United States Army
Corps of Engineers

Formerly Used
Defense Sites Program

DECISION DOCUMENT

Hazardous, Toxic, and Radioactive Waste

Project # F10AK0243-08

Umiat Air Force Station
Formerly Used Defense Site

Umiat, Alaska

September 2019

F10AK024308_05.09_0001_a
1200C PERM

Prepared By:
U.S. Army Corps of Engineers - Alaska District
Environmental Engineering Branch
P.O. Box 6898
JBER, Alaska 99506-0898

[This page intentionally blank]

EXECUTIVE SUMMARY

This Decision Document (DD) presents the selected remedy for the Umiat Air Force Station (AFS) Formerly Used Defense Site (FUDS) Hazardous Toxic and Radioactive Waste (HTRW) project titled Umiat Landfill, Project Number F10AK0243-08. The selected remedy decision is based upon the Administrative Record for this site. The former Umiat AFS is located along the Colville River in the arctic foothills north of the Brooks Range, Alaska, approximately 105 miles southwest of Deadhorse, 170 miles southeast of Utqiaġvik (Barrow), and 65 miles southwest of Nuiqsut. The landfill is located partially on land owned by the Bureau of Land Management and partially on land owned by the State of Alaska, Department of Transportation and Public Facilities.

The Umiat Air Force Station property consists of eleven separate projects, five of which are currently open. The Umiat Landfill project addresses impacts associated with the approximately 8-acre Umiat AFS landfill located about one-half mile east of the Umiat AFS cantonment facilities, within a seasonal slough of the Colville River. The Umiat Landfill project represents 95% of the remaining liability at the Umiat AFS property. Additional open projects at the Umiat AFS property include Umiat Test Well 7, Umiat Test Wells 2, 4, 5, 6, 8, 10, 11; Umiat Main Pad and Airfield; and Umiat Test Well #9 Drainage. The overall cleanup strategy for the Umiat AFS property includes pursuing implementation of land use controls and/or no further action at the Umiat Test Wells 2, 4, 5, 6, 8, 10, 11, and Umiat Test Well #9 Drainage. Umiat Test Well 7 and Umiat Main Pad and Airfield will be addressed in the future after completing other open projects.

The Umiat Landfill is located in an intermittently flooded side drainage channel of the Colville River, a short distance east of the main Umiat facilities and runway. Records indicate the landfill was created during a 1973 site-wide demolition and cleanup effort by the Navy in which 409 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 over 7,000 drums hauled from the surrounding exploratory-well sites. The eight acre landfill includes six distinct debris cells. Based on geophysical surveys, the estimated depth of the buried debris ranges from 4 to 17 feet below ground surface, with an average depth of 14.5 feet. The estimated volume of debris is approximately 100,000 cubic yards. The landfill contains junk equipment, crane parts, scrap metal, and crushed steel drums. 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 that may have leaked and contaminated the underlying soils.

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) contaminants of concern (COCs) identified in soil include the pesticides 4,4' dichlorodiphenyltrichloroethane (DDT) and 4,4' dichlorodiphenyldichloroethane (DDD), as well as lead, and polychlorinated biphenyls (PCBs). CERCLA COCs present in groundwater include 1,1,2,2 tetrachloroethane, DDT and DDD. Petroleum hydrocarbon contamination also exists in soil and groundwater at the site above State of Alaska cleanup levels. Petroleum hydrocarbon contamination that is associated with the Umiat Landfill and commingled with CERCLA hazardous substances will be addressed under this DD.

The selected remedy is Alternative 7, which involves removal of the landfill from the Colville River channel, removal of PCB-contaminated sediments located near the landfill, onsite treatment (locally in Umiat) or offsite transportation and disposal of hazardous substances and contaminated soil/sediment, and disposal of inert debris and treated soils in an inert waste monofill located on the FUDS Property. The estimated cost of the remedy is approximately $160 million, including a remedial design phase of $4 million over two to three years. After the selected remedy is successfully implemented, unlimited use/unrestricted exposure will be achieved under CERCLA. Because the remedy is anticipated to take more than five years to implement, one CERCLA policy five-year review will be conducted within five years of the start of the remedial action construction phase to ensure the remedy is, or will be, protective of human health and the environment. The monofill will be visually inspected annually post-construction for five years for signs of erosion, inadequate vegetative cover, settlement or sidewall slumps, pooling of water, or other indications that maintenance is needed. One periodic review will be conducted to evaluate the closure of the monofill.

Other potential remedial alternatives considered include: No Action, Land Use Controls (LUCs); LUCs and Contaminated Hot Spot Sediment Removal; Containment, Capping, and LUCs; Excavation and On-Site Disposal; Excavation and Off-Site Disposal; Excavation, On-Site Disposal, and Off-Site Disposal; and Step-Wise Implementation of Interim Actions.

The remedy is protective of human health and the environment, and complies with Applicable or Relevant and Appropriate Requirements. Cumulative risk calculations indicate a human cancer risk of 8×10^{-3} and a non-cancer hazard index of 4. After implementation of the remedy, risks will be within the National Oil and Hazardous Substances Pollution Contingency Plan acceptable risk range of 1×10^{-4} to 1×10^{-6} and 1.

TABLE OF CONTENTS

ATTACHMENTS

Attachment A – Figures

ACRONYMS AND ABBREVIATIONS

ADEC	Alaska Department of Environmental Conservation
ADNR	Alaska Department of Natural Resources
ADOT&PF	Alaska Department of Transportation and Public Facilities
AFS	Air Force Station
AGC	Army Geospatial Center
ARAR	Applicable or Relevant and Appropriate Requirements
ASRC	Arctic Slope Regional Corporation
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
BLM	Bureau of Land Management
BNA	Base Neutral Acid Extractable Compounds
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
COC	Contaminant of Concern *or* Chemical of Concern
COPC	Contaminant of Potential Concern
COPEC	Contaminant of Potential Ecological Concern
CRE	Cumulative Risk Evaluation
CSM	Conceptual Site Model
EO	Executive Order
EPA	Environmental Protection Agency
DD	Decision Document
DDD	4,4'-dichlorodiphenyldichloroethane (4,4'-DDD)
DDE	4,4'-dichlorodiphenyldichloroethylene (4,4'-DDE)
DDT	4,4'-dichlorodiphenyltrichloroethane (4,4'-DDT)
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
DOI	United States Department of the Interior
DRO	Diesel Range Organics
EM	Electromagnetic
ERA	Ecological Risk Assessment
FAA	Federal Aviation Administration
FDA	Food and Drug Administration
FS	Feasibility Study
FUDS	Formerly Used Defense Site
GAC	Granular Activated Carbon
GRO	Gasoline Range Organics
HI	Hazard Index
HHRA	Human Health Risk Assessment
HTRW	Hazardous, Toxic and Radioactive Waste
INPR	Inventory Project Report
LUC	Land Use Control
MW	Monitoring Well
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPR-4	National Petroleum Reserve 4
NPR-A	National Petroleum Reserve Alaska
NPRPA	Naval Petroleum Reserves Production Act
NSB	North Slope Borough
PAH	Polynuclear Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls

PCL	Potential Cleanup Level
PIP	Public Information Plan
POL	Petroleum, Oil, and Lubricants
PP	Proposed Plan
PRG	Preliminary Remediation Goal
QRA	Qualitative Risk Assessment
RA-C	Remedial Action - Construction
RAB	Restoration Advisory Board
RAO	Remedial Action Objectives
RBC	Risk-Based Concentration
RBSL	Risk Based Screening Level
RD	Remedial Design
RI	Remedial Investigation
RRO	Residual Range Organics
SARA	Superfund Amendments and Reauthorization Act
SB	Soil Boring
SVOC	Semi-volatile Organic Compound
TBC	To Be Considered
TOC	Total Organic Carbon
TRPH	Total Recoverable Petroleum Hydrocarbons
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
USGS	U.S. Geological Survey
VOC	Volatile Organic Compound

UNIT ABBREVIATIONS

bcy	bank cubic yard(s)
cfs	cubic feet per second
cy	cubic yard(s)
°F	degree Fahrenheit
fps	feet per second
lcy	loose cubic yard(s)
mph	miles per hour
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
ppm	parts per million

1.0 DECLARATION

1.1 Site Name and Location

The Umiat Landfill, Formerly Used Defense Site (FUDS) project number F10AK0243-08, is located at the former Umiat Air Force Station (AFS) FUDS in Umiat, Alaska. The former Umiat AFS is located along the Colville River in the arctic foothills north of the Brooks Range, Alaska, approximately 105 miles southwest of Deadhorse, 170 miles southeast of Utqiaġvik (Barrow), and 65 miles southwest of Nuiqsut (see Figure 1).

The Umiat Landfill is located at approximately 69.363972 North latitude and 152.120876 West longitude, in Section 10, Township 1 South, Range 1 West, Umiat Meridian. The landfill is located partially on land owned by the Bureau of Land Management (BLM) and partially on land owned by the State of Alaska, Department of Transportation and Public Facilities (ADOT&PF) (see Figure 2). The property is not listed on the National Priorities List (NPL).

1.2 Statement of Basis and Purpose

This Decision Document (DD) presents the U.S. Army Corps of Engineers (USACE) selected remedy for the Umiat Landfill project, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and the National Oil and Hazardous Substances Pollution Contingency Plan (also known as the National Contingency Plan) (NCP). This decision is based upon the Administrative Record file for this site. The State of Alaska, through the Department of Environmental Conservation (ADEC), has fully participated throughout the process at this site. ADEC will provide a formal determination on the selected remedy under a separate cover.

1.3 Assessment of Site

This DD provides an overview of the Umiat Landfill site. It summarizes the site description, previous investigations, risk evaluation, study of remedy alternatives, and the selected remedial action. The remedy selected in this DD is necessary to protect the public health and welfare or the environment from actual and threatened releases of hazardous substances into the environment from soil, groundwater, and landfill contents. CERCLA contaminants of concern (COCs) include polychlorinated biphenyls (PCB), 4,4'-dichlorodiphenyldichloroethane (DDD), 4,4'-dichlorodiphenyltrichloroethane (DDT), lead, and 1,1,2,2 tetrachloroethane. Other identified COCs include petroleum hydrocarbons. Based on the inherent unknowns and heterogeneous nature of the Umiat Landfill, additional sampling and waste characterization will be conducted during the remedial action phase.

1.4 Description of Selected Remedy

The remedial action selected in this DD is protective of public health, welfare, and the environment. The selected remedy entails the following approach:

- The landfill contents will be removed from the Colville River channel and wastes will be properly disposed.
- Items containing hazardous substances such as batteries, transformers, drums with hazardous contents, etc. that cannot be treated onsite will be transported offsite (out of Umiat) for disposal at a permitted offsite disposal facility. Liquid waste (i.e., hazardous drum or transformer contents) that cannot be treated onsite will be containerized for transport and disposed at a permitted facility off-site.
- Water pumped from landfill excavations may be contaminated and will be treated prior to discharge. Additional details will be developed during the remedial design phase and coordinated with the state regulator during review of project work plans.
- An inert waste monofill will be established out of the Colville River floodplain within the boundaries of the Umiat AFS FUDS Property that is designed, constructed, operated and closed in accordance with Applicable or Relevant and Appropriate Requirements (ARARs) (see Section 2.15.1). Inert debris such as scrap metal, lumber, and other solid waste items will be placed into the monofill.
- Soil excavated from the landfill area will be sampled.
    - Overburden that is shown by sampling to be clean, may be used at the monofill, handling pad, or for road maintenance/upgrade as needed.
    - Excavated soil that is contaminated will be treated onsite (within the FUDS property), if feasible. Treated soil that meets cleanup levels may be used at the monofill or for road maintenance. Treated soil may also be used at the handling pad. If onsite treatment is not feasible, the soil will be transported offsite (out of Umiat) for disposal at a permitted facility.
    - The landfill excavation will be backfilled with clean borrow material.
- The landfill excavation will be sampled to determine if the soil cleanup goals are met. Soil that exceeds the cleanup levels for CERCLA contaminants will be removed by excavation. Petroleum contaminated soil that is commingled with CERCLA contaminants above cleanup levels will also be removed.
- Sediment containing PCB concentrations above the cleanup level in Table 2 was previously identified in a limited interval of the slough down-gradient of the landfill. The slough will be re-sampled to determine current PCB concentrations and distribution. PCB-contaminated sediment exceeding the Remedial Action Objective (RAO) will be removed and treated in Umiat, if feasible. If onsite treatment is not feasible, the soil will be transported offsite (out of Umiat) for disposal at a permitted disposal facility.
- Construction of a gravel handling pad area is expected to be necessary to provide room outside the seasonally flooded channel to conduct treatment, staging, segregating, sampling, and packaging of materials. The pad is expected to be located a short distance west of the landfill and administered like a

Temporary Unit. Additional details will be developed during the remedial design phase and coordinated with the state regulator during review of project work plans.

- Borrow material will be needed for constructing the handling pad, the monofill base and cover, and for road improvements and maintenance, and backfilling the landfill excavations.
- At least three groundwater sampling events will be conducted after the landfill removal to verify source removal has achieved the groundwater RAOs. Depending on the results of this sampling, a background study may be conducted to evaluate sampling results, and additional groundwater sampling events may be warranted until RAOs are met.
- The monofill will be visually inspected annually for five years for signs of erosion, inadequate vegetative cover, settlement or sidewall slumps, pooling of water, or other indications that maintenance is needed.
- A request will be made to BLM to annotate the Federal Master Title Plats and the Alaska State Department of Natural Resources Recorders Office land records with a notation that an inert waste monofill exists, including the types of waste placed, surveyed boundary, design, and final cover details.

Because the remedy is anticipated to take more than five years to implement, one CERCLA policy five-year review will be conducted within five years of the start of the remedial action construction phase to ensure the remedy is, or will be, protective of human health and the environment. One periodic review will also be conducted to evaluate the closure of the monofill.

1.5 Statutory Determinations

The Department of Defense (DoD) is authorized to carry out a program of environmental restoration at former military sites pursuant to the Defense Environmental Restoration Account (DERA), which authorizes the Defense Environmental Restoration Program (DERP) (10 USC 2701 et seq). Under this program, FUDS properties are defined as real property that was owned by, leased to, or otherwise possessed by the United States, under the jurisdiction of the DoD, and transferred from DoD control prior to 17 October 1986. The areas of concern identified at this site exhibit petroleum contamination and CERCLA-regulated substances within the same footprint (i.e., commingled).

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are ARARs (for CERCLA hazardous substances), are cost-effective, and utilize permanent solutions to the extent practicable. This remedy also satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment). USACE has determined the selected remedy represents the maximum extent to which treatment technologies can be used in a cost-effective manner at this site considering all factors.

After the selected remedy is successfully implemented, unlimited use/unrestricted exposure (UU/UE) will be achieved under CERCLA. Because the remedy is anticipated to take more than five years to implement, one CERCLA policy five-year review will be conducted within five years of the start of the remedial action construction phase to ensure the remedy is, or will be, protective of human health and the environment. The monofill will be visually inspected annually post-construction for five years for signs of erosion, inadequate vegetative cover, settlement or sidewall slumps, pooling of water, or other indications that maintenance is needed. One periodic review will also be conducted to evaluate the closure of the monofill.

1.6 Decision Document Data Certification Checklist

The following information is included in **Part 2.0,** Decision Summary:

- Identified COCs and their respective concentrations;
- Risk represented by the COCs;
- Cleanup levels established for identified COCs and the basis for these levels;
- Current and reasonably anticipated future land uses;
- Estimated remedy costs; and
- Key factors that led to remedy selection.

Authorizing Signature

This DD presents the selected remedy for the Umiat AFS FUDS Landfill. This DD will be incorporated into the Administrative Record for the Umiat AFS FUDS Property which is available for public review. This DD has been developed consistent with CERCLA, as amended, and the NCP. This DD, presenting a selected remedy with a present worth cost estimate of approximately $160 million is approved by the undersigned, pursuant to Memorandum CEMP-CED, SUBJECT: Interim Guidance Document (IGD) for the Formerly Used Defense Sites (FUDS) Decision Document (DD) Staffing and Approval, 9 February 2017, and to Engineer Regulation 200-3-1, FUDS Program Policy.

APPROVED:

Anthony C. Funkhouser

Date 27 SEP 19

ANTHONY C. FUNKHOUSER
Major General, US Army
Deputy Commanding General
for Military and International Operations

2.0 DECISION SUMMARY

This Decision Summary provides an overview of the conditions at the Umiat Landfill, FUDS project number F10AK0243-08. This section summarizes the site conditions and data from the Remedial Investigation (RI), describes the remedial alternatives considered in the Feasibility Study (FS), and describes the comparison of alternatives to the criteria set forth in the NCP. The Decision Summary explains the rationale for selecting the remedy, and how the remedy satisfies the statutory requirements of the CERCLA.

2.1 Site Name, Location, and Brief Description

The Umiat Landfill, FUDS project number F10AK0243-08, is located at the former Umiat AFS FUDS in Umiat, Alaska. The Umiat Landfill is located along the Colville River in the arctic foothills north of the Brooks Range, Alaska, approximately 105 miles southwest of Deadhorse, 170 miles southeast of Utqiaġvik (Barrow), and 65 miles southwest of Nuiqsut (see Figure 1).

The lead agency is the DoD through the Alaska District of USACE. The state agency is ADEC.

The geographical location of the Umiat AFS FUDS Property is within Sections 20, 21, 22, 27, 28, 29, 32, 33, and 34, Township 1 North, Range 1 West, and Sections 3, 4, 5, 8, 9, 10, 16, 17, Township 1 South, Range 1 West, of the Umiat Meridian and is shown on the U.S. Geological Survey (USGS) Umiat (B-4) Alaska quadrangle map. The Umiat FUDS Landfill is located in Section 10, Township 1 South, Range 1 West, of the Umiat Meridian.

The landfill is located at approximately 69.363972 North latitude and 152.120876 West longitude, approximately 0.5-mile east of the main Umiat facility. The landfill is located partially on land owned by the BLM and partially on land owned by the State of Alaska, ADOT&PF (see Figure 2). Site work for the selected remedy will be conducted on land owned by ADOT&PF and BLM. Transportation access to Umiat will cross land owned by the State of Alaska, Department of Natural Resources (ADNR), BLM, and Arctic Slope Regional Corporation (ASRC).

The landfill area covers approximately eight-acres within a seasonal flow channel of the Colville River (see Figure 2). Records indicate the landfill was used as a primary disposal location during a 1973 site-wide demolition and cleanup effort by the Navy. The cleanup involved disposal of 409 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 landfill, including over 7,000 drums hauled from surrounding exploratory-well sites. Based on geophysical surveys, the estimated maximum depth of the buried debris ranges from about 4 to 17 feet below ground surface (bgs), depending on location. The estimated volume of landfill contents is approximately 101,000 bank (in-place) cubic yards of material.

The landfill contains equipment, scrap metal, and crushed steel drums. Buried debris is known to include possible contaminant sources such as lead-acid batteries and transformers, and suspected to include other containers, including pesticide containers

2.0 DECISION SUMMARY

This Decision Summary provides an overview of the conditions at the Umiat Landfill, FUDS project number F10AK0243-08. This section summarizes the site conditions and data from the Remedial Investigation (RI), describes the remedial alternatives considered in the Feasibility Study (FS), and describes the comparison of alternatives to the criteria set forth in the NCP. The Decision Summary explains the rationale for selecting the remedy, and how the remedy satisfies the statutory requirements of the CERCLA.

2.1 Site Name, Location, and Brief Description

The Umiat Landfill, FUDS project number F10AK0243-08, is located at the former Umiat AFS FUDS in Umiat, Alaska. The Umiat Landfill is located along the Colville River in the arctic foothills north of the Brooks Range, Alaska, approximately 105 miles southwest of Deadhorse, 170 miles southeast of Utqiaġvik (Barrow), and 65 miles southwest of Nuiqsut (see Figure 1).

The lead agency is the DoD through the Alaska District of USACE. The state agency is ADEC.

The geographical location of the Umiat AFS FUDS Property is within Sections 20, 21, 22, 27, 28, 29, 32, 33, and 34, Township 1 North, Range 1 West, and Sections 3, 4, 5, 8, 9, 10, 16, 17, Township 1 South, Range 1 West, of the Umiat Meridian and is shown on the U.S. Geological Survey (USGS) Umiat (B-4) Alaska quadrangle map. The Umiat FUDS Landfill is located in Section 10, Township 1 South, Range 1 West, of the Umiat Meridian.

The landfill is located at approximately 69.363972 North latitude and 152.120876 West longitude, approximately 0.5-mile east of the main Umiat facility. The landfill is located partially on land owned by the BLM and partially on land owned by the State of Alaska, ADOT&PF (see Figure 2). Site work for the selected remedy will be conducted on land owned by ADOT&PF and BLM. Transportation access to Umiat will cross land owned by the State of Alaska, Department of Natural Resources (ADNR), BLM, and Arctic Slope Regional Corporation (ASRC).

The landfill area covers approximately eight-acres within a seasonal flow channel of the Colville River (see Figure 2). Records indicate the landfill was used as a primary disposal location during a 1973 site-wide demolition and cleanup effort by the Navy. The cleanup involved disposal of 409 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 landfill, including over 7,000 drums hauled from surrounding exploratory-well sites. Based on geophysical surveys, the estimated maximum depth of the buried debris ranges from about 4 to 17 feet below ground surface (bgs), depending on location. The estimated volume of landfill contents is approximately 101,000 bank (in-place) cubic yards of material.

The landfill contains equipment, scrap metal, and crushed steel drums. Buried debris is known to include possible contaminant sources such as lead-acid batteries and transformers, and suspected to include other containers, including pesticide containers

and containers with unknown contents. Contaminated soil and groundwater exist in the landfill volume. Debris observed at the landfill surface during recent site visits included batteries, transformers, scrap metal, wire, pipe, pipe fittings, drill bits, drum carcasses, and drill-rig tracks. Public meeting input has indicated that small arms ammunition was placed in the landfill. Hazardous substances are known to be present; contaminants have been detected above acceptable risk levels and regulatory limits in soil, sediment and groundwater within and in the vicinity of the landfill, and fish tissue collected from fish down-gradient of the landfill. Erosion of the landfill surface is an on-going process, and there is risk of the Colville River eroding to the landfill and eroding the landfill itself.

2.2 Site History

2.2.1 Umiat Land Ownership History

The former Umiat 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 Utqiaġvik (Barrow), and 65 miles southwest of Nuiqsut (see Figure 1). All land in Alaska was originally owned by the Federal Government as Alaska was purchased from Russia by the U.S. Government. The 23-million-acre National Petroleum Reserve-4 ((NPR-4) now NPR-A) was withdrawn from public domain in 1923, reserving the oil and gas resources within it for the exclusive use of the United States (U.S.) Navy (Navy). From 1945 to 1954, the Navy constructed facilities at Umiat for oil and gas exploration purposes. Improvements constructed at Umiat included living quarters, mess hall, latrines, shops, powerhouse, office, storage, and miscellaneous buildings, together with related utilities and gravel runway. Starting in 1946, the Navy established 11 oil exploration wells in the Umiat vicinity.

In 1953, the Navy issued a Right-Of-Entry to the 8,000-acre Umiat facility to the U.S. Air Force (USAF) for use as the Umiat AFS. By letter dated 23 December 1954, the Navy transferred the Umiat improvements to the USAF. The USAF's plans to construct an Aircraft Control and Warning Station at the site never materialized, and the Umiat AFS was declared excess and transferred back to the Navy in January 1959. By Deed dated May 1966, the U.S. conveyed to the State of Alaska, a 1,450 acre tract of the Umiat AFS referred to as the Umiat Airport. In 1973, the Navy conducted cleanup activities at Umiat and constructed the landfill within the gravel bars and old channels of the Colville River. 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 Reserves Production Act (NPRPA) of 1976.

The Umiat Airport tract of the former Umiat AFS is currently owned by the ADOT&PF. The ADOT&PF grants leases for buildings and space to the Federal Aviation Administration (FAA), BLM, and private interests. The remainder of the former Umiat AFS is owned by the U.S. and remains under the jurisdiction of DOI, BLM. ASRC owns land across the Colville River, east of the Umiat AFS.

2.2.2 Landfill History

The approximately eight-acre Umiat landfill is located about one-half mile east of the Umiat AFS cantonment facilities, within a seasonal slough of the Colville River. Records indicate the landfill was created during a 1973 site-wide demolition and cleanup effort by the Navy in which 409 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 landfill, including over 7,000 drums hauled from the surrounding exploratory-well sites.

In 1972, ADEC first identified environmental concerns at the former Umiat AFS with the discovery of a cache of pesticides (4,4’-DDT) in an old Navy warehouse at the site. 4,4’-DDT was historically used as an insecticide, though the actual use and application at Umiat is unknown.

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. The landfill has no surface markers indicating its location or boundaries.

In 1992, the ADEC received reports from Nuiqsut residents, hunting guides, and lessees working in the Umiat area that the old landfill was exposed by the Colville River, revealing batteries, transformers, and oil drums. Later that year, USACE performed a visual inspection of Umiat to update previous information and document additional areas at the site for further investigation, which resulted in the identification of 11 areas of concern.

2.3 Summary of Site and Remedial Investigations

USACE initiated the environmental investigation process at the former Umiat AFS in 1986 under the FUDS program. Since that time, multiple preliminary environmental investigations and site visits were conducted to identify and investigate the potential military sites associated with the former Umiat AFS. In 1994, an RI was conducted that included collection of surface and subsurface soil samples. Additional RIs were performed in 1996, 1997, and 2013. Environmental media sampled during these investigations included surface and subsurface soil, sediment, groundwater, surface water, and fish tissue.

The Colville River floods the landfill area annually, typically in spring and some years during the fall. Water velocities during these events can be high. Sand and gravel historically covering the landfill have been eroded and re-deposited, resulting in exposed landfill debris. These flood events have uncovered hazardous substances and inert solid wastes, and transported contamination off-site to downstream sediments.

Landfill-cover erosion and subsequent exposure of potentially contaminated debris and soil is an on-going process, likely to result in future releases of chemicals of potential concern (COPCs) to the environment.

2.3.1 1986 Hazardous Waste Sampling and Analysis

USACE initiated a hazardous waste sampling and assessment program at Umiat in 1986, under the FUDS Program. Analytical samples were collected from areas of obvious Petroleum, Oil, and Lubricants (POL) contamination and areas suspected to be heavily used, including the landfill east of the site, the subject of this document. At the landfill, USACE collected one sediment and one surface water sample at locations downstream (north) of the landfill in the seasonally flooded channel. The samples were analyzed for PCBs, pesticides, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and extraction procedure (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 Resource Conservation and Recovery Act (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 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 from the 2013 RI Report (see Attachment A) shows the approximate location of the two samples.

2.3.2 1994 Phase I RI

In 1994, USACE conducted RI work at Umiat AFS to determine the horizontal and vertical extent of soil contamination at the 11 areas identified during the 1992 site inspection, of which the landfill was designated Area 11. The boundaries of the landfill were investigated using electromagnetic (EM) geophysical survey. The EM survey resulted in an estimate of 67,000 cubic yards (cy) of buried metallic debris extending at least as deep as nine feet bgs.

Six shallow borings were drilled at the landfill outside the debris areas and two soil borings were drilled at background locations. The approximate locations of the six shallow borings at the landfill are shown in Figure 4-2 from the 2013 RI Report (see Attachment A). The landfill borings were drilled to six, nine, or ten feet bgs and did not encounter permafrost. Soils were logged as sand and gravel. Six surface and 12 subsurface soil samples were collected at the landfill. The soil samples were tested for fuel constituents, PCBs, pesticides, VOCs, and metals. Diesel Range Organics (DRO) and total recoverable petroleum hydrocarbons (TRPH) were detected in all the landfill borings. 4,4'-DDT was detected at the surface, two-foot, and ten-foot depth of the boring, ranging from 0.029 mg/kg to 0.050 mg/kg in one boring (BH 11-6).

2.3.3 1996 Phase II RI

In 1996, USACE conducted a Phase II RI at the former Umiat AFS. The Phase II 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). 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).

Surface soil and subsurface soil, groundwater and surface water, and sediment samples were collected at the landfill. Figure 4-3 from the 2013 RI Report (see Attachment A) shows the Phase II RI landfill sample locations.

A total of 12 soil borings were drilled at the landfill with six completed as monitoring wells (MW) (three temporary and three permanent wells). The borings were drilled to about nine feet bgs. Permafrost was reported to be discontinuous and variable from three feet to six feet bgs in the borings south of the road that crosses the landfill. Permafrost was not reported in borings north of the road. Soils in the upper nine feet were logged as sand and gravel. 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. 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 in soil at the groundwater interface (about 3 feet bgs). PCBs (Aroclor 1254) were also detected in soils at the groundwater interface in MW-8 and Soil Boring (SB)-47 (0.0418 mg/kg and 0.224 mg/kg, respectively). Gasoline Range Organices (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 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 RI monitoring wells. The three wells along the centerline of the seasonal channel 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 channel 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 from the 2013 RI Report; see Attachment A). The density of sampling points in the Phase II fieldwork did not delineate the extent of contamination, and further delineation was recommended.

2.3.4 1996 Environmental Site Assessment

An environmental site assessment of Umiat was performed by the North Slope Borough (NSB). A qualitative risk assessment was prepared addressing potential health risks to people who use the area, potential impacts to wildlife, and estimates of health risks from identified chemicals.

Based on interviews with knowledgeable sources and geophysical methods, the depth of the landfill was indicated to be at least 20 feet, and possibly 40 feet deep.

Of the 31 samples collected at the Umiat facility during the site assessment, nine were collected at the landfill: two sediment samples in the landfill area and one sediment sample downstream, two soil and a duplicate sample north of the landfill, and three surface water samples. Locations are shown in Figure 4-4 from the 2013 RI Report (see Attachment A). 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 collected from the seasonal stream at one foot bgs contained 0.3 mg/kg of the PCB Aroclor 1254. Lead was detected in one sediment sample at 22 mg/kg. Detected arsenic concentrations ranged from 3 mg/kg to 8 mg/kg.

2.3.5 1997 Phase III RI

In 1997, USACE conducted a 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 down-gradient 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 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 following tasks associated with the landfill were completed during the 1997 Phase III RI:

- 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 eight-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 one mile upstream for background purposes.

Figure 4-5 from the 2013 RI Report (see Attachment A) shows sample locations from the 1997 Phase III RI. Although upper soils in the landfill area were logged as sand and gravel, fine-grained soil was identified at MW-21 (silty clay at 17 feet bgs), MW-22 (silty clay at 20.5 feet bgs), SB-185 (silty clay at 30.5 feet bgs), and SB-187 (silty clay at 17.5 feet bgs).

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). The deepest sample analyzed for chemical parameters from the Phase III RI was collected at seven feet bgs.

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'-dichlorodiphenyldichloroethylene (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.

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.

2.3.6 1998 Field Investigation

USACE conducted additional field investigations at Umiat in 1998 to fill data gaps at locations previously investigated from 1994 through 1997. Follow-up tasks were performed 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 from the 2013 RI Report (see Attachment A) shows sample locations for the 1998 field investigation.

Four existing groundwater wells at the landfill 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. Sediments, surface water, and fish were tested 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. The report 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."

2.3.7 1999 Field Investigation

USACE conducted another site investigation at Umiat in August 1999, during which surface water samples were collected from the seasonal slough and groundwater samples were collected from monitoring wells at the landfill. Figure 4-7 from the 2013 RI Report (see Attachment A) shows sample locations at the landfill for the 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.

2.3.8 2013 RI Summary Report

A RI summary report was prepared in 2013 that compiled, evaluated, and summarized the prior sampling conducted at the Umiat Landfill into a single document. This report also summarized geophysical surveys conducted during prior work to delineate the boundaries of the landfill, and the risk assessments conducted to evaluate risk to human health and the environment. Many of the figures from the 2013 RI summary report are contained in Attachment A of this DD as supporting documentation. Figure 4-9 from the 2013 RI Report (see Attachment A) shows the approximate locations of all sampling conducted at and down-drainage from the landfill between 1986 and 1999.

2.3.9 2017 Groundwater Sampling

USACE conducted groundwater sampling in June 2017 at the landfill area. Five temporary well points were installed and sampled, along with four existing groundwater monitoring wells that remain useable at the landfill area. The pesticides 4,4' DDD, 4,4' DDE, 4,4' DDT, Heptachlor Epoxide, and Endosulfan I were detected in groundwater samples. Concentrations of heptachlor epoxide, and 4,4' DDD exceeded 2017 screening levels. Volatile organic compound 1,1,2,2-Tetrachloroethane also exceeded the 2017 screening level in the sample from well point WP-04. A variety of VOCs and SVOCs were identified at levels below the reporting limit (J-flagged concentrations). DRO was detected up to 0.18 mg/L. Figure 3 from the 2017 groundwater sampling report (see Attachment A) shows the locations of sampling and concentrations that exceeded 2017 screening levels.

2.4 Geophysical Surveys

Various technologies have been used to estimate the aerial extent and depth of buried waste in the Umiat landfill. The subsections below summarize the surveys conducted.

2.4.1 1994 Geophysical Survey

During the Phase I RI, USACE performed a geophysical survey at Area 11 (the landfill) to screen boring locations for buried debris that could interfere with drilling soil borings. A Geonics electromagnetic conductivity instrument (EM-31) was used to perform the survey. The horizontal extent of the landfill was delineated and an estimate was made of 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 nine 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. The delineation results are shown in Figure 4-10 of the 2013 RI Report (see Attachment A).

2.4.2 2005 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 distinct cells of buried debris (metallic waste and conductive waste). Figure 4-11 of the 2013 RI Report (see Attachment A) shows the results of the 2005 USGS geophysical investigation. The USGS estimated the maximum depths of five of the six cells to be between 40 and 43 feet bgs.

2.4.3 2011 Geophysical Survey

In April 2011, USACE conducted another geophysical survey of the Umiat Landfill using ground-penetrating radar (GPR), EM, and Global Positioning System (GPS) instrumentation. The purpose of the survey was to reconcile the maximum depths of debris cells reported in 1994 (depths to 18 feet bgs) with those reported by the USGS in 2005 (depths to 43 feet bgs). The data acquisition plan included collecting 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. Five of the six debris cell locations previously identified by the USGS were confirmed. Within the area of geophysical data acquisition, data anomalies were identified and the vertical and lateral extent of the landfill pits or former ground surface prior to burial of debris were determined. See Figure 4-12 from the 2013 RI Report (Attachment A).

During the survey, numerous high-value data anomalies (spikes) were observed outside previously identified 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.

The maximum depths of the debris cells were interpreted, based on GPR data, to range from 8 feet to 17 feet bgs depending on location.

2.5 Hydrologic Analysis of Umiat Landfill

2.5.1 2011 Hydrologic Analysis

The Umiat Landfill is subject to overland flow during flood events. The water velocity during these events can be high enough to erode the sand and gravel covering the landfill. There is concern that flood events will continue to expose hazardous substances and transport contamination downstream, particularly into areas used for subsistence fishing by the residents of Nuiqsut.

USACE performed a hydrologic analysis and identified potential interim measures to temporarily prevent erosion of landfill-cover materials until a long-term/permanent solution is decided. 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 cubic feet per second (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 4 to 6 feet per second (fps), high enough to mobilize sands and gravels covering the landfill.

2.5.2 2017 Hydrologic Analysis

Aerial imagery was analyzed from the period 1947 to 2016 to perform a qualitative analysis of erosion and channel migration trends in the Colville River at the Umiat Landfill. The Colville River at Umiat is a braided stream that drains a 13,860 square mile basin in the northern slopes of Brooks Range. The landfill site is located in a channel on the inside of a point bar to the southeast of the Umiat runway and main facilities pad. The landfill site is inundated annually during the spring flood. In general, the area occupied by the Umiat Landfill and runway includes many small lakes and sloughs, and review of imagery indicates the Colville River has previously occupied the entire Umiat Landfill area in the geologic past.

The USGS operates a stream gage on the Colville River at Umiat (station USGS 15875000) which reports instantaneous stage and stream flow data. Peak annual stream flow records are available from 2002 to 2016. Peak stream flows occur generally between May 24 and June 10 of each year with magnitudes ranging from 108,000 cfs to 268,000 cfs. In 2003, the peak stage was reported a day before the peak flow at the site indicating that ice jams may form downstream of the site. Due to the short period of record, no long term trend in peak annual flow was identified on the Colville River at Umiat.

Geo-rectified aerial imagery of the site was obtained from the Army Geospatial Center (AGC) covering the period from 1947 to 2016. For each image, the Colville River watercourse and the braid plain extents on the image were digitized. The watercourse

was defined as the inundated extents of the Colville River at the time of the image, which shows the flow path during normal, non-peak flow. The braid plain was defined at the extent cleared of vegetation due to movement of water in the river. The watercourse upstream of the site shows a northward migration trend toward the landfill site from 1955 to 2011.

Analysis of the braid plain extents was performed to evaluate the rate at which the river has migrated northward toward the site. While rates were found ranging from 5.6 to 35.5 feet per year, the long term trend and recent erosion rates were consistently found in the 10 to 14 feet per year range. The most recent average erosion rate from 1991 to 2016 was only 5.6 feet per year upstream of the site, but was 12.4 feet per year downstream of the site.

This analysis does not predict the impacts caused by events larger than those covered by the period of record, ice jams or river avulsions, any of which could occur in the future and alter the erosion characteristics of the site.

Future high flow events could potentially deposit sediment in a manner that would direct flow through the slough where the landfill is located which would erode downward through the existing material at the site as the channel develops. The likelihood of this occurring is not quantifiable and the potential for this process to cause erosion and distribute materials from the landfill remains a residual risk at the site.

The hydrologic analysis concluded the Colville River shows a historical trend of erosion of the north bank toward the landfill site. Historical erosion rates vary from 5.6 to 35.5 feet per year and were most consistently found in the range from 10 to 14 feet per year. Extrapolation of these rates indicated there is risk of bank erosion affecting the landfill site in the future. Other processes such as high flow events greater than those recorded at the site, ice jams or river avulsions also pose an erosion risk to the site with the potential to move material from the landfill downstream.

