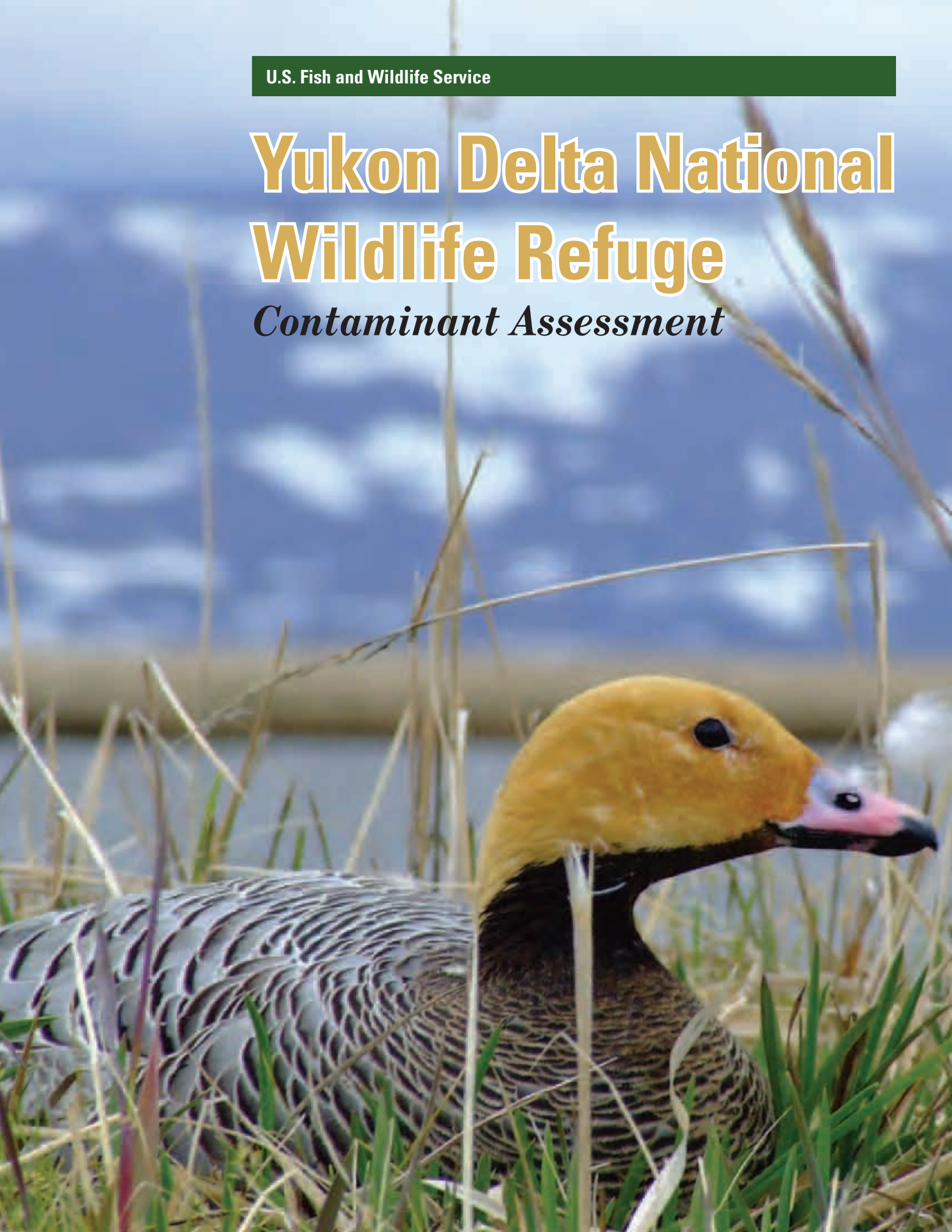
U.S. Fish and Wildlife Service

Yukon Delta National Wildlife Refuge

Contaminant Assessment



Yukon Delta National Wildlife Refuge
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On the cover: An emperor goose closely guards her nest. USFWS photo

Executive Summary

The purpose of the Contaminant Assessment Process (CAP) is to compile and summarize known past, present, and potential contaminant threats to National Wildlife Refuges. This report documents known and potential contaminant issues on the Yukon Delta National Wildlife Refuge (YDNWR).

Most people regard National Wildlife Refuges as pristine areas reserved for wildlife and fish. Although managing these species is a primary management goal, refuges often experience a variety of other uses. The YDNWR has past and current military use, a history of oil and mineral exploration, as well as ongoing use by the public. These activities can result in contamination of trust resources and their habitats, and require remediation. In addition, the Refuge has a history of complex land ownership. One of the primary purposes of the YDNWR is providing opportunity for continued subsistence uses by local residents. The dual purpose of wildlife conservation and human subsistence use protection makes scrutiny of contaminant issues doubly important.

Former military and mineral extraction activities frequently left facilities and other development remains on-site after operations ceased, often due to costs of materials removal, transport, and cleanup. At some sites, hazardous materials were spilled with inadequate or no cleanup. The United States Air Force (USAF) has operated the Cape Romanzof Long Range Radar Site (CRLRRS) since 1953. Past disposal practices and frequent spills created a patchwork of contaminated soils at this site. Remediation to date includes building and drum removal, landfill excavation, soil treatment in biocells, and monitoring. Another former military installation, an aircraft control and warning system (AC&W), was subsequently used as the headquarters for the Bureau of Indian Affairs (BIA) in Bethel. This site has been partially remediated; however a fire in 2002 released additional contamination and is one of the Refuge's most significant unresolved cleanup issues. Remediation has also been done at some Army National Guard (ANG) sites' fuel spills. There are numerous ANG training ranges where fired munitions remain. Mining and oil exploration sites have a mixed history of cleanup action. If and when any potentially contaminated lands are conveyed to the Refuge, a full contaminant assessment conforming to U.S. Fish and Wildlife Service (Service) and Department of the Interior (DOI) preacquisition policies must be completed prior to acceptance of any of these properties by the Service. Oil and hazardous materials spills will remain a potential threat to the Refuge.

Numerous Refuge contaminant issues are highlighted in this report. The CAP has gathered information to help Service personnel make informed management decisions about contaminant threats to Refuge lands and resources.

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Tables and Figures

Acronyms and Abbreviations

ACL	alternate cleanup level
ACM	asbestos containing materials
AC&W	Aircraft Control and Warning
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish & Game
ADNR	Alaska Department of Natural Resources
ADOT	Alaska Department of Transportation
AFS	Air Force Station
ANG	Army National Guard
ANILCA	Alaska National Interest Lands Conservation Act
ANCSA	Alaska Native Claims Settlement Act
AOC	area of concern
ASR	archive search report
AST	above-ground storage tank
AWCS	Air Weapons Control System
AWS	Aircraft Warning System
bgs	below ground surface
BEST	Biomonitoring of Environmental Status and Trends
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BNCI	Bethel Native Corporation Incorporated
BRD	Biological Resources Division (USGS)
BTEX	benzene, toluene, ethylbenzene, and xylene
CAA	Civil Aeronautics Administration
Calista	Calista Corporation
CAP	Contaminant Assessment Process
CCP	Comprehensive Conservation Plan
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
COC	contaminant of concern
CON/HTRW	Containerized Waste/Hazardous Toxic or Radiological Waste
Corps	United States Army Corps of Engineers
CRLRRS	Cape Romanzof Long Range Radar Site
cy	cubic yard(s)
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DEQ	Division of Environmental Quality (USFWS)
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
DOI	Department of the Interior
DRO	diesel range organics

EA	Environmental Assessment
EPA	U.S. Environmental Protection Agency
FAA	Federal Aviation Administration
FONSI	Finding of No Significant Impact
FS	Feasibility Study
FSA	Federal Scout Armory
FUDS	Formerly Used Defense Sites
GRO	gasoline range organics
GSA	Government Services Administration
IAP	Installation Action Plan
ICs	institutional controls
IRA	Interim Removal Action
IRP	Installation Restoration Program
LBP	lead-based paint
LD	Land Decisions
LKSD	Lower Kuskokwim School District
LRRS	Long Range Radar Site or Station
LUST	leaking underground storage tank
MC	munitions of concern
MCL	maximum contaminant level
MEC	munitions and explosives of concern
MeHg	methylmercury
mg/kg	milligrams per kilogram
mg/L	milligrams/liter
MMRP	Military Munitions Response Program
MOGA	motor gasoline
NEPA	National Environmental Policy Act
NFRAP	No Further Remedial Action Planned
OMS	Organizational Maintenance Shop
ORV	off-road vehicle
PA	Preliminary Site Assessment
PAHs	polycyclic aromatic hydrocarbons
PBDEs	polybrominated diphenyl ethers
PCBs	polychlorinated biphenyls
P.L.	Public Law
PLO	Public Land Order
POL	petroleum, oil, and lubricants
POPs	persistent organic pollutants
PP	priority pollutants
ppm	parts per million
RACM	regulated asbestos containing material
RAOs	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
Refuge	Yukon Delta National Wildlife Refuge

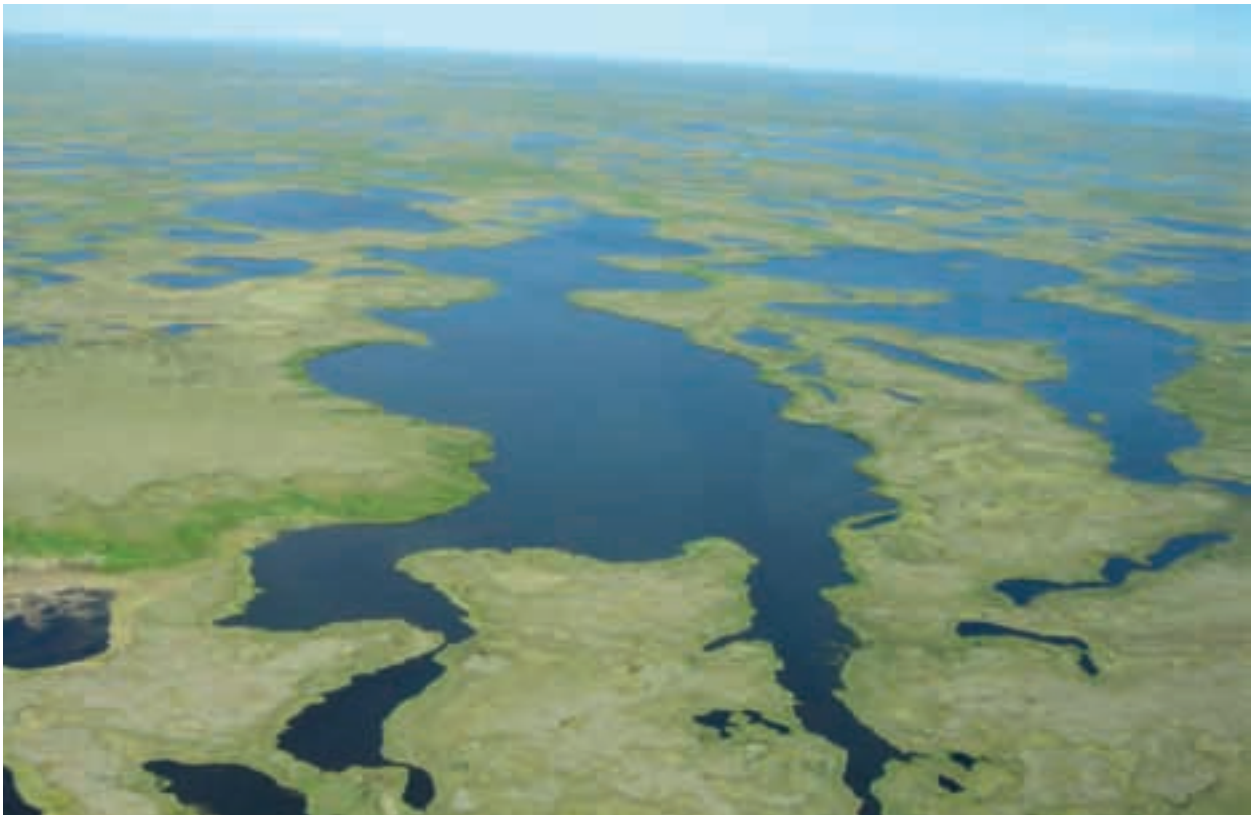
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
ROW	right-of-way
RP	responsible party
RRO	residual range organics
RRS	Radio Relay Station
Service	U.S. Fish and Wildlife Service
SI	Site Investigation
SPCC	Spill prevention, control, and countermeasures
SVOCs	semi-volatile organic compounds
TACAN	Tactical Air Navigation
TAH	total aromatic hydrocarbons
TAqH	total aqueous hydrocarbons
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TSCA	Toxic Substances Control Act
UCL	Upper Confidence Limit
ug/l	micrograms per liter
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	U.S. Geological Survey
USTs	underground storage tanks
VOCs	volatile organic compounds
WACS	White Alice Communication System
YDNWR	Yukon Delta National Wildlife Refuge
Y-K	Yukon-Kuskokwim
YKHC	Yukon-Kuskokwim Health Corporation

Acknowledgements

Many individuals contributed to this report. The YDNWR staff provided information, logistic support, and review of this document, in particular D. Staller. S. Janis and (presently) D. Jerry and her staff at the Division of Realty were exceptionally helpful and patient with records search and reviews. N. Walsh and S. LaKomski cheerfully provided innumerable Realty files and J. Brewer provided many of the Service graphics. P. Johnson provided support and feedback throughout this project. The Division of Engineering provided Nightmute School site cleanup information and photographs. Additional thanks to S. Brockmann and B. Hanson for review and support. Much appreciation to Schatz Publishing's staff for their professional expertise in final compilation and layout of this document.

Author's Notes

This report is a synthesis of available information on contaminant issues in the YDNWR. Many sources were used to produce this document, and some passages have been reproduced from the Refuge's Annual Narratives, Web site and Land Conservation Plan. When appropriate, specific sources of information have been cited and listed in the Bibliography and Literature Cited section of this document. The volume of internal memos, DoD documents, Division of Realty records, and personal observations and conversations preclude the citation of every source used to produce this CAP.



The Yukon Delta National Wildlife Refuge wetland complex includes thousands of unnamed lakes. USFWS photo.

Contaminant Assessment Process

This blue goose, designed by J.N. "Ding" Darling, has become a symbol of the National Wildlife Refuge System.

The Contaminant Assessment Process (CAP) is a standardized and comprehensive method for assessing contaminant threats on National Wildlife Refuges, which encompass over 92 million acres in the United States. The mission of the National Wildlife Refuge System is "to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans" [16 U.S.C. § 668dd(a)(2)]. It is the responsibility of the United States Fish and Wildlife Service (Service) to "ensure that the biological integrity, diversity, and environmental health of the System are maintained for the benefit of the present and future generations of Americans" [16 U.S.C. § 668dd (a)(4)(B)].

Wildlife refuges are often thought of as pristine areas; however, many refuges have contaminant issues. The CAP is an important way of documenting, assessing, and monitoring contaminant threats on refuges. The CAP was developed by the U. S. Geological Survey Biological Resources Division's (USGS/BRD) Biomonitoring of Environmental Status and Trends (BEST) Program and the Service's Division of Environmental Quality (DEQ). The Service uses the CAP to synthesize existing information, thereby documenting past, present, and potential contaminant issues that may affect refuges. Assessing contaminant sources and receptors, contamination events, transport mechanisms, and areas vulnerable to contamination are all aspects of the CAP. This comprehensive account of known and potential contaminant issues are entered into CAP national database, which enables Service personnel to initiate remedial activities or more detailed studies of potential problems affecting trust resources, develop proposals for future investigations, and initiate pollution prevention activities. The CAP was initiated nationally on refuges in 1995–1996.

"The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect, and enhance fish, wildlife, plants and their habitats for the continuing benefit of the American people."

The Contaminant Assessment Process in Alaska

In 1999, the CAP was initiated to evaluate contaminant issues for the 16 National Wildlife Refuges in Alaska (Figure 1). Fully 82 percent of the National Wildlife Refuge lands are in Alaska, totaling more than 76 million acres. Although Alaska is often regarded as a pristine wilderness, very few places in Alaska, even the most remote, are untouched. Alaska's history, and seemingly its future, is linked to its natural resources. The exploration and extraction of oil and precious metals has left a legacy of contaminant problems throughout the state, as well as in its National Wildlife Refuges. Past and current activities in Alaska's refuges include oil exploration and drilling, mining, military activities, and even nuclear weapons testing. Often, sites are abandoned after operations cease and, due to the high cost of removal, debris and structures are left to decay. In some areas, hazardous materials were spilled with little or no cleanup. On many refuges, abandoned 55-gallon drums, which eventually rust and release their contents, dot the landscape. The Alaska National Interest Lands Conservation Act (ANILCA) mandated that refuges develop a Comprehensive Conservation Plan (CCP) [16 U.S.C. § 304(g)(1)(1980)] that identifies and describes "significant problems which may adversely affect the populations and habitats of fish and wildlife" [ANILCA § 304(g)(2E)(1980)]. Implementation of the CAP in Alaska has made these issues part

of the public record and helped managers incorporate contaminant issues into refuge CCPs.

Refuges in Alaska that have received contaminant assessments include Kenai, Alaska Peninsula, Becharof, Togiak, Izembek, and Tetlin. These comprehensive reports detailing contaminant issues on the refuges are available in hard copy, on compact disc, and via the Internet at http://alaska.fws.gov/fisheries/contaminants/process.htm. For further information about these reports, please contact the regional office in Anchorage, Alaska.

Figure 1. The 16 National Wildlife Refuges in Alaska.

USFWS graphic

The Yukon Delta National Wildlife Refuge

Refuge lands in what is now the Refuge were first set aside in 1909 by President Theodore Roosevelt as a preserve and breeding ground for native birds. Additional lands were reserved as part of the refuge system through 1961. With the signing of ANILCA in December 1980, these existing Refuge lands were combined and enlarged to establish the Yukon Delta National Wildlife Refuge. The YDNWR (Figure 2) is the largest unit of the National Wildlife Refuge System, encompassing 19.2 million acres within the northern boreal zone of southwestern Alaska. Stretching from Nunivak Island in the Bering Sea, east for 300 miles to the village of Aniak, this Refuge spans more than 26 million acres of the Yukon-Kuskokwim (Y-K) Delta (Figure 3). The two largest rivers in Alaska, the Yukon and the Kuskokwim, flow through the Refuge. These rivers and their tributaries formed the delta, and they continue to be the major factor shaping the Refuge landscape. This dominant landscape feature, a generally flat marshland, contains countless lakes, ponds, and sloughs and covers about 70 percent of the Refuge.

Figure 2. Yukon Delta National Wildlife Refuge

USFWS graphic.

The northern, eastern, and southern borders of the Refuge are dominated by uplands and mountains, with the highest range in the southeastern part of the Refuge reaching 4,000 feet in elevation. Several small mountain groups are scattered across the coastal plain. Nunivak and Nelson islands are major islands; Nunivak is over a million acres in size. Coastal bluffs provide seabird nesting habitat, while walrus are found along the rocky, gravel beaches. Nelson Island is dominated by lowlands and small lakes and includes a mountain range to the north.

Wetlands, including lakes, ponds, streams, inlets, bays, and coastal areas within the Refuge, support an extremely rich and varied community of fish and wildlife species. The Y-K Delta supports one of the largest aggregations of water birds in the world. Annually, over one million ducks and half a million geese breed there. Waterfowl from all four North American flyways depend on the wetland habitats of the Y-K Delta, and in some

Figure 3. Yukon Delta National Wildlife Refuge

USFWS graphic

summers, up to a third of the continent's northern pintails can be found on the Refuge. In addition, nearly 40,000 loons, 40,000 grebes, 100,000 swans, and 30,000 cranes return to nest on the Refuge each year. About 900,000 young ducks are produced each year—more than 40 percent of the statewide total. Each summer, most of the world's population of emperor geese, about 80 percent of the Pacific brant, and tens of thousands of white-fronted geese nest on the river delta. Cackling Canada geese nest nowhere else. The high concentration of nesting and brood rearing habitats for waterfowl, shorebirds, and seabirds give the Refuge national significance. The Y-K Delta meets all of the criteria to be considered a Wetland of International Importance under Article 2 of the Ramsar Convention.

Millions of shorebirds use the Refuge for both breeding and staging. In terms of both density and species diversity, the Y-K Delta is the most important shorebird nesting area in the country, and the vast intertidal zone is the most important wetland for post-breeding shorebirds on the west coast of North America. Muskox were reintroduced to Nunivak Island

Spectacled eider nesting Critical Habitat on the YDNWR. USFWS graphic.

from Greenland in 1935. The offspring of these animals started new herds in other parts of Alaska.

Regionally and internationally significant salmon fisheries are found in the Yukon and Kuskokwim rivers and their tributaries. Water-based resources are critical to local residents. They provide food, inf uence where villages are located, and determine primary routes and modes of travel. Yup'ik residents participate in traditional subsistence activities throughout the Refuge.

Four threatened or endangered species are historically known to use the Refuge. These include three bird species (Steller's eider, spectacled eider, and Eskimo curlew) and one marine mammal species (Steller sea lion). The Eskimo curlew staged on the tundra near St. Michael during annual migrations but has not been documented in Alaska since the nineteenth century.

This region was once part of the Beringia land mass and has been occupied for thousands of years. It remains the home for over 25,000 Yup'ik Eskimos, who live in approximately 35 villages scattered throughout the Refuge. There are 56 villages that own some lands within the Refuge. Because Refuge boundaries were roughly drawn along major ecological features, many lands that were owned or claimed by individuals, Native corporations, or the State of Alaska were incorporated into the Refuge. Other landowners, including conveyed and selected Native Corporation lands, Native Allotments, State of Alaska, and other patents and federal withdrawals own or have claims to nearly eight million acres of land within the Refuge (USFWS 2004).

Other federal agencies control about 5,940 acres of lands within the Refuge boundaries. The largest withdrawal, at nearly 4,900 acres, is the USAF facility at Cape Romanzof. National Guard withdrawals total about 16 acres in 11 villages. The U.S. Army has withdrawn land at two other villages for National Guard sites. U.S. Coast Guard withdrawals occur around the Point Romanzof Light, Cape Stevens, the Pastolik River, and the north entrance of the Yukon River. Other federal lands within the Refuge include about 70 acres withdrawn for use by the Federal Aviation Administration (FAA) in Bethel and Aniak.

Regional and village Native corporations—effectively business corporations with shareholders—are responsible for receiving monies from land

A spectacled eider hen and her brood. USFWS photo

claim settlements and managing the lands on behalf of their shareholders. Native corporations are another significant landowner within the YDNWR boundaries.

Alaska National Interests Lands Conservation Act (ANILCA)

The management of each refuge is dictated, in large part, by the legislation that created the refuge. In 1980, ANILCA [16 U.S.C. § 303 (7) states:

A. The Yukon Delta National Wildlife Refuge shall consist of the existing Clarence Rhode National Wildlife Range, Hazen Bay National Wildlife Refuge, and Nunivak National Wildlife Refuge including lands, waters, interests, and whatever submerged islands, if any, were retained in Federal ownership at the time of statehood which shall be redesignated as units of the Yukon Delta National Wildlife Refuge and the addition of approximately thirteen million four hundred thousand acres of public lands, as generally depicted on the map entitled "Yukon Delta National Wildlife Refuge," dated April l980.

