US Army Corps of Engineers
Alaska District

Proposed Plan
Umiat Landfill
Formerly Used Defense Site

Umiat, Alaska
FUDS Project No. F10AK0243-08

February 2018

Sections:

Photo 1: Aerial view of Umiat 1963. Areas of drums later relocated to Landfill location.

Photo 2: Drill Rig Track exposed in Umiat Landfill, 2016

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INTRODUCTION

The United States Army Corps of Engineers (USACE) requests your comments on this Proposed Plan for remedial action at the Umiat Landfill Formerly Used Defense Site (FUDS) located at the former Umiat Air Force Station (AFS) in Umiat, Alaska.

The Proposed Plan is a component of the requirements of Section 117(a) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), also known as Superfund [42 U.S.C. § 9601 et al.]. The Proposed Plan was prepared in accordance with the National Oil And Hazardous Substances Pollution Contingency Plan (NCP) and follows the requirements from the Engineering Regulations 200-3-1 of the FUDS Program Policy (USACE 2004) and the United States Environmental Protection Agency (EPA) guidance provided in 'A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents' (EPA 1999). The site described in this Proposed Plan is a CERCLA site; however, it is not listed on the National Priority List. USACE is issuing this Proposed Plan as part of its public participation responsibilities under CERCLA.

The Department of Defense (DoD) is authorized to carry out a program of environmental restoration at former military sites under the Defense Environmental Restoration Program, which includes clean-up efforts at FUDS. FUDS are real property that was under the jurisdiction of the DoD and owned, leased, or otherwise possessed by the United States that were transferred from DoD control prior to 17 October 1986. FUDS properties range from privately owned lands to state or Federal lands such as national parks as well as residential land, schools and industrial parks. The FUDS program includes former Army, Navy, Marine, Air Force, and other defense-used properties. Over 500 FUDS have been identified in Alaska.

Although this Proposed Plan recommends a Preferred Alternative for the site, USACE may modify or select another remedial alternative based on new information or public comment. Therefore the public is encouraged to review and comment on all the alternatives presented in this Proposed Plan. After considering all public comments, USACE will prepare a Decision Document describing the selected remedy. The Decision Document will include responses to all significant public comments in a section called the Responsiveness Summary. Changes to the proposed approach may be made through this comment review process and highlights the importance of community involvement.

This Proposed Plan addresses contamination under CERCLA, which excludes petroleum hydrocarbon contamination, such as fuel releases. The project addresses remediation of petroleum contamination incidental to the cleanup under CERCLA when commingled with CERCLA contaminants.

This Proposed Plan is limited to a summary of the history, data, and actions conducted at the site. Detailed documentation is available for review at the information repository in the Native Village of Nuiqsut office.

ACRONYMS

This Proposed Plan contains acronyms used to represent complex terms and other words or phrases. Acronyms enable us to provide more information to the reader with less space and greater brevity. A list of acronyms and their meanings is provided at the end of the Proposed Plan. Please refer to the list, as needed, to improve your understanding of the site.

PURPOSE

The purpose of this Proposed Plan is to:

- Describe the environmental conditions and the risks posed by the site.
- Describe the clean-up criteria for the site.
- Describe the investigations, remedial actions, and removal actions conducted at the site.
- Describe the potential remedial alternatives that were considered with a comparative evaluation.
- Present the preferred remedial alternative for the site.
- Request public comment on the preferred remedial alternative.
- Provide information on how the public can provide input to the remedy selection process.

SITE LOCATION AND 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 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 Naval 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 Navy. From 1945 to 1954, the U.S. 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 eleven 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 United States 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 of 1976.

The Umiat Airport tract of the former Umiat AFS is currently owned by the State of Alaska, Department of Transportation and Public Facilities (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 United States and remains under the jurisdiction of DOI, Bureau of Land Management. The Arctic Slope Regional Corporation owns land across the Colville River, east of the Umiat AFS.

The subject of this Proposed Plan is the approximately 8-acre landfill located about one-half mile east of the Umiat AFS facilities, within a seasonal slough of the Colville River (see Figure 2). 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 (believed to be the subject landfill), including over 7,000 drums hauled from the surrounding exploratory-well sites. 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.

In 1972, the Alaska Department of Environmental Conservation (ADEC) first identified environmental concerns at the former Umiat AFS with the discovery of a cache of pesticides (4,4 dichlorodiphenyltrichloroethane (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.

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

In 1994, a remedial investigation (RI) was completed that included collecting 143 surface and subsurface soil samples.

Photo 3: Exposed Lead Battery from Landfill, 2014

PRIOR INVESTIGATION AND CLEANUP

Additional remedial investigations were performed in 1996, 1997, and 2013. Additional field investigations were performed in 1998 and 1999, and a limited removal action was performed in 2001. Several studies have been conducted to evaluate whether contamination from past activities at the former Umiat AFS may affect human health and ecological receptors. These studies have focused on chemicals detected in fish tissue and their potential effects on recreational and subsistence users.

Environmental media sampled during these investigations included surface and subsurface soil, sediment, groundwater, surface water, and fish tissue. Data generated during these investigations showed the contaminants of potential concern (COPCs) included total polychlorinated biphenyls (PCBs; specifically Aroclor 1254), pesticides (4,4’-DDD, 4,4’-DDE and 4,4’-DDT), diesel-range organics (DRO), naphthalene, methylene chloride, and lead.

PCBs, 4,4’-DDD, 4,4’-DDE, and 4,4’-DDT have been detected in fish samples in the vicinity of the Umiat AFS. However, an Agency for Toxic Substances and Disease Registry (ATSDR) health evaluation found that consumption of fish is not expected to cause harmful health effects.