2.6 Landfill Inspections and Interim Removal Actions

2.6.1 2001 Removal Action

Site inspections of the landfill area were conducted in July and August 2001, and one small transformer and areas containing debris from lead-acid batteries were found on the landfill surface. The visible lead debris was removed and surrounding soil was excavated 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. USACE 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. Figure 4-8 from the 2013 RI Report (see Attachment A) shows the sample locations for the 2001 removal action.

2.6.2 Annual Landfill Inspections

USACE inspected the Umiat Landfill annually a total of eight times between 2010 and 2017. The purpose of the 2010 inspection was to check the status of the landfill. The purpose of subsequent inspections was to identify if spring flooding at the landfill had exposed hazardous substances. Each inspection included photographic documentation and GPS data collection. On two visits (2014 and 2016), batteries were found exposed after the spring flooding. These items were packaged, transported and recycled in Fairbanks, Alaska.

2.7 Enforcement History

RI and remedial work at the Umiat Landfill site has been carried out under the DERP-FUDS program. There have been no enforcement activities or notices of violation pertaining to the DoD activities at the Umiat Landfill.

2.8 Community Participation

Public participation has been an important component of the CERCLA process for the Umiat Landfill site. A Community Relations/Public Involvement and Response Plan was developed in 1996 to describe the measures used to meet the community relations goal of keeping nearby residents and other interested people informed about project activities. The Public Involvement Plan (PIP) was updated in 2015. The PIP outlines the goals of USACE's public involvement initiative, the strategy for informing and involving the public in the cleanup process, and how activities meet program objectives. Ongoing community relations activities have allowed the residents and other interested persons to provide feedback and comments on project activities, and encouraged everyone to become involved in the projects at Umiat Landfill.

Since project activities were initiated at the Umiat Landfill in the 1990's, multiple public meetings have been held in Nuiqsut, and Restoration Advisory Board (RAB) meetings have been held in Utqiaġvik (Barrow). Additional information about public relations activities is included in Section 3.0 Responsiveness Summary.

As part of ongoing efforts to keep the community apprised of project activities, USACE held a public meeting in Nuiqsut on 8 March 2018, during which USACE solicited interest in the creation of a RAB in Nuiqsut. Representatives of USACE also met with the Native Village of Nuiqsut to discuss the Proposed Plan (PP) for the Umiat Landfill in detail, and to gain helpful local knowledge regarding Umiat characteristics and subsistence resource uses. Project documentation, reports, and other materials are maintained in the information repository at the Native Village of Nuiqsut office in Nuiqsut, Alaska.

USACE received input from the community on current subsistence concerns, recreational activities, drinking water sources, industrial oil field development, and other potential uses of the Umiat Landfill vicinity. Multiple stakeholders and public comments received on the PP voiced their concerns with future subsistence activities, recreational opportunities, and industrial oil field development.

The public had the opportunity to review and comment on the PP from 12 February to 23 March 2018, with an extension to 23 April 2018. The PP was made available for review via the USACE Alaska District internet website, and at the information repository located in Nuiqsut, Alaska. Detailed responses to comments received on the PP are provided in Part 3 of this DD.

2.9 Scope and Role of the Response Action

The Umiat Landfill is one of several open projects at the Umiat AFS FUDS Property. This project addresses impacts associated with the approximately 8-acre Umiat Landfill located about one-half mile east of the Umiat AFS cantonment facilities, within a seasonal slough of the Colville River. Additional open projects at the Umiat AFS property include Umiat Test Wells 2-8, 10, 11; Umiat Main Pad and Airfield; Umiat Drum Mound; and Umiat Test Well #9 Drainage. Four additional projects within the Umiat AFS property have been completed including: 350 Barrels/Transformers, Test Well #9, Test Well #1, and Umiat Lake. The overall cleanup strategy for the Umiat AFS property includes pursuing project closeout and no further action at the Umiat Test Wells 2-8, 10, 11; Umiat Drum Mound; and Umiat Test Well #9 Drainage. The Umiat Main Pad and Airfield will be addressed in the future after completing other open projects.

2.10 Site Characteristics (Umiat Area)

This section provides an overview of the general area of Umiat, including geology, hydrology, climate, and ecological resources. A description of subsurface characteristics specific to the landfill site is included in a separate Section 2.11.

2.10.1 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 degrees Fahrenheit (^{o}F), and the average temperature in February drops to -24.4 ^{o}F. The average annual temperature is 10.7 ^{o}F.

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).

2.10.2 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 down-cut through the sandstone and shale, creating high vertical bluffs. The Umiat AFS main facilities pad and runway are built on alluvial deposits; there are no sandstone or shale outcrops near the landfill.

2.10.3 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 main facilities area, permafrost is ubiquitous in the subsurface and believed to extend to depths of 1,000 feet or more. The main 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.

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.

2.10.4 Surface Water Hydrology

Surface water occurs as rivers, streams, shallow ponds, and lakes near the former Umiat AFS. Some ponds are the result of prior gravel extraction as shown in historical aerial photography. 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 cfs 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 Umiat 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 channel between the former Umiat AFS and Colville River. The seasonal stream runs directly across the landfill surface. There is another seasonal stream located west of the landfill. This other channel merges with the channel of the landfill location 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.

The USGS measured discharge data for the Colville River at Umiat from August 2002 through the present day. The river gage (USGS 15875000) is on the left bank (facing downstream) of the river, at the upstream end of the seasonal stream in which the landfill is located. Peak flows in May and June during spring melt have been measured from 173,000 to 261,000 cfs.

No public water supply system exists in Umiat. Drinking water is obtained from the Colville River and hauled for use at the facilities. Other potential sources of drinking water include Seabee Creek, the largest tributary of the Colville River located northwest of the runway, and many of the shallow cutoff lakes on the river terraces bordering the river are potential water sources only during the summer since they are reported to freeze to their beds during the winter. Deepened lakes or excavated pits may be used to store surface water for year-round use. During the winter, snow and ice may also serve as sources of drinking water if effective heating and treatment methods are available.

2.10.5 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. 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.

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. Permafrost is believed to be continuous beneath the area, but the depth to the top of permafrost varies mostly because of thawing caused by surface features. For example, permafrost under developed areas, such as gravel pads and immediately adjacent to the Colville River, is generally deeper than in the undisturbed areas where the natural vegetation acts as an insulating layer. Soil boring logs from the 1994 and 1996 RIs showed 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.

The 1996 RI 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.

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.

Groundwater is in close hydrological connection with surface water at the landfill project site. The potential beneficial uses of groundwater resources include future use as drinking water. The groundwater is connected to surface water that is currently used as a drinking water source. At Umiat, no wells are known to have been drilled into suprapermafrost or subpermafrost aquifers to obtain potable water. Wells drawing groundwater from shallow unfrozen aquifers in the alluvial sediments of the Colville River may yield water of sufficient quantity and quality to supply drinking water locally. Shallow aquifers, when recharged by rivers, may be acceptable drinking water sources. Groundwater in deeper aquifers within and below the thick permafrost interval is often brackish and generally is not a suitable drinking-water source. The permafrost in the Umiat area extends from the base of the active layer to a depth of 1,000 feet or more. Bedrock aquifers within and below the permafrost interval are characterized by increasing concentrations of salinity and dissolved solids with depth. Groundwater from these aquifers is probably not a potable water supply.

2.10.6 Ecological Setting

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.

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.

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.

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.

2.10.7 Subsistence and Cultural Resources

Subsistence Activities

Primary subsistence resources for Nuiqsut residents are bowhead whales, caribou, fish, ptarmigan, and waterfowl and, of lesser importance, seals, musk oxen, and Dall sheep. 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). Subsistence hunters catch broad whitefish, arctic cisco, and arctic grayling in the Colville River.

The primary historic use of the area was subsistence hunting and fishing by the nomadic people of Anaktuvuk Pass, and residents of Wainwright and Utqiaġvik (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).

Historical and Cultural Resources

Intensive historic and archaeological surveys have been conducted in and around the Umiat airfield (SRB&A 2011; BLM 2013). There are 38 historic properties in and around Umiat that are listed on the Alaska Heritage Resources Survey (AHRS). These sites are comprised of both pre-contact archaeological sites in the form of lithic scatters and historic properties from historic oil exploration activities in the area. Historic properties in the general area include seven former Cold War-era Test Wells, five Naval Ordnance Laboratory (NOL) seismic monitoring huts, a historic Navy tent frame, and various antenna and communications equipment left by the Navy. The Umiat Oil Exploration Camp (UOEC) is considered a historic district with the buildings in the main camp contributing to the district as well as structures surrounding the camp and airfield. All test wells are considered eligible for the National Register of Historic Places (NRHP). Sites not eligible for the NRHP include a drum mound (northeast of the airfield), generator building, and tower. All other sites in the area listed in the AHRS have not been evaluated for eligibility for the National Register of Historic Places.

2.11 Umiat Landfill Site Characteristics

The Umiat Landfill is located in a seasonally flooded side channel of the Colville River; the landfill has no surface features indicating its location or boundaries, except for several locations of exposed debris. The channel extends about a half-mile before rejoining the Colville River. The northern extent of the channel is a slough, with water in the slough for about four months of the year, mainly after spring ice breakup and during

heavy rain events. This channel/slough is referred to as the seasonal stream in some references.

Investigation of subsurface lithology, groundwater, and permafrost conditions has been conducted to a limited extent down to the maximum depth and beyond the maximum depth of the landfill. The upper approximately 17 feet of soil in the channel containing the landfill is comprised of well-graded sandy gravel with cobbles, and well-graded gravelly sand, based on investigation conducted in 2017 and soil boring logs from the 1990s. Adjacent to the drainage channel, away from the higher energy flow area, sand and silty sand exist in the upper several feet.

Four soil borings from 1997 were logged showing silty clay encountered at depths ranging from 17.5 to 30.5 feet bgs. This fine-grained soil extended to the base of each of these borings. The deepest of these borings was 38 feet bgs, where “consolidated silty clay” was reported. These borings were drilled to investigate permafrost characteristics at the site. Fine-grained soil is expected to exist at depths varying from approximately 17 to 30 feet beneath the ground surface at the landfill area.

Spring flooding of the channel where the landfill is located brings energy into the clean sandy gravel and thaws the active layer to an estimated 11 feet or more bgs, based on soil boring logs from the 1990s. The depth of thaw is expected to vary by year and the time period during which spring flood water flows through the channel. The thickness of the active layer nearby, but outside, the channel area, in vegetated areas, was observed to be thinner than in the channel.

The southern extent of the landfill debris cells is located approximately 750 feet north of the north edge of the Colville River (2016). The thaw bulb of the Colville River is expected to exist at some depth beneath the landfill, possibly forming subpermafrost aquifer, depending on soil type. Permafrost at the landfill site may be a lens of frozen ground of limited thickness that has not been determined. The depth to the thaw bulb was not identified during 1990’s drilling, which extended to 38 feet bgs at the landfill.

2.12 Nature and Extent of Contamination at Umiat Landfill

Landfill debris includes batteries, transformers, drums, and other items containing hazardous substances that have the potential to continue to impact soil, sediment, groundwater, and surface water.

This section summarizes the remedial investigation results in comparison to risk-based screening levels (RBSLs).

2.12.1 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, lead-acid batteries, transformers, cable, pipe, and equipment tracks. Wastes remaining in the landfill are expected to 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. Based on input at public meetings conducted during March 2018, small arms ammunition may be found in the landfill.

The estimated burial depth ranges from 8 feet to 17 feet bgs, depending on location.

Based on the results of geophysical surveys and the estimated maximum depths from the 2011 survey, the total estimated volume of landfill debris cells is about 101,000 bank (in-place) cy.

2.12.2 Soil

Methylene chloride (at 0.019 mg/kg) was the only VOC detected above its soil screening 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 screening level and all but two detections were flagged (most likely as estimated values, though flags were not defined). Methylene chloride was removed as a COPC based on the fact it is a common laboratory contaminant and did not substantially contribute to risk at the site.

The highest detection of PCBs (specifically Aroclor 1254) in soil was 2.3 mg/kg, which exceeds a screening level 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 Potential Cleanup Level (PCL) of 1 mg/kg. PCBs are associated with transformers and electrical equipment at the landfill. PCBs are a COC at the Umiat landfill.

One soil sample and its field duplicate exceeded screening levels 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. Pesticides were also detected in groundwater at this location, indicative of a point source within the landfill. 4,4'-DDD and 4,4'-DDT are COCs at the Umiat landfill.

Arsenic was detected above screening levels (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 the background sample set. This suggests arsenic probably occurs naturally in the soils. Based on statistical comparison of project sample results to background results, and the natural abundance of this element in arctic soils, arsenic is not considered a COPC at the Umiat landfill.

Lead was detected in soil above screening levels at 598 mg/kg in sample *96-UMT-401-SS*, collected from SB-47 in 1996, 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. Lead is associated, at least in part, with lead-acid batteries in the landfill. Lead is a COC at the Umiat landfill.

Petroleum hydrocarbons were detected above screening levels (230 mg/kg) in one soil sample and field duplicate at 3 feet bgs during the installation of MW-6 in 1996. Three

background soil borings were also analyzed for petroleum hydrocarbons as diesel range organics in 1996. Soil concentrations ranged from 5.5 mg/kg to 16.7 mg/kg. Groundwater concentrations ranged from 0.1 to 0.26 mg/L, which did not exceed a screening level of 1.5 mg/L. The Umiat site has historically been extensively explored for oil resources and naturally occurring oil seeps have been observed in the area. Naturally occurring biogenic compounds can also mask laboratory analytical results characterized as fuels.

Soil contamination exceeding RBSLs appears to be associated with discrete items of buried debris (such as transformers or lead-acid batteries or leaking drums). 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.

Soil sampling at the landfill has been limited to the depth of frozen ground encountered. The extent of soil contamination beneath the landfill, and possibly adjacent to the landfill at the maximum depth has some uncertainty.

2.12.3 Sediment

Petroleum hydrocarbons (GRO, DRO, RRO), PAHs, and SVOCs were not detected in sediment above screening levels. 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 1 mg/kg in two samples. No other Aroclors were detected in sediment. The wider distribution in sediment may be due to leaching from point sources in the landfill followed by down-gradient sorption to sediment, though the highest detection in sediment (17.8 mg/kg, sample *96-UMT-232-SD* at location LB) was 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 screening levels 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 may be due to leaching from point sources in the landfill followed by down-gradient 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 screening 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, 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 screening level 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, 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 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.

The current sediment volume anticipated to be above the RAO of 1.0 mg/kg for PCBs is assumed to be 1,000 cy.

2.12.4 Surface Water

The results of sampling surface water in the seasonal stream/slough down-gradient from the landfill 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 screening level of 0.000014 mg/L and 0.000001 mg/L, respectively.

Lead and aluminum concentrations in surface water in 1996 exceeded screening levels. 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). There was no statistically significant difference between aluminum concentrations in project samples versus background samples. Aluminum is not considered a COPC at the Umiat landfill.

2.12.5 Groundwater

Groundwater is in close hydrological connection with surface water at the site, and groundwater results were compared to surface water screening levels. 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 the screening levels. Naphthalene (a PAH commonly associated with petroleum-related contamination) was detected above the RBSL, and thus included in the cumulative risk evaluation (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 a screening level 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 screening level of 0.000001 mg/L. 4,4'-DDT was not detected groundwater samples collected from in any other wells; however, the reporting limit for 4,4'-DDT was above the screening level in each case. Groundwater sampling conducted in 2017 detected 4,4'-DDD and 1,1,2,2-tetrachloroethane. 4,4'-DDD, 4,4'-DDT and 1,1,2,2-tetrachloroethane are considered COPCs in groundwater for the Umiat landfill.

PCBs were not detected in groundwater at the site; however, reporting limits for PCBs were above screening levels. PCBs may be present above the screening level of 0.000014 mg/L in surface water or groundwater at the site. However, the presence of

PCBs in surface water is not probable because PCBs do not readily dissolve in water. Contact with sediment may be the more significant exposure pathway between contaminated media and fish in the seasonal stream/slough.

2.12.6 Fish Tissue

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.

2.13 Conceptual Site Model

Conceptual Site Models (CSM) were prepared as part of the 2013 RI for humans and ecological receptors depicting potential sources of chemicals, release mechanisms, means of retention in or migration to exposure media, exposure routes, and receptors. The CSMs describe 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 of the 2013 RI, which are included in Attachment A.

2.13.1 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.

2.13.2 Exposure Media

Impacted media at the Umiat landfill include soil, sediment, and groundwater.

2.13.3 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 in the near term is soil/sediment transport during flood events that over-wash 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/slough 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.

In the longer term, erosion of the entire landfill by the Colville River is a migration pathway that could produce substantive release of COPCs to the environment.

Migration of contaminants through the subsurface could occur through the active layer 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 significantly 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.

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, and have the potential to be distributed by windblown dust. 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).

2.13.4 Current and Potential Future Land Uses

The human receptors and associated intake routes evaluated in the CSM are based on an evaluation of likely current and future uses of the site, based on discussions with the landowners, stakeholders, community, and tribal representatives. 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 (see Attachment A), 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 water that originates in surface soil.

The Umiat site is currently utilized for airport activities, commercial activities, local subsistence activities, as well as potential future oil exploration activities. The BLM's Integrated Activity Plan for the NPR-A, makes approximately 11.8 million acres available for oil and gas leasing, including the area surrounding Umiat. The Plan also establishes performance-based stipulations and best management practices which apply to activities with the NPR-A including leasing activities, exploration programs, proposed oil and gas development, potential pipelines, subsistence and wildlife issues and other related matters.

2.14 Summary of Site Risks

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 are summarized in the following sections.

2.14.1 1997 Human Health and Ecological Risk Assessment

USACE conducted a baseline human health risk assessment (HHRA) and baseline ecological risk assessment (ERA) in 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 the following:

- “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 risk range of the NCP.
- Potential excessive lifetime cancer risks and HIs for future residents were greater than the acceptable risk range of the NCP. 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.” The analytical results from the 1994 and 1996 remedial investigations were used in the analysis. The conclusions of the baseline HHRA included the following:

- 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 within the acceptable risk range of the NCP under current and future land-use conditions.
- Potential excess lifetime cancer risks and HIs associated with consumption of fish caught in the seasonal stream exceeded the acceptable risk range of the NCP; 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.

2.14.2 1998 Technical Memo: Human Health and Ecological Risk Assessment

The original *Baseline Human Health Risk Assessment* and *Ecological Risk Assessment* (1997) concluded human health risks from eating fish potentially containing Aroclor 1254 from the seasonal stream and ecological risks to piscivorous (fish-eating) organisms exceeded the acceptable risk range of the NCP; 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, USACE collected additional fish-tissue and sediment samples to better characterize the risks of Aroclor 1254. The March 1998 *Technical Memorandum, Human Health and Ecological Risk Assessment* recalculated the hazard quotient using maximum detected concentrations and concluded the following:

- 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 within the acceptable risk range established in the NCP.
- Potential excess lifetime cancer risks and HIs for potential future residents exceeded the acceptable risk range established in the NCP. This demonstrates risks associated with ingesting fish contaminated with Aroclor 1254 are limited to the Unit C seasonal stream and unacceptable risks are not present within the Colville River.

2.14.3 2001 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.

2.14.4 2003 Evaluation of PCBs and DDTs in the Colville River

In response to recommendations in the 2001 ATSDR Health Consultation, USACE conducted additional evaluations in August 2001, and studied whether burbot in the Colville River were being adversely affected by contaminants from the slough at the former Umiat AFS. USACE 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 following:

- 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.

2.14.5 2003 Critical Document Review by CHPPM

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 from 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.

2.14.6 2003 Health Consultation: Review of Burbot Samples

A Nuiqsut community member requested the ATSDR evaluate the 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).

2.14.7 Summary of Human Health Risk

Based on the current and reasonably expected future land use, recreational users, site visitors, site workers, and subsistence users could have exposure to chemicals in surface and subsurface soil, surface water, and groundwater. Furthermore, as the Colville River continues to migrate across the floodplain, significant erosion may result in catastrophic release of contamination into surface water and sediment. Impacts would extend downstream and affect additional subsistence resources. Possible exposure routes include incidental soil or sediment ingestion, inhalation of particulates, drinking groundwater or surface water, ingestion of fish, and dermal contact with surface water and sediment.

Soil, sediment, surface-water, and groundwater results were compared to risk-based screening levels. Fish-sample results were compared to calculated site-specific risk-based fish-screening levels.

Cumulative risk is defined as the sum of risks resulting from multiple sources and pathways to which humans are exposed. The pre-cleanup (current) cumulative risks were calculated during the RI. Additionally, the post-remediation cumulative risks were calculated in the FS, applying the human health cleanup levels as the “site concentrations” for applicable COCs that exceed these criteria. In a cumulative risk evaluation (CRE) of contaminants detected above one-tenth of their respective cleanup level, the carcinogenic risk posed to human health by these COCs was calculated.

The highest detected concentrations from historic sampling events were compared to risk-based screening levels based on a subsistence exposure scenario. The subsistence scenario assumes an exposure frequency and duration of 200 days/year (incidental soil ingestion), 350 days/year (drinking water), and a combined adult/child duration of 26 years. The following chemicals are considered carcinogenic by one or

more exposure pathways and contributed to cumulative cancer risk for the site: arsenic; PCBs (Aroclor 1254; 1260; and 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 hazard index (HI) for the site: arsenic; PCBs (Aroclor 1254; 1016/1242); 4,4'-DDD; 4,4'-DDT; and naphthalene. Arsenic in soil is likely attributable to natural (background) presence of the element in Arctic soil and was eliminated from further consideration as a COC. 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 indicated a human cancer risk of 8×10^{-3} and a non-cancer HI of 4. Both the cancer risk and HI exceed the NCP acceptable risk range of 1×10^{-4} to 1×10^{-6} and 1, respectively. Consequently, the response action selected in this Decision Document is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

2.15 Remedial Action Objectives

The COCs identified during the RI were further refined during the FS for the purpose of developing Preliminary Remediation Goals (PRGs) using the following considerations:

- No PRGs were developed for fish tissue (ATSDR found no harmful human health effects).
- No PRG was developed for methylene chloride. It was removed as a COPC (assumed as a lab contaminant and determined to not substantially contribute to cumulative risk at the site).
- No PRG was developed for arsenic in soil as it is likely attributable to natural (background) presence of the element in Arctic soil.
- DRO and naphthalene in groundwater exceed screening levels based on State regulations, however as petroleum constituents they are not regulated under CERCLA. These petroleum constituents are commingled with CERCLA contaminants. For this reason, the identified petroleum contamination in groundwater is brought forward and PRGs and RAOs are established. Reduction of petroleum hydrocarbon concentrations in groundwater would occur under alternatives that involve removal of the source landfill material. Mitigating petroleum in groundwater would be conducted to the extent that the petroleum is commingled with CERCLA contaminants.

2.15.1 ARARs

The detailed evaluation of remedial alternatives includes an analysis of the extent to which the alternatives comply with ARARs. Chemical-specific ARARs are shown in Table 1. Any potential remedial action that includes on-site waste disposal is subject to the requirements of the action-specific ARARs also shown in Table 1.

Table 1: ARARs			
Chemical-Specific ARARs			
Topic	**Chemical of Concern**	**Regulation/Requirements Citation**	**Description**
Soil Cleanup	4,4'-DDT, 4,4'-DDD, Lead, PCBs	Alaska Oil and Hazardous Substances Pollution Control Regulations (18 AAC 75.341(c); Table B1)	These state regulations provide soil cleanup levels for CERCLA constituents and provide the basis for the site cleanup levels.
Groundwater Cleanup	4,4'-DDT, 4,4'-DDD, 1,1,2,2 tetrachloroethane	Alaska Oil and Hazardous Substances Pollution Control Regulations (18 AAC 75.345; Table C)	These state regulations provide groundwater cleanup levels for CERCLA constituents and provide the basis for the site cleanup levels.
Action-Specific ARARs			
Topic	**Action**	**Regulation/Requirements Citation**	**Description**
Waste Disposal and Handling	On-Site Inert Waste Monofill	Alaska Solid Waste Management Regulations 18 AAC 60.410 (a) Location Standards 18 AAC 60.460 (e) Inert Waste 18 AAC 60.490 (c) Closure Demonstration and Post-Closure Care	18 AAC 60.410. Location standards. (a) May not be constructed on slopes greater than 10 percent grade or unstable soils that might cause the waste to slide or settle excessively. 18 AAC 60.460 (e) The owner or operator of an inert waste monofill shall construct a final cover of soil material at least 24 inches thick, graded to promote drainage without erosion, and shall revegetate it. 18 AAC 60.490 (c) …the owner or operator of a monofill shall conduct visual monitoring, for settlement and erosion, for at least 60 consecutive months immediately following the closure. *

AAC Alaska Administrative Code
* Visual monitoring will be conducted annually for 5 years

Alaska regulations provide methods to establish soil cleanup levels under Alaska Administrative Code (18 AAC 75), ranging from simple lookup tables to full human health and ecological risk assessments. The Umiat Landfill FS compared site data with Method Two Arctic Zone and migration to groundwater cleanup levels. Method Two is based on conservative assumptions regarding potential exposure and enables site cleanup to meet unlimited use and unrestricted exposure. Method Two Table B1 cleanup levels are being applied for addressing COCs under CERCLA.

The RI concluded impacted media at the Umiat Landfill includes soil, sediment, surface water, and groundwater. For the purpose of this DD, sediment is considered the same as soil, and the sediment exists within isolated pockets in and down-drainage of the landfill. Groundwater is in close hydrological connection with surface water at the site, and groundwater results were compared to the same risk based screening levels as surface water. For these reasons, the cleanup levels for surface water and groundwater have been merged together.

CERCLA soil COCs above ADEC Method Two Table B1 migration to groundwater or human health cleanup levels are provided in Table 2. CERCLA surface and

groundwater COCs above ADEC Table C Groundwater Cleanup Levels (18 AAC 75) are provided in Table 3.

Table 2: Cleanup Levels – CERCLA COC in Soil/Sediment		
COC	**Cleanup Level (mg/kg)**	**Range of Concentration (mg/kg)**
4,4'-DDD	0.098[1]	0.026 – 31.4
4,4'-DDT	5.1[1]	0.0325 – 38.2
Lead	400[2]	598 – 1,170
PCBs (total)	1[2]	1.3 – 17.8

mg/kg - milligrams per kilogram
[1] ADEC Table B1 Method Two Migration to Groundwater Cleanup Levels (18 AAC 75.341 (c)) (October 27, 2018)
[2] ADEC Table B1 Method Two Human Health Cleanup Levels, Arctic Zone (18 AAC 75.341 (c)) (October 27, 2018)

Table 3: Cleanup Levels – CERCLA COC in Groundwater		
COC	**Cleanup Level (mg/L)**	**Maximum Concentration (mg/L)**
4,4'-DDD	0.00006[1]	0.0173
4,4'-DDT	0.0023[1]	0.0311
1,1,2,2-tetratchloroethane	0.00076[1]	

mg/L - milligrams per liter
[1] ADEC Table C Groundwater Cleanup Levels (18 AAC 75.345) (October 27, 2018).

The following were identified as RAOs based on a refined list of known COCs to address contamination at the Umiat Landfill.

2.15.2 RAO for Landfill Contents

Buried debris, potentially containing hazardous substances, could continue to be exposed by seasonal or catastrophic flooding. Without the implementation of appropriate remedial actions, ongoing erosion of the landfill surface will continue to present an exposure risk. Based on analysis of Colville River hydrographic trends, bank erosion and channel migration impacting the landfill is also a concern for future stability of the buried debris and associated contaminated soil.

The following RAO is established to address the contents of the existing landfill.

- Remove landfill contents from the floodway of the river to prevent potential mobilization of contaminants that may exist in source material contained in landfill contents from impacting surface water, groundwater, soil, and sediment in the future.

2.15.3 RAOs for Soil/Sediment

RAOs for soil and sediment include the following:

- Minimize or prevent exposure of groundwater to concentrations of 4,4'-DDT in soil above 5.1 mg/kg to minimize or prevent groundwater contamination above 0.0023 mg/L.
- Minimize or prevent exposure of groundwater to concentrations of 4,4'-DDD in soil above 0.098 mg/kg to minimize or prevent groundwater contamination above 0.00006 mg/L.
- Minimize or prevent direct contact, outdoor inhalation, and ingestion of soil and sediment in excess of 1 mg/kg Total PCBs.
- Minimize or prevent direct contact, outdoor inhalation, and ingestion of soil in excess of 400 mg/kg of lead.
- Minimize or prevent exposure of groundwater to concentrations of DRO in soil above 230 mg/kg to minimize or prevent groundwater contamination above 1.5 mg/L.
- Minimize or prevent exposure of groundwater to concentrations of naphthalene in soil above 0.038 mg/kg to minimize or prevent groundwater contamination above 0.0017 mg/L.

2.15.4 RAOs for Groundwater

RAOs for groundwater include the following.

- Minimize or prevent ingestion of groundwater in excess of 0.00076 mg/L 1,1,2,2 tetrachloroethane, 0.00006 mg/L of 4,4'-DDD and 0.0023 mg/L 4,4'-DDT, or levels determined to be background, whichever is higher.
- Minimize or prevent ingestion of groundwater in excess of 1.5 mg/L DRO and 0.0017 mg/L naphthalene, or levels determined to be background, whichever is higher.

2.15.5 POL Cleanup Levels

State of Alaska regulations provide methods to establish soil cleanup levels for petroleum hydrocarbons under Alaska Administrative Code (18 AAC 75). Table 4 shows the soil cleanup levels and Table 5 shows groundwater cleanup levels for POL contaminants of concern at the Umiat Landfill.

Table 4: Cleanup Levels – Petroleum Hydrocarbons in Soil

COC	Cleanup Level (mg/kg)	Maximum Concentration (mg/kg)
DRO	230[1]	1,300
Naphthalene	0.038[1]	0.042

[1] ADEC Table B1/B2 Method Two Over 40 Inch Zone Migration to Groundwater Cleanup Level (18 AAC 75.341 (c)) (October 27, 2018). Over 40 Inch Zone used due to episodic channel flooding over landfill.

Table 5: Cleanup Levels – Petroleum Hydrocarbons in Groundwater		
COC	**Cleanup Level (mg/L)**	**Maximum Concentration (mg/L)**
DRO	1.5[1]	76.1
Naphthalene	0.0017[1]	0.350

mg/L - milligrams per liter

[1] ADEC Table C Groundwater Cleanup Levels (18 AAC 75.345) (October 27, 2018).

2.16 Description of Remedial Alternatives

The following eight alternatives were evaluated to address the contamination at Umiat Landfill FUDS.

- Alternative 1 – No Action
- Alternative 2 – Land Use Controls (LUCs)
- Alternative 3 – LUCs and Contaminated Hot Spot Sediment Removal
- Alternative 4 – Containment, Capping, and LUCs
- Alternative 5 – Excavation and On-Site Disposal
- Alternative 6 – Excavation and Off-Site Disposal
- Alternative 7 – Excavation, On-Site Disposal, and Off-Site Disposal
- Alternative 8 – Step-Wise Implementation of Interim Actions

2.16.1 Alternative 1 - No Action

Evaluation of the No Action alternative is required by CERCLA as a baseline to reflect current conditions where no remediation would take place, and for comparison and evaluation of the other alternatives. Soil, groundwater, and debris would be left in place without any response actions, such as monitoring, LUCs, removal, and treatment.

2.16.2 Alternative 2 - LUCs

Under Alternative 2, soil, sediment, and groundwater would be left in place without any active remedial actions, such as removal and treatment. LUC measures would include administrative notifications on proper handling of contaminated materials during construction, excavation, and/or disturbance of soil in the landfill area and contaminated sediment areas down-drainage, and notifications on using groundwater or surface water as a drinking water source. The landowners would be requested to record notices of environmental contamination in relevant case files, such as annotation in BLM Master Title Plat and ADOT&PF land occupancy drawings. Based on stakeholder meetings, the BLM does not object to implementing notices of environmental contamination in their real estate records. Continued coordination with ADOT&PF will occur regarding the method to record notices of environmental contamination on their property. LUCs may also include placement of warning signs near the site to alert site visitors of the landfill location and potential for contamination. Administrative controls would be phased out as natural degradation of contaminants occurs. LUCs would also include public education to provide stakeholders with enough knowledge to understand the nature of the contamination and avoid exposure to contaminated media. Activities may include mailing information packets to Nuiqsut, Anaktuvuk Pass, and Utqiaġvik residents and/or

presentations at RAB meetings. For cost estimate purposes, long term management is assumed to last for 30 years.

2.16.3 Alternative 3 - LUCs and Contaminated Hot Spot Sediment Removal

Alternative 3 includes three primary components: 1) LUCs implemented to protect human health at the landfill area; 2) construction of a material handling pad; and 3) removal and disposal of contaminated hot spot sediments identified down-drainage from the landfill. LUCs would be implemented as in Alternative 2. Contaminated sediments would be removed, with appropriate measures taken to prevent transport of re-suspended sediments. Excavated sediment would be transported to a handling pad and dewatered to separate waste streams prior to offsite disposal at a permitted disposal facility.

2.16.4 Alternative 4 - Containment, Capping and LUCs

This alternative includes five primary components: 1) contaminated hot spot sediment removal; 2) a subsurface vertical barrier constructed around the landfill footprint; 3) a reinforced landfill cap; 4) construction of slough blocks to limit flooding and reduce erosive energy of floodwater in the landfill area; and 5) LUCs implemented to protect human health at the landfill area. Contaminated hot spot sediments would be excavated and placed in the location of the landfill. Landfill contents would be isolated using the vertical barrier and cap, and the installation of slough blocks would reduce water velocities to prevent erosion of the containment structure. LUCs would include requesting that landowners record notices of the presence of the landfill material and groundwater contamination in casefiles including the BLM Master Title Plat and ADOT&PF land occupancy drawings, and signage may be placed at the site to alert site users of groundwater and surface water contamination in the landfill area.

2.16.5 Alternative 5 - Excavation and On-site Disposal

This alternative involves the excavation of landfill contents and contaminated hot spot sediments, segregating contaminated and non-contaminated material, and disposal of all contaminated materials and debris in a permitted lined containment cell (landfill) on-site at a location that is not at risk of erosion by the Colville River. The conceptual location of the landfill was near Seabee Pad north of the Umiat runway. Non-contaminated soil would be reused as backfill, if appropriate. After completion of the landfill excavation activities, at least three consecutive groundwater sampling events would be conducted to verify source removal achieved the groundwater RAOs.

2.16.6 Alternative 6 - Excavation and Off-site Disposal

This alternative involves the excavation and segregation of landfill contents (landfill debris, contaminated soils, and/or hazardous substances). All debris and contaminated soil/sediment would be transported and disposed in appropriate permitted offsite disposal facilities. Items containing hazardous substances such as transformers and batteries would be transported and disposed at an appropriate permitted facility in the lower 48 states. After completion of the landfill excavation activities, at least three consecutive groundwater sampling events would be conducted to verify source removal

achieved the groundwater remedial action objectives. Depending on evaluation of the results of the confirmation groundwater sampling, the site would be available for UU/UE under this alternative.

2.16.7 Alternative 7 – Excavation, On-site Disposal, and Off-site Disposal

This alternative involves excavating the contents of the landfill, segregating inert debris from hazardous substances, segregating excavated soil, disposal of inert debris in an inert waste monofill constructed in close proximity to the site but in an area not subject to erosion, and off-site disposal of hazardous substances and contaminated soils which cannot be treated onsite. Removal of contaminated sediments identified down-drainage from the landfill would also be included in this alternative. Excavated soil segregated from landfill contents would be sampled and characterized for waste treatment and disposal purposes. Overburden that is shown by sampling to be clean, may be used at the monofill, handling pad, or for road maintenance as needed. Contaminated soil and sediment would be transported off-site for disposal at an appropriate permitted facility or treated onsite (in Umiat). Treated soil which meets applicable cleanup levels may be reused onsite for handling pad areas, road maintenance, or fill material for the monofill.

This alternative involves construction of a single-use inert waste monofill located on the plateau north of the Umiat airstrip, or other appropriate location within the FUDS property that is not subject to erosion by the Colville River. The PP described Alternative 7 as establishing a freeze-back monofill atop the plateau north of Umiat. The detailed design requirements for the monofill will be developed during the remedial design phase and currently envision a non-freeze-back design.

After completion of the landfill excavation activities, at least three consecutive groundwater sampling events would be conducted to verify source removal achieved the groundwater remedial action objectives. Depending on evaluation of the results of the confirmation groundwater sampling, the former landfill site would be available for UU/UE under this alternative.

2.16.8 Alternative 8 - Step-Wise Implementation of Interim Actions

This alternative involves the implementation of interim actions with progressively increasing levels of environmental protection in steps to be phased over several years. Immediate action would be taken to establish land use controls as described in Alternative 2. The next phase would be hot spot sediment removal, dewatering, and disposal off-site as described in Alternative 3. Lastly, the final response action would include excavation and full off-site disposal of the landfill contents as described in Alternative 6.

2.17 Comparative Analysis of Alternatives

The Environmental Protection Agency (EPA) has developed nine criteria to evaluate remedial alternatives and ensure all important considerations are factored into remedy selection decisions. The first step of remedy selection is to identify those alternatives that satisfy the threshold criteria, which are two statutory requirements that any alternative must meet in order for it to be eligible for selection. The second step is to

examine the five primary balancing criteria, which are used to identify major trade-offs between remedial alternatives. After considering the balancing criteria, the third step is to consider the modifying criteria, which are considered after the formal public comment period on the PP. The balancing and modifying criteria are used to identify the preferred alternative and to select the final remedy.

2.17.1 Threshold Criteria

The first threshold criteria is overall protection of human health and the environment, which addresses whether or not a remedy provides adequate protection and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls. The second criteria is compliance with ARARs, which addresses whether a remedy will meet all the identified requirements or whether a waiver can be justified.

2.17.2 Primary Balancing Criteria

The first primary balancing criteria is long-term effectiveness and performance, which refers to the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met. The second criteria is reduction of toxicity, mobility, or volume through treatment, which is the anticipated performance of the treatment technologies a remedy may employ. The third criteria is short-term effectiveness, which addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until cleanup goals are achieved. The fourth criteria is implementability, which evaluates the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option. The fifth primary balancing criteria is cost, which includes estimated capital and operation and maintenance costs, and net present worth costs.