B. The purposes for which the Yukon Delta National Wildlife Refuge is established and shall be managed include:

Stellers eider Critical Habitat on the YDNWR. USFWS graphic.

i. to conserve fish and wildlife populations and habitats in their natural diversity, including, but not limited to, shorebirds, seabirds, whistling swans, emperor, white-fronted and Canada geese, black brant and other migratory birds, salmon, muskox, and marine mammals;

ii. to fulfill the international treaty obligations of the United States with respect to fish and wildlife and their habitats;

With the passage of ANILCA, many of these small federal facilities became surrounded by a national wildlife refuge.

iii. to provide, in a manner consistent with the purposes set forth in subparagraphs (i) and (ii), the opportunity for continued subsistence uses by local residents; and

iv. to ensure, to the maximum extent practicable and in a manner consistent with the purposes set forth in paragraph (i), water quality and necessary water quantity within the refuge.

C. Subject to such reasonable regulations as the Secretary may prescribe, reindeer grazing, including necessary facilities and equipment, shall be permitted within areas where such use is, and in a manner which is, compatible with the purposes of this refuge.

D. Subject to reasonable regulation, the Secretary shall administer the refuge so as to not impede the passage of navigation and access by boat on the Yukon and Kuskokwim Rivers.

Alaska Native Claims Settlement Act (ANCSA)

ANCSA section 3(e) excluded from the public lands available for Native Corporation selection the smallest practable tract actually used in connections with the administration of a federal facility. With the passage of ANILCA, many of these small federal facilities became surrounded by a national wildlife refuge. If the primary manager of a 3(e) administrative site no longer needs the facility, relinquishment of the withdrawal is conducted through a Bureau of Land Management (BLM) process. However, if a 3(e) withdrawal is within the boundaries of a national wildlife refuge, then the FWS must concur with the relinquishment because that parcel becomes part of the refuge.

The following lands are withdrawn as a 3(e) withdrawal at the time of ANCSA, and the Service would need to concur with relinquishment of this withdrawal before the property could return to Refuge management. The holding agency is required to provide information on contamination and decontamination, 43 CFR § 2372.1 (b) (5) and (6). BLM is required to refuse to release an agency of its accountability and responsibility unless and until the land is decontaminated and restored, and any deterioration caused by the agency is corrected, arrested or prevented, 43 CFR § 2374.2. (USDOI, Office of the Solicitor, Memorandum to State Director, BLM, Alaska State Office, October 9, 1986)

- Bethel - FAA sewage lagoon, roadway, buried electric lines, buried communication cable and 25-foot right-of-way (ROW); Army Corps of Engineers buried communication cable

- Chevak - school access road
- Hooper Bay - Bureau of Indian Affairs (BIA) School, pipeline and tramway
- Lower Kalskag - BIA school, pipeline, tramway, and associated ROW
- Mountain Village - roads
- Nightmute School has been conveyed to Chinuruk Corporation, and the tramway site is in conveyance process
- Pilot Station - USGS Creek Flow Gauging Station, road, school

The Yukon Delta National Wildlife Refuge office in Bethel, Alaska. D. Rudis/ USFWS photo

Contaminant Sources and Issues

Prior to and since its establishment, the Refuge has experienced a variety of activities that introduced contaminants into the environment. The majority of known contaminant issues are associated with structures operated by the Alaska ANG; former BIA schools, and their associated debris piles and fuel supplies; military wastes at Cape Romanzof; and a variety of landfill sites. Oil spills and former mine exploration are also sources of contamination on Refuge lands. Mine development adjacent to or upstream of the Refuge has the potential to create future contaminant concerns.

Hundreds of fuel barrels and other debris were rolled downhill from the Cape Romanzof LRRS road. D. Rudis/USFWS photo

BIA Administrative site building debris and buried pipe are typical hazardous materials found on site. D. Rudis/USFWS photo

Bureau of Indian Affairs (BIA) Schools and Associated Properties

Prior to statehood, BIA operated approximately 140 schools across Alaska, including about 40 sites within Refuge boundaries. Most of these schools were built in the 1950s. After statehood, the state petitioned Congress to take over Native education. Transfer of schools by deed or lease began in the 1960s. The passage of ANILCA in 1980 effectively gave control of any former BIA school still in federal ownership within Refuge boundaries to the Service. It also made the Service the recipient of any BIA school deeded to the state within Refuge boundaries, with a reverter clause. Most of these school sites were transferred to the State of Alaska or other entities (such as Native corporations) by deed or lease during the 1960s–1980s. Some sites were initially leased but later deeded to the State of Alaska. Since the majority of sites have been deeded to other entities, contaminant cleanup responsibility would rest with the current owners.

The passage of ANILCA in 1980 effectively gave control of any former BIA school still in federal ownership within Refuge boundaries to the Service.

Within the YDNWR boundaries, former BIA school sites are located in the villages of Akiachak, Akiak, Alakanuk, Bethel, Chefornak, Chevak, Eek, Emmonak, Hooper Bay, Kasigluk, Kipnuk, Kongiganak, Kotlik, Kwethluk, Kwigillingok, Lower Kalskag, Mekoryuk, Mountain Village, Napakiak (old and new school sites), Napaskiak, Nash Harbor, Newtok, Nightmute, Nunapitchuk, Oscarville, Scammon Bay, Sheldon Point, Toksook Bay, Tuluksak, Tuntutuliak, Tununak, and Upper Kalksag. Since BIA transferred the schools in good condition, BIA is clear of any cleanup responsibility. That leaves the Service (Refuge lands) and BLM (public domain lands) as the federal parties with cleanup responsibilities.

At present, there are two school sites where we have requested conveyance: Kipnuk and the new school at Napakiak. The old Napakiak school site was previously conveyed, and those lands are now submerged due to river bank erosion. Land status of lands associated with the former Bethel BIA school site is still being researched by the Service.

Unless discussed elsewhere in this document, all BIA school sites were conveyed to the State Department of Education or other entity such as Native corporations.

Bethel BIA School Site

The initial territorial school for Bethel was originally located on the Kuskokwim River but burned, and that land has since eroded into the river. A BIA elementary school was located between Second Avenue and the river. That site is now an empty lot; the former housing and log cabin style structure are long gone. The site was later used by the ANG; any buildings constructed for that purpose are no longer present. There is a defunct fish packing facility adjacent to the old ANG site. This large gray metal building includes a transformer block and an old fuel tank. This building has a Bethel Native Corporation (BNC) ownership sign. The Service's Division of Realty is researching land status for this site.

(See file notes of Susie Alexander, Schools in Bethel – BIA and others, results of research, August and September 1997).

Figure 4. Bethel and location of the BIA Administration site west of town.

USFWS graphic

Nightmute School

The Nightmute School was located on a 4.96-acre site leased to the State Department of Education in 1982. The Lower Kuskokwim School District (LKSD) used the site in the 1980s; the state then relinquished its lease in 1987, with site ownership reverting to the federal government. Since the location was within the boundaries of a conservation unit, the YDNWR became the land manager for this site. The Nightmute School has experienced a wide range of contaminant issues over the years.

A 1979 site assessment of 41 BIA school sites, including Nightmute, was conducted for the BIA by Veco, Inc. According to this report, the school complex consisted of a two-classroom elementary school, a quarters building, two storage buildings, and a utility plant. The various structures were built between 1946 and 1977. This assessment identified significant leakage of the fuel storage system and a need to install a secondary containment system for spills. The Veco report also identified use of asbestos containing materials (ACM) in some buildings.

Thermal remediation was used to clean petroleum hydrocarbon contaminated soils at the Nightmute School site. Engineering/USFWS photo.

In October 1995, the LKSD removed a variety of hazardous wastes from the Nightmute School. These materials included five lead acid generator batteries, one oxygen cylinder, three acetylene cylinders, six empty 20-lb propane tanks, five 55-gallon drums of ethylene glycol and waste glycol, two 55-gallon drums of lube oil (new and used), a supply of calcium hypocholorite tablets and wastes associated with the water chlorination system, and a bottle of unknown liquid

Nightmute School cleanup project in 2002 included removal of asbestos-containing materials, building and tank farm demolition, and other waste removal. Engineering/USFWS photo

labeled "poison." Materials that could not be used by LKSD were removed from the site and disposed of properly.

The one-story 1,200-square-foot generator building burned to the ground in 2000. On August 15, 2001, the two-story, 7,500-square-foot BIA school classroom burned to the ground. Remnants of these structures after the fires included ash containing asbestos siding and other ACM, metal debris, utility connections, and foundation pilings.

The Service contracted site cleanup in 2002. Cleanup at this site included removal of ACM and lead-based paint (LBP) from intact buildings, demolition of all buildings, removal of the tank farm (including several above-ground fuel storage tanks), thermal remediation of soils contaminated with petroleum hydrocarbons, removal of 15 tons of scrap metal debris (disposal in Anchorage landfill), removal of 35 tons of ACM and asbestos-contaminated soil (disposed of at the Matanuska-Susitna Borough landfill), and disposal of 1,500 pounds of materials containing LBP. Following remediation, the site was graded; topsoil was added; the site was seeded, limed, and fertilized; and portions were secured with matting to reduce erosion. On September 18, 2006, the surface estate for this site was conveyed by the BLM to Chinuruk, Incorporated, and the subsurface estate was conveyed to the Calista Corporation (Calista).

Welcome to Bethel, population approximately 6,000 in 2006. D. Rudis/USFWS photo

BIA Administrative Site in Bethel

The following law applies to the 27-acre BIA Administrative Site. H.R. 5686 Sec. 13. (b) states that prior to

the conveyance of property to the Yukon-Kuskokwim Health Corporation (YKHC), response is required by the Secretary of the Interior and the Secretary of the USAF to clean up the site to protect human health and the environment with respect to any hazardous substances and hazardous waste.

Site History

The location of this property is approximately four miles west of the city of Bethel with road access from Bethel. The site was originally developed by the USAF in 1957 as the Aircraft Control and Warning (AC&W) portion of the White Alice Communication System (WACS). The WACS site is withdrawn from the Refuge, and the USAF would need Service concurrence to return this site to the Refuge. In 1963, the BIA acquired the AC&W site, including the barracks, several outlying buildings, fuel storage tanks, water treatment plant, and the sewage lagoon. In 1964, the BIA remodeled the barracks to serve as family living quarters and as an operations and administrative site. In 1990, BIA personnel left the site.

Figure 5. The BIA Administration site in Bethel has an assortment of abandoned structures and associated contaminant problems. It is located on federal Refuge property.

USFWS graphic

This tract was withdrawn for use by the BIA by Public Land Order (PLO) 3956 dated March 15, 1966. It was originally 275 acres and was reduced to 45 acres in 1985. In 1987, the BIA determined that not all of the acreage was needed, and approximately 27 acres was to be conveyed to the YKHC. The remaining 18.29-acre tract was retained in federal ownership and is under Service jurisdiction. This site is a complex of buildings, including administrative buildings, employee quarters, and a power supply building. Remaining structures were vandalized after closure and a fire in 1987 added to the destruction of the school complex. Days before this site was to be officially conveyed, the former Composite Building was set on

Buildings and other structures at this site pose safety and hazardous waste dangers. D. Rudis/USFWS photo

fire. This contamination has placed the land transfer on hold until cleanup issues are resolved.

The site's buildings are vandalized and in ruin, and numerous debris piles are found throughout the site.

The 18.29-acre parcel will be retained by the Service for the foreseeable future until the site is cleaned up. The Formerly Used Defense Sites (FUDS) program has the jurisdiction and responsibility for cleanup on this parcel. A cleanup of drums and contaminated soil is scheduled for 2016.

The 26.99-acre parcel was legislatively directed to be transferred to the YKHC. At a minimum, the Service is responsible for cleanup of fire-related contamination.

The Bethel Native Hospital site is also located in this area. It is unknown if this site has been conveyed to the Bethel Native Corporation.

There is also a closed and remediated sewage lagoon site. (See discussion later in this section.)

Service personnel conducted a site visit August 14–15, 2005. The site's buildings are vandalized and in ruin, and numerous debris piles are found throughout the site. Pipes with suspected asbestos coating are both elevated and on the ground surface.

Surface water resources at the site consist of small wetlands, including bogs and a small creek. Seasonal groundwater is present above the permafrost throughout the site. The likelihood of a connection between this water and the subpermafrost groundwater aquifer is minimal. Groundwater resources are discussed in detail in the Ecology and Environment (E&E) Report for ADEC (April 1999), *Bethel BIA Administrative Site: Development of Risk-Based Cleanup Levels and Corrective Action Alternatives, Bethel, Alaska.*

The BIA Administrative Site buildings contained asbestos, and many were partially burned in vandalism activities. D. Rudis/USFWS photo

A Level I survey was completed by Service staff Steve Ebbert and Ron Britton on August 4, 1993. A site characterization and Interim Removal Action (IRA) was conducted by the USAF in 1994. Those results indicate that soil at the site contained petroleum hydrocarbons, volatile organic compounds (VOCs), and polychlorinated biphenyls (PCBs) in selected areas at levels above federal and state regulatory standards. (See figures 2-3a,b,c and 2-4a,b,c in E&E 1999).

The USAF conducted a cleanup of their WACS site in 1991 and some of the 18-acre tract, which was returned to the Refuge. An August 1993 site visit (Level I survey) by Service personnel found that the1991 USAF contaminant cleanup was incomplete on the 18-acre tract. They located several partially buried drums adjacent to an excavated dump site. The area was covered with 20- to 40-year-old alders. They concluded the drums were part of an older dump or ditch that was not part of the site remediation. The USAF installed at least six ground water monitoring wells across the 18-acre site. In addition to the barrels, this site visit revealed wood and other building debris, as well as additional rusted barrels and scrap metal. The trip report included comments made by Gene Petola, the President and CEO of the YKHC, noting that he was aware of dump locations—one used by BIA and one used by the USAF—on the undeveloped tract. He also noted that there were three other dump locations nearby.

Approximately 1.5 million gallons of water was treated before it was discharged into adjacent wetlands. The petroleum-contaminated soils were excavated, placed in the southern lagoon, and capped with impermeable fabric and clean soils.

In 1996, EMCON conducted an ecological risk assessment of the BIA building area, the sewage lagoons, and the area north and east of the sewage lagoons. After an environmental assessment by the USAF in 1996, the USAF subsequently developed a final remediation plan for this site in 1997. Contaminated soils from five areas around the site and the two abandoned sewage lagoons were remediated in 1997 by the USAF and BIA. Sewage lagoons were dewatered, and sludge was covered with impermeable membranes and clean fill. Approximately 1.5 million gallons of water was treated before it was discharged into adjacent wetlands. The petroleum-contaminated soils were excavated, placed in the southern lagoon, and capped with impermeable fabric and clean soils. All areas were revegetated with

Asbestos piping is elevated, but other asbestos waste is found throughout the BIA Administrative site. D. Rudis/USFWS photo

Exclusion fencing and signage around the closed BIA site sewage lagoon is inadequate to prevent trespass. D. Rudis/USFWS photo

grass seed and allowed to return to native vegetation. The lagoon cells were enclosed by a chain link fence, and institutional controls (ICs) for the site included posted "closure" signs. Service personnel had no problem accessing the site by crawling under the fence during an August 2005 site visit. We noted that the site was completely revegetated with a variety of herbaceous species, and alder was growing on the higher spots.

Other cleanup actions to date include removal and sale of three large above-ground storage tanks (400,000 gallon). Smaller tanks were also removed in a 1996 IRA. Petroleum-contaminated soils were removed from storage tank areas at that time. See the Alaska Department of Environmental Conservation (ADEC) detailed timeline.

2001 Fire

Phukan, Inc., of Anchorage, Alaska, completed a Lead/Asbestos Report and Cost Estimate for the BIA Administration Building (Project), Bethel, Alaska, in 2002 (Phukan, Inc. 2002). This report included a cost estimate of $1,650,000 for managing the cleanup, building demolition, and remediation of hazardous materials. This information was distributed via correspondence from Engineering – Region 7, to Department of Interior, Office of the Secretary and the Yukon – Kuskokwim Health Corporation. There are no DOI funds available for site cleanup and remediation (R. Gould letter to Senator Ted Stevens, September 2, 2004).

During an August 2005 site visit, we noted wood and other building debris, as well as rusted barrels and scrap metal on site.

Fuel Spill

In March 1993, a 106,000-gallon diesel oil spill from a storage tank occurred at the WACS site when an elbow joint leading from the tank ruptured. The fuel product reportedly f owed down the outside of the containment berm and was initially contained by snow in a f at area just downhill from the release point. As spring breakup occurred, the diesel contamination spread away from the area into drainage channels and across the tundra to a seasonal creek and into a tundra lake. Approximately 27 acres of Refuge and Bethel Native Corporation Incorporated (BNCI) lands were affected. Emergency response actions consisted of containment and recovery in the creek. An estimated 63,000 gallons of fuel were recovered; 15,900 gallons evaporated; and 27,100 gallons were unaccounted for. Under a 1994 IRA, about 6,786 cubic yards (cy) of petroleum-contaminated soil were excavated. These soils were stockpiled and maintained in a bioremediation cell from 1995 to 1997.

An October 1998 site assessment by E&E concluded contaminant levels had not decreased significantly since the 1994 IRA. E&E prepared a report for ADEC in April 1999, *Bethel BIA Administrative Site: Development of Risk-Based Cleanup Levels and Corrective Action Alternatives, Bethel, Alaska*, on risk-based cleanup levels. It reported the majority of sediment samples collected from the seasonal creek contained polycyclic aromatic hydrocarbons (PAHs) above ecological screening benchmarks.

Building debris and trash is found scattered throughout the BIA Administrative Site. D. Rudis/ USFWS photo

Concentrations ranged from 36 to 20,000 milligrams per kilogram (mg/kg). A berry study was conducted to determine risk to both human health and wildlife. A risk-based cleanup level of 2,300 mg/kg diesel range organics (DRO) was established as protective to human health. The report summarized future cleanup alternatives and cleanup actions for the fuel spill. Estimated cleanup costs for 4,000 cy of petroleum hydrocarbon-contaminated soil were $1.5 million. ICs for this site are restricted use of suprapermafrost groundwater, no residential development, and no excavation or construction of new buildings.

The following detailed timeline is from the ADEC Contaminated Sites database at http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=2899 (accessed 8 September 2009)

The USAF conducted a Record of Decision (ROD) in 1998 and a Site Investigation (SI) in 1991. Issues of concern on the 13-acre FUDS parcel include petroleum and PCB contamination. Additional investigation and possible cleanup are necessary for both petroleum and PCB contamination present at the 27-acre site.

October 1998, the ROD was signed by the USAF, BIA, and ADEC. It specified surface soil in the garage (Building 413) contaminated with PCB (less than 10 mg/kg) will be excavated and placed in the landfill at the Radio Relay Station (RRS) (if > 10 mg/kg PCB is found, it will be shipped to a permitted disposal facility); surface soil outside building 413 that contains low levels of dichlorodiphenyltrichloroethane (DDT) will be excavated and disposed of at the landfill at the RRS; the sewage lagoon will be dewatered and capped. ICs will be established documenting the lagoon closure and limitation on future development over it; stockpiled soil from earlier removal actions will be characterized and either treated or used as fill; and the biocell at the RRS will be operated until total petroleum hydrocarbon (TPH) levels are below 1000 mg/kg.

In January 1999, ADEC sent the USAF a letter approving transporting 19 85-gallon drums of petroleum contaminated soil to Alaska Soil Recycling for thermal treatment. Documentation of treatment/disposal is to be included in the final report.

The USAF reported that wipe samples from concrete in the former generator room and a transformer room contained PCBs above the Toxic Substances Control Act (TSCA) cleanup levels for non-porous surfaces in high contact areas. Coordination between the USAF, ADEC, and the U.S. Environmental Protection Agency (EPA) followed. The USAF modified its cleanup contract with BNCI to include washing and triple-rinsing the area following TSCA procedure and re-sampling.

In April 1999, the USAF notified ADEC that cleaning the concrete was not successful, confirmation samples showed four areas with residual PCB

level exceeding the cleanup levels. Additional work found PCB contamination below the top four inches of concrete f oor.

The 1996 Remedial Actions at the BIA Administrative Site, Bethel, was prepared by EMCON (dated October 1997). It documents additional petroleum-contaminated soil excavation and placement in the biocell, capping low level DRO contaminated soil, additional site characterization in the former sewage lagoon (characterizing low level PCB contamination), and suprapermafrost groundwater monitoring.

The report documents that PCB-contaminated concrete was removed from portions of the generator and transformer rooms, and samples from the remaining concrete met cleanup levels.

The Final Technical Report August 1999 for BIA 27-Acre Administration Site Lagoon Dewatering and Capping Project, was prepared by BNCI. The report documents cleanup work completed at the sewage lagoon, management of soil removed from the lower lagoon, dewatering the upper lagoon and capping both the upper and lower lagoon, soil removal within building 413, and efforts to wash PCBs from concrete in the building.

The Final Technical Report for PCB Removal at the Bethel BIA 27-Acre Administration Site, Building 413, was prepared by BNCI. The report documents that PCB-contaminated concrete was removed from portions of the generator and transformer rooms, and samples from the remaining concrete met cleanup levels.

An Equitable Servitude Agreement was entered into between the BNCI and ADEC. It restricted use of suprapermafrost groundwater; no residential development; no excavation or construction of new buildings.

In October 2000, ADEC sent a letter to the USAF stating that "…no further cleanup is required. An IC still needs to be established by placing a notice in the property transfer documents. The land is slated to be transferred from the federal government to the YKHC in the near future."

In October 2001, the work plan changed from X1 (for oil) to X9 (for hazardous substances—PCBs and pesticides).

In October 2002, two tracts owned by BNC were investigated. Tract A (the southern one) contained two borrow pits with drums and debris on the east side of borrow pit. Two surface samples were collected; results were all below ADEC Method II levels, but low level (22 ug/kg) PCBs were present in one sample. EPA assigned a no further action status under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

Asbestos waste, including piping, is found throughout the BIA Administrative site. D. Rudis/USFWS photo

Also in October 2002, ADEC and the USAF signed an Explanation of Significant Difference amending the ROD for soil treatment at the Bethel RRS. Following plan review and approval, the biocell will be dismantled and the petroleum contaminated soil will be landfarmed.

In November 2002, the EPA sent a letter to the BNC stating it completed a Preliminary

Spectacled eiders prefer to nest in sedge meadows and on peninsulas and islands adjacent to tundra ponds. USFWS photo.

Assessment on the site and determined no further action was needed under the federal Superfund Program.

In June 2003, ADEC received the final work plan for dismantling the biocell and creating a landfarm in which petroleum-contaminated soil would be tilled to promote bioremediation.

After the No Further Remedial Action Planned (NFRAP) letter was signed in 2000, the administrative building at the site was destroyed in a fire; the remaining portions of the structure were heavily damaged. Also, it has been determined that the Service has jurisdiction over the property rather than BIA. All involved parties had thought BIA still had jurisdiction. These issues have complicated the land transfer to YKHC and establishment of ICs, which have yet to be developed.

