson).

Photo 25: Landfill area facing south. July 28, 2011 (Shannon & Wilson).

Photo 26: Pipe at Colville River downstream of landfill with eroding bank at right. July 28, 2011 (Shannon & Wilson).

APPENDIX D

TABLE D-1: POTENTIAL CHEMICAL-SPECIFIC ARARS

Table D-1
Potential Chemical-Specific Applicable or Relevant and Appropriate Requirements

Potential ARARs	Citation or Reference	Requirements	Applicability
Alaska Water Quality Standards (AWQS) and Alaska Water Quality Criteria	18 AAC 70	Specifies the degree of degradation that may not be exceeded in a water body as a result of human action. Provides water quality criteria and limits to protect fresh and marine water bodies for such uses as drinking water, recreation and growth and propagation of fish, other aquatic life, and wildlife.	Potentially Applicable
Oil and Hazardous Substances Pollution Control Regulations	18 AAC 75.341 – 18 AAC 75.345	Regulations establishing discharge reporting, cleanup, and disposal requirements for oil and other hazardous substances. Provide cleanup standards for soil and groundwater.	Potentially Applicable

APPENDIX E

TABLE E-1: SOIL AND SEDIMENT SAMPLING AND LABORATORY ANALYSIS SUMMARY
TABLE E-2: SURFACE WATER AND GROUNDWATER SAMPLING AND LABORATORY ANALYSIS SUMMARY
TABLE E-3: FISH TISSUE SAMPLING AND LABORATORY ANALYSIS SUMMARY

Table E-1
Soil and Sediment Sampling and Laboratory Analysis Summary

Sample Information											Soil/Sediment Sample Analysis																					
Event	Sample Location	Sample Number	Matrix	Sample Date	Median Sample Depth (ft. bgs)	Sample Depth (feet bgs)	Project Sample	Duplicate Sample	Triplicate Sample	MS/MSD Sample	GRO/BTEX (AK 101)	GRO (AK M 8015)	GRO (AK 101)	DRO (AK M 8100)	DRO (AK 102)	RRO (AK 103)	TRPH (method not listed)	Fuel ID (Corps M 8015)	VOC (SW-846 Method 8260A)	PAH (non-specified GC/MS SIM method)	Pest/PCB (SW-846 Method 8080A)	Pest/PCB (SW-846 Method 8081A)	PCB (SW-846 Method 8081)	Pesticides (SW-846 Method 8081)	PCB (SW-846 Method 8082)	BNA (SW-846 Method 8270B)	Arsenic (EPA Method 7060)	Lead (EPA Method 6010A)	Lead (SW-846 Method 7421)	TCLP Lead (SW-846 Method 1311/7421)	TAL Metals (Cu & Pb)	TAL Metals (SW-846 Method 6000/7000 Series)
1994 E&E	BH11-1	135SL	SL	8/25/94	0	0	1					X		X			X	X	X		X											X
1994 E&E	BH11-1	136SL	SL	8/25/94	0	0		1				X		X			X	X	X		X											X
1994 E&E	BH11-1	137SL	SL	8/25/94	0	0			1			X		X			X	X	X		X											X
1994 E&E	BH11-1	138SL	SL	8/25/94	2	2	1					X		X			X	X	X		X											X
1994 E&E	BH11-1	139SL	SL	8/25/94	9	9	1					X		X			X	X	X		X											X
1994 E&E	BH11-2	142SL	SL	8/25/94	0	0	1					X		X			X	X	X		X											X
1994 E&E	BH11-2	143SL	SL	8/25/94	2	2	1					X		X			X	X	X		X											X
1994 E&E	BH11-2	144SL	SL	8/25/94	9	9	1					X		X			X	X	X		X											X
1994 E&E	BH11-3	145SL	SL	8/25/94	0	0	1					X		X			X	X	X		X											X
1994 E&E	BH11-3	146SL	SL	8/25/94	2	2	1					X		X			X	X	X		X											X
1994 E&E	BH11-3	147SL	SL	8/25/94	9	9	1					X		X			X	X	X		X											X
1994 E&E	BH11-4	148SL	SL	8/25/94	0	0	1					X		X			X	X	X		X											X
1994 E&E	BH11-4	149SL	SL	8/25/94	2	2	1					X		X			X	X	X		X											X
1994 E&E	BH11-4	150SL	SL	8/25/94	6	6	1					X		X			X	X	X		X											X
1994 E&E	BH11-5	151SL	SL	8/25/94	0	0	1					X		X			X	X	X		X											X
1994 E&E	BH11-5	152SL	SL	8/25/94	2	2	1					X		X			X	X	X		X											X
1994 E&E	BH11-5	153SL	SL	8/25/94	6	6	1					X		X			X	X	X		X											X
1994 E&E	BH11-6	154SL	SL	8/25/94	0	0	1					X		X			X	X	X		X											X
1994 E&E	BH11-6	155SL	SL	8/25/94	2	2	1					X		X			X	X	X		X											X
1994 E&E	BH11-6	156SL	SL	8/25/94	2	2		1				X		X			X	X	X		X											X
1994 E&E	BH11-6	157SL	SL	8/25/94	2	2			1			X		X			X	X	X		X											X
1994 E&E	BH11-6	158SL	SL	8/25/94	10	10	1					X		X			X	X	X		X											X
1994 E&E	(Background)	140SL	SL	8/25/94	0	0	1																									X
1994 E&E	(Background)	141SL	SL	8/25/94	2	2	1																									X
1996 AGRA		1639-02	SD	8/8/96	2	2	1													X	X						X	X				
1996 AGRA		1639-03	SD	8/8/96	2	2	1													X	X						X	X				
1996 AGRA		1639-06	SL	8/8/96	2	2	1												X	X							X	X				
1996 AGRA		1639-07	SD	8/8/96	2	2	1													X	X						X	X				
1996 AGRA		1639-08	SL	8/8/96	2	2	1												X	X							X	X				
1996 AGRA		1639-08(DUP)	SL	8/8/96	2	2		1												X												
1996 E&E	MW-3	96-UMT-195-SS[α]	SL	8/10/96	0	0	1				X				X	X			X		X					X						X
1996 E&E	MW-3	96-UMT-196-SB[α]	SL	8/10/96	4	4	1				X				X	X			X		X					X						X
1996 E&E	MW-3	96-UMT-197-SB[α]	SL	8/10/96	4	4		1			X				X	X			X		X					X						X
1996 E&E	SB-44	96-UMT-199-SB	SL	8/10/96	5	5	1				X				X	X					X											
1996 E&E	SB-45	96-UMT-200-SB	SL	8/10/96	3	3	1				X				X	X					X											
1996 E&E	MW-4	96-UMT-201-SS	SL	8/10/96	0	0	1				X				X	X			X		X					X						X
1996 E&E	MW-4	96-UMT-202-SB	SL	8/10/96	5	5	1				X				X	X			X		X					X						X
1996 E&E	MW-6	96-UMT-203-SS[β]	SL	8/10/96	0	0	1				X				X	X			X		X					X						X
1996 E&E	MW-6	96-UMT-204-SB	SL	8/10/96	3	3	1				X				X	X			X		X					X						X
1996 E&E	MW-6	96-UMT-205-SB	SL	8/10/96	3	3		1			X				X	X			X		X					X						X
1996 E&E	MW-6	96-UMT-206-SB[γ]	SL		3	3					X																					
1996 E&E	SB-47	96-UMT-207-SB	SL	8/10/96	3	3	1				X				X	X					X											
1996 E&E	SB-401	96-UMT-207-SB[γ]	SL		3	3					X				X	X					X											
1996 E&E	MW-5	96-UMT-208-SB	SL	8/10/96	6	6	1				X				X	X					X											
1996 E&E	MW-7	96-UMT-209-SS	SL	8/10/96	0	0	1				X				X	X			X		X					X						X
1996 E&E	MW-7	96-UMT-210-SB	SL	8/10/96	6	6	1				X				X	X			X		X					X						X
1996 E&E	MW-8	96-UMT-211-SB	SL	8/10/96	3	3	1				X				X	X					X											
1996 E&E	SB-49	96-UMT-212-SB	SL	8/11/96	7	7	1				X				X	X																
1996 E&E	SB-50	96-UMT-213-SS	SL	8/10/96	0	0	1				X																					
1996 E&E	SB-50	96-UMT-214-SB	SL	8/11/96	6	6	1				X				X	X			X		X					X						X
1996 E&E	SB-51	96-UMT-215-SB	SL	8/11/96	7	7	1				X				X	X																
1996 E&E	LC	96-UMT-224-SD	SD	8/11/96	NA	NA	1									X			X		X					X						X
1996 E&E	LC	96-UMT-225-SD	SD	8/11/96	NA	NA		1								X			X		X					X						X
1996 E&E	LC	96-UMT-226-SD[γ]	SD		NA	NA										X			X		X					X						X
1996 E&E	LA	96-UMT-230-SD	SD	8/11/96	NA	NA	1									X			X		X					X						X
1996 E&E	LB	96-UMT-232-SD	SD	8/11/96	NA	NA	1									X			X		X					X						X
1996 E&E	SB-401	96-UMT-401-SB[δ]	SL	8/19/96	0	0	1								X	X			X		X					X						X
1997 E&E	T1R SED-1	97-UMT-001-SD	SD	8/8/97		0-0.17	1																X									
1997 E&E	T1C SED-2	97-UMT-002-SD	SD	8/8/97		0-0.17	1																X									
1997 E&E	T1L SED-3	97-UMT-003-SD	SD	8/8/97		0-0.17	1																X									
1997 E&E	T1L SED-3	97-UMT-004-SD	SD	8/8/97		0-0.17		1															X									
1997 E&E	T1L SED-3	97-UMT-005-SD[ε]	SD	8/8/97		0-0.17			1														X									
1997 E&E	T2R SED-4	97-UMT-006-SD	SD	8/8/97		0-0.17	1																X									
1997 E&E	T2C SED-5	97-UMT-007-SD	SD	8/8/97		0-0.17	1																X									
1997 E&E	T2L SED-6	97-UMT-008-SD	SD	8/8/97		0-0.17	1																X									
1997 E&E	T3R SED-7	97-UMT-009-SD	SD	8/8/97		0-0.17	1																X									
1997 E&E	T3C SED-8	97-UMT-010-SD	SD	8/8/97		0-0.17	1																X									
1997 E&E	T3L SED-9	97-UMT-011-SD	SD	8/8/97		0-0.17	1																X									
1997 E&E	T4R SED-10	97-UMT-012-SD	SD	8/8/97		0-0.17	1																X									
1997 E&E	T4R SED-10	97-UMT-013-SD	SD	8/8/97		0-0.17		1															X									
1997 E&E	T4R SED-10	97-UMT-014-SD[ε]	SD	8/8/97		0-0.17			1														X									
1997 E&E	T4C SED-11	97-UMT-015-SD	SD	8/8/97		0-0.17	1																X									
1997 E&E	T4L SED-12	97-UMT-016-SD	SD	8/8/97		0-0.17	1																X									
1997 E&E	T5R SED-13	97-UMT-017-SD	SD	8/8/97		0-0.17	1																X									
1997 E&E	T5C SED-14	97-UMT-018-SD	SD	8/8/97		0-0.17	1																X									
1997 E&E	T5L SED-15	97-UMT-019-SD	SD	8/8/97		0-0.17	1																X									
1997 E&E	T11R SED-31	97-UMT-020-SD	SD	8/10/97		0-0.17	1																X									
1997 E&E	T11R SED-31	97-UMT-021-SD	SD	8/10/97		0-0.17		1															X									
1997 E&E	T11R SED-31	97-UMT-022-SD[ε]	SD	8/10/97		0-0.17			1														X									
1997 E&E	T11L SED-50	97-UMT-023-SD	SD	8/10/97		0-0.17	1																X									
1997 E&E	T10R SED-28	97-UMT-024-SD	SD	8/10/97		0-0.17	1																X									
1997 E&E	T10C SED-29	97-UMT-025-SD	SD	8/10/97		0-0.17	1																X									
1997 E&E	T10L SED-30	97-UMT-026-SD	SD	8/10/97		0-0.17	1																X									
1997 E&E	T9R SED-25	97-UMT-027-SD	SD	8/10/97		0-0.17	1																X									
1997 E&E	T9C SED-26	97-UMT-028-SD	SD	8/10/97		0-0.17	1																X									
1997 E&E	T9L SED-27	97-UMT-029-SD	SD	8/10/97		0-0.17	1																X									
1997 E&E	T8R SED-22	97-UMT-030-SD	SD	8/10/97		0-0.17	1																X									
1997 E&E	T8C SED-23	97-UMT-031-SD	SD	8/10/97		0-0.17	1																X									
1997 E&E	T8L SED-24	97-UMT-032-SD	SD	8/10/97		0-0.17	1																X									

Table E-1
Soil and Sediment Sampling and Laboratory Analysis Summary

Sample Information											Soil/Sediment Sample Analysis																					
Event	Sample Location	Sample Number	Matrix	Sample Date	Median Sample Depth (ft. bgs)	Sample Depth (feet bgs)	Project Sample	Duplicate Sample	Triplicate Sample	MS/MSD Sample	GRO/BTEX (AK 101)	GRO (AK M 8015)	GRO (AK 101)	DRO (AK M 8100)	DRO (AK 102)	RRO (AK 103)	TRPH (method not listed)	Fuel ID (Corps M 8015)	VOC (SW-846 Method 8260A)	PAH (non-specified GC/MS SIM method)	Pest/PCB (SW-846 Method 8080A)	Pest/PCB (SW-846 Method 8081A)	PCB (SW-846 Method 8081)	Pesticides (SW-846 Method 8081)	PCB (SW-846 Method 8082)	BNA (SW-846 Method 8270B)	Arsenic (EPA Method 7060)	Lead (EPA Method 6010A)	Lead (SW-846 Method 7421)	TCLP Lead (SW-846 Method 1311/7421)	TAL Metals (Cu & Pb)	TAL Metals (SW-846 Method 6000/7000 Series)
1997 E&E	T7R SED-19	97-UMT-033-SD	SD	8/10/97		0-0.17	1																X									
1997 E&E	T7C SED-20	97-UMT-034-SD	SD	8/10/97		0-0.17	1																X									
1997 E&E	T7L SED-21	97-UMT-035-SD	SD	8/10/97		0-0.17	1																X									
1997 E&E	T7L SED-21	97-UMT-036-SD	SD	8/10/97		0-0.17		1															X									
1997 E&E	T7L SED-21	97-UMT-037-SD[ε]	SD	8/10/97		0-0.17			1														X									
1997 E&E	T6R SED+16	97-UMT-038-SD	SD	8/10/97		0-0.17	1																X									
1997 E&E	T6C SED-17	97-UMT-039-SD	SD	8/10/97		0-0.17	1																X									
1997 E&E	T6L SED-18	97-UMT-040-SD	SD	8/10/97		0-0.17	1																X									
1997 E&E	BIASED SED-32	97-UMT-041-SD[ζ]	SD	8/10/97		0-0.17	1																X									
1997 E&E	BIASED SED-32	97-UMT-042-SD[ζ]	SD	8/10/97		0-0.17		1															X									
1997 E&E	BIASED SED-32	97-UMT-043-SD[ζ]	SD	8/10/97		0-0.17			1														X									
1997 E&E	BIASED SED-33	97-UMT-044-SD[ζ]	SD	8/10/97		0-0.17	1																X									
1997 E&E	BIASED SED-34	97-UMT-045-SD[ζ]	SD	8/10/97		0-0.17	1																X									
1997 E&E	BIASED SED-35	97-UMT-046-SD[ζ]	SD	8/10/97		0-0.17	1																X									
1997 E&E	BIASED SED-36	97-UMT-047-SD[ζ]	SD	8/10/97		0-0.17	1																X									
1997 E&E	BIASED SED-37	97-UMT-048-SD[ζ]	SD	8/10/97		0-0.17	1																X									
1997 E&E	BIASED SED-38	97-UMT-049-SD[ζ]	SD	8/10/97		0-0.17	1																X									
1997 E&E	BIASED SED-39	97-UMT-050-SD[ζ]	SD	8/10/97		0-0.17	1																X									
1997 E&E	BIASED SED-40	97-UMT-051-SD	SD	8/10/97		0-0.17	1																X									
1997 E&E	BIASED SED-41	97-UMT-052-SD	SD	8/10/97		0-0.17	1																X									
1997 E&E	BIASED SED-42	97-UMT-053-SD	SD	8/10/97		0-0.17	1																X									
1997 E&E	BIASED SED-43	97-UMT-054-SD	SD	8/11/97		0-0.17	1																X									
1997 E&E	BIASED SED-44	97-UMT-055-SD	SD	8/11/97		0-0.17	1																X									
1997 E&E	BIASED SED-45	97-UMT-056-SD	SD	8/11/97		0-0.17	1																X									
1997 E&E	BIASED SED-46	97-UMT-057-SD	SD	8/11/97		0-0.17	1																X									
1997 E&E	BIASED SED-47	97-UMT-058-SD	SD	8/11/97		0-0.17	1																X									
1997 E&E	BIASED SED-48	97-UMT-059-SD	SD	8/11/97		0-0.17	1																X									
1997 E&E	MW-21	97-UMT-101-SB	SL	8/9/97		3-5	1								X									X								
1997 E&E	SB-173	97-UMT-102-SB	SL	8/9/97		6.5-7.5	1								X									X								
1997 E&E	SB-174	97-UMT-103-SB	SL	8/9/97		6.5-8.5	1								X									X								
1997 E&E	SB-175	97-UMT-104-SB	SL	8/9/97		5.5-7	1								X									X								
1997 E&E	MW-22	97-UMT-105-SB	SL	8/10/97		6.5-8.5	1								X									X								
1997 E&E	SB-176	97-UMT-106-SB	SL	8/10/97		7.5-9	1								X									X								
1997 E&E	SB-177	97-UMT-107-SB	SL	8/10/97		5-7	1								X									X								
1997 E&E	SB-178	97-UMT-108-SB	SL	8/10/97		4-6	1								X									X								
1997 E&E	SB-178	97-UMT-109-SB	SL	8/10/97		4-6		1							X									X								
1997 E&E	SB-178	97-UMT-110-SB[ε]	SL	8/10/97		4-6			1						X									X								
1997 E&E	SB-179	97-UMT-111-SB	SL	8/10/97		7-9	1								X									X								
1997 E&E	MW-24	97-UMT-112-SB	SL	8/11/97		7.5-9.5	1								X									X								
1997 E&E	MW-25	97-UMT-113-SB	SL	8/11/97		6-8	1								X									X								
1997 E&E	SB-180	97-UMT-114-SB	SL	8/12/97		8.5-9.5	1								X									X								
1997 E&E	MW-26	97-UMT-115-SB	SL	8/12/97		6-8	1								X									X								
1997 E&E	SB-181	97-UMT-116-SB	SL	8/12/97		5.5-7	1								X									X								
1997 E&E	SB-182	97-UMT-117-SB	SL	8/12/97		5-7	1								X									X								
1997 E&E	SB-183	97-UMT-118-SB	SL	8/12/97		5-7	1								X									X								
1997 E&E	MW-27	97-UMT-119-SB	SL	8/13/97		7-8.5	1								X									X								
1997 E&E	SB-184	97-UMT-120-SB	SL	8/14/97		5.5-7	1								X									X								
1997 E&E	SB-185	97-UMT-121-SB	SL	8/14/97		6-8	1								X									X								
1997 E&E	SB-186	97-UMT-122-SB	SL	8/16/97		6-7.5	1								X									X								
1997 E&E	SB-186	97-UMT-123-SB	SL	8/16/97		6-7.5		1							X									X								
1997 E&E	SB-186	97-UMT-124-SB[ε]	SL	8/16/97		6-7.5			1						X									X								
1997 E&E	SB-187	97-UMT-125-SB	SL	8/16/97		5-6.5	1								X									X								

Table E-1
Soil and Sediment Sampling and Laboratory Analysis Summary

Sample Information											Soil/Sediment Sample Analysis																					
Event	Sample Location	Sample Number	Matrix	Sample Date	Median Sample Depth (ft. bgs)	Sample Depth (feet bgs)	Project Sample	Duplicate Sample	Triplicate Sample	MS/MSD Sample	GRO/BTEX (AK 101)	GRO (AK M 8015)	GRO (AK 101)	DRO (AK M 8100)	DRO (AK 102)	RRO (AK 103)	TRPH (method not listed)	Fuel ID (Corps M 8015)	VOC (SW-846 Method 8260A)	PAH (non-specified GC/MS SIM method)	Pest/PCB (SW-846 Method 8080A)	Pest/PCB (SW-846 Method 8081A)	PCB (SW-846 Method 8081)	Pesticides (SW-846 Method 8081)	PCB (SW-846 Method 8082)	BNA (SW-846 Method 8270B)	Arsenic (EPA Method 7060)	Lead (EPA Method 6010A)	Lead (SW-846 Method 7421)	TCLP Lead (SW-846 Method 1311/7421)	TAL Metals (Cu & Pb)	TAL Metals (SW-846 Method 6000/7000 Series)
1998 E&E		98-UMT-600-SD	SD	8/10/98			1			1														X								
1998 E&E		98-UMT-601-SD	SD	8/10/98																				X								
1998 E&E		98-UMT-602-SD	SD	8/10/98			1																	X								
1998 E&E		98-UMT-603-SD	SD	8/10/98			1																	X								
1998 E&E		98-UMT-604-SD	SD	8/18/98			1																	X								
1998 E&E		98-UMT-605-SD	SD	8/18/98			1																	X								
1998 E&E		98-UMT-606-SD	SD	8/18/98			1																	X								
1998 E&E		98-UMT-607-SD	SD	8/18/98			1																	X								
1998 E&E		98-UMT-608-SD	SD	8/18/98			1																	X								
1998 E&E		98-UMT-609-SD	SD	8/18/98			1																	X								
1998 E&E		98-UMT-610-SD	SD	8/18/98			1																	X								
1998 E&E		98-UMT-621-SD	SD	8/19/98			1			1					X				X					X	X	X						
1998 E&E		98-UMT-622-SD	SD	8/19/98			1								X				X					X	X	X						
1998 E&E		98-UMT-623-SD	SD	8/19/98				1							X				X					X	X	X						
1998 E&E		98-UMT-624-SD	SD	8/19/98			1								X				X					X	X	X						
1998 E&E		98-UMT-625-SD	SD	8/19/98			1								X				X					X	X	X						
1998 E&E		98-UMT-626-SD	SD	8/19/98			1								X				X					X	X	X						
1998 E&E		98-UMT-627-SD	SD	8/19/98			1								X				X					X	X	X						
1998 E&E		98-UMT-628-SD	SD	8/19/98			1								X				X					X	X	X						
1998 E&E		98-UMT-629-SD	SD	8/19/98			1								X				X					X	X	X						
1998 E&E		98-UMT-630-SD	SD	8/19/98			1								X				X					X	X	X						
1998 E&E		98-UMT-631-SD	SD	8/19/98			1								X				X					X	X	X						
1998 E&E		98-UMT-632-SD	SD	8/19/98				1							X				X					X	X	X						
1998 E&E		98-UMT-633-SD	SD	8/19/98			1								X				X					X	X	X						
1998 E&E		98-UMT-634-SD	SD	8/19/98			1								X				X					X	X	X						
1998 E&E		98-UMT-635-SD	SD	8/19/98			1								X				X					X	X	X						
1998 E&E		98-UMT-636-SD	SD	8/19/98			1								X				X					X	X	X						

Matrix Key:
SL Soil
SD Sediment

Analysis Key:
GRO Gasoline range organics
BTEX Benzene, toluene, ethylbenzene, and xylenes
DRO Diesel range organics
RRO Residual range organics
TRPH Total recoverable petroleum hydrocarbons
VOC Volatile organic compounds
PAH Polynuclear aromatic hydrocarbons
PCB Polychlorinated biphenyls
BNA Base-, neutral-, acid-extractable compounds
TCLP Toxicity characteristic leaching procedure
TAL Total analyte list

Notes:
α Not listed in Table 3-3 Unit C Sampling and Analysis Summary
β Listed in Table 4-31 as 96-UMT-203-SB
γ Triplicate samples not listed in Table 4-31 results
δ Listed as 96-UMT-401-SS in Table 4-31
ε 1997 Triplicate results not listed in results summary tables
ζ These samples are not included in Table 2-3 of sediment results

Table E-2
Surface Water and Groundwater Sampling and Laboratory Analysis Summary

Sample Information											Water Sample Analysis														
Event	Sample Location	Sample Number	Matrix	Sample Date	Median Sample Depth (ft. bgs)	Sample Depth (feet bgs)	Project Sample	Duplicate Sample	Triplicate Sample	MS/MSD Sample	GRO (AK 101)	DRO (AK 102)	TRPH (EPA 418.1)	VOC (SW-846 Method 8260A)	PAH (non-specified GC/MS SIM method)	PAH (SW-846 Method 8310)	Pest/PCB (EPA 8080A)	Pest/PCB (EPA 8081)	Pesticides (SW-846 Method 8081)	PCB (SW-846 Method 8082)	Arsenic (EPA Method 7060)	Lead (SW-842 method 7421)**	Metals (Filtered)	Total Metals	TAL Metals (SW-846 Method 6000/7000 Series)**
1996 AGRA		1639-04	SW	8/8/96	0	0	1							X	X		X				X	X			
1996 AGRA		1639-05	SW	8/8/96	0	0	1							X	X		X				X	X			
1996 AGRA		1639-16	SW	8/8/96	0	0	1								X		X^{α}				X	X			
1996 E&E	LC	96-UMT-227-SW	SW	8/11/96	NA	NA	1							X		X	X							X	
1996 E&E	LC	96-UMT-227-SW-F	SW	8/11/96	NA	NA	1																X		
1996 E&E	LC	96-UMT-228-SW	SW	8/11/96	NA	NA		1						X		X	X							X	
1996 E&E	LC	96-UMT-228-SW-F	SW	8/11/96	NA	NA		1															X		
1996 E&E	LA	96-UMT-231-SW	SW	8/11/96	NA	NA	1							X		X	X							X	
1996 E&E	LA	96-UMT-231-SW-F	SW	8/11/96	NA	NA	1																X		
1996 E&E	LB	96-UMT-233-SW	SW	8/11/96	NA	NA	1							X		X	X							X	
1996 E&E	LB	96-UMT-233-SW-F	SW	8/11/96	NA	NA	1																X		
1996 E&E	MW-4	96-UMT-332-GW	GW	8/19/96	3.54	3.54	1				X	X	X	X		X	X								
1996 E&E	MW-5	96-UMT-333-GW	GW	8/20/96	5.1	5.1	1				X	X	X	X			X								
1996 E&E	MW-6	96-UMT-334-GW	GW	8/20/96	2.69	2.69	1				X			X		X									
1996 E&E	MW-7	96-UMT-335-GW	GW	8/19/96	5.32	5.32	1				X	X	X	X		X	X								
1996 E&E	MW-7	96-UMT-351-GW	GW	8/19/96	5.32	5.32		1			X	X		X		X									
1996 E&E	MW-8	96-UMT-336-GW	GW	8/20/96	0.58	0.58	1				X	X	X	X		X	X								
1996 E&E	MW-3	96-UMT-348-GW	GW	8/19/96	3.36	3.36	1				X	X	X	X		X	X								
1996 E&E	MW-3	96-UMT-349-GW	GW	8/19/96	3.36	3.36		1			X			X											
1996 E&E	MW-3	96-UMT-350-GW$^{\beta}$	GW		3.36	3.36					X	X	X	X		X	X								
1996 E&E	MW-7	96-UMT-352-GW$^{\beta}$	GW		5.32	5.32					X	X	X	X		X	X								
1997 E&E	MW-27	97-UMT-280-GW	GW	8/15/97			1					X						X							
1997 E&E	MW-27	97-UMT-281-GW	GW	8/15/97				1				X						X							
1997 E&E	MW-27	97-UMT-282-GW$^{\beta}$	GW	8/15/97					1			X						X							
1997 E&E	MW-26	97-UMT-283-GW	GW	5/15/97			1					X						X							
1997 E&E	MW-4	97-UMT-284-GW	GW	8/15/97			1					X													
1997 E&E	MW-23	97-UMT-285-GW	GW	8/15/97			1					X						X							
1997 E&E	MW-22	97-UMT-286-GW	GW	8/15/97			1					X						X							
1997 E&E	MW-25	97-UMT-287-GW	GW	5/15/97			1					X						X							
1997 E&E	MW-7	97-UMT-288-GW	GW	8/15/97			1					X													
1997 E&E	MW-3	97-UMT-289-GW	GW	8/15/97			1					X						X							
1997 E&E	MW-21	97-UMT-290-GW	GW	8/15/97			1					X													
1997 E&E	MW-24	97-UMT-291-GW	GW	8/15/97			1					X													
1997 E&E	MW-4	97-UMT-300-GW	GW	9/6/97			1											X							
1997 E&E	MW-7	97-UMT-301-GW	GW	9/6/97			1											X							
1997 E&E	MW-21	97-UMT-302-GW	GW	9/6/97			1											X							
1997 E&E	MW-24	97-UMT-303-GW	GW	9/6/97			1											X							
1998 E&E		98-UMT-621-SW	SW	8/19/98			1			1		X		X		X			X	X					
1998 E&E		98-UMT-622-SW	SW	8/19/98			1					X		X		X			X	X					
1998 E&E		98-UMT-623-SW	SW	8/19/98				1				X		X		X			X	X					
1998 E&E		98-UMT-624-SW	SW	8/19/98			1					X		X		X			X	X					
1998 E&E		98-UMT-625-SW	SW	8/19/98			1					X		X		X			X	X					
1998 E&E		98-UMT-626-SW	SW	8/19/98			1					X		X		X			X	X					
1998 E&E		98-UMT-627-SW	SW	8/19/98			1					X		X		X			X	X					
1998 E&E		98-UMT-628-SW	SW	8/19/98			1					X		X		X			X	X					
1998 E&E		98-UMT-629-SW	SW	8/19/98			1					X		X		X			X	X					
1998 E&E		98-UMT-630-SW	SW	8/19/98			1					X		X		X			X	X					
1998 E&E		98-UMT-631-SW	SW	8/19/98			1					X		X		X			X	X					
1998 E&E		98-UMT-632-SW	SW	8/19/98				1				X		X		X			X	X					
1998 E&E		98-UMT-633-SW	SW	8/19/98			1					X		X		X			X	X					
1998 E&E		98-UMT-634-SW	SW	8/19/98			1					X		X		X			X	X					
1998 E&E		98-UMT-635-SW	SW	8/19/98			1					X		X		X			X	X					
1998 E&E		98-UMT-636-SW	SW	8/19/98			1					X		X		X			X	X					
1998 E&E	MW-24	98-UMT-800-GW	GW	8/10/98			1			1		X							X	X					
1998 E&E	MW-7	98-UMT-801-GW	GW	8/10/98			1					X							X	X					
1998 E&E	MW-7	98-UMT-802-GW	GW	8/10/98				1				X							X	X					
1998 E&E	MW-23	98-UMT-803-GW	GW	8/10/98			1					X							X	X					
1998 E&E	MW-22	98-UMT-804-GW	GW	8/10/98			1					X							X	X					