The landfill area is intermittently flooded when the Colville River flow is high. This typically occurs during spring (May through mid-June) and may occur during fall high precipitation periods. The scour that occurs during these flooding events exposes landfill debris. In July and August 2001, the USACE conducted site inspections of the landfill area and found one small electrical transformer and areas containing debris from lead-acid batteries on the surface of the landfill. The visible lead debris and approximately 1.3 cubic yards (CY) of lead-contaminated soil were removed. The cleanup-verification soil sample collected from the excavation contained 1,170 milligram per kilogram (mg/kg) lead, indicating elevated lead contamination still remained at the site above the cleanup level of 400 mg/kg. A sample of the visibly stained soil immediately beneath the transformer was analyzed and found to contain 52,700 mg/kg of the PCB Aroclor 1254. The transformer and about one-third CY of contaminated soil was containerized and removed for off-site disposal. A cleanup-verification soil sample contained 2.3 mg/kg Aroclor 1254, which exceeded the cleanup level of 1 mg/kg.

Debris observed eroding at the surface of the landfill during recent site inspections included scrap metal, wire, pipe, pipe fittings, drill bits, transformer carcass, at least a half-dozen drum carcasses, and drill-rig tracks. In late May/early June 2011, a representative from the BLM photographed flooding of the Colville River over the Umiat landfill area and observed areas of erosion and exposed debris. Two lead batteries were observed during annual landfill site inspections, one in 2014, and the other in 2016. Both batteries were transported off site and delivered to Fairbanks for recycling.

The USACE has conducted annual site inspections of the Umiat Landfill since 2010. Site inspections are performed to visually inspect the landfill for signs of recently exposed and potentially hazardous waste sources such as lead batteries or transformers containing PCBs. Global Positioning System (GPS) data are also collected of photograph vantage points/site landmarks such as monitoring well locations or historically visible debris areas for comparison against photos taken during previous annual inspections. The physical changes at the landfill due to seasonal flooding can then be identified and documented. In 2014, and again in 2016, lead batteries were exposed and subsequently removed and transported for recycling in Fairbanks, Alaska.

A feasibility study (FS) was prepared in 2015 to identify and screen remedial response actions that address risks posed by known and suspected contamination remaining at the landfill. The FS provides information and analysis to support the selection of a preferred remedy for the site.

Photo 4: Umiat Landfill Area and Colville River, 2016

Photo 5: Spring Flooding of Colville River over Landfill, 2011

Photo 6: Drums Exposed in Landfill, 2016

CLEANUP OBJECTIVES

The detailed evaluation of remedial alternatives includes an analysis of the extent to which the alternatives comply with applicable or relevant and appropriate requirements (ARARs). Chemical-specific ARARs are shown in Table 1. Any potential remedial action that includes an on-site landfill 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	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 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) A monofill built after 1/28/96 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

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 contaminants of concern (COC) under CERCLA.

The RI concluded impacted media at the Umiat landfill includes soil, sediment, surface water, and groundwater. For the purpose of this Proposed Plan, sediment is considered the same as soil, and the sediment exists within isolated pockets in and immediately downstream 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.

Soil COCs (CERCLA contaminants) above ADEC Method Two Table B1 migration to groundwater or human health cleanup levels are provided in Table 2. Surface and groundwater COCs (CERCLA contaminants) above ADEC Table C Groundwater Cleanup Levels (18 AAC 75) are provided in Table 3. Petroleum hydrocarbons in soil above state risk-based criteria for the applicable pathway are listed in Table 4. Petroleum hydrocarbons in surface and groundwater above ADEC Table C Groundwater Cleanup Levels (18 AAC 75) are provided in Table 5.

Table 2: Cleanup Levels – CERCLA COC in Soil/Sediment	
COC	**(mg/kg)**
4,4'-DDD	0.49[1]
4,4'-DDT	5.1[1]
Lead	400[2]
PCBs (total)	1[2]

mg/kg milligrams per kilogram
[1] ADEC Table B1 Method Two Migration to Groundwater Cleanup Levels (18 AAC 75.341 (c)) (November 7, 2017)
[2] ADEC Table B1 Method Two Human Health Cleanup Levels, Arctic Zone (18 AAC 75.341 (c)) (November 7, 2017)

Table 3: Cleanup Levels – CERCLA COC in Groundwater	
COC	**(mg/L)**
4,4'-DDD	0.00032[1]
4,4'-DDT	0.0023[1]

mg/L milligrams per liter
[1] ADEC Table C Groundwater Cleanup Levels (18 AAC 75.345) (November 7, 2017).

Table 4: Cleanup Levels – Hydrocarbons in Soil	
Petroleum Hydrocarbons	**(mg/kg)**
DRO	230[1]

[1] ADEC Table B2 Method Two Over 40 Inch Zone Migration to Groundwater Cleanup Level (18 AAC 75.341 (c)) (November 7, 2017). Over 40 Inch Zone used due to episodic channel flooding over landfill.

Table 5: Cleanup Levels – Hydrocarbons in Groundwater	
Petroleum Hydrocarbons	**(mg/L)**
DRO	1.5[1]
Naphthalene	0.0017[1]

mg/L milligrams per liter
[1] ADEC Table C Groundwater Cleanup Levels (18 AAC 75.345) (November 7, 2017).

NATURE AND EXTENT OF CONTAMINATION

The Umiat Landfill area is adequately defined and covers approximately 8 acres. 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 2013 Remedial Investigation compiled historical environmental sampling data, geophysical assessments, and other information. The RI did not identify distinct contaminant sources within the landfill that may be targeted for a limited removal.

Uncertainty exists concerning the exact nature, distribution, and volume of contaminants in the landfill. The heterogeneous distribution of unknown wastes in a landfill makes it unfeasible to identify all potential discrete contaminant sources within the landfill. No amount of sampling, short of complete excavation of the contents, would reveal whether there is another small transformer filled with PCB oil that is, or may become, a point source for release of highly concentrated contaminants. Hazardous materials are known to be present; contaminants have been detected above acceptable risk levels and applicable regulatory limits in soil, sediment, and fish tissue.