June 2004, ADEC issued a non-objection to BNC related to a request to install a telecommunications cable across a portion of the former BIA spill site.

In February 2005, ADEC received a Final Technical Memorandum on the biocell landfarming remedial action. The report describes tilling of the soil, site monitoring, and confirmation sampling and results. It recommends no further action on the landfarmed soil.

In June 2005, ADEC sent the USAF a letter approving the soil treatment and landfarming, stating no further soil treatment was required but that ICs still needed to be established for the former BIA headquarters site.

Site closure information from the ADEC Web site includes the following: http://www.dec.state.ak.us/spar/csp/search/IC%5FTracking/public_report.aspx?Hazard_ID=2899 (Accessed 14 April 2008)

Areas of the site have DRO-contaminated soil that has been capped with clean soil and revegetated. Petroleum-contaminated soil remains beneath the former composite building. If exposed in the future, it needs to be managed in accordance with regulations applicable at that time. Low level PCB-contaminated sewage sludge was capped in place.

Additional site history details and information on Service involvement are found in Appendix B, Bethel BIA Administrative Site.

Federal Aeronautic Administration (FAA) Sites

Aniak and Toksook Bay airports are FAA developed sites within the Refuge. The Aniak site was developed as a VHF radio relay communications and radio range navigation facility. The Bethel FAA site is on Native corporation land (Scott Bergland, FAA, personal communication). Offsite contaminant migration would be the only Service concern.

Aniak site. USFWS graphic

Because there are often old fuel lines, fuel tanks, battery piles, drums, transformers, old buildings with asbestos siding, LBP, wooden crib sewage containers, etc., associated with developed properties, it would be useful to know if similar items of potential concern exist at any of these FAA sites.

Aniak Airport – Site cleaned in 1981 and 1983. A total of 17.7 acres was covered and graded. Drums and soils that were contaminated with petroleum products, solvents, and PCBs were removed for disposal out of state. Transformers with PCBs were also present at the site.

Aniak FAA site – In 1995, FAA removed pesticide-contaminated soil adjacent to the FAA storage building. In 1997, soil sampling by ADEC showed low pesticide levels in one area but high diesel levels where a former underground storage tank spilled. Monitoring wells were scheduled to be installed at this location.

Aniak – There is an FAA roadway to their communications facility that was conveyed to BNC in 1979.

Toksook Bay Airport – The Refuge owns subsurface rights at this airport. Surface rights are in private ownership. There are presently both ASTs and USTs for diesel fuel. There is also a 100 gallon gasoline tank. If a fuel spill occurs at this site, ADEC would seek cleanup by the responsible party. There is a gravel pit and an associated road for this airport on the Refuge. The FAA has no record of any contamination at their Toksook Bay site (Scott Bergland, FAA, personal communication).

The old Toksook Bay Airport was state owned and conveyed to the village corporation. This property is not a Refuge concern.

Subsurface rights may be a contaminants issue due to the potential for fuel spills. Deicing agents are not commonly used at small airports, although most small airstrips may have a small shack where chemical products are stored. The Service owns subsurface rights under proposed site for a new airport at Nightmute.

The Service had a minor aviation gasoline spill at one of our tanks at the Bethel Airport in 1999, according to ADEC records. While it does not appear to have been a major spill, it illustrates the point that our operations can also result in spills whenever we own and operate fuel tanks. The ADEC link is http://www.dec.state.ak.us/spar/csp/search/lust_report.asp?EventID=2359. (Accessed 9 April 2008)

Military Sites

U.S. Coast Guard

There are four parcels of land under U.S. Coast Guard jurisdiction within the Refuge. These lands were reserved for lighthouse purposes on February 13, 1921, under Executive Order 3406. The largest tract surrounds the Point Romanzof light and is nearly 600 acres. The locations of the three smaller properties are at the north entrance to the Yukon River, at the Pastolik River near Kotlik, and at Cape Stevens between Stebbins and St. Michael.

Yukon River North Entrance Light - Kotlik, K 028S, 025W Section 26. Kerosene was the original fuel source, and later acetylene was used as fuel for this light. In the late 1950s and early 1960s, the light was converted from acetylene to primary batteries and 12-volt operation. Primary batteries were used until 1997. The light currently uses a 12-volt solar powered power system. The U.S. Coast Guard has performed battery recovery operations at this location.

The largest tract surrounds the Point Romanzof light and is nearly 600 acres. The locations of the three smaller properties are at the north entrance to the Yukon River, at the Pastolik River near Kotlik, and at Cape Stevens between Stebbins and St. Michael.

Pastolik River Light - Kotlik, K 028S, 024W Section 30. This light was established in 1909. Kerosene was used to run the light through its existence. In January 1962, the aid was converted from a federal aid to a private aid to navigation. The onsite equipment was given to the Northern Commercial Company. The light was discontinued in 1974.

Point Romanzof Light - Stebbins and Kotlik, K 026S, 22W Section 35. This light was established in 1915. Kerosene or acetylene was used as fuel. In 1959, it was converted from acetylene to primary batteries and 12-volt operation. In 1998, the light was converted to rechargeable, solar powered batteries. The U.S. Coast Guard has performed battery recovery operations at this location.

Canal Point Light - Stebbins/St. Michael, K 024S, 019W Sections 18, 19. This aid was established in 1909 and discontinued around 1980. Kerosene was the original fuel source, and later acetylene was used as fuel for this light. In the late 1950s and early 1960s, the light was converted from acetylene to primary batteries and 12-volt operation.

Kwiguk Aircraft Warning Site (AWS)

This military site, listed in the FUDS inventory, is about 125 miles south of Nome and near the Village of Emmonak. This 19,500-acre parcel, which was withdrawn in 1942, was acquired by the War Department for the erection of an AWS, a classified military installation. However, this site was never developed, as stated in a letter dated September 23, 1949, from the Director of Real Estate, Corps of Engineers. No restoration or cleanup was needed and the site was declared excess to military needs and transferred to BLM on April 21, 1954. It is part of the Refuge and subject to conveyance to Emmonak Corporation and Cook Inlet Region, Inc.

Bethel TACAN Site - Bethel City Landfill

This is a former Tactical Air Navigation (TACAN) site and is listed on the U.S. Government Accounting Office Web site as property for potential

The Bethel City Landfill is on a former Tactical Air Navigation (TACAN) site. This site is federal Refuge property, as stated in an opinion provided by the DOI Solicitor's office January 16, 2003. D. Rudis/USFWS photo

inclusion in the FUDS cleanup program. This site is Refuge property as stated in an opinion provided by DOI Solicitors office on January 16, 2003. This site is presently the location of the landfill for the City of Bethel. The 2.07-acre tract was developed for use as a sanitation facility for the community of Bethel sometime in the late 1960s or early 1970s and has been in use by the city since that time. In their 2005 summer/fall newsletter, BNC notes that the BNC and City of Bethel reached a reconciliation agreement regarding Alaska Native Claims Settlement Act (ANCSA) land issues concerning the former TACAN site. It states, "It is BNC's position that the former TACAN site should have been conveyed to BNC as an ANCSA section 3(e) land conveyance in 1985. In order to resolve this long-standing and acrimonious dispute, BNC and the City agreed that the former TACAN site would be divided into two sections, with the eastern section being conveyed to the City and BNC retaining the remainder." It is apparent that federal ownership of this property is not recognized by BNC or the City of Bethel. (See, Deputy Regional Solicitor, Alaska Region, Draft Memorandum to Deputy State Director, Division of Conveyance Management, Alaska State Office, Bureau of Land Management, January 8, 2003.)

During the August 16, 2005, site visit, Service personnel noted active landfill operations, including solid waste bulldozing and capping; and metal, appliance, and auto disposal areas. As the landfill covers more than two acres, a survey would be needed to determine the Refuge parcel.

An undated Department of Defense (DoD) Native American Environmental Tracking System Report lists the TACAN site as Federal Facility ID AK 09799F700100 and lists no impacts at this site. The BNC is now located on the two-acre parcel that was the TACAN site used for testing of tactical aircraft navigation equipment until 1957.

NOTE: ADEC online database has a record for the "Bethel Dump." In 1990, they had reports of hundreds of leaking oil drums at the site and impact to human health; date of occurrence was unknown. The coordinates given in this database entry (60.79222, -161.75579), indicate a location within a lake in Bethel. Either the coordinates are wrong, or the site was inundated after 1990. It is unclear if there was more than one dump in Bethel, so we do not know if there is any association with the former TACAN site, as we don't know exactly where this site is located.

More information can be found on the ADEC online database at https://www.dec.state.ak.us/spar/csp/search/csites_report.asp?Hazard_ID=1033 (Accessed 8 April 2008).

This site is filed to return to the Refuge (USFWS, Region 7, Division of Realty files).

Bethel Radio Relay Station (RRS) (FUDS Property ID: F10AK0511)

Bethel Air Force White Alice Site
DDT-contaminated soil was disposed of in a landfill on this 14.69 acre site. In 1992 the FAA expressed interest in this site after cleanup. Given the litany of issues and existing landfills and contamination, the Service told the FAA that we would not take it back now or in the future until is was cleaned up. Site is a DoD withdrawal from the Refuge. Meetings on this site occurred in 2007 and most recently in January 2008.

Site Description
The RRS site, also known as the "New" White Alice Site, is located approximately four miles west-southwest of Bethel and one-half mile south of the "Old" White Alice Site, which is now occupied by the BIA. The 14-acre installation is surrounded by wetlands and was formerly part of a much larger military withdrawal. A small fuel distribution facility was located on a 100-square-foot gravel pad. The location is identified as SS01 in FUDS files. Permafrost occurs at 18–20 feet below ground surface (bgs), and groundwater is at 9–25 feet or more bgs. Local residents use this area for hunting and berry picking. The 800-square-foot site occupies part of Township 8 North, Range 72 West, Section 15, Southeast quarter, Seward Meridian. Abandoned structures were in good shape and were left with pencils, books, tables, light bulbs, magazines, etc., in place. The site included six antennas, three buildings, four gensets, two tanks, and other miscellaneous materials.

A 1994, Draft Preliminary Assessment Report from the USAF documented the presence of petroleum-contaminated soil and groundwater (suprapermafrost), DDT in soil, and an onsite landfill that contains the former structures and debris from the site.

Site History
Details are sketchy, but it appears that 1,473.38 acres were withdrawn for the USAF by PLO 1173 dated June 24, 1955, after 26.71 acres were set aside December 30, 1954 (source unknown). Additional tracts of 2.5 and 2.39 acres were added later. On June 31, 1951, 13.07 acres were relinquished, followed by 1,458.69 acres on January 6, 1964, and 11.48 acres on July 21, 1966. The remaining 21.77 acres are now to be excessed. An "Intention to Relinquish" letter dated October 9, 1981, was sent to BLM. Transfer was still pending as of August 15, 1985.

A vehicle maintenance facility (SS02) and equipment building (SS04) were razed and buried on site in 1990. Other drums were disposed of but stained surface soils remain (LF07). Petroleum-contaminated soil and shallow groundwater are present near the former fuel tank(s).

A preliminary SI was performed by the Alaska District on August 6, 1985, to prepare for a more substantial future visit. Sampling and a second visit occurred August 20–21, 1985. Hazardous waste removal for this site was scheduled for spring and summer 1984. Phone conversation with the USAF noted that PCBs were removed from both White Alice sites.

A 1994, Draft Preliminary Assessment Report from the USAF documented the presence of petroleum-contaminated soil and groundwater

(suprapermafrost), DDT in soil, and an onsite landfill that contains the former structures and debris from the site.

From 1996 through 1998, during the USAF cleanup at the 27-acre BIA Administrative Site (former WACS and Air Weapons Control System—or AWCS), approximately 9,000 cy of petroleum-contaminated soil were excavated and placed in a bioremediation cell located over the landfill at the RRS. The landfill was created in 1989 and 1990 when the USAF tore down the site and buried the wastes beneath the gravel pad. Further investigation and/or cleanup was recommended at that time.

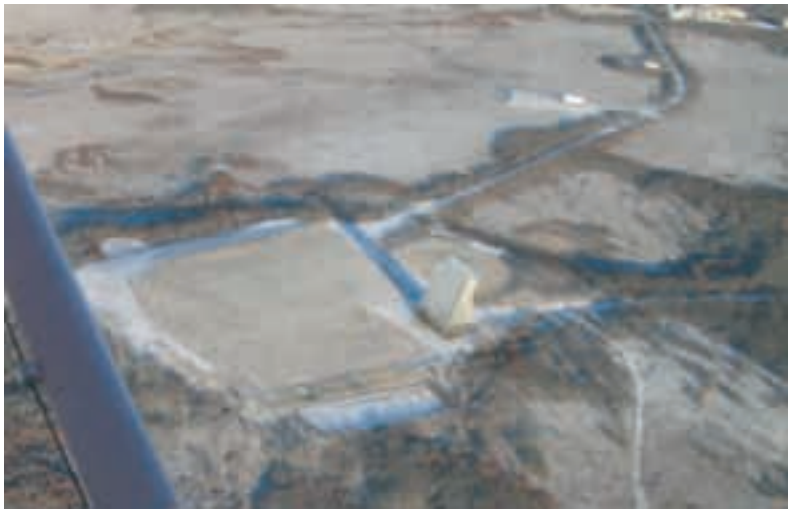
Also, monitoring wells installed at the RRS during the Preliminary Assessment (PA) were periodically sampled along with wells installed at the BIA site. Petroleum-contaminated soil and shallow groundwater, the landfill, and the biocell remain at this site, and all still need to be addressed.

ADEC received a technical memorandum of the Bethel BIA Biocell Demolition and Landfarm Construction in December 2003. The report describes closure of the biocell and construction of a fenced landfarming area.

In 2005, ADEC approved the landfarming technical memo and concurred that no further soil treatment was required for the soil that was landfarmed from the BIA site. Site characterization and cleanup work at the Bethel RRS site is not complete and is planned for a later date.

Remarks

Former White Alice sites typically have significant PCB issues, and there also is an asbestos landfill at this location. Contaminant legacy includes former petroleum and DDT spills, burial of debris, and establishment of several asbestos landfill cells, including asbestos from the former BIA Headquarters. After the site was razed, it was difficult to find any of the former spill sites. Actions included piling fill on top (as much as 10 feet), with 2 feet of landfarmed petroleum-contaminated soil piled on top of that (again taken from the BIA site). Because of this work, the site will not be dug up and the contaminated soil removed, so ADEC requires monitoring wells around the perimeter. Other more recent sampling included a subsistence (berry) study. The latest issue is that some contamination has gone offsite onto Native Corporation lands (but this might have been associated with sewage outfall). This may result in more sampling and perhaps some cleanup.



Bethel U.S. Air Force White Alice site is a DoD withdrawal from the Refuge. This site has a history of contaminant problems. P. Johnson/USFWS.

This site information is from the ADEC Web site at http://www.dec.state.ak.us/spar/csp/search/csites_report.asp?Hazard_ID=2831 (Accessed 14 April 2008).

Bethel Air Force White Alice Site ('Old' Site)

More than 10,000 gallons of diesel fuel was released due to a broken pipe fitting. The release was first noted in 1993. Recovery was estimated at over 50 percent. In 1999, a ROD was prepared for the site. It was decided that excavation of the tundra vegetation and sediments affected by the spill might cause more harm than good. In 2000, an IC was established for no residential development, no excavation or construction of new buildings and restricted use of suprapermafrost groundwater.

http://www.dec.state.ak.us/spar/csp/search/csites_report.asp?Hazard_ID=1868 (Accessed 9 April 2008).

Jack Todd Army Airfield and Staging Area

This site is also variously listed as the Bethel Airport, Bethel Airport Military Reservation, and Bethel Air Force Station (AFS). It is Federal Facility ID AK 09799F700200 and FUDS ID F10AK0514. This 1,853-acre site is located on the south side of the Kuskokwim River across from the city of Bethel. The site is a low marshy area subject to annual f ooding. The north end of the area had been eroding into the Kuskokwim River at about 20–30 feet per year but has slowed considerably since 1994. Legal description of this 1900 acre site is Township 8 North, Range 71 West, Section 15, Southwest quarter. (W 161 40 00, N 60 46 00).

The Jack Todd Army Airfield airstrip, constructed for WWII use, is currently in disrepair. D. Rudis/USFWS photo

The following site information is from the FUDS Site Closeout Report (June 2006), DoD Native American Environmental Tracking System, https://www.naets.info/Web/tribe/ViewTribal Site.cfm?tribeid=168&t (Accessed 8 April 2008).

The airstrip and associated buildings, including 11 Quonset huts and other structures, were constructed from 1941 to 1943. The site was used from 1951 to 1959 by the USAF and used for AC&W, radio relay communications, and air transportation operations for cargo and personnel movement to remote AC&W sites. Site improvements during this period included three 60-foot antennae, a 6,720-foot equipment power building, a vehicle maintenance shop, a fire pump station, fuel tanks, an underground fuel pipeline, a septic tank, and sanitary sewer mains.

The main portion of the site, totaling 1,467 acres, was declared excess in 1963. On October 29, 1964, 275 acres of the Bethel WACS site were transferred from the USAF to the BIA. The WACS site, consisting of 14 acres, was retained by the USAF and renamed the Bethel RRS. The RRS was deactivated in 1979 and declared excess on April 15, 1981. All WACS improvements were demolished by the USAF in 1989. The FUDS Site

Todd Army Airfield quonset hut surrounded by vegetation. D. Rudis/USFWS photo

Closeout Report states that the current owner of the site is the Bethel Native Corporation.

The June 2006 cleanup report describes the removal of about 5,050 asphalt drums, a process initiated in 1994. Cleanup focused on removal of the drums from the river bank where they had been used as erosion protection near the runway.

The DoD entry states that the FAA is the responsible party for materials on site, including a relatively large volume of asphalt in a mixing tank and 55-gallon drums; other petroleum, oil, or lubricants (POL) in barrels; and a large quantity of metal debris.

The June 2006 cleanup report describes the removal of about 5,050 asphalt drums, a process initiated in 1994. Cleanup focused on removal of the drums from the river bank where they had been used as erosion protection near the runway. Approximately 25 drums were also recovered downstream. Drum asphalt analysis revealed no hazardous contamination was present. Site contamination led to removal of about 2,000 cy of petroleum-contaminated soil and 500 cy of site debris. These materials were transported to the regional landfill in Roosevelt, Washington. The report states that no containerized hazardous or toxic waste remains on site.

On our site visit on August 16, 2005, we found the abandoned runway and two Quonset huts, one of which was an office and the other a shop. Both were in total disrepair. Debris included old solidified paint cans and a compressed gas tank. Miscellaneous rusty equipment, rusty drums, a drum of asphalt, and old machinery were also found at the site. Heavy equipment included a Caterpillar tractor and two barges. Service personnel were informed that there is an old airplane past the airstrip which we did not locate. A new metal building sits adjacent to the site. We noted at least several Native fish camps along the riverbank area.

The DoD entry also states that there are several industrial grade appliances, including a stove and clothing dryer, near the 10 fish camps. The area is overgrown with alder and difficult to traverse. We did not locate the large abandoned asphalt plant, boiler tank, and associated piping. The

DoD entry also states that there several open concrete shafts from an old well or sewer system, metal-clad tunnels and culverts, and an electrical screw shaft pump still in place. We did not locate any of these structures in the DoD site description. We did see some minor sheening in marshy areas. The U.S. Army Corps of Engineers (Corps) has no current plans for additional remediation at this site, as noted in the DoD entry.

Notice of cleanup closeout published in local newspaper (pg 2): http://www.alaskanewspapers.com/content/pdf/TD_8-3-06.pdf (Accessed 22 April 2008).

Additional information from the ADEC Web site database notes additional concerns at this site.

In October 1995, the Corps inspected the site and compiled a Remedial Investigation (RI) in-house. It did not think significant areas of concern (AOCs) existed but stated that approximately165 drums containing petroleum products were present behind the old Crowley site. The drums were dated 1951, thus Corps thought they were from the Civil Aeronautics Administration (CAA), and the FAA should be responsible for them. Also, a couple of old landfills were found at the site.

In January 1997, the Corps finalized an Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) under the National Environmental Policy Act (NEPA). The EA addressed a proposed removal action to address physical safety hazards at the site (fill in mechanics pits and hand dug wells, remove barbed wire, and f atten the top of an underground tank that had split open). It called for addressing the remainder of the site and possible contaminants at a later date.

Along the shore by the Jack Todd Army Airfield, landing craft and other heavy machinery was abandoned. D. Rudis/USFWS photo

A site assessment in June 1997 found a drum, metal debris, underground structures, and an asphalt plant remained onsite.

In September 2006, ADEC signed a decision document, concurring that the Corps has completed the Containerized Waste/Hazardous Toxic or Radiological Waste (CON/HTRW) project. The Corps removed all known DoD related drums during the mid 1990s. An HTRW project remains open, and further evaluation into whether any FUDS Program eligible contaminants remain at the site and warrant further cleanup is needed.

http://www.dec.state.ak.us/spar/csp/search/csites_report.asp?Hazard_ID=69 (Accessed 14 April 2008).

Army National Guard Sites and the Military Munitions Response Program Sites

The following laws apply to the Army National Guard (ANG) sites on the Refuge.

44 Land Decisions (LD) 513 (1916) - This is a notation of the land records pursuant to the instructions set forth at page 513 of volume 44 of the Interior Land Decisions issued January 13, 1916. The principle underlying the instructions is that the construction of improvements by a federal agency on public lands, pursuant to law, appropriates the lands to the extent of the ground actually used and occupied by the improvement and for so long as the improvements are used and occupied by the United States. The notation acts as a de facto withdrawal of the land. The appropriation of land does not expire until the appropriating agency has complied with the applicable procedures for the disposal of federal property for any federal property or improvement on the appropriation. When ANG has these lands, the Corps is the agent for the ANG.

This legislation allows use of Refuge lands as a conveyance to another entity for special use and often is a right-of-way for that use such as a road, tram, or pipeline. These lands can revert to the Refuge once the intended use or mission ceases; however, the Service must concur with the land transfer.

PLO 2020 (1959) - This legislation withdrew lands from refuges for ANG sites. If the ANG no longer requires a site, it reverts back to the Refuge. If there is a revocation from the military of an ANG site, the land must be restored before it is reverted back to the Refuge. The Service cannot sell or give this property away but can exchange this parcel with a Native corporation for more preferable land. An amendment to ANILCA can allow the Service to convey this parcel to the state or a Native corporation via a lengthy process.

PLO 5704 (1980) - Lands reserved under the YDNWR are subject to existing rights, such as PLO 2020 for lands for ANG use.

ANCSA section 3(e) - Disposal of excess property from the Refuge is conducted through BLM processes.

D. Rudis/USFWS photo

Almost every village within the Refuge has an ANG site. There are 34 ANG sites located within the Refuge that potentially could be transferred from the ANG (a state agency) to the Refuge. PLO 2020 (1959) withdrew lands from National Wildlife Refuges in Alaska for use of the ANG. The lands within the Refuge included in the 1959 PLO were tracts in the villages of Akiachak, Alakanuk, Kasigluk, Kipnuk, Kivalina, Kwethluk, Napakiak, Napaskiak, Newetok, Shismaref, Tuluksak, Tununak, and Tuntutuliak. Other lands were included in subsequent PLOs. During our site visits in August 2005, some villages were interested in acquiring these ANG properties.