Table E-2
Surface Water and Groundwater Sampling and Laboratory Analysis Summary

Sample Information											Water Sample Analysis														
Event	Sample Location	Sample Number	Matrix	Sample Date	Median Sample Depth (ft. bgs)	Sample Depth (feet bgs)	Project Sample	Duplicate Sample	Triplicate Sample	MS/MSD Sample	GRO (AK 101)	DRO (AK 102)	TRPH (EPA 418.1)	VOC (SW-846 Method 8260A)	PAH (non-specified GC/MS SIM method)	PAH (SW-846 Method 8310)	Pest/PCB (EPA 8080A)	Pest/PCB (EPA 8081)	Pesticides (SW-846 Method 8081)	PCB (SW-846 Method 8082)	Arsenic (EPA Method 7060)	Lead (SW-842 method 7421)**	Metals (Filtered)	Total Metals	TAL Metals (SW-846 Method 6000/7000 Series)**
1999 E&E	MW-7	99-UMT-003-GW	GW	8/27/99			1					X							X	X					
1999 E&E	MW-23	99-UMT-002-GW	GW	8/27/99			1					X							X	X					
1999 E&E	MW-24	00-UMT-001-GW	GW	8/27/99			1					X							X	X					
1999 E&E	downstream of T3	99-UMT-005-SW	SW	8/27/99			1					X							X	X					
1999 E&E	Transect T3	99-UMT-006-SW	SW	8/27/99			1					X							X	X					
1999 E&E	Transect T1	99-UMT-007-SW	SW	8/27/99			1					X							X	X					
1999 E&E	Transect T1	99-UMT-008-SW	SW	8/27/99				1		1		X							X	X					

Matrix Key:
SW Surface water
GW Groundwater

Analysis Key:
GRO Gasoline range organics
DRO Diesel range organics
TRPH Total recoverable petroleum hydrocarbons
VOC Volatile organic compounds
PAH Polynuclear aromatic hydrocarbons
PCB Polychlorinated biphenyls
TAL Total analyte list

Notes:
α Not listed in summary table for Pest/PCB, but results are listed in full analytical report
β Triplicate samples not listed in Table 4-31 results

Table E-3
Fish Tissue Sampling and Laboratory Analysis Summary

Sample Information					Fish Analysis								
Event	Sample Location	Sample Number	Matrix	Sample Date	Fish Identifier	Species	Length (inches)	Weight (grams)	Analyze	Archive	PCB (3550C/8082)	Pesticides (3550C/8081A)	PCB (SW-846 method 8081)
1997 E&E	SEAS. STREAM	97-UMT-060-FWB	FT	8/10/97	2		12.75	245.1					X
1997 E&E	SEAS. STREAM	97-UMT-061-FWB	FT	8/10/97	3		11.00	194.7					X
1997 E&E	SEAS. STREAM	97-UMT-062-FWB	FT	8/11/97	6		12.50	295.3					X
1997 E&E	SEAS. STREAM	97-UMT-063-FWB	FT	8/11/97	7		12.00	258.6					X
1997 E&E	SEAS. STREAM	97-UMT-064-FWB	FT	8/11/97	9		10.75	185.5					X
1997 E&E	SEAS. STREAM	97-UMT-065-FWB	FT	8/11/97	12		12.50	214.9					X
1997 E&E	SEAS. STREAM	97-UMT-066-FWB	FT	8/11/97	14		12.00	229.4					X
1997 E&E	BACKGROUND	97-UMT-067-FWB[α]	FT	8/11/97	1		11.50	244.7					X
1997 E&E	BACKGROUND	97-UMT-068-FWB[α]	FT	8/11/97	4		12.25	270.7					X
1997 E&E	BACKGROUND	97-UMT-069-FWB[α]	FT	8/11/97	5		13.00	220.8					X
1997 E&E	SEAS. STREAM	97-UMT-070-FF	FT	8/10/97	8		13.13	296.2					X
1997 E&E	SEAS. STREAM	97-UMT-071-FF	FT	8/10/97	10		15.00	446.1					X
1997 E&E	SEAS. STREAM	97-UMT-072-FF	FT	8/10/97	11		14.50	399.3					X
1997 E&E	SEAS. STREAM	97-UMT-073-FF	FT	8/11/97	15		13.50	363.5					X
1997 E&E	SEAS. STREAM	97-UMT-074-FF[β]	FT	8/11/97	01BKG		13.25	295.1					X
1997 E&E	SEAS. STREAM	97-UMT-075-FF[β]	FT	8/11/97	04BKG		12.75	279.7					X
1997 E&E	SEAS. STREAM	97-UMT-076-FF[β]	FT	8/11/97	05BKG		14.50	347.8					X
1997 E&E	BACKGROUND	97-UMT-077-FF	FT	8/11/97	02BKG		13.00	281.7					X
1997 E&E	BACKGROUND	97-UMT-078-FF	FT	8/11/97	03BKG		14.00	381.7					X
1997 E&E	BACKGROUND	97-UMT-079-FF	FT	8/11/97	06BKG		13.13	296.4					X
1998 E&E	Slough	98-UMT-401-FT	FT	8/13/98		Burbot			X		X	X	
1998 E&E	Slough	98-UMT-402-FT	FT	8/13/98		Whitefish			X		X	X	
1998 E&E	Slough	98-UMT-403-FT	FT	8/13/98		Whitefish			X		X	X	
1998 E&E	Slough	98-UMT-404-FT	FT	8/13/98		Whitefish			X		X	X	
1998 E&E	Slough	98-UMT-405-FT	FT	8/13/98		Whitefish			X		X	X	
1998 E&E	Slough	98-UMT-406-FT	FT	8/13/98		Whitefish				X	X	X	
1998 E&E	Slough	98-UMT-407-FT	FT	8/13/98		Whitefish				X	X	X	
1998 E&E	Slough	98-UMT-408-FT	FT	8/13/98		Whitefish				X	X	X	
1998 E&E	Upstream	98-UMT-409-FT	FT	8/13/98		Whitefish			X		X	X	
1998 E&E	Upstream	98-UMT-410-FT	FT	8/13/98		Whitefish			X		X	X	
1998 E&E	Upstream	98-UMT-411-FT	FT	8/13/98		Whitefish			X		X	X	
1998 E&E	Upstream	98-UMT-412-FT	FT	8/13/98		Whitefish			X		X	X	
1998 E&E	Upstream	98-UMT-413-FT	FT	8/13/98		Whitefish			X		X	X	
1998 E&E	Upstream	98-UMT-414-FT	FT	8/13/98		Burbot			X		X	X	
1998 E&E	Upstream	98-UMT-415-FT	FT	8/13/98		Burbot			X		X	X	
1998 E&E	Downstream	98-UMT-416-FT	FT	8/13/98		Whitefish			X		X	X	
1998 E&E	Downstream	98-UMT-417-FT	FT	8/13/98		Whitefish			X		X	X	
1998 E&E	Downstream	98-UMT-418-FT	FT	8/13/98		Whitefish			X		X	X	
1998 E&E	Downstream	98-UMT-419-FT	FT	8/13/98		Whitefish			X		X	X	
1998 E&E	Downstream	98-UMT-420-FT	FT	8/13/98		Whitefish			X		X	X	
1998 E&E	Downstream	98-UMT-421-FT	FT	8/13/98		Whitefish				X	X	X	
1998 E&E	Downstream	98-UMT-422-FT	FT	8/13/98		Whitefish				X	X	X	
1998 E&E	Downstream	98-UMT-423-FT	FT	8/13/98		Whitefish				X	X	X	
1998 E&E	Downstream	98-UMT-424-FT	FT	8/13/98		Whitefish				X	X	X	
1998 E&E	Downstream	98-UMT-425-FT	FT	8/13/98		Whitefish				X	X	X	
1998 E&E	Downstream	98-UMT-426-FT	FT	8/13/98		Burbot			X		X	X	
1998 E&E	Slough	98-UMT-427-FT	FT	8/14/98		Whitefish			X		X	X	
1998 E&E	Slough	98-UMT-428-FT	FT	8/14/98		Whitefish				X	X	X	
1998 E&E	Slough	98-UMT-429-FT	FT	8/14/98		Whitefish				X	X	X	
1998 E&E	Slough	98-UMT-430-FT	FT	8/14/98		Whitefish				X	X	X	
1998 E&E	Slough	98-UMT-431-FT	FT	8/14/98		Whitefish				X	X	X	
1998 E&E	Upstream	98-UMT-432-FT	FT	8/14/98		Whitefish				X	X	X	
1998 E&E	Upstream	98-UMT-433-FT	FT	8/14/98		Whitefish				X	X	X	
1998 E&E	Upstream	98-UMT-434-FT	FT	8/14/98		Burbot			X		X	X	
1998 E&E	Upstream	98-UMT-435-FT	FT	8/15/98		Whitefish				X	X	X	
1998 E&E	Upstream	98-UMT-436-FT	FT	8/15/98		Whitefish				X	X	X	
1998 E&E	Upstream	98-UMT-437-FT	FT	8/15/98		Whitefish				X	X	X	
1998 E&E	Downstream	98-UMT-438-FT	FT	8/20/98		Burbot			X		X	X	
1998 E&E	Slough	98-UMT-439-FT	FT	8/21/98		Burbot			X		X	X	

Matrix Key:
FT Fish tissue

Analysis Key:
PCB Polychlorinated biphenyls

Notes:
α These samples were listed in the original 1997 sampling and analysis summary as Fish Fillet (FF) samples collected from the Seasonal Stream; however, results Table 3-15 lists these as background Fish Whole Body (FWB) samples, and the weights/lengths match.

β These samples were listed in the original 1997 sampling and analysis summary as Fish Whole Body (FWB) samples collected from Background areas; however, results Table 3-15 list these as seasonal stream Fish Fillet (FF) samples, and the weights/lengths match

APPENDIX F

TABLE F-1A: SUMMARY OF PCL AND TBC CONCENTRATIONS
TABLE F-1C: SUMMARY OF TBC CONCENTRATIONS - FISH TISSUE
TABLES F-2A TO F-2E: SUMMARY OF SOIL-SAMPLE RESULTS
TABLES F-3A TO F-3E: SUMMARY OF SEDIMENT-SAMPLE RESULTS
TABLES F-4A TO F-4E: SUMMARY OF SURFACE-WATER SAMPLE RESULTS
TABLES F-5A TO F-5D: SUMMARY OF GROUNDWATER-SAMPLE RESULTS
TABLE F-6: SUMMARY OF FISH-TISSUE SAMPLE RESULTS

Table F-1a
Summary of PCL and TBC Concentrations for Soil and Sediment

Analyte	CAS Number/ Abbreviation	Soil				Sediment			
		Units	PCL	PCL Source	TBC	Units	PCL	PCL Source	TBC
Petroleum Hydrocarbons									
Gasoline Range Organics	GRO	mg/kg	260	OFMTG	—	mg/kg	260	—	—
Diesel Range Organics	DRO	mg/kg	230	OFMTG	—	mg/kg	230	—	—
Residual Range Organics	RRO	mg/kg	8300	OFIG	—	mg/kg	8300	—	—
Volatile Organic Compounds									
Acetone	67-64-1	mg/kg	88	MTG	2.5	mg/kg	88	MTG	—
Acrolein	107-02-8	mg/kg	—	—	5.27	mg/kg	—	—	—
Acrylonitrile	107-13-1	mg/kg	—	—	0.000007	mg/kg	—	—	0.00007
Benzene	71-43-2	mg/kg	0.025	MTG	0.01	mg/kg	0.25	MTG	0.01
Bromobenzene	108-86-1	mg/kg	—	—	—	mg/kg	—	—	—
Bromochloromethane	74-97-5	mg/kg	—	—	—	mg/kg	—	—	—
Bromodichloromethane	75-27-4	mg/kg	0.044	MTG	0.54	mg/kg	0.44	MTG	—
Bromoform	75-25-2	mg/kg	0.34	MTG	15.9	mg/kg	0.34	MTG	75
Bromomethane	74-83-9	mg/kg	0.16	MTG	0.235	mg/kg	0.16	MTG	—
2-Butanone (methyl ethyl ketone)	78-93-3	mg/kg	59	MTG	89.6	mg/kg	—	—	35
tert-Butylbenzene	98-06-6	mg/kg	12	MTG	—	mg/kg	12	MTG	—
Carbon disulfide	75-15-0	mg/kg	12	MTG	0.0941	mg/kg	12	MTG	—
Carbon tetrachloride	56-23-5	mg/kg	0.023	MTG	0.4	mg/kg	0.023	MTG	0.17
Chlorobenzene	108-90-7	mg/kg	0.63	MTG	0.03	mg/kg	0.63	MTG	0.03
Chloroethane	75-00-3	mg/kg	34	AZOI	—	mg/kg	34	AZOI	—
2-Chloroethyl vinyl ether	110-75-8	mg/kg	—	—	—	mg/kg	—	—	—
Chloroform	67-66-3	mg/kg	0.46	MTG	1.19	mg/kg	0.46	MTG	0.02
Chloromethane	74-87-3	mg/kg	0.21	MTG	10.4	mg/kg	0.21	MTG	—
2-Chlorotoluene	95-49-8	mg/kg	—	—	—	mg/kg	—	—	—
3-Chlorotoluene	108-41-8	mg/kg	—	—	—	mg/kg	—	—	—
4-Chlorotoluene	106-43-4	mg/kg	—	—	—	mg/kg	—	—	—
1,1-Dichloroethane	75-34-3	mg/kg	25	MTG	0.02	mg/kg	25	MTG	0.02
1,1-Dichloroethene	75-35-4	mg/kg	0.03	MTG	0.1	mg/kg	0.03	MTG	0.1
cis-1,2-Dichloroethene	156-59-2	mg/kg	0.24	MTG	—	mg/kg	0.24	MTG	—
trans-1,2-Dichloroethene	156-60-5	mg/kg	0.37	MTG	—	mg/kg	0.37	MTG	—
1,1-Dichloropropene	563-58-6	mg/kg	—	—	—	mg/kg	—	—	—
cis-1,3-Dichloropropene[2]	10061-01-5	mg/kg	0.033	MTG	0.398	mg/kg	0.033	MTG	—
trans-1,3-Dichloropropene[2]	10061-02-6	mg/kg	0.033	MTG	0.398	mg/kg	0.033	MTG	—
1,3-Dichloropropene (total)	542-75-6	mg/kg	0.033	MTG	—	mg/kg	0.033	MTG	—
1,2-Dibromo-3-chloropropane	96-12-8	mg/kg	—	—	0.0352	mg/kg	—	—	—
1,2-Dibromoethane	106-93-4	mg/kg	0.00016	MTG	1.23	mg/kg	0.00016	MTG	—

Table F-1a
Summary of PCL and TBC Concentrations for Soil and Sediment

Analyte	CAS Number/ Abbreviation	Soil				Sediment			
		Units	PCL	PCL Source	TBC	Units	PCL	PCL Source	TBC
1,2-Dichlorobenzene	95-50-1	mg/kg	5.1	MTG	0.03	mg/kg	5.1	MTG	0.03
1,2-Dichloroethane	107-06-2	mg/kg	0.016	MTG	0.02	mg/kg	0.016	MTG	0.02
1,2-Dichloropropane	78-87-5	mg/kg	0.018	MTG	0.002	mg/kg	0.018	MTG	0.002
1,3-Dichlorobenzene	541-73-1	mg/kg	28	MTG	0.03	mg/kg	28	MTG	0.03
1,3-Dichloropropane	142-28-9	mg/kg	—	—	—	mg/kg	—	—	—
1,4-Dichlorobenzene	106-46-7	mg/kg	0.64	MTG	0.03	mg/kg	0.64	MTG	0.03
1,4-Dioxane	123-91-1	mg/kg	0.21	MTG	2.05	mg/kg	0.21	MTG	—
2,2-Dichloropropane	594-20-7	mg/kg	—	—	—	mg/kg	—	—	—
Dibromochloromethane	124-48-1	mg/kg	0.032	MTG	2.05	mg/kg	0.032	MTG	—
Dibromomethane	74-95-3	mg/kg	1.1	MTG	65	mg/kg	—	—	—
Dichlorodifluoromethane	75-71-8	mg/kg	140	MTG	39.5	mg/kg	140	MTG	—
Ethylbenzene	100-41-4	mg/kg	6.9	MTG	0.03	mg/kg	6.9	MTG	0.03
Hexachlorobutadiene	87-68-3	mg/kg	0.12	MTG	0.0398	mg/kg	0.12	MTG	—
2-Hexanone	591-78-6	mg/kg	—	—	12.6	mg/kg	—	—	—
Isopropylbenzene	98-82-8	mg/kg	51	MTG	—	mg/kg	51	MTG	—
4-Isopropyltoluene	99-87-6	mg/kg	—	—	—	mg/kg	—	—	—
4-Methyl-2-pentanone	108-10-1	mg/kg	8.1	MTG	443	mg/kg	—	—	—
Methylene chloride	75-09-2	mg/kg	0.016	MTG	0.4	mg/kg	0.016	MTG	0.018
Naphthalene	91-20-3	mg/kg	20	MTG	0.0994	mg/kg	20	MTG	0.01465
n-Butylbenzene	104-51-8	mg/kg	15	MTG	—	mg/kg	15	MTG	—
n-Propylbenzene	103-65-1	mg/kg	15	MTG	—	mg/kg	15	MTG	—
sec-Butylbenzene	135-98-8	mg/kg	12	MTG	—	mg/kg	12	MTG	—
Styrene	100-42-5	mg/kg	0.96	MTG	0.3	mg/kg	0.96	MTG	0.2
1,1,1,2-Tetrachloroethane	630-20-6	mg/kg	—	—	225	mg/kg	—	—	—
1,1,1-Trichloroethane	71-55-6	mg/kg	0.82	MTG	0.07	mg/kg	0.82	MTG	0.07
1,1,2,2-Tetrachloroethane	79-34-5	mg/kg	0.017	MTG	0.127	mg/kg	0.017	MTG	—
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	mg/kg	10	AZDC	—	mg/kg	750	MTG	—
1,1,2-Trichloroethane	79-00-5	mg/kg	0.018	MTG	0.4	mg/kg	0.018	MTG	0.4
1,2,3-Trichlorobenzene	87-61-6	mg/kg	—	—	0.03	mg/kg	—	—	0.011
1,2,3-Trichloropropane	96-18-4	mg/kg	0.00053	MTG	3.36	mg/kg	0.00053	MTG	—
1,2,4-Trichlorobenzene	120-82-1	mg/kg	0.85	MTG	0.03	mg/kg	0.85	MTG	0.011
1,2,4-Trimethylbenzene	95-63-6	mg/kg	23	MTG	—	mg/kg	23	MTG	—
1,3,5-Trimethylbenzene	108-67-8	mg/kg	23	MTG	—	mg/kg	23	MTG	—
Tetrachloroethene	127-18-4	mg/kg	0.024	MTG	0.002	mg/kg	0.024	MTG	0.002
Tetrahydrofuran	109-99-9	mg/kg	—	—	0.1	mg/kg	—	—	0.1
Toluene	108-88-3	mg/kg	6.5	MTG	0.01	mg/kg	6.5	MTG	0.01
Trichloroethene	79-01-6	mg/kg	0.02	MTG	0.1	mg/kg	0.02	MTG	—

Table F-1a
Summary of PCL and TBC Concentrations for Soil and Sediment

Analyte	CAS Number/ Abbreviation	Soil				Sediment			
		Units	PCL	PCL Source	TBC	Units	PCL	PCL Source	TBC
Trichlorofluoromethane	75-69-4	mg/kg	86	MTG	16.4	mg/kg	86	MTG	—
Vinyl acetate	108-05-4	mg/kg	100	MTG	12.7	mg/kg	100	MTG	—
Vinyl chloride	75-01-4	mg/kg	0.0085	MTG	0.01	mg/kg	0.0085	MTG	0.01
Xylenes (total)	1330-20-7	mg/kg	63	MTG	0.1	mg/kg	63	MTG	0.13
Semivolatile Organic Compounds									
Acenaphthene	83-32-9	mg/kg	180	MTG	20	mg/kg	180	MTG	0.00671
Acenaphthylene	208-96-8	mg/kg	180	MTG	682	mg/kg	180	MTG	0.00587
Anthracene	120-12-7	mg/kg	3000	MTG	1.48E+03	mg/kg	3000	MTG	0.01
Benzo(a)anthracene	56-55-3	mg/kg	3.6	MTG	5.21	mg/kg	3.6	MTG	0.01572
Benzo(a)pyrene	50-32-8	mg/kg	0.66	AZDC	1.52	mg/kg	0.66	AZDC	0.0319
Benzo(b)fluoranthene	205-99-2	mg/kg	6.6	AZDC	59.8	mg/kg	6.6	AZDC	—
Benzo(g,h,i)perylene	191-24-2	mg/kg	1900	AZDC	119	mg/kg	1900	AZDC	0.17
Benzo(k)fluoranthene	207-08-9	mg/kg	66	AZDC	148	mg/kg	66	AZDC	0.0272
Benzoic acid	65-85-0	mg/kg	410	MTG	—	mg/kg	410	MTG	—
Benzyl alcohol	100-51-6	mg/kg	—	—	65.8	mg/kg	—	—	—
Benzyl butyl phthalate	85-68-7	mg/kg	920	MTG	0.1	mg/kg	920	MTG	0.1
4-Bromophenyl phenyl ether	101-55-3	mg/kg	—	—	—	mg/kg	—	—	—
4-Chloroaniline	106-47-8	mg/kg	0.057	MTG	0.3	mg/kg	0.057	MTG	—
bis-(2-Chloroethoxy)methane	111-91-1	mg/kg	—	—	0.302	mg/kg	—	—	—
bis-(2-Chloroethyl)ether	111-44-4	mg/kg	0.0022	MTG	23.7	mg/kg	0.0022	MTG	—
bis-(2-Chloroisopropyl)ether	108-60-1	mg/kg	—	—	19.9	mg/kg	—	—	—
4-Chloro-3-methyl phenol	59-50-7	mg/kg	—	—	7.95	mg/kg	—	—	15
2-Chloronaphthalene	91-58-7	mg/kg	120	MTG	0.0122	mg/kg	120	MTG	0.25
2-Chlorophenol	95-57-8	mg/kg	1.5	MTG	0.01	mg/kg	1.5	MTG	0.055
4-Chlorophenyl phenyl ether	7005-72-3	mg/kg	—	—	—	mg/kg	—	—	—
Chrysene	218-01-9	mg/kg	360	MTG	4.73	mg/kg	360	MTG	0.02683
Dibenzo(a,h)anthracene	53-70-3	mg/kg	0.66	AZDC	18.4	mg/kg	0.66	AZDC	0.00622
Dibenzofuran	132-64-9	mg/kg	11	MTG	—	mg/kg	11	MTG	5.1
1,2-Dichlorobenzene	95-50-1	mg/kg	5.1	MTG	0.03	mg/kg	5.1	MTG	0.03
1,3-Dichlorobenzene	541-73-1	mg/kg	28	MTG	0.03	mg/kg	28	MTG	0.03
1,4-Dichlorobenzene	106-46-7	mg/kg	0.64	MTG	0.03	mg/kg	0.64	MTG	0.03
3,3'-Dichlorobenzidine	91-94-1	mg/kg	0.19	MTG	0.646	mg/kg	0.19	MTG	—
2,4-Dichlorophenol	120-83-2	mg/kg	1.3	MTG	0.01	mg/kg	1.3	MTG	0.01
2,4-Dimethylphenol	105-67-9	mg/kg	8.8	MTG	0.01	mg/kg	8.8	MTG	—
Diethyl phthalate	84-66-2	mg/kg	130	MTG	0.1	mg/kg	130	MTG	0.53
Dimethyl phthalate	131-11-3	mg/kg	1100	MTG	0.1	mg/kg	1100	MTG	1

Table F-1a
Summary of PCL and TBC Concentrations for Soil and Sediment

Analyte	CAS Number/ Abbreviation	Soil				Sediment			
		Units	PCL	PCL Source	TBC	Units	PCL	PCL Source	TBC
Di-n-butyl phthalate	84-74-2	mg/kg	80	MTG	0.1	mg/kg	80	MTG	0.11
Di-n-octyl phthalate	117-84-0	mg/kg	3800	MTG	0.1	mg/kg	3800	MTG	0.1
2,4-Dinitrophenol	51-28-5	mg/kg	0.54	MTG	0.0609	mg/kg	0.54	MTG	—
2,4-Dinitrotoluene	121-14-2	mg/kg	0.0093	MTG	1.28	mg/kg	0.0093	MTG	—
2,6-Dinitrotoluene	606-20-2	mg/kg	0.0094	MTG	0.0328	mg/kg	0.0094	MTG	—
bis-(2-Ethylhexyl)phthalate	117-81-7	mg/kg	13	MTG	0.1	mg/kg	13	MTG	0.1
Fluoranthene	206-44-0	mg/kg	1400	MTG	122	mg/kg	1400	MTG	0.03146
Fluorene	86-73-7	mg/kg	220	MTG	30	mg/kg	220	MTG	0.01
Hexachlorobenzene	118-74-1	mg/kg	0.047	MTG	0.199	mg/kg	0.047	MTG	0.0014
Hexachlorobutadiene	87-68-3	mg/kg	0.12	MTG	0.0398	mg/kg	0.12	MTG	—
Hexachlorocyclopentadiene	77-47-4	mg/kg	1.3	MTG	0.755	mg/kg	1.3	MTG	—
Hexachloroethane	67-72-1	mg/kg	0.21	MTG	0.596	mg/kg	0.21	MTG	—
Indeno(1,2,3-cd)pyrene	193-39-5	mg/kg	6.6	AZDC	109	mg/kg	6.6	AZDC	0.01732
Isophorone	78-59-1	mg/kg	3.1	MTG	139	mg/kg	3.1	MTG	—
2-Methyl-4,6-dinitrophenol	534-52-1	mg/kg	—	—	0.144	mg/kg	—	—	—
2-Methylnaphthalene	91-57-6	mg/kg	6.1	MTG	3.24	mg/kg	6.1	MTG	—
2-Methylphenol (o-cresol)	95-48-7	mg/kg	15	MTG	0.05	mg/kg	15	MTG	0.5
4-Methylphenol (p-cresol)	106-44-5	mg/kg	1.5	MTG	0.05	mg/kg	1.5	MTG	0.0051
Naphthalene	91-20-3	mg/kg	20	MTG	0.0994	mg/kg	20	MTG	0.01465
2-Nitroaniline	88-74-4	mg/kg	—	—	74.1	mg/kg	—	—	—
3-Nitroaniline	99-09-2	mg/kg	—	—	3.16	mg/kg	—	—	—
4-Nitroaniline	100-01-6	mg/kg	—	—	21.9	mg/kg	—	—	—
Nitrobenzene	98-95-3	mg/kg	0.094	MTG	1.31	mg/kg	0.094	MTG	—
2-Nitrophenol	88-75-5	mg/kg	—	—	1.6	mg/kg	—	—	—
4-Nitrophenol	100-02-7	mg/kg	—	—	5.12	mg/kg	—	—	—
n-Nitrosodi-n-propylamine	621-64-7	mg/kg	0.0011	MTG	0.544	mg/kg	0.0011	MTG	—
n-Nitrosodiphenylamine	86-30-6	mg/kg	15	MTG	0.545	mg/kg	15	MTG	—
Pentachlorophenol	87-86-5	mg/kg	0.047	MTG	0.199	mg/kg	0.047	MTG	0.01
Phenanthrene	85-01-8	mg/kg	3000	MTG	45.7	mg/kg	3000	MTG	0.01873
Phenol	108-95-2	mg/kg	68	MTG	30	mg/kg	68	MTG	0.048
Pyrene	129-00-0	mg/kg	1000	MTG	78.5	mg/kg	1000	MTG	0.04427
1,2,4-Trichlorobenzene	120-82-1	mg/kg	0.85	MTG	0.03	mg/kg	0.85	MTG	0.011
2,4,5-Trichlorophenol	95-95-4	mg/kg	67	MTG	0.01	mg/kg	67	MTG	0.01
2,4,6-Trichlorophenol	88-06-2	mg/kg	1.4	MTG	0.01	mg/kg	1.4	MTG	0.01