2.17.3 Modifying Criteria

The first modifying criteria is State Acceptance, which considers the State's views on the alternatives evaluated. The second criteria is community acceptance, which refers to the public's general response to the alternatives described in the PP.

2.17.4 Comparative Analysis

An FS was conducted in 2015 to evaluate a variety of possible remedial alternatives for the Umiat landfill. Alternatives were evaluated against CERCLA's threshold, balancing, and modifying criteria, and were compared against one another regarding advantages and disadvantages, to arrive at a refined set of likely alternatives for further consideration. In 2017, the two most likely remedies (Alternatives 6 and 7) were further evaluated to support selection of a preferred remedy for development of a PP. Table 7 graphically shows the relative performance of the alternatives evaluated for the threshold and primary balancing criteria, including the estimated costs of each alternative.

TABLE 7: COMPARATIVE ANALYSIS OF ALTERNATIVES BASED ON 2015 FS									
		1*	2*	3*	4	5	6	7	8
Evaluation Criteria		No Action	Land Use Controls	Land Use Controls / Hot Spot Sediment Removal	Containment & Capping	Excavation and On-Site Disposal	Excavation and Off-Site Disposal	Excavation, On-Site and Off-Site Disposal	Step-Wise Interim Actions with Disposal Alternatives
THRESHOLD (Pass/Fail)	Overall Protection of Human Health and the Environment	○	○	○	●	●	●	●	●
	Compliance with applicable or relevant and appropriate requirements	○	○	○	●	●	●	●	●
BALANCING	Long-Term Effectiveness and Permanence	○	◗	◗	◗	◗	●	●	●
	Reduction in Toxicity, Mobility, and Volume Through Treatment	○	○	○	○	○	○	◗	○
	Short-Term Effectiveness	○	◗	◗	●	●	●	●	◗
	Implementability	○	●	●	◗	◗	◗	◗	◗
	Cost	$0	$383 K	$66 M	$124 M	$155 M	$368 M	$224 M	$401 M[1]

Key For Threshold Criteria: ○ = does not meet criteria ● = meets criteria
Key For Balancing Criteria: ○ = low ◗ = medium ● = high
* Does not meet the threshold criterion, therefore it is not eligible for selection as a remedy.
[1] Includes elements of Alternatives 2, 3 and 6. All costs based on 2015 Feasibility Study.
K = Thousand M = Million

The eight alternatives were first evaluated against the threshold criteria as part of the CERCLA process. As shown in Table 7, Alternatives 1, 2, and 3 did not meet the threshold criteria and were eliminated from further consideration.

The remaining five alternatives were then evaluated against the primary balancing criteria under the CERCLA process. Alternative 8 was removed from further consideration because it merely represents an approach for implementation of the other alternatives, and it was estimated to have the highest overall cost. This resulted in four remaining alternatives for consideration; Alternatives 4, 5, 6, and 7.

Alternatives 4, 5, 6, and 7 were re-evaluated against the Balancing Criteria as shown in Table 8.

TABLE 8: RE-EVALUATION OF ALTERNATIVES AGAINST BALANCING CRITERIA

	Evaluation Criteria	4 Containment & Capping	5 Excavation and On-Site Disposal	6 Excavation and Off-Site Disposal	7 Excavation, On-Site and Off-Site Disposal
BALANCING	Long-Term Effectiveness and Permanence	◗	◗	●	●
	Reduction in Toxicity, Mobility, and Volume Through Treatment	○	○	○	◗
	Short-Term Effectiveness	●	●	●	●
	Implementability	◗	◗	◗	◗
	Estimated Cost ($M)	$124 M	$155 M	$368 M	$224 M

Key: ○ = low ◗ = medium ● = high

One balancing criteria, Reduction in Toxicity, Mobility, and Volume through Treatment, was rated medium for Alternative 7 since treatment onsite will be considered if feasible for the contaminated soil. The other alternatives do not involve elimination of the chemical contaminants; instead they involve containment of the contaminants or movement of the contaminants from one place to another place.

Two balancing criteria appeared equal for each of the four remaining alternatives. First, all four alternatives were considered to have high Short Term Effectiveness and were expected to meet remedial goals within a short duration because they physically isolate the contaminants and debris or they move the contaminants and debris away from the intermittently flooded river channel to other locations/landfills. The overall volume of waste leaving Umiat is reduced by segregating materials under Alternatives 6 and 7, and especially by directing inert debris and treated soils to a nearby monofill under Alternative 7. This volume reduction saves space in offsite permitted disposal facilities. The overall quantity of chemicals is further reduced through treatment under Alternative 7.

Finally, all four alternatives were evaluated as medium for the Implementability criteria. The primary reasons are the remoteness of the project site (located about 100 miles from the nearest road), the short construction seasons, intermittent flooding of the channel containing the landfill, transportation challenges and the difficulty of constructing physical barriers or removing contents of a landfill with the anticipated permafrost and groundwater challenges.

Removing the two balancing criteria having equal results for each of the four remaining alternatives from further discussion left three remaining differentiating balancing criteria;

Reduction in Toxicity, Mobility, and Volume through Treatment, Long Term Effectiveness and Permanence, and Cost. The following discussion focuses on the four alternatives and these three differentiating criteria.

Alternative 4 involved leaving the landfill contents in place, containing the landfill inside a surrounding wall of auger-cast piles keyed into permafrost, and capping the landfill in a manner sufficient to resist erosion during annual flooding events. Alternative 4 also involved removing impacted PCB sediments above cleanup levels that are located down-gradient in the channel and placing them in the containment structure. Alternative 4 initially met the threshold criteria, resulting in a permanent, protective structure within the existing channel. Long Term Effectiveness and Permanence is a primary differentiating factor for Alternative 4. Alternative 4 would not remove the source of groundwater contamination and therefore would not address the groundwater RAOs as effectively as other alternatives. Furthermore, analysis of historical imagery shows that the Colville River watercourse is migrating northward toward the landfill. In addition to moving northward, the Colville River is capable of very high flow events, ice jams or river avulsions. Although an engineered containment structure with cap could be expected to mitigate the effects of seasonal flooding in the channel containing the landfill, it would not be expected to withstand the full force of the Colville River when the river migrates to the landfill as a result of erosion over time or a sudden river avulsion event. Under Alternative 4, remedy failure would be expected to occur at some time in the future. Consequently, Alternative 4 is not considered to have Long Term Effectiveness and Permanence. Alternative 4 was therefore removed from further consideration.

Alternatives 5, 6, and 7 involve removal of the landfill material from the current location in the drainage channel that continues as a source or potential source of groundwater contamination. Therefore, when combined with groundwater monitoring after landfill removal, Alternatives 5, 6, and 7 substantively address the groundwater RAOs.

Alternative 5 involves excavation of landfill contents and contaminated hot spot sediments, and disposal of all debris and contaminated materials in a new lined permitted landfill on-site in Umiat. The conceptual location was near Seabee Pad north of the Umiat runway near the lower edge of the south side of the mountain front. This location is well away from the current Colville River watercourse, and roughly 35 feet higher in elevation than the river (depending upon location). This location is, however, still within the lower Umiat area as opposed to high atop the plateau north of Umiat. The location has the potential to be susceptible to a major Colville River channel change. Review of aerial photography clearly shows that the Colville River watercourse has existed north of the Umiat runway during the geologic past. Alternative 5 has greater Long Term Effectiveness and Permanence than Alternative 4, however it ranks lower than Alternatives 6 and 7 in this criteria.

Because Alternative 5 involves onsite (Umiat) placement of all excavated material, including highly contaminated materials, there is greater future risk and liability for the FUDS Program associated with Alternative 5. The importance of careful long term maintenance is also greater when compared to Alternative 7, which primarily involves placement of inert debris in a monofill. Future risks from contaminated soil, for example,

as a result of a landfill sidewall or liner breach has more significant ramifications than exposure of inert debris such as scrap metal. Alternative 5 was therefore removed from further consideration.

Alternatives 6 and 7 are considered preferable to the other alternatives, with cost being the most significant differentiating factor. Alternative 7 also rates higher based on the Reduction in Toxicity, Mobility, and Volume through Treatment factor since onsite treatment will be incorporated as feasible before disposal of treated soil in the monofill or an offsite permitted disposal site. A Feasibility Study Addendum was developed in 2017 in order to refine cost information based on coordination with landowners and further analysis of implementation process and assumed or estimated quantities.

The estimated cost for gravel fill material comprised a significant percentage of the overall estimated costs to implement Alternatives 4 through 7 in the 2015 FS. The 2015 FS assumed a commercially available gravel source would be developed up to five miles away from the site on the side of the Colville River opposite the landfill, thus constraining material transportation to the site to winter seasons using ice roads and an ice bridge.

Extraction of gravel borrow material from the point bar a short distance east of the landfill site was recognized as a potentially cost-saving measure. The gravel bar is located on the same side of the Colville River as the landfill site and on ADOT&PF property. The gravel bar enables material extraction and transportation in both summer and winter seasons, with less material transportation distance. This revised borrow area location was incorporated into the development of the 2017 FS Addendum.

Material quantity estimates and assumptions were also revisited in the 2017 FS Addendum. The volume of the landfill itself was estimated based on the geophysical survey data available. The volume is over 100,000 cy, and the volume estimate used in the 2017 FS Addendum was within about 2,000 cy of that used in the 2015 FS.

The volume of contaminated soil to be encountered that exceeds cleanup levels carries more uncertainty. The 2015 FS assumed a contaminated soil volume of 44,500 cy, with the assumption that all soil removed from the excavation would be contaminated. This scenario was inconsistent with the available soil sampling data from the upper 11 feet bgs which showed that not all soil is contaminated above cleanup levels.

The 2017 FS Addendum assumed a smaller volume of soil would be excavated and that only a portion of the excavated soil would be contaminated, more consistent with the available data. The 2017 FS Addendum also envisioned that the excavated soil would be processed in Umiat to remove the oversized fraction of cobble and large gravel, so that this material would not be transported and disposed as waste. The 2017 FS Addendum assumed that debris would be excavated to the maximum depths identified by geophysical survey at each landfill cell, that 50% of the underlying soil area beneath the debris would be contaminated to two feet below the base of the landfill cell, requiring over-excavation vertically, and that 50% of landfill cell perimeter soil would be contaminated requiring over-excavation a short distance laterally. These assumptions reduced the overall volume of contaminated soil assumed for removal to approximately 11,000 cy.

Alternatives 5, 6, and 7 each involve excavation of the landfill, however they each differ by their proposed disposition of excavated materials. Alternative 5, as described above, involved leaving all landfill contents in Umiat in a new landfill. Alternative 6, conversely, involves transporting all excavated materials out of Umiat to offsite disposal facilities. Alternative 7 involves a combination of removing hazardous substances from Umiat, treating contamination onsite, and relocating inert and non-hazardous solid waste to a new inert waste monofill location in Umiat. Potential locations for the inert waste monofill have been coordinated with the landowner, BLM, in multiple stakeholder meetings. Each proposed monofill location will have an archaeological survey completed to ensure cultural resources are not significantly impacted. There is implied acceptance from BLM of the proposed remedy and relocation of inert wastes to a monofill within the FUDS boundary.

Umiat is located approximately 100 miles from the nearest road. Consequently, movement of equipment and materials to and from Umiat is typically conducted during winter via overland winter trails using low ground pressure equipment, or potentially via a formal constructed ice road at least 6 inches thick. Accessing and conducting work in Umiat is logistically complicated, expensive, and risky. This complicating factor, more than any other factor, affects the evaluation and selection of the disposition of excavated materials from this project.

On-site disposal options significantly reduce the logistical complexities and overall material transportation costs, however they do add long-term management considerations. Off-site disposal options (i.e., at permitted facilities elsewhere in Alaska or the Lower 48 states) increase logistical complexity and project risk, and increase material transportation costs, but they do eliminate post-remedy site exposures and maintenance liabilities.

Table 9 below shows the revised assumed costs from the 2017 FS Addendum along with balancing criteria for Alternatives 6 and 7.

TABLE 9: RE-EVALUTION OF ALTERNATIVES 6 AND 7

Evaluation Criteria		6 Excavation and Off-Site Disposal	7 Excavation, On-Site and Off-Site Disposal
BALANCING	Long-Term Effectiveness and Permanence	●	●
	Reduction in Toxicity, Mobility, and Volume Through Treatment	○	◗
	Short-Term Effectiveness	●	●
	Implementability	◗	◗
	Estimated Cost ($M)	$239 M	$160 M

Key: ○ = low ◗ = medium ● = high

The cost difference shown in the table between full offsite disposal (Alternative 6) versus constructing a local monofill for inert material and treated soils (Alternative 7) demonstrates that based on cost-effectiveness, Alternative 7 is the preferred alternative.

The risks and liabilities associated with placing inert debris in a monofill (Alternative 7) are lower than those associated with leaving all material in Umiat in a new lined landfill (Alternative 5). The cost of implementing Alternative 7 is expected to be less than the cost of transporting the entire volume of material, over 100,000 cy, offsite for disposal (Alternative 6).

2.18 Selected Remedy

The selected remedy for clean-up of the Umiat Landfill FUDS is Alternative 7, involving removal of the landfill from its current location, and a combination of on-site treatment/ disposal and offsite disposal. One significant change was made to a component of the Preferred Alternative that could have been reasonably anticipated by the public based on information in the RI/FS and PP: Materials will be treated in Umiat on a gravel pad, if feasible, to reduce the volume and/or mobility of contaminated material. The methods of treatment will vary depending on the contaminant (organics, metals), and will be determined during the work based on the materials found in the landfill. This change balances the cost-effectiveness of onsite treatment with the high transportation and disposal costs for offsite alternatives.

2.18.1 Description of the Selected Remedy

The selected remedy involves the following approach.

- The landfill contents will be removed from the Colville River channel and wastes will be properly disposed.
- Items containing hazardous substances such as batteries, transformers, drums with hazardous contents, etc. that cannot be treated onsite will be transported offsite (out of Umiat) for disposal at a permitted off-site disposal facility. Liquid waste (i.e., hazardous drum or transformer contents) that cannot be treated onsite will be containerized for transport and disposed at a permitted facility off-site.
- Water pumped from landfill excavations may be contaminated and will be treated prior to discharge. Additional details will be developed during the remedial design phase and coordinated with the state regulator during review of project work plans.
- An inert waste monofill will be established out of the Colville River floodplain within the boundaries of the Umiat AFS FUDS Property that is designed, constructed, operated and closed in accordance with ARARs (see Section 2.15.1). Inert debris such as scrap metal, lumber, and other solid waste items will be placed into the monofill.

- Soil excavated from the landfill area will be sampled.
    - Overburden that is shown by sampling to be clean, may be used at the monofill, handling pad, or for road maintenance as needed.
    - Excavated soil that is contaminated will be treated onsite (within the FUDS Property) prior to disposal, if feasible. Treated soil that meets cleanup levels may be used at the monofill or for road maintenance. Treated soil may also be used at the handling pad. If onsite treatment is not feasible, contaminated soil will be transported offsite (out of Umiat) for disposal at a permitted facility.
    - The landfill excavation will be backfilled with clean borrow material.
- The landfill excavation will be sampled to determine if the soil cleanup goals are met. Soil that exceeds the cleanup levels for CERCLA contaminants will be removed by excavation. Petroleum contaminated soil that is commingled with CERCLA contaminants above cleanup levels will also be removed.
- Sediment containing PCB concentrations above the cleanup level in Table 2 was previously identified in a limited interval of the slough down-gradient of the landfill. The slough will be re-sampled to determine current PCB concentrations and distribution. PCB-contaminated sediment exceeding the RAO will be removed and treated onsite (within the FUDS Property), if feasible. If onsite treatment is not feasible, the soil will be transported offsite (out of Umiat) for disposal at a permitted disposal facility.
- Construction of a gravel handling pad area is expected to be necessary to provide room outside the seasonally flooded channel to conduct treatment, staging, segregating, sampling, and packaging of materials. The pad is expected to be located a short distance west of the landfill and administered like a Temporary Unit. Additional details will be developed during the remedial design phase and coordinated with the state regulator during review of project work plans.
- Borrow material will be needed for constructing the handling pad and the monofill base and cover, and for road improvements and maintenance, and backfilling the landfill excavations.
- At least three groundwater sampling events will be conducted after the landfill removal to verify source removal has achieved the groundwater RAOs. Depending on the results of this sampling, a background study may be conducted to evaluate sampling results, and additional groundwater sampling events may be warranted until RAOs are met.
- The monofill will be visually inspected annually for 5 years for signs of erosion, inadequate vegetative cover, settlement or sidewall slumps, pooling of water, or other indications that maintenance is needed.
- A request will be made to BLM to annotate the Federal Master Title Plats and the Alaska State Department of Natural Resources Recorders Office land

records with a notation that an inert waste monofill exists, including the types of waste placed, surveyed boundary, design, and final cover details.

Because the remedy is anticipated to take more than five years to implement, one CERCLA policy five-year review will be conducted within five years of the start of the remedial action construction phase to ensure the remedy is, or will be, protective of human health and the environment. The monofill will be visually inspected annually post-construction for five years for signs of erosion, inadequate vegetative cover, settlement or sidewall slumps, pooling of water, or other indications that maintenance is needed. One periodic review will also be conducted to evaluate the closure of the monofill.

2.18.2 Summary of Estimated Remedy Costs

The estimated cost for the selected remedy is approximately $160 million. A breakdown of the estimated cost is provided below in Table 10.

Table 10 - Estimated Cost for Selected Remedy (Alternative 7)

Remedial Design	$4,000,000
Remedial Action – Construction • Planning • Mobilization/Demobilization • Site Preparation • Landfill Removal • Screening • Segregating • Sampling • Onsite Treatment • Monofill • Packaging, Transportation, Offsite Disposal • Reporting	$111,000,000
Contingency	$32,000,000
Project Oversight/Administration	$11,000,000
Remedial Action Operations • Planning • Groundwater sampling • Monofill Inspections • Reporting	$2,000,000
Total	**$160,000,000**

The information in the cost estimate summary table above is based on the available information regarding the anticipated scope of the selected remedy. Detailed cost estimates are available in the 2015 FS and 2017 FS Addendum. Changes in the cost elements are likely to occur as a result of new information and data collected during the design of the remedy. Significant changes to the DD would be documented in the form of a memorandum in the Administrative Record, an Explanation of Significant Differences or a DD amendment.

The cost estimate above is considered an order-of-magnitude estimate that is expected to be within -30 to +50 percent of the actual project cost based on the assumed material quantities.

2.18.3 Expected Outcomes of the Selected Remedy

After successful completion of the selected remedy, the Umiat Landfill site will be available for UU/UE under CERCLA. The site will be available for subsistence, recreational, industrial, and other uses consistent with the land's current status within the BLM's Land Management Plan. Protection of human health and the environment will be achieved by removing hazardous substances from the site and soil/sediment contaminated with CERCLA COCs to below applicable cleanup levels.

Groundwater contamination is expected to be addressed during the landfill excavation, or to attenuate after landfill contents and contaminated soil are removed. The groundwater/surface water will be available for use as drinking water source upon achieving the cleanup levels.

Toxicity, mobility, and volume of contamination will be reduced by the selected remedy as a result of onsite treatment. Landfill debris that would be eroded when the Colville River watercourse migrates through the landfill area will be shifted to a stable location on the Umiat AFS FUDS Property to eliminate the future vessel transportation hazard and obstructions to subsistence fishing nets.

2.18.4 Statutory Determinations

Under CERCLA Section 121 and the NCP, the lead agency must select remedies protective of human health and the environment, compliant with ARARs (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element as well as a bias against offsite disposal of untreated wastes. The following subsections discuss how the selected remedy meets these statutory requirements.

Protective of Human Health and the Environment

The selected remedy is protective of human health and the environment. The remedy prevents migration of contamination associated with landfill contents, contaminated soil and groundwater by removing the landfill from the Colville River floodplain. Removal of the source contamination is expected to enable impacted groundwater, if present after

the removal, to attenuate. Pumping of water from the excavation and treatment of the water prior to discharge is expected to remove groundwater currently known to be impacted above cleanup levels. Placement of inert debris in a monofill designed and developed in accordance with ARARs (see Section 2.15.1) and located away from the Colville River, is considered protective. It also prevents spreading of the debris downstream when the landfill area is eroded by the Colville River. Onsite treatment will reduce waste volume and mobility. Placement of treated soil in the monofill is also considered protective.

Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy complies with ARARs. The landfill contents, which include items that represent a potential continuing source of contamination to the environment, will be removed from the Colville River floodplain. The associated soil impacted by CERCLA contaminants in excess of the cleanup levels will be excavated and treated or disposed in accordance with applicable regulations. Excavation of the landfill will be conducted in a manner that minimizes the spread of contamination to down-drainage sediment and the Colville River.

Cost-Effectiveness

The selected remedy is considered cost-effective with respect to the comparative cost to the other alternatives that are considered adequately protective, effective in the short term, and effective in the long term. In making this determination, the following definition was used: “A remedy shall be cost-effective if its costs are proportional to its overall effectiveness” (NCP Section 300.430(f)(1)(ii)(D)). This was accomplished by evaluating the overall effectiveness of those alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and were ARAR-compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness).

The cost of conducting the remedy is driven significantly by the remote location of Umiat and the significant costs of accessing the site and moving materials to and from Umiat. Incorporating onsite treatment will reduce the volume of material transported out of Umiat. The selected remedy is the more cost-effective alternative and leaving inert debris in a monofill away from the Colville River is considered adequately protective.

Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The selected remedy represents a reasonable use of permanent solutions that are practicable and cost-effective at this site. Transportation of waste streams out of Umiat is complicated and expensive. Screening of oversize material will reduce waste volume. Onsite treatment of contaminated soil will reduce waste volume and mobility. Placement of debris in a monofill will reduce waste volume needing transportation out of Umiat. Hazardous substances that cannot be treated onsite will be removed from Umiat and transported to an offsite disposal facility. The mixed approach of the selected remedy to waste stream disposition maximizes the on-site benefits while balancing the trade-offs with risks and costs.

Preference for Treatment as a Principal Element

Onsite treatment was not evaluated as an alternative in the 2015 FS, however it is included in the selected remedy and will reduce waste volume and cost. Onsite treatment methods will be evaluated to address petroleum contaminated soil excavated from the landfill, to reduce potential transportation and disposal costs. Onsite treatment of other contaminants, such as lead, pesticides and PCBs, will also be evaluated and incorporated to the extent that they can feasibly be implemented at Umiat to reduce the volume of waste to be transported out of Umiat. USACE has determined the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be used in a cost-effective manner at this site considering all factors.

Documentation of Significant Changes Since the PP

The following significant changes were made to the selected remedy since the PP was released.

- The PP described Alternative 7 as placing segregated soil in the monofill, based on an evaluation of leachability using computer modeling in combination with an analysis of waste characterization samples using SW-846 Test Method 1312 Synthetic Precipitation Leaching Procedure (SPLP). One significant change to a component of the Preferred Alternative that could have been reasonably anticipated by the public based on information in the RI/FS and PP is being made to Alternative 7. Segregated soils may be treated onsite via methods such as thermal treatment, landfarming, or stabilization/solidification. Based on post-treatment sampling results, treated soils may be reused onsite or at the monofill if needed. This change balances the cost-effectiveness of onsite treatment with the high transportation and disposal costs for offsite alternatives.

3.0 RESPONSIVENESS SUMMARY

This Responsiveness Summary outlines the public involvement outreach efforts and the response to comments received on the PP for the Umiat Landfill project at the Umiat AFS FUDS located in Umiat, Alaska. The PP was issued to the public February 2018.

3.1 Public Involvement

Several activities were conducted to inform and engage the public about the opportunity to provide comments for the FUDS Umiat Landfill Project. The following public involvement efforts were conducted:

- A public comment period was held between 12 February and 23 March 2018, with an extension to 23 April 2018.
- Two advertisements were placed in the *Arctic Sounder* weekly newspaper. The one-eighth page advertisement contained the dates, times, and locations of the public meetings; project contact information; and a brief description of the project. It included the location of the PP and encouraged public comments. The two advertisements were placed on 15 February 2018, at the start of the comment period, and 1 March 2018, prior to the public meetings.
- An email notification was sent out on 12 February 2018 notifying stakeholders of the PP availability. The email notification contained the dates, times, and locations of the public meetings; project contact information; and a brief description of the project. It also included the location of the PP and encouraged public comments. The total list of subscribers contained 50 email addresses. This email notification had a 41.9 percent open rate and a total of 306 total opens.
- On 1 March 2018, the operator of the “What’s Up” listserv was provided information to include in distribution. This listserv includes subscribers of the Trustees for Alaska, The Alaska Center, and the Alaska Women’s Environmental Network. The email contained the dates, times, and locations of the public meetings; project contact information; and a brief description of the project. It also included the location of the public materials and the duration of the public comment period as well as encouraged public comments. The comment period was promoted and included in the “What’s Up” weekly email distribution sent out on 14 and 21 March 2018.
- A postcard was mailed on 22 February 2018 to all U.S. Post Office boxes in Nuiqsut, informing community members of the upcoming public meeting. Three participants at the Nuiqsut meeting indicated on the meeting sign-in sheet that they learned of the meeting from the postcard.
- A flyer was posted in the local communities of Nuiqsut and Utqiaġvik (Barrow), advertising the public meetings. The flyer was translated and distributed to various public locations on 27-28 February 2018. The flyer was also emailed to the Nuiqsut Cultural Coordinator on 2 March 2018 for distribution around Nuiqsut.

- KBRW Radio was contacted with information about the public meetings, to be broadcasted from 28 February through 9 March 2018 in both English and Iñupiaq. KBRW Radio is a non-commercial, community radio station owned and operated by Silakkuagvik Communications, Inc. The station broadcasts from Utqiaġvik (formerly known as Barrow), Alaska, and reaches the North Slope communities of Utqiaġvik, Nuiqsut, Point Hope, Point Lay, Wainwright, Anaktuvuk Pass, Prudhoe Bay, Kaktovik, and Atqasuk. KBRW can be heard on AM radio at 680 kHz and FM radio at 91.9.
- USACE conducted outreach with Alaska Native tribal governments including the Native Village of Nuiqsut, Native Village of Barrow, Native Village of Anaktuvuk Pass, and the Inupiaq Community of the Arctic Slope.
- A government-to-government meeting was held in Nuiqsut on 7 March 2018 between the Native Village of Nuiqsut and USACE project team members. Comments were collected during this meeting and included in the Administrative Record.
- A public meeting was held in Nuiqsut on 7 March 2018 to determine interest in establishing a Nuiqsut Restoration Advisory Board (RAB) to help facilitate community outreach and stakeholder engagement.
- Two public meetings for the FUDS Umiat Landfill Project were conducted in March 2018. The purpose of the public meetings was to formally collect stakeholder comments and document public feedback regarding the PP for the Umiat Landfill Project. The meetings included a formal presentation on the PP, identification of the preferred alternative, and identification of an open comment period. Both public meetings were recorded by a court reporter. Transcripts of the public meetings are available as a part of the Administrative Record.
    - The first meeting was held in Nuiqsut, Alaska, at the Nuiqsut City Hall on 7 March 2018 from 6:00 to 8:30 pm.
    - The second meeting was held in Utqiaġvik, Alaska, on 8 March 2018 at the NSB Assembly Chambers Conference Room. The meeting ran from 6:15 to 8:30 pm
- An additional presentation was given by the USACE on the Umiat Landfill project in Utqiaġvik, Alaska, at the 21 March 2018 Utqiaġvik RAB meeting.

3.2 Stakeholder Comments and Lead Agency Responses

3.2.1 State Agency Coordination

USACE coordinated with ADEC prior to the public comment period on the PP. ADEC provided detailed comments on the PP which USACE responded to in writing and discussed during a teleconference. In those comments, ADEC identified as potential ARARs multiple sections of Alaska regulations from 18 AAC Chapters 60, 70 and 75. USACE has determined that some of these state regulations are not ARARs. The

proposed ARAR and USACE's rationale for not considering them ARARs are discussed below:

- ADEC made several comments stating that POL should be a contaminant of concern (COC), or, in the alternative, that State regulations constitute ARARs if POL is comingled with a CERCLA contaminant. CERCLA Section 101(14) specifically excludes petroleum from the definitions of hazardous substance and pollutant or contaminant. Based on this exclusion, POL is not a COC under CERCLA, and State regulations for POL cannot be ARARs.
- 18 AAC 60.010(a) deals with storage of solid waste. USACE will not be storing accumulated solid waste, so this provision is not applicable or relevant and appropriate. Accordingly, this is not an ARAR.
- 18 AAC 60.015 deals with transportation of solid waste off-site because movement of material within a CERCLA site is not considered transportation. ARARs do not apply off-site. Accordingly, this is not an ARAR. However, USACE is required to follow all applicable laws and regulations during the movement of solid waste off-site, and will fully comply with this requirement off site.
- 18 AAC 60.217 requires that a landfill be at least 10 feet above the highest measured level of an aquifer of resource value. Because the thrust of the requirement is to prevent migration of contamination to ground water, it is not applicable or relevant and appropriate for two reasons. First, there is no aquifer of resource value, as defined by ADEC's regulations, present at any of three potential monofill locations. Second, USACE is only putting inert, uncontaminated material in the monofill. Accordingly, this is not an ARAR.
- 18 AAC 60.227 contains three subprovisions related to landfills located on permafrost. Subparagraph (a) is procedural, not substantive. Subparagraphs (b) and (c) are primarily concerned with containing contamination from leaching out of the landfill. Due to the fact that only inert, uncontaminated material will be placed in the monofill, this is not applicable or relevant and appropriate. Accordingly, this is not an ARAR.
- 18 AAC 60.228 contains exemptions related to freezeback monofills. This is not applicable or relevant and appropriate because USACE is not proposing to construct a freezeback monofill as defined by ADEC's regulations. Accordingly, this is not an ARAR.
- 18 AAC 60.233(1) deals with controlling impacts outside of the facility boundaries related to the proposed monofill. The thrust of the regulation is controlling contamination from traveling offsite. USACE is only putting inert, uncontaminated material in the monofill, which makes this regulation not applicable or relevant and appropriate. Accordingly, this is not an ARAR.
- 18 AAC 70.010 is a general section of the State's Water Quality Standards regulations. This section does not contain any substantive requirements, and therefore, is not an ARAR.
- 18 AAC 75.325(g) requires the cumulative carcinogenic risk standard post remedy implementation to be 1 in 100,000 or less. A risk range does not provide a substantive cleanup standard, standard of control, or other requirement

addressing the contaminant, remedial action or remedial location. Rather, a risk range is used to determine whether the contamination poses a risk to human health or the environment necessitating action under CERCLA during the RI/FS phase. Cleanup levels are based on the substantive ARARs, which require cleaning up to a specific value, not a range. Accordingly, this is not an ARAR.

- 18 AAC 75.355(b) requires that sampling be conducted by a qualified environmental professional. This is a non-substantive requirement that is not an ARAR. However, as a best management practice, USACE requires that sampling and analysis is conducted or supervised by a qualified environmental professional.
- 18 AAC 75.355(d) deals with sampling of petroleum contamination. CERCLA Section 101(14) specifically excludes petroleum from the definitions of hazardous substance and pollutant or contaminant. Accordingly, this is not an ARAR.
- 18 AAC 75.355(e) requires any laboratory analysis be performed by an ADEC-approved lab. This is a non-substantive requirement that is not an ARAR. However, as a best management practice, USACE requires any laboratory analysis be performed by an ADEC-approved lab.
- 18 AAC 75.375(c) pertains to institutional controls. This regulation does not provide a substantive cleanup standard, standard of control, or other requirement addressing the contaminant, remedial action or remedial location. As such it does not meet the definition of an ARAR. Accordingly, the proposed regulation is not an ARAR.

The requirements of 18 AAC 75.355(b) and (d) and 75.370(a) will be incorporated into future planning documents as applicable. ADEC also expressed concerns regarding the future monitoring requirements and requested additional coordination during the work plan stages for specific long term monitoring or management details. ADEC raised concerns regarding the heterogeneous nature of the landfill and the potential for identification of additional contaminants of concern. ADEC requested additional analytical testing for more contaminants likely to be present, including additional petroleum hydrocarbon fractions, volatile organic compounds, semi-volatile organic compounds, polycyclic aromatic hydrocarbons, pesticides, and metals. ADEC requested the specifics of the necessary sampling frequency and strategy be discussed during the work plan stage. Additional regulatory coordination will continue during the remedial design and remedial action implementation phases.

3.2.2 Community Comments

Comments were received during the public review period and at the public meetings in Nuiqsut and Utqiaġvik (Barrow) regarding the PP. A more detailed discussion of public comments is provided in the Responses to Stakeholder Comments by Subject/Topic section below. The community's primary concerns with the preferred remedy that impact their acceptance of the selected remedy include:

- Placing some wastes in a monofill located in Umiat, versus disposing of all wastes from the landfill off-site.

- Use of the gravel bar located east of the landfill as a source of gravel borrow material.

Removal of the landfill debris and contaminated soil from the landfill site will allow unlimited use of and unrestricted exposure to the landfill site, and will remove the landfill and CERCLA contaminated soil from the Colville River floodplain as a continuing potential source of environmental impact downstream due to annual flooding and erosion, and when the Colville River ultimately migrates to the landfill site and erodes the landfill.

USACE received and collected comments on the PP through several methods: mail, email, during public meetings, and government-to-government meetings. Transcripts of the public meetings are included in the Administrative Record. USACE has provided responses to the project comments in Responses to Stakeholder Comments by Subject/Topic (Section 3.4).

USACE received formal comments from private citizens, BLM, ADNR, NSB, City of Anaktuvuk Pass, Native Village of Nuiqsut, ASRC, and a private energy company.

3.3 Technical and Legal Issues

No technical or legal issues were identified.

3.4 Responses to Stakeholder Comments by Subject/Topic

The following subsections are a summary of the comments, criticisms, and new data received during the public comment period and at public meetings regarding the PP as required by 42 U.S.C. § 9617(b) and 40 C.F.R. §§ 300.430(f)(3)(i)(F) and 300.430(f)(5)(iii)(B). In preparing this summary, actual comment language may have been abbreviated, paraphrased, and/or edited for clarity.

3.4.1 Remedial Action Responsiveness

A consistent theme in several comments was the request to begin remedial actions as soon as possible. The commenters expressed concern about the existence of the landfill in the Colville River floodplain over the past 20-plus years. The stakeholders identified the area as a source of contamination to the environment and believed it to be affecting water sources and subsistence food sources.

Comment: We need to secure the Umiat Landfill temporarily. That's got to be priority No. 1, to secure it and minimize that erosion going on every spring breakup or during rainy seasons we have.

Comment: We strongly support Native Village of Nuiqsut for remedial action at the Umiat Landfill which is located in Umiat, Alaska. This is way overdue, as we see in the aerial view of Umiat 1963 and 2016 drill rig track exposed. It's been too long, immediate cleanup should be done because we as Inupiaqs are good stewardship to our land that gives us food to put on our tables. Our concern is that how about if barrels contain little or lots of toxic chemicals open and spill in the river or land?

Response: It is the intent and objective of this project to remediate the contamination as quickly as possible. The USACE is working under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process. This process requires investigation and analysis and has specific process requirements, which take time. The USACE is diligently working through this process as expeditiously as possible while complying with CERCLA and ensuring the remedy is protective of human health and the environment under federal, state, and local regulations.

3.4.2 Contamination Area/Project Area

Commenters expressed concern regarding contamination in areas outside of the identified project area.

Comment: USACE should amend its proposed plan to: clean up debris downstream from Umiat, as drums and other metal debris have been transported downstream from the Umiat landfill site, littering the Colville River. The residents of Nuiqsut have continually expressed concern that drums and other metal debris have been transported out of the landfill during break-up and have spread downstream, littering the Colville. Therefore, we request that USACE amend its plan to clean up debris transported downstream from the Umiat Landfill.

Comment: There's a lot of debris out there in the Colville River area that needs to be cleaned up, too, all that debris that you see every summer popping up everywhere in the Colville River area. Some things that we have never seen before emerging. So you've got to look not just at one area, but the whole Colville River. There's a lot of debris from that landfill that every year turns up out there, just sitting.

Comment: But it doesn't seem like there's been sampling in other areas as much in that general vicinity near where the can crusher was, and I'm not sure exactly where it was. I also know that in the time I've spent in Umiat, and when DOT was evaluating whether they could build a road to Umiat that would help with the cleanup, that talking to one of the guys there, he found sprinklers out in that area. Then I've heard these stories in a couple different places, that DDT was actually applied to sprinklers because the mosquitoes were so bad out there for the guys that were working there in the '40s and '50s and into the '60s, they were using DDT to keep the mosquitoes to a low roar. Applying it with sprinklers kind of makes sense -- not now, obviously, but in that time period. So what happened to all the DDT, if it's true? And I don't know why you'd have lawn sprinklers out there if you weren't using them for something like DDT. What happened to all of that stuff? Where is it? It just doesn't evaporate and disappear. It's around someplace. So, to me, that should be a big worry for the Army Corps. Cleaning up where you have found all of the metal is great, but there's obviously chemicals that you're not finding by looking at the ground-penetrating radar to figure out where the metals and stuff has been buried. So more extensively testing for some of these chemicals, to me, is really important

Response: The Umiat Landfill Project is one of several different projects associated with the overall Umiat AFS FUDS Property. The Umiat AFS Property is one of over 500 FUDS properties identified in Alaska. The USACE has continued to make progress completing environmental cleanup projects in Umiat since the early 2000s. The identified cleanup

area is specified on Figure 3 and only includes the landfill area. It is based on the historical data and research conducted for the area. Any additional areas that may need cleanup is beyond the scope of this project. Regarding the potential application of pesticides using sprinklers throughout the Umiat area during the Test Wells exploration work, a remedial investigation was conducted in 1997 at each Test Well location that included sampling for pesticides. Pesticides were not detected above screening levels during the remedial investigation. A cleanup conducted in 1973 by the Navy included removal of DDT discovered in a cache at an old Navy warehouse near the airstrip. These sources of contamination were removed and properly disposed off-site. Extensive testing throughout the Umiat area is beyond the scope of this project to address the landfill.