Alaska Army National Guard (ANG) building and fuel supply tank in Akiachak. Most villages in the refuge have similar ANG buildings and associated fuel tanks. D. Rudis/USFWS

ANG sites can be placed in three categories: (1) lands withdrawn by PLO 2020 and still in ANG possession; (2) lands withdrawn by PLO 2020 and still in ANG possession but with a Notice of Intent filed with BLM for conveyance, pending action by BLM; and (3) lands appropriated under 44 LD 513, which was repealed in 1976. Lands included in this legislation were under BLM jurisdiction; ANG could select sites and later inform BLM of their choices.

Excess ANG sites located on National Wildlife Refuges in Alaska could then be conveyed by BLM to the State of Alaska or Alaska Native corporations under the Bob Stump National Defense Authorization Act of 2003 without cleanup requirements as included under the requirements of CERCLA and Resource Conservation and Recovery Act (RCRA). Under the Bob Stump National Defense Authorization Act of 2003, funding (any "consideration") obtained by the government as part of the land transfer could be used to pay for EAs or remedial work. The act also allows this funding to be used for any such assessments considered appropriate by the Secretary.

In 1996, ANG underground storage tanks were slated for removal or an upgrade to applicable standards. Remediation of documented fuel releases was undertaken that year. Most contaminant problems associated with ANG sites include fuel spills from tanks or fuel lines, small trash piles, burn barrels or pits, building debris, and/or abandoned drums. Buildings are primarily metal, and it is unknown if any contain lead paint or asbestos. Some ANG buildings are adjacent to rivers, and there is a potential for bank erosion and the eventual collapse of the buildings into the rivers.

ANG Cleanup Program Summary - Installation Historic Activity

The Alaska ANG has operated since statehood in 1959. During the interim years, the structure of the organization has included light infantry, mechanized infantry, armor, fixed- and rotary-wing aviation, and water-borne assets. The current organization operates under a single command forming the 207th Group. The five components consist of three light infantry battalions and one each support battalion and aviation regiment. The ANG is administered at the Joint Activity Command on Fort Richardson, just outside of Anchorage. The entire installation consists of 74 past and current facility locations throughout the state. There are 64 facility locations affected by this Installation Action Plan (IAP). The facility properties are used under withdrawals, licenses (equivalently referred to as permits), leases, easements, and other use agreements administered by the Army Corps of Engineers and State of Alaska Department of Natural Resources (ADNR). The ANG also uses 45 local training areas by non-exclusive use permit. A total of 107 transferred ranges are inventoried on local training areas used by the ANG since 1959. ANG facilities and local training areas

are primarily used for light infantry training, surveillance, communications, navigation, and maneuvers.

Mission f exibility of the Alaska ANG ref ects the utility of the force. During the Cold War, the Federal Scouts provided front line observation and detection, as well as local defenses for strategic early warning assets in western and northern Alaska. Recent shifts to global peacekeeping and anti-terrorism emphases are manifested in homeland and critical security missions. In part as a response to numerous findings from an audit, the Alaska ANG initiated numerous SIs related to historical petroleum releases and underground storage tank sites. Many of the SIs confirmed releases due to petroleum product storage, delivery, and handling operations. All regulated underground storage tanks were removed and contamination issues addressed. RIs were also initiated at many surface release sites to define the extent of contamination and explore remedial alternatives. Beginning in 1999, IRAs to excise significant source volumes were performed at the higher priority contaminated sites. Because most of the sites were accessible only by water or aircraft, logistical challenges and barge availability dictated the pace of progress. Removal actions continued in 2005 at some remaining medium and low priority sites. Most of the sites could not be completely remediated, and are included in a comprehensive long-term monitoring program. Details on site history and removal actions were updated in the FY2007 Alaska National Guard Compliance-Related Cleanup Installation Action Plan.

Beginning in 1999, IRAs to excise significant source volumes were performed at the higher priority contaminated sites. Because most of the sites were accessible only by water or aircraft, logistical challenges and barge availability dictated the pace of progress.

The following lands were appropriated by other entities under 44 LD 513 authority: Akiak, Cherfornak, Chevak, Hooper Bay, Kwillingok, Scammon Bay, Toksook Bay, and Tuluksak. If any ANG sites are conveyed in the future, they will go to the ANCSA Corporation or other entities as identified in P.L. 107-314. They will not go to the villages themselves.

Because these lands are withdrawn by ANG as an ANCSA section 3(e) withdrawal, the Service would need to concur with relinquishment of this withdrawal before the property could return to Refuge management.

Travel between site visits for this report was often by river travel. P. Johnson/USFWS.

Military Munitions Response Program (MMRP) Contamination Assessment Overview

One of the main challenges in performing investigations at the ANG sites is the lack of infrastructure. All sites that are off the road system are hampered by a chronic lack of infrastructure development.

The Military Munitions Response Program (MMRP) was initiated by the DoD in 2001 as part of the Defense Environmental Restoration Program (DERP). In 2002, Congress passed the National Defense Authorization Act of Fiscal Year 2002 (10 USC 2710), which required DoD to complete a listing of all munitions-contaminated sites throughout the United States [10 USC 2710(a)] and to create a protocol with which to rank all the sites for remediation and funding [10 USC 2710(b)]. There were 181 MMRP sites identified at 50 installations across Alaska as part of the Army range inventory that was conducted in 2002. Many of these are located in villages with ANG sites. Most of these sites are small arm ranges, a few are training and maneuver areas, and 50 are multi-use ranges.

One of the main challenges in performing investigations at the ANG sites is the lack of infrastructure. All sites that are off the road system are hampered by a chronic lack of infrastructure development. Equipment scarcity, transportation difficulties, weather delays, and numerous other factors provide insurmountable obstacles in many cases. For remedial actions, the need to ship equipment and contaminated soil by barge or aircraft adds considerable cost and logistical challenge. Schedules are f exible by necessity, and complete investment in rigid timetables guarantees failures.

SIs will be conducted at all of the MMRP sites. See Appendix A for cleanup strategy details for each ANG site.

https://aero.apgea.army.mil/pIAP-Doc/alaskaarmynationalguard/alaskaarmynationalguard.html#mmrp_sum Accessed 24 April 2008 for all ANG - MMRP data.

At the following ANG sites, contaminant problems and/or primarily fuel spills have been documented by ANG and/or ADEC. Some of these sites have been visited by Service personnel. Many of the fuel spills on these properties are the result of years of contamination from leaking fuel lines and faucets, and not major spill incidents (Debra Caillouet, ADEC, personal communication). Some ANG sites lacking a reported spill incident (but primarily chronic pollution sites) are not included in the ADEC spill database. Some spill reports were found as notes in the site record from the ANG files and are not necessarily included in the ADEC Web site database.

Akiak

Service personnel visited the village and the 0.213-acre ANG site on August 15, 2005. This site is about 39 river miles from Bethel. Based on a visual inspection from the outside, the building appeared to be in good condition, but there was a pile of old, rusty drums adjacent to it. Most—if not all—were empty. In addition, there was a storage container that was open, unlocked, and filled with miscellaneous office items and unknown debris. Shelia Williams with the Akiak Native Corporation told Service personnel that the Corps had visited earlier in the summer (May or June) and said that they intended to convey the site to either the Service or the village corporation. The Akiak Native Corporation is interested in ownership of this building.

A Conex trash storage container on the Akiak ANG site and Philip Johnson. Conex contents are unknown and could contain hazardous materials. D. Rudis/ USFWS photo

The ADEC database includes the following information.

First noted in the ADEC database in 1981, fuel oil spilled into soil and allegedly contaminated the shallow ground water. The specific contaminants, amounts, time, extent of contamination, and public health concerns were unknown.

A Draft RI Report was prepared by CH2MHill in 1999 and an IRA Plan, Federal Scout Armory (FSA), Akiak, Alaska, in March 2004. The plan provided a general approach for the excavation and handling of impacted petroleum-contaminated soil but lacked site specific detail for ADEC approval. ANG was performing this action to reduce risk to human health and the environment under 18 AAC 75.330 and to provide for a partial cleanup (interim removal) at the site, rather than to achieve cleanup levels. It was presumed that information gathered during this interim action would provide data to be used in determining any future actions required for site cleanup. ADEC deferred any further regulatory decisions until site work data review.

The Akiak Federal Scout Armory IAP, 2005, contained a summary of the actions to date and proposed cleanup strategy. The removal action report documenting work conducted in 2004 had not been received and was not described in the IAP. ADEC needed to review the removal action report prior to concurring with a cleanup strategy.

In February 2009, Final Secondary Site Characterization, Federal Scout Armory, Akiak was reviewed by ADEC. The report provided additional characterization of the nature and extent of the contamination remaining at the Armory.

The following information is from the USFWS Division of Realty case file. This site was part of a Native reserve in 1917, but that withdrawal was revoked by ANCSA in 1971. With ANILCA in 1980, the federally owned site became part of the YDNWR. In 1985, the size of the federal parcel was reduced to 0.213 acres via an ANCSA section 3(e) determination.

According to one of the realty specialists (January 2008), the ANCSA 3(e) withdrawal for the Akiak ANG site is still in effect; the ANG has not expressed any intention to relinquish that withdrawal. If they issue a Notice of Intent to relinquish that withdrawal, the Service would have the same involvement as in any other relinquishment. Since it is an improved property, BLM would most likely [should] determine the property "not fit for return to the public domain," and the ANG would dispose of it through the appropriate disposal process.

Because these lands are withdrawn by ANG as an ANCSA section 3(e) withdrawal, the Service would need to concur with relinquishment of this withdrawal before the property could return to Refuge management.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=2456 (Accessed 01 September 2009).

Akiachak

This site is 34 river miles from Bethel. In an April 1996 letter from ADEC to the ANG, the state asked for remediation at two areas at this site. CH2MHill, the ANG contractor, looked at petroleum hydrocarbons in soils from an earlier fuel release and reported that no remediation was needed. However, in October 2000, ADEC sent a letter to Norman Straub at ANG suggesting the ADEC Voluntary Cleanup Program would be a cost-effective cleanup approach for this site.

Service personnel did not detect any stained soils or other visual indications of spills on an August 15, 2005, site visit. The ANG building consists of an older structure with a newer attachment. Both buildings and the fuel storage tanks visually appeared to be in excellent condition.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=2459 (Accessed 3 September 2009).

The Final IRA Report adequately documented removal and offsite treatment of some petroleum-contaminated soil from the site. Because residual petroleum contamination in soil exceeded cleanup levels and two areas were insufficiently characterized, additional site characterization and/or cleanup were necessary.

Three MMRP sites in the vicinity of the Village of Akiachak were weapons qualifications ranges. DoD has never owned or controlled any of these properties. There have been no known munitions response actions at these sites.

Alakanuk

In 2005, the IRA Report documented that 20.8 tons of petroleum-contaminated soil was removed and treated at TPS Technologies in Washington. DRO up to 12,300 mg/kg remained in the sidewall of the excavation next to the building. All gasoline range organics (GRO), benzene, toluene, ethylbenzene, and xylene (BTEX) results were rejected due potential sampling errors. Results of an Alternative Cleanup Level Demonstration Project at the site, including sampling and analysis for GRO and BTEX could be sufficient to allow determination of any necessary future actions regarding those analytes. The SI summary did not include the finding of a leaking creosote container and the storage of dry cleaning solvent in the storage van. It also did not include a drum storage area or the stressed vegetation that was noted during the SI. This storage area was sampled only for petroleum hydrocarbons and found low levels of DRO. ADEC requested that the area be sampled for chlorinated hydrocarbons and semi-volatile organic compounds (SVOCs) and a proposed date was needed for the building removal to assist in determining an appropriate long-term plan. The Final IRA Report adequately documented removal and offsite treatment of some petroleum-contaminated soil from the site. Because residual petroleum contamination in soil exceeded cleanup levels and two areas were insufficiently characterized, additional site characterization and/or cleanup were necessary.

This site is filed to return to the Refuge (USFWS Region 7 Division of Realty office files).

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=3060 (Accessed 3 September 2009).

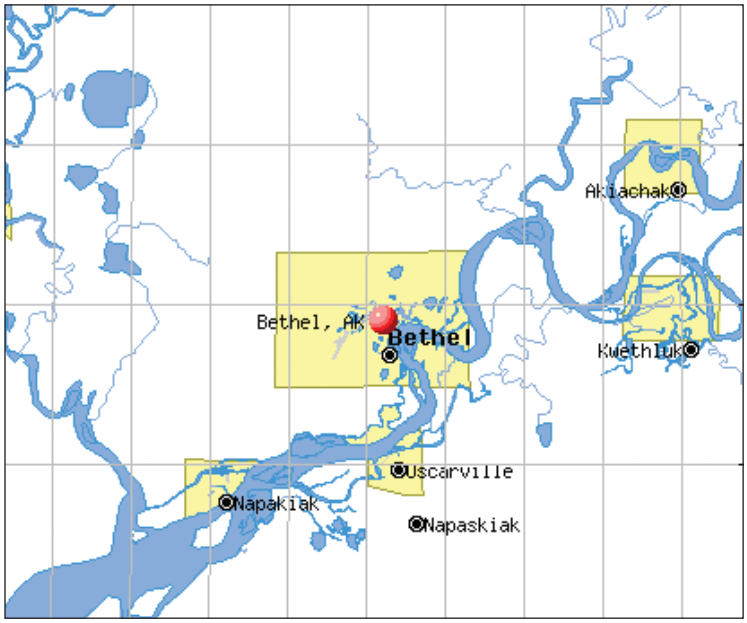
Bethel ANG Site

This two-acre aircraft maintenance and storage hangar site was on the southwest shore of Hangar Lake, located about 1.5 miles from Bethel. It was used from 1950–1962 and has since burned down. A 1992 site inspection by representatives of the ANG and ADEC found no hazardous waste or unsafe debris or waste on site.

Bethel ANG hangar at Bethel Airport Site - (ADEC calls this AKARNG Bethel Old AAOF.) This site had a removal of 107 cy of contaminated soil (included in a 2000 report noted on the ADEC database). DRO was detected at 2,600 mg/kg and TPH was detected at 5,700 mg/kg near the above-ground tank area. No date is included with this information.

https://www.dec.state.ak.us/spar/csp/search/csites_report.asp?Hazard_ID=3048 (Accessed 9 April 2008).

Figure 6. Bethel and nearby villages on the Kuskokwim River.



USFWS graphic

Additional information from the ADEC Leaking Underground Storage Tank (LUST) record for this facility notes the following. In 1994, highest soil samples from this site had DRO of 8,200 parts per million (ppm), GRO of 2,500 ppm, and BTEX of 62 ppm. The responsible party (RP) conducted removal of 930 cy of contaminated soil in 1999. Diesel- and gasoline-contaminated soil was excavated and treated at an approved portable thermo treatment facility located near the old hospital in Bethel. Contamination remains and the RP did not determine the horizontal or vertical extent of the contamination.

https://www.dec.state.ak.us/spar/csp/search/lust_report.asp?EventID=1340 (Accessed 9 April 2008).

AKARNG Bethel New AAOF - A minor spill of 38 gallons was reported in 2004. Absorbent pads and booms were deployed to collect free product from the hardstand surface. Six 85-gallon drums of petroleum-impacted soil were removed from the site. Sampling in 2004 found a maximum of 4,090 mg/kg of DRO remaining in the affected area.

https://www.dec.state.ak.us/spar/csp/search/csites_report.asp?Hazard_ID=4159 (Accessed 9 April 2008).

AKARNG Bethel Organizational Maintenance Shop OMS - This site is located near the Kilbuck School. More moderate contamination is near the site of the fuel tank and former above-ground storage tanks (ASTs). DRO concentrations ranged from 570–880 ppm, compared to some of the other ANG sites with contamination in the tens of thousands of mg/kg in soil. ADEC sent a letter to Norman Straub of ANG in October 2000,

suggesting the ADEC Voluntary Cleanup Program as a cost-effective cleanup approach for this site.

https://www.dec.state.ak.us/spar/csp/search/csites_report.asp?Hazard_ID=3049 (Accessed 9 April 2008).

The LUST database record for this OMS site notes that a 1,000-gallon tank leaked, and the spill was reported in March 1993.

https://www.dec.state.ak.us/spar/csp/search/lust_report.asp?EventID=1341 (Accessed 9 April 2008).

Chefornak

There are seven MMRP sites near the Village of Cherfornak. These areas were used as firing ranges, most likely from 1957 until 1985.

At this 0.78-acre site, fuel spills in four locations covered an area of about 20 square feet. Spill history includes an October 1996 discovery of joint leaks in a fuel feed line from the barge dock. This line was to be decommissioned. The pipeline was owned by the Lower Kuskokwim School District, but ANG did the cleanup work. In 1997, soil samples that were collected between the boardwalk and the old armory building had DRO from 250–386,000 ppm. An IRA excavated four areas and removed about 47 cy of petroleum-contaminated soil. The soil was transported to Bethel for treatment. Soil that remained on site met applicable soil cleanup levels for petroleum hydrocarbons and BTEX (S. Pexton, ADEC, Anchorage, letter of July 2002). Cleanup was complete and the site was designated closed by ADEC in 2002. Clean up levels achieved were 1,000 mg/kg for GRO and 2,000 mg/kg for DRO.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=2609 (Accessed 3 September 2009).

There are seven MMRP sites near the Village of Cherfornak. These areas were used as firing ranges, most likely from 1957 until 1985. DoD has never owned or controlled any of these areas; they are currently undeveloped land. An installation wide SI is assigned to these sites, and the archive search report (ASR) is assigned to CHEFR-005-R-01.

Chevak

Petroleum contamination occurred at this ANG site. Prior to 1992, a five-foot by ten-foot area at the Chevak FSA was affected by a heating oil spill beneath the ancillary piping of a 3,000-gallon heating oil above-ground storage tank. DRO were found at 3,620 mg/kg and benzene at 3.3 mg/kg. A November 2000 Draft IRA Report was prepared by Clearwater Environmental, Inc., for the Alaska ANG. The report indicated that approximately 50 cy of DRO-impacted soil was excavated to a depth of three feet bgs and transported via air carrier to Bethel for thermal treatment and disposal at the BNCI portable treatment facility.

A summary of the May 2005 update on the ADEC database includes the following discussion.

> ADEC staff reviewed the IAP. Results of the SI in 1995 included two AOCs that the ANG believes are not their responsibility. The area called AOC 5 is on land that is part of the village medical clinic, and the

release is around the 100-gallon fuel tank for the clinic. ADEC concurs that this site should not be included as part of the Chevak Armory. Site AOC 3 includes the area that the ANG believes was impacted by equipment used by the Public Health Service to drill a water well. This area is on the Armory land; photographs show the equipment on the property but no obvious release. Because this area is adjacent to the former 3,000-gallon AST and the fuel transfer pipeline, it is possible that it could have been impacted by a release from either of those sources. As the land owner and operator, ADEC considers the ANG to be a responsible party and requests additional characterization of the area. AOC 1 is the location of the former 3000-gallon AST. Two borings were placed near it with only one soil sample analyzed by a laboratory. This boring had 2,930 mg/kg DRO and a TPH reading of less than 30 mg/kg. The other boring had a TPH of 61 mg/kg, but no soil samples were submitted to the lab. ADEC requests additional characterization of this area to determine the extent of contamination. AOC 2 is the fuel transfer pipeline and was only visually inspected for signs of release. This pipeline is not in use and is reported to have been capped. The SI recommends that the pipeline be cleaned and removed. ADEC requests that soil samples along the pipeline be taken and analyzed for GRO, DRO, BTEX, and PAHs to check for possible contamination. AOC 4 is an area that had been reported to have a sheen on standing water in 1994. This area was visually inspected, and no samples were taken. This is adjacent to the current 1,500-gallon AST. ADEC requested that soil samples be obtained and analyzed for DRO, GRO, and BTEX. The area of the Chevak Armory is classified as a wetland, and impacts to the wetland will need to be considered, along with the levels and extent of contamination, in determining the necessity of future remedial action.

The area of the Chevak Armory is classified as a wetland, and impacts to the wetland will need to be considered, along with the levels and extent of contamination, in determining the necessity of future remedial action.

A ROD was prepared in 2008 and is under review by ADEC.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=2458 (Accessed 3 September 2009).

There are also three rif e ranges near the Village of Chevak, covering about ten acres.

Eek

A site assessment in February 1995 by Environmental Health Sciences of Alaska, Inc., included the following site history. A 350-gallon diesel spill occurred in 1993 from vandalism to piping. About 50 to 150 cy of soil was contaminated above the ADEC guidelines of 2,000 ppm DRO. In 1996, DRO was detected in eight soil samples, ranging from 3,800–20,000 mg/kg. Benzene was detected in one sample at 0.91 mg/kg.

The following edited summary is from a May 2005, ADEC database for Eek.

> The IAP fairly summarizes the results of a SI in 1994 resulting from a release of approximately 350 gallons of heating oil from a 2,000-gallon AST in 1993. An RI in 1997 found permafrost in all 17 borings at 3–4.5 feet bgs. DRO were found at levels up to 56,000 mg/kg, but the results are impacted by moisture content of 73 percent. An IRA in May 2000

removed 20 cy of impacted soil. Confirmation sampling showed DRO remaining in the bottom of the excavation at eight inches bgs up to 50,000 mg/kg, and at the end furthest from the building, up to 31,800 mg/kg six inches bgs. The moisture content in these samples were 66 percent and 77 percent respectively. Benzene was not detected in the confirmation samples, but that limit for the samples ranged from 0.0201 mg/kg to 0.152 mg/kg. An Alternate Cleanup Level (ACL) Report for the site is pending. The Cleanup Strategy for the site includes additional source removal, ICs, public outreach about potential impacts to development on adjacent parcels, and five-year reviews. Clarification is needed on property boundary locations and where contamination may have migrated offsite. The area of the Eek Armory is on a wetland, and impacts to the wetland will need to be considered, along with the levels and extent of contamination, in determining the necessity of future remedial action. ADEC concurred with the proposed cleanup strategy.

There are eight MMRP sites near the Village of Emmonak. The sites are currently undeveloped, and some are primarily open water.

Although the ANG conducted a cleanup, high levels of contamination remained. ADEC is called for additional source removal, ICs, public outreach about developing adjacent parcels, and five-year reviews. In 2009, the final Secondary Site Characterization Report was accepted by ADEC.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=1864 (Accessed 3 September 2009).

There are six MMRP sites in the vicinity of Eek. These sites are located on undeveloped land, and some areas are on residential-type property. There are no known munitions response actions at these sites. DoD has never owned or controlled these properties. An installation wide SI and ASR is assigned to all of these sites. No contamination is expected at the first four MMRP sites but may be present at the last two sites.

Emmonak

In 1996, this site was added to the ADEC database. In 2000, ADEC sent a letter to Norman Straub of ANG suggesting implementing the ADEC Voluntary Cleanup Program as a cost-effective cleanup approach for this site. There is no additional information on petroleum product contamination at this site on the ADEC Web site database. In 2008 an Exposure Tracking model was completed.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=2457 (Accessed 3 September 2009).