Table F-1a
Summary of PCL and TBC Concentrations for Soil and Sediment

Analyte	CAS Number/ Abbreviation	Soil				Sediment			
		Units	PCL	PCL Source	TBC	Units	PCL	PCL Source	TBC
Polychlorinated Biphenyls (PCBs)									
PCB-1016 (Aroclor 1016)	—	—	—	—	—	—	—	—	—
PCB-1221 (Aroclor 1221)	—	—	—	—	—	—	—	—	—
PCB-1232 (Aroclor 1232)	—	—	—	—	—	—	—	—	—
PCB-1242 (Aroclor 1242)	—	—	—	—	—	—	—	—	—
PCB-1248 (Aroclor 1248)	—	—	—	—	—	—	—	—	—
PCB-1254 (Aroclor 1254)	—	—	—	—	—	—	—	—	0.06
PCB-1260 (Aroclor 1260)	—	—	—	—	—	—	—	—	—
Total PCBs	1336-36-3	mg/kg	1	AZDC	0.000332	mg/kg	1	AZDC	0.06
Pesticides									
Aldrin	309-00-2	mg/kg	0.07	MTG	0.00006	mg/kg	0.07	MTG	0.00006
Chlordane (total)	57-74-9	mg/kg	2.3	MTG	0.00003	mg/kg	2.3	MTG	0.00003
4,4'-DDD	72-54-8	mg/kg	7.2	MTG	0.01	mg/kg	—	—	0.00354
4,4'-DDE	72-55-9	mg/kg	5.1	MTG	0.01	mg/kg	—	—	0.00142
4,4'-DDT[3]	50-29-3	mg/kg	7.3	MTG	0.01	mg/kg	—	—	0.00119
Dieldrin	60-57-1	mg/kg	0.0076	MTG	0.022	mg/kg	0.0076	MTG	0.0005
Endosulfan I	959-98-8	mg/kg	—	—	0.00001	mg/kg	—	—	0.00001
Endosulfan II	33213-65-9	mg/kg	—	—	0.00001	mg/kg	—	—	0.00001
Endosulfan (total)	115-29-7	mg/kg	64	MTG	—	mg/kg	64	MTG	0.00001
Endosulfan sulfate	1031-07-8	mg/kg	—	—	0.0358	mg/kg	—	—	—
Endrin	72-20-8	mg/kg	0.29	MTG	0.00004	mg/kg	0.29	MTG	0.00004
Endrin aldehyde	7421-93-4	mg/kg	—	—	0.0105	mg/kg	—	—	—
Endrin ketone	53494-70-5	mg/kg	—	—	—	mg/kg	—	—	—
Heptachlor	76-44-8	mg/kg	0.28	MTG	0.00007	mg/kg	0.28	MTG	0.0007
Heptachlor epoxide	1024-57-3	mg/kg	0.014	MTG	0.0000002	mg/kg	0.014	MTG	0.0000002
alpha-HCH	319-84-6	mg/kg	0.0064	MTG	0.003	mg/kg	0.0064	MTG	0.003
beta-HCH	319-85-7	mg/kg	0.022	MTG	0.009	mg/kg	0.022	MTG	0.005
delta-HCH	319-86-8	mg/kg	—	—	0.01	mg/kg	—	—	0.01
gamma-HCH (Lindane)	58-89-9	mg/kg	0.0095	MTG	0.00005	mg/kg	0.0095	MTG	0.00005
Methoxychlor	72-43-5	mg/kg	23	MTG	0.0199	mg/kg	23	MTG	—
Toxaphene	8001-35-2	mg/kg	3.9	MTG	0.119	mg/kg	3.9	MTG	0.0001

Table F-1a
Summary of PCL and TBC Concentrations for Soil and Sediment

Analyte	CAS Number/ Abbreviation	Soil				Sediment			
		Units	PCL	PCL Source	TBC	Units	PCL	PCL Source	TBC
Inorganics									
Aluminum	7429-90-5	mg/kg	—	—	50	mg/kg	—	—	25500
Antimony	7440-36-0	mg/kg	3.6	MTG	0.142	mg/kg	3.6	MTG	3
Arsenic	7440-38-2	mg/kg	3.9	MTG	5.7	mg/kg	3.9	MTG	5.9
Barium	7440-39-3	mg/kg	1100	MTG	1.04	mg/kg	1100	MTG	—
Beryllium	7440-41-7	mg/kg	42	MTG	1.06	mg/kg	42	MTG	—
Cadmium	7440-43-9	mg/kg	5	MTG	0.00222	mg/kg	5	MTG	0.583
Calcium	7440-70-2	mg/kg	—	—	—	mg/kg	—	—	—
Chromium (total)	7440-47-3	mg/kg	25	MTG	—	mg/kg	25	MTG	26
Cobalt	7440-48-4	mg/kg	—	—	0.14	mg/kg	—	—	50
Copper	7440-50-8	mg/kg	460	MTG	5.4	mg/kg	460	MTG	16
Iron	7439-89-6	mg/kg	—	—	200	mg/kg	—	—	20000
Lead	7439-92-1	mg/kg	400	AZDC	0.0537	mg/kg	400	AZDC	31
Magnesium	7439-95-4	mg/kg	—	—	—	mg/kg	—	—	—
Manganese	7439-96-5	mg/kg	—	—	100	mg/kg	—	—	460
Mercury	7439-97-6	mg/kg	1.4	MTG	0.1	mg/kg	1.4	MTG	0.174
Nickel	7440-02-0	mg/kg	86	MTG	13.6	mg/kg	86	MTG	16
Potassium	7440-09-7	mg/kg	—	—	—	mg/kg	—	—	—
Selenium	7782-49-2	mg/kg	3.4	MTG	0.52	mg/kg	3.4	MTG	—
Silver	7440-22-4	mg/kg	11.2	MTG	2	mg/kg	11.2	MTG	0.5
Sodium	7440-23-5	mg/kg	—	—	—	mg/kg	—	—	—
Thallium	7440-28-0	mg/kg	1.9	MTG	0.0569	mg/kg	1.9	MTG	—
Vanadium	7440-62-2	mg/kg	960	AZDC	1.59	mg/kg	960	AZDC	—
Zinc	7440-66-6	mg/kg	4100	MTG	6.62	mg/kg	4100	MTG	98

Table F-1a
Summary of PCL and TBC Concentrations for Soil and Sediment

Notes:

—	CAS Number, PCL, or TBC does not exist for this analyte/compound
PCL	Chemical-specific Applicable or Relevant and Appropriate Requirements for soil or water
TBC	To Be Considered, non-promulgated advisories, guidance, or proposed standards; listed as National Ocean and Atmospheric Administration (NOAA) Screening Quick Reference Tables (SQuiRTs); 2008 version - most stringent freshwater sediment or soil levels
mg/kg	milligrams per kilogram
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
HCH	Hexachlorocyclohexane

Sources:

ADEC	Alaska Department of Environmental Conservation
MTG	18 AAC 75.341 (April 2012) - Method Two Tables B1 and B2 Soil Cleanup Levels: Migration to Groundwater
AZOI	18 AAC 75.341 (April 2012) - Method Two Tables B1 and B2 Soil Cleanup Levels: Arctic Zone Outdoor Inhalation
AZDC	18 AAC 75.341 (April 2012) - Method Two Tables B1 and B2 Soil Cleanup Levels: Arctic Zone Direct Contact
OFIG	18 AAC 75.341 (April 2012) - Method Two Tables B1 and B2 Soil Cleanup Levels: Over 40 Inch Zone, Ingestion
OFMTG	18 AAC 75.341 (April 2012) - Method Two Tables B1 and B2 Soil Cleanup Levels: Over 40 Inch Zone, Migration to Groundwater

Assumptions:

1 Criteria for chlordane was used for alpha-Chlordane and gamma-Chlordane

2 Criteria for 1,3-Dichloropropene was used for cis-1,3-Dichloropropene and trans-1,3-Dichloropropene

3 Criteria for total DDT used for 4,4'-DDT

Table F-1b
Summary of PCL and TBC Concentrations for Surface Water and Groundwater

Analyte	CAS Number/ Abbreviation	Surface Water				Groundwater			
		Units	PCL	PCL Source	TBC	Units	PCL	PCL Source	TBC
Petroleum Hydrocarbons									
Gasoline Range Organics	GRO	mg/L	2.2	C	—	mg/L	2.2	C	—
Diesel Range Organics	DRO	mg/L	1.5	C	—	mg/L	1.5	C	—
Residual Range Organics	RRO	mg/L	1.1	C	—	mg/L	1.1	C	—
Water Quality Criteria									
Total Aromatic Hydrocarbons	TAH	mg/L	0.01	A	—	—	—	—	—
Total Aqueous Hydrocarbons	TAqH	mg/L	0.015	A	—	—	—	—	—
Volatile Organic Compounds									
Acetone	67-64-1	mg/L	33	C	1.5	mg/L	33	C	—
Acrolein	107-02-8	mg/L	320	A	0.00001	mg/L	320	A	—
Acrylonitrile	107-13-1	mg/L	—	—	2.6	mg/L	—	—	0.00008
Benzene	71-43-2	mg/L	0.005	C	0.046	mg/L	0.005	C	0.0002
Bromobenzene	108-86-1	mg/L	—	—	—	mg/L	—	—	—
Bromochloromethane	74-97-5	mg/L	—	—	—	mg/L	—	—	—
Bromodichloromethane	75-27-4	mg/L	0.014	C	11	mg/L	0.014	C	0.06
Bromoform	75-25-2	mg/L	0.11	C	0.32	mg/L	0.11	C	0.63
Bromomethane	74-83-9	mg/L	48	A	0.016	mg/L	48	A	—
2-Butanone (methyl ethyl ketone)	78-93-3	mg/L	22	C	14	mg/L	22	C	6
tert-Butylbenzene	98-06-6	mg/L	—	—	—	mg/L	—	—	—
Carbon disulfide	75-15-0	mg/L	3.7	C	0.00092	mg/L	3.7	C	0.00092
Carbon tetrachloride	56-23-5	mg/L	0.005	C	0.0098	mg/L	0.005	C	0.00001
Chlorobenzene	108-90-7	mg/L	0.1	C	0.0013	mg/L	0.1	C	0.007
Chloroethane	75-00-3	mg/L	0.29	C	—	mg/L	0.29	C	—
2-Chloroethyl vinyl ether	110-75-8	mg/L	—	—	—	mg/L	—	—	—
Chloroform	67-66-3	mg/L	0.14	C	0.0018	mg/L	0.14	C	0.006
Chloromethane	74-87-3	mg/L	0.066	C	—	mg/L	0.066	C	—
2-Chlorotoluene	95-49-8	mg/L	—	—	—	mg/L	—	—	—
3-Chlorotoluene	108-41-8	mg/L	—	—	—	mg/L	—	—	—
4-Chlorotoluene	106-43-4	mg/L	—	—	—	mg/L	—	—	—
1,1-Dichloroethane	75-34-3	mg/L	7.3	C	0.0047	mg/L	7.3	C	0.007
1,1-Dichloroethene	75-35-4	mg/L	0.007	C	0.025	mg/L	0.007	C	0.00001
cis-1,2-Dichloroethene	156-59-2	mg/L	0.07	C	—	mg/L	0.07	C	—
trans-1,2-Dichloroethene	156-60-5	mg/L	0.1	C	1.16	mg/L	0.1	C	0.1
1,1-Dichloropropene	563-58-6	mg/L	—	—	—	mg/L	—	—	—
cis-1,3-Dichloropropene[2]	10061-01-5	mg/L	—	—	0.000055	mg/L	—	—	0.02

Table F-1b
Summary of PCL and TBC Concentrations for Surface Water and Groundwater

Analyte	CAS Number/ Abbreviation	Surface Water				Groundwater			
		Units	PCL	PCL Source	TBC	Units	PCL	PCL Source	TBC
trans-1,3-Dichloropropene[2]	10061-02-6	mg/L	—	—	0.000055	mg/L	—	—	0.02
1,3-Dichloropropene (total)	542-75-6	mg/L	0.0085	C	0.000055	mg/L	0.0085	C	0.02
1,2-Dibromo-3-chloropropane	96-12-8	mg/L	—	—	—	mg/L	—	—	0.0002
1,2-Dibromoethane	106-93-4	mg/L	0.00005	C	—	mg/L	0.00005	C	0.0004
1,2-Dichlorobenzene	95-50-1	mg/L	0.6	C	0.0007	mg/L	0.6	C	0.003
1,2-Dichloroethane	107-06-2	mg/L	0.005	C	0.1	mg/L	0.005	C	0.005
1,2-Dichloropropane	78-87-5	mg/L	0.005	C	5.7	mg/L	0.005	C	0.00008
1,3-Dichlorobenzene	541-73-1	mg/L	0.4	A	0.038	mg/L	0.4	A	0.003
1,3-Dichloropropane	142-28-9	mg/L	—	—	—	mg/L	—	—	—
1,4-Dichlorobenzene	106-46-7	mg/L	0.075	C	0.0094	mg/L	0.075	C	0.003
1,4-Dioxane	123-91-1	mg/L	0.077	C	—	mg/L	0.077	C	—
2,2-Dichloropropane	594-20-7	mg/L	—	—	—	mg/L	—	—	—
Dibromochloromethane	124-48-1	mg/L	0.01	C	11	mg/L	0.01	C	0.1
Dibromomethane	74-95-3	mg/L	0.37	C	11	mg/L	0.37	C	—
Dichlorodifluoromethane	75-71-8	mg/L	7.3	C	—	mg/L	7.3	C	—
Ethylbenzene	100-41-4	mg/L	0.7	C	0.0073	mg/L	0.7	C	0.004
Hexachlorobutadiene	87-68-3	mg/L	0.0073	C	0.000053	mg/L	0.0073	C	0.0006
2-Hexanone	591-78-6	mg/L	—	—	0.099	mg/L	—	—	—
Isopropylbenzene	98-82-8	mg/L	3.7	C	—	mg/L	3.7	C	—
4-Isopropyltoluene	99-87-6	mg/L	—	—	—	mg/L	—	—	—
4-Methyl-2-pentanone	108-10-1	mg/L	2.9	C	0.17	mg/L	2.9	C	0.00017
Methylene chloride	75-09-2	mg/L	0.005	C	0.0981	mg/L	0.005	C	0.00001
Naphthalene	91-20-3	mg/L	0.73	C	0.0011	mg/L	0.73	C	0.00001
n-Butylbenzene	104-51-8	mg/L	0.37	C	—	mg/L	0.37	C	—
n-Propylbenzene	103-65-1	mg/L	0.37	C	—	mg/L	0.37	C	—
sec-Butylbenzene	135-98-8	mg/L	0.37	C	—	mg/L	0.37	C	—
Styrene	100-42-5	mg/L	0.1	C	0.032	mg/L	0.1	C	0.006
1,1,1,2-Tetrachloroethane	630-20-6	mg/L	—	—	—	mg/L	—	—	—
1,1,1-Trichloroethane	71-55-6	mg/L	0.2	C	0.011	mg/L	0.2	C	0.00001
1,1,2,2-Tetrachloroethane	79-34-5	mg/L	0.0043	C	0.111	mg/L	0.0043	C	—
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	mg/L	1100	C	—	mg/L	1100	C	—
1,1,2-Trichloroethane	79-00-5	mg/L	0.005	C	0.5	mg/L	0.005	C	0.00001
1,2,3-Trichlorobenzene	87-61-6	mg/L	—	—	0.008	mg/L	—	—	0.0001
1,2,3-Trichloropropane	96-18-4	mg/L	0.00012	C	—	mg/L	0.00012	C	—
1,2,4-Trichlorobenzene	120-82-1	mg/L	0.07	C	0.024	mg/L	0.07	C	0.0001
1,2,4-Trimethylbenzene	95-63-6	mg/L	1.8	C	—	mg/L	1.8	C	—

Table F-1b
Summary of PCL and TBC Concentrations for Surface Water and Groundwater

Analyte	CAS Number/ Abbreviation	Surface Water				Groundwater			
		Units	PCL	PCL Source	TBC	Units	PCL	PCL Source	TBC
1,3,5-Trimethylbenzene	108-67-8	mg/L	1.8	C	—	mg/L	1.8	C	—
Tetrachloroethene	127-18-4	mg/L	0.005	C	0.045	mg/L	0.005	C	0.00001
Tetrahydrofuran	109-99-9	mg/L	—	—	—	mg/L	—	—	0.0005
Toluene	108-88-3	mg/L	1	C	0.0098	mg/L	1	C	0.007
Trichloroethene	79-01-6	mg/L	0.005	C	0.021	mg/L	0.005	C	0.005
Trichlorofluoromethane	75-69-4	mg/L	11	C	11	mg/L	11	C	—
Vinyl acetate	108-05-4	mg/L	37	C	0.016	mg/L	37	C	—
Vinyl chloride	75-01-4	mg/L	0.002	C	0.93	mg/L	0.002	C	0.00001
Xylenes (total)	1330-20-7	mg/L	10	C	0.013	mg/L	10	C	0.0002
Semivolatile Organic Compounds									
Acenaphthene	83-32-9	mg/L	1.2	A	0.0058	mg/L	1.2	A	—
Acenaphthylene	208-96-8	mg/L	2.2	C	4.84	mg/L	2.2	C	—
Anthracene	120-12-7	mg/L	9.6	A	0.000012	mg/L	9.6	A	0.0000007
Benzo(a)anthracene	56-55-3	mg/L	0.0012	C	0.000027	mg/L	0.0012	C	0.0000001
Benzo(a)pyrene	50-32-8	mg/L	0.0002	C	0.000014	mg/L	0.0002	C	0.0000005
Benzo(b)fluoranthene	205-99-2	mg/L	0.0012	C	0.00907	mg/L	0.0012	C	—
Benzo(g,h,i)perylene	191-24-2	mg/L	1.1	C	0.00764	mg/L	1.1	C	0.0000003
Benzo(k)fluoranthene	207-08-9	mg/L	0.12	C	—	mg/L	0.12	C	0.0000004
Benzoic acid	65-85-0	mg/L	150	C	0.042	mg/L	150	C	—
Benzyl alcohol	100-51-6	mg/L	—	—	0.0086	mg/L	—	—	—
Benzyl butyl phthalate	85-68-7	mg/L	3	A	0.019	mg/L	3	A	0.0029
4-Bromophenyl phenyl ether	101-55-3	mg/L	—	—	—	mg/L	—	—	—
4-Chloroaniline	106-47-8	mg/L	0.016	C	0.05	mg/L	0.016	C	0.03
bis-(2-Chloroethoxy)methane	111-91-1	mg/L	—	—	11	mg/L	—	—	—
bis-(2-Chloroethyl)ether	111-44-4	mg/L	0.00077	C	1.9	mg/L	0.00077	C	—
bis-(2-Chloroisopropyl)ether	108-60-1	mg/L	—	—	—	mg/L	—	—	—
4-Chloro-3-methyl phenol	59-50-7	mg/L	—	—	—	mg/L	—	—	0.35
2-Chloronaphthalene	91-58-7	mg/L	1.7	A	0.000396	mg/L	1.7	A	0.000016
2-Chlorophenol	95-57-8	mg/L	0.12	A	0.024	mg/L	0.12	A	0.0003
4-Chlorophenyl phenyl ether	7005-72-3	mg/L	—	—	—	mg/L	—	—	—
Chrysene	218-01-9	mg/L	0.12	C	—	mg/L	0.12	C	0.000003
Dibenzo(a,h)anthracene	53-70-3	mg/L	0.00012	C	—	mg/L	0.00012	C	—
Dibenzofuran	132-64-9	mg/L	0.073	C	0.0037	mg/L	0.073	C	—
1,2-Dichlorobenzene	95-50-1	mg/L	0.6	C	0.0007	mg/L	0.6	C	0.003
1,3-Dichlorobenzene	541-73-1	mg/L	0.4	A	0.038	mg/L	0.4	A	0.003
1,4-Dichlorobenzene	106-46-7	mg/L	0.075	C	0.0094	mg/L	0.075	C	0.003

Table F-1b
Summary of PCL and TBC Concentrations for Surface Water and Groundwater

Analyte	CAS Number/ Abbreviation	Surface Water				Groundwater			
		Units	PCL	PCL Source	TBC	Units	PCL	PCL Source	TBC
3,3'-Dichlorobenzidine	91-94-1	mg/L	—	—	0.0045	mg/L	—	—	—
2,4-Dichlorophenol	120-83-2	mg/L	0.093	A	0.011	mg/L	0.093	A	0.0002
2,4-Dimethylphenol	105-67-9	mg/L	0.54	A	0.1	mg/L	0.54	A	—
Diethyl phthalate	84-66-2	mg/L	23	A	0.11	mg/L	23	A	0.0005
Dimethyl phthalate	131-11-3	mg/L	313	A	0.003	mg/L	313	A	0.0005
Di-n-butyl phthalate	84-74-2	mg/L	2.7	A	0.0097	mg/L	2.7	A	0.0005
Di-n-octyl phthalate	117-84-0	mg/L	1.5	C	0.003	mg/L	1.5	C	0.0005
2,4-Dinitrophenol	51-28-5	mg/L	0.073	C	0.019	mg/L	0.073	C	—
2,4-Dinitrotoluene	121-14-2	mg/L	0.0013	C	0.044	mg/L	0.0013	C	—
2,6-Dinitrotoluene	606-20-2	mg/L	0.0013	C	—	mg/L	0.0013	C	—
bis-(2-Ethylhexyl)phthalate	117-81-7	mg/L	0.006	C	0.0003	mg/L	0.006	C	0.0019
Fluoranthene	206-44-0	mg/L	0.3	A	0.00004	mg/L	0.3	A	0.000003
Fluorene	86-73-7	mg/L	1.3	A	0.0039	mg/L	1.3	A	—
Hexachlorobenzene	118-74-1	mg/L	0.001	C	0.0000003	mg/L	0.001	C	2.10E-09
Hexachlorobutadiene	87-68-3	mg/L	0.0073	C	0.000053	mg/L	0.0073	C	0.0006
Hexachlorocyclopentadiene	77-47-4	mg/L	0.05	C	0.0052	mg/L	0.05	C	0.05
Hexachloroethane	67-72-1	mg/L	0.04	C	0.008	mg/L	0.04	C	—
Indeno(1,2,3-cd)pyrene	193-39-5	mg/L	0.0012	C	0.00431	mg/L	0.0012	C	0.0000004
Isophorone	78-59-1	mg/L	0.9	C	0.92	mg/L	0.9	C	—
2-Methyl-4,6-dinitrophenol	534-52-1	mg/L	0.0134	A	—	mg/L	0.0134	A	—
2-Methylnaphthalene	91-57-6	mg/L	0.15	C	0.33	mg/L	0.15	C	—
2-Methylphenol (o-cresol)	95-48-7	mg/L	1.8	C	0.013	mg/L	1.8	C	0.0002
4-Methylphenol (p-cresol)	106-44-5	mg/L	0.18	C	—	mg/L	0.18	C	0.0002
Naphthalene	91-20-3	mg/L	0.73	C	0.0011	mg/L	0.73	C	0.00001
2-Nitroaniline	88-74-4	mg/L	—	—	—	mg/L	—	—	—
3-Nitroaniline	99-09-2	mg/L	—	—	—	mg/L	—	—	—
4-Nitroaniline	100-01-6	mg/L	—	—	—	mg/L	—	—	—
Nitrobenzene	98-95-3	mg/L	0.018	C	0.22	mg/L	0.018	C	—
2-Nitrophenol	88-75-5	mg/L	—	—	—	mg/L	—	—	—
4-Nitrophenol	100-02-7	mg/L	—	—	0.06	mg/L	—	—	—
n-Nitrosodi-n-propylamine	621-64-7	mg/L	—	—	—	mg/L	—	—	—
n-Nitrosodiphenylamine	86-30-6	mg/L	0.17	C	0.21	mg/L	0.17	C	—
Pentachlorophenol	87-86-5	mg/L	0.001	C	0.015	mg/L	0.001	C	0.00004
Phenanthrene	85-01-8	mg/L	11	C	0.0036	mg/L	11	C	0.000003
Phenol	108-95-2	mg/L	11	C	0.18	mg/L	11	C	0.0002
Pyrene	129-00-0	mg/L	0.96	A	0.00025	mg/L	0.96	A	—

Table F-1b
Summary of PCL and TBC Concentrations for Surface Water and Groundwater

Analyte	CAS Number/ Abbreviation	Surface Water				Groundwater			
		Units	PCL	PCL Source	TBC	Units	PCL	PCL Source	TBC
1,2,4-Trichlorobenzene	120-82-1	mg/L	0.07	C	0.024	mg/L	0.07	C	0.0001
2,4,5-Trichlorophenol	95-95-4	mg/L	2.6	A	0.063	mg/L	2.6	A	0.00003
2,4,6-Trichlorophenol	88-06-2	mg/L	0.077	C	0.0049	mg/L	0.077	C	0.00003
Polychlorinated Biphenyls (PCBs)									
PCB-1016 (Aroclor 1016)	—	—	—	—	—	—	—	—	—
PCB-1221 (Aroclor 1221)	—	—	—	—	—	—	—	—	—
PCB-1232 (Aroclor 1232)	—	—	—	—	—	—	—	—	—
PCB-1242 (Aroclor 1242)	—	—	—	—	—	—	—	—	—
PCB-1248 (Aroclor 1248)	—	—	—	—	—	—	—	—	—
PCB-1254 (Aroclor 1254)	—	—	—	—	—	—	—	—	—
PCB-1260 (Aroclor 1260)	—	—	—	—	—	—	—	—	—
Total PCBs	1336-36-3	mg/L	1.4E-05	A	0.000014	mg/L	1.4E-05	A	0.00001
Pesticides									
Aldrin	309-00-2	mg/L	0.00005	C	0.000017	mg/L	0.00005	C	0.000009
Chlordane (total)	57-74-9	mg/L	4.3E-06	A	2.15E-06	mg/L	4.3E-06	A	0.00002
4,4'-DDD	72-54-8	mg/L	0.0035	C	0.000011	mg/L	0.0035	C	0.000004
4,4'-DDE	72-55-9	mg/L	0.0025	C	0.105	mg/L	0.0025	C	0.000004
4,4'-DDT[7]	50-29-3	mg/L	1E-06	A	0.0000005	mg/L	1E-06	A	0.000004
Dieldrin	60-57-1	mg/L	5.3E-05	C	0.000056	mg/L	5.3E-05	C	0.0001
Endosulfan I[6]	959-98-8	mg/L	5.6E-05	A	0.000028	mg/L	5.6E-05	A	—
Endosulfan II[6]	33213-65-9	mg/L	5.6E-05	A	0.000028	mg/L	5.6E-05	A	—
Endosulfan (total)	115-29-7	mg/L	—	—	—	mg/L	—	—	0.0002
Endosulfan sulfate	1031-07-8	mg/L	0.11	A	0.00222	mg/L	0.11	A	—
Endrin	72-20-8	mg/L	3.6E-05	A	0.000036	mg/L	3.6E-05	A	0.00004
Endrin aldehyde	7421-93-4	mg/L	0.00076	A	0.00015	mg/L	0.00076	A	—
Endrin ketone	53494-70-5	mg/L	—	—	—	mg/L	—	—	—
Heptachlor	76-44-8	mg/L	3.8E-06	A	0.0000019	mg/L	3.8E-06	A	0.000005
Heptachlor epoxide	1024-57-3	mg/L	3.8E-06	A	0.0000019	mg/L	3.8E-06	A	0.000005
alpha-HCH	319-84-6	mg/L	0.00014	C	0.0022	mg/L	0.00014	C	0.001
beta-HCH	319-85-7	mg/L	0.00047	C	0.000495	mg/L	0.00047	C	0.001
delta-HCH	319-86-8	mg/L	—	—	0.0022	mg/L	—	—	0.001
gamma-HCH (Lindane)	58-89-9	mg/L	0.0002	C	0.00008	mg/L	0.0002	C	0.0002
Methoxychlor	72-43-5	mg/L	0.00003	A	0.00003	mg/L	0.00003	A	0.04
Toxaphene	8001-35-2	mg/L	2E-07	A	0.0000002	mg/L	2E-07	A	0.003

Table F-1b
Summary of PCL and TBC Concentrations for Surface Water and Groundwater

Analyte	CAS Number/ Abbreviation	Surface Water				Groundwater			
		Units	PCL	PCL Source	TBC	Units	PCL	PCL Source	TBC
Inorganics									
Aluminum	7429-90-5	mg/L	0.087	A	0.087	mg/L	0.087	A	0.05
Antimony	7440-36-0	mg/L	0.006	C	0.03	mg/L	0.006	C	0.006
Arsenic	7440-38-2	mg/L	0.01	C	0.15	mg/L	0.01	C	0.01
Barium	7440-39-3	mg/L	2	C	0.0039	mg/L	2	C	2
Beryllium	7440-41-7	mg/L	0.004	C	0.00066	mg/L	0.004	C	0.004
Cadmium	7440-43-9	mg/L	0.0002	A[4]	0.00025	mg/L	0.0002	A[4]	0.005
Calcium	7440-70-2	mg/L	—	—	—	mg/L	—	—	—
Chromium (total)	7440-47-3	mg/L	0.1	C	—	mg/L	0.1	C	0.1
Cobalt	7440-48-4	mg/L	0.05	A	0.003	mg/L	0.05	A	—
Copper	7440-50-8	mg/L	0.005	A[4]	0.009	mg/L	0.005	A[4]	1.3
Iron	7439-89-6	mg/L	1	A	1	mg/L	1	A	0.3
Lead	7439-92-1	mg/L	0.001	A[4]	0.0025	mg/L	0.001	A[4]	0.015
Magnesium	7439-95-4	mg/L	—	—	—	mg/L	—	—	—
Manganese	7439-96-5	mg/L	0.05	A	0.08	mg/L	0.05	A	0.05
Mercury	7439-97-6	mg/L	0.00005	A	0.00077	mg/L	0.00005	A	0.002
Nickel	7440-02-0	mg/L	0.1	C	0.052	mg/L	0.1	C	0.02
Potassium	7440-09-7	mg/L	—	—	373	mg/L	—	—	—
Selenium	7782-49-2	mg/L	0.005	A	0.005	mg/L	0.005	A	0.05
Silver	7440-22-4	mg/L	0.001	A[4]	0.00036	mg/L	0.001	A[4]	0.1
Sodium	7440-23-5	mg/L	—	—	—	mg/L	—	—	—
Thallium	7440-28-0	mg/L	0.0017	A	0.00003	mg/L	0.0017	A	0.002
Vanadium	7440-62-2	mg/L	0.1	A	0.019	mg/L	0.1	A	—
Zinc	7440-66-6	mg/L	0.07	A[4]	0.12	mg/L	0.07	A[4]	5

Table F-1b
Summary of PCL and TBC Concentrations for Surface Water and Groundwater

Notes:

—	CAS Number, PCL, or TBC does not exist for this analyte/compound
PCL	Chemical-specific Applicable or Relevant and Appropriate Requirements for soil or water
TBC	To Be Considered, non-promulgated advisories, guidance, or proposed standards; listed as National Ocean and Atmospheric Administration (NOAA) Screening Quick Reference Tables (SQuiRTs); 2008 version - most stringent fresh surface-water or groundwater levels
mg/L	milligrams per liter
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
HCH	Hexachlorocyclohexane

Sources:

ADEC	Alaska Department of Environmental Conservation
A	18 AAC 70.020 - Alaska Water Quality Criteria Manual (December 2008) - Fresh Water, most stringent criteria
A[4]	18 AAC 70.020 - Alaska Water Quality Criteria Manual (December 2008) - Hardness Dependant Water Quality - Reference Appendix A
C	18 AAC 75.345 (April 2012) - Table C Groundwater Cleanup Levels

Assumptions:

[1] Criteria for chlordane was used for alpha-Chlordane and gamma-Chlordane

[2] Criteria for 1,3-Dichloropropene was used for cis-1,3-Dichloropropene and trans-1,3-Dichloropropene

[4] Criteria is hardness dependent; a hardness value of 50 mg/L was assumed for calculations.