3.4.3 Contamination Under the Landfill and Migrating Downstream

Commenters raised concerns about additional contamination underground, on top of permafrost, and downgradient impacts to the Colville River. Concerns were also raised about the extent of the landfill excavation and delineation of contamination.

Comment: And that process and that work, it's not probably done -- it's probably not done yet. There is more dirt and more gravel, more battery acid under the ground on the permafrost. That oil and the battery acid, everything that's underground probably flowed through the permafrost into the main channel, probably every springtime. It melts and the earth moves and there's more oil under the earth, under the ground. The ground -- the permafrost is between. Probably still flowed more oil and more battery, all kinds of chemicals. I go out boating in the summertime and there's always real shiny water out there, everywhere you go, coming downstream. It was real shiny like glass. It's probably not for drinking water. My brother named Harry. He was adopted. My brother named Harry took that water like for Kool-Aid water. He got sick from that water on this side of Umiat. On this side of Umiat, that point, we were there for about a week or two. He drank water from that river, and he got sick and we had to go home. From that water, he got sick from all the chemicals. Maybe this coming spring, maybe that cleanup, they clean up Umiat and then probably there's more oil flowing in that permafrost, oil, battery acid, all kinds of chemicals. Flowing real slowly towards the Colville and then start flowing where you never see it. You can't smell it. It's invisible. And it's always shiny. Real, just like glass. It looks like water, but it's not water. This area that you cleaned up not too long ago, the acid, batteries, oil, everything in there. And there's permafrost -- there's the earth and the permafrost in between the earth, permafrost, and more permafrost. Acid, diesel, gas, you name it, it's covered with that gravel, dirt. It still flows in the Colville real slow, under the earth, in between the earth and the permafrost real nice and slowly. It flows and it goes downstream.

Comment: I think that he made a statement that in regards to the land itself, every spring we all know there's a breakup. There's always an underground stream in between that can easily flow through that landfill and cause the debris to go on the river and some of the chemicals that we have mentioned between the top surface and the permafrost underneath where the ice melts. Mr. Ahnupkana knows for sure at some point it will go underneath the landfill, and it will flow down to the main Colville while there's breakup going on. That is one thing that he's concerned about and has already mentioned about his brother getting sick. I've never heard of any people getting sick

when they're out camping, drinking water from the river, creeks, but this is the first time I've heard someone got sick from water that's so clear. It kind of reminds me of the oil sheens that can be seen on the river, in the calm glassy bays upriver, and that oil sheen doesn't just go anywhere. There's one there about 8 miles from here. That's one of them. The other locations are further upriver. That still needs to be identified. So there's certain areas that has certain chemicals that are still up there they may have gone into the river.

Comment: Request that all DRO and naphthalene contamination found over Alaska DEC cleanup levels to be addressed. Furthermore, the Umiat landfill is the only source of contamination at this location. As such, all COC's, DRO and naphthalene found above cleanup levels should be addressed not just those found commingled. This will prevent migration of these contaminants to the soil surface, groundwater and Colville River.

Response: The remedial action construction phase contractor will be required to utilize best management practices during all excavation activities to ensure safe execution of the field work and minimize the potential for offsite migration of contaminants. At least three groundwater sampling events are planned to verify that the source of contamination has been removed and remedial action objectives for groundwater have been met after excavation activities are completed.

The FUDS program policy is following CERCLA authority for this cleanup project. Reduction of petroleum hydrocarbon concentrations in soil and groundwater would occur under the proposed remedy which involves the removal of the source landfill material and associated contaminated soils.

3.4.4 Waste Segregation and Characterization

Comment: Alternative 7 does not clearly explain which materials will be disposed of onsite and offsite. Under this alternative, USACE will excavate the Umiat landfill and dispose of hazardous materials and soil offsite and dispose of nonhazardous/inert materials in an on-site monofill. The proposed plan does not define inert materials, or explain what classifies as hazardous and nonhazardous materials, leaving much discrepancy concerning what wastes will remain onsite in the monofill. It also fails to specify how USACE will determine what materials are hazardous and nonhazardous/inert when sorting materials onsite. Thus, it is foreseeable that a considerable amount of contaminated materials will remain onsite under Alternative 7, and the specter of uncertainty over the Umiat landfill will continue.

Comment: How are you doing your sampling? Do you have more information about that? Are you going to go into the layers of the soil that is sampled as you're digging down into it that's going to be assessed for all the various contaminants, not just metal debris or batteries or those kind of things? Are you going to look for the other things that we know that were in your list of things that were sent to Umiat and were buried out there with all the different chemical contaminants that were included?

Response: Items containing hazardous substances such as batteries, transformers, drums with hazardous chemical contents, etc. will be transported offsite (out of Umiat) for disposal at a permitted offsite disposal facility.

Inert debris such as scrap metal, clean concrete and lumber, and other solid waste items will be placed into a monofill located at an appropriate location on the plateau north of Umiat (out of the Colville River floodplain) that is designed, constructed, operated and closed in accordance with Sections 410 (a), 460 (e), and 490 (c) of 18 AAC 60 Solid Waste Management.

Soil from amongst the landfill debris will be segregated and sampled for waste characterization. Segregated soils may be treated onsite (within the FUDS property) via several methods such as landfarming or thermal treatment. Treated soil that meets cleanup levels may be used at the monofill or handling pad and road areas as needed.

Groundwater that is pumped from the excavation during the removal has the potential to be impacted by the landfill contents. Ice melt-water resulting from winter excavation of debris and summer excavation of debris from permafrost may also be impacted. Potentially impacted water will be treated prior to discharge. Treatment methods will be evaluated during the remedial design phase and decided as part of the development of planning documents for the remedial action phase.

3.4.5 Monofill Location

The proposed monofill was a frequent subject of comments due to the nature, location, purpose, material, potential impacts, cost, and methodology of placing a monofill.

Comment: Should a monofill be decided, the location is vulnerable to thaw just by the fact that currently frozen ground might be underneath it. It is probably a bad assumption that permafrost in that area would remain frozen, if the water table is going to change with the river moving and the temperature rising. Since the river is meandering toward the site, it seems very important to me that whatever is left behind is agreed by all stakeholders to not be harmful, not just to humans, but to the ecosystem on which humans hundreds of miles away depend.

Comment: So the snow and the rain and everything isn't going to cause a problem when it melts up there and comes down off the bank and into the area?

Comment: As the Lessee holding the oil and gas leases at Umiat, Renaissance requests that USACE consult with Malamute before selecting the final location for the proposed monofill at Umiat. Monofill locations presented in Figure 3 of the Proposed Plan could conflict with currently contemplated locations for future oil development pads and facilities. Malamute would be pleased to work collaboratively with USACE and BLM in the selection of a monofill location that would not conflict with future development of the oil resource at Umiat, ensuring that the objectives of both the clean-up of pre-existing environmental contamination and future oil development at Umiat can be met.

Comment: ASRC does not find this alternative to be in line with the intent of this project, the Corps' responsibility to ensure a complete clean-up of the site, or the least environmentally damaging alternative. While Alternative 7 and Alternative 6 address the

immediate issues regarding the current location of the landfill, the proposed relocation of the nonhazardous waste under Alternative 7 could pose future problems that are not well described in the proposed plan and shift this burden to future generations. The Corps should explain the base material at the monofill, potential impacts to permafrost and erosion, how waste at the monofill will be monitored, how sorting of hazardous material is to be conducted, and how the Corps can ensure the integrity of the monofill in perpetuity. Beyond these logistical issues, the permanent presence of the monofill would serve as a constant reminder for future generations of the disregard the federal government had for the Inupiat.

Comment: I see that you have an option of storing the contaminants on a higher slope, but when spring thaws, I would be very concerned about that because of all the water that's going to be going from the top of Umiat Mountain to the Colville. That is an extreme valid concern I have regarding that option.

Response: Under CERCLA Section 121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, are compliant with ARARs (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Of the remedial alternatives considered in the 2015 FS, the selected remedy (Alternative 7) represents a protective approach in compliance with legal requirements that is more cost-effective than Alternative 6, which involves removal of all excavated material from Umiat. For this reason, Alternative 7 remains the selected remedy.

The USACE proposes to place inert debris and treated soil in a monofill, located away from the vicinity of the Colville River floodplain. Inert debris includes items such as scrap metal, clean concrete and lumber, rubber tires, and other solid waste items.

Contaminated soils excavated from the landfill may be treated onsite via several methods such as landfarming or thermal treatment. Treated soils which meet cleanup levels may be reused as cover material at the monofill, at the handling pad, or road areas as needed.

The potential monofill location is anticipated at one of three proposed locations on the plateau north of Umiat within the FUDS property, which meets the location standards of 18 AAC 60.410 (a) Solid Waste Regulations. Based on comments, additional coordination with BLM is planned to ensure the selected location avoids affecting potential future activities. Based on USACE’s current knowledge of the plateau area, an appropriate location is able to be identified.

Monofill access and development, as well as material transport and placement, would be conducted during seasons in which work can be productive while reducing impacts to the environment.

The monofill will be designed in accordance with sections 410(a), 460 (e) and 490 (c) of 18 AAC 60 Solid Waste Regulations. The design will address concerns raised regarding erosion, permafrost, and re-vegetation. The design effort will involve field data collection at the monofill location. See section 3.4.6, which addresses monitoring.

3.4.6 Monofill Monitoring

In general commenters requested more detailed monitoring of the monofill to ensure that it does not release contamination as constructed.

Comment: The monofill will require long term monitoring and maintenance, which Alternative 7 does not adequately address. The amount and scope of monitoring for contaminants in soil, water and Colville River fish is insufficient under the current plan. Moreover, the draft plan appears to include only one review after five years to verify whether the monofill remains protective of human health and only three groundwater sampling efforts. We find this level of monitoring to be inadequate and request USACE to implement a more robust and long term monitoring program for hazardous contaminants to ensure that residents are informed of the level of contamination in soils near the site, waters along the Colville and in fish near the site and Village of Nuiqsut.

Comment: How long will the monofill be monitored? What will the monitoring consist of (visual monitoring, surface water monitoring, etc.)? How frequently will the monitoring be conducted? Who is responsible for the long term monitoring?

Comment: For how many decades do you expect that solution to be stable, that monofill solution?

Comment: Concerned that erosion off the top of the mountain [monofill location] will wash away the cap and organics on the top of the mountain. Melted permafrost is like foam. “Nuna” is soft like foam.

Comment: Our elders talked about how they opened up hundreds of barrels and dumped that debris onto the soils. So we have reports of over thousands of barrels that were put in there. So is that calculated into what you're considering as what's going to be left behind up on the plateau? Then, are you going to cover that area? Is that going to work the same way you did the previous covering of the landfill, but the covers blew off and didn't get the protective mechanism that you said it would with the dust and the winds that blew all the contaminants around up there?

Response: The monofill will be monitored in accordance with 18 AAC 60.490(c) requirements. The monofill will be inspected visually annually for 5 years (60 months) post-construction. Visual monitoring will focus on signs of erosion, inadequate vegetative cover, sidewall slumps, wildlife burrows, pooling of water, or other indications that maintenance is needed. The cap will be monitored for signs of erosion. A phased approach to the project lends itself to identifying maintenance issues and correcting problems while equipment is available at the site, prior to completion of the final project phase. If substantive maintenance needs are identified and conducted during the five-year period, a reevaluation will occur to determine appropriate actions. All materials planned for placement in the monofill are considered nonhazardous, therefore more stringent monitoring is not required.

Contaminated soils may also be treated onsite via several methods such as landfarming or thermal treatment. Treated soils which meet cleanup levels may be reused onsite as monofill cover, handling pads, or road areas as needed.

The monofill is expected to be a long-term solution for the relocated inert landfill materials with a longevity of 50-100 years. After the initial monitoring period to demonstrate stability and monofill cover integrity, the monofill may be closed and remain in place until new information demonstrates potential problems need to be addressed. The prospective monofill locations are underlain by fine-grained soil and depth to bedrock is not known. These soils are not anticipated to be thaw-stable, which further supports winter development of the monofill. The monofill cover after construction will be monitored to demonstrate it is stable and not eroding. A deed notation will also be recorded that informs current and future property owners of the existence of the monofill.

3.4.7 Long-term Monitoring

Concerns regarding monitoring during and after landfill excavation activities were consistently voiced in meetings and emails.

Comment: Clarify and improve the monitoring of hazardous contaminants in the Colville River: a.) the cleanup will disturb sediment, potentially resulting in the inadvertent release of additional toxic substances into the Colville River; b.) downstream monitoring is necessary, before cleanup, to establish a baseline, and during and after cleanup to determine if the cleanup has caused more contaminants to enter the Colville River; and c.) post-cleanup soil samples are also necessary to ensure that all contaminated soil has been removed.

Comment: The preferred alternative includes three consecutive groundwater sampling events to verify source removal has achieved the groundwater remedial action objectives, however there is no discussion of sampling that would occur during the removal actions. A sampling plan for down gradient of the landfill is recommended during the excavation activities, particularly because the project is anticipated to take multiple years to complete.

Comment: Can USACE contain the oil sheen around the Colville River near the Umiat Landfill? There are drums that float down the river and for the last five years the community has seen an oil sheen when the snow melts. Fish and caribou are sick. Concerned about the white fish. The contamination is causing some of the fish from that area to mold. How can USACE remedy our fish for the long term? There is major flooding every spring, summer, winter. This will cause more changes to fish that come up the Colville River to spawn every year. There are caribou with puss and tumors, sick animals.

Response: The remedial action construction phase contractor will be required to utilize best management practices during all excavation activities to ensure safe execution of the field work and minimize the potential for offsite migration of contaminants. At least three groundwater sampling events are planned to verify that the source of contamination has been removed and remedial action objectives for groundwater have been met after excavation activities are completed. Depending on the results of the sampling efforts, the former landfill site would then be made available for unlimited use/unrestricted exposure.

Comment: Alternative 6 would not require monitoring in perpetuity but a shorter term monitoring program which could also mitigate costs and is not currently reflected in the

Corps' analysis. In consideration of these factors, the Corps should reevaluate their alternatives and consider both the cost efficiencies and long-term benefits of offsite disposal of all materials abandoned at Umiat.

Response: Of the remedial alternatives considered in the 2015 FS, the selected remedy represents a reasonable use of permanent solutions and treatment technologies practicable and cost-effective at this site. The cost associated with monitoring requirements under Alternatives 6 and 7 were fully considered in the 2015 FS. Alternative 7 is protective of human health and the environment and is more cost-effective than Alternative 6.

3.4.8 Transportation and Offsite Disposal Cost Evaluation

Comment: With respect to the Corps' concerns regarding the cost of Alternative 6, there are several factors that may have been overlooked which could impact the Corps' analysis. Specifically, the Corps has raised concerns about the cost of transporting all the material from the Umiat Landfill. Rather than using costly ice roads to transport materials and waste, the Corps could prioritize waste and transport non-hazardous waste via snow trails over several years. As a cost efficiency, ASRC recommends the Corps evaluate the change in costs of Alternative 6 if snow trails are used to dispose of all non-hazardous waste and materials over several years rather than ice roads.

Comment: Did the Army Corps of Engineers (Corps) evaluate the potential for using the Colville River (either barging in the summer or by frozen ground in the winter) as a transportation route for shipping hazardous materials to Nuiqsut to be picked up and transported away by barge at the next availability?

Comment: You've got some federal laws that say there are certain chemicals you cannot move anywhere or take out from the water, like PCB and PCB pentachlorophenol. How do you propose to get around that federal regulation that says you can't move it? I was just looking and you have federal regulations that say you can't move it over public lands. There's some chemicals so bad you can't move them because if you have an accident, it spreads, just like what that pentachlorobiphenyl is doing on the Colville River. It's flowing down the river, going down, and there are certain fish you can't eat in there anymore. This is our river, a whole river system that nobody's living on.

Response: A significant volume of inert debris is expected to be removed from the landfill that will not present a CERCLA contaminant migration concern, such as scrap metal, lumber, possibly concrete, and other items. The inert debris and CERCLA contaminants and hazardous waste are commingled with one another. The inert debris cannot be left on ADOT&PF property at the handling pad; it must be moved to an appropriate permanent resting place. Minimizing the distance of transportation of the inert debris by placing the material in a local Umiat monofill on the FUDS Property, yet up and out of the Colville River floodplain, appears to be an appropriate choice. The 2015 FS and 2017 FS Addendum evaluated transportation alternatives, including both packed snow trails and ice roads. Consideration of transportation via the Colville River was evaluated but determined impracticable due to low water levels and the potential for unfrozen conditions downgradient near the confluence with brackish or salt water.

PCBs can be transported and are subject to the Department of Transportation (DOT) and International Air Transport Association (IATA) regulations for transporting hazardous materials. USACE has extensive experience in transporting PCB waste out of Umiat for proper disposal in licensed disposal facilities in Oregon. USACE transported tens of thousands of cubic yards of PCB contaminated soil originating from Test Well #9 within the last ten years for proper disposal.

3.4.9 Cultural and Archaeological Significance of the Project Location

Comment: Has the Corps begun consulting with the Alaska State Historic Preservation Officer (SHPO) regarding the proposed action? As the landfill contains historic properties, will the Corps be submitting a Determination of Eligibility (DOE) for the National Register of Historic Places before commencing the removal? The materials seem to lack integrity per the criteria for eligibility, so this should not be a problem. Per 36CFR§60.4 of the National Historic Preservation Act 1966, as amended, this and a finding of no historic properties affect from the SHPO must be done before removal begins. Have the proposed monofill sites been archaeologically-surveyed? Not only the ground surface inspected, but has subsurface testing (i.e. small test excavations) been conducted at these sites? If not, this should be done. The Umiat area is noted in Alaskan ethnographic documents as a significant location for historic and prehistoric Inupiat living in the Brooks Range. The selected monofill site should be adequately tested to demonstrate that no cultural properties will be affected. If such properties are found, they should be mitigated in conjunction to consulting with the Alaska SHPO before removal of materials at the Umiat landfill site begins.

Response: Cultural and archeological resources are considered during the CERCLA process through the Remedial Investigation and the Feasibility Study. As the lead federal agency, USACE will continue to coordinate with SHPO regarding potential impacts to cultural resources as this project moves forward.

3.4.10 Borrow Area

Comment: For the borrow area, has that [gravel] all been sampled?

Comment: So in the borrow site, is there stuff that's there and by digging it up, are you actually potentially making the situation worse by putting more chemicals into the river because you're taking gravel there to try to remedy some other situation? So I think the suggestion of doing extensive, not just a couple of sites, but doing extensive testing of that soil is vitally important before you take material out of there.

Comment: Concerned about taking an area for utilizing the gravel that's going to increase our risks with erosions of that landfill into the river.

Comment: Find an alternative borrow site for gravel to construct the gravel pad and monofill.

Comment: I also am worried about the borrow site. To me, it's so close to the river that moving a bunch of gravel has potential consequences that nobody is really thinking about. I mean, I've seen in Barrow where the Air Force and the Navy moved a bunch of gravel and it breached the spit out to the point. So people couldn't go out there and

access hunting sites and fishing sites because all this gravel was moved. So what are the unforeseen consequences of taking a bunch of gravel out of that borrow site?

Comment: Your area where you're going to do your gravel renewable, you're only increasing our risk. It's going to decrease your risk because you're allowing more to slough off and get into the river and contaminate our food sources, but you'll have less to clean up by causing the erosion to increase and causing that to slough off more. Our risks go up. When you take that area of gravel removal you're planning there, our risks go up. Why would you do that to increase our risks when erosion factor would probably increase and lead to more of that landfill leaching into the river? That's very concerning.

Comment: I see your borrow site is either working on the river channel and the bank itself -- that borrow site right there, what do you do with local ordinances and laws? Land use policy says you can't mine from there. Did you know that the Alaska statutes require departments of the state to follow the home rule ordinances and laws of the Borough as a political subdivision? That means to adhere to local zoning and land use policies. Our policy is -- it's pretty restrictive on mining, sourcing gravel from active river, I forgot the name of it. I forgot the name of it. From bank to bank and excluding the areas that are part of the river, the active river channel, and then creating, I think, a 1,500-foot buffer from the active channel so that it doesn't alter the -- alter the movement of the river itself to make permanent channel shifts and stuff like that. So there's policies like that in place. I just wanted to point those out because we've encountered them. We do work with DOT on the Haul Road because they tend to want to mine the river for other things and we're always tugging. So we entered into a memorandum of understanding with Alaska DOT to better coordinate so that they can better understand the home rule policies of the Borough.

Comment: The potential borrow sites for gravel around Umiat are in environmentally sensitive areas around the Colville River. Mining gravel around the Colville could result in erosion and possible channel shifts, leading to undiscovered hazardous materials entering into the Colville.

Response: The USACE will conduct an assessment of the most appropriate location for a borrow area on the point gravel bar east of the landfill site on ADOT&PF property to minimize impact on Colville River hydraulics and prevent entrapment. Potential borrow material will undergo chemical sampling to verify that it is not impacted by contamination above cleanup levels applicable to the Umiat Landfill. USACE will continue to coordinate with the ADOT&PF and ADNR regarding potential permitting aspects of a designated gravel source on state-owned lands. USACE has also reviewed the North Slope Borough municipal code. Title 19 Zoning of the North Slope Borough Municipal Code requires land use permits for all developments and uses within the North Slope Borough boundary, which includes the Umiat area. According to the permit application materials, the responsible entity, including private, state or federal agencies, must submit a North Slope Borough permit application for any developments and uses within the North Slope Borough boundaries. Examples of developments and uses which may occur during the Umiat Landfill remedy implementation include: earth moving activities; creation of ice roads/pads; dredge or fill activities; creation of an

equipment or material storage site; activities directly related to resource extractions (gravel extraction); and tundra travel.

According to Section 19.70.050 Coastal Management and Area-Wide Policies, (1) Mining (including sand and gravel extraction) in the coastal area shall be evaluated with respect to type of extraction operation, location, possible mitigation measures, and season so as to lessen, to the maximum extent practicable, environmental degradation of coastal lands and waters (for example, siltation of anadromous rivers and streams). 2.4.5.2(a); and (4) Gravel extraction activities within the floodplain shall maintain buffers between active channels and the work area, avoid in-stream work, permanent channel shifts and ponding of water, clearing of riparian vegetation and disturbance to natural banks. 2.4.5.2(d).

3.4.11 Local Hire/Contractors/Community Representative

Commenters consistently requested that local hires be used for completing the project.

Comment: Hire local community members to advise, assist and monitor cleanup efforts. Adequate oversight and community consultation are necessary to ensure that community's concerns are properly addressed.

Comment: Speaking of contractors, have you talked to the various corporations to at least get a bid on that project? What kind of contract does it take to proceed? Because Wainwright just passed over the cat train going to Umiat for a project. What kind of contract does it take to proceed? Are you guys aware of that?

Comment: But the other thing I really want to emphasize is this is going to be a mega project, a lot of dollars. I think it would be prudent to use a local workforce. The eyes of the people that have watched the contamination to watch it clean up. To have that confidence built into the people that America is doing something for it, and they're going to hold our hand so that we can watch this process and not second-guess or be on the sidelines and heckle the process. I really encourage you to -- a lot of them have their own corporations in this area. I would try to engage Anaktuvuk Pass, a very economically depressed area on the North Slope that doesn't have very much opportunities. I would engage them in a way that would offer some level of cooperation and contract help even if you've got to foster their development. Periodically there's several village corporations that go under and close until they get 7(i) funding or something like that from their mother corporation. So that's how dire, in some cases, our region is. It needs some level of economic opportunity. Seems like this is so big, because I've seen the numbers involved here. You need to be prudent because your own laws I think -- what do they call it, 8(a) or something like that? Some of these are very disadvantaged minorities among minorities among minorities of the minorities. There's only 10,000 of us. We're almost extinct people. By the way, in the '50s they made us glow with iodine 131. But work with us up here. We really need that.

Response: USACE will continue open communications and collaboration with the tribal governments, local communities and stakeholders to ensure awareness and coordination on the Umiat Landfill remediation. USACE utilizes a procurement process that complies with federal acquisition regulations. USACE has multiple small and

disadvantaged business goals when developing an acquisition strategy. This project will have various components and opportunities for contractors and subcontractors. USACE may utilize set-aside provisions to encourage the use of Native Alaskan owned businesses.

3.4.12 Community Advisory Inclusion

Multiple commenters requested continuing involvement of local stakeholders.

Comment: Assist and Monitor Cleanup Efforts: We request that USACE engage in thorough community consultation and hire representatives from the community of Nuiqsut to advise, assist and monitor the progress of this project. Adequate oversight and community consultation are critical to make certain that the community's concerns are properly addressed throughout this process as local residents may have information concerning areas of contamination unknown to USACE. Taking these measures will help ensure that the cleanup is as comprehensive and effective as possible.

Comment: Consult with local residents on impacts from Umiat and how these will be addressed by the Corps; Form an "Umiat Formerly Used Defense Site Restoration Advisory Board" with local people and entities.

Comment: Cleanup is taking too long. Wants to see local knowledge incorporated. Local people know just as much as agency people.

Response: As part of the public outreach process, USACE is evaluating the need for establishment of a Restoration Advisory Board in Nuiqsut. Furthermore, USACE is a member of the U.S. Air Force-led Restoration Advisory Board (RAB) in Utqiaġvik.

The purpose of a RAB is to provide the government with community input on the environmental restoration at the FUDS property. A RAB, consisting of five to ten members, is strictly advisory and is co-chaired by a representative of the USACE Alaska District and a public citizen selected by the RAB members. RAB community members function in a voluntary capacity for one- to two-year terms; members serve without compensation. RAB responsibilities include:

- Representing community and stakeholder interests in cleanup of eligible sites.
- Participating in approximately one RAB meeting per year with the purpose of resolving issues and soliciting input on the proposed cleanup strategies.
- Reviewing and providing written comments about key technical reports and work plans for proposed cleanup actions.
- Facilitating open and active communication among the USACE, state and federal regulatory agencies, other agencies, federally recognized tribes, Alaska Native Claims Settlement Act Native corporations, and other community members.
- Providing feedback to members of the USACE, regulatory agencies, and other agencies about the interests and concerns of the community.
- Reporting back to the community about the outcome of each RAB meeting.

RAB members are selected from interested individuals who live and/or work in an area affected by the FUDS. Potential members represent the community with diverse interests.

3.4.13 Subsistence Impacts, Health Concerns, Traditional Knowledge of Waste/Contaminants, Legacy Impacts

Comment: Staff needs to fully review the village comments from the generations of concern for this area. Our fish were proven to have contaminants (sic) from activity in this area. There are documents that show many barrels of contaminants (sic) shipped to this area and hardly any information it has been shipped out. Staff came and talked about the barrels being full of sewage. Our elders talked about hundreds of drums dumped with many contaminants to over thousands. The CDC presented a report about fish [contaminants] but we changed this report but our tribal risks were not fully covered in this report. Follow up assessments have not occurred. The area for material accumulation puts the landfill at more risk for erosion and increase our exposure risk decreasing the concern for your liability. We are being left with generations still being exposed after almost 100 years and clean up still being planned and yet continued project approval adds to our cumulative risks. The staging of material has happened and poor capping led to exposure outside your pits as our traditional knowledge said would happen yet many months passed before the area was covered to reduce migration. The area has exposed our food, our life health and safety for almost 100 yrs. Your process is costing our people life health safety and tradition and culture. Hundreds of our village use this area with increasing needs. The area will continue to generations. Few worked at that project. Little benefit with all the users. [Many] concerned the project is just placating our concerns and not giving us protections for our lives and future generations.

Comment: Our elders talked about Umiat, and some of our elders actually worked there. Some of our elders' jobs were to cut open those barrels that had various contaminants in them, not just sewage. All sorts of chemicals and different contaminants that were in those barrels, and their job was to cut them open, pour the contents onto the ground, and throw the barrel into the barrel crusher. So you're belittling some of those comments, but you guys came here and our elders educated you about that. That's very disrespectful that you're not including some of that into this discussion. Archie is one of the elders and there were other elders that were involved in that process. We had 23 elders that were interviewed about their knowledge of Umiat prior to you starting these cleanups. If you haven't reviewed that document, you need to go back and do so because you're not being very respectful of our traditional knowledge that says that we have a lot to be concerned about what's there and what was put into the ground, not just the barrel carcasses like you're alluding to.

Comment: The contaminated sites on these formerly used defense sites at Umiat on the north slope are impacting the health of the residents of the North Slope because of the great risks it possesses by potentially hazardous wastes sources that are in an area that we do have access to and do go around to hunt some subsistence resources and some of these sites have recently have been exposed and can impact also the wildlife that also may live near these sites and may even be crossing over these sites as they are open and not protected or cut off and may enter freely around that area.

Comment: We've already proven that the contaminants have gotten into our fish, but yet we've had no support from any of you to get more studies in this area to fully assess

our subsistence risks. It's not only the fish that we're concerned about; it's the migratory caribou that go through this area. But this area has an increased need for our community with the changes around our village. We're having 30 to 50 boats go up there in the summertime to try to get away from some of this activity. You all thought in those early assessments that we would go with minimal boats that you put into your assessment. Well, that didn't stay that way. We've changed tremendously. Now we have a lot of boats that are going up that way, trying to get harvests as well as trying to get away from changes in our traditional lands and waters that are being impacted with the changes around this. So those assessments are very concerning. We have a lot of people that still go out and do a lot of fishing on the Colville River. We do have more people that are going upriver because of trying to get away from all of the changes that are happening. So people are moving to different areas, trying to get out and do things in a more traditional way. But we have multiple areas that have had erosions where we've had contaminants go through. The floodings are tremendously concerning because of the continued contaminants, but where is the damn support to get us our subsistence foods assessed and sampled to show whether or not any of your cleanup is doing any good?

Comment: It was basically the industry that caused this contaminated site, oil exploration. When I go back home in April, I'm going to have to deal with it. On the other hand, the new industry, ConocoPhillips has numerous sites along the coast of the Colville. What happened as a result of this -- I do notice one thing. I shared this with -- my testimonies to the federal and state authorities that come in for meetings. For two years I looked for the big bow caribous in our area. We used to find them on the coast of the Colville. For two years I looked for them. That's why I decided to start looking upriver. I finally found these big bow caribous 60 miles upriver in the Chandler River. So these caribous, where they used to be all in the vicinity of Nuiqsut, is 60 miles upriver now in the vicinity of Umiat. So it's a double thing that I'm looking at where I have to go hunt. I have to go near this contaminated site to the old oil industry site because the new industry site offset these caribous that I need to eat. This is a real scenario that I'm talking about. It's -- this is what the Nuiqsut people have to deal with while you guys are discussing money about this project. Conoco, I know, is very concerned about this. They are very aware of Umiat. So they start these fish studies as a result of our concerns in Nuiqsut.

Comment: When you look at the name of that place, Umiat, the reason why it's called Umiat is this community used to live there on the edge of the ocean. We followed it going back up there, still being on the edge of the ocean, and then we make these permanent sites to store contaminants. It's going out the ocean because the ocean is coming. With this warming that's occurring, it's coming. You can't leave anything. It wasn't there before. You can take it out.

Response: This project's purpose is specifically to be protective of human health and the environment. Clean up levels discussed in the Remedial Action Objectives are regulatory levels required to achieve in the clean up to protect human and environmental health.

As an initial step, the remedial design phase will include detailed discussions with multiple persons who worked at the Umiat site during the 1970's cleanup efforts, in order to obtain valuable information about the disposal practices that occurred, types of wastes placed into the landfill, and locations where specific types of waste items may have been placed. Each of these people will be presented with map(s) so that location-based notes can be recorded.

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.

The landfill debris includes batteries, transformers, drums, and other items containing hazardous substances that have the potential to continue to impact the soil, sediment, groundwater, and surface water. Based on public comments in 2018 there are indications that there may also be small arms ammunition. The chemicals found to be of concern on this project location are 4,4'-DDT, 4,4'DDD, lead, PCBs, and diesel range organics (DRO). Several studies have been conducted, starting in 1986, to determine the level of contamination. Detailed waste characterization and sampling will be conducted when excavation of the landfill begins.

3.4.14 Stakeholder Communication/Coordination

Several comments concerned future coordination and communication regarding selection and implementation of the selected remedy.

Comment: We all need to keep the lines communication open. That is where traditional knowledge comes in and how do you utilize our hunters for accurate information – where things are, etc.?

Comment: Work with locals. We are very knowledgeable people. We have lots of experience.

Comment: As the potential future land owner, it is important to note that DNR-DMLW must concur prior to site closure.

Comment: Yeah, but you were here for that public record before, and you're not carrying it forward into this process.

Response: The USACE intends to continue open communications and collaboration with the tribal governments, local communities, and stakeholders to ensure awareness and coordination on the Umiat Landfill remediation. All comments received for this project have been taken under consideration.

3.4.15 Design Considerations – Ice Roads and Alternatives

Concerns were raised about the feasibility of some design considerations such as utilization of ice roads.

Comment: I have a comment regarding these ice roads. This year, due to the extreme warm weather, we had extreme difficulty completing the ice roads because you're talking about soft snow and the ground is not frozen under the snow. There was more tundra damage done than in previous years. I know that because I was out there. Usually the ice road is done in the middle part of December on average. It was finally completed about two or three weeks ago, all due to the warm weather that we've been experiencing. So that's something you guys need to be aware of now.

Comment: I don't think you even really need to do ice roads if you use the Rolligon type stuff that can go -- some are approved vehicles, like piston pulleys and that stuff. Seems to me you can start pretty early, because DNR will let you go if you have vehicles that are summer approved and capable of traversing the tundra like that.

Comment: So when the ice road first starts, the oil industry sends these Rolligons filled with water and they splash water to where the ice road is going to be. These Rolligons do not cause tundra damage when they travel across the tundra. That's a very viable option to get these contaminants out of Umiat. When you think about possible millions of dollars it's going to cost to do the ice road versus sending Rolligons over there and get these contaminants out of Umiat. That's realistic to me.

Comment: So you can fly it out with a sky crane 20,000 pounds at a time. Don't need a road.

Comment: How about a permanent site at Umiat? You know, maybe in the future we'll have oil fields surrounding Umiat eventually. They've got to bring their stuff -- junk to that one spot. You can build one permanent road. I think that would be cheaper and more feasible probably.

Comment: All you need is one bunker buster and let it go off. Then you make a landfill real quick.

Comment: Another way to remove that contaminant is to put in a slurry line and take the contaminants out. You don't need a road. Push it out with contaminated water and a slurry line.

Comment: The other thing is I think a lot of the industrial operators that can't access our landfills and the waste stream tend to develop grind and inject capabilities and inject that subsurface way into the geologic formation of the earth. You might want to think about that. Because if those wells that were drilled by Linc and some others, if they're just in suspended mode, I do know that they convert some of those. They go back into them and make injector wells out of them for disposing the waste. Some kind of Class or some other hazardous waste. I don't know.

Response: The cleanup activities would be conducted during times when it is most feasible to complete the work in a safe manner and reduce impacts to the environment. Methods for mobilization and transportation of equipment and materials will be evaluated during the remedial design process and decided during the remedial action phase. The use of low-pressure tundra vehicles such as Rolligons may be considered during the remedial design phase.

The monofill will be designed in accordance with sections 410(a), 460 (e) and 490 (c) of 18 AAC 60 Solid Waste Regulations. The design will address concerns raised regarding erosion, permafrost, and re-vegetation. The design effort will involve field data collection at the monofill location.

Under CERCLA Section 121 and the NCP, the lead agency must select remedies protective of human health and the environment, compliant with legal requirements (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Of the remedial alternatives considered in the 2015 FS, the selected remedy represents a reasonable use of permanent solutions and treatment technologies practicable and cost-effective at this site.

3.4.16 Remedial Action Construction Design Details

Commenters requested additional information on various aspects of the project design details.

Comment: When will this off-site transport occur? Will hazardous materials be stored for an extended period of time? If so what will be done to protect the staging/storage area? When will demobilization occur? Will this occur during the winter months along with transporting materials to the inert monofill? Please provide more details regarding the scheduling and plan for demobilizing.

Response: Cleanup activities, including landfill excavation, sorting, monofill development, material transport, and placement, mobilization and demobilization would be conducted during times when it is most feasible to complete the work in a safe manner and reduce impacts to the environment as required by regulations and will be determined during the remedial design and remedial action process.

3.4.17 Project Timing Constraints

Multiple commenters raised concerns about the impact of cleanup activities, including landfill excavation, sorting, monofill development, material transport, and placement.

Comment: Any activity, not just noise, affects subsistence resources that are important to the Village including caribou and moose. Fishing season occurs June to October; moose hunting season occurs August to October; and the caribou migration occurs from June to October. Moose, fish and caribou are all very important subsistence resources for livelihood of the community. Air traffic during these times cause too much disruption and NVN asks not to have any air activity during these timeframes.

Comment: Any activity scares away animals. Moose are coming back and that is a really big deal for the community when a moose is caught. There is a one month moose season. Umiat is the area for moose hunting. And salmonberries in August, and geese and ducks.

Comment: Concerns over fish spawning and birds nesting. If contaminants are spilled in the summer time then it will affect all fish, including spawning fish. The birds are attracted to all gravel. Geese are attracted to gravel for their digestion. Birds come

here from all over the world. Work in the winter has less effects to subsistence, the summer is more delicate. There are trappers and wolf hunters in the winter.

Comment: Heavy rain and flooding occurs in that area during June, July, and August. The Colville can rise up 10-12 feet overnight, it is a really strong river.

Comment: You know how it's really raining more and more in that location? Weather is changing. Have you guys done any kind of cleanup in areas that has lots of rain that you get ideas from on how to do it here? Like Florida. It's always raining there. How did you handle cleaning up a site where there's lots of rain?

Comment: I understand that, but we also have had a tremendous change in the way that we're having precipitation out here. In July we had a big rainfall that happened, and there was a tremendous amount of erosions all around town as well as upriver. So if you're not making sure that you incorporate a plan to respond -- it's not just the slough flooding; it's the amount of rainfall that's coming down that embankment where the landfill is. When you're having those kinds of rains, and they happen rapidly in July, and you already have the permafrost that's eroding, then you add in those warm rains, there's a lot of erosion that's occurring in these areas. So I'm just making sure that you're looking at the opportunity to prevent the continued exposure that we've already failed to prevent.