There are eight MMRP sites near the Village of Emmonak. The sites are currently undeveloped, and some are primarily open water. There have been no known munitions response actions at these sites. DoD has never owned or controlled these properties. An installation wide ASR is assigned to EMMNK-008-R-01 and is pertinent to all of these sites

Hooper Bay

There are two parcels of 2.05 and 3.96 acres, an ANG site and road. In 1998, there was a 500-gallon or more fuel spill from a tank. In 2002, 80 cy

of petroleum-contaminated soil was removed and shipped to Washington for treatment to provide partial clean up. Approved soil cleanup levels by ADEC were: Benzene 0.02 mg/kg, GRO 100 mg/kg, DRO 200 mg/kg, and residual range organics (RRO) 2,000 mg/kg.

The May 2005 ADEC staff comments on the IAP are summarized below..

> An SI in 1998 identified four AOCs. The 2002 IRA partially addressed one of the AOCs. The area between the old and new armory buildings was not addressed, yet it had the highest detection of DRO at 440,000 mg/kg. Confirmation sampling of the excavated area detected DRO up to 26,100 mg/kg. It is unclear from the IRA Report if all contamination associated with the unused fuel pipeline was removed, as there were no confirmation samples where DRO had been found at 130,000 mg/kg. A drum storage area with DRO up to 26,100 mg/kg during the SI also remains. An ACL Demonstration Report is pending. Data review indicates residual contamination remains below the f oor of the excavation. The IAP recommends further RI, another IRA to address the area between the armory buildings, a final remedial action and long-term monitoring. An additional RI is necessary to include the areas underneath the buildings, the entire length of the fuel pipeline, and the drum storage area. Soil and groundwater should be sampled where possible and the depth to groundwater and permafrost determined. ADEC requested that the remaining unused pipeline be cleaned and removed from the site. ADEC will work with the ANG to determine the best course of action to address the remaining contamination.

ADEC also notes that the IAP that was reviewed in May 2005 recommended further RI, another IRA to address the area between the armory buildings, a final remedial action and long-term monitoring.

In August 2005, ADEC staff approved the final IRA Report; summarized comments follow..

> The IRA documents that approximately 74 tons of petroleum-contaminated soil was removed and treated at TPS Technologies in Washington. DRO were found up to 26,100 mg/kg remaining in the sidewall at the southeast end of the excavation. Excavation was stopped because the contracted volume of soil had been reached. There was no confirmation sample at the northwest end of the excavation to indicate if a clean point had been reached. All GRO and BTEX results were rejected due to potential sampling errors. The Final IRA Report adequately documents the removal and offsite treatment of some petroleum-contaminated soil from the site. An Alternative Cleanup Level Demonstration Project is ongoing for the site that includes sampling and analysis for GRO and BTEX. The results of that effort could be sufficient to allow determination of any necessary future actions regarding those analytes.

ADEC also notes that the IAP that was reviewed in May 2005 recommended further RI, another IRA to address the area between the armory buildings, a final remedial action and long-term monitoring. ADEC concurred with the need for additional RI to include the areas underneath the buildings, the entire length of the fuel pipeline, and the drum storage area. Soil and groundwater would be sampled where possible and the depth to groundwater and permafrost determined. ADEC also had requested that the remaining unused pipeline be cleaned and removed from the site.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=3061 (Accessed 3 September 2009).

There are seven MMRP firing range sites in the vicinity of Hooper Bay, ranging in size from less than one acre to 2,336 acres.

Kasigluk

At this site, very high petroleum hydrocarbon levels were reported in soil from a fuel spill; in addition, chlorinated solvents may be an issue. Because the site is a wetland, ADEC noted that if alternative cleanup values are approved, contamination levels must meet water quality standards. A summary of ADEC comments in the May 2005 database entry follow.

> The IAP provides a summary of the SI that identified three AOCs. AOC 1 was reported to be the location of a fuel release in 1990 of unknown quantity with DRO up to 97,000 mg/kg in surface soil. Subsurface soil samples collected at the permafrost interface (about two feet bgs) contained DRO up to 450 mg/kg. AOC 2 is around the new AST. In 1992, surface soil samples from this site contained DRO up to 89,000 mg/kg in the surface soil and at the permafrost interface contained 180 mg/kg. AOC 3 is an area around the storage van that was used to store drums. In the PA, it was noted that the storage unit contained half of a drum of dry cleaning solvent. Soil analysis did not include chlorinated hydrocarbons. ADEC requested that this area be resampled and analyzed for chlorinated hydrocarbons. An IRA work plan was reviewed in 2004, and it is unclear if the removal action occurred. The IAP suggests that soil will remain above the Method II cleanup level of 250 mg/kg after the IRA. While this level is appropriate for soil, the site of the armory is a wetland, and the water quality standards found at 18 AAC 70: total aqueous hydrocarbons (TAqH) in the water column may not exceed 15 μg/l, total aromatic hydrocarbons (TAH) in the water column may not exceed 10 μg/l, and surface waters must be virtually free from f oating oil, film, sheen, or discoloration apply.

Then May 2008, ADEC summary comments follow.

> The final report for the IRA at Kasigluk documents the removal and off-site treatment of 28 cubic yards of petroleum contaminated soil from two areas at the site. Confirmation sampling from the limits of the excavations showed DRO remaining in Area 1 up to 16,000 mg/kg. Three of the six samples analyzed had results rejected due to moisture content of greater than 90%. Area 1 is associated with a former above ground storage tank. Further characterization of the remaining extent of contamination will be needed to determine the appropriate remedy for Area 1. Area 2 is associated with the current AST. Confirmation sampling at the limits of the excavation showed DRO remaining up to 594 mg/kg. The report demonstrates that the action meets the requirements of 18 AAC 75.330, IRA.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=3062 (Accessed 3 September 2009).

There is a 69-acre MMRP firing range site northwest of the village.

Kipnuk

There was an AST spill and soil exaction and removal (no date). A BLM site visit in 1986 reported fuel tanks and drums, sheds, and shipping containers. The site was being used by local residents, and there was a trespass of fuel dispensing. About one-third of the site was eroded from collapsing river banks. A 1988 inspection by C. Hunt, Native Liason, USFWS, (memo to R. Perry, June 23, 1989) found debris, drums, and fuel. Refuge file photos show oil tanks, debris, a truck, and a boat. Earlier correspondence (letter, December 12, 1988, from R. Perry to D. LaMore, Chief, Management and Disposal Branch, U.S. Army Corps of Engineers, Alaska District), stated coordination was needed between agencies and that cleanup must occur at Kipnuk and Tuntutuliak before property transfer could occur. R. Perry expressed concerned about trash, equipment, oil drums, and fuel tanks, and requested cleanup (memo to Sandra Dunn, BLM, November 2, 1988). ANG was scheduled to clean up this site before the Service would take acceptance. Details from the ADEC Web site are as follows.

In 2005, ADEC wrote that the results of the confirmation testing of the excavation walls indicated that DRO contamination remained in place after the excavation.

In 2000, ADEC noted that a total of eight cy of DRO-contaminated soil was removed from the site and placed in 32 55-gallon drums for transport to the BNCI thermal treatment facility in Bethel. Confirmation soil samples collected from the excavated area were reported with DRO concentrations ranging from 811 to 17,700 mg/kg. Benzene was reported in one soil confirmation sample at a concentration of 0.171 mg/kg.

In 2005, ADEC wrote that the results of the confirmation testing of the excavation walls indicated that DRO contamination remained in place after the excavation. The level remaining was up to 17,000 mg/kg DRO, but the results were rejected due to moisture content up to 90 percent. The excavation and sampling occurred when soils were frozen. No GRO or BTEX were detected in the samples. Currently, the results of an Alternative Cleanup Level (Method III) evaluation are pending. These results will determine the future action at the site. If the results do not show any significant change in contaminant levels remaining at the site, ADEC concurs that the plan for a NFRAP or long-term monitoring with five-year reviews should address concerns at the site.

In 2008, ADEC received the Alternative Cleanup Level Demonstration Project, Kipnuk Federal Scout Armory, November 2005 final report. The report does not address their earlier concerns of October 2005. ADEC stated that the report did not accurately present the data obtained and does not meet the requirements of 18 AAC 75.335.

This site is filed to return to the Refuge (USFWS Region 7 Division of Realty office files).

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=1557 (Accessed 3 September 20009).

There are four MMRP ranges in the vicinity of Kipnuk.

Kongiganak

Significant contamination was detected at the site. Specifically, high levels (up to 240,000 mg/kg) of DRO were reported in surface soil samples, but these samples had moisture contents up to 94 percent. Samples at 3–4 feet bgs contained DRO up to 2,100 mg/kg.

Remedial actions were performed, although some lower level contamination remained (read following database summary for details). ADEC approved closure of site in September, 2007.

A May 2005 ADEC database entry states that ADEC staff reviewed the IAP and the summarized comments follow.

> The IAP fairly presents the results of a SI in 1995 and an RI in 1998. The Kongiganak FSA is located on a wetland. Permafrost was detected in all borings at depths from 2 feet to 5.5 feet bgs. High levels (up to 240,000 mg/kg) of DRO were reported in surface soil samples, but these samples had moisture contents up to 94 percent. Samples at 3-4 feet bgs contained DRO up to 2,100 mg/kg. The IAP states that a removal of DRO impacted peat would not be desirable due to the potential impacts on permafrost. An ACL Development Project is underway.

Burn pits can be of potential contaminant concern, as hazardous wastes may have been burned at this site, leaving residual contamination.

A September 2007 update from ADEC noted that the maximum DRO remaining at the site were 287 mg/kg. The mean soil concentration at the 95 percent Upper Confidence Limit (UCL) is calculated to be 215 mg/kg. No other contaminants were detected in the soil above the 18 AAC 75.241 Table B cleanup levels. Maximum detected DRO in groundwater was 1.36 mg/L, which is below the cleanup level of 1.5 mg/L in 18 AAC 75.345. ADEC determined that the Kongiganak FSA meets the requirements for closure because 18 AAC 75.380(c) allows the determination of site closure to be based upon the mean soil concentration at the 95 percent UCL.

This site is filed to return to the Refuge (USFWS Region 7 Division of Realty office files).

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=1890 (Accessed 3 September 2009).

There are three MMRP range sites near the Village of Kongiginak.

Kotlik

A 1990 release from an AST and associated piping was noted in 1995 as covering an area of about 100 square feet. This release resulted in significant soil contamination of up to 24,000 mg/kg of DRO. A potential burn pit was located just west of the ANG building and an onsite ditch was used for waste disposal. Burn pits can be of potential contaminant concern, as hazardous wastes may have been burned at this site, leaving residual contamination. Substances such as waste oils, solvents, degreasers, and other potentially toxic materials would be collected, dumped into pits, ignited, and later extinguished. Burn pits were often unlined or without containment, allowing offsite contamination.

The RI in 2004 identified one area on the north side of the armory building as having up to 24,000 mg/kg of DRO in surface soil. Cleanup work included removal and off-site treatment of 11 cubic yards of petroleum contaminated soil from two areas at the site and was documented in the 2008 final report for the IRA.

Confirmation sampling from the limits of the excavations reported in 2008 showed DRO remained in Area 1 up to 1120 mg/kg adjacent to the fuel tank. Area 2 is associated with the former day tank on the north side of the building. Confirmation sampling at the limits of the excavation showed DRO remained up to 7,560 mg/kg. Remaining contamination is next to the building or AST and could not be removed without endangering the structural integrity of the structures. The report demonstrates that the action meets the requirements of 18 AAC 75.330, IRA.

Remaining contamination is next to the building or AST and could not be removed without endangering the structural integrity of the structures. The report demonstrates that the action meets the requirements of 18 AAC 75.330, IRA.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=2822 (Accessed 3 September 2009).

There are six MMRP firing ranges in the vicinity of Kotlick.

Kwethluk

This site has significant fuel contamination from an AST and pipeline. There have been at least a couple of removal actions; however, cleanup did not extend beneath the building, so contamination was left in place. Additional information from the ADEC Web site database follows.

In December 2001, ADEC received a Final IRA Report prepared by Clearwater Environmental, Inc. A total of 25 cy of DRO-contaminated soil was removed from the site and placed in 102 55-gallon drums for transport to the BNCI thermal treatment facility in Bethel. Confirmation samples collected from the excavation area had DRO in one sample reported at 25,400 mg/kg. The other six confirmation soil samples had DRO reported ranging from undetected to 111 mg/kg.

In May 2005, ADEC staff reviewed the IAP. Their summarized comments follow.

> In a SI conducted in 1995 and an RI in 1998, three AOCs were found to contain DRO at concentrations of concern. An IRA in 1999 removed 50 cy of contaminated soil. Confirmation sampling confirmed two of the areas had no contamination remaining above 18 AAC 75.341 Method II levels. One area, adjacent to the old armory and the enclosed walkway to the new armory, had DRO at 25,400 mg/kg, benzene at 0.0207 mg/kg, and GRO at 647 mg/kg. An ACL Demonstration is currently pending. Preliminary results show DRO remaining at 11,500 mg/kg in the location that previously had 25,400 mg/kg DRO. Another IRA is underway to excavate soil at the north edge of the armory as part of site cleanup. If a no further action determination cannot be obtained from the ACL Demonstration, long-term monitoring and five-year reviews would be appropriate for the site.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=2814 (Accessed 3 September 2009).

There are five firing ranges in the vicinity of Kwethluk, ranging in size from 23 to 509 acres.

Kwigillingok

This site has significant fuel contamination in two areas; based on information from the ADEC database, it is unknown if any cleanup actions have occurred.

The following information is summarized from the ADEC database 2005 database entry.

> The area near the old AST had up to 64,000 mg/kg DRO in surface soil. The area near the Conex contained DRO in surface soil up to 47,000 mg/kg. Permafrost was found in all borings at depths from 2.5 feet to 3 feet bgs. The Kwigillingok FSA is located on a wetland with summer boardwalk access. Soil moisture content in the above samples was up to 92 percent. The Cleanup Strategy speculates that there may be contamination remaining along the pipeline corridor above ACLs and that the wetland site and its peat soils should be considered in the closure determination for the site. ADEC requested that the pipeline be cleaned and capped or removed to prevent future contamination. The proposed Cleanup Strategy of a "no further action" determination is not possible, and long-term monitoring and five-year reviews must be implemented until the site can be closed.

In 2008 the final report for the IRA at the Kwigillingok Federal Scout Armory was approved by ADEC, it documents the removal of 10 cubic yards of petroleum contaminated soil from two areas.

In 2008 the final report for the IRA at the Kwigillingok Federal Scout Armory was approved by ADEC, it documents the removal of 10 cubic yards of petroleum contaminated soil from two areas. Area 1 was associated with a former above ground storage tank and its fill pipeline. Confirmation samples at the limits of the excavation for Area 1 contained up to 89,300 mg/kg diesel range organics (DRO), 642 mg/kg gasoline range organics (GRO), 0.0711 mg/kg benzene and 8.55 mg/kg ethylbenzene. ADEC stated that additional cleanup will be needed for Area 1. Area 2 was the site of a former drum storage area. Confirmation sampling at the limits of the excavation contained up to 103,000 mg/kg DRO. Additional remedial action will be required for Area 2. The report documents the actions were consistent with 18 AAC 75.330, IRA.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=3063 (Accessed 3 September 2009).

Mekoryuk

In 1992, a 1,000-gallon release may have occurred. The old ANG building was soaked in fuel. The 0.32-acre property is under ownership of the NIMA Corporation with a use permit to the ANG that expired November 20, 2001. No asbestos was found in the building. There are no entries in the ADEC database for this site.

There is one MMRP range near the Village of Mekoryuk.

Mountain Village

Fuel releases from the heating oil system were reported in 1979, 1984, 1995, and 1996. Although some cleanup actions have occurred, significant

contamination remains, and ICs are required at this site. Requiring ICs is an indication that significant contamination remains at the site. In June 2005, the ADEC Web site database included the following information.

The soil around the old AST contained DRO up to 59,000 mg/kg. Soil near the new AST contained up to 10,000 mg/kg DRO. The SI estimated 70–90 cy of soil contaminated above a proposed action level of 10.250 mg/kg were at the site. An IRA in 2002 removed and treated offsite 15 cy of DRO-contaminated soil near the old AST. Confirmation samples from the excavation sidewalls contained DRO remaining up to 23,600 mg/kg and benzene at 0.171 mg/kg in one sample.

The 2005 IRA Report for the Alaska ANG site in Mountain Village documents that 17.6 tons of petroleum-contaminated soil were removed and treated at TPS Technologies in Washington. Diesel DRO were found up to 23,600 mg/kg remaining in the western sidewall of the excavation near the existing AST. Because residual petroleum contamination in soil for six of six confirmation samples exceeds 18 AAC 75.341, Table B1, migration to groundwater cleanup levels, additional site characterization and/or cleanup are necessary.

In May, 2006 ADEC approved alternative cleanup levels for this site (i.e., higher than the default) and required ICs at the site. Their database entry follows.

> Alternative soil cleanup levels result in the GRO soil cleanup level being capped at the maximum allowable level of 1400 mg/kg. The alternative soil cleanup level and other petroleum range and constituent cleanup levels, which are based on the migration to groundwater pathway, are as follows for each contaminant of concern (COC): GRO 1,400 mg/kg , DRO 1,800 mg/kg , benzene 0.0421 mg/kg, toluene 19.9 mg/kg, ethylbenzene 25.8 mg/kg, and xylenes 367 mg/kg. ADEC approves these alternative cleanup levels for the site as identified in the Final Alternative Cleanup Level Demonstration Report for Mountain Village FSA Contaminated Site. The use of these cleanup levels will require establishment of ICs to document the location of soil with residual contamination above the Method II levels and in accordance with 18 AAC 75.325(i). ADEC approval is required prior to transporting such soil offsite.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=3064 (Accessed 3 September 2009).

There are three MMRP sites near the vicinity of Mountain Village. DoD has never owned or controlled these sites. These areas are primarily owned by the local Native corporation, but a section of the Mountain Village Yukon Inlet range is Refuge land. All sites are undeveloped.

Napakiak

Service personnel visited the site on August 16, 2005. Visually, the buildings appeared to be in good condition; there is an older structure with a newer addition. Fuel tanks were older but in good condition, with no

stained soils or other evidence of recent spills. However, information from the ADEC database notes that after contaminated soil removal, significant fuel contamination remains at this site adjacent and perhaps under the ANG building. Empty drums, a hazardous materials locker, and a red metal storage unit were noted during the site visit. One of the village's honey bucket dump stations is located in front of the ANG building.

The May 2004 ADEC Web site database notation for this site is summarized as in the following text.

> ADEC staff reviewed the IAP and sent these comments: The IAP summarized the results of a SI in 1995 and an RI in 1998. The main area impacted is on the south side of the old armory building near the former aboveground storage tank. DRO were found up to 38,000 mg/kg in the surface soil. On the north side of the armory, up to 31,000 mg/kg DRO was identified in the surface soil near the fuel pipeline; at the valve junction northwest of the armory, up to 20,000 mg/kg DRO was found. BTEX was not detected in soil above 18 AAC 75.341 Method II levels at any location. After the removal of the 60 cy, DRO remained in the soil next to the armory foundation at levels up to 18,000 mg/kg.

The Final IRA Report, Federal Scout Armory, Napakiak, Alaska, November 2006, documents the removal of 61 cubic yards of petroleum contaminated soil from three areas. Area 1 is adjacent to the south side of the old armory building and is the former location of a 3,000-gallon heating oil above ground storage tank. Approximately 56 cubic yards of contaminated soil was removed. Confirmation sampling showed DRO remaining in the soil up to 18,000 mg/kg and GRO up to 2,400 mg/kg. Benzene and xylene were also detected above cleanup levels. Additional actions will be needed to achieve closure for this area. Area 2 was the location of a leaking pipeline joint where four cubic yards of contaminated soil was removed. Confirmation sampling did not detect any DRO, GRO or BTEX above cleanup levels. The area of a former pipeline valve where the armory pipeline spur branched from the main pipeline was designated Area 3. One cubic yard of contaminated soil was removed and confirmation sampling at the limits of the excavation did not detect DRO, GRO or BTEX above cleanup levels. The report documents the actions were consistent with 18 AAC 75.330, IRA.

Napakiak community honey bucket dumping station located adjacent to the ANG site. D. Rudis/USFWS photo

In 2009, ADEC received the final secondary site characterization report for Napakiak. The report provided additional characterization of the nature and extent of the contamination remaining at the Armory, but it did not completely define the extent. Sampling near the road indicates that soil under the road is most likely impacted but no samples were obtained in the road bed to determine the extent. The 1998 sampling results

Napakiak ANG facility with a modern fuel storage tank. D. Rudis/USFWS photo

showed DRO in Area 2, associated with a pipeline to be contaminated but this sampling event did not include Area 2. When planning for a final remedial action at the Napakiak FSA these data gaps from the site characterization will need to be considered and addressed.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=2454 (Accessed 3 September 2009).

There are five MMRP sites near the Village of Napakiak. These areas remain primarily undeveloped, and there have been no known munitions response actions at these ranges. DoD has never owned or controlled these properties.

Napaskiak

Service personnel visited the site on August 16, 2005. A combination of old and new buildings make up the facility. There is a coating around a structure under the old building; we believe it is probably asbestos. There are empty drums stacked alongside the building and a metal storage unit on the site. Approximately 50 cy of petroleum-contaminated soil was removed from this site, but significant contamination remains and ICs are required.

The May 2005 ADEC database entry is summarized here.

> The IAP summarizes the results of the SI that evaluated five AOCs in 1995. AOC 5, the old AST stand on the east side of the building, had up to 22,000 mg/kg DRO in soil. The RI in 1998 confirmed the presence of DRO up to 39,000 mg/kg at AOC 5 and also found DRO up to 5,900 mg/kg at AOC 1, the old AST stand on the west side of the building. An IRA in 2000 removed approximately 37 cy of DRO impacted soil. At AOC 1, confirmation sampling at the bottom of the excavation showed DRO contamination remaining up to 582 mg/kg. Confirmation sampling at AOC 5 showed low levels of DRO remaining (maximum 385 mg/kg)—except near the armory, where excavation was stopped to protect the structure. DRO remained next to the armory at 18,200 mg/kg. An unused pipeline is described in the SI and the RI. Photographs in the IRA Report show the excavation went up to the location of the pipeline. ADEC requests this unused pipeline be cleaned and removed to ensure it is not a source for continued petroleum releases. Currently, an ACL report is pending for the Napaskiak FSA. The results will be used to determine future actions at the site that may include another removal action once the building is removed, no further action, or long-term monitoring until the building is removed. ADEC would like additional information on the schedule for building removal. A new armory building is shown in the ACL work plan that was not present at any of the earlier actions. When the results of the ACL Demonstration project are available, ADEC would like to work with the Alaska ANG to determine the most appropriate actions for the site.

The May 2006 entry includes the following update.