[6] Criteria for endosulfan used for both endosulfan isomers

[7] Criteria for total DDT used for 4,4'-DDT

Table F-1c
Summary of Risk-Based Screening Levels and Risk-Based Concentrations for Fish Tissue

Analyte	CAS Number/ Abbreviation	Fish Tissue			
		Units	RBSL	Non-carcinogenic RBC	Carcinogenic RBC
Polychlorinated Biphenyls (PCBs)					
PCB-1016 (Aroclor 1016)	—	µg/kg	1.31	13.1	62.4
PCB-1221 (Aroclor 1221)	—	µg/kg	0.218	—	2.18
PCB-1232 (Aroclor 1232)	—	µg/kg	0.218	—	2.18
PCB-1242 (Aroclor 1242)	—	µg/kg	0.218	—	2.18
PCB-1248 (Aroclor 1248)	—	µg/kg	0.218	—	2.18
PCB-1254 (Aroclor 1254)	—	µg/kg	0.218	3.74	2.18
PCB-1260 (Aroclor 1260)	—	µg/kg	0.218	—	2.18
Total PCBs	1336-36-3	µg/kg	0.218	—	2.18
Pesticides					
2,4'-DDD	53-19-0	µg/kg	—	—	—
2,4'-DDE	3424-82-6	µg/kg	—	—	—
4,4'-DDD	72-54-8	µg/kg	1.82	93.6	18.2
4,4'-DDE	72-55-9	µg/kg	1.28	—	12.8
4,4'-DDT	50-29-3	µg/kg	1.28	—	12.8

Notes:

RBSL — Risk-based screening level (used to screen results to determine what to include in the CRE)

RBC — Risk-based concentration (used in the CRE to calculate individual chemical cancer risk and hazard quotient at the site)

µg/kg — micrograms per kilogram

— — RBSL does not exist for this compound

Note: RBSLs were calculated using the EPA's "Regional Screening Levels for Chemical Contaminants at Superfund Sites" calculator:
http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search
using the following assumptions:

	RBSL	RBC
Scenario:	Fish (RSL only)	Fish (RSL only)
SL Type:	Site-specific	Site-specific
Chemical Info Type:	Database hierarchy defaults	Database hierarchy defaults
RfD/RfC Type:	Chronic	Chronic
Body weight:	70 kg (default)	70 kg (default)
Exposure duration:	30 yr (default)	30 yr (default)
Exposure frequency:	350 days/yr (default)	350 days/yr (default)
Lifetime:	70 yr (default)	70 yr (default)
Target Hazard Quotient:	0.1	1
Target Cancer Risk:	1.00E-06	1.00E-05
Fish consumption rate:	390 g/day	390 g/day

Table F-2a
Summary of Soil Sample Results - Fuels and Fuel-related Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1994 E&E BH 11-1 94-UMT-135-SL	1994 E&E BH 11-1 94-UMT-136-SL	1994 E&E BH 11-1 94-UMT-137-SL	1994 E&E BH 11-1 94-UMT-138-SL	1994 E&E BH 11-1 94-UMT-139-SL	1994 E&E BH 11-2 94-UMT-142-SL	1994 E&E BH 11-2 94-UMT-143-SL
Gasoline range organics	AK 101	260	OFMTG	—	mg/kg	—	—	—	—	—	—	—
	AK M 8015	260	OFMTG	—	mg/kg	<5.0 UJ	<5.0 UJ	<1.2 UJ	<5.0 UJ	<5.0 UJ	<5.0 UJ	<5.0 UJ
Diesel range organics	AK 102	230	OFMTG	—	mg/kg	—	—	—	—	—	—	—
	AK M 8100	230	OFMTG	—	mg/kg	26	36	<13	16	22	12	14
Residual range organics	AK 103	8300	OFIG	—	mg/kg	—	—	—	—	—	—	—
Diesel	Corps M 8015	—	—	—	mg/kg	<10	<10	<12	<10	<10	<10	<10
Gasoline	Corps M 8015	—	—	—	mg/kg	<10	<10	<12	<10	<10	<10	<10
Jet fuel	Corps M 8015	—	—	—	mg/kg	<10	<10	<12	<10	<10	<10	<10
Kerosene	Corps M 8015	—	—	—	mg/kg	<10	<10	<12	<10	<10	<10	<10
Mineral spirits	Corps M 8015	—	—	—	mg/kg	<10	<10		<10	<10	<10	<10
Other	Corps M 8015	—	—	—	mg/kg	55	67	<12	30	50	29	30
Total Organic Carbon	EPA 415.1 mod	—	—	—	mg/kg	—	—	—	—	—	—	—
TRPH	not listed	—	—	—	mg/kg	46	42	68	76	26	13	19
Benzene	AK 101	0.025	MTG	0.01	mg/kg	—	—	—	—	—	—	—
Toluene	AK 101	6.5	MTG	0.01	mg/kg	—	—	—	—	—	—	—
Ethylbenzene	AK 101	6.9	MTG	0.03	mg/kg	—	—	—	—	—	—	—
Total Xylenes	AK 101	63	MTG	0.1	mg/kg	—	—	—	—	—	—	—

Table F-2a
Summary of Soil Sample Results - Fuels and Fuel-related Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1994 E&E BH 11-2 94-UMT-144-SL	1994 E&E BH 11-3 94-UMT-145-SL	1994 E&E BH 11-3 94-UMT-146-SL	1994 E&E BH 11-3 94-UMT-147-SL	1994 E&E BH 11-4 94-UMT-148-SL	1994 E&E BH 11-4 94-UMT-149-SL	1994 E&E BH 11-4 94-UMT-150-SL
Gasoline range organics	AK 101	260	OFMTG	—	mg/kg	—	—	—	—	—	—	—
	AK M 8015	260	OFMTG	—	mg/kg	<1.2 UJ	<5.0 UJ	<5.0 UJ	<5.0 UJ	<5.0 UJ	<5.0 UJ	<5.0 UJ
Diesel range organics	AK 102	230	OFMTG	—	mg/kg	—	—	—	—	—	—	—
	AK M 8100	230	OFMTG	—	mg/kg	17	19	<10	21	41	36	21
Residual range organics	AK 103	8300	OFIG	—	mg/kg	—	—	—	—	—	—	—
Diesel	Corps M 8015	—	—	—	mg/kg	<10	<10	<10	<10	<10	<10	<10
Gasoline	Corps M 8015	—	—	—	mg/kg	<10	<10	<10	<10	<10	<10	<10
Jet fuel	Corps M 8015	—	—	—	mg/kg	<10	<10	<10	<10	<10	<10	<10
Kerosene	Corps M 8015	—	—	—	mg/kg	<10	<10	<10	<10	<10	<10	<10
Mineral spirits	Corps M 8015	—	—	—	mg/kg	<10	<10	<10	<10	<10	<10	<10
Other	Corps M 8015	—	—	—	mg/kg	35	34	19	42	78	76	47
Total Organic Carbon	EPA 415.1 mod	—	—	—	mg/kg	—	—	—	—	—	—	—
TRPH	not listed	—	—	—	mg/kg	17	21	17	111	39	34	30
Benzene	AK 101	0.025	MTG	0.01	mg/kg	—	—	—	—	—	—	—
Toluene	AK 101	6.5	MTG	0.01	mg/kg	—	—	—	—	—	—	—
Ethylbenzene	AK 101	6.9	MTG	0.03	mg/kg	—	—	—	—	—	—	—
Total Xylenes	AK 101	63	MTG	0.1	mg/kg	—	—	—	—	—	—	—

Table F-2a
Summary of Soil Sample Results - Fuels and Fuel-related Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1994 E&E BH 11-5 94-UMT-151-SL	1994 E&E BH 11-5 94-UMT-152-SL	1994 E&E BH 11-5 94-UMT-153-SL	1994 E&E BH 11-6 94-UMT-154-SL	1994 E&E BH 11-6 94-UMT-155-SL	1994 E&E BH 11-6 94-UMT-156-SL	1994 E&E BH 11-6 94-UMT-157-SL
Gasoline range organics	AK 101	260	OFMTG	—	mg/kg	—	—	—	—	—	—	—
	AK M 8015	260	OFMTG	—	mg/kg	<5.0 UJ	<5.0 UJ	<5.0 UJ	<5.0 UJ	<5.0 UJ	<5.0 UJ	<1.1 UJ
Diesel range organics	AK 102	230	OFMTG	—	mg/kg	—	—	—	—	—	—	—
	AK M 8100	230	OFMTG	—	mg/kg	12	<10	10	30	19	40	18
Residual range organics	AK 103	8300	OFIG	—	mg/kg	—	—	—	—	—	—	—
Diesel	Corps M 8015	—	—	—	mg/kg	<10	<10	<10	<10	<10	<10	<11
Gasoline	Corps M 8015	—	—	—	mg/kg	<10	<10	<10	<10	<10	<10	<11
Jet fuel	Corps M 8015	—	—	—	mg/kg	<10	<10	<10	<10	<10	<10	<11
Kerosene	Corps M 8015	—	—	—	mg/kg	<10	<10	<10	<10	<10	<10	<11
Mineral spirits	Corps M 8015	—	—	—	mg/kg	<10	<10	<10	<10	<10	<10	
Other	Corps M 8015	—	—	—	mg/kg	25	<20	23	71	34	97	<11
Total Organic Carbon	EPA 415.1 mod	—	—	—	mg/kg	—	—	—	—	—	—	—
TRPH	not listed	—	—	—	mg/kg	25	11	48	39	42	37	26
Benzene	AK 101	0.025	MTG	0.01	mg/kg	—	—	—	—	—	—	—
Toluene	AK 101	6.5	MTG	0.01	mg/kg	—	—	—	—	—	—	—
Ethylbenzene	AK 101	6.9	MTG	0.03	mg/kg	—	—	—	—	—	—	—
Total Xylenes	AK 101	63	MTG	0.1	mg/kg	—	—	—	—	—	—	—

Table F-2a
Summary of Soil Sample Results - Fuels and Fuel-related Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1994 E&E BH 11-6 94-UMT-158-SL	1996 E&E MW-3 96-UMT-195-SS	1996 E&E MW-3 96-UMT-196-SB	1996 E&E MW-3 96-UMT-197-SB	1996 E&E MW-4 96-UMT-201-SS	1996 E&E MW-4 96-UMT-202-SB	1996 E&E MW-5 96-UMT-208-SB
Gasoline range organics	AK 101	260	OFMTG	—	mg/kg	—	<6.2 UJK	<5.4 UJK	<5.7 UJK	<5.2 UJK	<5.6 UJK	<5.5 UJK
	AK M 8015	260	OFMTG	—	mg/kg	<5.0 UJ	—	—	—	—	—	—
Diesel range organics	AK 102	230	OFMTG	—	mg/kg	—	11 JK	<4.4 UJK	<4.5 UJK	<4.1 UJK	<4.5 UJK	<4.4 UJK
	AK M 8100	230	OFMTG	—	mg/kg	44	—	—	—	—	—	—
Residual range organics	AK 103	8300	OFIG	—	mg/kg	—	73 JK	<44 UJK	19 JK	20 JK	<45 UJK	<44 UJK
Diesel	Corps M 8015	—	—	—	mg/kg	<10	—	—	—	—	—	—
Gasoline	Corps M 8015	—	—	—	mg/kg	<10	—	—	—	—	—	—
Jet fuel	Corps M 8015	—	—	—	mg/kg	<10	—	—	—	—	—	—
Kerosene	Corps M 8015	—	—	—	mg/kg	<10	—	—	—	—	—	—
Mineral spirits	Corps M 8015	—	—	—	mg/kg	<10	—	—	—	—	—	—
Other	Corps M 8015	—	—	—	mg/kg	111	—	—	—	—	—	—
Total Organic Carbon	EPA 415.1 mod	—	—	—	mg/kg	—	—	5550 JK	—	—	7080 JK	—
TRPH	not listed	—	—	—	mg/kg	48	—	—	—	—	—	—
Benzene	AK 101	0.025	MTG	0.01	mg/kg	—	**<0.099 UJK**	**<0.087 UJK**	**<0.091 UJK**	**<0.083**	**<0.090**	**<0.089**
Toluene	AK 101	6.5	MTG	0.01	mg/kg	—	<0.15 UJK	<0.13 UJK	<0.14 UJK	<0.12	<0.14	<0.13
Ethylbenzene	AK 101	6.9	MTG	0.03	mg/kg	—	<0.11 UJK	<0.098 UJK	<0.10 UJK	<0.093	<0.10	<0.10
Total Xylenes	AK 101	63	MTG	0.1	mg/kg	—	<0.31 UJK	<0.27 UJK	<0.28 UJK	<0.26	<0.28	<0.28

Table F-2a
Summary of Soil Sample Results - Fuels and Fuel-related Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1996 E&E MW-6 96-UMT-203-SB	1996 E&E MW-6 96-UMT-204-SB	1996 E&E MW-6 96-UMT-205-SB	1996 E&E MW-7 96-UMT-209-SS	1996 E&E MW-7 96-UMT-210-SB	1996 E&E MW-8 96-UMT-211-SB	1996 E&E SB-44 96-UMT-199-SB
Gasoline range organics	AK 101	260	OFMTG	—	mg/kg	<5.1 UJK	10 JK	10 JK	<5.2 UJK	<5.8 UJK	<5.2 UJK	<5.2 UJK
	AK M 8015	260	OFMTG	—	mg/kg	—	—	—	—	—	—	—
Diesel range organics	AK 102	230	OFMTG	—	mg/kg	<4.1 UJK	**1200 JK**	**1300 JK**	5.2 JK	<4.6 UJK	<4.2 UJK	<4.1 UJK
	AK M 8100	230	OFMTG	—	mg/kg	—	—	—	—	—	—	—
Residual range organics	AK 103	8300	OFIG	—	mg/kg	15 JK	4000 JK	4100 JK	<100 UJK	<120 UJK	<42 UJK	<41 UJK
Diesel	Corps M 8015	—	—	—	mg/kg	—	—	—	—	—	—	—
Gasoline	Corps M 8015	—	—	—	mg/kg	—	—	—	—	—	—	—
Jet fuel	Corps M 8015	—	—	—	mg/kg	—	—	—	—	—	—	—
Kerosene	Corps M 8015	—	—	—	mg/kg	—	—	—	—	—	—	—
Mineral spirits	Corps M 8015	—	—	—	mg/kg	—	—	—	—	—	—	—
Other	Corps M 8015	—	—	—	mg/kg	—	—	—	—	—	—	—
Total Organic Carbon	EPA 415.1 mod	—	—	—	mg/kg	—	—	—	—	—	—	—
TRPH	not listed	—	—	—	mg/kg	—	—	—	—	—	—	—
Benzene	AK 101	0.025	MTG	0.01	mg/kg	**<0.082**	**<0.082**	**<0.083**	**<0.083**	**<0.093 UJK**	**<0.083 UJK**	**<0.083 UJK**
Toluene	AK 101	6.5	MTG	0.01	mg/kg	<0.12	<0.12	<0.12	<0.12	<0.14 UJK	<0.12 UJK	<0.12 UJK
Ethylbenzene	AK 101	6.9	MTG	0.03	mg/kg	<0.092	<0.092	<0.093	<0.093	<0.10 UJK	<0.093 UJK	<0.093 UJK
Total Xylenes	AK 101	63	MTG	0.1	mg/kg	<0.25	<0.26	<0.26	<0.26	<0.29 UJK	<0.26 UJK	<0.26 UJK

Table F-2a
Summary of Soil Sample Results - Fuels and Fuel-related Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1996 E&E SB-45 96-UMT-200-SB	1996 E&E SB-47 96-UMT-207-SB	1996 E&E SB-47 96-UMT-401-SS	1996 E&E SB-49 96-UMT-212-SB	1996 E&E SB-50 96-UMT-213-SS	1996 E&E SB-50 96-UMT-214-SB	1996 E&E SB-51 96-UMT-215-SB
Gasoline range organics	AK 101	260	OFMTG	—	mg/kg	19 JK	<5.2 UJK		<5.3 UJK	<6.0 UJK	<5.3 UJK	<5.5 UJK
	AK M 8015	260	OFMTG	—	mg/kg	—	—	—	—	—	—	—
Diesel range organics	AK 102	230	OFMTG	—	mg/kg	<4.2 UJK	<4.2 UJK	5.2 JK	<4.3 UJK	8.8 JK	5.1 JK	<4.4 UJK
	AK M 8100	230	OFMTG	—	mg/kg	—	—	—	—	—	—	—
Residual range organics	AK 103	8300	OFIG	—	mg/kg	<42 UJK	<42 UJK	24 JK	<43 UJK	<120 UJK	<110 UJK	<44 UJK
Diesel	Corps M 8015	—	—	—	mg/kg	—	—	—	—	—	—	—
Gasoline	Corps M 8015	—	—	—	mg/kg	—	—	—	—	—	—	—
Jet fuel	Corps M 8015	—	—	—	mg/kg	—	—	—	—	—	—	—
Kerosene	Corps M 8015	—	—	—	mg/kg	—	—	—	—	—	—	—
Mineral spirits	Corps M 8015	—	—	—	mg/kg	—	—	—	—	—	—	—
Other	Corps M 8015	—	—	—	mg/kg	—	—	—	—	—	—	—
Total Organic Carbon	EPA 415.1 mod	—	—	—	mg/kg	—	—	—	—	—	—	—
TRPH	not listed	—	—	—	mg/kg	—	—	—	—	—	—	—
Benzene	AK 101	0.025	MTG	0.01	mg/kg	**<0.083 UJK**	**<0.084**	—	**<0.085 UJK**	**<0.096 UJK**	**<0.085 UJK**	**<0.088 UJK**
Toluene	AK 101	6.5	MTG	0.01	mg/kg	<0.13 UJK	<0.13	—	<0.13 UJK	<0.14 UJK	<0.13 UJK	0.50 JK
Ethylbenzene	AK 101	6.9	MTG	0.03	mg/kg	<0.094 UJK	<0.094	—	<0.096 UJK	<0.11 UJK	<0.095 UJK	<0.099 UJK
Total Xylenes	AK 101	63	MTG	0.1	mg/kg	<0.26 UJK	<0.26	—	<0.27 UJK	<0.30 UJK	<0.26 UJK	0.22 JK

Table F-2a
Summary of Soil Sample Results - Fuels and Fuel-related Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1997 E&E SB-182 97-UMT-117-SB	1997 E&E SB-183 97-UMT-118-SB	1997 E&E SB-184 97-UMT-120-SB	1997 E&E SB-185 97-UMT-121-SB	1997 E&E SB-186 97-UMT-122-SB	1997 E&E SB-186 97-UMT-123-SB	1997 E&E SB-187 97-UMT-125-SB
Gasoline range organics	AK 101	260	OFMTG	—	mg/kg	—	—	—	—	—	—	—
	AK M 8015	260	OFMTG	—	mg/kg	—	—	—	—	—	—	—
Diesel range organics	AK 102	230	OFMTG	—	mg/kg	13	8.8	<4.6	9.0	12 J	<4.2	14
	AK M 8100	230	OFMTG	—	mg/kg	—	—	—	—	—	—	—
Residual range organics	AK 103	8300	OFIG	—	mg/kg	—	—	—	—	—	—	—
Diesel	Corps M 8015	—	—	—	mg/kg	—	—	—	—	—	—	—
Gasoline	Corps M 8015	—	—	—	mg/kg	—	—	—	—	—	—	—
Jet fuel	Corps M 8015	—	—	—	mg/kg	—	—	—	—	—	—	—
Kerosene	Corps M 8015	—	—	—	mg/kg	—	—	—	—	—	—	—
Mineral spirits	Corps M 8015	—	—	—	mg/kg	—	—	—	—	—	—	—
Other	Corps M 8015	—	—	—	mg/kg	—	—	—	—	—	—	—
Total Organic Carbon	EPA 415.1 mod	—	—	—	mg/kg	—	—	—	—	—	—	—
TRPH	not listed	—	—	—	mg/kg	—	—	—	—	—	—	—
Benzene	AK 101	0.025	MTG	0.01	mg/kg	—	—	—	—	—	—	—
Toluene	AK 101	6.5	MTG	0.01	mg/kg	—	—	—	—	—	—	—
Ethylbenzene	AK 101	6.9	MTG	0.03	mg/kg	—	—	—	—	—	—	—
Total Xylenes	AK 101	63	MTG	0.1	mg/kg	—	—	—	—	—	—	—

Table F-2a
Summary of Soil Sample Results - Fuels and Fuel-related Compounds

Notes:

U, J, K	Flags are carried over from the original reports, and in some cases were undefined. Refer to original report for flag definitions.
Column headings:	Event Location (LOCID) Sample ID
PCL	Chemical-specific Applicable or Relevant and Appropriate Requirements
TBC	To Be Considered, non-promulgated advisories, guidance, or proposed standards
mg/kg	milligrams per kilogram
ADEC	Alaska Department of Environmental Conservation
MTG	18 AAC 75.341 (April 2012) - Method Two Tables B1 and B2 Soil Cleanup Levels: Migration to Groundwater
OFIG	18 AAC 75.341 (April 2012) - Method Two Tables B1 and B2 Soil Cleanup Levels: Over 40 Inch Zone, Ingestion
OFMTG	18 AAC 75.341 (April 2012) - Method Two Tables B1 and B2 Soil Cleanup Levels: Over 40 Inch Zone, Migration to Groundwater
<	Result is less than the listed reporting limit
bold	Result or reporting limit exceeds the PCL
bold shaded	Result exceeds PCL (regulatory exceedance)

Table F-2b
Summary of Soil Sample Results - Volatile Organic Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1994 E&E BH 11-1 94-UMT-135-SL	1994 E&E BH 11-1 94-UMT-136-SL	1994 E&E BH 11-1 94-UMT-137-SL	1994 E&E BH 11-1 94-UMT-138-SL	1994 E&E BH 11-1 94-UMT-139-SL	1994 E&E BH 11-2 94-UMT-142-SL	1994 E&E BH 11-2 94-UMT-143-SL
Benzene	AK 101	0.025	MTG	0.01	mg/kg	—	—	—	—	—	—	—
	SW8260	0.025	MTG	0.01	mg/kg	<0.0050 UJ	<0.0050 UJ	<0.0062 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ
Toluene	AK 101	6.5	MTG	0.01	mg/kg	—	—	—	—	—	—	—
	SW8260	6.5	MTG	0.01	mg/kg	<0.0050 UJ	<0.0050 UJ	<0.0062 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ
Ethylbenzene	AK 101	6.9	MTG	0.03	mg/kg	—	—	—	—	—	—	—
	SW8260	6.9	MTG	0.03	mg/kg	<0.0050 UJ	<0.0050 UJ	<0.0062 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ
Xylenes (total)	AK 101	63	MTG	0.1	mg/kg	—	—	—	—	—	—	—
	SW8260	63	MTG	0.1	mg/kg	<0.0050 UJ	<0.0050 UJ	<0.0062 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ
1,1,1-Trichloroethane	SW8260	0.82	MTG	0.07	mg/kg	<0.0050 UJ	<0.0050 UJ	<0.0062 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ
1,2,4-Trimethylbenzene	SW8260	23	MTG	—	mg/kg	<0.020 UJ	<0.020 UJ	<0.0062 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ
1,2-Dichloroethane	SW8260	0.016	MTG	0.02	mg/kg	<0.0050 UJ	<0.0050 UJ	<0.0062 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ
1,3,5-Trimethylbenzene	SW8260	23	MTG	—	mg/kg	<0.020 UJ	<0.020 UJ	<0.0062 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ
2-Butanone	SW8260	59	MTG	89.6	mg/kg	<0.020 UJ	<0.020 UJ	<0.012 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ
4-Isopropyltoluene	SW8260	—	—	—	mg/kg	<0.020 UJ	<0.020 UJ	<0.0062 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ
Acetone	SW8260	88	MTG	2.5	mg/kg	<0.050 UJ	<0.050 UJ	<0.012 UJ	<0.050 UJ	<0.050 UJ	<0.050 UJ	<0.050 UJ
Chlorobenzene	SW8260	0.63	MTG	0.03	mg/kg	<0.0050 UJ	<0.0050 UJ	<0.0062 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ
Chloroform	SW8260	0.46	MTG	1.19	mg/kg	<0.0050 UJ	<0.0050 UJ	<0.0062 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ
Chloromethane	SW8260	0.21	MTG	10.4	mg/kg	<0.0050 UJ	<0.0050 UJ	<0.0062 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ
Isopropylbenzene	SW8260	51	MTG	—	mg/kg	<0.020 UJ	<0.020 UJ	<0.0062 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ
Methylene chloride	SW8260	0.016	MTG	0.4	mg/kg	0.011 J	<0.010 UJ	<0.0062 UJ	<0.010 UJ	<0.010 UJ	<0.010 UJ	<0.010 UJ
Naphthalene	SW8260	20	MTG	0.0994	mg/kg	<0.020 UJ	<0.020 UJ	<0.0062 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ
n-Butylbenzene	SW8260	15	MTG	—	mg/kg	<0.020 UJ	<0.020 UJ	<0.0062 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ
n-Propylbenzene	SW8260	15	MTG	—	mg/kg	<0.020 UJ	<0.020 UJ	<0.0062 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ
sec-Butylbenzene	SW8260	12	MTG	—	mg/kg	<0.020 UJ	<0.020 UJ	<0.0062 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ
Trichlorofluoromethane	SW8260	86	MTG	16.4	mg/kg	<0.0050 UJ	<0.0050 UJ	<0.0062 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ
1,1,1,2-Tetrachloroethane	SW8260	—	—	225	mg/kg	—	—	—	—	—	—	—
1,1,2,2-Tetrachloroethane	SW8260	0.017	MTG	0.127	mg/kg	—	—	—	—	—	—	—
1,1,2-Trichloroethane	SW8260	0.018	MTG	0.4	mg/kg	—	—	—	—	—	—	—
1,1-Dichloroethane	SW8260	25	MTG	0.02	mg/kg	—	—	—	—	—	—	—
1,1-Dichloroethene	SW8260	0.03	MTG	0.1	mg/kg	—	—	—	—	—	—	—