Comment: Now, it's not just the water--water flows. It rains up there. It's rained real heavy. That water, after it rains, that water drains to the Colville. Take that chemical to the Colville at the same time.

Response: The cleanup activities would be conducted during times when it is most feasible to complete the work in a safe manner and reduce impacts to the environment as required by regulations and will be determined during the remedial design and remedial action process.

The USACE has experience cleaning up FUDS sites throughout the United States. The CERCLA regulations and requirements remain the same in all weather conditions and will be adhered to on this project. Based on the 2017 Site Inspection, there is no evidence that existing contamination is spreading from the landfill to the Colville River. Groundwater contamination exceeding ADEC screening levels existed in two temporary wells, (WP-03 and 04). Well point WP-04 contained 4,4’-DDD and heptachlor epoxide. WP-04 was placed approximately at the former temporary well location MW-6, which in 1996 had detections of 4,4'-DDD and 4,4'- DDT in both groundwater and soil at 3 feet bgs. Well point WP-03 had an exceedance of 1,1,2,2-Tetrachloroethane. This evidence indicates that pockets of contamination within the soil remain and are impacting groundwater in those immediate areas.

3.4.18 Fish Contamination

Several commenters voiced concerns regarding fish contamination that has been identified on the North Slope and that the contamination is coming from the contaminated landfill. (See also specific comments under 3.4.7 and 3.4.13.)

Comment: Nuiqsut residents are concerned that pollutants from the Umiat landfill site have contaminated Colville River fish. The cleanup will disturb sediment, potentially resulting in the inadvertent release of additional toxic substances into the Colville, which may end up in fish consumed by Nuiqsut residents. The current proposed plan is unclear on whether the amount and scope of monitoring for contaminants in soils water and fish of the Colville is sufficient. The draft plan appears to include only one review after five years to verify the monofill remains protective of human health and only three groundwater sampling efforts. We believe this level of monitoring is inadequate and request USACE to implement a more robust monitoring program for hazardous contaminants to ensure that residents are informed of the level of contamination in soils, waters of the Colville and in fish.

Response: After completion of the landfill excavation activities, at least three consecutive groundwater sampling events would be conducted to verify source removal achieved the groundwater remedial action objectives. Depending on evaluation of the results of the confirmation groundwater sampling, the former landfill site would be available for unlimited use / unrestricted exposure under this alternative.

Comment: Will cleanup include the drums by the river and the impacts to the fish?

Comment: Fish and caribou are sick. He is concerned about the white fish. The contamination is causing some of the fish from that area to mold. How can USACE remedy our fish for the long term? There is major flooding every spring, summer, winter. This will cause more changes to fish that come up the Colville River to spawn every year.

Comment: What is the remedy for the fish? Fish liver is a delicacy and we are told not to eat the liver of fish from the Colville due to DDT and PCB in the liver. The fish was bountiful. Elders used to catch thousands in their net. Now just a couple hundred. Fish Creek is healthy. Fish Creek is to the side of the Colville. For the last 5 years the Colville has not been healthy. There are differences in adjacent streams. The fish in Fish Creek are healthy. Fish Creek is not connected to the Colville. The Colville, the main river, is not healthy.

Comment: We are very concerned about our fish flowing down to our river streams from the Colville river especially spring breakup when the current is strong and how the current will take the debris far from the Umiat Landfill Site. It's been too long, immediate cleanup should be done because we as Inupiaqs are good stewardship to our land that gives us food to put on our tables. Our concern is that how about if barrels contain little or lots of toxic chemicals open and spill in the river or land?

Comment: Staff needs to fully review the village comments from the generations of concern for this area. Staff intentionally came to present in a way to decrease concerns that contradict the generations of engagement that presented concerns. Our fish were proven to have contaminants from activity in this area. There are documents that show many barrels of contaminants shipped to this area and hardly any information it has been shipped out. Staff came and talked about the barrels being full of sewage. Our elders talked about hundreds of drums dumped with many contaminants to over thousands. The CDC presented a report about fish [contaminants] but we changed this

report but our tribal risks were not fully covered in this report. Follow up assessments have not occurred. The area for material accumulation puts the landfill at more risk for erosion and increase our exposure risk decreasing the concern for your liability. We are being left with generations still being exposed after almost 100 yrs and clean up still being planned and yet continued project approval adds to our cumulative risks.

Comment: Unfortunately it's in our food, and that's the biggest concern about why we're here to talk about this stuff. Because we've known it's been in the food for a long time, but the process to try to remove some of these things is not happening when it could have happened. Instead we're still at it 40 years later, talking about these same concerns.

Comment: How are the fish being affected by now with all this debris? How are the burbot being affected by all this stuff, you know, going to the river now?

Comment: I'm one of the residents of Nuiqsut. Especially in the last five years I've been boating heavily along the way to the Umiat site for moose hunting. My moose hunting site is three miles north of Umiat, downriver from the Umiat site. I am one of the fisherman that sends samples to the Borough regarding these fish you guys are talking about. Especially the last several years we fishermen in Nuiqsut watch more and more sick fish that have been increasing especially the last couple of years. These sick fish are different species of fish, not only with the burbot, but with the whitefish and the other fish we call koktuk. There seems to be an increase of sick fish on the Colville with no one really having an explanation of why.

Response: This project’s purpose is specifically to be protective of human health and the environment. However, 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. It is less indicative of contamination from point sources within the landfill, though these sources may contribute to the concentrations in the landfill stream for a fraction of the year, when surface water is present.

3.4.19 Contaminated Soils and Groundwater

Comments received included preferences for one alternative over others presented at public meetings. Other comments included ideas regarding how to remove the contaminated soils from the area. As the basis of this project under CERCLA Section 121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, are compliant with legal requirements, are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Of the remedial alternatives considered, the selected remedy represents a reasonable use of permanent solutions and treatment technologies practicable and cost-effective at this site.

Other commenters expressed concern regarding the amount and kinds of contamination that has been found in the project area.

Comment: It's going out the ocean because the ocean is coming. With this warming that's occurring, it's coming. You can't leave anything. It wasn't there before. You can take it out.

Response: The landfill debris includes batteries, transformers, drums, and other items containing hazardous substances that have the potential to continue to impact the soil, sediment, groundwater, and surface water. Based on public comments in 2018 there are indications that there may also be small arms ammunition. The chemicals found to be of concern on this project location are 4,4'-DDT, 4,4'-DDD, lead, PCBs, and diesel range organics (DRO). Several studies have been conducted, starting in 1986, to determine the level of contamination. Detailed waste characterization and sampling will be conducted once excavation of the landfill begins.

4.0 REFERENCES

Agency for Toxic Substances and Disease Registry (ATSDR). 2001. *Health Consultation, Review of Fish Samples, US Army USACE Umiat Air Force Station*. F10AK024303_03.11_0005_a. 25 June.

Agency for Toxic Substances and Disease Registry (ATSDR). 2003. *Health Consultation, Review of Burbot Samples, US Army USACE Umiat Air Force Station*. F10AK024303_03.11_0010_a. 25 November.

Alaska Department of Environmental Conservation (ADEC). 2017. 18 AAC 60. Solid Waste Management. As amended through November 7, 2017.

ADEC. 2018. 18 AAC 75. Oil and Other Hazardous Substances Pollution Control. As amended through October 27, 2018.

Bureau of Land Management (BLM). 2013. *National Petroleum Reserve in Alaska: 2013 Legacy Wells Summary Report. Open File Report 127*. U.S. Department of Interior. May.

Stephen R. Braund & Associates (SRB&A). 2011. *2010 Cultural Resources Survey Report: Foothills West Transportation Access Project, Volume I*. Prepared for the Alaska Department of Transportation and Public Facilities, Fairbanks, AK. June.

Stephen R. Braund & Associates (SRB&A). 2011. *2010 Cultural Resources Survey Report: Foothills West Transportation Access Project, Volume II: Maps*. Prepared for the Alaska Department of Transportation and Public Facilities, Fairbanks, AK. June.

USACE. 1988. *Defense Environmental Restoration Program (DERP) Inventory Project Report (IPR), Umiat Air Force Station, Umiat, Alaska, PN: F10AK0000243*. F10AK0243--_01.08_0500_a. 25 April.

USACE. 1993. *Defense Environmental Restoration Program (DERP) Inventory Project Report (IPR), Umiat Air Force Station, Umiat, Alaska, Site No. F10AK024300, Project No. F10AK0214303 (HTRW-RI/FS)*. F10AK0243--_01.08_0502_a. 27 May.

USACE. 1996. *Community Relations/Public Involvement and Response Plan, Former Umiat Air Force Station, Umiat, Alaska*. Prepared by Ecology & Environment, Inc. for USACE, Alaska District. February. F10AK024303_08.06_0001_a.

USACE. 1997. *Final Risk Assessment Report, Baseline Human Health Risk Assessment, Baseline Ecological Risk Assessment, Former Umiat Air Force Station, Umiat, Alaska*. Prepared by Ecology & Environment, Inc. for USACE, Alaska District. F10AK024303_03.11_0003_a. June.

USACE. 1997. *Final Remedial Investigation Report, Former Umiat Air Force Station, Umiat, Alaska*. Prepared by Ecology & Environment, Inc. for USACE. Volume 1 F10AK024303_03.10_0002_a, Volume 2 F10AK024303_03.10_0004_a. June.

USACE. 1998. *1997 Remedial Investigation Report Umiat, Alaska Volume 1 Report*. Prepared by Ecology & Environment, Inc. for USACE. F10AK024303_03.10_0003_a. July.

USACE. 1999. *Final 1998 Field Investigation Report, Former Umiat Air Force Station, Umiat, Alaska*. Prepared by Ecology & Environment, Inc. for USACE. F10AK024303_03.10_0008_a. October.

USACE. 2000. *1999 Field Investigation Technical Memorandum, Former Umiat Air Force Station, Umiat, Alaska*. Prepared by Ecology & Environment, Inc. for USACE. F10AK024303_03.10_0005_a. January.

USACE. 2001. *Technical Memorandum, Hazardous Waste Removal From Umiat Unit C Landfill, Umiat, Alaska, Final*. Prepared by Jacobs Engineering Group, Inc. for USACE. F10AK024303_07.08_0505_p. October.

USACE. 2003. *Evaluation of PCBs and DDTs in the Colville River, Former Umiat Air Force Station, Umiat, Alaska*. Prepared by Ecology & Environment, Inc. for USACE and ASCI/NANA JV. F10AK024308_03.11_0500_a. March.

USACE. 2008. *Defense Environmental Restoration Program – Formerly Used Defense Sites (DERP-FUDS) Revised Inventory Project Report (INPR) for Property No. F10AK0243, Former Umiat Air Force Station, Umiat, Alaska*. F10AK0243--_01.08_0503_a. August.

USACE. 2010. *Trip Report, Umiat Formerly Used Defense Site (FUDS), Umiat Landfill F10AK0243-09, Umiat, Alaska*. F10AK024308_03.13_0501_p, June.

USACE. 2011. *Hydrologic Analysis of Umiat Landfill*. F10AK024308_04.09_0500_a. April.

USACE. 2011. *Trip Report, Umiat Formerly Used Defense Site (FUDS), Umiat Landfill F10AK0243-08, Umiat, Alaska*. F10AK024308_03.13_0500_p, September.

USACE. 2011. *Final Technical Memorandum, Umiat Landfill Geophysical Survey, FUDS Project F10AK024308, Umiat, Alaska*. F10AK024308_03.08_0500_p. November.

USACE. 2012. Final Trip Report, *Umiat Formerly Used Defense Site (FUDS), Umiat Landfill Site Visit, August 20, 2012, F10AK0243-08, Umiat, Alaska.* F10AK024308_03.13_0502_p. November.

USACE. 2013. *Final Remedial Investigation Report Umiat Air Force Station Landfill Umiat, Alaska*. Prepared by Shannon & Wilson, Inc. for USACE, Alaska District. F10AK0243-08_03.10_ 0500_a. March.

USACE. 2013. *Trip Report, Umiat Formerly Used Defense Site (FUDS), Umiat Landfill August 13, 2013 Site Inspection*. F10AK024308_03.13_0503_p, October.

USACE. 2014. *Trip Report, Umiat Formerly Used Defense Site (FUDS), Umiat Landfill July 14, 2014 Site Inspection*. F10AK024308_03.13_0504_p, October.

USACE. 2015. *Final Feasibility Study Report: Umiat Air Force Station Landfill, Umiat, Alaska*. Prepared by Shannon & Wilson Inc. for USACE, Alaska District. F10AK0243-08_04.09_ 0501_a. September.

USACE. 2015. *Public Involvement Plan, Umiat Air Force Station*. F10AK024308_08.06_0500_a. December.

USACE. 2015. *Trip Report, Umiat Formerly Used Defense Site (FUDS), Umiat Landfill June 9-10, 2015 Site Inspection*. F10AK024308_03.13_0505_p. November.

USACE. 2016. *Trip Report, Umiat Formerly Used Defense Site (FUDS), Umiat Landfill June 6-7, 2016 Site Inspection*. F10AK024308_03.xx_xxxx_p. August.

USACE. 2017. *Amendment, Findings and Determination of Eligibility (2017), Defense Environmental Restoration Program – Formerly Used Defense Sites (FUDS), Umiat AFS* (F10AK0243), Umiat, Alaska.

USACE. 2017. *Feasibility Study Addendum, Revised Conceptual Approach and Cost Estimates for Alternative 6 and Alternative 7, Umiat Air Force Station Landfill.* F10AK024308_04.09_0502_a. August.

USACE. 2017. *Aerial Imagery Analysis of Coleville River Morphology at Umiat, AK*. F10AK024308_04.09_0503_a. January.

USACE. 2017. *Report, Test Pit Investigation for Possible Borrow Area, Umiat AFS – F10AK024308 Formerly Used Defense Site (FUDS)*. F10AK024308_03.04_0503_a. November.

USACE. 2017. *Trip Report, Umiat Formerly Used Defense Site (FUDS), Umiat Landfill June 19-22, 2017 Site Inspection and Groundwater Sampling*. F10AK024308_03.04_0501_a. December.

USACE. 2018. *Proposed Plan, Umiat Landfill Formerly Used Defense Site, Umiat, Alaska, FUDS Project No. F10AK0243-08*. F10AK024308_04.10_0501_a. February.

U.S. Geological Survey (USGS). 2006. *Geophysical Investigations of Selected Infrastructure Sites within the National Petroleum Reserve, Alaska*. USGS Administrative Report 2006-LAI-05-0015. F10AK024308_01.06_0500_a.

ATTACHMENT A
FIGURES

UMIAT AFS - FUDS PROPERTY F10AK0243
Centroid Latitude: 69.393583 N
Centroid Longitude: -152.155546 E
Meridian: Umiat
Sections: 20, 21, 22, 27, 28, 29, 32, 33, 34, T1N, R1W
Sections: 3, 4, 5, 8, 9, 10, 16, 17, T1S, R1W

PLATEAU

NPR-A

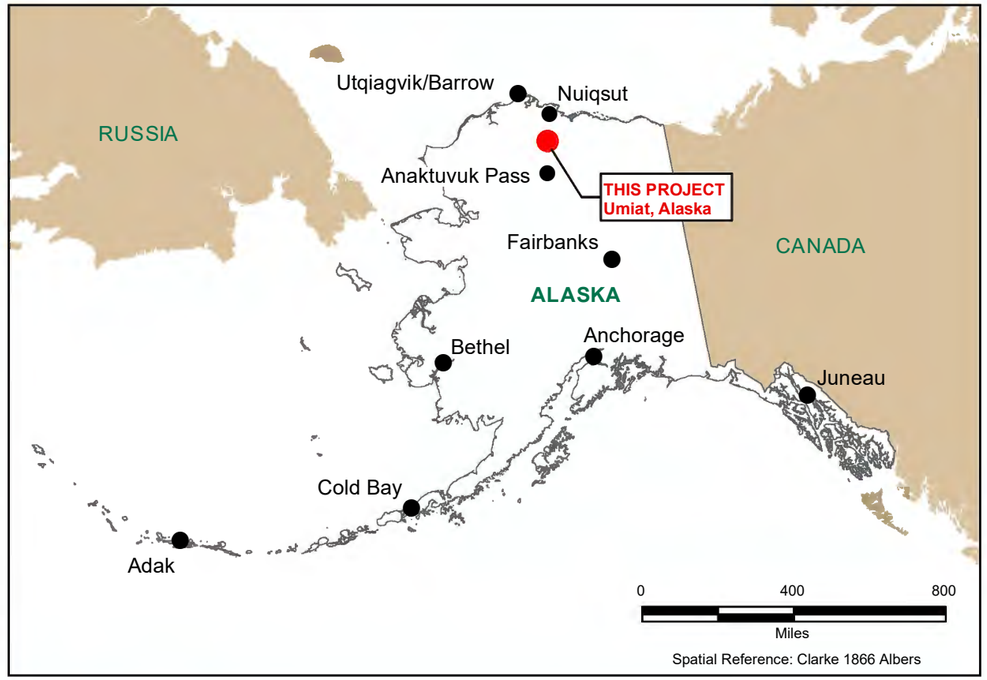
UMIAT RUNWAY

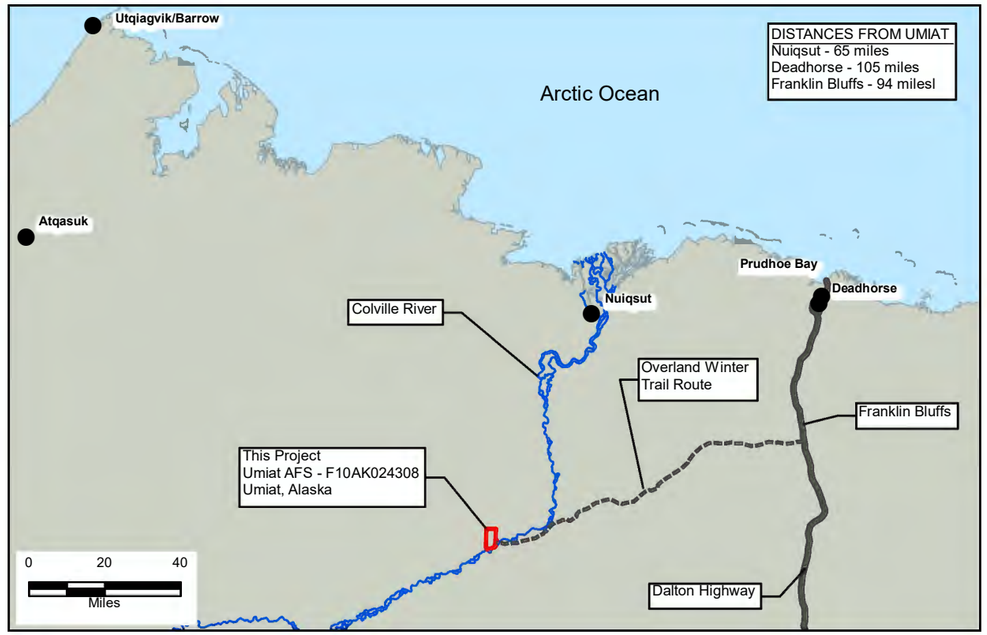
UMIAT, ALASKA

UMIAT LANDFILL - PROJECT 08
Centroid Latitude: 69.366264 N
Centroid Longitude: -152.120469 E
Section 10, T1S, R1W, Umiat Meridian

COLVILLE RIVER

0 2,000 4,000
Feet





LEGEND
- NPR-A Boundary
- Umiat AFS FUDS Property
- Umiat Landfill

REFERENCES
- USGS Map, Umiat B-4, 1955, 1:63,360

N

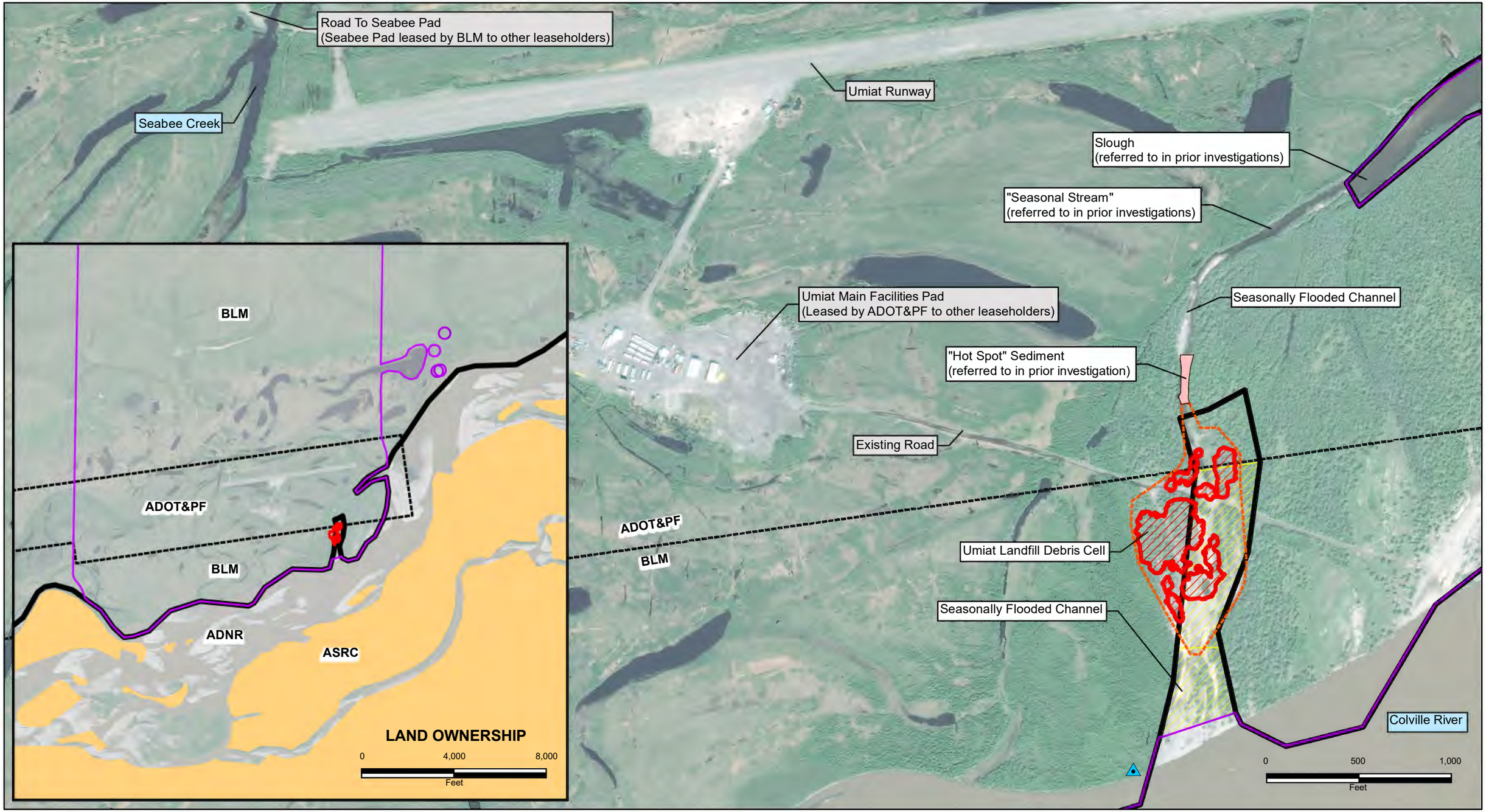
U.S. ARMY CORPS OF ENGINEERS ALASKA DISTRICT

Location And Vicinity Maps
Former Umiat Air Force Station

DECISION DOCUMENT
Landfill, Umiat AFS Formerly Used Defense Site (FUDS) - F10AK0243-08
Umiat, Alaska

Date: 5/30/2019 **Figure 1**

Document Path: C:\Users\j4enegno_GIS\UMIAT_GIS\01_MXD\2018 DD\F1_LocVic_UmiatLandfill_F10AK0243_30May2019.mxd



LEGEND

- NPRA Boundary
- Land Owned by ADOT&PF
- Land Owned By ASRC (ANCSA)
- Umiat AFS FUDS Property Boundary
- BLM Land (State Selected)
- River Gage (USGS 15875000)
- Contaminated Sediment
- Landfill Debris Cell
- Near-Surface Debris Area

NOTES

- Background imagery dated 23 June 2016

ACRONYMS

ADNR - Alaska Department of Natural Resources
ADOTPF - Alaska Department of Transportation and Public Facilities
ASRC - Arctic Slope Regional Corporation
BLM - Bureau of Land Management

N

U.S. ARMY
CORPS OF ENGINEERS
ALASKA DISTRICT

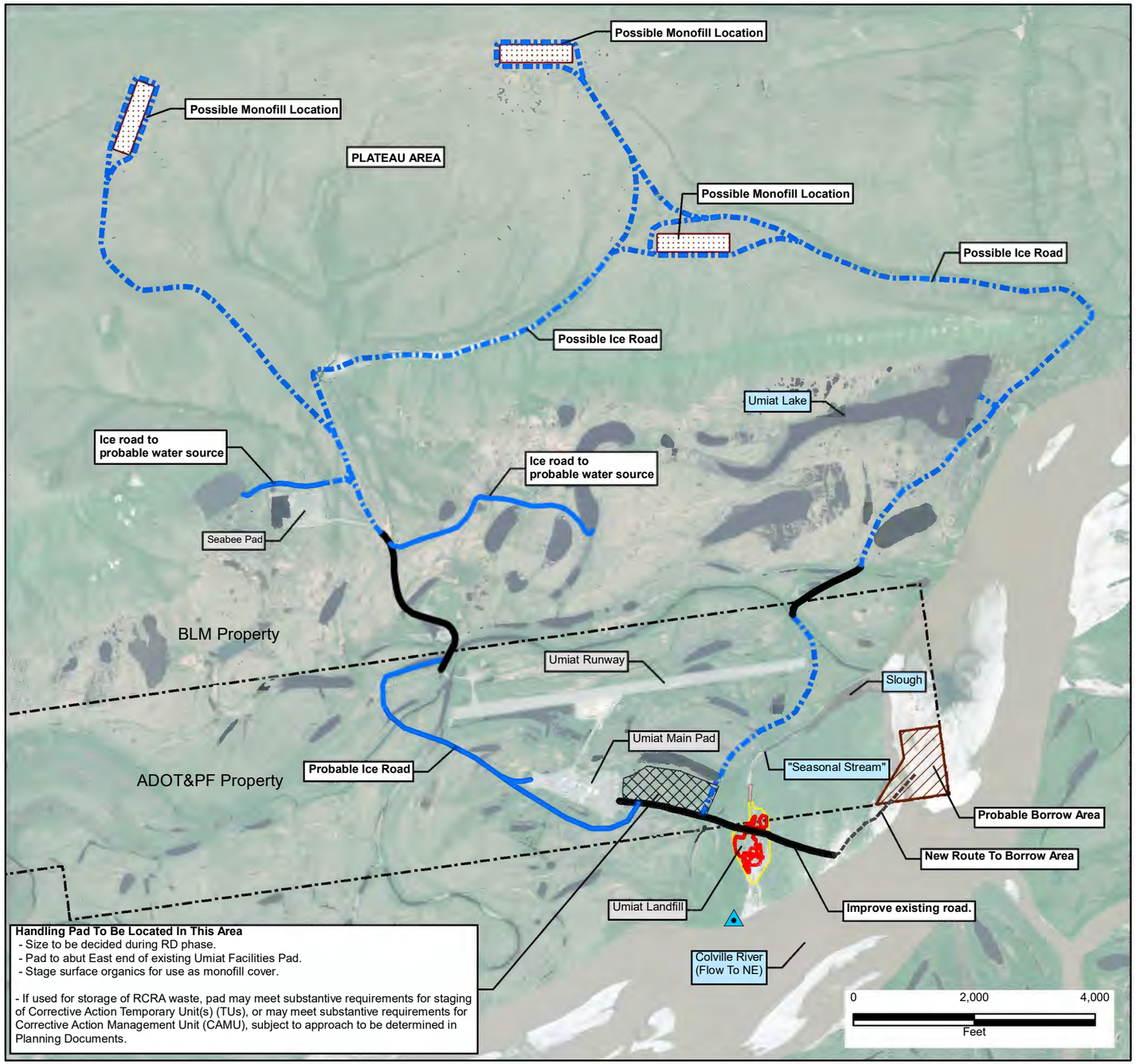
Land Ownership and Landfill Site Location
Umiat AFS Landfill

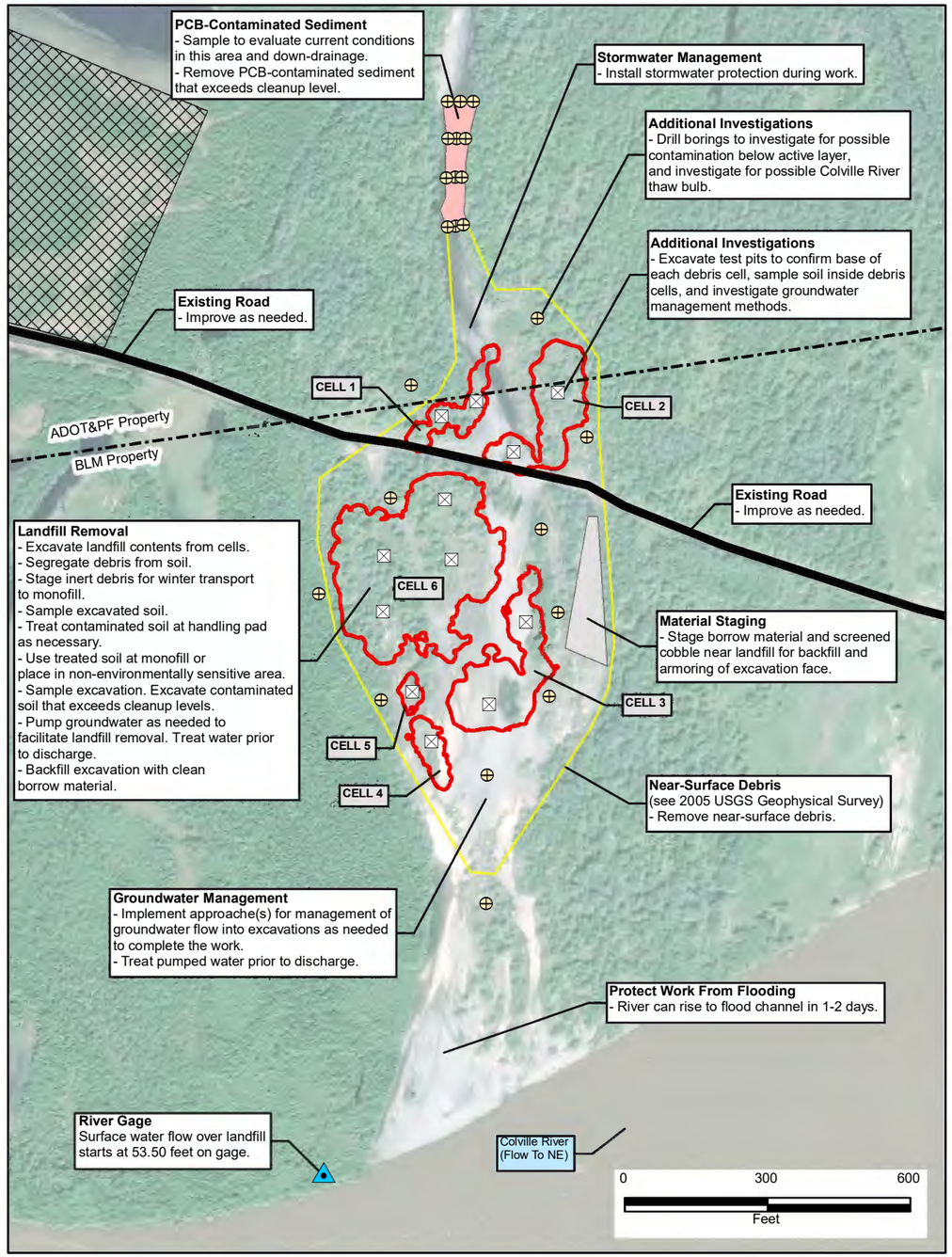
DECISION DOCUMENT
Landfill, Umiat AFS Formerly Used Defense Site (FUDS) - F10AK0243-08
Umiat, Alaska

Date: 5/30/2019

Figure 2

Document Path: C:\Users\j4enegno_GIS\UMIAT_GIS\01_MXD\2018 DD\F2_Site Map_Umiat_Landfill_F10AK0243_30May2019.mxd





LEGEND

- River Gage - Existing
- Upgrade Existing Road
- Probable Ice Road
- Possible Ice Road
- New Access Route
- Proposed Borrow Area
- Proposed Handling Pad
- Contaminated Sediment Prior
- Landfill Debris Cell
- Near-Surface Debris Area
- Possible Monofill Location
- Proposed Boring
- Proposed Test Pit
- ADOT&PF Property Line

NOTES

- This figure depicts a conceptual approach to accomplish the remedy described in the Decision Document. The actual approach may be modified and refined during Remedial Design and Remedial Action-Construction.

N

U.S. ARMY CORPS OF ENGINEERS ALASKA DISTRICT

Conceptual Remedy Approach
Umiat AFS Landfill

DECISION DOCUMENT
Landfill, Umiat AFS Formerly Used Defense Site (FUDS) - F10AK0243-08
Umiat, Alaska

Date: 5/30/2019

Figure 3

Document Path: C:\Users\j4enegno_GIS\UMIAT_GIS\01_MXD\2018 DD\F3_DD_Remedy Approach_Umiat_Landfill_F10AK0243_30May2019.mxd

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.