The Colville River floods the ephemeral slough and landfill areas annually, typically in spring and fall. Water velocities during these events can be high. Sand and gravel placed to cover the landfill has been eroded and redistributed and periodically exposes landfill debris. These flood events have historically uncovered hazardous materials and solid wastes, and likely transported contamination off-site as evidenced by downstream sediment samples. Landfill-cover erosion and subsequent exposure of potentially contaminated debris and soil is an on-going process, likely to result in future releases of contaminants to the environment.

In January 2017, the Hydraulics and Hydrology Section at the USACE Alaska District conducted an aerial imagery analysis of Colville River morphology at Umiat. 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 near the landfill site. The analysis concluded the Colville River bank is migrating north towards the landfill site. Historical erosion rates varied from 5.6 to 35.5 feet per year and were typically 10 to 14 feet per year. Extrapolation of these rates indicates there is significant 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.

The Feasibility Study recommended interim and/or permanent remedial actions be implemented to reduce the potential for contaminant exposure to humans and ecological receptors.

Photo 7: Crushed Drums Exposed in Umiat Landfill, 2016

Table 6 provides a summary of those contaminant concentrations identified during the remedial investigation in soil/sediment above soil cleanup levels.

Table 7 provides a summary of those contaminant concentrations in groundwater identified during the remedial investigation above cleanup levels.

Table 6: Concentrations of Contaminants in Soil/Sediment Above Cleanup Levels		
Chemical	**Cleanup Levels (mg/kg)**	**Range of Concentration (mg/kg)**
4,4'-DDD	0.49[1]	0.026 - 31.4
4,4'-DDT	5.1[1]	0.0325 - 38.2
Lead	400[2]	598 – 1,170
PCBs	1[2]	1.3 – 17.8
DRO	230[3]	1,300

1 ADEC Table B1 Method Two Migration to Groundwater Cleanup Levels (18 AAC 75.341 (c)) (November 7, 2017).
2 ADEC Table B1 Method Two Human Health Cleanup Levels (18 AAC 75.341 (c)) (November 7, 2017)
3 ADEC Table B2 Method Two Petroleum Hydrocarbon Soil Cleanup Level, Over 40 Inch Zone, Migration to Groundwater (18 AAC 75.341 (c)) (November 7, 2017)

Table 7: Concentrations of Contaminants in Groundwater Above Cleanup Levels		
Chemical	**Cleanup Levels (mg/L)[1]**	**Maximum Concentration (mg/L)**
DRO	1.5	76.1
4,4' DDD	0.00032	0.0173
4,4' DDT	0.0023	0.0311
Naphthalene	0.0017	0.350

1 ADEC Table C Groundwater Cleanup Levels (18 AAC 75.345) (November 7, 2017)

SUMMARY OF SITE RISKS

In 2001, 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.

In 2003, the U.S. Army Center for Health Promotion and Preventive Medicine (CHPPM) consolidated information from previous environmental reports on the presence of PCBs in fish tissue and other media of the Colville River Seasonal Slough at the Umiat 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 Landfill was a historical source of PCBs to the 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 U.S. Food and Drug Administration (FDA) action limit of 2.0 parts per million (ppm) in only one study. PCB concentrations in two other fish species collected in the slough (Arctic grayling and Broad whitefish) are all well below the FDA action limit and at the lower end of the range of concentrations found in the Colville River and greater Alaska region.

- Despite the occasional exceedances of the FDA action limit for PCBs in burbot of the Seasonal Slough, there are no health risks associated with consuming the slough's fish. The slough supports a very limited fishery, and generally would not allow individuals to consume a sufficient diet of contaminated fish to pose a health concern.

Human Health Risk

Based on the current and 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. 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 potential cleanup levels (PCLs) from Alaska Regulations and the highest results for soil and sediment were compared to one-tenth the Method Two Table B1 soil-cleanup levels for the Arctic Zone, and surface-water and groundwater results to one-tenth the Table C groundwater cleanup levels, in accordance with the ADEC's *Cumulative Risk Guidance*. 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. The highest detected concentrations exceeding the RBSLs were included in the CRE. 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 indicate a human cancer risk of 8×10^{-3} and a non-cancer HI of 4. Both the cancer risk and HI exceed the risk range of 1×10^{-4} to 1×10^{-6} and 1, respectively.

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 PCLs 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.

The following were identified as Remedial Action Objectives (RAOs) based on a refined list of COCs to address contamination at the Umiat Landfill:

- Reduce soil concentrations of 4,4’-DDT to below 5.1 mg/kg to minimize or prevent migration to groundwater above the groundwater cleanup level.
- Reduce soil concentrations of 4,4’-DDD to below 0.49 mg/kg to minimize or prevent migration to groundwater above the groundwater cleanup level.
- Minimize or prevent ingestion of groundwater in excess of 0.00032 mg/L of 4,4’-DDD and 0.0023 mg/L 4,4’DDT.
- 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 and sediment in excess of 400 mg/kg of lead.
- To the extent that DRO and naphthalene are commingled with CERCLA contaminants, minimize or prevent ingestion of groundwater in excess of 1.5 mg/L DRO and 0.0017 mg/L naphthalene.
- To the extent that DRO is commingled with CERCLA contaminants, reduce soil concentrations of DRO to below 230 mg/kg to minimize or prevent migration to groundwater above the groundwater cleanup level.
- To the extent that naphthalene is commingled with CERCLA contaminants, reduce soil concentrations of naphthalene to below 0.038 mg/kg to minimize or prevent migration to groundwater above the groundwater cleanup level.

Subsurface contaminants or buried debris, potentially containing hazardous substances, could continue to be exposed by seasonal 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 is also a concern for impacting future stability of the buried debris and associated contaminated soil.

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

- Remove and appropriately dispose of the landfill contents to prevent solid or hazardous waste items such as metal debris, crushed drums, transformers, and batteries from impacting soil, sediment, groundwater, and surface water in the future.