Table F-2b
Summary of Soil Sample Results - Volatile Organic Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1994 E&E BH 11-1 94-UMT-135-SL	1994 E&E BH 11-1 94-UMT-136-SL	1994 E&E BH 11-1 94-UMT-137-SL	1994 E&E BH 11-1 94-UMT-138-SL	1994 E&E BH 11-1 94-UMT-139-SL	1994 E&E BH 11-2 94-UMT-142-SL	1994 E&E BH 11-2 94-UMT-143-SL
1,1-Dichloropropene	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
1,2,3-Trichlorobenzene	SW8260	—	—	0.03	mg/kg	—	—	—	—	—	—	—
1,2,3-Trichloropropane	SW8260	0.00053	MTG	3.36	mg/kg	—	—	—	—	—	—	—
1,2,4-Trichlorobenzene	SW8260	0.85	MTG	0.03	mg/kg	—	—	—	—	—	—	—
1,2-Dibromo-3-chloropropane	SW8260	—	—	0.0352	mg/kg	—	—	—	—	—	—	—
1,2-Dibromoethane	SW8260	0.00016	MTG	1.23	mg/kg	—	—	—	—	—	—	—
1,2-Dichlorobenzene	SW8260	5.1	MTG	0.03	mg/kg	—	—	—	—	—	—	—
1,2-Dichloropropane	SW8260	0.018	MTG	0.002	mg/kg	—	—	—	—	—	—	—
1,3-Dichlorobenzene	SW8260	28	MTG	0.03	mg/kg	—	—	—	—	—	—	—
1,4-Dichlorobenzene	SW8260	0.64	MTG	0.03	mg/kg	—	—	—	—	—	—	—
2,2-Dichloropropane	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
2-Chlorotoluene	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
2-Hexanone	SW8260	—	—	12.6	mg/kg	—	—	—	—	—	—	—
4-Chlorotoluene	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
4-Methyl-2-pentanone	SW8260	8.1	MTG	443	mg/kg	—	—	—	—	—	—	—
Bromobenzene	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
Bromochloromethane	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
Bromodichloromethane	SW8260	0.044	MTG	0.54	mg/kg	—	—	—	—	—	—	—
Bromoform	SW8260	0.34	MTG	15.9	mg/kg	—	—	—	—	—	—	—
Bromomethane	SW8260	0.16	MTG	0.235	mg/kg	—	—	—	—	—	—	—
Carbon disulfide	SW8260	12	MTG	0.0941	mg/kg	—	—	—	—	—	—	—
Carbon tetrachloride	SW8260	0.023	MTG	0.4	mg/kg	—	—	—	—	—	—	—
Chloroethane	SW8260	34	AZOI	—	mg/kg	—	—	—	—	—	—	—
cis-1,2-Dichloroethene	SW8260	0.24	MTG	—	mg/kg	—	—	—	—	—	—	—
cis-1,3-Dichloropropene	SW8260	0.033	MTG	0.398	mg/kg	—	—	—	—	—	—	—
Dibromochloromethane	SW8260	0.032	MTG	2.05	mg/kg	—	—	—	—	—	—	—
Dibromomethane	SW8260	1.1	MTG	65	mg/kg	—	—	—	—	—	—	—
Dichlorodifluoromethane	SW8260	140	MTG	39.5	mg/kg	—	—	—	—	—	—	—
Hexachlorobutadiene	SW8260	0.12	MTG	0.0398	mg/kg	—	—	—	—	—	—	—
m,p-Xylene	SW8260	63	MTG	0.1	mg/kg	—	—	—	—	—	—	—

Table F-2b
Summary of Soil Sample Results - Volatile Organic Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1994 E&E BH 11-1 94-UMT-135-SL	1994 E&E BH 11-1 94-UMT-136-SL	1994 E&E BH 11-1 94-UMT-137-SL	1994 E&E BH 11-1 94-UMT-138-SL	1994 E&E BH 11-1 94-UMT-139-SL	1994 E&E BH 11-2 94-UMT-142-SL	1994 E&E BH 11-2 94-UMT-143-SL
o-Xylene	SW8260	63	MTG	0.1	mg/kg	—	—	—	—	—	—	—
Styrene	SW8260	0.96	MTG	0.3	mg/kg	—	—	—	—	—	—	—
tert-Butylbenzene	SW8260	12	MTG	—	mg/kg	—	—	—	—	—	—	—
Tetrachloroethene	SW8260	0.024	MTG	0.002	mg/kg	—	—	—	—	—	—	—
trans-1,2-Dichloroethene	SW8260	0.37	MTG	—	mg/kg	—	—	—	—	—	—	—
trans-1,3-Dichloropropene	SW8260	0.033	MTG	0.398	mg/kg	—	—	—	—	—	—	—
Trichloroethene	SW8260	0.02	MTG	0.1	mg/kg	—	—	—	—	—	—	—
Vinyl chloride	SW8260	0.0085	MTG	0.01	mg/kg	—	—	—	—	—	—	—

Table F-2b
Summary of Soil Sample Results - Volatile Organic Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1994 E&E BH 11-2 94-UMT-144-SL	1994 E&E BH 11-3 94-UMT-145-SL	1994 E&E BH 11-3 94-UMT-146-SL	1994 E&E BH 11-3 94-UMT-147-SL	1994 E&E BH 11-4 94-UMT-148-SL	1994 E&E BH 11-4 94-UMT-149-SL	1994 E&E BH 11-4 94-UMT-150-SL
Benzene	AK 101	0.025	MTG	0.01	mg/kg	—	—	—	—	—	—	—
	SW8260	0.025	MTG	0.01	mg/kg	<0.0062 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ
Toluene	AK 101	6.5	MTG	0.01	mg/kg	—	—	—	—	—	—	—
	SW8260	6.5	MTG	0.01	mg/kg	<0.0062 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	0.0080 J	<0.0050 UJ	<0.0050 UJ
Ethylbenzene	AK 101	6.9	MTG	0.03	mg/kg	—	—	—	—	—	—	—
	SW8260	6.9	MTG	0.03	mg/kg	<0.0062 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ
Xylenes (total)	AK 101	63	MTG	0.1	mg/kg	—	—	—	—	—	—	—
	SW8260	63	MTG	0.1	mg/kg	<0.0062 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ
1,1,1-Trichloroethane	SW8260	0.82	MTG	0.07	mg/kg	<0.0062 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ
1,2,4-Trimethylbenzene	SW8260	23	MTG	—	mg/kg	<0.0062 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ
1,2-Dichloroethane	SW8260	0.016	MTG	0.02	mg/kg	<0.0062 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ
1,3,5-Trimethylbenzene	SW8260	23	MTG	—	mg/kg	<0.0062 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ
2-Butanone	SW8260	59	MTG	89.6	mg/kg	<0.012 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ
4-Isopropyltoluene	SW8260	—	—	—	mg/kg	<0.0062 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ
Acetone	SW8260	88	MTG	2.5	mg/kg	<0.012 UJ	<0.050 UJ	<0.050 UJ	<0.050 UJ	<0.050 UJ	<0.050 UJ	<0.050 UJ
Chlorobenzene	SW8260	0.63	MTG	0.03	mg/kg	<0.0062 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ
Chloroform	SW8260	0.46	MTG	1.19	mg/kg	<0.0062 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ
Chloromethane	SW8260	0.21	MTG	10.4	mg/kg	<0.0062 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ
Isopropylbenzene	SW8260	51	MTG	—	mg/kg	<0.0062 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ
Methylene chloride	SW8260	0.016	MTG	0.4	mg/kg	<0.0062 UJ	<0.010 UJ	<0.010 UJ	<0.010 UJ	**0.019 J**	0.011 J	0.011 J
Naphthalene	SW8260	20	MTG	0.0994	mg/kg	<0.0062 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ
n-Butylbenzene	SW8260	15	MTG	—	mg/kg	<0.0062 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ
n-Propylbenzene	SW8260	15	MTG	—	mg/kg	<0.0062 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ
sec-Butylbenzene	SW8260	12	MTG	—	mg/kg	<0.0062 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ
Trichlorofluoromethane	SW8260	86	MTG	16.4	mg/kg	<0.0062 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ
1,1,1,2-Tetrachloroethane	SW8260	—	—	225	mg/kg	—	—	—	—	—	—	—
1,1,2,2-Tetrachloroethane	SW8260	0.017	MTG	0.127	mg/kg	—	—	—	—	—	—	—
1,1,2-Trichloroethane	SW8260	0.018	MTG	0.4	mg/kg	—	—	—	—	—	—	—
1,1-Dichloroethane	SW8260	25	MTG	0.02	mg/kg	—	—	—	—	—	—	—
1,1-Dichloroethene	SW8260	0.03	MTG	0.1	mg/kg	—	—	—	—	—	—	—

Table F-2b
Summary of Soil Sample Results - Volatile Organic Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1994 E&E BH 11-2 94-UMT-144-SL	1994 E&E BH 11-3 94-UMT-145-SL	1994 E&E BH 11-3 94-UMT-146-SL	1994 E&E BH 11-3 94-UMT-147-SL	1994 E&E BH 11-4 94-UMT-148-SL	1994 E&E BH 11-4 94-UMT-149-SL	1994 E&E BH 11-4 94-UMT-150-SL
1,1-Dichloropropene	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
1,2,3-Trichlorobenzene	SW8260	—	—	0.03	mg/kg	—	—	—	—	—	—	—
1,2,3-Trichloropropane	SW8260	0.00053	MTG	3.36	mg/kg	—	—	—	—	—	—	—
1,2,4-Trichlorobenzene	SW8260	0.85	MTG	0.03	mg/kg	—	—	—	—	—	—	—
1,2-Dibromo-3-chloropropane	SW8260	—	—	0.0352	mg/kg	—	—	—	—	—	—	—
1,2-Dibromoethane	SW8260	0.00016	MTG	1.23	mg/kg	—	—	—	—	—	—	—
1,2-Dichlorobenzene	SW8260	5.1	MTG	0.03	mg/kg	—	—	—	—	—	—	—
1,2-Dichloropropane	SW8260	0.018	MTG	0.002	mg/kg	—	—	—	—	—	—	—
1,3-Dichlorobenzene	SW8260	28	MTG	0.03	mg/kg	—	—	—	—	—	—	—
1,4-Dichlorobenzene	SW8260	0.64	MTG	0.03	mg/kg	—	—	—	—	—	—	—
2,2-Dichloropropane	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
2-Chlorotoluene	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
2-Hexanone	SW8260	—	—	12.6	mg/kg	—	—	—	—	—	—	—
4-Chlorotoluene	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
4-Methyl-2-pentanone	SW8260	8.1	MTG	443	mg/kg	—	—	—	—	—	—	—
Bromobenzene	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
Bromochloromethane	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
Bromodichloromethane	SW8260	0.044	MTG	0.54	mg/kg	—	—	—	—	—	—	—
Bromoform	SW8260	0.34	MTG	15.9	mg/kg	—	—	—	—	—	—	—
Bromomethane	SW8260	0.16	MTG	0.235	mg/kg	—	—	—	—	—	—	—
Carbon disulfide	SW8260	12	MTG	0.0941	mg/kg	—	—	—	—	—	—	—
Carbon tetrachloride	SW8260	0.023	MTG	0.4	mg/kg	—	—	—	—	—	—	—
Chloroethane	SW8260	34	AZOI	—	mg/kg	—	—	—	—	—	—	—
cis-1,2-Dichloroethene	SW8260	0.24	MTG	—	mg/kg	—	—	—	—	—	—	—
cis-1,3-Dichloropropene	SW8260	0.033	MTG	0.398	mg/kg	—	—	—	—	—	—	—
Dibromochloromethane	SW8260	0.032	MTG	2.05	mg/kg	—	—	—	—	—	—	—
Dibromomethane	SW8260	1.1	MTG	65	mg/kg	—	—	—	—	—	—	—
Dichlorodifluoromethane	SW8260	140	MTG	39.5	mg/kg	—	—	—	—	—	—	—
Hexachlorobutadiene	SW8260	0.12	MTG	0.0398	mg/kg	—	—	—	—	—	—	—
m,p-Xylene	SW8260	63	MTG	0.1	mg/kg	—	—	—	—	—	—	—

Table F-2b
Summary of Soil Sample Results - Volatile Organic Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1994 E&E BH 11-2 94-UMT-144-SL	1994 E&E BH 11-3 94-UMT-145-SL	1994 E&E BH 11-3 94-UMT-146-SL	1994 E&E BH 11-3 94-UMT-147-SL	1994 E&E BH 11-4 94-UMT-148-SL	1994 E&E BH 11-4 94-UMT-149-SL	1994 E&E BH 11-4 94-UMT-150-SL
o-Xylene	SW8260	63	MTG	0.1	mg/kg	—	—	—	—	—	—	—
Styrene	SW8260	0.96	MTG	0.3	mg/kg	—	—	—	—	—	—	—
tert-Butylbenzene	SW8260	12	MTG	—	mg/kg	—	—	—	—	—	—	—
Tetrachloroethene	SW8260	0.024	MTG	0.002	mg/kg	—	—	—	—	—	—	—
trans-1,2-Dichloroethene	SW8260	0.37	MTG	—	mg/kg	—	—	—	—	—	—	—
trans-1,3-Dichloropropene	SW8260	0.033	MTG	0.398	mg/kg	—	—	—	—	—	—	—
Trichloroethene	SW8260	0.02	MTG	0.1	mg/kg	—	—	—	—	—	—	—
Vinyl chloride	SW8260	0.0085	MTG	0.01	mg/kg	—	—	—	—	—	—	—

Table F-2b
Summary of Soil Sample Results - Volatile Organic Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1994 E&E BH 11-5 94-UMT-151-SL	1994 E&E BH 11-5 94-UMT-152-SL	1994 E&E BH 11-5 94-UMT-153-SL	1994 E&E BH 11-6 94-UMT-154-SL	1994 E&E BH 11-6 94-UMT-155-SL	1994 E&E BH 11-6 94-UMT-156-SL	1994 E&E BH 11-6 94-UMT-157-SL
Benzene	AK 101	0.025	MTG	0.01	mg/kg	—	—	—	—	—	—	—
	SW8260	0.025	MTG	0.01	mg/kg	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0053 UJ
Toluene	AK 101	6.5	MTG	0.01	mg/kg	—	—	—	—	—	—	—
	SW8260	6.5	MTG	0.01	mg/kg	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0053 UJ
Ethylbenzene	AK 101	6.9	MTG	0.03	mg/kg	—	—	—	—	—	—	—
	SW8260	6.9	MTG	0.03	mg/kg	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0053 UJ
Xylenes (total)	AK 101	63	MTG	0.1	mg/kg	—	—	—	—	—	—	—
	SW8260	63	MTG	0.1	mg/kg	<0.0050 UJ	<0.0050 UJ	0.0050 J	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0053 UJ
1,1,1-Trichloroethane	SW8260	0.82	MTG	0.07	mg/kg	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0053 UJ
1,2,4-Trimethylbenzene	SW8260	23	MTG	—	mg/kg	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.0053 UJ
1,2-Dichloroethane	SW8260	0.016	MTG	0.02	mg/kg	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0053 UJ
1,3,5-Trimethylbenzene	SW8260	23	MTG	—	mg/kg	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.0053 UJ
2-Butanone	SW8260	59	MTG	89.6	mg/kg	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.011 UJ
4-Isopropyltoluene	SW8260	—	—	—	mg/kg	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.0053 UJ
Acetone	SW8260	88	MTG	2.5	mg/kg	<0.050 UJ	<0.050 UJ	<0.050 UJ	<0.050 UJ	<0.050 UJ	<0.050 UJ	<0.011 UJ
Chlorobenzene	SW8260	0.63	MTG	0.03	mg/kg	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0053 UJ
Chloroform	SW8260	0.46	MTG	1.19	mg/kg	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0053 UJ
Chloromethane	SW8260	0.21	MTG	10.4	mg/kg	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0053 UJ
Isopropylbenzene	SW8260	51	MTG	—	mg/kg	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.0053 UJ
Methylene chloride	SW8260	0.016	MTG	0.4	mg/kg	<0.010 UJ	<0.010 UJ	<0.010 UJ	<0.010 UJ	<0.010 UJ	<0.010 UJ	<0.0060 UJ
Naphthalene	SW8260	20	MTG	0.0994	mg/kg	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.0053 UJ
n-Butylbenzene	SW8260	15	MTG	—	mg/kg	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.0053 UJ
n-Propylbenzene	SW8260	15	MTG	—	mg/kg	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.0053 UJ
sec-Butylbenzene	SW8260	12	MTG	—	mg/kg	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.020 UJ	<0.0053 UJ
Trichlorofluoromethane	SW8260	86	MTG	16.4	mg/kg	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0050 UJ	<0.0053 UJ
1,1,1,2-Tetrachloroethane	SW8260	—	—	225	mg/kg	—	—	—	—	—	—	—
1,1,2,2-Tetrachloroethane	SW8260	0.017	MTG	0.127	mg/kg	—	—	—	—	—	—	—
1,1,2-Trichloroethane	SW8260	0.018	MTG	0.4	mg/kg	—	—	—	—	—	—	—
1,1-Dichloroethane	SW8260	25	MTG	0.02	mg/kg	—	—	—	—	—	—	—
1,1-Dichloroethene	SW8260	0.03	MTG	0.1	mg/kg	—	—	—	—	—	—	—

Table F-2b
Summary of Soil Sample Results - Volatile Organic Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1994 E&E BH 11-5 94-UMT-151-SL	1994 E&E BH 11-5 94-UMT-152-SL	1994 E&E BH 11-5 94-UMT-153-SL	1994 E&E BH 11-6 94-UMT-154-SL	1994 E&E BH 11-6 94-UMT-155-SL	1994 E&E BH 11-6 94-UMT-156-SL	1994 E&E BH 11-6 94-UMT-157-SL
1,1-Dichloropropene	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
1,2,3-Trichlorobenzene	SW8260	—	—	0.03	mg/kg	—	—	—	—	—	—	—
1,2,3-Trichloropropane	SW8260	0.00053	MTG	3.36	mg/kg	—	—	—	—	—	—	—
1,2,4-Trichlorobenzene	SW8260	0.85	MTG	0.03	mg/kg	—	—	—	—	—	—	—
1,2-Dibromo-3-chloropropane	SW8260	—	—	0.0352	mg/kg	—	—	—	—	—	—	—
1,2-Dibromoethane	SW8260	0.00016	MTG	1.23	mg/kg	—	—	—	—	—	—	—
1,2-Dichlorobenzene	SW8260	5.1	MTG	0.03	mg/kg	—	—	—	—	—	—	—
1,2-Dichloropropane	SW8260	0.018	MTG	0.002	mg/kg	—	—	—	—	—	—	—
1,3-Dichlorobenzene	SW8260	28	MTG	0.03	mg/kg	—	—	—	—	—	—	—
1,4-Dichlorobenzene	SW8260	0.64	MTG	0.03	mg/kg	—	—	—	—	—	—	—
2,2-Dichloropropane	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
2-Chlorotoluene	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
2-Hexanone	SW8260	—	—	12.6	mg/kg	—	—	—	—	—	—	—
4-Chlorotoluene	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
4-Methyl-2-pentanone	SW8260	8.1	MTG	443	mg/kg	—	—	—	—	—	—	—
Bromobenzene	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
Bromochloromethane	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
Bromodichloromethane	SW8260	0.044	MTG	0.54	mg/kg	—	—	—	—	—	—	—
Bromoform	SW8260	0.34	MTG	15.9	mg/kg	—	—	—	—	—	—	—
Bromomethane	SW8260	0.16	MTG	0.235	mg/kg	—	—	—	—	—	—	—
Carbon disulfide	SW8260	12	MTG	0.0941	mg/kg	—	—	—	—	—	—	—
Carbon tetrachloride	SW8260	0.023	MTG	0.4	mg/kg	—	—	—	—	—	—	—
Chloroethane	SW8260	34	AZOI	—	mg/kg	—	—	—	—	—	—	—
cis-1,2-Dichloroethene	SW8260	0.24	MTG	—	mg/kg	—	—	—	—	—	—	—
cis-1,3-Dichloropropene	SW8260	0.033	MTG	0.398	mg/kg	—	—	—	—	—	—	—
Dibromochloromethane	SW8260	0.032	MTG	2.05	mg/kg	—	—	—	—	—	—	—
Dibromomethane	SW8260	1.1	MTG	65	mg/kg	—	—	—	—	—	—	—
Dichlorodifluoromethane	SW8260	140	MTG	39.5	mg/kg	—	—	—	—	—	—	—
Hexachlorobutadiene	SW8260	0.12	MTG	0.0398	mg/kg	—	—	—	—	—	—	—
m,p-Xylene	SW8260	63	MTG	0.1	mg/kg	—	—	—	—	—	—	—

Table F-2b
Summary of Soil Sample Results - Volatile Organic Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1994 E&E BH 11-5 94-UMT-151-SL	1994 E&E BH 11-5 94-UMT-152-SL	1994 E&E BH 11-5 94-UMT-153-SL	1994 E&E BH 11-6 94-UMT-154-SL	1994 E&E BH 11-6 94-UMT-155-SL	1994 E&E BH 11-6 94-UMT-156-SL	1994 E&E BH 11-6 94-UMT-157-SL
o-Xylene	SW8260	63	MTG	0.1	mg/kg	—	—	—	—	—	—	—
Styrene	SW8260	0.96	MTG	0.3	mg/kg	—	—	—	—	—	—	—
tert-Butylbenzene	SW8260	12	MTG	—	mg/kg	—	—	—	—	—	—	—
Tetrachloroethene	SW8260	0.024	MTG	0.002	mg/kg	—	—	—	—	—	—	—
trans-1,2-Dichloroethene	SW8260	0.37	MTG	—	mg/kg	—	—	—	—	—	—	—
trans-1,3-Dichloropropene	SW8260	0.033	MTG	0.398	mg/kg	—	—	—	—	—	—	—
Trichloroethene	SW8260	0.02	MTG	0.1	mg/kg	—	—	—	—	—	—	—
Vinyl chloride	SW8260	0.0085	MTG	0.01	mg/kg	—	—	—	—	—	—	—

Table F-2b
Summary of Soil Sample Results - Volatile Organic Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1994 E&E BH 11-6 94-UMT-158-SL	1996 AGRA — 1639-06	1996 AGRA — 1639-08	1996 E&E MW-3 96-UMT-195-SS	1996 E&E MW-3 96-UMT-196-SB	1996 E&E MW-3 96-UMT-197-SB	1996 E&E MW-4 96-UMT-201-SS
Benzene	AK 101	0.025	MTG	0.01	mg/kg	—	—	—	**<0.099 UJK**	**<0.087 UJK**	**<0.091 UJK**	**<0.083**
	SW8260	0.025	MTG	0.01	mg/kg	<0.0050 UJ	**<0.10**	**<0.10**	—	—	—	—
Toluene	AK 101	6.5	MTG	0.01	mg/kg	—	—	—	<0.15 UJK	<0.13 UJK	<0.14 UJK	<0.12
	SW8260	6.5	MTG	0.01	mg/kg	<0.0050 UJ	<0.10	<0.10	0.00176 B	<0.00524	<0.00555	<0.00505
Ethylbenzene	AK 101	6.9	MTG	0.03	mg/kg	—	—	—	<0.11 UJK	<0.098 UJK	<0.10 UJK	<0.093
	SW8260	6.9	MTG	0.03	mg/kg	<0.0050 UJ	<0.10	<0.10	—	—	—	—
Xylenes (total)	AK 101	63	MTG	0.1	mg/kg	—	—	—	<0.31 UJK	<0.27 UJK	<0.28 UJK	<0.26
	SW8260	63	MTG	0.1	mg/kg	<0.0050 UJ	—	—	<0.00619	<0.00524	<0.00555	<0.00505
1,1,1-Trichloroethane	SW8260	0.82	MTG	0.07	mg/kg	<0.0050 UJ	<0.10	<0.10	—	—	—	—
1,2,4-Trimethylbenzene	SW8260	23	MTG	—	mg/kg	<0.020 UJ	<0.10	<0.10	—	—	—	—
1,2-Dichloroethane	SW8260	0.016	MTG	0.02	mg/kg	<0.0050 UJ	**<0.10**	**<0.10**	—	—	—	—
1,3,5-Trimethylbenzene	SW8260	23	MTG	—	mg/kg	<0.020 UJ	<0.10	<0.10	—	—	—	—
2-Butanone	SW8260	59	MTG	89.6	mg/kg	<0.020 UJ	<1.0	<1.0	—	—	—	—
4-Isopropyltoluene	SW8260	—	—	—	mg/kg	<0.020 UJ	<0.10	<0.10	—	—	—	—
Acetone	SW8260	88	MTG	2.5	mg/kg	<0.050 UJ	<2.0	<2.0	<0.0124 UJL	<0.0105 UJL	<0.0111 UJL	<0.0101 UJL
Chlorobenzene	SW8260	0.63	MTG	0.03	mg/kg	<0.0050 UJ	<0.10	<0.10	—	—	—	—
Chloroform	SW8260	0.46	MTG	1.19	mg/kg	<0.0050 UJ	<0.10	<0.10	—	—	—	—
Chloromethane	SW8260	0.21	MTG	10.4	mg/kg	<0.0050 UJ	<0.10	<0.10	—	—	—	—
Isopropylbenzene	SW8260	51	MTG	—	mg/kg	<0.020 UJ	<0.10	<0.10	—	—	—	—
Methylene chloride	SW8260	0.016	MTG	0.4	mg/kg	<0.010 UJ	**<0.10**	**<0.10**	0.00156 JH	<0.00524	<0.00555	<0.00505
Naphthalene	SW8260	20	MTG	0.0994	mg/kg	<0.020 UJ	<2.0	<2.0	—	—	—	—
n-Butylbenzene	SW8260	15	MTG	—	mg/kg	<0.020 UJ	<0.10	<0.10	—	—	—	—
n-Propylbenzene	SW8260	15	MTG	—	mg/kg	<0.020 UJ	<0.10	<0.10	—	—	—	—
sec-Butylbenzene	SW8260	12	MTG	—	mg/kg	<0.020 UJ	<0.10	<0.10	—	—	—	—
Trichlorofluoromethane	SW8260	86	MTG	16.4	mg/kg	<0.0050 UJ	<0.10	<0.10	—	—	—	—
1,1,1,2-Tetrachloroethane	SW8260	—	—	225	mg/kg	—	<0.10	<0.10	—	—	—	—
1,1,2,2-Tetrachloroethane	SW8260	0.017	MTG	0.127	mg/kg	—	**<0.10**	**<0.10**	—	—	—	—
1,1,2-Trichloroethane	SW8260	0.018	MTG	0.4	mg/kg	—	**<0.10**	**<0.10**	—	—	—	—
1,1-Dichloroethane	SW8260	25	MTG	0.02	mg/kg	—	<0.10	<0.10	—	—	—	—
1,1-Dichloroethene	SW8260	0.03	MTG	0.1	mg/kg	—	**<0.10**	**<0.10**	—	—	—	—

Table F-2b
Summary of Soil Sample Results - Volatile Organic Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1994 E&E BH 11-6 94-UMT-158-SL	1996 AGRA — 1639-06	1996 AGRA — 1639-08	1996 E&E MW-3 96-UMT-195-SS	1996 E&E MW-3 96-UMT-196-SB	1996 E&E MW-3 96-UMT-197-SB	1996 E&E MW-4 96-UMT-201-SS
1,1-Dichloropropene	SW8260	—	—	—	mg/kg	—	<0.10	<0.10	—	—	—	—
1,2,3-Trichlorobenzene	SW8260	—	—	0.03	mg/kg	—	<2.0	<2.0	—	—	—	—
1,2,3-Trichloropropane	SW8260	0.00053	MTG	3.36	mg/kg	—	**<0.10**	**<0.10**	—	—	—	—
1,2,4-Trichlorobenzene	SW8260	0.85	MTG	0.03	mg/kg	—	<0.10	<0.10	—	—	—	—
1,2-Dibromo-3-chloropropane	SW8260	—	—	0.0352	mg/kg	—	<0.10	<0.10	—	—	—	—
1,2-Dibromoethane	SW8260	0.00016	MTG	1.23	mg/kg	—	**<0.10**	**<0.10**	—	—	—	—
1,2-Dichlorobenzene	SW8260	5.1	MTG	0.03	mg/kg	—	<0.10	<0.10	—	—	—	—
1,2-Dichloropropane	SW8260	0.018	MTG	0.002	mg/kg	—	**<0.10**	**<0.10**	—	—	—	—
1,3-Dichlorobenzene	SW8260	28	MTG	0.03	mg/kg	—	<0.10	<0.10	—	—	—	—
1,4-Dichlorobenzene	SW8260	0.64	MTG	0.03	mg/kg	—	<0.10	<0.10	—	—	—	—
2,2-Dichloropropane	SW8260	—	—	—	mg/kg	—	<0.10	<0.10	—	—	—	—
2-Chlorotoluene	SW8260	—	—	—	mg/kg	—	<0.10	<0.10	—	—	—	—
2-Hexanone	SW8260	—	—	12.6	mg/kg	—	<1.0	<1.0	—	—	—	—
4-Chlorotoluene	SW8260	—	—	—	mg/kg	—	<0.10	<0.10	—	—	—	—
4-Methyl-2-pentanone	SW8260	8.1	MTG	443	mg/kg	—	<1.0	<1.0	—	—	—	—
Bromobenzene	SW8260	—	—	—	mg/kg	—	<0.10	<0.10	—	—	—	—
Bromochloromethane	SW8260	—	—	—	mg/kg	—	<0.10	<0.10	—	—	—	—
Bromodichloromethane	SW8260	0.044	MTG	0.54	mg/kg	—	**<0.10**	**<0.10**	—	—	—	—
Bromoform	SW8260	0.34	MTG	15.9	mg/kg	—	<0.10	<0.10	—	—	—	—
Bromomethane	SW8260	0.16	MTG	0.235	mg/kg	—	<0.10	<0.10	—	—	—	—
Carbon disulfide	SW8260	12	MTG	0.0941	mg/kg	—	<0.10	<0.10	—	—	—	—
Carbon tetrachloride	SW8260	0.023	MTG	0.4	mg/kg	—	**<0.10**	**<0.10**	—	—	—	—
Chloroethane	SW8260	34	AZOI	—	mg/kg	—	<0.10	<0.10	—	—	—	—
cis-1,2-Dichloroethene	SW8260	0.24	MTG	—	mg/kg	—	<0.10	<0.10	—	—	—	—
cis-1,3-Dichloropropene	SW8260	0.033	MTG	0.398	mg/kg	—	**<0.10**	**<0.10**	—	—	—	—
Dibromochloromethane	SW8260	0.032	MTG	2.05	mg/kg	—	**<0.10**	**<0.10**	—	—	—	—
Dibromomethane	SW8260	1.1	MTG	65	mg/kg	—	<0.10	<0.10	—	—	—	—
Dichlorodifluoromethane	SW8260	140	MTG	39.5	mg/kg	—	<0.10	<0.10	—	—	—	—
Hexachlorobutadiene	SW8260	0.12	MTG	0.0398	mg/kg	—	<0.10	<0.10	—	—	—	—
m,p-Xylene	SW8260	63	MTG	0.1	mg/kg	—	<0.10	<0.10	<0.00619	<0.00524	<0.00555	<0.00505