> The cleanup levels proposed are based on a site specific total organic carbon (TOC) content in the soil of 2.4 percent rather than the default 0.1 percent, dry bulk soil density 0.96 g/cm3 (default 1.5 g/cm3), and an average moisture content of 32 percent (default 10 percent). Average moisture content was obtained by averaging the results of one sampling event. ADEC does not concur with the use of the average moisture value, as it should be obtained over multiple seasons. ADEC does concur with the use of the TOC value and the bulk soil density. This results in the GRO soil cleanup level being capped at the maximum allowable level of 1,400 mg/kg. The alternative soil cleanup level and other petroleum range and constituent cleanup levels, which are based on the migration to groundwater pathway for each COC are GRO 1,400 mg/kg, DRO 6,000 mg/kg, benzene 0.115 mg/kg, toluene 62.6 mg/kg, ethylbenzene 84.6 mg/kg, and xylenes 1200 mg/kg. ADEC approves these alternative cleanup levels for the site identified in the Napaskiak FSA Report. The use of these cleanup levels will result in a conditional closure and require establishment of ICs to document the location of soil with residual contamination above the Method II levels and to provide notice that ADEC approval is required prior to transporting such soil offsite.

Fuel contamination is present in soils and surface water, based on information in the ADEC database for [Newtok site].

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=2813 (Accessed 3 September 2009).

There are two MMRP training areas in the vicinity of Napaskiak.

Newtok

Fuel contamination is present in soils and surface water, based on information in the ADEC database for this site. The May 2005 ADEC database includes the following details.

> ADEC staff reviewed the IAP and sent the following comments. The IAP includes the results of a SI and RI that indicate DRO up to 6,000 mg/kg and RRO up to 50,000 mg/kg are present in surface soil at the site. The samples had high moisture and organic content and the results are questionable. The Newtok FSA is located on a wetland. The introduction to the IAP states that there was an IRA during which 60 cy of contaminated soil was excavated. ADEC has no information on this action in our files. The IAP provides no further information on the IRA. The IAP introduction also states that there is a possible offsite source for petroleum contamination but does not provide any supporting information. This should be expanded upon in the IAP and the Alaska ANG should notify the person(s) responsible for this offsite source. Photographs in the RI show a pipeline on the ground on the north side of the armory. This pipeline is not included in the RI Report. The current use of this pipeline should be determined, and an investigation of its integrity should be preformed. If the pipeline is not in use, it should be cleaned and removed. ADEC does not have enough information at this time to agree that no further action is appropriate. Potential impact to the wetland needs to be assessed.

When the ACL Demonstration results are available, ADEC would like to work with the ANG to determine the most appropriate actions for the site.

In January 2006, ADEC noted that ADEC staff reviewed an ACL Demonstration Report and provided comments to the ANG. The site observations section of this report indicates the potential for improper disposal of drums and debris creating a sheen on the surface water at the site. The Alaska ANG should remove the drums and debris, and characterize any contents in the drums and the surrounding soil and surface water for potential contamination.

The Final RI Report, Site Characterization and Restoration-Related Activities Project, Newtok Federal Scout Armory, May 2008, report met the requirements of 18 AAC 75.335, Site Characterization, and was approved by ADEC. The ANG is reviewing the report and will submit a Decision Document containing the selected site remedy. ADEC will then make a decision on the acceptability of the proposed remedy and cleanup levels for the Newtok FSA.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=1558 (Accessed 3 September 2009).

Nightmute

Fuel-contaminated soils are at this site, and cleanup is not complete. The following information is summarized from the July 2004 ADEC database entry.

Nightmute Village is located on the Toksook River. Engineering/USFWS photo

ADEC completed review of the document titled Final IRA Plan, FSA, Nightmute, Alaska, dated March 2004. ADEC concurred with the general approach of the plan but could not provide approval to the plan as written. The plan provided a general approach for the excavation and handling of impacted petroleum-contaminated soil but lacked site specific detail for ADEC approval under 18 AAC 75. ADEC understood that the ANG is performing this action to reduce risk to human health and the environment under 18 AAC 75.330 and to provide for a partial cleanup at the site—not to achieve cleanup levels. It is presumed that information gathered during this interim action will provide data for use in determining any future actions required for site cleanup. ADEC had no objection to the interim removal approach provided and deferred any further regulatory decisions until site work data is completed.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=3199 (Accessed 3 September 2009).

There are five MMRP sites in the vicinity of Nightmute. DoD has never owned or controlled these undeveloped lands.

Nunapitchuk

Diesel spill–contaminated soil excavated and removed.

In April 2000, ADEC approved the interim action to excavate up to 10 cy of petroleum-contaminated soil from known hotspots, with soil to be stored in 55-gallon drums for future transport to an offsite treatment facility. In December 2001, ADEC received a Final IRA Report prepared by Clearwater Environmental, Inc. A total of 10 cy of DRO-contaminated soil was removed from the site and placed in 55-gallon drums for transport to the BNCI thermal treatment facility in Bethel. Confirmation soil samples collected from the excavated area were reported with DRO concentrations ranging from 514 to 14, 200 mg/kg. The site is on a f oating muskeg and consequently has surface water rather than groundwater that has been impacted by historic spills.

In April 2000, ADEC approved the interim action to excavate up to 10 cy of petroleum-contaminated soil from known hotspots, with soil to be stored in 55-gallon drums for future transport to an offsite treatment facility.

ADEC received the Alternative Cleanup Level Demonstration Project, Nunapitchuk Federal Scout Armory, December 2005, final report in 2008. The report did not address 2005 ADEC comments and did not accurately present the data obtained, and so does not meet the requirements of 18 AAC 75.335.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=1859 (Accessed 3 September 2009).

Two MMRP sites are in the vicinity of Nunapitchuk.

Scammon Bay

Fuel-contaminated soil is present. In August 2005, an IRA was approved by ADEC. The following information is summarized from the ADEC database.

> The IRA documents that approximately 43 tons of petroleum-contaminated soil was removed and treated at TPS Technologies in Washington. DRO were found up to 50,500 mg/kg remaining in the sidewall at the west end of the excavation and approximately 12,000 mg/kg on the south side of the excavation. Excavation was stopped because the contracted volume of soil had been reached. All GRO, and BTEX results were rejected due to high moisture content and a possibility of field sampling error. An Alternative Cleanup Level Demonstration Project for the site includes sampling and analysis for GRO and BTEX. Those results could be sufficient to allow determination of any necessary future actions regarding those analytes. ADEC approved the interim action under 18 AAC 75.330. However, because residual petroleum contamination in soil exceeds cleanup levels additional site characterization and/or cleanup are necessary.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=2821 (Accessed 3 September 2009).

There are five MMRP ranges in the vicinity of the Village of Scammon Bay and Paimiut.

Stebbins

Fuel-contaminated soil was excavated and removed from this site, but significant contamination remains and ICs are required by ADEC. The ADEC database provides the following information from September 2005.

> The IRA for the Alaska ANG site in Stebbins was approved by ADEC. It documents that 60 tons of petroleum-contaminated soil were removed and treated at TPS Technologies in Washington. DRO were found up to 42,700 mg/kg remaining in the southern sidewall of the excavation near the existing armory building at 28" bgs. Six other confirmation samples ranged from 575-8,010 mg/kg DRO and GRO up to 459 mg/kg left. Residual petroleum contamination in soil, for five of six confirmation samples, exceeds 18 AAC 75.341, Table B1, migration to groundwater cleanup levels, and additional site characterization and/or cleanup are necessary.

This was followed by a June 2006 ADEC entry, summarized as follows.

> Cleanup levels proposed are based on a site specific TOC content in the soil, dry bulk soil density, and an average moisture content of 14 percent (default 10 percent). The average moisture content was obtained by averaging the results of one sampling event. ADEC does not concur with the use of the average moisture value, as it should be obtained over multiple seasons. The dry bulk soil density is calculated from one sample during this event and two from the 1999 RI. Cleanup levels which are based on the migration to groundwater pathway, are GRO 558 mg/kg, DRO 504 mg/kg, benzene 0.0225 mg/kg, toluene 7.82 mg/kg, ethylbenzene 8.89 mg/kg, and xylenes 126 mg/kg. The use of these cleanup levels will result in a conditional closure and require establishment of ICs to document the location of soil with residual contamination above the Method II levels.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=3095 (Accessed 3 September 2009).

St. Mary's

Fuel-contaminated soil was excavated and removed from this site, but significant contamination remains and exceeds state standards. Additional site characterization and/or cleanup are necessary. Details from the ADEC database are summarized as follows for May 2002.

> ADEC approved the IRA plan (with addendum) prepared by Clearwater Environmental, Inc. The plan describes procedures to conduct an IRA in accordance with 18 AAC 75.330. ADEC determined that the proposed IRA will reduce human and environmental exposure to hazardous substances at the site and help prevent the migration of hazardous substances from the site to groundwater and surface water. Up to 20 cy of petroleum-contaminated soil will be excavated and placed in 55-gallon steel drums or one-cy Supersacks for temporary storage on site in an area lined with 10-mil polyethylene plastic. The drums or Supersacks will also be covered with a six-mil polyethylene plastic

> cover. Contaminated soil will be transported to a thermal desorption treatment facility located in Lakewood, Washington.
>
> The ROD was approved with the following cleanup levels: benzene 0.02 mg/kg, GRO 500 mg/kg, DRO 1,000 mg/kg, and RRO 2,000 mg/kg using Method I, Table A1 and Table B1 at 18 AAC 75.341. Approximately 20 cy of petroleum-contaminated soil will be excavated in accordance with an approved IRA plan.

This was followed by an entry in September 2005.

> ADEC approved the IRA Report for the Alaska Army National Guard site in St. Mary's. The report documents that 22.3 tons of petroleum-contaminated soil were removed and treated at TPS Technologies in Washington. DRO were found up to 20,200 mg/kg remaining in the southern sidewall of the excavation. Because residual petroleum contamination in soil, for five of six confirmation samples, exceeds 18 AAC 75.341, Table B1, migration to groundwater cleanup levels, additional site characterization and/or cleanup are necessary.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=3095 (Accessed 3 September 2009).

There are three MMRP sites in the vicinity of St. Mary's.

St. Michael

There is no listing for this site in the ADEC database, although a minor spill was reported in the ANG files. No volume was noted.

There is one MMRP site near St. Michael.

Toksook Bay

Fuel-contaminated soil was excavated and removed from this site, but cleanup has not been completed as of October 2005 as noted in the ADEC database.

> September 2000: The Alaska Soil Recycling facility treated 188.08 tons of petroleum-impacted soil from the Tooksok Bay site. Post-treatment analysis indicated the treated soil met Level A cleanup levels.
>
> July 2001: The IRA Report (Volumes 1 and 2) was prepared by Clearwater Environmental, Inc. A total of approximately 150 cy of DRO-contaminated soil was removed and stored in 55-gallon drums for transport to the Alaska Soil Recycling thermal treatment facility in Anchorage. Confirmation soil samples collected from the excavated areas were reported with DRO concentrations in five samples ranging from 4,800 to 12,000 mg/kg.
>
> October 2005: ADEC staff sent a comment letter on the Draft ACL Report. There are significant issues with the report that need to be addressed. In particular, the samples analyzed for total organic carbon are not representative of the soil where the contamination was detected. ADEC has not approved the ACL to date.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=2455 (Accessed 3 September 2009).

In the Toksook Bay area, the subsurface estate remains in federal ownership; therefore, any contamination at these sites will affect Refuge lands.

There are six MMRP sites near the Village of Toksook Bay, with the largest firing range consisting of three areas that cover 2,557 acres.

A 1998 report by EG&G Services (EG&G Services 1998) reported no hazardous waste and that [Tuntutuliak site] was obliterated.

Tuluksak

ANG records state that as a result of a fuel spill, 200 cy of soil were removed. There is no listing for this site on the ADEC Web site. There are two buildings on this site.

Tuntutuliak

A 1988 inspection by the Service, recorded in memos from October 19, 1988 and June 23, 1989 from Charles Hunt (Native Liaison) to Ronald Perry (Refuge Manager), found debris, drums, and fuel. Refuge file photos show oil tanks, debris, a truck, and a boat.

R. Perry (letter to David LaMore, Chief, Management and Disposal Branch, U.S. Army Corps of Engineers, Alaska District, December 12, 1988) stated coordination was needed between agencies, and clean up must occur at Kipnuk and Tuntutuliak before property transfer could occur. R. Perry (memo to Sandra Dunn, BLM , November 2, 1988) expressed concern about trash, equipment, oil drums, and fuel tanks as noted in the 1988 Service inspection and requested cleanup.

There was no cleanup as of 1992, and no funds budgeted by the Corps for clean up. ANG was scheduled to clean up these two sites before the Service would accept these properties. A fuel spill left soil concentrations of 150,000 mg/kg and 500 mg/kg DRO in surface soils. DRO-contaminated soils were found to depths of at least 1.5 feet. A 1998 report by EG&G Services (EG&G Services 1998) reported no hazardous waste and that the site was obliterated. In 2000, Qinarmiut Corporation expressed interest in the site.

This site is filed to return to the Refuge (USFWS Region 7 Division of Realty office files).

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=2824 (Accessed 3 September 2009).

There is one MMRP, a small arms training area, located near the village of Tuntutuliak.

Tununak

In the ANG files, fuel leaks reported included a 150-gallon fuel spill that occurred in 1995. The ADEC Web site database shows the following information for this site.

> August 1999: ADEC received Final SI Report, prepared by Hart Crowser, Inc.

January 2004: ADEC received draft ACL Demonstration Project work plan.

January 2006: ADEC staff reviewed and prepared comments on an ACL Demonstration Report.

February 2009: ADEC comments on the Final Secondary Site Characterization, Federal Scout Armory, Tununak, report noted that additional characterization of the contamination remaining at the Armory is provided, but it does not define the extent.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=3201 (Accessed 3 September 2009).

There are five MMRP sites in the vicinity of the Village of Tununak. Although there have been no known munitions response actions at these ranges, brass was collected after firing. DoD has never owned or controlled these lands. Weapons Qualification Areas 1 and 2 near the village encompass a portion of a Native allotment selection. If this parcel is not conveyed, it will remain in federal jurisdiction as Refuge property. If the land is conveyed and contaminants are found onsite, the United States would be unable to convey the parcel due to contamination (D. Jerry, letter to Y. Chong, February 15, 2008).

Cape Romanzof Long Range Radar Site

The Cape Romanzof LRRS base station and fuel storage area. This site has a history of fuel spills. D. Rudis/USFWS photo

The Cape Romanzof Long Range Radar (CRLRRS) site covers 4,900 acres on lands withdrawn from the Refuge and is surrounded by Refuge lands. The CRLRRS is located on a small peninsula that extends into the Bering Sea and is 160 miles northwest of Bethel. It was one of ten original USAF AC&W sites in the Alaska air defense system. Installation construction began in 1952, and operations began in 1953. In 1958, Cape Romanzof was established as a WACS site. A commercially owned and operated communications system, Alascom, established a satellite earth terminal in 1979, and the Cape Romanzof WACS was deactivated. The facility presently operates as a minimally attended radar site.

The USAF is the primary land manager for the facility, and they deal directly with ADEC on cleanup of past contamination at the site. The Service, along with other members of the public, including local communities and citizens, can offer comments to the USAF and ADEC on their cleanup activities, but these suggestions are not necessarily adopted. Ultimately, the cleanup actions are determined by and/or approved by ADEC.

The CRLRRS facility now is comprised of a Lower and Upper Camp connected by a gravel road and tramway. The Upper Camp houses radar and communication equipment and is situated on Towak Mountain at 2,250-foot elevation. The Lower Camp has a composite facility for industrial and living facilities, and the power plant and bulk fuel storage. It is situated in a glacial cirque at 1,550-foot elevation.

The USAF has to date identified 16 contaminated sites; they consist of landfills, drum storage areas, fuel spill areas, and leaking underground

Sediment samples indicated that Landfill Number 2 (LF03) was a primary contributor of PAHs, PCBs, chlordane, lead, and cadmium contamination.

storage tanks. Soil in some areas is contaminated with PCBs, pesticides, diesel, and other petroleum constituents. Multiple above-ground and below-ground fuel releases have occurred at the facility. ADEC also notes 16 sites in their database.

Wildlife and humans may be exposed to pollutants through dermal contact or accidental ingestion of contaminated soil or water. Contaminants that have bioaccumulated in fish and other wildlife may also pose a health threat to humans.

A Service contaminants study of the area around Cape Romanzof was completed in 1991 by Wayne Crayton, former Environmental Contaminants Specialist with the Anchorage U.S. Fish and Wildlife Service Field Office (Crayton 1991). Tissue samples from voles, fox, and fish, and sediment samples were analyzed for a variety of organic compounds. Most notable results were p, p' dichlorodiphenyldichloroethylene (DDE) was present in all but one tissue sample; p, p' dichlorodiphenyldichloroethane (DDD) was present in vole and fish samples; and total PCBs were found in all tissue samples. Sediment samples indicated that Landfill Number 2 (LF03) was a primary contributor of PAHs, PCBs, chlordane, lead, and cadmium contamination.

Figure 7. Location of the Long Range Radar Site (LRRS) on Cape Romanzof.

USFWS graphic

In 1992, United States Environmental Protection Agency (USEPA) conducted a Preliminary Site Assessment (PA) at this site and determined it did not score high enough to be added to the National Priorities List.

Confirmed or suspected contaminant source areas are identified as Installation Restoration Program (IRP) Sites or Areas of Concern (AOCs). An IRP Site is an official designation where contamination is verified. The site is recognized by federal and state regulatory agencies as requiring further examination and cleanup consistent with CERCLA. IRP sites are assigned a two-letter prefix indicating the type of contaminant discharge (e.g., SS=Spill Site, ST=Storage Tank, SD=Surface Disposal, DP=Dump Area, OT=Other, and LF=Landfill). An AOC is an area of suspected contamination that has been identified in the Preliminary Assessment/ Site Inspection (PA/SI) or

Figure 8. Cape Romanzof LRRS base structures and contaminated sites.

equivalent phase of site characterization. An AOC usually requires further evaluation to determine if the site can be closed or if further restorative action and IRP designation are required.

A proposed closure plan for six sites at CRLLRS was developed by the USAF in 2006 and a final management action plan in 1998. USAF actions as of fall 2008 for various Cape Romanzof sites are as follows. A ROD was signed on sites SS007, ST009, DP011 and SS014. In April 2008, a five-year review was signed for LF003, SS013, and SS015. In September 2008, they completed field work on the RI of sites LF003, SS010, SS016, and SS017. Field work was also completed on sites ST009, SS013, and SS015. A ROD on SS013 and SS015 were contracted in late 2008. In 2009, reports should be completed for the September 2008 field work, and Agency for Toxic Substances and Disease Registry is scheduled to review the subsistence study report. In 2010, a Feasibility Study (FS) is scheduled for LF003, SS010, SS016, and SS017.

In 2007, the USAF proposed remedial actions at several sites or operable units at the CRLRRS. More detailed information can be found at the following sources.

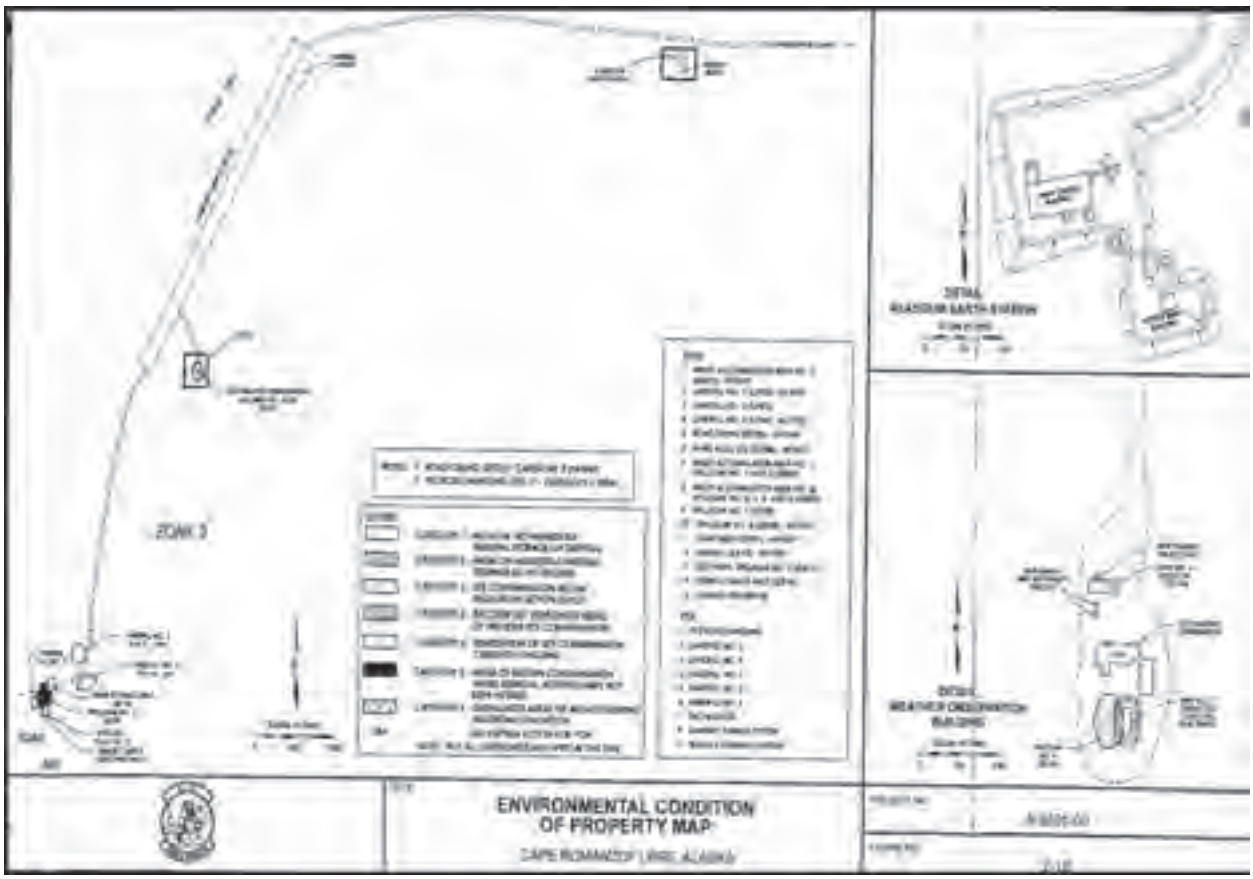
ADEC has an online database with information on various contaminated sites in the state (https://www.dec.state.ak.us/spar/csp/search/default.asp).

Cape Romanzof information can be accessed by entering that site name in the "Facility/Site Name" field.

There are 16 ADEC record entries for Cape Romanzof. Each represents a specific contaminated area (e.g., landfill, spill area) or a collection of more than one site. The ADEC Web site with information about the CRLRRS sites is at https://www.dec.state.ak.us/spar/csp/search/results.asp On the right side of the page, there are icons for documents. Each document lists ADEC database entries, with a history of notes/actions for that particular site or issue.

Information and/or some of the original source documents, such as preliminary assessments, site inspections, comment letters, etc., can be found at the USAF Administrative Record site. (http://www.adminrec.com/PACAF.asp?Location=Alaska). Select "Cape Romanzof" on the left of the page, select the "Unlimited records per page" button, to see old reports, and select "View Cape Romanzof Index." There is a list of approximately 141 documents, including letters, reports, etc. The USAF entries stop in 2004, and there has been additional activity since then.