Remedial Action Alternatives

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

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

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. Land Use Controls

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 hot spot sediment areas, 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 casefiles, 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 residents and/or presentations at Restoration Advisory Board meetings. For cost estimate purposes, long term management is assumed to last for 30 years.

3. LUCs and Hot Spot Sediment Removal

This alternative includes three primary components: 1) LUCs implemented to protect human health at the landfill area; 2) construction of a temporary processing pad; and 3) removal and disposal of “hot spot” sediments identified down-drainage from the landfill. LUCs would be implemented as in Alternative 2. Hot spot contaminated sediments would be removed using an excavator, with appropriate measures taken to prevent transport of re-suspended sediments, and transported to a temporary processing pad and dewatered to separate waste streams prior to disposal at a RCRA facility.

4. Containment, Capping and LUCs

This alternative includes five primary components: 1) hot spot sediment removal; 2) a subsurface vertical barrier around the landfill footprint; 3) a reinforced landfill cap; 4) construction of permanent slough blocks to limit flooding of the landfill area and reduce erosive energy of floodwater in the landfill area; and 5) LUCs implemented to protect human health at the landfill area. 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.

5. Excavation and On-site Disposal

This alternative involves the excavation of landfill contents and hot spot sediments, segregating contaminated and non-contaminated material, and disposal of all contaminated materials in a permitted containment cell (landfill) on-site at a location that is not at risk of erosion by the Colville River. Non-contaminated soil would be reused, if appropriate.

After completion of the landfill excavation activities, 3 consecutive groundwater sampling events will be conducted to verify source removal achieved the groundwater remedial action objectives.

6. Excavation and Off-site Disposal

This alternative involves the excavation and segregation of landfill contents (landfill debris, contaminated soils, and/or hazardous materials). Solid waste would be transported and disposed in a permitted offsite disposal facility. Contaminated sediment and soil would be transported and disposed at an appropriate permitted facility. Hazardous materials 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, 3 consecutive groundwater sampling events will be conducted to verify source removal achieved the groundwater remedial action objectives. Based on an evaluation of the results of the confirmation groundwater sampling, the site would be available for unlimited use / unrestricted exposure under this alternative.

7. Excavation and On-site Disposal of Inert Material, Off-site Disposal of Hazardous Materials and Contaminated Soil/Sediment

This alternative involves excavating the contents of the landfill, segregating inert debris from hazardous materials, segregating excavated soil, disposal of inert debris in a monofill constructed in close proximity to the site but in an area not subject to erosion, and off-site disposal of hazardous materials and contaminated soils not placed in the monofill. 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 characterized for waste disposal purposes and placed in the monofill, if appropriate. Oversize fractions of the excavated soil such as large cobbles would also be segregated for potential reuse as backfill material or erosion protection at the monofill. Contaminated soil and sediment not placed in the monofill will be transported off-site for disposal at an appropriate permitted facility. Criteria for placement of excavated soil/sediment in the on-site monofill are shown in Table 8.

Table 8: Monofill Soil Placement Criteria

COC	(mg/kg)
4,4'-DDD	40[1]
4,4'-DDT	33[1]
DRO	12,500[2, 3]

mg/kg milligrams per kilogram
[1] ADEC Table B1 Method Two Human Health Cleanup Levels, Arctic Zone (18 AAC 75.341 (c)) (November 7, 2017)
[2] ADEC Table B2 Method Two Arctic Zone Cleanup Levels (18 AAC 75.341 (c)) (November 7, 2017)
[3] Evaluation of leachability will also be conducted using computer modeling in combination with analysis of waste characterization samples using SW-846 Test Method 1312 (Synthetic Precipitation Leaching Procedure).

This alternative involves construction of a single-use monofill (freeze-back) 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.

After completion of the landfill excavation activities, 3 consecutive groundwater sampling events will be conducted to verify source removal achieved the groundwater remedial action objectives. Based on an evaluation of the results of the confirmation groundwater sampling, the former landfill site would be available for unlimited use / unrestricted exposure under this 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 will include excavation and off-site disposal of the landfill contents as described in Alternative 6.

Photo 8: Exposed Debris in Landfill, 2011

Remedy Selection Process and Comparison of Alternatives

The 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 Proposed Plan. The balancing and modifying criteria are used to identify the preferred alternative and to select the final remedy.

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 applicable or relevant and appropriate requirements (ARARs), which addresses whether a remedy will meet all the identified requirements or whether a waiver can be justified.

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.

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 Proposed Plan.

Table 9 graphically shows the relative performance of the alternatives evaluated for the threshold and primary balancing criteria including the estimated costs of each alternative.

TABLE 9: COMPARATIVE ANALYSIS OF ALTERNATIVES BASED ON 2015 FS									
Evaluation Criteria		1*	2*	3*	4	5	6	7	8
		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	Overall Protection of Human Health and the Environment	○	○	○	●	●	●	●	●
THRESHOLD	Compliance with applicable or relevant and appropriate requirements	○	○	○	●	●	●	●	●
BALANCING	Long-Term Effectiveness and Permanence	○	◗	◗	◗	◗	●	●	●
BALANCING	Reduction in Toxicity, Mobility, and Volume Through Treatment	○	○	○	○	○	○	○	○
BALANCING	Short-Term Effectiveness	○	◗	◗	●	●	●	●	◗
BALANCING	Implementability	○	●	●	◗	◗	◗	◗	◗
BALANCING	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

TABLE 10: REFINED COSTS OF ALTERNATIVES					
Evaluation Criteria		4	5	6	7
		Containment & Capping	Excavation and On-Site Disposal	Excavation and Off-Site Disposal	Excavation/ On-Site and Off-Site Disposal
BALANCING	Long-Term Effectiveness and Permanence	◗	◗	●	●
BALANCING	Reduction in Toxicity, Mobility, and Volume Through Treatment	○	○	○	○
BALANCING	Short-Term Effectiveness	●	●	●	●
BALANCING	Implementability	◗	◗	◗	◗
BALANCING	Cost ($M)	$124	$155	$239*	$160*

Key: ○ = low ◗ = medium ● = high
*Costs for Alternatives 6 and 7 only were updated based on the 2017 FS Addendum.