N

0 400 800

Scale in Feet

Final Remedial Investigation Report
Umiat Landfill
North Slope Borough, Alaska

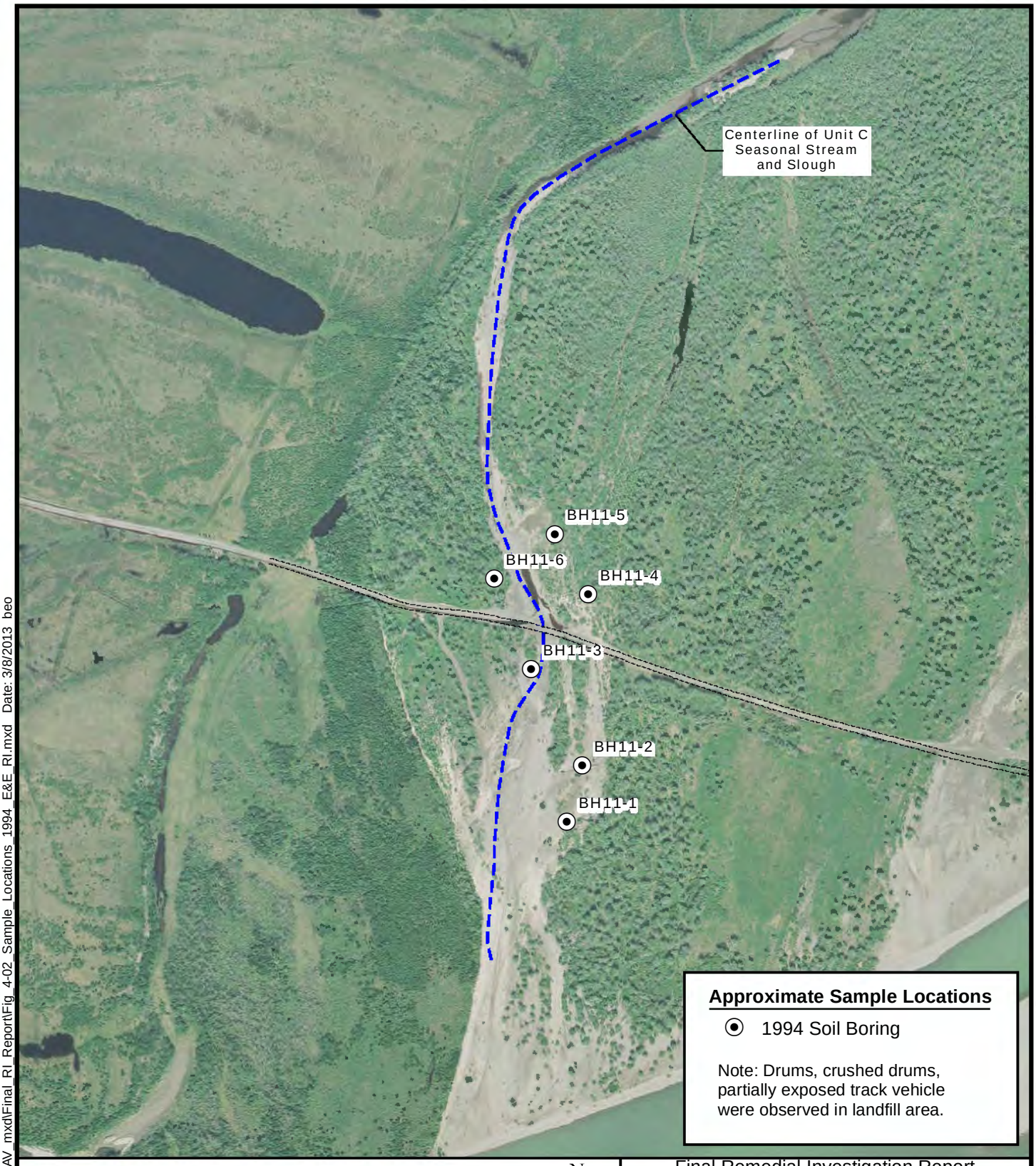
SAMPLE LOCATIONS
1986 USACE HAZARDOUS WASTE SAMPLING AND ANALYSIS

March 2013 31-1-11544-005

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

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



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

Final Remedial Investigation Report
Umiat Landfill
North Slope Borough, Alaska

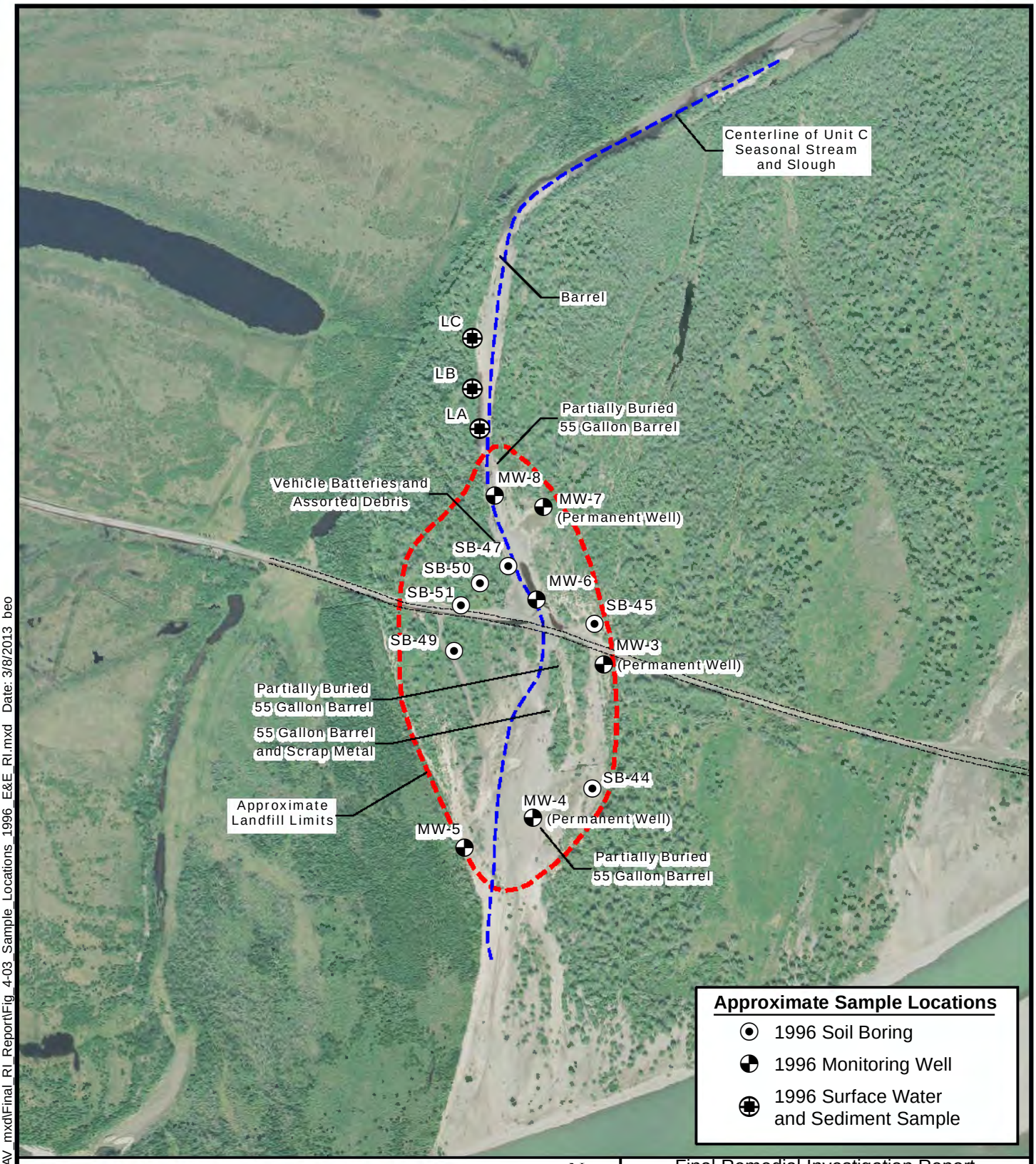
SAMPLE LOCATIONS
1994 E&E PHASE I
REMEDIAL INVESTIGATION

March 2013 31-1-11544-005

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

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



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

Final Remedial Investigation Report
Umiat Landfill
North Slope Borough, Alaska

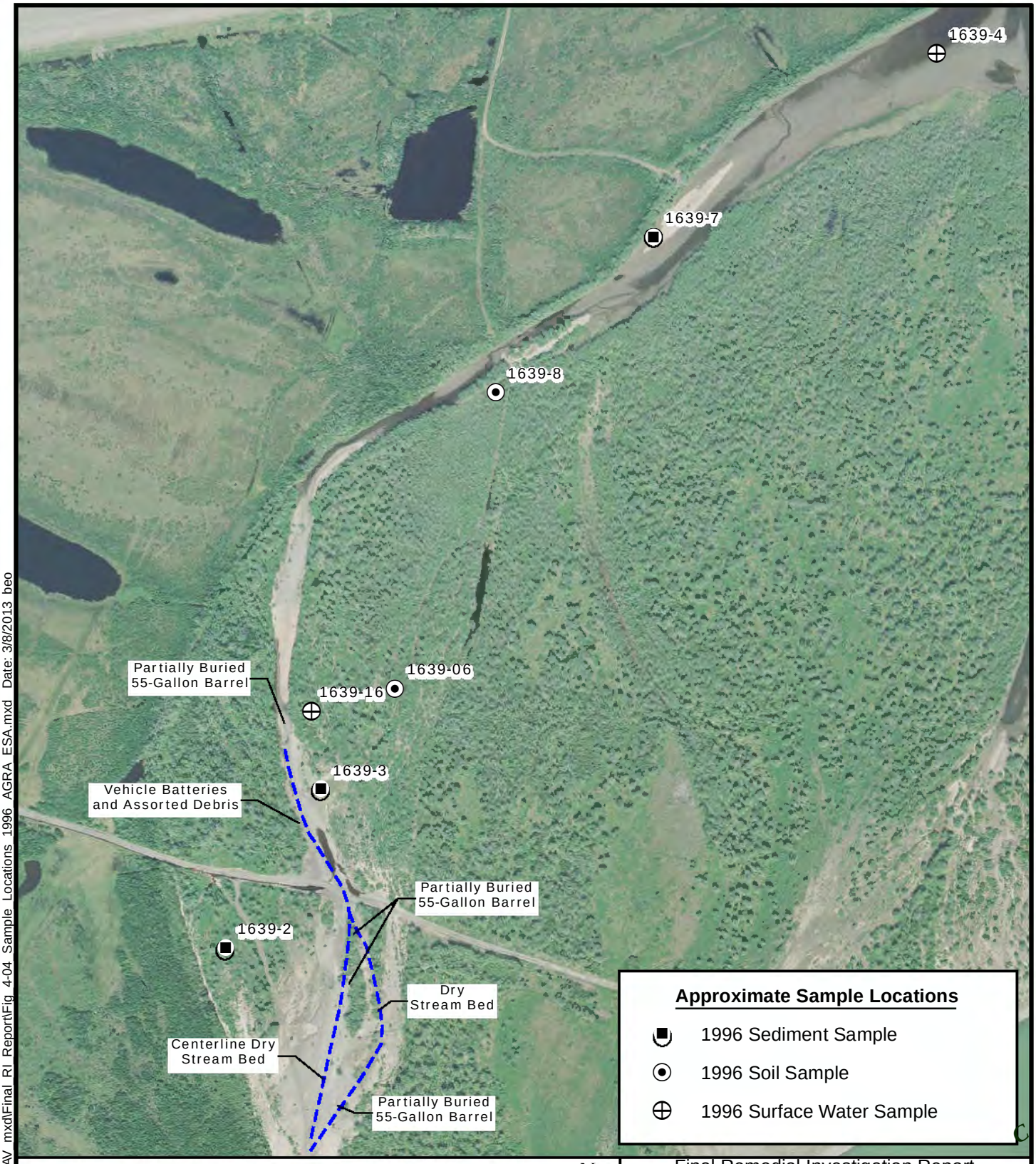
SAMPLE LOCATIONS
1996 E&E PHASE II
REMEDIAL INVESTIGATION

March 2013 31-1-11544-005

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

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



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.

N

0 400 800

Scale in Feet

Final Remedial Investigation Report
Umiat Landfill
North Slope Borough, Alaska

SAMPLE LOCATIONS
1996 AGRA ENVIRONMENTAL SITE ASSESSMENT

March 2013 31-1-11544-005

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

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

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

Final Remedial Investigation Report
Umiat Landfill
North Slope Borough, Alaska

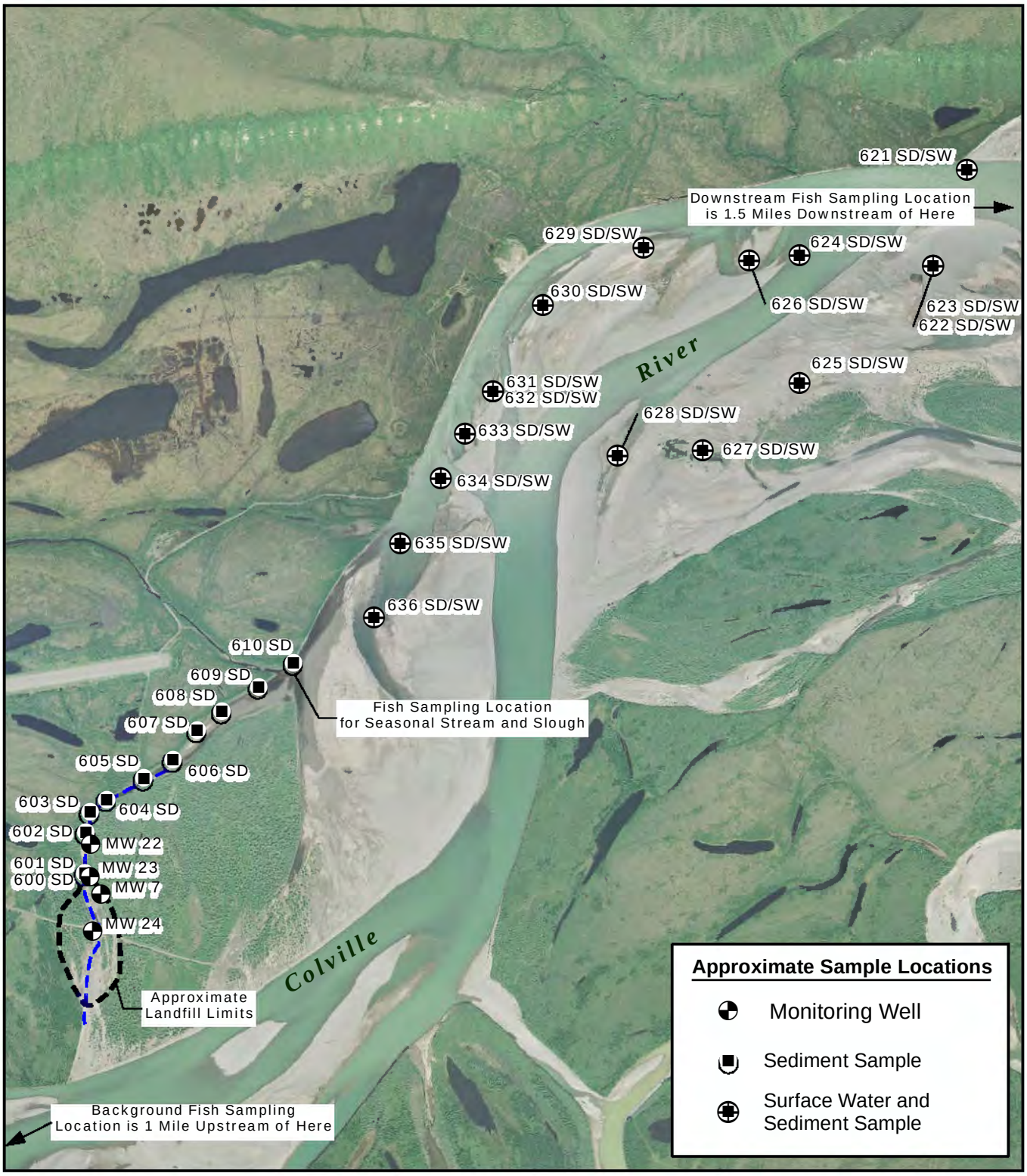
SAMPLE LOCATIONS
1997 E&E PHASE III
REMEDIAL INVESTIGATION

March 2013 31-1-11544-005

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

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



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

Final Remedial Investigation Report
Umiat Landfill
North Slope Borough, Alaska

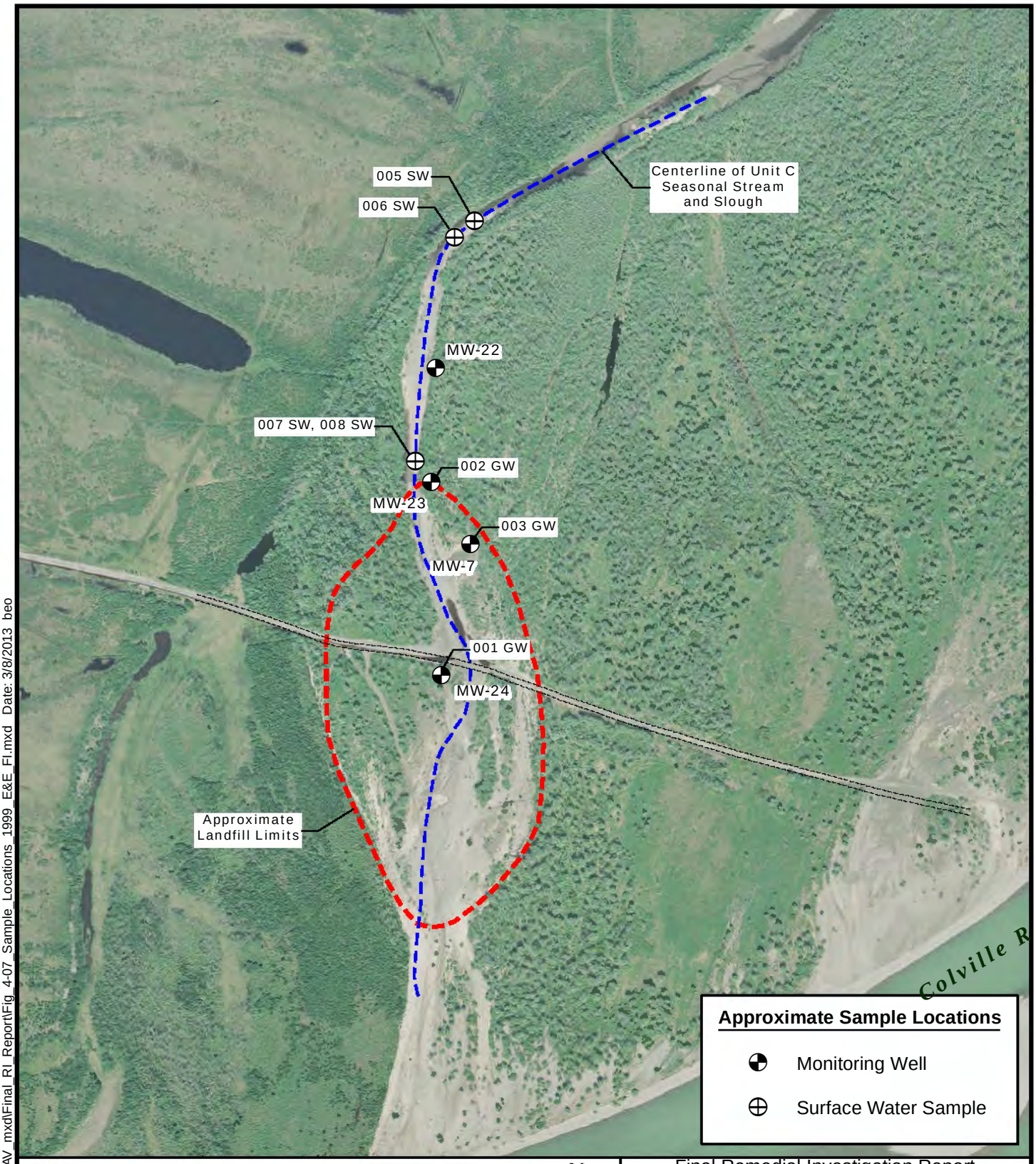
SAMPLE LOCATIONS
1998 E&E FIELD INVESTIGATION

March 2013 31-1-11544-005

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

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



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

Final Remedial Investigation Report
Umiat Landfill
North Slope Borough, Alaska

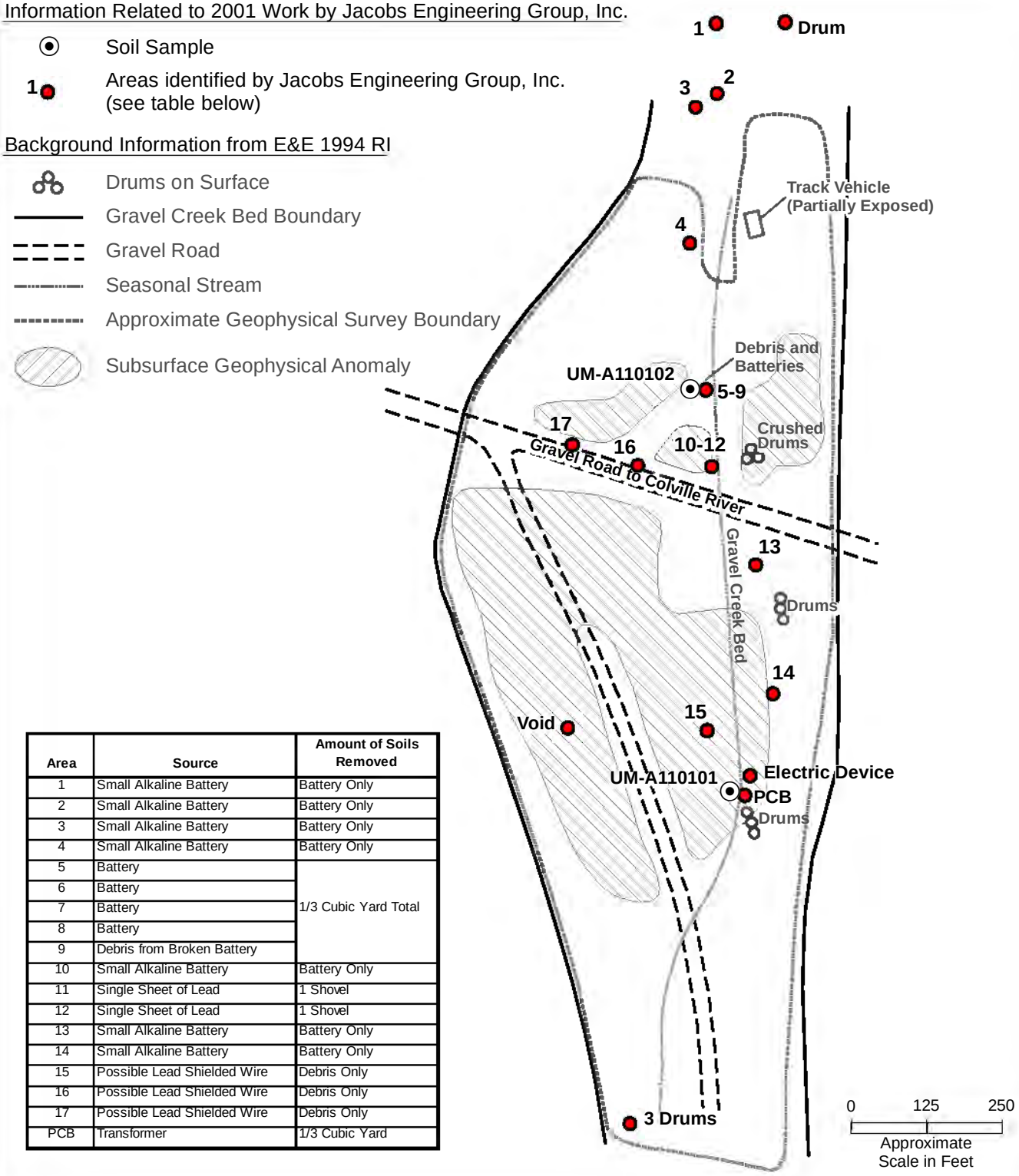
SAMPLE LOCATIONS
1999 E&E FIELD INVESTIGATION

March 2013 31-1-11544-005

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

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



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

Final Remedial Investigation Report
Umiat Landfill
North Slope Borough, Alaska

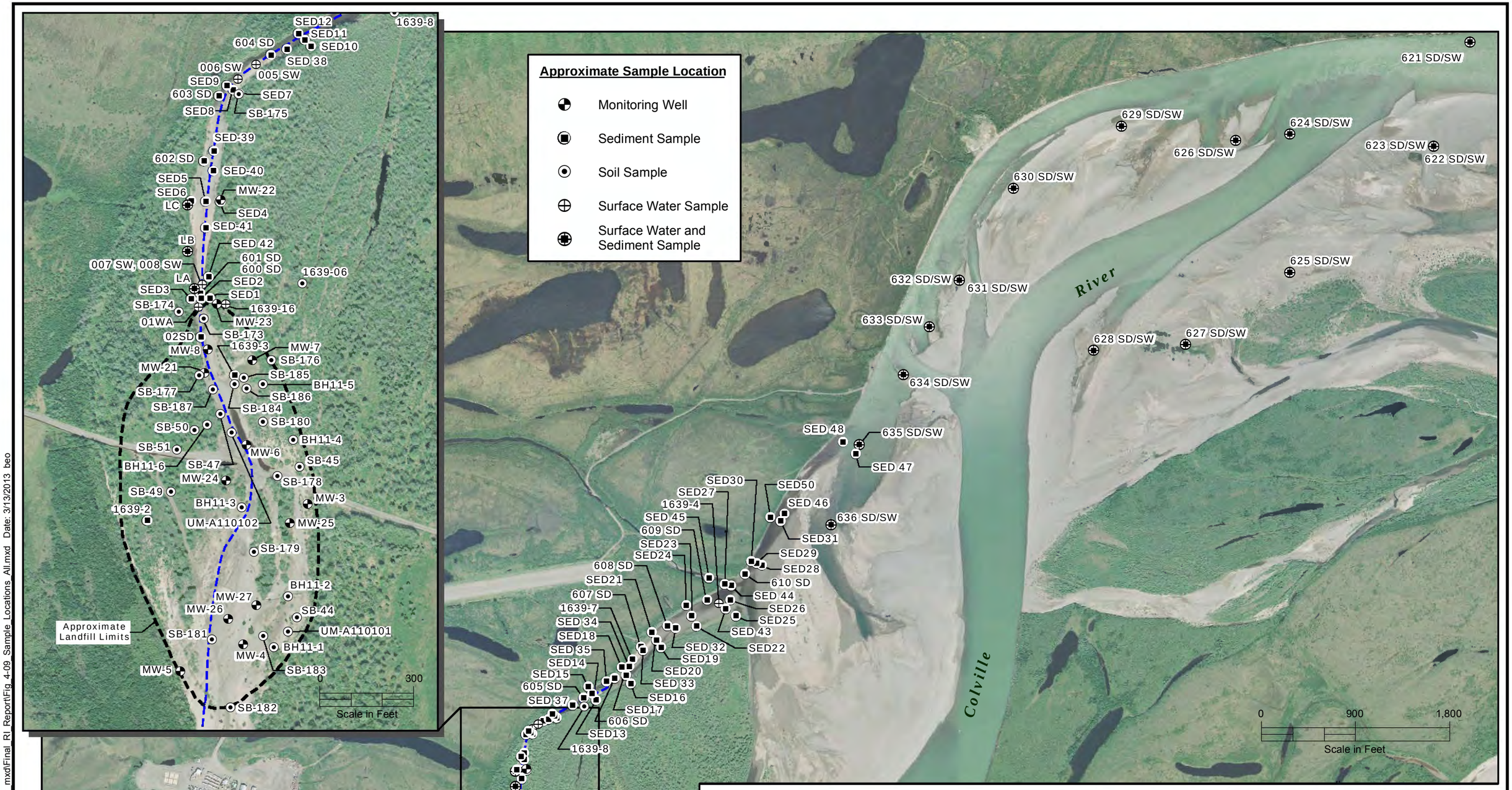
SAMPLE LOCATIONS 2001 JACOBS REMOVAL ACTION

March 2013 31-1-11544-005

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

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



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.

Final Remedial Investigation Report
Umiat Landfill
North Slope Borough, Alaska

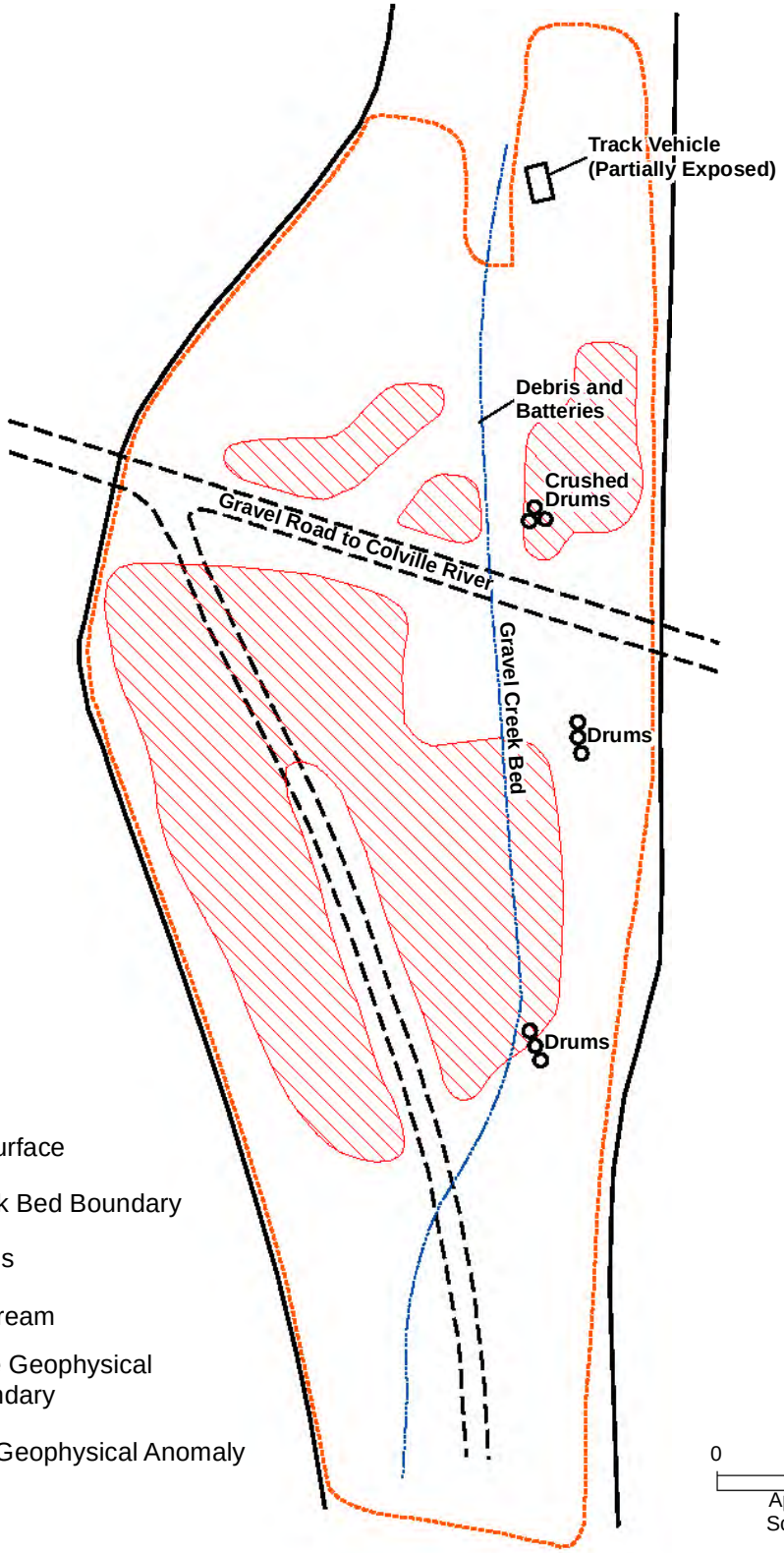
ALL SAMPLE LOCATIONS

March 2013 | 31-1-11544-005

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

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



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.

N

Final Remedial Investigation Report
Umiat Landfill
North Slope Borough, Alaska

RESULTS OF 1994 E&E GEOPHYSICAL INVESTIGATION

March 2013

31-1-11544-005

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

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

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
Umiat Landfill
North Slope Borough, Alaska

RESULTS OF 2005 USGS GEOPHYSICAL INVESTIGATION

March 2013 31-1-11544-005

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

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

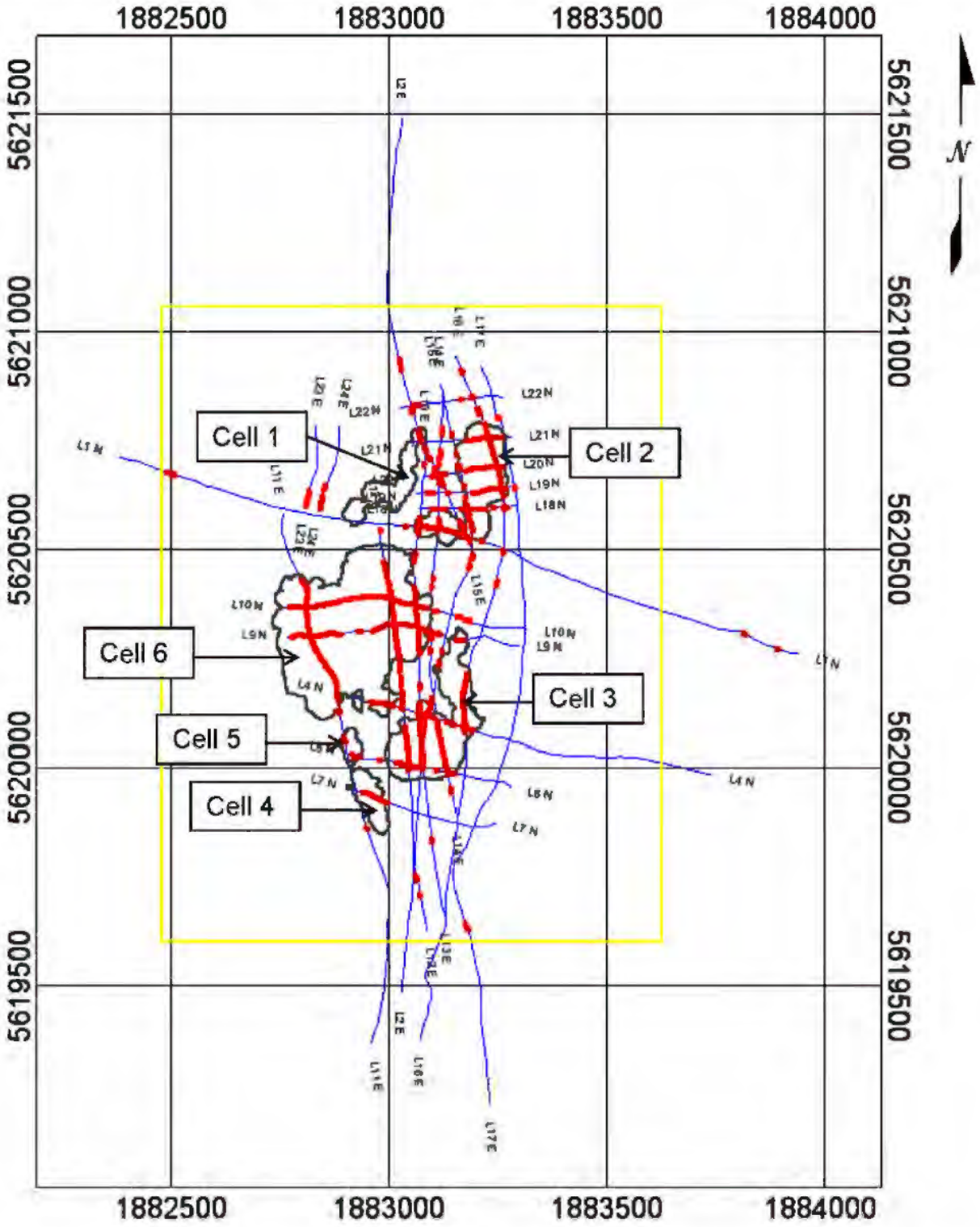


Figure from GeoTek Alaska, Inc.'s Figure 26: Marsh Creek, Umiat, Alaska, Geophysical Data Location, dated October 25, 2011.

Final Remedial Investigation Report
Umiat Landfill
North Slope Borough, Alaska

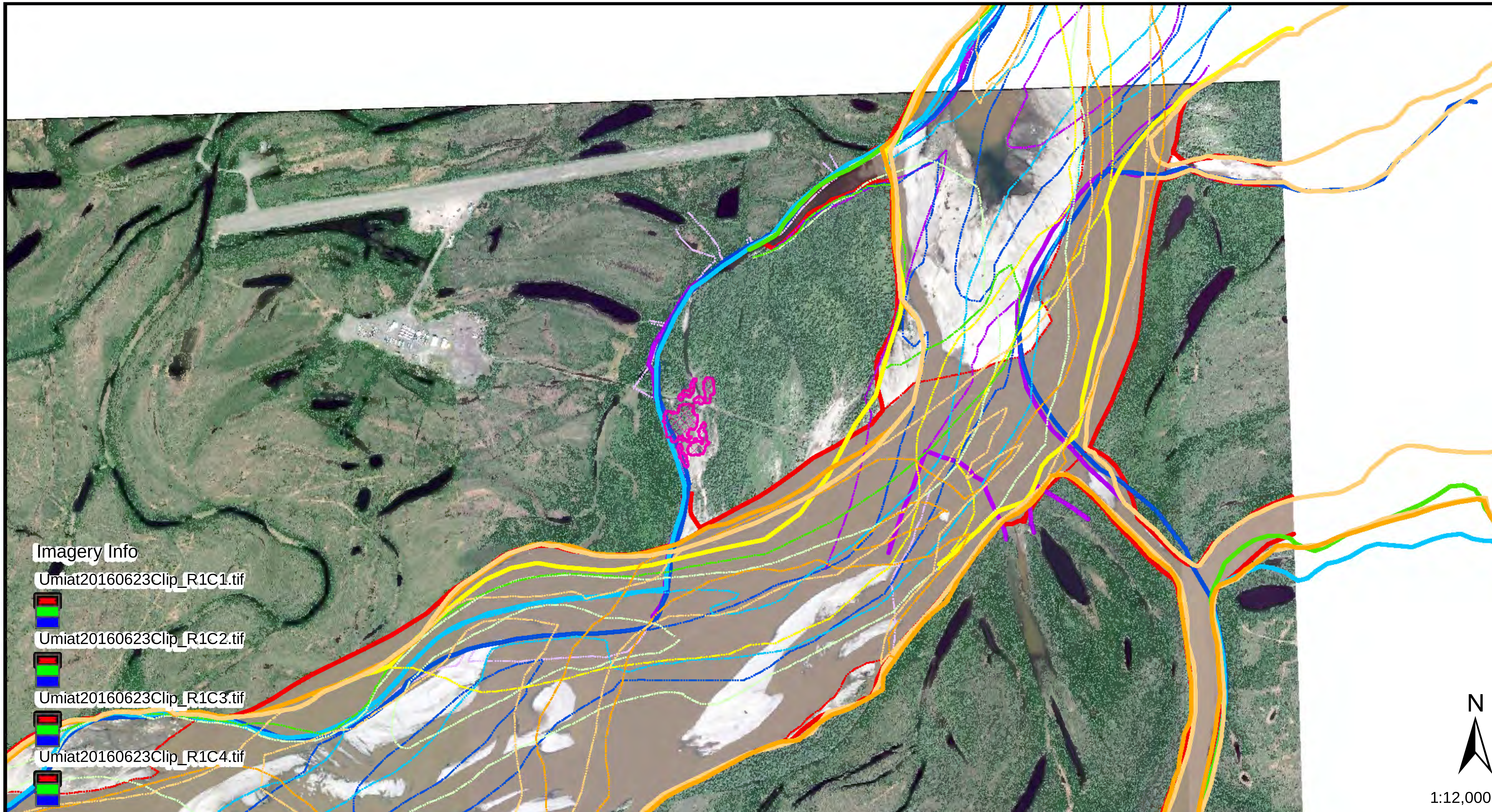
RESULTS OF 2011 GEOTEK GEOPHYSICAL INVESTIGATION

March 2013 31-1-11544-005

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 4-12

Filename: T:\Project\31-1\11544_Umiat\AV_mxd\Final_RI_Report\Fig_4-12_Results_2011_GeoTek_Geophysical.mxd Date: 3/8/2013 beo



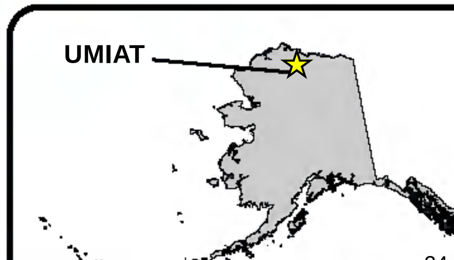
UMIAT LANDFILL

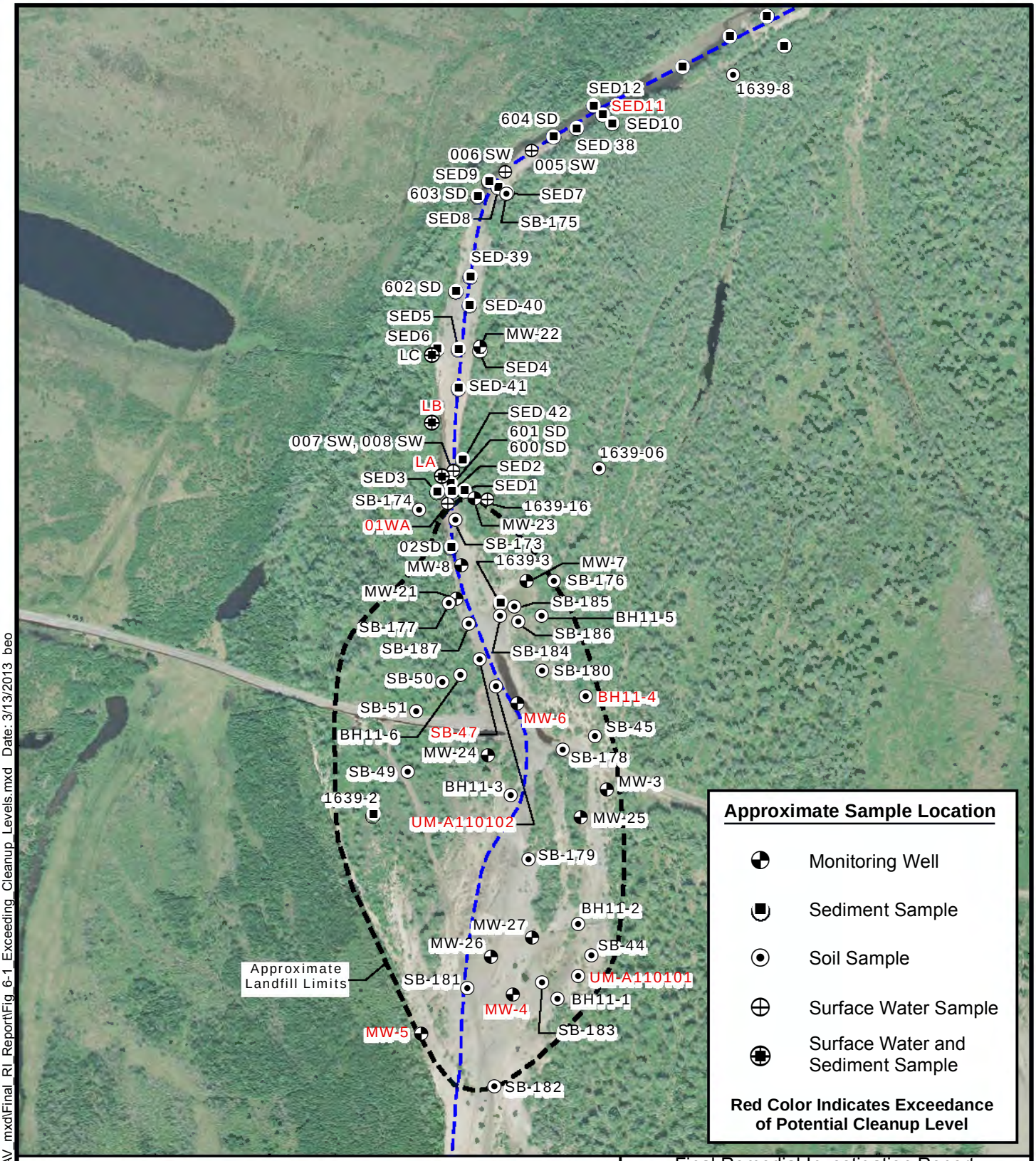
UMIAT, ALASKA

US Army Corps of Engineers Alaska District

- BURIED DEBRIS CELLS
- **BANKLINES ALL YEARS**
- **RiverFeature, ImageryYear**
- BRAIDEXTENT, 1947
- BRAIDEXTENT, 1955
- BRAIDEXTENT, 1966
- BRAIDEXTENT, 1979
- BRAIDEXTENT, 1991
- BRAIDEXTENT, 2009
- BRAIDEXTENT, 2011
- BRAIDEXTENT, 2016
- WATERCOURSE, 1947
- WATERCOURSE, 1948
- WATERCOURSE, 1955
- WATERCOURSE, 1966
- WATERCOURSE, 1974
- WATERCOURSE, 1979
- WATERCOURSE, 1991
- WATERCOURSE, 2009
- WATERCOURSE, 2011
- WATERCOURSE, 2016

Imagery Credits: National Geographic, ESRI, DeLorme, NAVTEQ, UNEP-WCMC, USGS, NASA, METI, NRCAN, GEBCO, NOAA, IPC, DigitalGlobe, GeoEye, Earthstar Geographics, SIO, ESRI





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

Final Remedial Investigation Report
Umiat Landfill
North Slope Borough, Alaska

SAMPLES EXCEEDING POTENTIAL CLEANUP LEVELS

March 2013

31-1-11544-005

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 6-1

Filename: T:\Project\31-1\11544_Umiat\AV_mxd\Final_RI_Report\Fig_6-1_Exceeding_Cleanup_Levels.mxd Date: 3/13/2013 beo

PRIMARY SOURCE	RELEASE MECHANISM	SECONDARY SOURCE	TRANSPORT MECHANISM	EXPOSURE MEDIA	RECEPTORS AND ROUTES OF EXPOSURE	SITE RESIDENTS	SITE VISITORS	SUBSISTENCE USERS	CONSTRUCTION WORKER
Historic Aerial Application of Pesticides		Surface Soils	Runoff	Surface Soil	Incidental Ingestion	●	●	●	●
					Dermal Contact	—	—	—	●
			Leaching and Infiltration	Subsurface Soil	Incidental Ingestion	—	—	—	●
					Dermal Contact	—	—	—	●
			Volatilization	Vapors	Inhalation [a]	—	—	—	—
			Wind Dispersion	Particulates	Inhalation	●	●	●	●
			Uptake by Plants	Animals that consume site vegetation	Ingestion of Game	●	●	●	●
				Aquatic Organisms	Ingestion of Fish	●	●	●	●
Landfill	Leaching and Infiltration	Subsurface Soils	Groundwater Movement	Surface Water	Incidental Ingestion	●	●	●	●
					Dermal Contact	●	●	●	●
	Erosion	Groundwater		Sediment	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.