Table F-2b
Summary of Soil Sample Results - Volatile Organic Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1994 E&E BH 11-6 94-UMT-158-SL	1996 AGRA — 1639-06	1996 AGRA — 1639-08	1996 E&E MW-3 96-UMT-195-SS	1996 E&E MW-3 96-UMT-196-SB	1996 E&E MW-3 96-UMT-197-SB	1996 E&E MW-4 96-UMT-201-SS
o-Xylene	SW8260	63	MTG	0.1	mg/kg	—	<0.10	<0.10	<0.00619	<0.00524	<0.00555	<0.00505
Styrene	SW8260	0.96	MTG	0.3	mg/kg	—	<0.10	<0.10	—	—	—	—
tert-Butylbenzene	SW8260	12	MTG	—	mg/kg	—	<0.10	<0.10	—	—	—	—
Tetrachloroethene	SW8260	0.024	MTG	0.002	mg/kg	—	**<0.10**	**<0.10**	—	—	—	—
trans-1,2-Dichloroethene	SW8260	0.37	MTG	—	mg/kg	—	<0.10	<0.10	—	—	—	—
trans-1,3-Dichloropropene	SW8260	0.033	MTG	0.398	mg/kg	—	**<0.10**	**<0.10**	—	—	—	—
Trichloroethene	SW8260	0.02	MTG	0.1	mg/kg	—	**<0.10**	**<0.10**	—	—	—	—
Vinyl chloride	SW8260	0.0085	MTG	0.01	mg/kg	—	**<0.10**	**<0.10**	—	—	—	—

Table F-2b
Summary of Soil Sample Results - Volatile Organic Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1996 E&E MW-4 96-UMT-202-SB	1996 E&E MW-5 96-UMT-208-SB	1996 E&E MW-6 96-UMT-203-SB	1996 E&E MW-6 96-UMT-204-SB	1996 E&E MW-6 96-UMT-205-SB	1996 E&E MW-7 96-UMT-209-SS	1996 E&E MW-7 96-UMT-210-SB
Benzene	AK 101	0.025	MTG	0.01	mg/kg	**<0.090**	**<0.089**	**<0.082**	**<0.082**	**<0.083**	**<0.083**	**<0.093 UJK**
	SW8260	0.025	MTG	0.01	mg/kg	—	—	—	—	—	—	—
Toluene	AK 101	6.5	MTG	0.01	mg/kg	<0.14	<0.13	<0.12	<0.12	<0.12	<0.12	<0.14 UJK
	SW8260	6.5	MTG	0.01	mg/kg	<0.00554	—	<0.00509	<0.0260	<0.00519	0.00450 B	<0.00540
Ethylbenzene	AK 101	6.9	MTG	0.03	mg/kg	<0.10	<0.10	<0.092	<0.092	<0.093	<0.093	<0.10 UJK
	SW8260	6.9	MTG	0.03	mg/kg	—	—	—	—	—	—	—
Xylenes (total)	AK 101	63	MTG	0.1	mg/kg	<0.28	<0.28	<0.25	<0.26	<0.26	<0.26	<0.29 UJK
	SW8260	63	MTG	0.1	mg/kg	<0.00554	—	<0.00509	0.00859 JH	<0.00519	<0.00502	<0.00540
1,1,1-Trichloroethane	SW8260	0.82	MTG	0.07	mg/kg	—	—	—	—	—	—	—
1,2,4-Trimethylbenzene	SW8260	23	MTG	—	mg/kg	—	—	—	—	—	—	—
1,2-Dichloroethane	SW8260	0.016	MTG	0.02	mg/kg	—	—	—	—	—	—	—
1,3,5-Trimethylbenzene	SW8260	23	MTG	—	mg/kg	—	—	—	—	—	—	—
2-Butanone	SW8260	59	MTG	89.6	mg/kg	—	—	—	—	—	—	—
4-Isopropyltoluene	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
Acetone	SW8260	88	MTG	2.5	mg/kg	<0.0111 UJL	—	<0.0102 UJL	<0.0519 UJL	<0.0104 UJL	<0.0100 UJL	<0.0108 UJL
Chlorobenzene	SW8260	0.63	MTG	0.03	mg/kg	—	—	—	—	—	—	—
Chloroform	SW8260	0.46	MTG	1.19	mg/kg	—	—	—	—	—	—	—
Chloromethane	SW8260	0.21	MTG	10.4	mg/kg	—	—	—	—	—	—	—
Isopropylbenzene	SW8260	51	MTG	—	mg/kg	—	—	—	—	—	—	—
Methylene chloride	SW8260	0.016	MTG	0.4	mg/kg	0.00261 JH	—	0.00228 J	0.00676 JH	<0.00519	0.0135	0.00248 J
Naphthalene	SW8260	20	MTG	0.0994	mg/kg	—	—	—	—	—	—	—
n-Butylbenzene	SW8260	15	MTG	—	mg/kg	—	—	—	—	—	—	—
n-Propylbenzene	SW8260	15	MTG	—	mg/kg	—	—	—	—	—	—	—
sec-Butylbenzene	SW8260	12	MTG	—	mg/kg	—	—	—	—	—	—	—
Trichlorofluoromethane	SW8260	86	MTG	16.4	mg/kg	—	—	—	—	—	—	—
1,1,1,2-Tetrachloroethane	SW8260	—	—	225	mg/kg	—	—	—	—	—	—	—
1,1,2,2-Tetrachloroethane	SW8260	0.017	MTG	0.127	mg/kg	—	—	—	—	—	—	—
1,1,2-Trichloroethane	SW8260	0.018	MTG	0.4	mg/kg	—	—	—	—	—	—	—
1,1-Dichloroethane	SW8260	25	MTG	0.02	mg/kg	—	—	—	—	—	—	—
1,1-Dichloroethene	SW8260	0.03	MTG	0.1	mg/kg	—	—	—	—	—	—	—

Table F-2b
Summary of Soil Sample Results - Volatile Organic Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1996 E&E MW-4 96-UMT-202-SB	1996 E&E MW-5 96-UMT-208-SB	1996 E&E MW-6 96-UMT-203-SB	1996 E&E MW-6 96-UMT-204-SB	1996 E&E MW-6 96-UMT-205-SB	1996 E&E MW-7 96-UMT-209-SS	1996 E&E MW-7 96-UMT-210-SB
1,1-Dichloropropene	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
1,2,3-Trichlorobenzene	SW8260	—	—	0.03	mg/kg	—	—	—	—	—	—	—
1,2,3-Trichloropropane	SW8260	0.00053	MTG	3.36	mg/kg	—	—	—	—	—	—	—
1,2,4-Trichlorobenzene	SW8260	0.85	MTG	0.03	mg/kg	—	—	—	—	—	—	—
1,2-Dibromo-3-chloropropane	SW8260	—	—	0.0352	mg/kg	—	—	—	—	—	—	—
1,2-Dibromoethane	SW8260	0.00016	MTG	1.23	mg/kg	—	—	—	—	—	—	—
1,2-Dichlorobenzene	SW8260	5.1	MTG	0.03	mg/kg	—	—	—	—	—	—	—
1,2-Dichloropropane	SW8260	0.018	MTG	0.002	mg/kg	—	—	—	—	—	—	—
1,3-Dichlorobenzene	SW8260	28	MTG	0.03	mg/kg	—	—	—	—	—	—	—
1,4-Dichlorobenzene	SW8260	0.64	MTG	0.03	mg/kg	—	—	—	—	—	—	—
2,2-Dichloropropane	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
2-Chlorotoluene	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
2-Hexanone	SW8260	—	—	12.6	mg/kg	—	—	—	—	—	—	—
4-Chlorotoluene	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
4-Methyl-2-pentanone	SW8260	8.1	MTG	443	mg/kg	—	—	—	—	—	—	—
Bromobenzene	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
Bromochloromethane	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
Bromodichloromethane	SW8260	0.044	MTG	0.54	mg/kg	—	—	—	—	—	—	—
Bromoform	SW8260	0.34	MTG	15.9	mg/kg	—	—	—	—	—	—	—
Bromomethane	SW8260	0.16	MTG	0.235	mg/kg	—	—	—	—	—	—	—
Carbon disulfide	SW8260	12	MTG	0.0941	mg/kg	—	—	—	—	—	—	—
Carbon tetrachloride	SW8260	0.023	MTG	0.4	mg/kg	—	—	—	—	—	—	—
Chloroethane	SW8260	34	AZOI	—	mg/kg	—	—	—	—	—	—	—
cis-1,2-Dichloroethene	SW8260	0.24	MTG	—	mg/kg	—	—	—	—	—	—	—
cis-1,3-Dichloropropene	SW8260	0.033	MTG	0.398	mg/kg	—	—	—	—	—	—	—
Dibromochloromethane	SW8260	0.032	MTG	2.05	mg/kg	—	—	—	—	—	—	—
Dibromomethane	SW8260	1.1	MTG	65	mg/kg	—	—	—	—	—	—	—
Dichlorodifluoromethane	SW8260	140	MTG	39.5	mg/kg	—	—	—	—	—	—	—
Hexachlorobutadiene	SW8260	0.12	MTG	0.0398	mg/kg	—	—	—	—	—	—	—
m,p-Xylene	SW8260	63	MTG	0.1	mg/kg	<0.00554	—	<0.00509	0.00572 JH	<0.00519	<0.00502	<0.00540

Table F-2b
Summary of Soil Sample Results - Volatile Organic Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1996 E&E MW-4 96-UMT-202-SB	1996 E&E MW-5 96-UMT-208-SB	1996 E&E MW-6 96-UMT-203-SB	1996 E&E MW-6 96-UMT-204-SB	1996 E&E MW-6 96-UMT-205-SB	1996 E&E MW-7 96-UMT-209-SS	1996 E&E MW-7 96-UMT-210-SB
o-Xylene	SW8260	63	MTG	0.1	mg/kg	<0.00554	—	<0.00509	0.00288 JH	<0.00519	<0.00502	<0.00540
Styrene	SW8260	0.96	MTG	0.3	mg/kg	—	—	—	—	—	—	—
tert-Butylbenzene	SW8260	12	MTG	—	mg/kg	—	—	—	—	—	—	—
Tetrachloroethene	SW8260	0.024	MTG	0.002	mg/kg	—	—	—	—	—	—	—
trans-1,2-Dichloroethene	SW8260	0.37	MTG	—	mg/kg	—	—	—	—	—	—	—
trans-1,3-Dichloropropene	SW8260	0.033	MTG	0.398	mg/kg	—	—	—	—	—	—	—
Trichloroethene	SW8260	0.02	MTG	0.1	mg/kg	—	—	—	—	—	—	—
Vinyl chloride	SW8260	0.0085	MTG	0.01	mg/kg	—	—	—	—	—	—	—

Table F-2b
Summary of Soil Sample Results - Volatile Organic Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1996 E&E MW-8 96-UMT-211-SB	1996 E&E SB-44 96-UMT-199-SB	1996 E&E SB-45 96-UMT-200-SB	1996 E&E SB-47 96-UMT-207-SB	1996 E&E SB-47 96-UMT-401-SS	1996 E&E SB-49 96-UMT-212-SB	1996 E&E SB-50 96-UMT-213-SS
Benzene	AK 101	0.025	MTG	0.01	mg/kg	**<0.083 UJK**	**<0.083 UJK**	**<0.083 UJK**	**<0.084**	—	**<0.085 UJK**	**<0.096 UJK**
	SW8260	0.025	MTG	0.01	mg/kg	—	—	—	—	—	—	—
Toluene	AK 101	6.5	MTG	0.01	mg/kg	<0.12 UJK	<0.12 UJK	<0.13 UJK	<0.13	—	<0.13 UJK	<0.14 UJK
	SW8260	6.5	MTG	0.01	mg/kg	—	—	—	—	<0.00504	—	<0.00597
Ethylbenzene	AK 101	6.9	MTG	0.03	mg/kg	<0.093 UJK	<0.093 UJK	<0.094 UJK	<0.094	—	<0.096 UJK	<0.11 UJK
	SW8260	6.9	MTG	0.03	mg/kg	—	—	—	—	—	—	—
Xylenes (total)	AK 101	63	MTG	0.1	mg/kg	<0.26 UJK	<0.26 UJK	<0.26 UJK	<0.26	—	<0.27 UJK	<0.30 UJK
	SW8260	63	MTG	0.1	mg/kg	—	—	—	—	<0.00504	—	<0.00597
1,1,1-Trichloroethane	SW8260	0.82	MTG	0.07	mg/kg	—	—	—	—	—	—	—
1,2,4-Trimethylbenzene	SW8260	23	MTG	—	mg/kg	—	—	—	—	—	—	—
1,2-Dichloroethane	SW8260	0.016	MTG	0.02	mg/kg	—	—	—	—	—	—	—
1,3,5-Trimethylbenzene	SW8260	23	MTG	—	mg/kg	—	—	—	—	—	—	—
2-Butanone	SW8260	59	MTG	89.6	mg/kg	—	—	—	—	—	—	—
4-Isopropyltoluene	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
Acetone	SW8260	88	MTG	2.5	mg/kg	—	—	—	—	<0.0101 UJL	—	0.0199 B
Chlorobenzene	SW8260	0.63	MTG	0.03	mg/kg	—	—	—	—	—	—	—
Chloroform	SW8260	0.46	MTG	1.19	mg/kg	—	—	—	—	—	—	—
Chloromethane	SW8260	0.21	MTG	10.4	mg/kg	—	—	—	—	—	—	—
Isopropylbenzene	SW8260	51	MTG	—	mg/kg	—	—	—	—	—	—	—
Methylene chloride	SW8260	0.016	MTG	0.4	mg/kg	—	—	—	—	0.00321 JB	—	0.00248 JH
Naphthalene	SW8260	20	MTG	0.0994	mg/kg	—	—	—	—	—	—	—
n-Butylbenzene	SW8260	15	MTG	—	mg/kg	—	—	—	—	—	—	—
n-Propylbenzene	SW8260	15	MTG	—	mg/kg	—	—	—	—	—	—	—
sec-Butylbenzene	SW8260	12	MTG	—	mg/kg	—	—	—	—	—	—	—
Trichlorofluoromethane	SW8260	86	MTG	16.4	mg/kg	—	—	—	—	—	—	—
1,1,1,2-Tetrachloroethane	SW8260	—	—	225	mg/kg	—	—	—	—	—	—	—
1,1,2,2-Tetrachloroethane	SW8260	0.017	MTG	0.127	mg/kg	—	—	—	—	—	—	—
1,1,2-Trichloroethane	SW8260	0.018	MTG	0.4	mg/kg	—	—	—	—	—	—	—
1,1-Dichloroethane	SW8260	25	MTG	0.02	mg/kg	—	—	—	—	—	—	—
1,1-Dichloroethene	SW8260	0.03	MTG	0.1	mg/kg	—	—	—	—	—	—	—

Table F-2b
Summary of Soil Sample Results - Volatile Organic Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1996 E&E MW-8 96-UMT-211-SB	1996 E&E SB-44 96-UMT-199-SB	1996 E&E SB-45 96-UMT-200-SB	1996 E&E SB-47 96-UMT-207-SB	1996 E&E SB-47 96-UMT-401-SS	1996 E&E SB-49 96-UMT-212-SB	1996 E&E SB-50 96-UMT-213-SS
1,1-Dichloropropene	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
1,2,3-Trichlorobenzene	SW8260	—	—	0.03	mg/kg	—	—	—	—	—	—	—
1,2,3-Trichloropropane	SW8260	0.00053	MTG	3.36	mg/kg	—	—	—	—	—	—	—
1,2,4-Trichlorobenzene	SW8260	0.85	MTG	0.03	mg/kg	—	—	—	—	—	—	—
1,2-Dibromo-3-chloropropane	SW8260	—	—	0.0352	mg/kg	—	—	—	—	—	—	—
1,2-Dibromoethane	SW8260	0.00016	MTG	1.23	mg/kg	—	—	—	—	—	—	—
1,2-Dichlorobenzene	SW8260	5.1	MTG	0.03	mg/kg	—	—	—	—	—	—	—
1,2-Dichloropropane	SW8260	0.018	MTG	0.002	mg/kg	—	—	—	—	—	—	—
1,3-Dichlorobenzene	SW8260	28	MTG	0.03	mg/kg	—	—	—	—	—	—	—
1,4-Dichlorobenzene	SW8260	0.64	MTG	0.03	mg/kg	—	—	—	—	—	—	—
2,2-Dichloropropane	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
2-Chlorotoluene	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
2-Hexanone	SW8260	—	—	12.6	mg/kg	—	—	—	—	—	—	—
4-Chlorotoluene	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
4-Methyl-2-pentanone	SW8260	8.1	MTG	443	mg/kg	—	—	—	—	—	—	—
Bromobenzene	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
Bromochloromethane	SW8260	—	—	—	mg/kg	—	—	—	—	—	—	—
Bromodichloromethane	SW8260	0.044	MTG	0.54	mg/kg	—	—	—	—	—	—	—
Bromoform	SW8260	0.34	MTG	15.9	mg/kg	—	—	—	—	—	—	—
Bromomethane	SW8260	0.16	MTG	0.235	mg/kg	—	—	—	—	—	—	—
Carbon disulfide	SW8260	12	MTG	0.0941	mg/kg	—	—	—	—	—	—	—
Carbon tetrachloride	SW8260	0.023	MTG	0.4	mg/kg	—	—	—	—	—	—	—
Chloroethane	SW8260	34	AZOI	—	mg/kg	—	—	—	—	—	—	—
cis-1,2-Dichloroethene	SW8260	0.24	MTG	—	mg/kg	—	—	—	—	—	—	—
cis-1,3-Dichloropropene	SW8260	0.033	MTG	0.398	mg/kg	—	—	—	—	—	—	—
Dibromochloromethane	SW8260	0.032	MTG	2.05	mg/kg	—	—	—	—	—	—	—
Dibromomethane	SW8260	1.1	MTG	65	mg/kg	—	—	—	—	—	—	—
Dichlorodifluoromethane	SW8260	140	MTG	39.5	mg/kg	—	—	—	—	—	—	—
Hexachlorobutadiene	SW8260	0.12	MTG	0.0398	mg/kg	—	—	—	—	—	—	—
m,p-Xylene	SW8260	63	MTG	0.1	mg/kg	—	—	—	—	<0.00504	—	<0.00597

Table F-2b
Summary of Soil Sample Results - Volatile Organic Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1996 E&E MW-8 96-UMT-211-SB	1996 E&E SB-44 96-UMT-199-SB	1996 E&E SB-45 96-UMT-200-SB	1996 E&E SB-47 96-UMT-207-SB	1996 E&E SB-47 96-UMT-401-SS	1996 E&E SB-49 96-UMT-212-SB	1996 E&E SB-50 96-UMT-213-SS
o-Xylene	SW8260	63	MTG	0.1	mg/kg	—	—	—	—	<0.00504	—	<0.00597
Styrene	SW8260	0.96	MTG	0.3	mg/kg	—	—	—	—	—	—	—
tert-Butylbenzene	SW8260	12	MTG	—	mg/kg	—	—	—	—	—	—	—
Tetrachloroethene	SW8260	0.024	MTG	0.002	mg/kg	—	—	—	—	—	—	—
trans-1,2-Dichloroethene	SW8260	0.37	MTG	—	mg/kg	—	—	—	—	—	—	—
trans-1,3-Dichloropropene	SW8260	0.033	MTG	0.398	mg/kg	—	—	—	—	—	—	—
Trichloroethene	SW8260	0.02	MTG	0.1	mg/kg	—	—	—	—	—	—	—
Vinyl chloride	SW8260	0.0085	MTG	0.01	mg/kg	—	—	—	—	—	—	—

Table F-2b
Summary of Soil Sample Results - Volatile Organic Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1996 E&E SB-50 96-UMT-214-SB	1996 E&E SB-51 96-UMT-215-SB
Benzene	AK 101	0.025	MTG	0.01	mg/kg	**<0.085 UJK**	**<0.088 UJK**
	SW8260	0.025	MTG	0.01	mg/kg	—	—
Toluene	AK 101	6.5	MTG	0.01	mg/kg	<0.13 UJK	0.50 JK
	SW8260	6.5	MTG	0.01	mg/kg	<0.00517	—
Ethylbenzene	AK 101	6.9	MTG	0.03	mg/kg	<0.095 UJK	<0.099 UJK
	SW8260	6.9	MTG	0.03	mg/kg	—	—
Xylenes (total)	AK 101	63	MTG	0.1	mg/kg	<0.26 UJK	0.22 JK
	SW8260	63	MTG	0.1	mg/kg	<0.00517	—
1,1,1-Trichloroethane	SW8260	0.82	MTG	0.07	mg/kg	—	—
1,2,4-Trimethylbenzene	SW8260	23	MTG	—	mg/kg	—	—
1,2-Dichloroethane	SW8260	0.016	MTG	0.02	mg/kg	—	—
1,3,5-Trimethylbenzene	SW8260	23	MTG	—	mg/kg	—	—
2-Butanone	SW8260	59	MTG	89.6	mg/kg	—	—
4-Isopropyltoluene	SW8260	—	—	—	mg/kg	—	—
Acetone	SW8260	88	MTG	2.5	mg/kg	<0.0104 UJL	—
Chlorobenzene	SW8260	0.63	MTG	0.03	mg/kg	—	—
Chloroform	SW8260	0.46	MTG	1.19	mg/kg	—	—
Chloromethane	SW8260	0.21	MTG	10.4	mg/kg	—	—
Isopropylbenzene	SW8260	51	MTG	—	mg/kg	—	—
Methylene chloride	SW8260	0.016	MTG	0.4	mg/kg	0.0117 JH	—
Naphthalene	SW8260	20	MTG	0.0994	mg/kg	—	—
n-Butylbenzene	SW8260	15	MTG	—	mg/kg	—	—
n-Propylbenzene	SW8260	15	MTG	—	mg/kg	—	—
sec-Butylbenzene	SW8260	12	MTG	—	mg/kg	—	—
Trichlorofluoromethane	SW8260	86	MTG	16.4	mg/kg	—	—
1,1,1,2-Tetrachloroethane	SW8260	—	—	225	mg/kg	—	—
1,1,2,2-Tetrachloroethane	SW8260	0.017	MTG	0.127	mg/kg	—	—
1,1,2-Trichloroethane	SW8260	0.018	MTG	0.4	mg/kg	—	—
1,1-Dichloroethane	SW8260	25	MTG	0.02	mg/kg	—	—
1,1-Dichloroethene	SW8260	0.03	MTG	0.1	mg/kg	—	—

Table F-2b
Summary of Soil Sample Results - Volatile Organic Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1996 E&E SB-50 96-UMT-214-SB	1996 E&E SB-51 96-UMT-215-SB
1,1-Dichloropropene	SW8260	—	—	—	mg/kg	—	—
1,2,3-Trichlorobenzene	SW8260	—	—	0.03	mg/kg	—	—
1,2,3-Trichloropropane	SW8260	0.00053	MTG	3.36	mg/kg	—	—
1,2,4-Trichlorobenzene	SW8260	0.85	MTG	0.03	mg/kg	—	—
1,2-Dibromo-3-chloropropane	SW8260	—	—	0.0352	mg/kg	—	—
1,2-Dibromoethane	SW8260	0.00016	MTG	1.23	mg/kg	—	—
1,2-Dichlorobenzene	SW8260	5.1	MTG	0.03	mg/kg	—	—
1,2-Dichloropropane	SW8260	0.018	MTG	0.002	mg/kg	—	—
1,3-Dichlorobenzene	SW8260	28	MTG	0.03	mg/kg	—	—
1,4-Dichlorobenzene	SW8260	0.64	MTG	0.03	mg/kg	—	—
2,2-Dichloropropane	SW8260	—	—	—	mg/kg	—	—
2-Chlorotoluene	SW8260	—	—	—	mg/kg	—	—
2-Hexanone	SW8260	—	—	12.6	mg/kg	—	—
4-Chlorotoluene	SW8260	—	—	—	mg/kg	—	—
4-Methyl-2-pentanone	SW8260	8.1	MTG	443	mg/kg	—	—
Bromobenzene	SW8260	—	—	—	mg/kg	—	—
Bromochloromethane	SW8260	—	—	—	mg/kg	—	—
Bromodichloromethane	SW8260	0.044	MTG	0.54	mg/kg	—	—
Bromoform	SW8260	0.34	MTG	15.9	mg/kg	—	—
Bromomethane	SW8260	0.16	MTG	0.235	mg/kg	—	—
Carbon disulfide	SW8260	12	MTG	0.0941	mg/kg	—	—
Carbon tetrachloride	SW8260	0.023	MTG	0.4	mg/kg	—	—
Chloroethane	SW8260	34	AZOI	—	mg/kg	—	—
cis-1,2-Dichloroethene	SW8260	0.24	MTG	—	mg/kg	—	—
cis-1,3-Dichloropropene	SW8260	0.033	MTG	0.398	mg/kg	—	—
Dibromochloromethane	SW8260	0.032	MTG	2.05	mg/kg	—	—
Dibromomethane	SW8260	1.1	MTG	65	mg/kg	—	—
Dichlorodifluoromethane	SW8260	140	MTG	39.5	mg/kg	—	—
Hexachlorobutadiene	SW8260	0.12	MTG	0.0398	mg/kg	—	—
m,p-Xylene	SW8260	63	MTG	0.1	mg/kg	<0.00517	—

Table F-2b
Summary of Soil Sample Results - Volatile Organic Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1996 E&E SB-50 96-UMT-214-SB	1996 E&E SB-51 96-UMT-215-SB
o-Xylene	SW8260	63	MTG	0.1	mg/kg	<0.00517	—
Styrene	SW8260	0.96	MTG	0.3	mg/kg	—	—
tert-Butylbenzene	SW8260	12	MTG	—	mg/kg	—	—
Tetrachloroethene	SW8260	0.024	MTG	0.002	mg/kg	—	—
trans-1,2-Dichloroethene	SW8260	0.37	MTG	—	mg/kg	—	—
trans-1,3-Dichloropropene	SW8260	0.033	MTG	0.398	mg/kg	—	—
Trichloroethene	SW8260	0.02	MTG	0.1	mg/kg	—	—
Vinyl chloride	SW8260	0.0085	MTG	0.01	mg/kg	—	—

Table F-2b
Summary of Soil Sample Results - Volatile Organic Compounds

Notes:

U, J, K	Flags are carried over from the original reports, and in some cases were undefined. Refer to original report for flag definitions.