The eight alternatives were evaluated against the threshold and primary balancing criteria as part of the CERCLA process. As shown in Table 9, Alternatives 1 through 3 did not meet the threshold criteria and were eliminated from further discussion. Alternative 8 was also removed from further discussion because it merely represents an approach for implementation of the other alternatives.

Table 10 provides a focused comparison of the remaining four alternatives and the balancing criteria. Three balancing criteria are equal for all alternatives. First, all four alternatives have high Short Term Effectiveness and are expected to meet remedial goals within a short duration because they physically isolate or remove contaminants. Second, all four alternatives are evaluated as low for Reduction in Toxicity, Mobility, and Volume through Treatment in Table 10. All four alternatives either involve leaving waste in place or moving the landfill contents to other locations/ landfills. The overall volume of waste leaving the site is reduced by segregating materials under Alternatives 6 and 7, and especially by directing inert debris and segregated soils to a nearby monofill under Alternative 7. This volume reduction saves space in offsite permitted disposal facilities. However, the overall quantity of chemicals is not reduced through treatment under any of the four alternatives. Finally, all four alternatives are evaluated as medium for the Implementability criteria. The primary reasons are remoteness of the project site, the short construction seasons, transportation challenges and the difficulty of constructing physical barriers or removing contents of a landfill with permafrost and groundwater challenges, and changing flow in the nearby Colville River.

Removing the three balancing criteria that have equal results for all of the alternatives in Table 10 from further discussion leaves two remaining differentiating balancing criteria; Long Term Effectiveness and Cost. The following discussion focuses on the four alternatives and these two differentiating criteria.

Alternative 4 involves constructing a vertical barrier and an engineered cap to contain the existing landfill. The alternative also includes removing impacted PCB sediments within the slough. A primary differentiating factor is Long Term Effectiveness and Permanence. Imagery analysis of erosion trends of the Colville show that the river is migrating north toward the landfill area. It is not possible to know exactly how long until the Colville River reaches the landfill boundary but it is likely. The landfill is flooded annually and previous high flow events have caused erosion. Although the cap would be constructed to address a range of flow events, uncertainty exists due to lack of river gage data. In addition to moving northward, the Colville River is capable of very high flow events, ice jams or river avulsions that could damage an engineered barrier and cap resulting in excessive maintenance or potential remedy failure. Due to the risk of future damage and excess maintenance, or even remedy failure if and when the Colville River reaches the landfill, it is less preferable in comparison to other alternatives.

Although Alternative 4 would reduce the movement of groundwater from the debris cells to adjacent area, the alternative does not remove the source of groundwater contamination and therefore does not address the groundwater related RAOs as effectively as other alternatives. Alternatives 5, 6, and 7 involve removal of the material 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 hot spot sediments, segregating contaminated and non-contaminated material, and disposal of all contaminated materials in a containment cell on-site. The containment cell would be situated in a similar area as the proposed Monofill but would be constructed to more stringent requirements. Similar to capping, the alternative partially meets the Long Term Effectiveness and Permanence criteria. Because the alternative includes relocating contaminated material on the site, it includes long term maintenance and higher future risk and liability in comparison to Alternative 6 where all contaminated material in excess of cleanup levels is disposed offsite or Alternative 7 where the inert debris and segregated soils (see Table 8) are placed in an onsite monofill.

Alternative 6 and 7 are considered preferable to other alternatives, with cost being the differentiating factor. To better evaluate cost, a Feasibility Study Addendum was developed to refine cost information based on coordination with landowners and further analysis of implementation process and assumed or estimated quantities. Costs for Alternatives 6 and 7 were refined and are presented in Table 10. The cost difference between full offsite disposal versus constructing a local monofill for inert material and segregated soils appears to warrant selection of Alternative 7 as the preferred alternative.

The long term risks and liabilities associated with a monofill (Alternative 7) are lower than those associated with leaving all material in Umiat in a permitted landfill (Alternative 5). The cost of implementing Alternative 7 is expected to be less than the cost of transporting the entire volume of materials offsite for disposal (Alternative 6).

Refinement of estimated cost was conducted by USACE Alaska District while coordinating with governmental stakeholders. As a result of these meetings, a closer possible gravel source and onsite monofill location were identified versus the locations that had been considered during prior analysis. USACE refined the estimated costs for Alternatives 6 and 7 based on these new assumed locations.

In the 2015 FS, gravel cost comprised a significant percentage of the overall estimated costs to implement Alternatives 4 through 7. The 2015 FS assumed a commercially available gravel source would be developed up to five miles away from the site on the opposite side of the Colville River, thus constraining transportation to the site to a winter field season using ice roads and an ice bridge. During government stakeholder meetings, participants suggested a potentially cost-saving alternative gravel source on gravel bars of the Colville River a short distance east of the Umiat Landfill on the same side of the river.

Another reduction in estimated costs for Alternatives 6 and 7 is attributed to revision of the assumed volume of contaminated soil and segregating soils to remove oversized fraction of cobbles. The 2015 FS assumed a more conservative landfill excavation scenario (larger area and depth than identified by geophysical survey) and under Alternative 6 assumed that all soil that is excavated would be transported off-site (including cobbles).