Figure 9. Cape Romanzof LRRS upper structures and contaminated sites.



U.S. Fish and Wildlife Service Site Visit (August 2005) and Site Information from U.S. Air Force Remedial Investigations and Removal Actions

In 2004 sampling, the truck fueling station (ST09) soil and groundwater samples had diesel fuel contamination above cleanup levels.

Sites are described from the coastline up the road to Towek Mountain. Most of the immediate shoreline of Kokechik Bay is granite cobble, and there is an extensive sand bar. Few invertebrates were noted on this trip. A herring camp is located here in the spring.

ST009 - This site was a former truck fueling station located less than 200 feet east of Fowler Creek. Also classified as spill site #3, it is located next to a former beach warehouse (now demolished) and near the northern wall of the passive biocell. Extensive routine POL losses occurred at this site since the 1950s. There are contaminated soils and groundwater and PCBs in surface water downgradient of the site. In 1991, a 46,000-gallon fuel spill occurred from leaking underground storage tanks (USTs). Approximately 1,910 cy of soil were removed and placed into nearby biocell number 1 in 1993. Monitoring wells were established in 2004. PCB sampling was conducted in 2004, with no detections. Monitoring well 7 (MW-7) was a "hot" sample in the last sampling period (D. Akres, Arctec Alaska, Cape Romanzof site manager, personal communication). There is a salmon creek along the edge of this site with small beaver ponds and lodges upstream.

In 2004 sampling, the truck fueling station (ST09) soil and groundwater samples had diesel fuel contamination above cleanup levels. Surface water and sediments are not contaminated above cleanup levels at this site.

ADEC has reached some recent regulatory decisions regarding this site and some other operable units at CRLRRS. Specifically, ADEC has determined that although site ST009 does not pose unacceptable risk to human health or the environment, soil contamination above concentrations that would allow unrestricted use have been left in place; therefore, ICs are proposed for this site. ADEC has determined that conditional closure with groundwater/surface water monitoring is appropriate at this site. The Remedial Action Objectives (RAOs) for ST009 are: a) ensure that groundwater contamination is not migrating downgradient into Kokechik Bay at levels that could be detrimental to surface water quality; b) restrict use of the groundwater as long as the groundwater DRO concentrations exceed ADEC cleanup levels that are protective of drinking water; and, c) restrict

Cape Romanzof LRRS site landfills are graded and have closure signs. Those with surface and groundwater contamination have monitoring wells. D. Rudis/USFWS photo

Fowler Creek drains the Cape Romanzof LRRS. A 1992 Service report found creek sediments and biota were contaminated with petroleum hydrocarbons; biota also had PCB and DDT-related compounds. D. Rudis/USFWS photo

direct contact with petroleum-contaminated subsurface soil, and document that petroleum hydrocarbons in surface and subsurface soil exceed levels protective of unrestricted use. Because contamination will remain onsite above cleanup levels, five-year reviews will be conducted until cleanup levels have been met. ICs will remain until applicable cleanup levels are achieved in the soil and groundwater.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=1339 (Accessed 3 September 2009).

SS14 - This upper coastal site was a waste drum storage area where drummed liquid wastes had been staged for shipment. The site is east of the beaver ponds near the mouth of Fowler creek, and south of the creek. Based on the ADEC site database, approximately 1,152 cy of POL-contaminated soil were removed in1995 and placed in biocell number 1, the cell closest to the beach. Three monitoring wells were installed. Stained soils and stressed vegetation were noted by cleanup contractors in 2004. Twenty-one soil borings were drilled at this site. Soil samples from these borings were field screened and submitted for laboratory analysis. Based on these results, approximately 755 to 1,500 cy of DRO-contaminated soil is present at this site. Sediment, surface water, and groundwater POL contaminant concentrations were not above established cleanup levels. Monitoring well and surface water samples were all non-detect for PCBs and other COCs.

Metals are within background range for Alaska and are found, in similar magnitude, throughout the Cape Romanzof area.

Three lower mounds on the south side of the creek are former large fuel tank sites that have not been sampled to date. Spill potential exists in this area. An additional unused biocell is also located in this area.

ADEC has concluded that ICs are necessary at SS14. Additional details about this site from the ADEC Web site database are summarized as follows.

> ADEC staff reviewed and commented on the *Draft Record of Decision SS007, ST009, SS014, DP011, Cape Romanzof LRRS*, dated December 2007. ADEC requested adding another RAO which describes land use restrictions. Current and future land use at the facility will remain as the current land use (minimally-attended radar system) with temporary residents only.

ADEC requested the text specify the land use scenario/assumptions (i.e., based on industrial use with temporary residents). Example language: "The Method III cleanup levels represent the maximum allowable DRO and GRO cleanup levels under Alaska regulations; these cleanup levels are protective of the ingestion and inhalation pathways at SS014 based on industrial land use with temporary residents." ADEC requests adding text as follows: "However, ICs are required to restrict land use at ST009 and SS014 to industrial use with temporary residents to ensure compliance with the exposure assumptions in the risk assessment…." (i.e., no subsurface activities that would allow exposure to subsurface soil and no groundwater use for water supply at ST009)."

An incident in1979 involved a loss of 500 gallons of diesel fuel from a 25,000-gallon tank near the runway that was formerly located at [SS10].

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=1340 (Accessed 3 September 2009).

SS15 - Diesel contamination in soil and groundwater was confirmed from two abandoned USTs connected to an active pipeline, with an estimated release of 46,000 gallons of product. In 1995, the USAF excavated contaminated soils from three source areas: SS15 (spill site/USTs), SS08 (waste accumulation area), and SS14 (drum storage area). Information from the ADEC Web site database is as follows.

In July 2002, the ADEC, DoD section manager, signed an interim ROD for LF03, SS15, SS13. RAOs for the groundwater at this site are GRO 1.3 mg/L (7.95 mg/L 1997 WW02), DRO 1.5 mg/L (WW02 400 mg/L), RRO 1.1 mg/L (WW02 1.38 mg/L), and benzene 0.005 mg/L (WW02 1.11 mg/L). Monitored natural attenuation with ICs is the selected remedy for SS13 and SS15. ICs will restrict access to the contaminated groundwater, soils, and sediments. This interim action is protective of human health and the environment in the short term and is intended to provide adequate protection until a final action ROD is signed. A five-year review will be necessary to ensure that the remedy is protective of human health and the environment (Section 121 CERCLA). The first five-year review was due in July 14, 2007.

The selected remedy for SS15 is monitored natural attenuation of all COCs, long-term groundwater monitoring to confirm the progress of natural attenuation of the fuel contaminants, and soil sampling to confirm the progress of natural attenuation of fuel constituents in soil.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=1329 (Accessed 3 September 2009).

SS10 - This was the site of spill/leak #4. SS10 is near the present weather station building; the old weather station building was demolished after asbestos abatement in 2003. All demolition materials were placed in an on-site landfill. An incident in1979 involved a loss of 500 gallons of diesel fuel from a 25,000-gallon tank near the runway that was formerly located at this site. In 1994, ADEC reported no visible staining or obvious contamination at the fuel tank/berm area. The tank was demolished in 1996. In that year or later, the tank containment berm was leveled and the site graded to fit the landscape. There was no record in the ADEC file of confirmation sampling done post-tank removal. The former USAF site name is ROM-2 for SS10 Weather Station Wells Number 2 and 3 plus Spill Site #4. The EPA ID is AK9572728633.

The area around the Weather Station Building has been extensively reworked by heavy equipment, and it is believed that Well Number 2 may have been buried or destroyed.

Pipelines at the Cape Romanzof LRRS carried fuel to the facility. D. Rudis/ USFWS photo

The following additional information on this site is from the ADEC record.

Water Well 2 was drilled from October 25, 1962–November 17, 1962, by F & M Branch, close to the Weather Station above the airstrip on the south valley slope, to serve the Weather Station Building.

The well reportedly became contaminated with POL products in 1964 (Feulner 1966). Later in 1965, efforts to purify the water for continued use utilizing a charcoal filtration device were not successful (Feulner, 1966).

The area around the Weather Station Building has been extensively reworked by heavy equipment, and it is believed that Well Number 2 may have been buried or destroyed. Groundwater from this well was reported to be contaminated with fuel oil in 1964 (Feulner 1966). The 1989 field investigation and the 1990 visit at this site found no evidence of any well at this reported location; an aboveground petroleum storage tank was observed uphill from this location.

A January 2004 notation indicates Building 4100, the old weather station building adjacent to the runway below Lower Camp, was demolished following asbestos abatement. It was a single story wood frame building that covered approximately 2,168 square feet. All materials derived from the destruction of the building were placed in the on-site landfill. A 25,000-gallon diesel above-ground tank was located approximately 40 feet south of the building. A moderate sized fuel spill had occurred along the west side of the AST in the 1970s. The tank was demolished during an earlier clean sweep program in 1996, and the tank containment berm was leveled and graded to fit the contours of the landscape in 1996 or at some later date. There was no visible staining or obvious contamination at the fuel tank/

berm area. (NOTE to ADEC file: no mention of confirmation sampling taken at the fuel tank/berm area or field screening).

In 2006, workers installing an underground utility reported a strong fuel odor while excavating a trench through the pad near the weather station building. All excavated soil was placed back in the trench, and no analytical samples taken.

In February 2008, a Draft Work Plan for RI at four source areas (LF003, SS010, SS016 and SS017) was received by ADEC, indicating the 2008 RI field effort would focus on addressing the uncertainties and identified data gaps. "In general, the 2008 field effort will use high density surface and subsurface soil sampling with field screening for multiple contaminants to define the nature and extent of contaminants, and lower density laboratory analytical sampling to confirm sufficient delineation. The sampling strategy is as follows. 1) A minimum of five soil borings will be advanced at 25-foot intervals parallel and perpendicular to a utility trench which was previously identified as contaminated, to determine the source and define the nature and extent. Soils will be screened, and analytical samples of both surface and subsurface soil will be collected based on screening results. 2) Monitoring wells will be installed in-source and downgradient of SS010. Wells will be developed and analytical samples will be collected to determine if impacts to groundwater have occurred. Both analytical and field groundwater quality parameters will be collected to assess intrinsic remediation at SS010. 3) Analytical samples of surface water and associated sediment may be collected from Fowler (Nilamut) Creek, downgradient of SS010, to determine if contaminant migration is occurring. Analytical sample locations will be based on screening results."

In February 2008, a Draft Work Plan for RI at four source areas (LF003, SS010, SS016 and SS017) was received by ADEC, indicating the 2008 RI field effort would focus on addressing the uncertainties and identified data gaps.

The Draft Remedial Investigation Report using TRIAD approach was received by ADEC in March 2009. Of the soil borings sampled at SS10, one surface soil sample contained two constituents in excess of Method II migration to groundwater screening criteria: DRO (1,200M mg/kg), and arsenic (5.78B mg/kg). Twenty-six subsurface soil samples collected for lab analysis were in excess of screening criteria: 24 samples contained arsenic, three samples contained DRO, and one sample contained 1,2,4-Trimethylbenzene, 1-Methylnaphthalene, 2-Methylnaphthalene, benzene, DRO, and GRO. DRO results ranged from 840 mg/kg to 11,000 mg/kg. GRO was found in one boring at 1,180 mg/kg. Based on property boundaries provided by the BLM, the general location of SS010 is within lands withdrawn by the USAF. The area of surficial contamination found near the utility trench (1,000 square feet) is likely the result of past surface spills or leaks from piping runs or building connections from the Old Weather Station Building 4100 to diesel fuel AST Tank #11. The largest area of contamination (15,200 square feet) is likely remnant contamination from Spill/Leak #4 from the 25,000 gallon AST Tank #4 (removed). The limited surficial contamination (approximately 2,300 square feet) may be associated with surficial debris that was observed in the vicinity around the borings. Irregularly shaped berms were also located several feet from the boring locations. The nature of these berms could not be determined. Contamination in this area appears to be limited to the vicinity of the soil borings. A surficial area of contamination which generally parallels the reportedly contaminated utility corridor is approximately 1,000 square feet

in size. The area is conservatively estimated to reach a depth of 5 feet bgs (approximately 185 cubic yards). Two subsurface zones of contamination were identified at SS10 at the former location of the 25,000-gallon AST. A shallower zone of contamination was estimated at 15.200 square feet. A deeper zone of contamination (approximately 9,500 square feet in area), delineated from soil borings, has a vertical extent of contamination that extends beyond the depths reached during the 2008 RI (approximately 20 feet bgs), and likely extends to the water table. A localized area (approximately 2,300 square feet) was identified approximately 300 feet southwest of Weather Station Building 4101 at approximately 3 feet to 7 feet bgs in soil boring SB-23. Metallic surficial debris as well as unusual berm shaped features (5 to 6 feet tall), were observed in the immediate area of soil borings during the 2008 RI. Based on field screening and analytical results from samples collected at nearby soil borings, the DRO exceedance appears to be localized to the vicinity of this soil boring. Sediments downgradient of SS10 contain elevated arsenic which is likely representative of naturally occurring concentrations. Delineation of contaminant migration to groundwater could not be achieved during the 2008 RI as the suspected groundwater depth (approximately 70 feet bgs) was not reached with the direct-push drilling method. Historical reports indicate groundwater from Well #2 contained a petroleum odor, and is likely impacted at this source area. Collocated surface water and sediment samples from downgradient of SS10 indicate migration into Fowler Creek has not occurred.

Potential COCs included lubricating oil, hydraulic fluids, ethylene glycol, and possibly solvents.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=1334 (Accessed 3 September 2009).

OT05 - Road oiling with various liquid industrial wastes occurred between 1953 and 1978. The description states that liquid industrial wastes were commonly applied to adjacent drainage ditches and road surfaces for dust control. Potential COCs included lubricating oil, hydraulic f uids, ethylene glycol, and possibly solvents. Sample analyses, referenced in 1993, reported no PCBs, with TPH at 100 and 380 mg/kg. The Proposed Closure Plan stated that only two samples were taken to represent the entire road. The Service raised concern about this small number of samples. This site was proposed for closure in the Proposed Closure Plan for six sites at CRLRRS. In 1993, the site was determined to be of insignificant risk, and no further action was required. If additional contamination is discovered, ADEC may require further investigation and/or remedial action.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=1342 (Accessed 3 September 2009).

LF03 - Landfill Number 2 is situated south of the access road between the Lower Camp and the airstrip; it covers approximately 43,800 square feet. It is located about 0.5 miles west of the road leading to the Upper Camp. Landfill Number 2 was operated from the 1950s to the 1970s and received a variety of contaminants. Reportedly, LF03 received garbage, rubbish, wood, metal, plastic, construction and demolition debris, shop wastes, and incinerator ash. POL, PCBs, chlordane, lead and cadmium, and heavy metals have been detected. The landfill was capped in 1994 with an impermeable hypalon liner overlain by geotextile fabric between layers of sand and pit-run material.

The 1992 Service study found that Landfill Number 2 (LF03) at the Cape Romanzof LRRS was a primary contributor of contaminants, including PAHs, PCBs, chlordane, lead, and cadmium to Fowler Creek sediments. D. Rudis/ USFWS photo

ADEC states that soil contamination has been dealt with and long-term groundwater monitoring is ongoing. PCBs have primarily been detected in downgradient sediments and concentrations were found to be increasing in one sampling location. Groundwater and surface water samples collected from 1999 to 2003 did not exceed ADEC groundwater or surface water criteria for cleanup levels. In 2000, nickel and beryllium slightly exceeded the maximum contaminant level (MCL) (drinking water standards) in one monitoring well downgradient from LF03, and lead and cadmium exceeded the MCL at another monitoring well downgradient from the landfill. ADEC said, "Elevated levels of metals at these wells may be associated with migration of contaminants from the landfill. Recommend continue long term monitoring of groundwater and surface water." All three near surface soil samples had DRO concentrations exceeding cleanup levels. Concentrations ranged from 16,800 to 59,400 mg/kg. Final report recommendations made in 2004 were to continue long-term groundwater, surface water, and soil monitoring at this location. Additional recommendations included continued inspection of the landfill cap and reconfiguring the area to allow proper drainage. Because seep areas with rust colored stained soils were identified in 2000, additional sampling was recommended at those three sites to determine if there is contaminant migration from the landfill.

In 2004, the USAF planned to conduct a limited removal of PCB-contaminated soils from around the former landfill. Additional site characterization revealed more PCB contamination, and this will be addressed in a future remedial action that most likely will involve capping the landfill. Biocell soil was placed on LF003 as cap material and covered with impermeable liner in 2004.

PCBs are a significant issue at this location. A summary of the February 2005 ADEC database entry includes the following.

> Concentrations of PCB-1260 are consistently above the cleanup level in samples taken along the seep f ow path. PCB concentrations are generally higher closer to the landfill and decrease downgradient. The highest concentration of PCB was noted in sample SS-18, just downgradient from SD2, with a concentration of 195 mg/kg. SS-18 was collected west and down slope of SD2 in the approximate location of

where PCBs had previously been detected at a concentration of 395 mg/kg. No samples taken from the Fowler Creek area were above the cleanup level.

As evidenced by the three seeps emerging from the landfill toe, water is still entering the landfill, despite the landfill cap. Future efforts to prevent water from entering the landfill are recommended, as these efforts may prevent further migration of PCBs downgradient towards Fowler Creek. Possible efforts to prevent infiltration of water could include: diverting the existing drainage ditch upgradient of road, building impermeable water device layers upgradient of landfill, and constructing a bottom liner for the landfill.

In March 2005, ADEC noted that monitoring should continue.

In summary, although the primary line of evidence suggests that natural attenuation is acting to keep hydrocarbon levels at this site stable or declining, the secondary evidence for natural attenuation does not exist. Recommendations are that groundwater, soil, sediment, and surface water monitoring should continue.

ADEC will require periodic reviews to evaluate whether current site conditions and remedial measures are and will continue to be protective of human health and the environment for those sites not remediated under CERCLA authority (i.e. state authority).

A March 2008 update also states that ADEC staff reviewed and commented on the Draft-Five Year Review for LF003, SS013, SS015. Staff indicated sites with surface water and groundwater contamination at any point in time would need all of these monitoring points sampled one year prior to the five-year review or in the same year to be included in the five-year review. ADEC will require periodic reviews to evaluate whether current site conditions and remedial measures are and will continue to be protective of human health and the environment for those sites not remediated under CERCLA authority (i.e. state authority). ADEC requests the text throughout the document in final reporting be corrected to ref ect current (if any) land use controls for LF003.

The Draft Remedial Investigation Report using TRIAD approach was reviewed by ADEC in March 2009. Conclusions are that collocated surface water and sediment samples collected along Fowler Creek both up and down stream of LF003 indicate minimal or no impact to Fowler Creek from upstream. Sample results indicate PCB contamination is limited to two areas around the east and south of the landfill perimeter (1,000 and 775 square feet respectively). Sample results indicate an area approximately 2,970 square feet had surface soil results in excess of the regulatory screening criteria . Sample results indicate that seep sediments are contaminated along the length of the seep emanating from the northwest corner of the landfill through approximately the location of SS07 (approximately 1,755 square feet). Sample results from five sediment samples indicate that seep sediments are contaminated along the length of the seep emanating from the northwest corner of the landfill. PCB results ranged from 60 mg/kg to 240 mg/kg. All sediment and surface water results for samples collected along Fowler Creek were below the method detection limits, indicating PCBs are not migrating from the identified source areas near the landfill through discharge pathways to Fowler Creek. Based on field testing and analytical results, the sampling grid indicates an area approximately 100' by 80' (8,000 square feet), is in excess of the regulatory screening criteria of 1.0 mg/kg. Based on surface water and sediment analytical results from

The asbestos landfill is signed as a closed area at the Cape Romanzof LRRS. D. Rudis/USFWS photo

samples collected within the seep pathway upstream of SS-18, the primary PCB source area appears to be upstream of SS-18.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=1341 (Accessed 3 September 2009).

LF04 - Landfill Number 3 is located almost adjacent to the present Lower Camp area. This location was used for disposal of various wastes, debris and garbage. Petroleum-contaminated soils (TPH at 100 mg/kg, the State of Alaska clean up level) are present at the site. Since the TPH did not exceed state cleanup standards, remediation was not required. Biocell-contaminated soils were used as capping material for this active landfill. A leaching model run using site specific data showed that groundwater would not be contaminated with any petroleum constituents. An additional level of conservatism is incorporated since soils will be mixed with clean fill, covered with at least eight inches of clean soil and then revegetated. ICs include restrictions for no residential land use or occupied buildings to ever be built on it. They will be in place and enforced by the closure plan submitted to the ADEC solid waste program.

An adjacent asbestos disposal pit is signed as an IC. The ADEC solid waste permit issued in 2004 (SWG0307004) allowed the following materials, inert municipal ash, regulated asbestos containing material (RACM) asbestos, non-RACM asbestos, and sludge. RACM is any material that contains greater than one percent asbestos and is friable. Both RACM and non-RACM asbestos may be buried at this site; hence, the asbestos warning signs that are posted at this active landfill. The following information on asbestos wastes is summarized from the ADEC Web site.

> Some common examples of RACM are spray acoustic ceilings, acoustic tiles, various plasters, duct wrap, paper backing of linoleum, non-bituminous roofing felt, wallboard, joint compound (joint "mud"), and thermal insulation on pipes and boilers. Use of asbestos in the manufacturing of these products was banned by 1978. However, some products remained on the shelf and were used in the construction of buildings and homes for several years thereafter, and some are still used today. Non-friable ACM is typically bound up with cement, vinyl, asphalt, or some other type of hardening binder. Some examples of non-friable asbestos building products are transite (cement) siding, vinyl asbestos f oor tiles, and asphalt roofing shingles. Non-friable materials are not regulated. Some non-friable asbestos materials are

still being manufactured. Note: non-friable ACM can become RACM if it is pulverized or turned to dust during remodel and/or repair activities. Non-friable ACM can also become RACM if it is burned.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=1337 (Accessed 3 September 2009).

At the SS13 Landfarm site, 1750 cy of contaminated soil was excavated and treated by soil washing. Soil was excavated to within a few inches of the tundra surface, achieving total cleanup within the site.

LF12 - The 5099th Landfill was used from 1987–1988 as a disposal pit for metal, concrete, wood, and other demolition products from the demolition of Lower Camp facilities. The site was backfilled. A soil gas survey was done in 1989, and two soil samples were collected at the areas of highest soil gas readings. TPH was detected at a low concentration (30 mg/kg); no other contaminants (metals, TPH, VOCs, SVOCs, PCBs) were detected. Because no State of Alaska cleanup levels were exceeded, the site was closed out. If additional contamination is discovered at these sites in the future, further investigation and/or remedial actions may be required by ADEC.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=1338 (Accessed 3 September 2009).

SS13 - SS13 is located approximately 1,000 feet south of the Lower Camp and can be accessed by foot or vehicle by the north-south road from the Lower Camp. This site is adjacent to a wetland and a salmon spawning stream (Fowler Creek). Several major spills and leaks of diesel fuel and motor gasoline (MOGAS) from storage tanks and pump fill nozzles contributed to contamination at SS13. Native vegetation was severely impacted by a spill that occurred in 1979. In 1985, 14,000 gallons of fuel spilled near the incinerator (Building 2-219) when a fuel bladder was being pulled across the snow and ruptured. Fuel f owed under the dining hall and commissary. Drummed new products and liquid wastes were also stored at this location until 1982.