Column headings:

Event
Location (LOCID)
Sample ID

PCL	Chemical-specific Applicable or Relevant and Appropriate Requirements
TBC	To Be Considered, non-promulgated advisories, guidance, or proposed standards
mg/kg	milligrams per kilogram
ADEC	Alaska Department of Environmental Conservation
MTG	18 AAC 75.341 (April 2012) - Method Two Tables B1 and B2 Soil Cleanup Levels: Migration to Groundwater
AZOI	18 AAC 75.341 (April 2012) - Method Two Tables B1 and B2 Soil Cleanup Levels: Arctic Zone Outdoor Inhalation
<	Result is less than the listed reporting limit
bold	Result or reporting limit exceeds the PCL
bold shaded	Result exceeds PCL (regulatory exceedance)

Table F-2c
Summary of Soil Sample Results - Semivolatile Organic Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1996 AGRA 1639-06	1996 AGRA 1639-08	1996 AGRA 1639-08(DUP)	1996 E&E MW-3 96-UMT-195-SS	1996 E&E MW-3 96-UMT-196-SB	1996 E&E MW-3 96-UMT-197-SB	1996 E&E MW-4 96-UMT-201-SS
2-Methylnaphthalene	PAH SIM	6.1	MTG	3.24	mg/kg	0.012	0.020	0.024	—	—	—	—
	SW8270	6.1	MTG	3.24	mg/kg	—	—	—	0.0753	<0.359	<0.374	<0.342
Acenaphthene	PAH SIM	180	MTG	20	mg/kg	<0.0050	<0.0050	<0.0050	—	—	—	—
Acenaphthylene	PAH SIM	180	MTG	682	mg/kg	<0.0050	<0.0050	<0.0050	—	—	—	—
Anthracene	PAH SIM	3000	MTG	1480	mg/kg	<0.0050	<0.0050	<0.0050	—	—	—	—
Benzo(a)anthracene	PAH SIM	3.6	MTG	5.21	mg/kg	<0.0050	<0.0050	<0.0050	—	—	—	—
Benzo(a)pyrene	PAH SIM	0.66	AZDC	1.52	mg/kg	<0.0050	<0.0050	<0.0050	—	—	—	—
Benzo(b)fluoranthene	PAH SIM	6.6	AZDC	59.8	mg/kg	<0.0050	<0.0050	0.010	—	—	—	—
Benzo(g,h,i)perylene	PAH SIM	1900	AZDC	119	mg/kg	<0.0050	<0.0050	0.0070	—	—	—	—
Benzo(k)fluoranthene	PAH SIM	66	AZDC	148	mg/kg	<0.0050	<0.0050	<0.0050	—	—	—	—
Chrysene	PAH SIM	360	MTG	4.73	mg/kg	0.0060	<0.0050	0.017	—	—	—	—
Dibenzo(a,h) anthracene	PAH SIM	0.66	AZDC	18.4	mg/kg	<0.0050	<0.0050	<0.0050	—	—	—	—
Dibenzofuran	PAH SIM	11	MTG	—	mg/kg	<0.0050	<0.0050	0.0070	—	—	—	—
Fluoranthene	PAH SIM	1400	MTG	122	mg/kg	<0.0050	<0.0050	<0.0050	—	—	—	—
Fluorene	PAH SIM	220	MTG	30	mg/kg	<0.0050	<0.0050	<0.0050	—	—	—	—
Indeno(1,2,3-cd) pyrene	PAH SIM	6.6	AZDC	109	mg/kg	<0.0050	<0.0050	<0.0050	—	—	—	—
Naphthalene	PAH SIM	20	MTG	0.0994	mg/kg	0.0090	0.014	0.010	—	—	—	—
Phenanthrene	PAH SIM	3000	MTG	45.7	mg/kg	0.012	0.013	0.039	—	—	—	—
	SW8270	3000	MTG	45.7	mg/kg	—	—	—	0.0691	<0.359	<0.374	<0.342
Pyrene	PAH SIM	1000	MTG	78.5	mg/kg	<0.0050	<0.0050	0.0050	—	—	—	—
	SW8270	1000	MTG	78.5	mg/kg	—	—	—	<0.409	<0.359	<0.374	<0.342
Benzoic acid	SW8270	410	MTG	—	mg/kg	—	—	—	<2.04	<1.80	<1.87	<1.71
bis(2-Ethylhexyl)phthalate	SW8270	13	MTG	0.1	mg/kg	—	—	—	<0.409	0.0566 JB	0.0429	<0.342

Table F-2c
Summary of Soil Sample Results - Semivolatile Organic Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1996 E&E MW-4 96-UMT-202-SB	1996 E&E MW-6 96-UMT-203-SB	1996 E&E MW-6 96-UMT-204-SB	1996 E&E MW-6 96-UMT-205-SB	1996 E&E MW-7 96-UMT-209-SS	1996 E&E MW-7 96-UMT-210-SB	1996 E&E SB-47 96-UMT-401-SS
2-Methylnaphthalene	PAH SIM	6.1	MTG	3.24	mg/kg	—	—	—	—	—	—	—
	SW8270	6.1	MTG	3.24	mg/kg	<0.371	<0.336	<3.39	<3.43	<0.341	<0.382	<0.348
Acenaphthene	PAH SIM	180	MTG	20	mg/kg	—	—	—	—	—	—	—
Acenaphthylene	PAH SIM	180	MTG	682	mg/kg	—	—	—	—	—	—	—
Anthracene	PAH SIM	3000	MTG	1480	mg/kg	—	—	—	—	—	—	—
Benzo(a)anthracene	PAH SIM	3.6	MTG	5.21	mg/kg	—	—	—	—	—	—	—
Benzo(a)pyrene	PAH SIM	0.66	AZDC	1.52	mg/kg	—	—	—	—	—	—	—
Benzo(b)fluoranthene	PAH SIM	6.6	AZDC	59.8	mg/kg	—	—	—	—	—	—	—
Benzo(g,h,i)perylene	PAH SIM	1900	AZDC	119	mg/kg	—	—	—	—	—	—	—
Benzo(k)fluoranthene	PAH SIM	66	AZDC	148	mg/kg	—	—	—	—	—	—	—
Chrysene	PAH SIM	360	MTG	4.73	mg/kg	—	—	—	—	—	—	—
Dibenzo(a,h) anthracene	PAH SIM	0.66	AZDC	18.4	mg/kg	—	—	—	—	—	—	—
Dibenzofuran	PAH SIM	11	MTG	—	mg/kg	—	—	—	—	—	—	—
Fluoranthene	PAH SIM	1400	MTG	122	mg/kg	—	—	—	—	—	—	—
Fluorene	PAH SIM	220	MTG	30	mg/kg	—	—	—	—	—	—	—
Indeno(1,2,3-cd) pyrene	PAH SIM	6.6	AZDC	109	mg/kg	—	—	—	—	—	—	—
Naphthalene	PAH SIM	20	MTG	0.0994	mg/kg	—	—	—	—	—	—	—
Phenanthrene	PAH SIM	3000	MTG	45.7	mg/kg	—	—	—	—	—	—	—
	SW8270	3000	MTG	45.7	mg/kg	<0.371	<0.336	<3.39	<3.43	<0.341	<0.382	<0.348
Pyrene	PAH SIM	1000	MTG	78.5	mg/kg	—	—	—	—	—	—	—
	SW8270	1000	MTG	78.5	mg/kg	<0.371	<0.336	0.377	0.616 JH	<0.341	<0.382	<0.348
Benzoic acid	SW8270	410	MTG	—	mg/kg	<1.86	<1.68	<17.0	<17.1	<1.70	<1.91	<1.74
bis(2-Ethylhexyl)phthalate	SW8270	13	MTG	0.1	mg/kg	0.0461 JB	0.0517	<3.39	<3.43	0.118 JB	0.0483 JB	0.105 J

Table F-2c
Summary of Soil Sample Results - Semivolatile Organic Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1996 E&E SB-50 96-UMT-213-SS	1996 E&E SB-50 96-UMT-214-SB
2-Methylnaphthalene	PAH SIM	6.1	MTG	3.24	mg/kg	—	—
	SW8270	6.1	MTG	3.24	mg/kg	0.0428 J	<0.349
Acenaphthene	PAH SIM	180	MTG	20	mg/kg	—	—
Acenaphthylene	PAH SIM	180	MTG	682	mg/kg	—	—
Anthracene	PAH SIM	3000	MTG	1480	mg/kg	—	—
Benzo(a)anthracene	PAH SIM	3.6	MTG	5.21	mg/kg	—	—
Benzo(a)pyrene	PAH SIM	0.66	AZDC	1.52	mg/kg	—	—
Benzo(b)fluoranthene	PAH SIM	6.6	AZDC	59.8	mg/kg	—	—
Benzo(g,h,i)perylene	PAH SIM	1900	AZDC	119	mg/kg	—	—
Benzo(k)fluoranthene	PAH SIM	66	AZDC	148	mg/kg	—	—
Chrysene	PAH SIM	360	MTG	4.73	mg/kg	—	—
Dibenzo(a,h) anthracene	PAH SIM	0.66	AZDC	18.4	mg/kg	—	—
Dibenzofuran	PAH SIM	11	MTG	—	mg/kg	—	—
Fluoranthene	PAH SIM	1400	MTG	122	mg/kg	—	—
Fluorene	PAH SIM	220	MTG	30	mg/kg	—	—
Indeno(1,2,3-cd) pyrene	PAH SIM	6.6	AZDC	109	mg/kg	—	—
Naphthalene	PAH SIM	20	MTG	0.0994	mg/kg	—	—
Phenanthrene	PAH SIM	3000	MTG	45.7	mg/kg	—	—
	SW8270	3000	MTG	45.7	mg/kg	<0.396	<0.349
Pyrene	PAH SIM	1000	MTG	78.5	mg/kg	—	—
	SW8270	1000	MTG	78.5	mg/kg	<0.396	<0.349
Benzoic acid	SW8270	410	MTG	—	mg/kg	0.0585 J	<1.75
bis(2-Ethylhexyl)phthalate	SW8270	13	MTG	0.1	mg/kg	0.0447 JB	0.0536 JB

Table F-2c
Summary of Soil Sample Results - Semivolatile Organic Compounds

Notes:

B, J	Flags are carried over from the original reports, and in some cases were undefined. Refer to original report for flag definitions.
Column headings:	Event Location (LOCID) Sample ID
PCL	Chemical-specific Applicable or Relevant and Appropriate Requirements
TBC	To Be Considered, non-promulgated advisories, guidance, or proposed standards
mg/kg	milligrams per kilogram
ADEC	Alaska Department of Environmental Conservation
MTG	18 AAC 75.341 (April 2012) - Method Two Tables B1 and B2 Soil Cleanup Levels: Migration to Groundwater
AZDC	18 AAC 75.341 (April 2012) - Method Two Tables B1 and B2 Soil Cleanup Levels: Arctic Zone Direct Contact
<	Result is less than the listed reporting limit
bold	Result or reporting limit exceeds the PCL
bold shaded	Result exceeds PCL (regulatory exceedance)

Table F-2d
Summary of Soil Sample Results - PCBs & Pesticides

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1994 E&E BH 11-1 94-UMT-135-SL	1994 E&E BH 11-1 94-UMT-136-SL	1994 E&E BH 11-1 94-UMT-137-SL	1994 E&E BH 11-1 94-UMT-138-SL	1994 E&E BH 11-1 94-UMT-139-SL	1994 E&E BH 11-2 94-UMT-142-SL
Aroclor 1016	SW8080 Series	1 (Total PCBs)	AZDC	0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1221	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1232	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1242	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1248	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1254	SW8080 Series			0.000332	mg/kg	<0.10	<0.10	<0.059	<0.10	<0.10	<0.10
Aroclor 1260	SW8080 Series			0.000332	mg/kg	<0.10	<0.10	<0.059	<0.10	<0.10	<0.10
4,4'-DDD	SW8080 Series	7.2	MTG	0.01	mg/kg	<0.010	<0.010	<0.0035	<0.010	<0.010	<0.010
4,4'-DDE	SW8080 Series	5.1	MTG	0.01	mg/kg	<0.010	<0.010	<0.0035	<0.010	<0.010	<0.010
4,4'-DDT	SW8080 Series	7.3	MTG	0.01	mg/kg	<0.010	<0.010	<0.0035	<0.010	<0.010	<0.010
Endosulfan II	SW8080 Series	64	MTG	0.00001	mg/kg	<0.010	<0.010	<0.0035	<0.010	<0.010	<0.010
Endosulfan sulfate	SW8080 Series	—	—	0.0358	mg/kg	<0.010	<0.010	<0.0035	<0.010	<0.010	<0.010
Endrin	SW8080 Series	0.29	MTG	0.00004	mg/kg	<0.010	<0.010	<0.0035	<0.010	<0.010	<0.010
Endrin aldehyde	SW8080 Series	—	—	0.0105	mg/kg	<0.010	<0.010	<0.0035	<0.010	<0.010	<0.010

Table F-2d
Summary of Soil Sample Results - PCBs & Pesticides

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1994 E&E BH 11-2 94-UMT-143-SL	1994 E&E BH 11-2 94-UMT-144-SL	1994 E&E BH 11-3 94-UMT-145-SL	1994 E&E BH 11-3 94-UMT-146-SL	1994 E&E BH 11-3 94-UMT-147-SL	1994 E&E BH 11-4 94-UMT-148-SL
Aroclor 1016	SW8080 Series	1 (Total PCBs)	AZDC	0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1221	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1232	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1242	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1248	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1254	SW8080 Series			0.000332	mg/kg	<0.10	<0.059	<0.10	<0.10	<0.10	<0.10
Aroclor 1260	SW8080 Series			0.000332	mg/kg	<0.10	<0.059	<0.10	<0.10	<0.10	<0.10
4,4'-DDD	SW8080 Series	7.2	MTG	0.01	mg/kg	<0.010	<0.0035	<0.010	<0.010	<0.010	<0.010
4,4'-DDE	SW8080 Series	5.1	MTG	0.01	mg/kg	<0.010	<0.0035	<0.010	<0.010	<0.010	<0.010
4,4'-DDT	SW8080 Series	7.3	MTG	0.01	mg/kg	<0.010	<0.0035	<0.010	<0.010	<0.010	<0.010
Endosulfan II	SW8080 Series	64	MTG	0.00001	mg/kg	<0.010	<0.0035	<0.010	<0.010	<0.010	<0.010
Endosulfan sulfate	SW8080 Series	—	—	0.0358	mg/kg	<0.010	<0.0035	<0.010	<0.010	<0.010	<0.010
Endrin	SW8080 Series	0.29	MTG	0.00004	mg/kg	<0.010	<0.0035	<0.010	<0.010	<0.010	<0.010
Endrin aldehyde	SW8080 Series	—	—	0.0105	mg/kg	<0.010	<0.0035	<0.010	<0.010	<0.010	<0.010

Table F-2d
Summary of Soil Sample Results - PCBs & Pesticides

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1994 E&E BH 11-4 94-UMT-149-SL	1994 E&E BH 11-4 94-UMT-150-SL	1994 E&E BH 11-5 94-UMT-151-SL	1994 E&E BH 11-5 94-UMT-152-SL	1994 E&E BH 11-5 94-UMT-153-SL	1994 E&E BH 11-6 94-UMT-154-SL
Aroclor 1016	SW8080 Series	1 (Total PCBs)	AZDC	0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1221	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1232	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1242	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1248	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1254	SW8080 Series			0.000332	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Aroclor 1260	SW8080 Series			0.000332	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
4,4'-DDD	SW8080 Series	7.2	MTG	0.01	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
4,4'-DDE	SW8080 Series	5.1	MTG	0.01	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
4,4'-DDT	SW8080 Series	7.3	MTG	0.01	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	0.040
Endosulfan II	SW8080 Series	64	MTG	0.00001	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
Endosulfan sulfate	SW8080 Series	—	—	0.0358	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
Endrin	SW8080 Series	0.29	MTG	0.00004	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
Endrin aldehyde	SW8080 Series	—	—	0.0105	mg/kg	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10

Table F-2d
Summary of Soil Sample Results - PCBs & Pesticides

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1994 E&E BH 11-6 94-UMT-155-SL	1994 E&E BH 11-6 94-UMT-156-SL	1994 E&E BH 11-6 94-UMT-157-SL	1994 E&E BH 11-6 94-UMT-158-SL	1996 E&E MW-3 96-UMT-195-SS	1996 E&E MW-3 96-UMT-196-SB
Aroclor 1016	SW8080 Series	1 (Total PCBs)	AZDC	0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1221	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1232	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1242	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1248	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1254	SW8080 Series			0.000332	mg/kg	<0.10	<0.10	<0.11	<0.10	<0.0495	<0.0218
Aroclor 1260	SW8080 Series			0.000332	mg/kg	<0.10	<0.10	<0.11	<0.10	—	—
4,4'-DDD	SW8080 Series	7.2	MTG	0.01	mg/kg	<0.010	<0.010	0.026	<0.010	0.00384 J	<0.00218
4,4'-DDE	SW8080 Series	5.1	MTG	0.01	mg/kg	<0.010	<0.010	<0.0063	<0.010	<0.00495	<0.00218
4,4'-DDT	SW8080 Series	7.3	MTG	0.01	mg/kg	0.020	0.020	0.029	0.050	0.00953 J	<0.00544 UJL
Endosulfan II	SW8080 Series	64	MTG	0.00001	mg/kg	<0.010	<0.010	<0.0063	<0.010	—	—
Endosulfan sulfate	SW8080 Series	—	—	0.0358	mg/kg	<0.010	<0.010	<0.0063	<0.010	—	—
Endrin	SW8080 Series	0.29	MTG	0.00004	mg/kg	<0.010	<0.010	<0.0063	<0.010	—	—
Endrin aldehyde	SW8080 Series	—	—	0.0105	mg/kg	<0.010	<0.010	<0.0063	<0.010	—	—

Table F-2d
Summary of Soil Sample Results - PCBs & Pesticides

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1996 E&E MW-3 96-UMT-197-SB	1996 E&E MW-4 96-UMT-201-SS	1996 E&E MW-4 96-UMT-202-SB	1996 E&E MW-5 96-UMT-208-SB	1996 E&E MW-6 96-UMT-203-SB	1996 E&E MW-6 96-UMT-204-SB
Aroclor 1016	SW8080 Series	1 (Total PCBs)	AZDC	0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1221	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1232	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1242	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1248	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1254	SW8080 Series			0.000332	mg/kg	<0.0227	<0.0207	<0.0225	<0.0222	<0.0204	**<41.1**
Aroclor 1260	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
4,4'-DDD	SW8080 Series	7.2	MTG	0.01	mg/kg	<0.00227	<0.00207	0.000563 J	<0.00222	<0.00204	**29.0 JK**
4,4'-DDE	SW8080 Series	5.1	MTG	0.01	mg/kg	<0.00227	<0.00207	<0.00225	<0.00222	<0.00204	<4.11
4,4'-DDT	SW8080 Series	7.3	MTG	0.01	mg/kg	<0.00567	0.00173 J	0.00105 JL	<0.00554 UJL	<0.00509	**35.5 JK**
Endosulfan II	SW8080 Series	64	MTG	0.00001	mg/kg	—	—	—	—	—	—
Endosulfan sulfate	SW8080 Series	—	—	0.0358	mg/kg	—	—	—	—	—	—
Endrin	SW8080 Series	0.29	MTG	0.00004	mg/kg	—	—	—	—	—	—
Endrin aldehyde	SW8080 Series	—	—	0.0105	mg/kg	—	—	—	—	—	—

Table F-2d
Summary of Soil Sample Results - PCBs & Pesticides

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1996 E&E MW-6 96-UMT-205-SB	1996 E&E MW-7 96-UMT-209-SS	1996 E&E MW-7 96-UMT-210-SB	1996 E&E MW-8 96-UMT-211-SB	1996 E&E SB-44 96-UMT-199-SB	1996 E&E SB-45 96-UMT-200-SB
Aroclor 1016	SW8080 Series	1 (Total PCBs)	AZDC	0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1221	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1232	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1242	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1248	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1254	SW8080 Series			0.000332	mg/kg	**<41.5**	<0.0206	<0.0231	0.0418	<0.0207	<0.0207
Aroclor 1260	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
4,4'-DDD	SW8080 Series	7.2	MTG	0.01	mg/kg	**31.4 JK**	<0.00206	<0.00231	0.00192 J	<0.00207	<0.00208
4,4'-DDE	SW8080 Series	5.1	MTG	0.01	mg/kg	<4.15	<0.00206	<0.00231	<0.00208	<0.00207	<0.00208
4,4'-DDT	SW8080 Series	7.3	MTG	0.01	mg/kg	**38.2 JK**	<0.00516 UJL	<0.00579 UJL	0.00498 JL	0.000363 JL	0.00198 JL
Endosulfan II	SW8080 Series	64	MTG	0.00001	mg/kg	—	—	—	—	—	—
Endosulfan sulfate	SW8080 Series	—	—	0.0358	mg/kg	—	—	—	—	—	—
Endrin	SW8080 Series	0.29	MTG	0.00004	mg/kg	—	—	—	—	—	—
Endrin aldehyde	SW8080 Series	—	—	0.0105	mg/kg	—	—	—	—	—	—

Table F-2d
Summary of Soil Sample Results - PCBs & Pesticides

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1996 E&E SB-47 96-UMT-207-SB	1996 E&E SB-47 96-UMT-401-SS	1996 E&E SB-49 96-UMT-212-SB	1996 E&E SB-50 96-UMT-213-SS	1996 E&E SB-50 96-UMT-214-SB	1996 E&E SB-51 96-UMT-215-SB
Aroclor 1016	SW8080 Series	1 (Total PCBs)	AZDC	0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1221	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1232	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1242	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1248	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
Aroclor 1254	SW8080 Series			0.000332	mg/kg	0.224	<0.527	<0.0851	<0.240	<0.0212	<0.0221
Aroclor 1260	SW8080 Series			0.000332	mg/kg	—	—	—	—	—	—
4,4'-DDD	SW8080 Series	7.2	MTG	0.01	mg/kg	0.0306	0.0579 JK	0.0154 JH	0.0393	0.00219	<0.00221
4,4'-DDE	SW8080 Series	5.1	MTG	0.01	mg/kg	0.000619 J	<0.0527	<0.00851	0.000504 J	<0.00212	<0.00221
4,4'-DDT	SW8080 Series	7.3	MTG	0.01	mg/kg	0.0435 JL	0.376 JH	0.0423 JL	0.171 JL	0.0111 JL	0.00254 J
Endosulfan II	SW8080 Series	64	MTG	0.00001	mg/kg	—	—	—	—	—	—
Endosulfan sulfate	SW8080 Series	—	—	0.0358	mg/kg	—	—	—	—	—	—
Endrin	SW8080 Series	0.29	MTG	0.00004	mg/kg	—	—	—	—	—	—
Endrin aldehyde	SW8080 Series	—	—	0.0105	mg/kg	—	—	—	—	—	—

Table F-2d
Summary of Soil Sample Results - PCBs & Pesticides

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1997 E&E SB-182 97-UMT-117-SB	1997 E&E SB-183 97-UMT-118-SB	1997 E&E SB-184 97-UMT-120-SB	1997 E&E SB-185 97-UMT-121-SB	2001 Jacobs — UM-A110101
Aroclor 1016	SW8080 Series	1 (Total PCBs)	AZDC	0.000332	mg/kg	—	—	—	—	<0.11
Aroclor 1221	SW8080 Series			0.000332	mg/kg	—	—	—	—	<0.21
Aroclor 1232	SW8080 Series			0.000332	mg/kg	—	—	—	—	<0.11
Aroclor 1242	SW8080 Series			0.000332	mg/kg	—	—	—	—	<0.11
Aroclor 1248	SW8080 Series			0.000332	mg/kg	—	—	—	—	<0.11
Aroclor 1254	SW8080 Series			0.000332	mg/kg	—	—	—	—	**2.3**
Aroclor 1260	SW8080 Series			0.000332	mg/kg	—	—	—	—	<0.11
4,4'-DDD	SW8080 Series	7.2	MTG	0.01	mg/kg	0.0059	<0.0037	<0.0019	<0.0036	—
4,4'-DDE	SW8080 Series	5.1	MTG	0.01	mg/kg	—	—	—	—	—
4,4'-DDT	SW8080 Series	7.3	MTG	0.01	mg/kg	0.0065	<0.0037	<0.0019	<0.0036	—
Endosulfan II	SW8080 Series	64	MTG	0.00001	mg/kg	—	—	—	—	—
Endosulfan sulfate	SW8080 Series	—	—	0.0358	mg/kg	—	—	—	—	—
Endrin	SW8080 Series	0.29	MTG	0.00004	mg/kg	—	—	—	—	—
Endrin aldehyde	SW8080 Series	—	—	0.0105	mg/kg	—	—	—	—	—

Table F-2d
Summary of Soil Sample Results - PCBs & Pesticides

Notes:

H, J, K, L, U	Flags are carried over from the original reports, and in some cases were undefined. Refer to original report for flag definitions.
Column headings:	Event Location (LOCID) Sample ID
PCL	Chemical-specific Applicable or Relevant and Appropriate Requirements
TBC	To Be Considered, non-promulgated advisories, guidance, or proposed standards
mg/kg	milligrams per kilogram
MTG	18 AAC 75.341 (April 2012) - Method Two Tables B1 and B2 Soil Cleanup Levels: Migration to Groundwater
AZDC	18 AAC 75.341 (April 2012) - Method Two Tables B1 and B2 Soil Cleanup Levels: Arctic Zone Direct Contact
—	NoPCL/TBC was available for this analyte
<	Result is less than the listed reporting limit
bold	Result or reporting limit exceeds the PCL
bold shaded	Result exceeds PCL (regulatory exceedance)

Table F-2e
Summary of Soil Sample Results - Metals

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1994 E&E BH 11-1 94-UMT-135-SL	1994 E&E BH 11-1 94-UMT-136-SL	1994 E&E BH 11-1 94-UMT-137-SL	1994 E&E BH 11-1 94-UMT-138-SL	1994 E&E BH 11-1 94-UMT-139-SL	1994 E&E BH 11-2 94-UMT-142-SL
Aluminum	SW6000/7000 Series	—	—	50	mg/kg	—	—	—	—	—	—
Antimony	SW6000/7000 Series	3.6	MTG	0.142	mg/kg	—	—	—	—	—	—
Arsenic	SW6000/7000 Series	3.9	MTG	5.7	mg/kg	**5.0 J**	**4.0 J**	**4.4 J**	2.0 J	**6.0 J**	**4.0 J**
Barium	SW6000/7000 Series	1100	MTG	1.04	mg/kg	276 J	272 J	400 J	160 J	194 J	243 J
Beryllium	SW6000/7000 Series	42	MTG	1.06	mg/kg	—	—	—	—	—	—
Cadmium	SW6000/7000 Series	5	MTG	0.00222	mg/kg	<1.0	<1.0	<2.4	<1.0	<1.0	<1.0
Calcium	SW6000/7000 Series	—	—	—	mg/kg	—	—	—	—	—	—
Chromium	SW6000/7000 Series	25	MTG	—	mg/kg	13 J	12 J	13 J	5.0 J	7.0 J	8.0 J
Cobalt	SW6000/7000 Series	—	—	0.14	mg/kg	—	—	—	—	—	—
Copper	SW6000/7000 Series	460	MTG	5.4	mg/kg	—	—	—	—	—	—
Iron	SW6000/7000 Series	—	—	200	mg/kg	—	—	—	—	—	—
Lead	SW6000/7000 Series	400	AZDC	0.0537	mg/kg	7.0	7.0	6.6	3.0	8.0	5.0
Magnesium	SW6000/7000 Series	—	—	—	mg/kg	—	—	—	—	—	—
Manganese	SW6000/7000 Series	—	—	100	mg/kg	—	—	—	—	—	—
Mercury	SW6000/7000 Series	1.4	MTG	0.1	mg/kg	<0.20	<0.20	<0.10	<0.20	<0.20	<0.20
Nickel	SW6000/7000 Series	86	MTG	13.6	mg/kg	—	—	—	—	—	—
Potassium	SW6000/7000 Series	—	—	—	mg/kg	—	—	—	—	—	—
Selenium	SW6000/7000 Series	3.4	MTG	0.52	mg/kg	<1.0	<1.0	<0.60	<1.0	<1.0	<1.0
Silver	SW6000/7000 Series	11.2	MTG	2	mg/kg	<2.0	<2.0	<2.4	<2.0	<2.0	<2.0
Sodium	SW6000/7000 Series	—	—	—	mg/kg	—	—	—	—	—	—
Thallium	SW6000/7000 Series	1.9	MTG	0.0569	mg/kg	—	—	—	—	—	—
Vanadium	SW6000/7000 Series	960	AZDC	1.59	mg/kg	—	—	—	—	—	—
Zinc	SW6000/7000 Series	4100	MTG	6.62	mg/kg	—	—	—	—	—	—

Table F-2e
Summary of Soil Sample Results - Metals

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1994 E&E BH 11-2 94-UMT-143-SL	1994 E&E BH 11-2 94-UMT-144-SL	1994 E&E BH 11-3 94-UMT-145-SL	1994 E&E BH 11-3 94-UMT-146-SL	1994 E&E BH 11-3 94-UMT-147-SL	1994 E&E BH 11-4 94-UMT-148-SL
Aluminum	SW6000/7000 Series	—	—	50	mg/kg	—	—	—	—	—	—
Antimony	SW6000/7000 Series	3.6	MTG	0.142	mg/kg	—	—	—	—	—	—
Arsenic	SW6000/7000 Series	3.9	MTG	5.7	mg/kg	**4.0 J**	**4.0 J**	**5.0 J**	1.0 J	2.0 J	**7.0 J**
Barium	SW6000/7000 Series	1100	MTG	1.04	mg/kg	173 J	158 J	273 J	239 J	125 J	430 J
Beryllium	SW6000/7000 Series	42	MTG	1.06	mg/kg	—	—	—	—	—	—
Cadmium	SW6000/7000 Series	5	MTG	0.00222	mg/kg	<1.0	<2.4	<1.0	<1.0	<1.0	<1.0
Calcium	SW6000/7000 Series	—	—	—	mg/kg	—	—	—	—	—	—
Chromium	SW6000/7000 Series	25	MTG	—	mg/kg	6.0 J	6.0 J	10 J	4.0 J	5.0 J	23 J
Cobalt	SW6000/7000 Series	—	—	0.14	mg/kg	—	—	—	—	—	—
Copper	SW6000/7000 Series	460	MTG	5.4	mg/kg	—	—	—	—	—	—
Iron	SW6000/7000 Series	—	—	200	mg/kg	—	—	—	—	—	—
Lead	SW6000/7000 Series	400	AZDC	0.0537	mg/kg	5.0	4.0	6.0	2.0	3.0	10
Magnesium	SW6000/7000 Series	—	—	—	mg/kg	—	—	—	—	—	—
Manganese	SW6000/7000 Series	—	—	100	mg/kg	—	—	—	—	—	—
Mercury	SW6000/7000 Series	1.4	MTG	0.1	mg/kg	<0.20	<0.10	<0.20	<0.20	<0.20	<0.20
Nickel	SW6000/7000 Series	86	MTG	13.6	mg/kg	—	—	—	—	—	—
Potassium	SW6000/7000 Series	—	—	—	mg/kg	—	—	—	—	—	—
Selenium	SW6000/7000 Series	3.4	MTG	0.52	mg/kg	<1.0	<0.60	<1.0	2.0	1.0	<1.0
Silver	SW6000/7000 Series	11.2	MTG	2	mg/kg	<2.0	<2.4	<2.0	<2.0	<2.0	<2.0
Sodium	SW6000/7000 Series	—	—	—	mg/kg	—	—	—	—	—	—
Thallium	SW6000/7000 Series	1.9	MTG	0.0569	mg/kg	—	—	—	—	—	—
Vanadium	SW6000/7000 Series	960	AZDC	1.59	mg/kg	—	—	—	—	—	—
Zinc	SW6000/7000 Series	4100	MTG	6.62	mg/kg	—	—	—	—	—	—