The 2017 FS Addendum assumes a smaller volume of soil will be excavated and that only a portion of the excavated soil will be contaminated. In addition, under both Alternatives 6 and 7, the excavated soil would be processed to remove the oversized fraction of cobbles so that it does not need to be transported and disposed as waste. The 2017 FS Addendum assumes that debris will be excavated to the basal depths identified by geophysical survey at each landfill cell, that 50% of the underlying soil area beneath the debris will be contaminated to two feet below the base of the landfill, and that 50% of landfill cell perimeter soil will be contaminated. These assumptions reduce the overall volume of contaminated soil expected to be removed, transported and disposed off-site.

Alternative 7 assumes monofill construction within the FUDS property boundary, to contain inert debris and segregated soils from the Umiat Landfill material. Possible monofill locations are identified on Figure 3.

Preferred Alternative

The preferred alternative for clean-up of the Umiat Landfill FUDS is Alternative 7. This alternative involves the on-site disposal of inert debris (e.g., crushed drums, miscellaneous metal) and segregated soil/sediment) in a monofill within the FUDS site property, likely on the plateau north of Umiat. Hazardous materials and contaminated soil/sediment above cleanup levels would be transported and disposed offsite.

Preparation of planning and design documents would be the first step in proceeding with this alternative. The general sequencing of onsite work for Alternative 7 includes:

- Mobilize equipment and personnel to Umiat.
- Develop borrow area for gravel. Construct processing pad and prepare monofill location.
- Excavate landfill cells, segregate inert debris from hazardous materials, and segregate excavated soil/sediment.
- Package and prepare hazardous materials and soil/sediment for transport to off-site disposal facility.
- Transport and dispose of inert debris and segregated soil at the on-site monofill.
- Demobilize equipment and personnel from Umiat.
- Conduct long term management of monofill.
- Conduct 3 consecutive groundwater sampling events to verify source removal achieved the groundwater RAOs.
- Request BLM annotate Federal Master Title Plats with a notation that a monofill exists including type of waste placed, geographical boundary, and final cover details.

The areas within the cells identified on Figure 2, which make up the landfill, will be excavated. The preferred location of the temporary processing pad is adjacent to the eastern edge of the main gravel pad, on ADOT&PF property. This location is advantageous due to its proximity to the landfill area and potential post remediation usability for the landowner. Coordination with the landowner for placement of a temporary processing pad is currently underway.

The anticipated monofill site is on the plateau north of Umiat within the FUDS property that meets the location standards of 18 AAC 60.410 Solid Waste Regulations, at or close to one of the locations identified on Figure 3. Monofill access, development, and material transport and placement would be conducted during winter conditions to minimize impact to tundra.

Any liquid waste (i.e., drum or transformer contents) will be containerized for transport and disposal at a permitted waste facility off-site.

Backfill material for the excavated landfill would consist of locally available gravel suitable for this purpose, with the surface graded to provide adequate drainage and restored as appropriate.

The monofill will be monitored in accordance with 18 AAC 60.490 (c) requirements.

A CERCLA Five Year Review will not be required after completion of the remedial action as the remedial action objective is to remove contaminants from the current landfill location to meet unlimited use and unrestricted exposure. However, one Periodic Review will be conducted after 5 years to verify the monofill remains protective of human health and the environment.

COMMUNITY PARTICIPATION

The public is encouraged to provide comments on the alternatives presented in this Proposed Plan for the Umiat Landfill FUDS. A final decision for this site will be made only after public comments are considered.

The **Public Comment Period is**:

12 February to 23 March 2018

Your comments can be provided to USACE by any of the following methods.

- Mail a written comment

  CEPOA-PM-ESP-FUDS
  Umiat Landfill Proposed Plan
  PO Box 6898
  JBER, Alaska 99506-0898

- Email your comments

  POA-FUDS@usace.army.mil

- Present your comments and attend one of the two scheduled public meetings

7 March 2018
Nuiqsut City Office
Nuiqsut, Alaska
6:00 PM

8 March 2018
North Slope Borough
Assembly Chambers
Utqiaġvik, Alaska
6:00 PM

USACE will provide a written response to all significant comments. A summary of the responses will accompany the Decision Document and will be made available in the Administrative Record and Information Repositories.

For additional information, please contact:

Stan Wharry
USACE Project Manager
907-753-5781

Administrative Record Location

Additional detailed information that is not presented in this Proposed Plan (documents that detail previous investigations, remedial actions, and results) is available for your review in the Administrative Record located at the Native Village of Nuiqsut office in Nuiqsut, Alaska.

ACRONYMS

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
ARAR	applicable or relevant and appropriate requirements
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
COC	contaminants of concern
COPC	chemical of potential concern
CY	cubic yards
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
DoD	Department of Defense
DRO	diesel-range organics
EPA	United States Environmental Protection Agency
ft	feet
ft^2	square feet
FUDS	Formerly Used Defense Site
FS	Feasibility Study
LUC	land use control
mg/kg	milligrams per kilogram
mg/L	milligrams per Liter
NCP	National Contingency Plan
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RRO	residual-range organics
RAO	Remedial Action Objectives
TEQ	toxicity equivalent
TSCA	Toxic Substances Control Act (1976) (15 U.S.C. s/s 2601 et seq.)
USACE	U.S. Army Corps of Engineers