Final Remedial Investigation Report
Umiat Landfill
North Slope Borough, Alaska

HUMAN HEALTH CONCEPTUAL SITE MODEL

March 2013 31-1-11544-005

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 6-2

Filename: I:\WIP\Active\XX\1500-1549\1544 Umiat RIFS\005 Remedial I\...\Final RI Report\Figures\31-1-11544-005 Fig 6-2.dwg Date: 03-07-2013 Login:

PRIMARY SOURCE	RELEASE MECHANISM	SECONDARY SOURCE	TRANSPORT MECHANISM	EXPOSURE MEDIA	RECEPTORS AND ROUTES OF EXPOSURE	TERRESTRIAL	AQUATIC
Historic Aerial Application of Pesticides							
		Surface Soils					
			Leaching and Infiltration				
			Volatilization	Vapors	Inhalation [a]	—	—
			Wind Dispersal	Particulates	Inhalation	●	●
			Uptake by Plants	Animals that consume site vegetation	Ingestion	●	●
			Runoff	Surface Soil	Ingestion	●	—
					Direct Contact	●	—
					Plant Uptake	●	—
Landfill	Leaching and Infiltration	Subsurface Soils	Groundwater Movement	Surface Water	Ingestion	●	●
					Direct Contact	●	●
	Erosion			Sediment	Ingestion	●	●
					Direct Contact	●	●

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.

Final Remedial Investigation Report
Umiat Landfill
North Slope Borough, Alaska

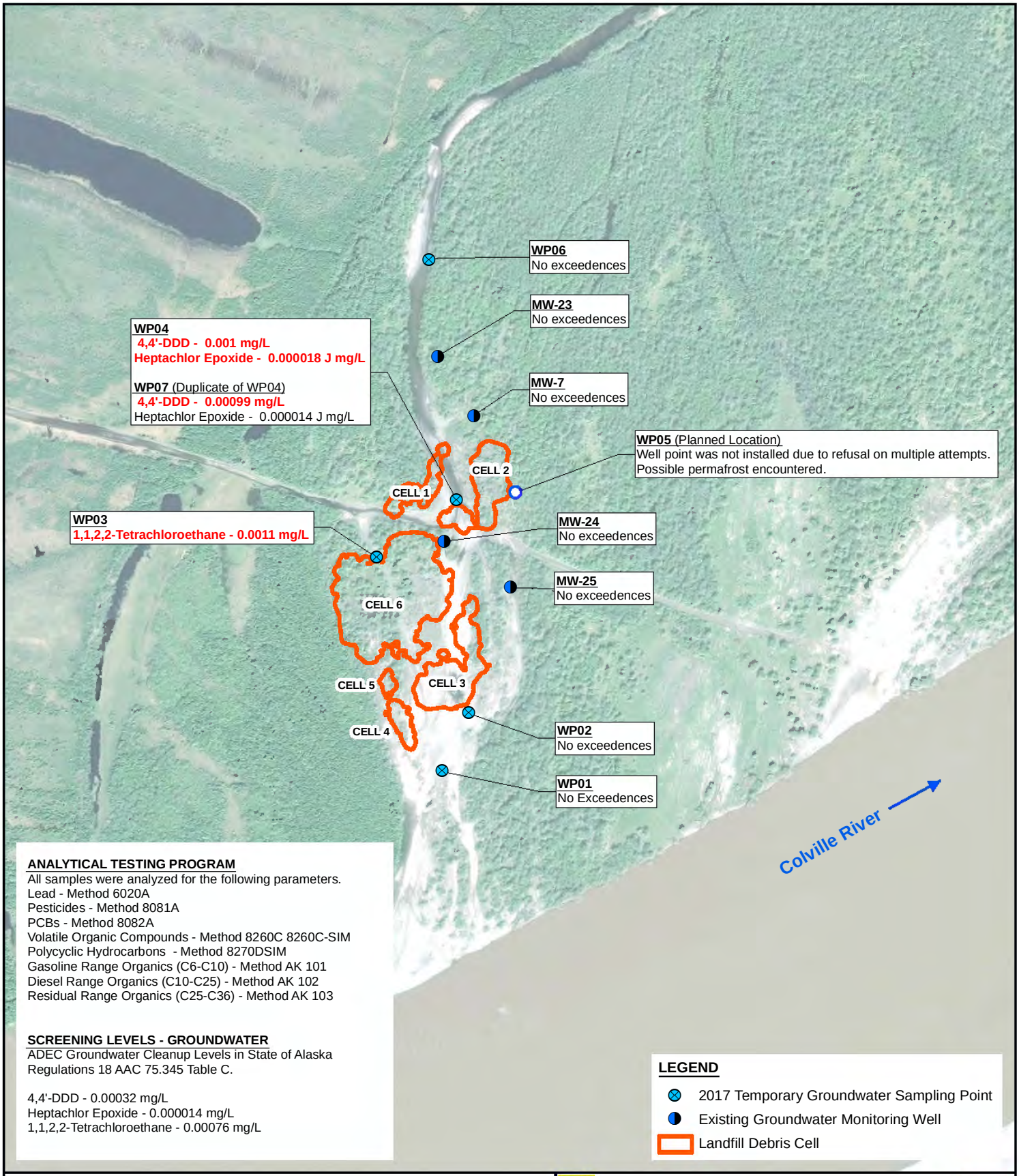
ECOLOGICAL CONCEPTUAL SITE MODEL

March 2013 31-1-11544-005

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 6-3

Filename: i:\WIP\Active\XX\1500-1549\1544 Umiat RIFS\005 Remedial [illegible] Final RI Report\Figures\31-1-11544-005 Fig 6-3.dwg Date: 03-07-2013 Login: [illegible]



ANALYTICAL TESTING PROGRAM
All samples were analyzed for the following parameters.
Lead - Method 6020A
Pesticides - Method 8081A
PCBs - Method 8082A
Volatile Organic Compounds - Method 8260C 8260C-SIM
Polycyclic Hydrocarbons - Method 8270DSIM
Gasoline Range Organics (C6-C10) - Method AK 101
Diesel Range Organics (C10-C25) - Method AK 102
Residual Range Organics (C25-C36) - Method AK 103

SCREENING LEVELS - GROUNDWATER
ADEC Groundwater Cleanup Levels in State of Alaska Regulations 18 AAC 75.345 Table C.

4,4'-DDD - 0.00032 mg/L
Heptachlor Epoxide - 0.000014 mg/L
1,1,2,2-Tetrachloroethane - 0.00076 mg/L

LEGEND
- 2017 Temporary Groundwater Sampling Point
- Existing Groundwater Monitoring Well
- Landfill Debris Cell

NOTES
- Background imagery is dated 23 June 2016.

- Where the term "No exceedences" is indicated, this means no analyte concentrations exceeded the screening level.

- Analyte concentrations that exceeded screening levels are shown in bold red text.

N
0 200 400
Feet

U.S. ARMY
CORPS OF ENGINEERS
ALASKA DISTRICT

Analyte Exceedences in Groundwater
June 2017 Groundwater Sampling

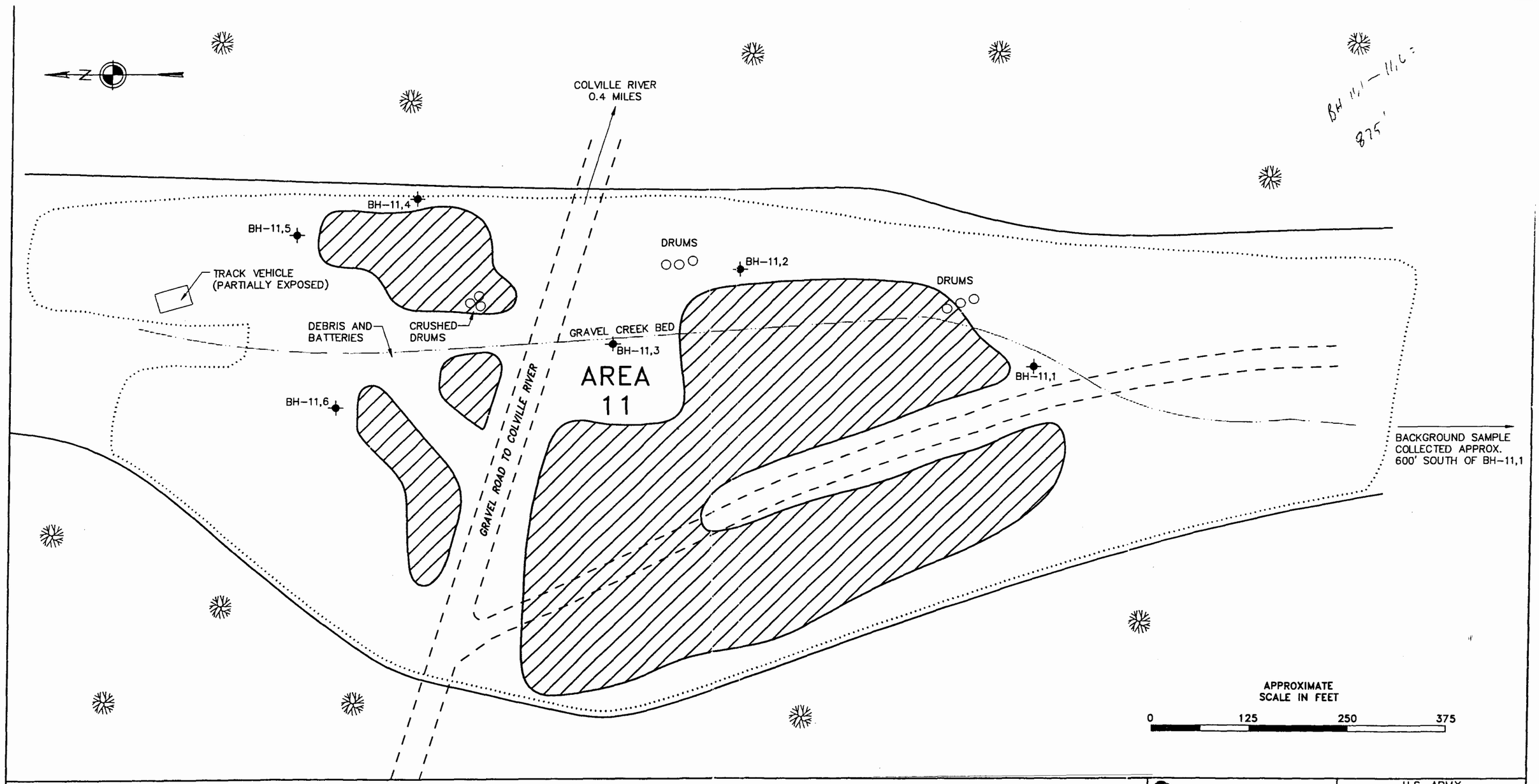
Umiat AFS Formerly Used Defense Site (FUDS) - F10AK0243
Project 08 Landfill, 2017 Investigation
Umiat, Alaska

Date: 12/20/2017

Figure 3

Document Path: O:\EN\Public\Engineer\Projects\FUDS\UMIAT_GIS\01_MXD\2017 RI\F3_2017_GW Sampling_r0.mxd

ATTACHMENT B
SOIL BORING LOGS



LEGEND

- GRAVEL CREEK BED BOUNDARY
- GRAVEL ROADWAYS
- HEAVY BRUSH AND SMALL TREES
- DRUMS ON SURFACE
- APPROXIMATE GEOPHYSICAL SURVEY BOUNDARY
- SUBSURFACE GEOPHYSICAL ANOMALY, APPROXIMATE LANDFILL BOUNDARY
- SEASONAL STREAM
- SOIL BORING

ecology and environment, inc.
International Specialists in the Environment

U.S. ARMY
ENGINEER DISTRICT, ALASKA
CORPS OF ENGINEERS
ANCHORAGE, ALASKA

Figure 3-5

SOIL BORING LOCATIONS

AREA 11

UMIAT AIR FORCE STATION ALASKA

SIZE	JOB. NO.	FILE NO.	DATE:	PLATE
B	JY2000	JY2S005B	12/20/93	

DACA85-93-D-0009
DELIVERY ORDER No. 0008

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: Umiat Air Force Station	SHEET # 1 OF 1
	LOCATION COORD NA	
	DRILLING AGENCY other (X) USACE ( )	
HOLE NO. (field): Area No. 11 (11-1, 11-2, 11-5, 11-6) HOLE NO. (permanent):	NAME OF DRILLER Ecology and Environment, Inc., (E & E)	WEATHER: 40°F, cloudy, light rain

TYPE OF HOLE Test Pit ( ) Auger Hole (X) Churn Drill ( )	HAMMER WEIGHT NA	SIZE AND TYPE OF BIT Solid stem auger
TOTAL DEPTH OF HOLE Approximately 9 feet	DATUM FOR ELEVATION SHOWN ( ) MSL Not surveyed	TYPE OF EQUIPMENT Little Beaver
APPROX # OF SAMPLES 4 per borehole	TYPE OF SAMPLES Hand auger	DEPTH TO GROUNDWATER Approximately 5 feet	DATE HOLE STARTED: 8-25-94 DATE HOLE COMPLETED: 8-25-94
ELEV. TOP OF HOLE Not surveyed	INSPECTOR Brad Ackman	CHIEF SOILS SECTION Jerry Raychel	CHIEF GEOTECHNICAL BRANCH Del Thomas

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RECOVERY	CLASSIFICATION	DESCRIPTION AND REMARKS	HNu (ppm)
				SP	0' Dark brown SAND, poorly-graded, 70% to 90% sand, 5% to 20% gravel, 5% to 20% silt, maximum size 15 cm, average size 2 cm, moist, no petroleum odor or sheen.	
2.5				SP	2' Dark brown gravelly SAND, 30% to 90% sand, 5% to 65% gravel, 5% to 10% silt, maximum size 15 cm, average size 3 cm, saturated, no petroleum odor or sheen.	
5	▽					
				GW	6' Dark brown GRAVEL, 60% gravel, 30% sand, 10% silt, well-graded, maximum size 4 cm, saturated, no petroleum odor or sheen.	
7.5						
				GW	9' Dark brown sandy GRAVEL, 40% to 65% gravel, 30% to 50% sand, 5% to 10% silt, maximum size 4 cm, well-graded, saturated, no petroleum odor or sheen.	
10					Bottom of explorations at approximately 9 feet.	

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: Umiat Air Force Station	SHEET # 1 OF 1
	LOCATION COORD NA	
	DRILLING AGENCY other (X) USACE ( )	
HOLE NO. (field): Area No. 11 (11-3, 11-4) HOLE NO. (permanent):	NAME OF DRILLER Ecology and Environment, Inc., (E & E)	WEATHER: 40°F, cloudy, light rain

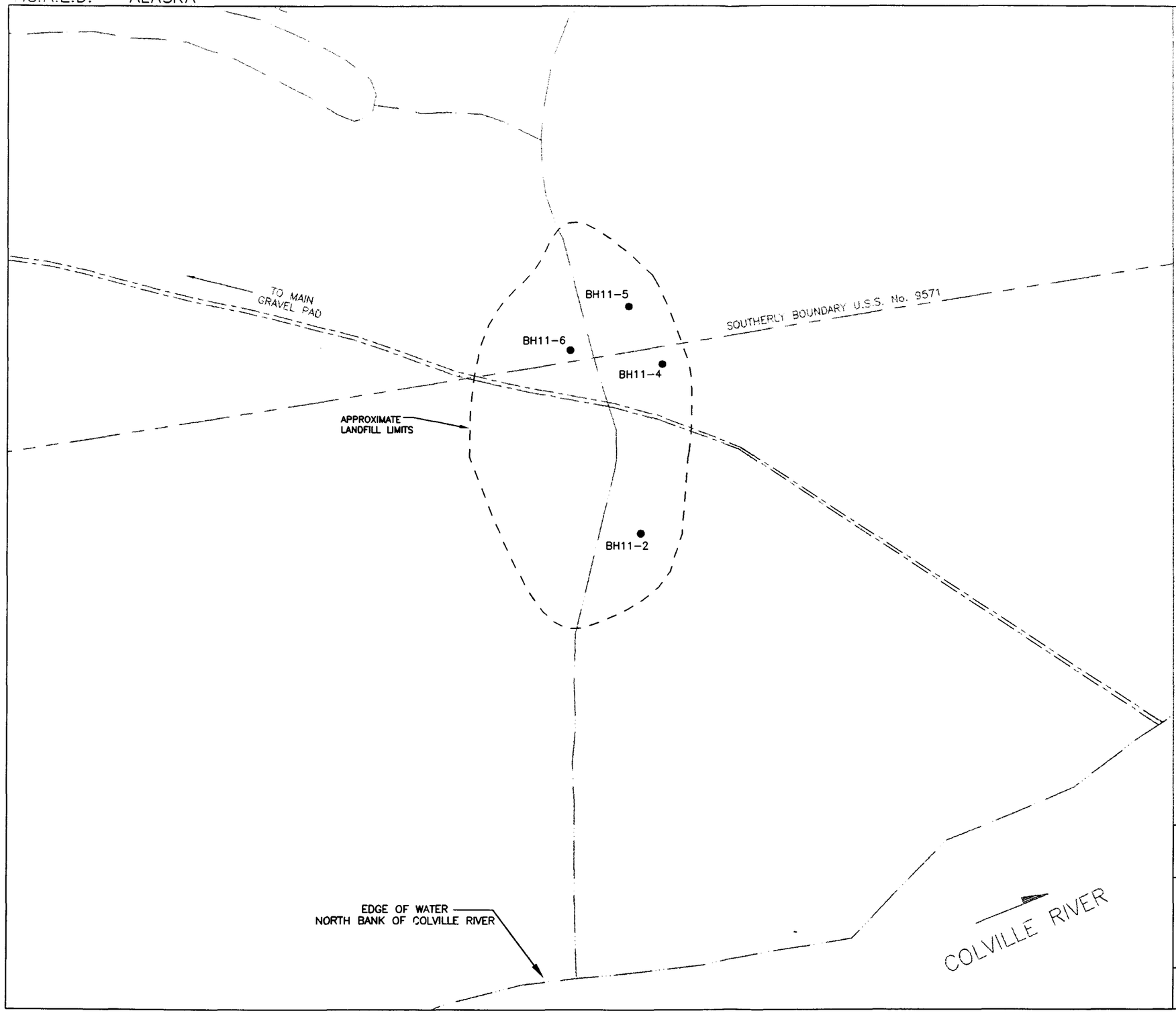
TYPE OF HOLE Test Pit ( ) Auger Hole (X) Churn Drill ( )	HAMMER WEIGHT NA	SIZE AND TYPE OF BIT Solid stem auger
TOTAL DEPTH OF HOLE Approximately 9 feet	DATUM FOR ELEVATION SHOWN ( ) MSL Not surveyed	TYPE OF EQUIPMENT Little Beaver
APPROX # OF SAMPLES 4 per borehole	TYPE OF SAMPLES Hand auger	DEPTH TO GROUNDWATER Approximately 5 feet
		DATE HOLE STARTED: 8-25-94 DATE HOLE COMPLETED: 8-25-94
ELEV. TOP OF HOLE Not surveyed	INSPECTOR Bred Ackman	CHIEF SOILS SECTION Jerry Raychel
		CHIEF GEOTECHNICAL BRANCH Del Thomas

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RECOVERY	CLASSIFICATION	DESCRIPTION AND REMARKS	HNu (ppm)
2.5				GW	0' Dark brown sandy gravel, 40% to 60% gravel, 30% to 50% sand, 10% silt, maximum size 15 cm, well-graded, moist, no petroleum odor or sheen.	
				GW	2' Dark brown sandy gravel, 40% to 60% gravel, 30% to 50% sand, 10% silt, maximum size 10 cm, well-graded, moist, no petroleum odor or sheen.	
5	▽					
				GW	6' Dark brown sandy gravel, 60% gravel, 30% sand, 10% silt, well-graded, maximum size 15 cm, saturated, no petroleum odor or sheen.	
7.5						
				SW	9' Dark brown gravelly sand, 50% sand, 40% gravel, 10% silt, well-graded, maximum size 4 cm, saturated, no petroleum odor or sheen.	
10					Bottom of explorations at approximately 9 feet.	

U.S.A.E.D. – ALASKA

U.S. ARMY

DRAFT



LEGEND

BH11–4 ● 1994 RI SAMPLE LOCATION

EDGE OF GRAVEL

EDGE OF WATER

RIVER FLOW DIRECTION

N

SCALE IN FEET

0 300 600 900

ecology and environment, inc.
International Specialists in the Environment

U.S. ARMY
ENGINEER DISTRICT ALASKA
ANCHORAGE, ALASKA

Figure 3–3

1994 RI SAMPLE LOCATION MAP

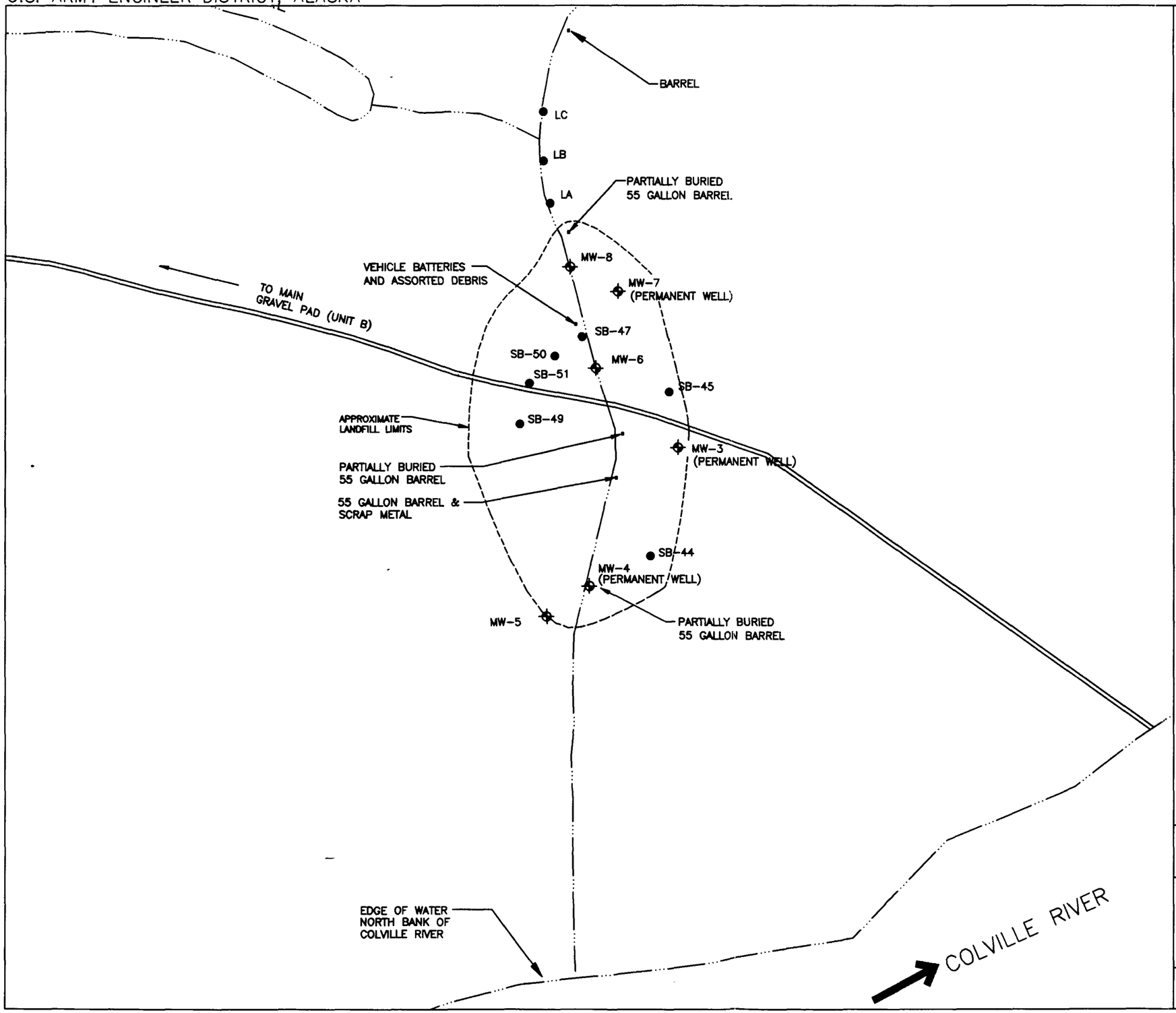
LANDFILL

UMIAT ALASKA

SIZE	JOB. NO.	FILE NO.	DATE:	PLATE
B	JR5987	JR5S230B	3/97	

BUFF Plo' 03/10/97

U.S. ARMY ENGINEER DISTRICT, ALASKA



LEGEND

- MW-7 — 1996 RI MONITORING WELL LOCATION
- LA — 1996 RI SURFACE WATER AND SEDIMENT SAMPLE LOCATION
- SB-47 — 1996 RI SAMPLE LOCATION
- EDGE OF GRAVEL
- EDGE OF WATER
- RIVER FLOW DIRECTION

N

SCALE IN FEET

0 300 600 900

ecology and environment, inc.
International Specialists in the Environment

U.S. ARMY
ENGINEER DISTRICT, ALASKA
ANCHORAGE, ALASKA

Figure 3-7
UNIT C
1996 RI SAMPLE LOCATION MAP
LANDFILL
UMIAT ALASKA

SIZE	JOB. NO.	FILE NO.	DATE:	PLATE
B	JR6000	JR5S231B	05/97	

Plotted: 06/02/97

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: Umiat Phase II RI	SHEET # 1 OF 1
	LOCATION COORD N.	E.
	DRILLING AGENCY other (X)	USACE ( )
HOLE NO. (field): Area C Landfill (North of Road) HOLE NO. (permanent):	NAME OF DRILLER Hughes Drilling, Inc./Gary Wilson	WEATHER 32-45°F

TYPE OF HOLE Test Pit ( ) Auger Hole (X) Churn Drill ( )	HAMMER WEIGHT 140 pounds	SIZE AND TYPE OF BIT 6" hollow stem auger

TOTAL DEPTH OF HOLE Approximately 9' BGS	DATUM FOR ELEVATION SHOWN (X) MSL ____	TYPE OF EQUIPMENT Truck-Mounted SIMCO

APPROXIMATE # OF SAMPLES 2 per soil boring	TYPE OF SAMPLES 1.5" O.D. split spoon	DEPTH TO GROUNDWATER Approximately 3' BGS	DATE HOLE STARTED: 8-10-96 DATE HOLE COMPLETED: 8-11-96

ELEV. TOP OF HOLE	INSPECTOR Jackie Donley/Brad Ackman	CHIEF SOILS SECTION Jerry Raychel	CHIEF GEOTECHNICAL BRANCH Del Thomas

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RECOVERY	CLASSIFI-CATION	DESCRIPTION AND REMARKS	PID (ppm)
		NA	100%	GW	0' Dark brown, sandy GRAVEL, 40-60% gravel, 30-50% sand, 10% silt, max. size=15 cm, well-graded, dry.	NR
	▽	NA	100%	GW	2' Dark brown, sandy GRAVEL, 40-60% gravel, 30-50% sand, 10% silt, max. size=10 cm, well-graded, moist.	NR
5		NA	100%	GW	3' Bluish gray, sandy GRAVEL, 40% gravel, 40% sand, 20% silt and clay, max. size=3 cm, saturated.	NR
		NA	100%	GW	6' Dark brown, sandy GRAVEL, 60% gravel, 30% sand, 10% silt, well-graded, max. size=15 cm, saturated.	NR
10		NA	100%	GW	9' Dark brown, sandy GRAVEL, 40-65% gravel, 30-50% sand, 5-10% silt, max. size=4 cm, well-graded, saturated.	NR
					Bottom of explorations @ approximately 9' BGS.	
15						
20						

DEPARTMENT OF THE ARMY NORTH PACIFIC DIVISION U.S. ARMY ENGINEER DISTRICT, ALASKA EXPLORATION LOG	PROJECT: Umiat Phase II RI	SHEET # 1 OF 1
	LOCATION COORD N.	E.
	DRILLING AGENCY other (X)	USACE ( )

HOLE NO. (field): Area C Landfill (South of Road) HOLE NO. (permanent):	NAME OF DRILLER Hughes Drilling, Inc./Gary Wilson	WEATHER 32-45 °F

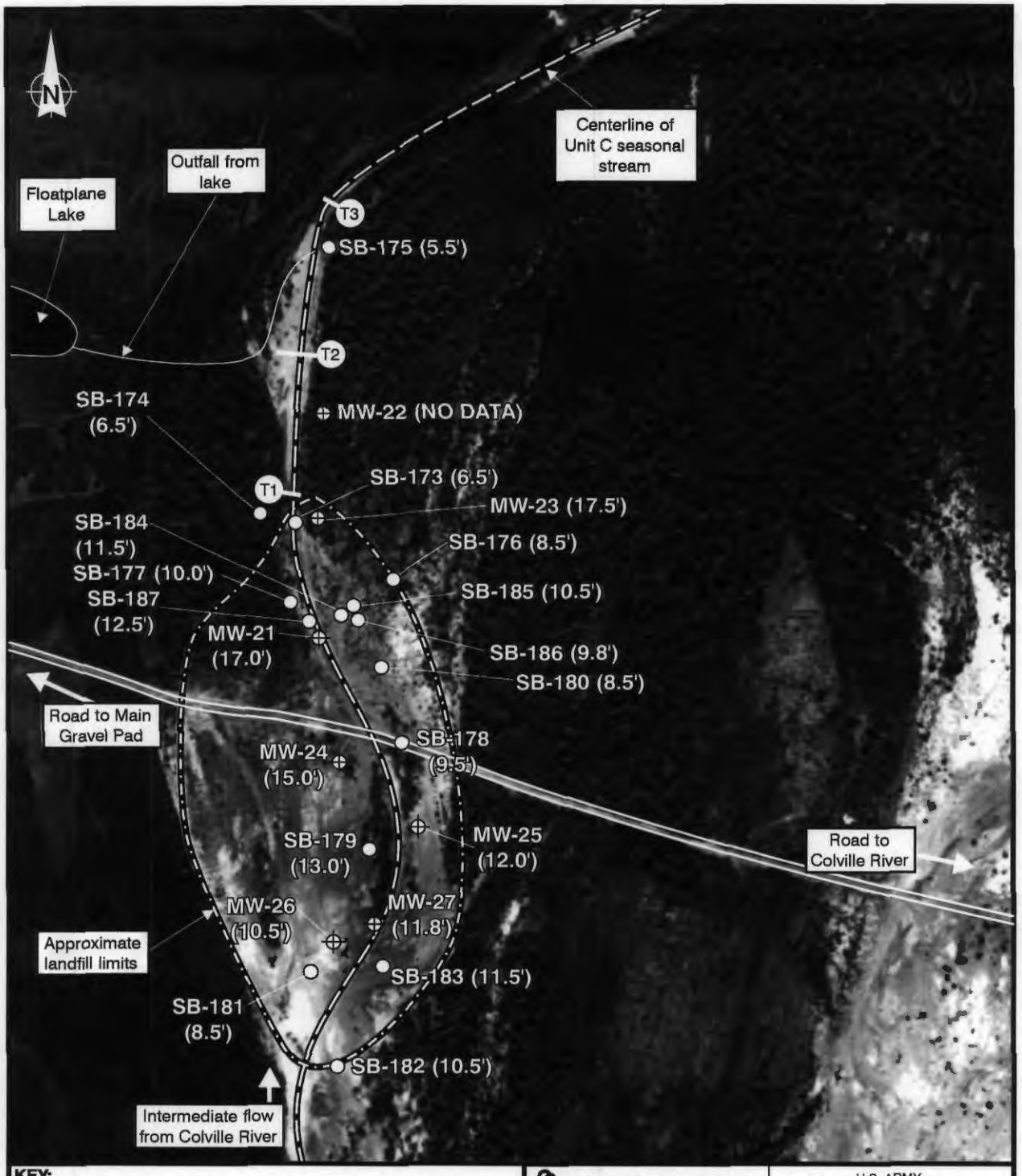
TYPE OF HOLE Test Pit ( ) Auger Hole (X) Churn Drill ( )	HAMMER WEIGHT 140 pounds	SIZE AND TYPE OF BIT 6" hollow stem auger

TOTAL DEPTH OF HOLE Approximately 9' BGS	DATUM FOR ELEVATION SHOWN (X) MSL ____	TYPE OF EQUIPMENT Truck-Mounted SIMCO

APPROXIMATE # OF SAMPLES 2 per soil boring	TYPE OF SAMPLES 1.5" O.D. split spoon	DEPTH TO GROUNDWATER Approxiimately 3' BGS	DATE HOLE STARTED: 8-10-96 DATE HOLE COMPLETED: 8-11-96

ELEV. TOP OF HOLE	INSPECTOR Jackie Donley/Brad Ackman	CHIEF SOILS SECTION Jerry Raychel	CHIEF GEOTECHNICAL BRANCH Del Thomas

DEPTH IN FEET	GROUND-WATER	BLOW COUNTS	% RECOVERY	CLASSIFI-CATION	DESCRIPTION AND REMARKS	PID (ppm)
		NA	100%	GW	0' Dark brown, sandy GRAVEL, 40% gravel, 40% sand, 20% silt, max. size=3 cm, well-graded, dry.	NR
	▽	NA	100%	GW	3' Grayish brown, sandy GRAVEL, 40-50% gravel, 40% sand, 10-20% silt, max. size=3 cm, saturated.	NR
5		NA	100%	GW	6' Dark brown, sandy GRAVEL, 40-60% gravel, 30-40% sand, 10-20% silt, max. size=15 cm, well-graded, saturated.	NR
10		NA	100%	SW	9' Dark brown, gravelly SAND, 50% sand, 40% gravel, 10% silt, max. size=4 cm, well-graded, saturated. Permafrost discontinuous and variable from approximately 3 to 6' BGS. Bottom of explorations @ approximately 9' BGS.	NR
15						
20						