Table F-2e
Summary of Soil Sample Results - Metals

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1994 E&E BH 11-4 94-UMT-149-SL	1994 E&E BH 11-4 94-UMT-150-SL	1994 E&E BH 11-5 94-UMT-151-SL	1994 E&E BH 11-5 94-UMT-152-SL	1994 E&E BH 11-5 94-UMT-153-SL	1994 E&E BH 11-6 94-UMT-154-SL
Aluminum	SW6000/7000 Series	—	—	50	mg/kg	—	—	—	—	—	—
Antimony	SW6000/7000 Series	3.6	MTG	0.142	mg/kg	—	—	—	—	—	—
Arsenic	SW6000/7000 Series	3.9	MTG	5.7	mg/kg	**6.0 J**	**5.0 J**	3.0 J	3.0 J	**4.0 J**	**4.0 J**
Barium	SW6000/7000 Series	1100	MTG	1.04	mg/kg	375 J	269 J	189 J	162 J	236 J	170 J
Beryllium	SW6000/7000 Series	42	MTG	1.06	mg/kg	—	—	—	—	—	—
Cadmium	SW6000/7000 Series	5	MTG	0.00222	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Calcium	SW6000/7000 Series	—	—	—	mg/kg	—	—	—	—	—	—
Chromium	SW6000/7000 Series	25	MTG	—	mg/kg	14 J	11 J	7.0 J	6.0 J	12 J	7.0 J
Cobalt	SW6000/7000 Series	—	—	0.14	mg/kg	—	—	—	—	—	—
Copper	SW6000/7000 Series	460	MTG	5.4	mg/kg	—	—	—	—	—	—
Iron	SW6000/7000 Series	—	—	200	mg/kg	—	—	—	—	—	—
Lead	SW6000/7000 Series	400	AZDC	0.0537	mg/kg	8.0	6.0	5.0	4.0	6.0	5.0
Magnesium	SW6000/7000 Series	—	—	—	mg/kg	—	—	—	—	—	—
Manganese	SW6000/7000 Series	—	—	100	mg/kg	—	—	—	—	—	—
Mercury	SW6000/7000 Series	1.4	MTG	0.1	mg/kg	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Nickel	SW6000/7000 Series	86	MTG	13.6	mg/kg	—	—	—	—	—	—
Potassium	SW6000/7000 Series	—	—	—	mg/kg	—	—	—	—	—	—
Selenium	SW6000/7000 Series	3.4	MTG	0.52	mg/kg	1.0	1.0	<1.0	2.0	<1.0	3.0
Silver	SW6000/7000 Series	11.2	MTG	2	mg/kg	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Sodium	SW6000/7000 Series	—	—	—	mg/kg	—	—	—	—	—	—
Thallium	SW6000/7000 Series	1.9	MTG	0.0569	mg/kg	—	—	—	—	—	—
Vanadium	SW6000/7000 Series	960	AZDC	1.59	mg/kg	—	—	—	—	—	—
Zinc	SW6000/7000 Series	4100	MTG	6.62	mg/kg	—	—	—	—	—	—

Table F-2e
Summary of Soil Sample Results - Metals

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1994 E&E BH 11-6 94-UMT-155-SL	1994 E&E BH 11-6 94-UMT-156-SL	1994 E&E BH 11-6 94-UMT-157-SL	1994 E&E BH 11-6 94-UMT-158-SL	1996 AGRA — 1639-06	1996 AGRA — 1639-08
Aluminum	SW6000/7000 Series	—	—	50	mg/kg	—	—	—	—	—	—
Antimony	SW6000/7000 Series	3.6	MTG	0.142	mg/kg	—	—	—	—	—	—
Arsenic	SW6000/7000 Series	3.9	MTG	5.7	mg/kg	3.0 J	3.0 J	**4.0 J**	**4.0 J**	3	**8**
Barium	SW6000/7000 Series	1100	MTG	1.04	mg/kg	181 J	158 J	274 J	223 J	—	—
Beryllium	SW6000/7000 Series	42	MTG	1.06	mg/kg	—	—	—	—	—	—
Cadmium	SW6000/7000 Series	5	MTG	0.00222	mg/kg	<1.0	<1.0	<2.1	<1.0	—	—
Calcium	SW6000/7000 Series	—	—	—	mg/kg	—	—	—	—	—	—
Chromium	SW6000/7000 Series	25	MTG	—	mg/kg	4.0 J	5.0 J	5.8 J	7.0 J	—	—
Cobalt	SW6000/7000 Series	—	—	0.14	mg/kg	—	—	—	—	—	—
Copper	SW6000/7000 Series	460	MTG	5.4	mg/kg	—	—	—	—	—	—
Iron	SW6000/7000 Series	—	—	200	mg/kg	—	—	—	—	—	—
Lead	SW6000/7000 Series	400	AZDC	0.0537	mg/kg	5.0	5.0	5.3	7.0	<20	<20
Magnesium	SW6000/7000 Series	—	—	—	mg/kg	—	—	—	—	—	—
Manganese	SW6000/7000 Series	—	—	100	mg/kg	—	—	—	—	—	—
Mercury	SW6000/7000 Series	1.4	MTG	0.1	mg/kg	<0.20	<0.20	<0.10	<0.20	—	—
Nickel	SW6000/7000 Series	86	MTG	13.6	mg/kg	—	—	—	—	—	—
Potassium	SW6000/7000 Series	—	—	—	mg/kg	—	—	—	—	—	—
Selenium	SW6000/7000 Series	3.4	MTG	0.52	mg/kg	<1.0	<1.0	<0.50	<1.0	—	—
Silver	SW6000/7000 Series	11.2	MTG	2	mg/kg	<2.0	<2.0	<2.1	<2.0	—	—
Sodium	SW6000/7000 Series	—	—	—	mg/kg	—	—	—	—	—	—
Thallium	SW6000/7000 Series	1.9	MTG	0.0569	mg/kg	—	—	—	—	—	—
Vanadium	SW6000/7000 Series	960	AZDC	1.59	mg/kg	—	—	—	—	—	—
Zinc	SW6000/7000 Series	4100	MTG	6.62	mg/kg	—	—	—	—	—	—

Table F-2e
Summary of Soil Sample Results - Metals

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1996 E&E MW-3 96-UMT-195-SS	1996 E&E MW-3 96-UMT-196-SB	1996 E&E MW-3 96-UMT-197-SB	1996 E&E MW-4 96-UMT-201-SS	1996 E&E MW-4 96-UMT-202-SB	1996 E&E MW-6 96-UMT-203-SB
Aluminum	SW6000/7000 Series	—	—	50	mg/kg	9280	2830	1700	3470	3900	1730
Antimony	SW6000/7000 Series	3.6	MTG	0.142	mg/kg	**<7.10 UJL**	**<5.60**	**<6.20 UJL**	**<5.80 UJL**	**<6.10 UJL**	**<5.80 UJL**
Arsenic	SW6000/7000 Series	3.9	MTG	5.7	mg/kg	**8.40 JK**	1.90	1.80 JK	**5.70 JK**	**5.10**	1.80 JK
Barium	SW6000/7000 Series	1100	MTG	1.04	mg/kg	552	164 JK	137	220	287 JK	102
Beryllium	SW6000/7000 Series	42	MTG	1.06	mg/kg	0.370 J	0.0700 J	0.0700 J	0.170 J	0.160 J	0.0700 J
Cadmium	SW6000/7000 Series	5	MTG	0.00222	mg/kg	<0.320 UJL	<0.250	<0.280 UJL	<0.260 UJL	<0.270 UJL	<0.260 UJL
Calcium	SW6000/7000 Series	—	—	—	mg/kg	4290	1240	718	1580	1620	736
Chromium	SW6000/7000 Series	25	MTG	—	mg/kg	19.2	8.50	4.00	6.10	8.30	3.20
Cobalt	SW6000/7000 Series	—	—	0.14	mg/kg	13.8	3.60	2.80	5.70	5.70	2.90
Copper	SW6000/7000 Series	460	MTG	5.4	mg/kg	31.4 JH	9.30 JK	7.20 JH	14.1 JH	14.4 JK	8.30 JH
Iron	SW6000/7000 Series	—	—	200	mg/kg	27800	7580	5590	12300	11800	5800
Lead	SW6000/7000 Series	400	AZDC	0.0537	mg/kg	10.9 JK	2.30 JK	3.00 JK	4.60 JK	5.60 JK	3.30 JK
Magnesium	SW6000/7000 Series	—	—	—	mg/kg	5170	1650 JK	828	1880	1990 JK	930
Manganese	SW6000/7000 Series	—	—	100	mg/kg	805	198	215	364	391	195
Mercury	SW6000/7000 Series	1.4	MTG	0.1	mg/kg	0.0400	<0.0200	<0.0200	<0.0200	0.0600 JH	<0.0200
Nickel	SW6000/7000 Series	86	MTG	13.6	mg/kg	38.5	10.6	9.00	17.8	17.4	9.40
Potassium	SW6000/7000 Series	—	—	—	mg/kg	912	305	227	336	489	185
Selenium	SW6000/7000 Series	3.4	MTG	0.52	mg/kg	<0.500	<0.390	<0.430	0.450 J	<0.430	<0.410
Silver	SW6000/7000 Series	11.2	MTG	2	mg/kg	<0.250 UJL	<0.200	<0.220 UJL	<0.210 UJL	<0.220 UJL	<0.210 UJL
Sodium	SW6000/7000 Series	—	—	—	mg/kg	<85.5	<66.7	<74.8	<70.2	<73.4	<69.7
Thallium	SW6000/7000 Series	1.9	MTG	0.0569	mg/kg	<0.360	<0.280	<0.320	<0.300	<0.310	<0.300
Vanadium	SW6000/7000 Series	960	AZDC	1.59	mg/kg	30.7	11.1 JK	5.80	13.7	12.5 JK	6.70
Zinc	SW6000/7000 Series	4100	MTG	6.62	mg/kg	121	21.4	47.9	59.5	39.6	40.2

Table F-2e
Summary of Soil Sample Results - Metals

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1996 E&E MW-6 96-UMT-204-SB	1996 E&E MW-6 96-UMT-205-SB	1996 E&E MW-7 96-UMT-209-SS	1996 E&E MW-7 96-UMT-210-SB	1996 E&E SB-47 96-UMT-401-SS	1996 E&E SB-50 96-UMT-213-SS
Aluminum	SW6000/7000 Series	—	—	50	mg/kg	2340	2530	4890	3040	2700	8060
Antimony	SW6000/7000 Series	3.6	MTG	0.142	mg/kg	**<5.00 UJL**	**<5.90 UJL**	**<5.50**	**<6.30**	0.950 J	**<6.30**
Arsenic	SW6000/7000 Series	3.9	MTG	5.7	mg/kg	2.60 JK	3.90 JK	**5.70**	3.50	3.90	**6.80**
Barium	SW6000/7000 Series	1100	MTG	1.04	mg/kg	140	187	264 JK	271 JK	200	537 JK
Beryllium	SW6000/7000 Series	42	MTG	1.06	mg/kg	0.0900 J	0.100 J	0.170 J	0.110 J	0.120 J	0.280 J
Cadmium	SW6000/7000 Series	5	MTG	0.00222	mg/kg	<0.220 UJL	<0.260 UJL	<0.240	<0.280	<0.250 UJL	<0.280
Calcium	SW6000/7000 Series	—	—	—	mg/kg	879	1360	1930	1350	2150	2670
Chromium	SW6000/7000 Series	25	MTG	—	mg/kg	5.10	5.00	8.70	9.60	6.90	16.0
Cobalt	SW6000/7000 Series	—	—	0.14	mg/kg	3.40	3.80	7.50	4.60	5.20	11.8
Copper	SW6000/7000 Series	460	MTG	5.4	mg/kg	10.9 JH	11.4 JH	16.5 JK	11.9 JK	12.2	24.7 JK
Iron	SW6000/7000 Series	—	—	200	mg/kg	7760	9010	16900	10400	12700	25000
Lead	SW6000/7000 Series	400	AZDC	0.0537	mg/kg	18.0 JK	25.2 JK	5.60 JK	4.00 JK	**598**	17.6 JK
Magnesium	SW6000/7000 Series	—	—	—	mg/kg	1250	1320	2490 JK	1510 JK	1380	4130 JK
Manganese	SW6000/7000 Series	—	—	100	mg/kg	229	240	461	357	805	737
Mercury	SW6000/7000 Series	1.4	MTG	0.1	mg/kg	<0.0200	<0.0200	0.0400 JH	0.0400 JH	<0.0200 UJL	0.0600 JH
Nickel	SW6000/7000 Series	86	MTG	13.6	mg/kg	12.3	13.2	22.2	15.5	14.7	33.3
Potassium	SW6000/7000 Series	—	—	—	mg/kg	227	278	473	340	281 J	756
Selenium	SW6000/7000 Series	3.4	MTG	0.52	mg/kg	<0.350	<0.410	<0.380	<0.440	<0.410	<0.440
Silver	SW6000/7000 Series	11.2	MTG	2	mg/kg	<0.180 UJL	<0.210 UJL	<0.200	<0.230	<0.210 UJL	<0.230
Sodium	SW6000/7000 Series	—	—	—	mg/kg	<60.4	<70.4	<65.5	<75.6	61.4 J	<76.2
Thallium	SW6000/7000 Series	1.9	MTG	0.0569	mg/kg	<0.260	<0.300	<0.280	<0.320	<0.290 UJL	<0.320
Vanadium	SW6000/7000 Series	960	AZDC	1.59	mg/kg	9.00	10.4	18.5 JK	11.0 JK	10.8 JH	26.8 JK
Zinc	SW6000/7000 Series	4100	MTG	6.62	mg/kg	39.6	64.7	51.0	35.3	32.0	78.9

Table F-2e
Summary of Soil Sample Results - Metals

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1996 E&E SB-50 96-UMT-214-SB	2001 Jacobs — UM-A110102
Aluminum	SW6000/7000 Series	—	—	50	mg/kg	3260	—
Antimony	SW6000/7000 Series	3.6	MTG	0.142	mg/kg	**<5.60**	—
Arsenic	SW6000/7000 Series	3.9	MTG	5.7	mg/kg	3.40	—
Barium	SW6000/7000 Series	1100	MTG	1.04	mg/kg	222 JK	—
Beryllium	SW6000/7000 Series	42	MTG	1.06	mg/kg	0.110 J	—
Cadmium	SW6000/7000 Series	5	MTG	0.00222	mg/kg	<0.250	—
Calcium	SW6000/7000 Series	—	—	—	mg/kg	1230	—
Chromium	SW6000/7000 Series	25	MTG	—	mg/kg	6.20	—
Cobalt	SW6000/7000 Series	—	—	0.14	mg/kg	4.70	—
Copper	SW6000/7000 Series	460	MTG	5.4	mg/kg	11.8 JK	—
Iron	SW6000/7000 Series	—	—	200	mg/kg	11100	—
Lead	SW6000/7000 Series	400	AZDC	0.0537	mg/kg	4.70 JK	**1170**
Magnesium	SW6000/7000 Series	—	—	—	mg/kg	1580 JK	—
Manganese	SW6000/7000 Series	—	—	100	mg/kg	286	—
Mercury	SW6000/7000 Series	1.4	MTG	0.1	mg/kg	<0.0200	—
Nickel	SW6000/7000 Series	86	MTG	13.6	mg/kg	14.9	—
Potassium	SW6000/7000 Series	—	—	—	mg/kg	396	—
Selenium	SW6000/7000 Series	3.4	MTG	0.52	mg/kg	<0.390	—
Silver	SW6000/7000 Series	11.2	MTG	2	mg/kg	<0.200	—
Sodium	SW6000/7000 Series	—	—	—	mg/kg	<67.2	—
Thallium	SW6000/7000 Series	1.9	MTG	0.0569	mg/kg	<0.290	—
Vanadium	SW6000/7000 Series	960	AZDC	1.59	mg/kg	12.3 JK	—
Zinc	SW6000/7000 Series	4100	MTG	6.62	mg/kg	33.5	—

Table F-2e
Summary of Soil Sample Results - Metals

Notes:

H, J, K, L, U	Flags are carried over from the original reports, and in some cases were undefined. Refer to original report for flag definitions.
Column headings:	Event Location (LOCID) Sample ID
PCL	Chemical-specific Applicable or Relevant and Appropriate Requirements
TBC	To Be Considered, non-promulgated advisories, guidance, or proposed standards
mg/kg	milligrams per kilogram
MTG	18 AAC 75.341 (April 2012) - Method Two Tables B1 and B2 Soil Cleanup Levels: Migration to Groundwater
AZDC	18 AAC 75.341 (April 2012) - Method Two Tables B1 and B2 Soil Cleanup Levels: Arctic Zone Direct Contact
—	No PCL/TBC was available for this analyte
<	Result is less than the listed reporting limit
bold	Result or reporting limit exceeds the PCL
bold shaded	Result exceeds PCL (regulatory exceedance)

Table F-3a
Summary of Sediment Sample Results - Fuels and Fuel-related Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1986 E&E 02SD	1996 E&E LA 96-UMT-230-SD	1996 E&E LB 96-UMT-232-SD	1996 E&E LC 96-UMT-224-SD	1996 E&E LC 96-UMT-225-SD	1998 E&E — 98-UMT-621-SD
Diesel range organics	AK 102	230	OFMTG	—	mg/kg	10	—	—	—	—	35 J,AH
Residual range organics	AK 103	8300	OFIG	—	mg/kg	—	31 JK	<50 UJK	14 JK	48 JK	—

Table F-3a
Summary of Sediment Sample Results - Fuels and Fuel-related Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1998 E&E — 98-UMT-622-SD	1998 E&E — 98-UMT-623-SD	1998 E&E — 98-UMT-624-SD	1998 E&E — 98-UMT-625-SD	1998 E&E — 98-UMT-626-SD	1998 E&E — 98-UMT-627-SD
Diesel range organics	AK 102	230	OFMTG	—	mg/kg	<2.3	<2.2	54 J,AH	10 J,AH	9.6 J	<2.7
Residual range organics	AK 103	8300	OFIG	—	mg/kg	—	—	—	—	—	—

Table F-3a
Summary of Sediment Sample Results - Fuels and Fuel-related Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1998 E&E — 98-UMT-628-SD	1998 E&E — 98-UMT-629-SD	1998 E&E — 98-UMT-630-SD	1998 E&E — 98-UMT-631-SD	1998 E&E — 98-UMT-632-SD	1998 E&E — 98-UMT-633-SD
Diesel range organics	AK 102	230	OFMTG	—	mg/kg	<2.5	<2.4	<2.3	12 J,AH	10 J,AH	<2.6
Residual range organics	AK 103	8300	OFIG	—	mg/kg	—	—	—	—	—	—

Table F-3a
Summary of Sediment Sample Results - Fuels and Fuel-related Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1998 E&E — 98-UMT-634-SD	1998 E&E — 98-UMT-635-SD	1998 E&E — 98-UMT-636-SD
Diesel range organics	AK 102	230	OFMTG	—	mg/kg	9.2 J,AH	18 J,AH	11 J,AH
Residual range organics	AK 103	8300	OFIG	—	mg/kg	—	—	—

Table F-3a
Summary of Sediment Sample Results - Fuels and Fuel-related Compounds

Notes:

AH, J, K	Flags are carried over from the original reports, and in some cases were undefined. Refer to original report for flag definitions.
Column headings:	Event Location (LOCID) Sample ID
PCL	Chemical-specific Applicable or Relevant and Appropriate Requirements
TBC	To Be Considered, non-promulgated advisories, guidance, or proposed standards
mg/kg	milligrams per kilogram
OFIG	18 AAC 75.341 (April 2012) - Method Two Tables B1 and B2 Soil Cleanup Levels: Over 40 Inch Zone, Ingestion
OFMTG	18 AAC 75.341 (April 2012) - Method Two Tables B1 and B2 Soil Cleanup Levels: Over 40 Inch Zone, Migration to Groundwater
—	No PCL/TBC was available for this analyte
<	Result is less than the listed reporting limit
bold	Result or reporting limit exceeds the PCL
bold shaded	Result exceeds PCL (regulatory exceedance)

Table F-5a
Summary of Groundwater Sample Results - Fuels and Fuel-related Compounds

Analyte	Analytical Method	PCL	PCL Source	TBC	Units	1996 E&E MW-3 96-UMT-349-GW	1996 E&E MW-4 96-UMT-332- GW	1996 E&E MW-5 96-UMT-333-GW	1996 E&E MW-6 96-UMT-334-GW	1996 E&E MW-7 96-UMT-335-GW	1996 E&E MW-7 96-UMT-351-GW
Gasoline range organics	AK 101	2.2	C	—	mg/L	<0.10	<0.10	0.12	0.76	<0.10	<0.10
Diesel range organics	AK 102	1.5	C	—	mg/L	0.18	**76**	0.34	**4.0**	0.22	<0.10

Analyte	Analytical Method	ARAR	ARAR Source	TBC	Units	1996 E&E MW-8 96-UMT-336-GW	1997 E&E MW-21 97-UMT-290-GW	1997 E&E MW-22 97-UMT-286-GW	1997 E&E MW-23 97-UMT-285-GW	1997 E&E MW-24 97-UMT-291-GW	1997 E&E MW-25 97-UMT-287-GW
Gasoline range organics	AK 101	2.2	C	—	mg/L	0.48	—	—	—	—	—
Diesel range organics	AK 102	1.5	C	—	mg/L	<0.10	<0.26	<0.25	<0.26	<0.25	<0.25

Analyte	Analytical Method	ARAR	ARAR Source	TBC	Units	1997 E&E MW-26 97-UMT-283-GW	1997 E&E MW-27 97-UMT-280-GW	1997 E&E MW-27 97-UMT-281-GW	1997 E&E MW-3 97-UMT-289-GW	1997 E&E MW-4 97-UMT-284-GW	1997 E&E MW-7 97-UMT-288-GW
Gasoline range organics	AK 101	2.2	C	—	mg/L	—	—	—	—	—	—
Diesel range organics	AK 102	1.5	C	—	mg/L	<0.25	<0.27	<0.26	<0.26	0.73	<0.25

Analyte	Analytical Method	ARAR	ARAR Source	TBC	Units	1998 E&E MW-22 98-UMT-804-GW	1998 E&E MW-23 98-UMT-803-GW	1998 E&E MW-24 98-UMT-800-GW	1998 E&E MW-7 98-UMT-801-GW	1998 E&E MW-7 98-UMT-802-GW	1999 E&E MW-23 99-UMT-002-GW
Gasoline range organics	AK 101	2.2	C	—	mg/L	—	—	—	—	—	—
Diesel range organics	AK 102	1.5	C	—	mg/L	<0.098	<0.098	<0.11	0.12 AE	0.15 AE	<0.105

Analyte	Analytical Method	ARAR	ARAR Source	TBC	Units	1999 E&E MW-24 99-UMT-001-GW	1999 E&E MW-7 99-UMT-003-GW
Gasoline range organics	AK 101	2.2	C	—	mg/L	—	—
Diesel range organics	AK 102	1.5	C	—	mg/L	0.0890	0.107

Table F-5a
Summary of Groundwater Sample Results - Fuels and Fuel-related Compounds

Notes:

AE	Flags are carried over from the original reports, and in some cases were undefined. Refer to original report for flag definitions.
Column headings:	Event Location (LOCID) Sample ID
PCL	Chemical-specific Applicable or Relevant and Appropriate Requirements
TBC	To Be Considered, non-promulgated advisories, guidance, or proposed standards
mg/L	milligrams per liter
C	18 AAC 75.345 (April 2012) - Table C Groundwater Cleanup Levels
—	No PCL/TBC was available for this analyte
<	Result is less than the listed reporting limit
bold	Result or reporting limit exceeds the PCL
bold shaded	Result exceeds PCL (regulatory exceedance)

APPENDIX G

BACKGROUND STATISTICAL COMPARISON – ARSENIC AND ALUMINUM IN SOIL AND SURFACE WATER

Table G-1
Background Statistical Comparison
Arsenic and Aluminum in Soil and Surface Water

Analyte	Medium	Sample Type	Concentration	Units
Arsenic	Soil	Site	5.0	mg/kg
Arsenic	Soil	Site	4.0	mg/kg
Arsenic	Soil	Site	4.4	mg/kg
Arsenic	Soil	Site	2.0	mg/kg
Arsenic	Soil	Site	6.0	mg/kg
Arsenic	Soil	Site	4.0	mg/kg
Arsenic	Soil	Site	4.0	mg/kg
Arsenic	Soil	Site	4.0	mg/kg
Arsenic	Soil	Site	5.0	mg/kg
Arsenic	Soil	Site	1.0	mg/kg
Arsenic	Soil	Site	2.0	mg/kg
Arsenic	Soil	Site	7.0	mg/kg
Arsenic	Soil	Site	6.0	mg/kg
Arsenic	Soil	Site	5.0	mg/kg
Arsenic	Soil	Site	3.0	mg/kg
Arsenic	Soil	Site	3.0	mg/kg
Arsenic	Soil	Site	4.0	mg/kg
Arsenic	Soil	Site	4.0	mg/kg
Arsenic	Soil	Site	3.0	mg/kg
Arsenic	Soil	Site	3.0	mg/kg
Arsenic	Soil	Site	4.0	mg/kg
Arsenic	Soil	Site	4.0	mg/kg
Arsenic	Soil	Site	3	mg/kg
Arsenic	Soil	Site	8	mg/kg
Arsenic	Soil	Site	8.40	mg/kg
Arsenic	Soil	Site	1.90	mg/kg
Arsenic	Soil	Site	1.80	mg/kg
Arsenic	Soil	Site	5.70	mg/kg
Arsenic	Soil	Site	5.10	mg/kg
Arsenic	Soil	Site	1.80	mg/kg
Arsenic	Soil	Site	2.60	mg/kg
Arsenic	Soil	Site	3.90	mg/kg
Arsenic	Soil	Site	5.70	mg/kg
Arsenic	Soil	Site	3.50	mg/kg
Arsenic	Soil	Site	3.90	mg/kg
Arsenic	Soil	Site	6.80	mg/kg
Arsenic	Soil	Site	3.40	mg/kg
Arsenic	Soil	Background	6.4	mg/kg
Arsenic	Soil	Background	5.2	mg/kg
Arsenic	Soil	Background	5.8	mg/kg
Arsenic	Soil	Background	4.0	mg/kg
Arsenic	Soil	Background	5.3	mg/kg

Table G-1
Background Statistical Comparison
Arsenic and Aluminum in Soil and Surface Water

Analyte	Medium	Sample Type	Concentration	Units
Arsenic	Soil	Background	4.7	mg/kg
Aluminum	Surface water	Site	0.0243 J	mg/L
Aluminum	Surface water	Site	<0.0239	mg/L
Aluminum	Surface water	Site	0.0302 J	mg/L
Aluminum	Surface water	Site	<0.0239	mg/L
Aluminum	Surface water	Site	0.136	mg/L
Aluminum	Surface water	Site	0.0242 J	mg/L
Aluminum	Surface water	Site	0.0330 J	mg/L
Aluminum	Surface water	Site	<0.0239	mg/L
Aluminum	Surface water	Background	<0.0240	mg/L
Aluminum	Surface water	Background	<0.0241	mg/L
Aluminum	Surface water	Background	<0.0242	mg/L
Aluminum	Surface water	Background	<0.0243	mg/L
Aluminum	Surface water	Background	0.0304 J	mg/L
Aluminum	Surface water	Background	0.167	mg/L
Aluminum	Surface water	Background	0.377	mg/L
Aluminum	Surface water	Background	0.385	mg/L

Notes:

mg/kg milligrams per kilogram
mg/L milligrams per liter
J estimated value

ProUCL 4.1 Output

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Full Data Sets without NDs

User Selected Options

From File	Sheet2.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: Arsenic_Project
Background Data: Arsenic_BKG

Raw Statistics

	Site	Background
Number of Valid Observations	37	6
Number of Distinct Observations	19	6
Minimum	1000	4000
Maximum	8400	6400
Mean	4132	5233
Median	4000	5250
SD	1735	835.9
SE of Mean	285.2	341.2

Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	758
WMW Test U-Stat	-1.98
WMW Critical Value (0.050)	1.645
P-Value	0.976

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Site <= Background
P-Value >= alpha (0.05)

ProUCL 4.1 Output

Wilcoxon-Mann-Whitney Site vs Background Comparison Test for Data Sets with Non-Detects

User Selected Options

From File	SW_Aluminum.wst
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference (S)	0
Selected Null Hypothesis	Site or AOC Mean/Median Less Than or Equal to Background Mean/Median (Form 1)
Alternative Hypothesis	Site or AOC Mean/Median Greater Than Background Mean/Median

Area of Concern Data: PS_Al
Background Data: BKG_Al

Raw Statistics

	Site	Background
Number of Valid Data	8	8
Number of Non-Detect Data	3	4
Number of Detect Data	5	4
Minimum Non-Detect	23.9	23.9
Maximum Non-Detect	23.9	23.9
Percent Non detects	37.50%	50.00%
Minimum Detected	24.2	30.4
Maximum Detected	136	385
Mean of Detected Data	49.54	239.9
Median of Detected Data	30.2	272
SD of Detected Data	48.48	172.3

Wilcoxon-Mann-Whitney Site vs Background Test
Wilcoxon-Mann-Whitney (WMW) Test

H0: Mean/Median of Site or AOC <= Mean/Median of Background

Site Rank Sum W-Stat	64
WMW Test U-Stat	28
WMW Critical Value (0.050)	48
Approximate P-Value	0.682

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Site <= Background