REFERENCES

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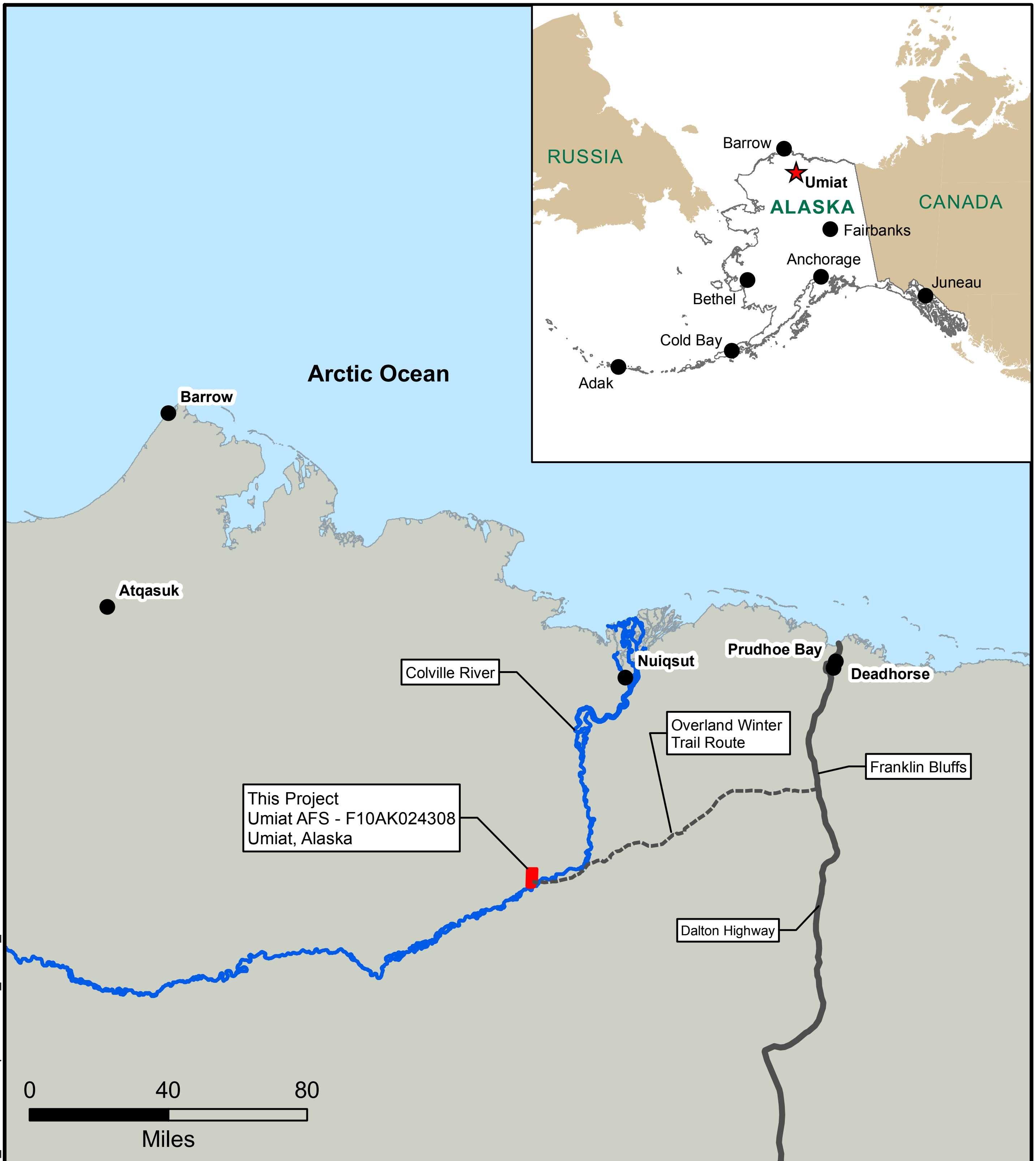

Umiat Landfill Proposed Plan
Umiat, Alaska

SITE LOCATION

FEBRUARY 2018

U.S. Army Corps of Engineers

FIGURE 1

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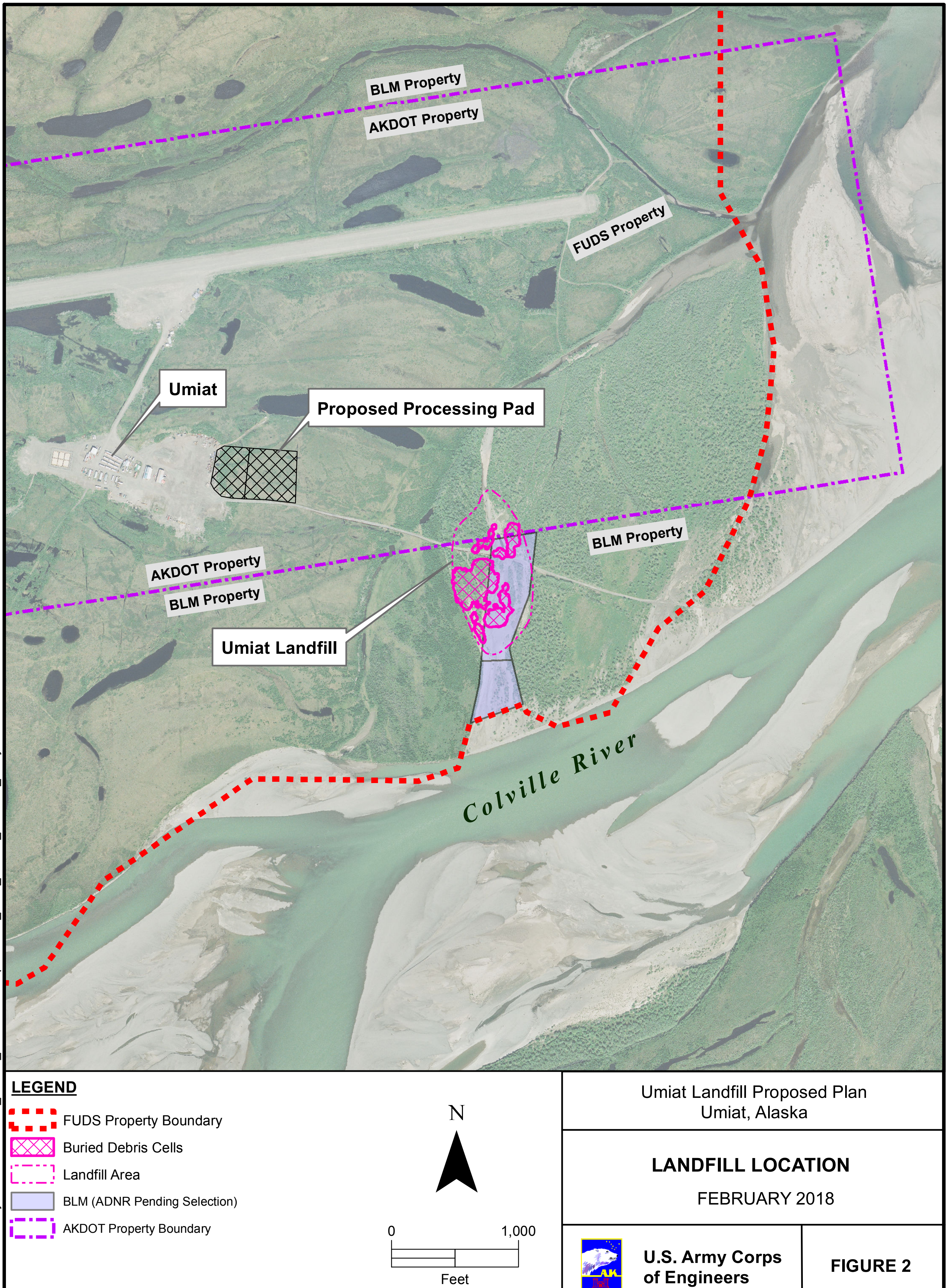