KEY:

- ⊕ 1997 Monitoring wells (Phase III)
- ○ 1997 Soil borings (Phase III)

Note: All depths in feet BGS

APPROXIMATE SCALE
0 400 800 Feet

ecology and environment, inc.
International Specialists in the Environment

U.S. ARMY
ENGINEER DISTRICT, ALASKA
ANCHORAGE, ALASKA

Figure 3-1

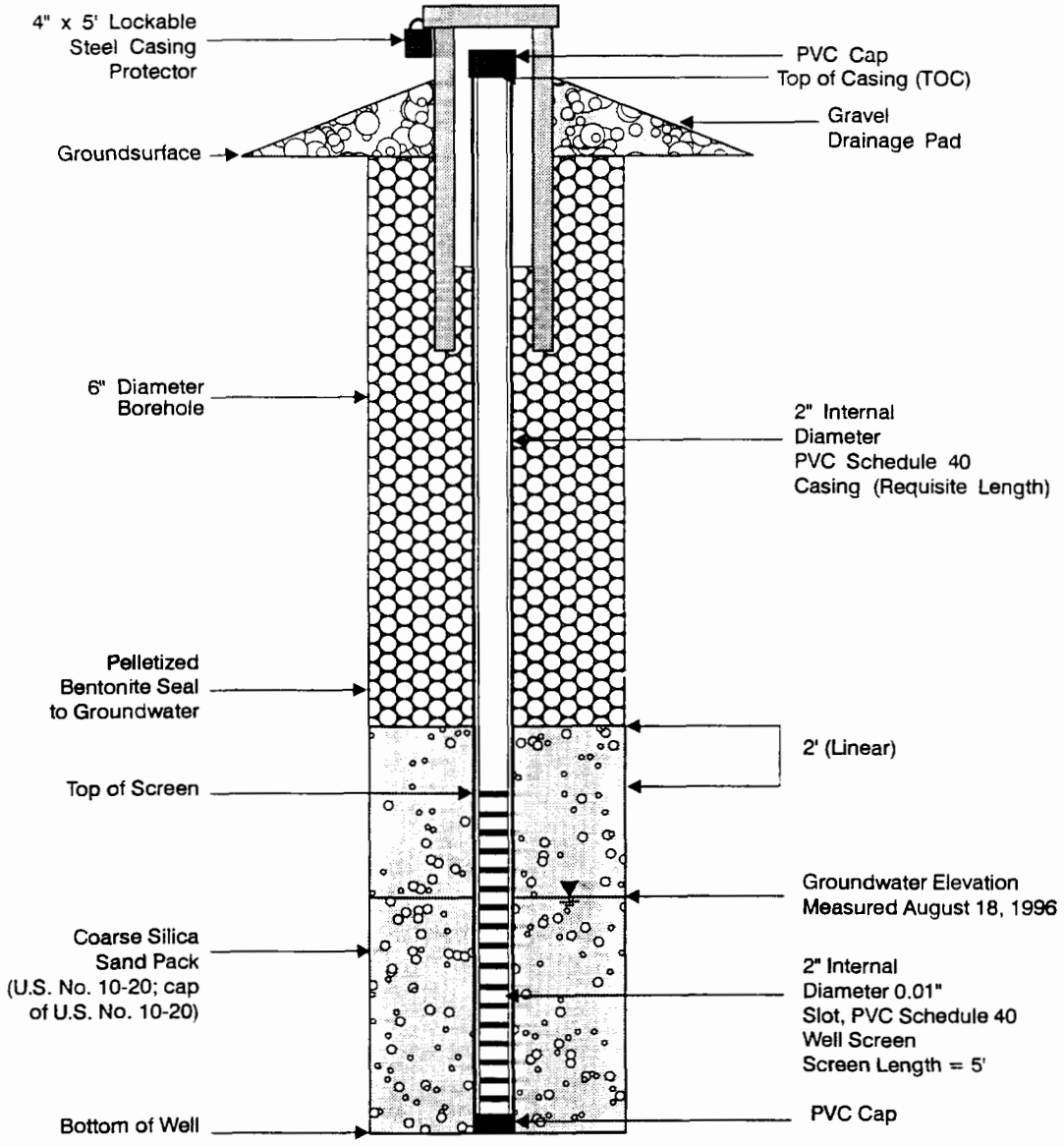
UNIT C LANDFILL
1997 PERMAFROST DEPTHS

Former Umiat Air Force Station

Umiat Alaska

SIZE	JOB NO.	FILE NO.	DATE
A	JR5997_A757	JR5_31.CDR	98MAR18

19: JV6902/JV6_NEW.CDR



Monitoring Wells	Groundwater Elevation	Elevation to TOC•	Groundsurface Elevation
MW-3	93.53'	99.89'	96.89'
MW-4	92.85'	99.09'	96.39'
MW-7	91.32'	99.84'	96.64'

NOT TO SCALE

SOURCE: Ecology and Environment, Inc., 1997

PERMANENT MONITORING WELL CONSTRUCTION DIAGRAM (ABOVEGROUND CASING)

DRILLING LOG OF WELL NO. MW-21

Project/Location: Umiat Air Force Station / Umiat, Alaska
Boring Location (Northing/Easting): 1048.60 / 3021.03
Date Started/Finished: 8/9/97
Drilling Company: Hughes Drilling/G. Wilson
Driller/Geologist: Brad Ackman

Total Depth of Hole (feet BGS): 24
Ground Elevation (feet above MSL):
Inner casing elevation (feet AMSL):
Groundwater Depth (feet):
During Drilling (BGS) (): 3.1 ▽
After development (BTOC) (): 5.8 ▼

ELEVATION / DEPTH	WELL COMPLETION DIAGRAM	GRAPHIC LOG	SOIL/ROCK DESCRIPTION	SAMPLE NUMBER / SAMPLE INTERVAL	BLOW COUNT	RECOVERY (inches)	FID/PID (ppm) SAMPLE / HOLE	COMMENTS
gs elevation 999	Locking Cover; Protective Casing		ground surface (gs)					
	Bentonite chips; 20-40 sand; 2" ID, schedule 40, PVC, 10-slot 10-20 sand		Sandy **GRAVEL** (GWS), 60% gravel, 35% sand, 5% silt, brownish gray, max.=4 cm, subrounded, saturated, no fuel odor, no sheen.		7 10 10 12		0	Groundwater encountered at 3.1 ft. Sample: 97UMT101SB
995 4			5.0					
990 9	Backfill material							Monitoring well installed at 7.2 ft. BGS.
985 14								

Unit C Landfill

ecology and environment, inc.

WELL_LOG UMIAT.GPJ 3-16-98

DRILLING LOG OF WELL NO. MW-21

Project/Location: Umiat Air Force Station / Umiat, Alaska

Total Depth of Hole (feet BGS): 24

ELEVATION	DEPTH	WELL COMPLETION DIAGRAM	GRAPHIC LOG	SOIL/ROCK DESCRIPTION	SAMPLE NUMBER SAMPLE INTERVAL	BLOW COUNT	RECOVERY (inches)	FID/ PID (ppm) SAMPLE / HOLE	COMMENTS
	16								
	17			Silty **CLAY** (CL-ML), soil saturated.		103			Permafrost encountered at 17 ft.
	18					84			
				18.5		79			
980	19			Silty **CLAY** (CL-ML), minor gravel, 75% clay, 15% gravel, 10% sand, dark gray, max. = 1 cm, moist, not		32			
						51			
	20			20.0 saturated, very dense, no ice, no fuel odor.		28			
	21								
	22			Silty **CLAY** (CL-ML), 100% clay, minor silt, dark gray, very dense, clay fractures, dry, no fuel odor.		63			
	23					75			
				23.5		85			
975	24								Bottom of exploration at 24 ft.
	25								
	26								
	27								
	28								
970	29								
	30								
	31								
	32								
	33								
965	34								
	35								
	36								

Unit C Landfill

ecology and environment, inc.

WELL_LOG_UMIAT.GPJ 3-16-98

DRILLING LOG OF WELL NO. MW-22

Project/Location: Umiat Air Force Station / Umiat, Alaska
Boring Location (Northing/Easting): 1601.97 / 2819.82
Date Started/Finished: 8/10/97
Drilling Company: Hughes Drilling/G. Wilson
Driller/Geologist: Brad Ackman

Total Depth of Hole (feet BGS): 22
Ground Elevation (feet above MSL):
Inner casing elevation (feet AMSL):
Groundwater Depth (feet):
During Drilling (BGS) (▽): 6.5
After development (BTOC) (▼): 8.8

ELEVATION / DEPTH	WELL COMPLETION DIAGRAM	GRAPHIC LOG	SOIL/ROCK DESCRIPTION	SAMPLE NUMBER / SAMPLE INTERVAL	BLOW COUNT	RECOVERY (inches)	FID/PID (ppm) SAMPLE / HOLE	COMMENTS
gs elevation 999	Locking Cover; Protective Casing		ground surface (gs)					
	Bentonite chips							
1								
2								
	20-40 sand							
3	10-20 sand							
995 4								
5	2" ID, schedule 40 PVC, 10-slot							
6		▽	Sandy, **GRAVEL** (GWS), 60% gravel, 35% sand, 5% silt, dark gray, max.= 5 cm, saturated, no fuel odor, no sheen.		1			Groundwater encountered at 6.5 ft.
7					3 7		0	Sample: 97UMT105SB
8			8.0		17			
990 9								
10								Monitoring well installed at 10.2 ft. BGS.
11	Backfill material							
12								
13								
985 14								
15								

Unit C Landfill

ecology and environment, inc.

WELL_LOG UMIAT.GPJ 3-16-98

DRILLING LOG OF WELL NO. MW-22

Project/Location: Umiat Air Force Station / Umiat, Alaska

Total Depth of Hole (feet BGS): 22

ELEVATION / DEPTH	WELL COMPLETION DIAGRAM	GRAPHIC LOG	SOIL/ROCK DESCRIPTION	SAMPLE NUMBER / SAMPLE INTERVAL	BLOW COUNT	RECOVERY (inches)	FID/PID (ppm) SAMPLE / HOLE	COMMENTS
16								
17								
18								
980 19								
20								
21			Silty **CLAY** (CL-ML), 95% clay, 5% silt, dark gray, very dense, dry to slightly moist, no fuel odor, no		NR		0	Driller reports decrease in drilling rate.
22			22.0 sheen.					
23								
975 24								
25								
26								
27								
28								
970 29								
30								
31								
32								
33								
965 34								
35								
36								

Unit C Landfill

DRILLING LOG OF WELL NO. MW-23

Project/Location: Umiat Air Force Station / Umiat, Alaska
Boring Location (Northing/Easting): 1319.87 / 3016.58
Date Started/Finished: 8/10/97
Drilling Company: Hughes Drilling/G. Wilson
Driller/Geologist: Brad Ackman

Total Depth of Hole (feet BGS): 18.5
Ground Elevation (feet above MSL):
Inner casing elevation (feet AMSL):
Groundwater Depth (feet):
During Drilling (BGS) (▽): 7.3
After development (BTOC) (▼): 9.94

ELEVATION / DEPTH	WELL COMPLETION DIAGRAM	GRAPHIC LOG	SOIL/ROCK DESCRIPTION	SAMPLE NUMBER / SAMPLE INTERVAL	BLOW COUNT	RECOVERY (inches)	FID/PID (ppm) SAMPLE / HOLE	COMMENTS
gs elevation 999	Locking Cover; Protective Casing		ground surface (gs)					
995 (4)	Bentonite chips; 20-40 sand; 10-20 sand; 2" ID, schedule 40 PVC, 10-slot							
990 (9)			Sandy **GRAVEL** (GWS), saturated, no fuel odor, no sheen. 8.5		NR		0	Insufficient recovery to collect sample. Groundwater encountered at 7.3 ft.
985 (14)	Backfill material							Monitoring well installed at 10.2 ft. BGS.

Unit C Landfill

ecology and environment, inc.

WELL_LOG_UMIAT.GPJ 3-16-98

DRILLING LOG OF WELL NO. MW-23

Project/Location: Umiat Air Force Station / Umiat, Alaska

Total Depth of Hole (feet BGS): 18.5

ELEVATION	DEPTH	WELL COMPLETION DIAGRAM	GRAPHIC LOG	SOIL/ROCK DESCRIPTION	SAMPLE NUMBER / SAMPLE INTERVAL	BLOW COUNT	RECOVERY (inches)	FID/ PID (ppm) SAMPLE / HOLE	COMMENTS
	16								
	17								
	18			Sandy **GRAVEL** (GWS), 60% gravel, 35% sand, 5% silt, brownish gray, max.= 3 cm, saturated, frozen, visible ice crystals, no fuel odor, no sheen.		NR		0	Permafrost encountered at 17.5 ft. Bottom of
980	19			18.5					
	20								
	21								
	22								
	23								
975	24								
	25								
	26								
	27								
	28								
970	29								
	30								
	31								
	32								
	33								
965	34								
	35								
	36								

Unit C Landfill

ecology and environment, inc.

WELL_LOG UMIAT.GPJ 3-16-98

DRILLING LOG OF WELL NO. MW-24

Project/Location: Umiat Air Force Station / Umiat, Alaska

Boring Location (Northing/Easting): 757.07 / 3050.50

Date Started/Finished: 8/11/97

Drilling Company: Hughes Drilling/G. Wilson

Driller/Geologist: Brad Ackman

Total Depth of Hole (feet BGS): 15.5

Ground Elevation (feet above MSL):

Inner casing elevation (feet AMSL):

Groundwater Depth (feet):

During Drilling (BGS) (▽): 7.5

After development (BTOC) (▼): 10.49

ELEVATION / DEPTH	WELL COMPLETION DIAGRAM	GRAPHIC LOG	SOIL/ROCK DESCRIPTION	SAMPLE NUMBER / SAMPLE INTERVAL	BLOW COUNT	RECOVERY (inches)	FID/PID (ppm) SAMPLE / HOLE	COMMENTS
gs elevation 999	Locking Cover; Protective Casing		ground surface (gs)					
	Bentonite chips							
1								
2								
3	20-40 sand							
995 4	10-20 sand							
5								
	2" ID, schedule 40 PVC, 10-slot							
6								
7		▽						
8			Sandy **GRAVEL** (GWS), 80% gravel, 20% sand, brownish gray, max.= 4 cm, saturated, no fuel odor, no sheen.		3 7 12 13		0	Groundwater encountered at 7.5 ft. Sample: 97UMT112SB
990 9			9.5					
10								
11								Monitoring well installed at 10.7 ft. BGS.
	Backfill material							
12								
13								
985 14								
15								

Unit C Landfill

ecology and environment, inc.

WELL_LOG_UMIAT.GPJ 3-16-98

DRILLING LOG OF WELL NO. MW-24

Project/Location: Umiat Air Force Station / Umiat, Alaska

Total Depth of Hole (feet BGS): 15.5

ELEVATION	DEPTH	WELL COMPLETION DIAGRAM	GRAPHIC LOG	SOIL/ROCK DESCRIPTION	SAMPLE NUMBER / SAMPLE INTERVAL	BLOW COUNT	RECOVERY (inches)	FID/PID (ppm) SAMPLE / HOLE	COMMENTS
				15.5 **SAND** (SW) and **GRAVEL** (GW), frozen.		76			Permafrost encountered at 15 ft.
	16								
	17								
	18								
980	19								
	20								
	21								
	22								
	23								
975	24								
	25								
	26								
	27								
	28								
970	29								
	30								
	31								
	32								
	33								
965	34								
	35								
	36								

Unit C Landfill

ecology and environment, inc.

WELL_LOG_UMIAT.GPJ 3-16-98

DRILLING LOG OF WELL NO. MW-25

Project/Location: Umiat Air Force Station / Umiat, Alaska

Boring Location (Northing/Easting): 624.44 / 3252.62

Date Started/Finished: 8/11/97

Drilling Company: Hughes Drilling/G. Wilson

Driller/Geologist: Brad Ackman

Total Depth of Hole (feet BGS): 12.51

Ground Elevation (feet above MSL):

Inner casing elevation (feet AMSL):

Groundwater Depth (feet):

During Drilling (BGS) (▽): 6.1

After development (BTOC) (▼): 9.69

ELEVATION / DEPTH	WELL COMPLETION DIAGRAM	GRAPHIC LOG	SOIL/ROCK DESCRIPTION	SAMPLE NUMBER / SAMPLE INTERVAL	BLOW COUNT	RECOVERY (inches)	FID/PID (ppm) SAMPLE / HOLE	COMMENTS
gs elevation 999	Locking Cover; Protective Casing		ground surface (gs)					
	Bentonite chips							
1								
2	20-40 sand							
3	10-20 sand							
995 4	2" ID, schedule 40 PVC, 10-slot							
5								
6			Sandy **GRAVEL** (GWS), 50% gravel, 40% sand, 10% silt, brownish gray, max.= 3 cm, saturated, no fuel odor, no sheen.		17 26 19 32		0	Groundwater encountered at 6.1 ft. Sample: 97UMT113SB
7								
8			8.0					
990 9								Monitoring well installed at 9.2 ft. BGS.
10	Backfill material							
11								
12								Permafrost encountered at 12 ft.
13								
985 14								
15								

Unit C Landfill

ecology and environment, inc.

WELL_LOG_UMIAT.GPJ 3-16-98

DRILLING LOG OF WELL NO. MW-26

Project/Location: Umiat Air Force Station / Umiat, Alaska
Boring Location (Northing/Easting): 356.05 / 2997.71
Date Started/Finished: 8/12/97
Drilling Company: Hughes Drilling/G. Wilson
Driller/Geologist: Brad Ackman

Total Depth of Hole (feet BGS): 10.5
Ground Elevation (feet above MSL): _____
Inner casing elevation (feet AMSL): _____
Groundwater Depth (feet):
During Drilling (BGS) (▽): 6.5
After development (BTOC) (▼): 9.76

ELEVATION / DEPTH	WELL COMPLETION DIAGRAM	GRAPHIC LOG	SOIL/ROCK DESCRIPTION	SAMPLE NUMBER / SAMPLE INTERVAL	BLOW COUNT	RECOVERY (inches)	FID/PID (ppm) SAMPLE / HOLE	COMMENTS
gs elevation 999	Locking Cover; Protective Casing		ground surface (gs)					
995 / 4	Bentonite chips; 20-40 sand; 10-20 sand; 2" ID, schedule 40 PVC, 10-slot		4'-6' Landfill debris encountered.					
6			6.0					
7		▽	**PEAT** (PT), and **CLAY** (CL) Black peat, fairly well compacted, moist, no fuel odor, no sheen. Dark gray silty clay, moist to saturated, fairly plastic, no fuel odor, no sheen.		NR		0	Groundwater encountered at 6.5 ft. Sample: 97UMT115SB
7.0								
8			8.0					
990 / 9								Monitoring well installed at 9.7 ft. BGS.
10								Permafrost encountered at 10.5 ft.
11								
12								
13								
985 / 14								
15								

Unit C Landfill

ecology and environment, inc.

WELL_LOG UMIAT.GPJ 3-16-98

DRILLING LOG OF WELL NO. MW-27

Project/Location: Umiat Air Force Station / Umiat, Alaska
Boring Location (Northing/Easting): 101.93 / 3088.57
Date Started/Finished: 8/13/97
Drilling Company: Hughes Drilling/G. Wilson
Driller/Geologist: Brad Ackman

Total Depth of Hole (feet BGS): 11.8
Ground Elevation (feet above MSL):
Inner casing elevation (feet AMSL):
Groundwater Depth (feet):
During Drilling (BGS) (): 6.8 ▽
After development (BTOC) (): 9.75 ▼

ELEVATION / DEPTH	WELL COMPLETION DIAGRAM	GRAPHIC LOG	SOIL/ROCK DESCRIPTION	SAMPLE NUMBER / SAMPLE INTERVAL	BLOW COUNT	RECOVERY (inches)	FID/PID (ppm) SAMPLE / HOLE	COMMENTS
gs elevation 999	Locking Cover; Protective Casing		ground surface (gs)					
1	Bentonite chips							
2								
3	20-40 sand							
995 4	10-20 sand							
5	2" ID, schedule 40 PVC, 10-slot							
6								
7	▽		Sandy **GRAVEL**, (GWS), 80% gravel, 20% sand, brownish gray, max.= 4 cm, subangular to subrounded, satruated, no fuel odor, no sheen.		NR		0	Groundwater encountered at 6.8 ft.
8			8.5					Sample: 97UMT119SB
990 9								
10								Monitoring well installed at 10.2 ft. BGS.
11	Backfill material							
12								Permafrost encountered at 11.8 ft.
13								
985 14								
15								

Unit C Landfill

ecology and environment, inc.

WELL_LOG_UMIAT.GPJ 3-16-98

DRILLING LOG OF WELL NO. SB-180

Project/Location: Umiat Air Force Station / Umiat, Alaska
Boring Location (Northing/Easting): 983.95 / 3163.22
Date Started/Finished: 8/12/97
Drilling Company: Hughes Drilling/G. Wilson
Driller/Geologist: Brad Ackman

Total Depth of Hole (feet BGS): 18
Ground Elevation (feet above MSL):
Inner casing elevation (feet AMSL):
Groundwater Depth (feet):
During Drilling (BGS) (): 8.3 ▽
After development (BTOC) ():

ELEVATION / DEPTH	WELL COMPLETION DIAGRAM	GRAPHIC LOG	SOIL/ROCK DESCRIPTION	SAMPLE NUMBER / SAMPLE INTERVAL	BLOW COUNT	RECOVERY (inches)	FID/PID (ppm) SAMPLE / HOLE	COMMENTS
gs elevation 999			*ground surface (gs)*					
1	*1/2" ID, schedule 40 PVC 10-20 sand*							
2								
3								
995 4	*Thermistor*		Sandy **GRAVEL** (GWS), landfill debris consisting of scrap metal, wood and cloth.					
5								
6								
7	*Thermistor*							
8		▽	8.0					
990 9			Gravelly **SAND** (SWG), 60% sand, 25% gravel, 15% silt, brownish gray, max.= 1 cm, frozen, no fuel odor, no sheen.		74 84		0	Groundwater encountered at 8.3 ft. Sample: 97UMT114SB. Permafrost encountered at 8.5 ft.
9.5 10								
11	*Thermistor*							
12								
13								
985 14								
15	*Thermistor*							

Unit C Landfill

ecology and environment, inc.

WELL_LOG UMIAT.GPJ 3-16-98

DRILLING LOG OF WELL NO. SB-180

Project/Location: Umiat Air Force Station / Umiat, Alaska

Total Depth of Hole (feet BGS): 18

ELEVATION	DEPTH	WELL COMPLETION DIAGRAM	GRAPHIC LOG	SOIL/ROCK DESCRIPTION	SAMPLE NUMBER SAMPLE INTERVAL	BLOW COUNT	RECOVERY (inches)	FID/ PID (ppm) SAMPLE / HOLE	COMMENTS
	16								
	17								
	18	*Thermistor*							Bottom of exploration at 18 ft. Thermistors installed every 3.6 ft to a total depth of 18 ft. BGS.
980	19								
	20								
	21								
	22								
	23								
975	24								
	25								
	26								
	27								
	28								
970	29								
	30								
	31								
	32								
	33								
965	34								
	35								
	36								

Unit C Landfill

ecology and environment, inc.

WELL_LOG_UMIAT.GPJ 3-16-98

DRILLING LOG OF WELL NO. SB-184

Project/Location: Umiat Air Force Station / Umiat, Alaska
Boring Location (Northing/Easting): 1101.99 / 3069.14
Date Started/Finished: 8/14/97
Drilling Company: Hughes Drilling/G. Wilson
Driller/Geologist: Brad Ackman

Total Depth of Hole (feet BGS): 26
Ground Elevation (feet above MSL):
Inner casing elevation (feet AMSL):
Groundwater Depth (feet):
During Drilling (BGS) (): 5.5 ▽
After development (BTOC) ():

ELEVATION / DEPTH	WELL COMPLETION DIAGRAM	GRAPHIC LOG	SOIL/ROCK DESCRIPTION	SAMPLE NUMBER / SAMPLE INTERVAL	BLOW COUNT	RECOVERY (inches)	FID/PID (ppm) SAMPLE / HOLE	COMMENTS
gs elevation 999			*ground surface (gs)*					
1	*10-20 sand 1/2" ID, schedule 40 PVC Thermistor*							
2								
3								
995 4								
5	*Thermistor*	▽						
6			Sandy **GRAVEL** (GWS), 60% gravel, 35% sand, 5% silt, brownish gray, max.= 6 cm, saturated, no fuel odor, no sheen.		NR		0	Groundwater encountered at 5.5 ft. Sample: 97UMT120SB
7			7.0					
8								
990 9								
10	*Thermistor*							
11			Frozen **GRAVEL**.					Permafrost encountered at 11.5 ft.
12								
13								
985 14								
15								

Unit C Landfill

ecology and environment, inc.

WELL_LOG UMIAT.GPJ 3-16-98

DRILLING LOG OF WELL NO. SB-184

Project/Location: Umiat Air Force Station / Umiat, Alaska

Total Depth of Hole (feet BGS): 26

ELEVATION	DEPTH	WELL COMPLETION DIAGRAM	GRAPHIC LOG	SOIL/ROCK DESCRIPTION	SAMPLE NUMBER SAMPLE INTERVAL	BLOW COUNT	RECOVERY (inches)	FID/ PID (ppm) SAMPLE / HOLE	COMMENTS
	16	*Thermistor*							
	17								
	18								
980	19								
	20								
	21	*Thermistor*							
	22								
	23								
975	24								
	25								
	26	*Thermistor*							Bottom of exploration at 26 ft. BGS. Thermisters installed every 5.2 ft. to a total depth of 26 ft.
	27								
	28								
970	29								
	30								
	31								
	32								
	33								
965	34								
	35								
	36								

Unit C Landfill

ecology and environment, inc.

WELL_LOG_UMIAT.GPJ 3-16-98

DRILLING LOG OF WELL NO. SB-185

Project/Location: Umiat Air Force Station / Umiat, Alaska
Boring Location (Northing/Easting): 1121.37 / 3099.78
Date Started/Finished: 8-14-97 / 8-16-97
Drilling Company: Hughes Drilling/G. Wilson
Driller/Geologist: Brad Ackman

Total Depth of Hole (feet BGS): 37
Ground Elevation (feet above MSL):
Inner casing elevation (feet AMSL):
Groundwater Depth (feet):
During Drilling (BGS) (): 14.6 ▽
After development (BTOC) ():

ELEVATION / DEPTH	WELL COMPLETION DIAGRAM	GRAPHIC LOG	SOIL/ROCK DESCRIPTION	SAMPLE NUMBER / SAMPLE INTERVAL	BLOW COUNT	RECOVERY (inches)	FID/PID (ppm) SAMPLE / HOLE	COMMENTS
gs elevation 999			ground surface (gs)					
1	1/2" ID, schedule 40 PVC		0'-7' Landfill pilot cap.					
2								
3								
995 4								
5	Thermistor							
6								
7	10-20 sand Thermistor		7.0 7' Original landfill grade.					
8								
990 9								
10	Thermistor							
11								
12								
13								
985 14	▽				NR			
15								

Unit C Landfill

ecology and environment, inc.

WELL_LOG_UMIAT.GPJ 3-16-98

DRILLING LOG OF WELL NO. SB-185

Project/Location: Umiat Air Force Station / Umiat, Alaska

Total Depth of Hole (feet BGS): 37

ELEVATION / DEPTH	WELL COMPLETION DIAGRAM	GRAPHIC LOG	SOIL/ROCK DESCRIPTION	SAMPLE NUMBER / SAMPLE INTERVAL	BLOW COUNT	RECOVERY (inches)	FID/PID (ppm) SAMPLE / HOLE	COMMENTS
16	Thermistor		15.1 Sandy **GRAVEL** (GWS) 60% gravel, 16.0 35% sand, 5% silt, brownish gray, max.= 6 cm, saturated, no fuel odor, no sheen.				0	Groundwater encountered at 14.6 ft. Sample: 97UMT121SB
17	Thermistor							
18								
980 19			Frozen **GRAVEL** (GWS).					Permafrost encountered at 18.5 ft.
20								
21	Thermistor							
22								
23								
975 24								
25								
26	Thermistor							
27	Thermistor							
28								
970 29								
30								
31			Silty **CLAY** (CL-ML).					
32								
33								
965 34								
35								
36								

Unit C Landfill

ecology and environment, inc.

WELL_LOG_UMIAT.GPJ 3-16-98

DRILLING LOG OF WELL NO. SB-185

Project/Location: Umiat Air Force Station / Umiat, Alaska

Total Depth of Hole (feet BGS): 37

ELEVATION	DEPTH	WELL COMPLETION DIAGRAM	GRAPHIC LOG	SOIL/ROCK DESCRIPTION	SAMPLE NUMBER SAMPLE INTERVAL	BLOW COUNT	RECOVERY (inches)	FID/ PID (ppm) SAMPLE / HOLE	COMMENTS
	37	*Thermistor*		37.0					*Bottom of exploration* at 37 ft. Nested thermistors installed to 37 ft. BGS.
	38			Suspected confining layer consisting of consolidated silty clay. 38.0					
960	39								
	40								
	41								
	42								
	43								
955	44								
	45								
	46								
	47								
	48								
950	49								
	50								
	51								
	52								
	53								
945	54								
	55								
	56								
	57								

Unit C Landfill

DRILLING LOG OF WELL NO. SB-186

Project/Location: Umiat Air Force Station / Umiat, Alaska
Boring Location (Northing/Easting): 1247.75 / 3084.20
Date Started/Finished: 8/16/97
Drilling Company: Hughes Drilling/G. Wilson
Driller/Geologist: Brad Ackman

Total Depth of Hole (feet BGS): 18
Ground Elevation (feet above MSL):
Inner casing elevation (feet AMSL):
Groundwater Depth (feet):
During Drilling (BGS) (): 5.7 ▽
After development (BTOC) ():

ELEVATION / DEPTH	WELL COMPLETION DIAGRAM	GRAPHIC LOG	SOIL/ROCK DESCRIPTION	SAMPLE NUMBER / SAMPLE INTERVAL	BLOW COUNT	RECOVERY (inches)	FID/PID (ppm) SAMPLE / HOLE	COMMENTS
gs elevation 999			*ground surface (gs)*					
1	*10-20 sand 1/2" ID, schedule 40 PVC*							
2								
3								
995 4	*Thermistor*							
5								
6		▽			16			Groundwater encountered at 5.7 ft.
7			Sandy **GRAVEL** (GWS), saturated, no fuel odor, no sheen.		22		0	Samples: 97UMT122SB, 97UMT123SB, 97UMT124SB
Thermistor			7.5		23			
8								
990 9								
10								Permafrost encountered at 9.8 ft.
11 *Thermister*								
12								
13								
985 14								
15 *Thermister*								

Unit C Landfill

ecology and environment, inc.

WELL_LOG UMIAT.GPJ 3-16-98

DRILLING LOG OF WELL NO. SB-186

Project/Location: Umiat Air Force Station / Umiat, Alaska

Total Depth of Hole (feet BGS): 18

ELEVATION	DEPTH	WELL COMPLETION DIAGRAM	GRAPHIC LOG	SOIL/ROCK DESCRIPTION	SAMPLE NUMBER SAMPLE INTERVAL	BLOW COUNT	RECOVERY (inches)	FID/ PID (ppm) SAMPLE / HOLE	COMMENTS
	16								
	17								
	18	*Thermister*							Bottom of exploration at 18 ft. *Thermistors installed every 3.6 ft. to* a total depth of 18 ft.
980	19								
	20								
	21								
	22								
	23								
975	24								
	25								
	26								
	27								
	28								
970	29								
	30								
	31								
	32								
	33								
965	34								
	35								
	36								

Unit C Landfill

DRILLING LOG OF WELL NO. SB-187

Project/Location: Umiat Air Force Station / Umiat, Alaska
Boring Location (Northing/Easting): 1084.00 / 3016.30
Date Started/Finished: 8/16/97
Drilling Company: Hughes Drilling/G. Wilson
Driller/Geologist: Brad Ackman

Total Depth of Hole (feet BGS): 29
Ground Elevation (feet above MSL):
Inner casing elevation (feet AMSL):
Groundwater Depth (feet):
During Drilling (BGS) (): 2.5 ▽
After development (BTOC) ():

ELEVATION / DEPTH	WELL COMPLETION DIAGRAM	GRAPHIC LOG	SOIL/ROCK DESCRIPTION	SAMPLE NUMBER / SAMPLE INTERVAL	BLOW COUNT	RECOVERY (inches)	FID/PID (ppm) SAMPLE / HOLE	COMMENTS
gs elevation 999			*ground surface (gs)*					
1	*10-20 sand 1/2" ID, schedule 40 PVC*							
2								
3								Groundwater encountered at 2.5 ft.
995 4								
5			Sandy **GRAVEL** (GWS), 60% gravel, 30% sand, 5% silt, brownish gray, max.= 4 cm, saturated, no fuel odor, no sheen.		29 34 16		0	
6 6.5								
7								
8								
990 9	*Thermistor*							
10								
11								
12								
13								Permafrost encountered at 12.5 ft.
985 14								
15								

Unit C Landfill

ecology and environment, inc.

WELL_LOG UMIAT.GPJ 3-16-98

DRILLING LOG OF WELL NO. SB-187

Project/Location: Umiat Air Force Station / Umiat, Alaska

Total Depth of Hole (feet BGS): 29

ELEVATION / DEPTH	WELL COMPLETION DIAGRAM	GRAPHIC LOG	SOIL/ROCK DESCRIPTION	SAMPLE NUMBER / SAMPLE INTERVAL	BLOW COUNT	RECOVERY (inches)	FID/ PID (ppm) SAMPLE / HOLE	COMMENTS
16								
17								
18			Silty **CLAY** (CL-ML).					
980 19	Thermistor		19.0					
20								
21								
22								
23								
975 24								
25								
26								
27								
28								
970 29	Thermistor		Refusal at 29 ft. BGS. Suspected confining layer consisting of consolidated silty clay.					Bottom of exploration at 29 ft. Thermistors installed approximately every 10 ft. to a total depth of 29 ft. BGS.
30			30.0					
31								
32								
33								
965 34								
35								
36								

Unit C Landfill

ecology and environment, inc.

WELL_LOG UMIAT.GPJ 3-16-98

THE STATE of ALASKA
GOVERNOR MIKE DUNLEAVY

Department of Environmental Conservation

SPILL PREVENTION & RESPONSE
Contaminated Sites Program

610 University Avenue
Fairbanks, Alaska 99709
Main: 907.451.2143
Fax: 907.451.2155
www.dec.alaska.gov

File: 335.38.001

March 11, 2020

Guy Warren
CEPOA-PM-C-FUDS
Alaska District U.S. Army Corps of Engineers
P.O. Box 6898
Anchorage, AK 99506-6898

RE: *Decision Document; Hazardous, Toxic, and Radioactive Waste; Project #F10AK0243-08; Umiat Air Station Formerly Used Defense Site, Umiat, Alaska, September 2019*

Dear Mr. Warren:

The Alaska Department of Environmental Conservation (ADEC) Contaminated Sites Program received the "Decision Document; Hazardous, Toxic, and Radioactive Waste; Project #F10AK0243-08; Umiat Air Station Formerly used Defense Site, Umiat, Alaska" dated September 2019, on October 4, 2019.

Given the information provided at this time, while DEC generally supports the remedy, it continues to disagree with U.S. Army Corps of Engineers' (USACE) dismissal of multiple state regulations as applicable or relevant and appropriate requirements (ARARs). ARARs identified in the Decision Document are summarized below.

- Petroleum, Oil, and Lubricant (POL) contaminants should be considered contaminants of concern (COC), or, in the alternative, State of Alaska regulations constitute ARARs if POL is comingled with a Comprehensive Environmental Response, Compensation, and Liability (CERCLA) contaminant.
- The landfill construction must be in compliance with 18 Alaska Administrative Code (AAC) 60.010(a).
- All transportation of solid waste on- and off-site must be in compliance with 18 AAC 60.015.
- Landfill construction and location must be in compliance with 18 AAC 60.217 referencing that a landfill must be at least 10 feet above the highest measured level of an aquifer of resource value.
- Landfills constructed on permafrost must be in compliance with 18 AAC 60.227-228.
- Because material placed in the monofill are from a contaminated site, there is an increased potential for contamination. For this reason, the ADEC recommends that the landfill is constructed to control contamination from migrating off site in compliance with 18 AAC 60.233(1).

- Because of activities planned at the site, there is an increased potential for degradation of a waterbody as a result of human actions. For this reason, water quality standards outlined in 18 AAC 70.010 should be monitored throughout the project.
- As outlined in 18 AAC 75.325(g), the cumulative carcinogenic risk post remedy implementation must be at or below 1 in 100,000.
- All environmental sampling during project activities must be conducted by a qualified environmental profession (QEP) as described in 18 AAC 75.355(b). In addition, all sample analytical methods and analytical laboratories must be in accordance with 18 AAC 75.355(d) and (e).
- If contamination is left on site and human and ecological exposure pathways are incomplete, institutional controls that run with all landowners and are required to be maintained by each responsible person or owner of the site will be in place. These regulations are described in 18 AAC 75.375(c).

DEC continues to have concerns that without USACE acknowledging the state regulations as ARARs, the implementation of the proposed remedy could lead to activities not in compliance with state law. Of particular concern is USACE's dismissal of landfill design specification as described in 18 AAC 60.330, as the United States Bureau of Land Management, as a landowner, indicated at the November 13, 2019 restoration advisory board meeting in Nuiqsut, Alaska that it believed USACE had committed to designing the monofill in accordance with state regulations.

Please call Melinda Brunner at (907) 451-2192 or email melinda.brunner@alaska.gov with any questions or comments.

Sincerely,

Melinda Brunner
Environmental Program Manager

CC: Melody Debenham, BLM, via email