Umiat Landfill Proposed Plan
Umiat, Alaska

LANDFILL LOCATION

FEBRUARY 2018

U.S. Army Corps of Engineers

FIGURE 2

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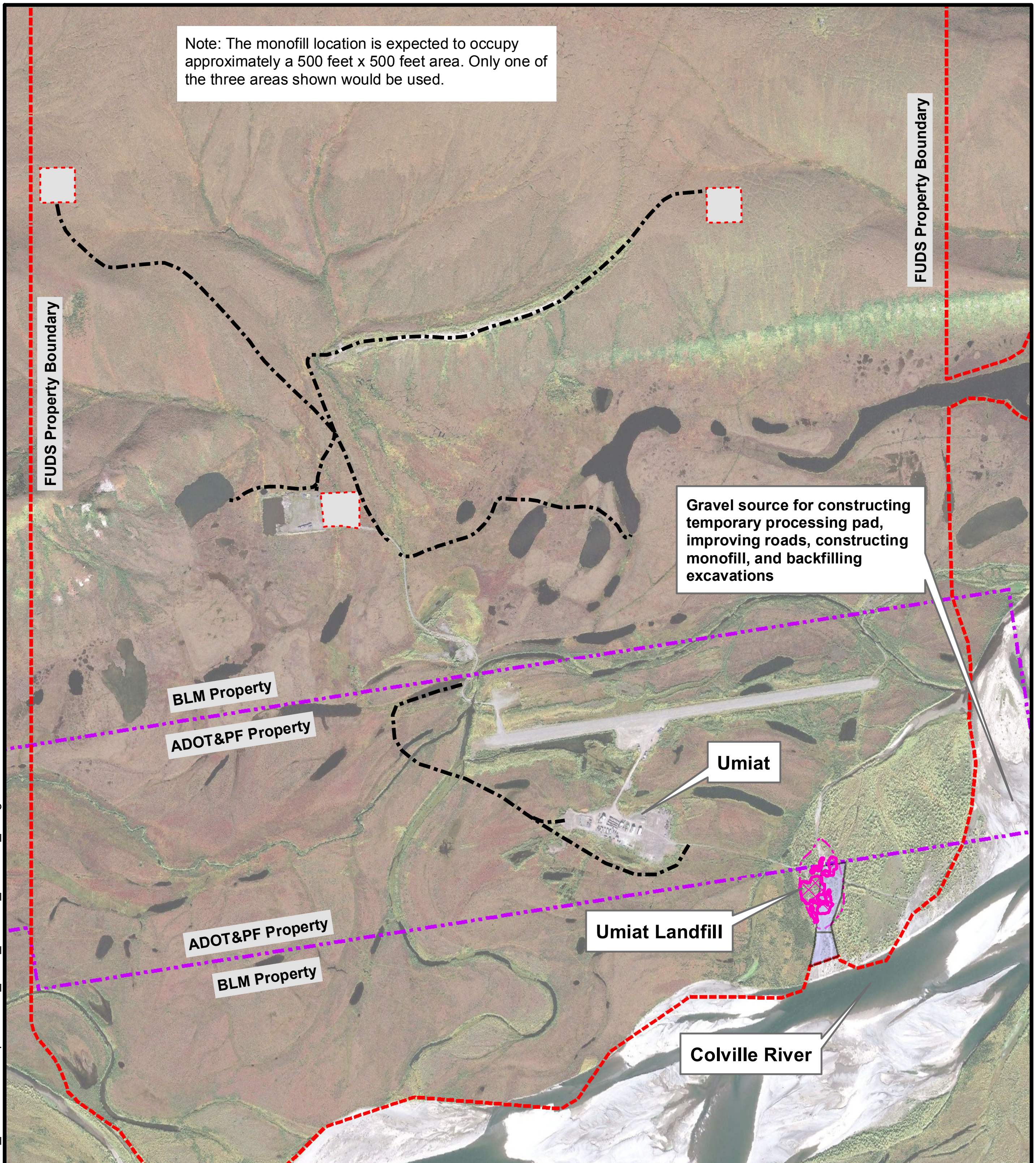

LEGEND

- Winter Ice Road or Trail
- Buried Debris Cells
- Landfill Area
- Possible Monofill Location
- BLM (ADNR Pending Selection)
- FUDS Property Boundary
- ADOT&PF Property Boundary

N

0 2,000
Feet

Aerial photography:
9/10/2010 Google Earth Pro imagery

Umiat Landfill Proposed Plan
Umiat, Alaska

PROPOSED MONOFILL LOCATION

FEBRUARY 2018

U.S. Army Corps of Engineers

FIGURE 3

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