A Remediation Report of 1995 and 1996 Field Activities presents the results of remedial actions at four POL-contaminated source areas using a soil washing treatment process. At the SS13 Landfarm site, 1750 cy of contaminated soil was excavated and treated by soil washing. Soil was excavated to within a few inches of the tundra surface, achieving total cleanup within the site. Treated soil was backfilled in excavations and graded. DRO less than 1000 mg/kg was recommended.

Natural attenuation was the preferred alternative selected until cleanup levels are met. Surface and groundwater sampling in 1999 showed natural attenuation processes were ongoing. DRO was the only analyte to exceed cleanup levels. Analytical results for surface water samples in 1999 showed that hydrocarbon constituents were below method detection limits for parameters analyzed. Presently, soil contamination was addressed, groundwater monitoring is ongoing, and no further remedial action is planned.

ICs were imposed at this site by ADEC in a 2002 Interim ROD restricting access to the contaminated groundwater, soils, and sediments. This interim action was considered by ADEC to be protective of human health and the environment. ADEC approved a sampling work plan for this site

in July 2006. A five-year review of this site in 2008 by ADEC found that the remedy at SS13 is expected to be protective of human health and the environment when completed, and in the interim, exposure pathways that could result in unacceptable risks are being controlled. However, they also stated that if land use controls are not in place, then they will need to be established for the entire acreage covered by LF003 as well as the area where off-site migration of PCB contamination is present downgradient of the site.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=1335 (Accessed 3 September 2009)

SS007 became a solid waste disposal area for building debris in 2004. It is managed by the USAF in accordance with 18 AAC 60, Solid Waste regulations. The land is available for unrestricted use.

SS007 - Waste Accumulation Area 1 and Spill Locations 1 and 2, formerly referred to as ROM-3, is at the south end of the demolished Lower Camp. Waste Accumulation Area Number 1 was used as a staging and temporary storage area located next to the power plant. In the past, the area was the waste accumulation area for the entire station. Spill/Leak #1 was a UST adjacent to the power plant, which experienced several spills and leaks as a result of fueling vehicles and other equipment. Spill/Leak #2 occurred in 1979 when a diesel fuel bladder towed over snow by a track vehicle ruptured and spilled 470 gallons of fuel near the power plant. In 1996, petroleum-contaminated soil excavation from the site and bioremediation was approved. Drum removal and natural attenuation was the preferred alternative approved in 1998. Closure was approved for this site by ADEC in 2001.

In April 2007, ADEC proposed unconditional closure of this site because contamination is below levels allowed in Alaska's contaminated site regulations. In addition, the site does not pose an unacceptable potential risk to human health or the environment.

A focused RI in 2005 showed that Site SS007 is covered by approximately 15–25 feet of disposal material, and DRO is present in soil (at the toe of the disposal area) at concentrations slightly above the ADEC Method II cleanup level. However, the detected concentrations do not pose unacceptable potential risk to human health or the environment. All four samples had DROs at concentrations between 38 mg/kg and 479 mg/kg. Two DRO detections were above the ADEC Method II cleanup level of 250 mg/kg, which is protective of the migration to groundwater pathway, (479 mg/kg and 301 mg/kg). However, all DRO detections were significantly below the cleanup levels protective of inhalation and ingestion (10,250 mg/kg). Risk calculations were not performed for SS007 because no COCs have been identified at SS007. COCs are constituents of petroleum products (i.e., DRO and GRO) and are therefore excluded as CERCLA hazardous substances under the CERCLA petroleum exclusion. As there are no CERCLA COCs, a "no action response" is the selected remedy for this site under CERCLA. The site is buried under 15–25 feet of disposal material, so there is no complete exposure pathway to contamination if it were present. SS007 became a solid waste disposal area for building debris in 2004. It is managed by the USAF in accordance with 18 AAC 60, Solid Waste regulations. The land is available for unrestricted use.

The December 2007 ADEC database update further defined the unconditional closure of this site.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=1336 (Accessed 3 September 2009).

SS15 and USTs - SS15 is located 200 feet south of the Lower Camp, and just south of the Waste Accumulation Area 1. Initial fuel spills from leaking tanks occurred in the 1970s. In 1985, a 14,000-gallon diesel fuel spill affected this adjacent area. In 1985, a number of spills occurred. One was 1,000 gallons of MOGA; another was about 1,500 gallons of diesel lost from piping in the same vicinity. In addition, two abandoned USTs released diesel in 1985. The two USTs were left connected to an active fuel line at the time they were abandoned. This allowed fuel to flow into them each time the intermediate tank was filled from bulk storage. Based on records of fuel discrepancies since 1985, it is estimated that lost fuel totaled 46,000 gallons. However, the USTs abandonment date is not known. It is likely that considerably more fuel was spilled to the environment. The estimated volume of fuel saturated ground at that time by GE Government services was placed at 100 feet by 100 feet x 50 feet deep.

ADEC Method II cleanup levels are considered protective of human health and the environment and allow for unrestricted land use and access.

About 900 cy of soil and the two USTs were removed from this area in 1991. Because pipeline connections to these two tanks remained after the tanks were abandoned, fuel continued to flow into these tanks.

The 1993 Remedial Investigation/Feasibility Study (RI/FS) sampling results indicated petroleum hydrocarbon DROs, GROs, and BTEX contamination remained above the ADEC current 18 ACC 75 Method II cleanup levels. ADEC Method II cleanup levels are considered protective of human health and the environment and allow for unrestricted land use and access. The solvent trichloroethene was detected at 0.001 mg/L in a sample from one of six groundwater monitoring wells. The cleanup level for this compound is 0.005 mg/L. Groundwater sampling performed in 1997, 1999, 2000, 2003, and 2004 suggests that a DRO/GRO plume with decreasing benzene concentrations is present.

In 1995, the USAF excavated contaminated soils from three source areas: SS15 (spill site/USTs), SS08 (waste accumulation area), and SS14 (drum storage area).

The 2002 Interim ROD for this site required long-term monitoring to evaluate natural attenuation of existing contamination. ICs were established for this site in 2002. In 2006, ADEC reviewed the latest USAF sampling plan for this site. Soil contamination has been dealt with to the maximum extent practicable. Contaminated groundwater monitoring is ongoing. No further remedial action is planned for this site.

A summary of the March 2008 update for this site states that ADEC staff reviewed and commented on the Draft Five-Year Review for LF003, SS013, SS015.

> Sites with surface water and groundwater contamination at any point in time will need to have all groundwater and surface water monitoring points sampled one year prior to the five-year-review, or in the same year to be included in the five year review. SS015 Well WW-04 1993 had detections above cleanup levels for either BTEX, GROs,

and/or DROs in 1993 and 1997. It was never sampled again after that time and was not sampled in 2007, prior to the five-year review, for any constituents that had exceeded groundwater cleanup levels.

The 2008 update states the review is limited to only the sites specified that are being remediated under CERCLA authority. ADEC will require periodic reviews to evaluate whether current site conditions and remedial measures are and will continue to be protective of human health and the environment for those sites not remediated under CERCLA authority, i.e. state authority.

In the final reporting requirements and site closure (other information requested by ADEC, as ADEC determines necessary to ensure protection of human health, safety, or welfare, or of the environment), the text states: "The land use still represents a relatively low level of occupancy and activity, but no land use controls have been established. Therefore, the potential for completed exposure pathways still exist at the present time."

Typically, a statutory review is triggered by the initiation of the first remedial action that leaves hazardous substances, pollutants, or contaminants on site at levels that do not allow for unlimited use and unrestricted exposure.

This is in direct conf ict with statements at 2.5 Installation Land Use Control and Remedy Implementation, 3.4.2 Remedy Implementation on Page 3-7, and 3.10 Protectiveness Statement on Page 3-15. The text states if the items discussed are not completed before 2013, five years from the date of this review, the next five-year review will be performed as required.

ADEC disagrees. Typically, a statutory review is triggered by the initiation of the first remedial action that leaves hazardous substances, pollutants, or contaminants on site at levels that do not allow for unlimited use and unrestricted exposure. In cases where there are multiple remedial actions, the earliest remedial action that leaves such substances on site (at any source area on CRLRRS—not just LF003) should trigger the initial review, even if it is an interim remedial action. In 5.10 Protectiveness Statement(s), ADEC concurs the remedy at SS015 is expected to be protective of human health and the environment when completed; and in the interim, exposure pathways that could result in unacceptable risks are being controlled.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=1329 (Accessed 4 September 2009).

SS001 Waste Accumulation Area 2 - This site is located near the Lower Camp bulk storage tanks. Waste Accumulation Area 2 was used to store drummed new product and liquid waste from 1982 to at least 1985. The liquid waste probably consisted primarily of waste oil with small quantities of solvents, hydraulic f uid, and ethylene glycol. The site is located within the boundaries of SS15. Only 14 people were stationed at the installation when this area was first used; therefore, the quantity of waste generated was likely small. During the 1987 site reconnaissance and the 1989 RI/FS activities, no evidence of contamination was found at SS001. Sampling in 2000 did not find contamination in areas downgradient of the site.

The 2001 entry in the ADEC database indicates that during the 1989 field investigation, the field team was not able to determine the exact location of the site because all drums and surface features had been removed in the

late 1980s during a demolition and cleanup of the Lower Camp. The entire area was graded at the completion of demolition, covering or removing any stains if they had existed. The ground surface of this area consisted of rock rubble and gravel fill over tundra. The reported location of Waste Accumulation Area 2 was at the edge of the fill, where the gravel pad sloped sharply to the surrounding tundra about six feet below. The 1989 field team could not find any visual indications of contamination, such as staining, on the tundra below the estimated location of Waste Accumulation Area 2. No laboratory samples were collected. The area believed to comprise the former Waste Accumulation Area 2 was (at the time of the site visit) being used to store diesel and MOGAS fuels in two above-ground horizontal, cylindrical tanks. A pump house with fuel dispensing equipment was also located in this area. Debris or other signs of contamination were not found and the area had been capped with clean fill.

Debris cleanups performed during 1976, 1977, and 1984 removed all visual clues that could be used to locate [LF02]. Field workers in 1985 could not determine the landfill location.

ADEC approved a "no further action" for this site in 1993, and the site is closed.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=1347 (Accessed 4 September 2009).

SS08 - The former USAF site name was ROM-1, now SS08 Waste Accumulation Area 3, Spill Site 6-9. This site was used to store drummed new POL products and liquid wastes from 1950s to late 1980s. The EPA ID is AK9572728633. The area reportedly received leaking drums, causing spills in the area. Several major spills, as well as diesel fuel and motor gasoline leaks from storage tanks and pump fill nozzles, occurred nearby. PCBs were detected in surface water samples downgradient SW of ROM-8 (the Old Landfill) at levels 40 times higher than the chronic criterion. PCB levels in soils were below the EPA acceptable 10 ppm standard. In 1994, approximately 772 cy of petroleum-contaminated soil was removed from this site and placed in biocells constructed for that purpose. The soil from this biocell was later used at LF003. Because the 1994 USAF sampling results indicated no known areas of soil contamination above cleanup levels, this site has been proposed for closure by the USAF.

The 2006 ROD proposed no further action under CERCLA at SS08. ADEC agreed with this determination. ADEC also stipulated that decision may be reviewed and modified in the future if new information becomes available that indicates the presence of contamination, waste, or exposure that may cause an unacceptable risk to human health or the environment.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=1343 (Accessed 4 September 2009).

LF02 - Landfill Number 1 is on the backside of the mountain ridge north of the Lower Camp. Formerly referred to as ROM-9, it is now called LF02 Landfill Number 1. This open dump site reportedly received garbage, debris, and some shop wastes. Debris cleanups performed during 1976, 1977, and 1984 removed all visual clues that could be used to locate this site. Field workers in 1985 could not determine the landfill location. In 1989, a field team found one area on the south side of the road that appeared to have received fill materials, but no contamination was observed. No further

The former tramway building at the Cape Romanzof LRRS has PCB-contaminated paint and friable asbestos. PCBs and petroleum based lubricating oil were used on tramway cables. D. Rudis/USFWS photo

action was planned, and the site was closed by ADEC in 1993. In 2000, ADEC concurred with their previous "no action" decision, stating, "The rationale for this alternative is that the waste has already been removed, and no residual contamination was indicated."

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=1345 (Accessed 4 September 2009).

SS016_017 Former Tramway - This metal building is signed with a PCB warning, as paint with PCBs was used on this structure. Small pieces of friable asbestos are on the ground adjacent to the building. PCBs and petroleum based lubricating oil were used on the tramway cables. Visible soil staining was present in 2005 during the USFWS site visit. Total extent of contamination and risk to human health and the environment is unknown.

Historically, cables associated with the tramways were lubricated with petroleum based oils. Petroleum based oils are no longer used, and vegetable based oils are now used for cable lubrication. Petroleum based oils may have dripped from the cables onto the underlying soils, as evidenced by isolated areas of soil staining present beneath the cables and adjacent buildings. Because petroleum hydrocarbons in site soils may pose ecological risks, SI soil sampling was conducted to determine whether these oils caused soil contamination. Nine samples associated with the tramway were collected. Results indicate that GRO, BTEX, and barium are not COCs. RRO, DRO, and PCBs were detected above regulatory limits (2000 mg/kg, 250 mg/kg and 1 mg/kg, respectively). Sample results for Upper Terminal were RRO 5,000 mg/kg; DRO 5,300 mg/kg, 780 mg/kg, and 500 mg/kg; and PCBs 1,700 mg/kg and 21 mg/kg. Lower Terminal results were RRO 26,000 mg/kg; DRO 12,000 mg/kg, 1,200 mg/kg, and 260 mg/kg; and PCBs 49 mg/kg 2.6 mg/kg, 2.0 mg/kg, and 1.9 mg/kg.

Most likely, PCB-contaminated oil was inadvertently used to oil the tramway cables on isolated occasions. Oil from these events probably dripped randomly within the bigger petroleum-contaminated area, such that PCBs could be present above regulatory criteria throughout. Although some samples have PCB concentrations below the regulatory cleanup criteria, segregation of PCB and non-PCB waste would probably be unfeasible. The contaminated soil qualifies as TSCA PCB waste and is recommended for removal. Based on analytical results and visual observations of stained soil, volumes of contaminated soil are estimated as follows: 37.34 cy in situ at the lower tram terminal building, 1.19 cy in situ in the water discharge pit behind the lower tram terminal building, and 8 cy in situ at the upper tram terminal building. The total volume of contaminated soil is approximately 47 cy in situ—or, assuming 10 percent swell upon excavation,

approximately 51 cy ex situ. High PCB concentrations in most of the contaminated soils at CRLRRS prevent onsite treatment of these soils.

The recommended remediation strategy includes (1) excavation and containerization of contaminated soil, (2) field sampling using immunoassay field test kits for the COCs, PCBs, and petroleum hydrocarbons (DRO and RRO), and (3) offsite disposal of contaminated soil as a non-hazardous PCB waste. Upon excavation, contaminated soils may be segregated into PCB and non-PCB soils using field test kits. The costs of testing and segregating soils in the field (and the detection level of test kits not being accurate enough to meet the cleanup level of 1 mg/kg) should be balanced with the cost of transporting and disposing of all soils as PCB waste.

A 2003 ADEC entry indicates that the excavated area at the upper tram terminal building was approximately 28 feet by 10 feet with an average depth of 0.75 feet for a total volume of 8 cy of soil. The excavated area near the lower tram terminal building was approximately 718 square feet with average excavated depth at about 1.5 feet. A total volume of approximately 40 cy of contaminated soil was removed. The excavated area at the lower tram terminal pit was approximately 16 square feet. The average excavated depth was about 1.5 feet. A volume of approximately 1 cy of contaminated soil was removed. A large quantity of sand blast material was noted on the ground surface around the upper and lower tram terminal buildings. This material was from sand blasting the metal frame structure of the tram terminal buildings for repainting. Field screening results showed very high levels of PCBs at 298 ppm. Approximately 50 cy of soil was excavated from the site. According to the 2003 entry, "additional excavation is required at the lower and upper tram terminal buildings to reach compliance with the regulatory levels for PCBs and DRO. ADEC recommended that the sand blast material be investigated and removed prior to additional excavation. Based on field observations and excavation activities at the upper tram terminal area, additional excavation and backfill of the excavation is not recommended. Due to the high degree of the slope and the large number of very large boulders, additional excavation would be difficult. The large boulders can only be excavated using heavy equipment and placing heavy equipment on the slope is not recommended unless the hillside is altered to support the use of such equipment."

PCB and petroleum-contaminated soils were still present as of the 2005 entry.

A February 2008 ADEC update indicated that the 2008 RI field effort would focus on addressing uncertainties and data gaps.

> In general, the 2008 field effort will define the nature and extent of contaminants, and use lower density laboratory analytical sampling with rapid turnaround times to confirm sufficient delineation. The sampling strategy at each site is: 1) A minimum of 15–20 analytical soil samples will be collected from around each tramway facility at a frequency of one sample per 250 square feet. Additional analytical samples may be collected as 10-foot step outs to define the extent of PCB contamination greater than 1 mg/kg, based on field screening results. 2) Soil samples will be collected from in and around the formerly excavated areas. Additional analytical samples may be collected

as 10-foot step outs to define the extent of PCB contamination greater than 1 mg/kg, based on field screening results.

The ADEC review (March 2009) of the Draft Remedial Investigation Report using TRIAD approach, included the following information. Surface soil at SS016 (Upper Tramway Terminal) is defined as soil from ground surface to two feet bgs. The highest PCB and lead results were 6,600 mg/kg and 617 mg/kg, respectively, in surface soil sample collected from immediately below the tram docking and maintenance area. Lead was detected exceeding residential, but below industrial, screening criteria in three samples along the northern wall of the facility. The vertical extent of PCB contamination appear to be limited to less than one foot due to the geologic makeup of the site. The horizontal extent includes three areas: 240 square feet along the south of the facility, east of the entrance to the arctic walkway; 1,790 square feet, near the tram docking area; 2,540 square feet near the elevated walkway, and step-out areas abutting the radar station) and to the north.

SS017 is recommended for remedial action including placing an appropriate cap over the site to limit the migration of PCBs through runoff, wind, or other pathway, and implementing institutional controls (deed restriction).

SS017- Lower Tramway Terminal: The area surrounding SS017 had been backfilled and compacted prior to the 2008 field effort, potentially mixing or covering previously identified contaminated materials and requiring additional screening and sampling. Based on surface soil screening and analytical sample results, two areas of surface soil were identified exceeding screening criteria. One area of 1,270 square feet that is near the tram docking area is in excess of the regulatory screening criteria for PCBs, as is an area of 930 square feet near the elevated access ramp. Lead was detected in excess of both residential and industrial screening criteria at a single sample location, adjacent to an AST and lead contamination appears to be localized at the vicinity of this sample. Based on subsurface soil screening and analytical sample results, contamination appears to be limited to greater than two feet bgs. Three subsurface soil samples to a depth of 3.5 feet bgs contained PCBs in excess of screening criteria, and one of these contained lead in excess of both residential and industrial screening criteria. A soil boring that contained lead and PCBs exceeding screening criteria was collected beneath the surface soil contamination identified in the vicinity of the tram docking area (approximately 100 square feet). A soil boring contained PCBs exceeding screening criteria was collected beneath the eastern edge of the surface soil contamination identified around the elevated access ramp (65 square feet). A soil boring (SB-007) contained PCBs exceeding screening criteria, and was not associated with surface contamination (55 square feet). PCB levels exceeding screening criteria are present in surface soils. Direct contact and inhalation appear to be potentially completed pathways for exposure to PCBs at SS017. However, there are no current residents at this site and workers would have only occasional potential exposure to contaminated soil since work activities outside of the tram building take place only occasionally and because the site is snow covered much of the year. SS017 is recommended for remedial action including placing an appropriate cap over the site to limit the migration of PCBs through runoff, wind, or other pathway, and implementing institutional controls (deed restriction). PCB concentrations identified at SS017 during the 2008 RI ranged from 1 mg/kg to 68 mg/kg in surface soils, and 3.02

mg/kg to 13.6 mg/kg at three subsurface soil sample locations. These levels exceed ADEC regulations but fall within the acceptable range for leaving soils in place and capping in accordance with TSCA regulations. SS016 is recommended for remedial action including limited removal, and institutional controls (deed restriction). PCB concentrations identified at SS016 during the 2008 RI ranged from 1.41 mg/kg to 6,600 mg/kg in surface soils. Due to site access, safety, and feasibility, removal of PCBs greater than 50 mg/kg is recommended at SS016. Two general areas with concentrations greater than 50 mg/kg are present; beneath the tram docking station, and an area north of the substation and west of the radome. This would meet the requirements of TSCA for instituting site control (fence) and institutional controls for the remaining PCBs contaminated areas. While this remedy exceeds ADEC regulations for capping, the feasibility of remediating soils to below 10 mg/kg is questionable. The feasibility of installing a cap given the harsh conditions and site features is also questionable.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=4129 (Accessed 4 September 2009).

DP11 - The Towek Mountain Debris Area (also known as the Towek Mountain East Valley) is located near the Upper Camp and the former WACS facilities (OT06), which was part of the AC&W System. Debris disposed of in this area included scrap metal, wood, plastic materials, drums, vehicles, and other materials. The debris was dumped along the upper mountain road and has cascaded down the boulder and cobble mountainside. At least 1,300 to 1,500 drums are in this area, and little soil is visible.

The ADEC Contaminated Sites Report states that 16 soil samples were taken, and DRO and PCBs were detected above cleanup levels in two samples located near the top of the ridge where debris was concentrated. One soil sample at DP11 had slightly exceeded the "migration to groundwater" cleanup level of 250 mg/kg of POL.

Downgradient contamination was not found in 2004 in surface water, soil, and sediment samples, or subsurface materials on this rocky slope. Analytical results were either non-detect or below applicable cleanup levels

Cape Romanzof road to Towak Mountain. ADEC photo

There are also areas of buried debris near the present communication structures. The Service is concerned that only16 samples were collected to characterize such a large area.

Under Alaska's contaminated site regulations, conditional site closure with ICs is proposed for Site DP011, because contamination at the site does not pose unacceptable potential risk to human health or the environment. However, site contamination exceeds levels allowed in Alaska's contaminated site regulations for unrestricted use. ADEC also requested the USAF add text stating: "Because contamination will remain onsite above cleanup levels for more than five years, a five-year review will

be conducted until cleanup levels have been met." ICs will remain until applicable cleanup levels are achieved in the soil.

A December 2007 database update indicates that ADEC requested the addition of another RAO in the Draft ROD to state that "land use at the facility will remain as the current land use (minimally-attended radar system) with temporary residents only."

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=1344 (Accessed 4 September 2009).

OT06 - The White Alice Site, formerly known as ROM-11, is located at 2,300-feet elevation on Towek Mountain at Cape Romanzof. The White Alice Site was demolished in the late 1980s as part of a larger site cleanup. Demolition debris was buried in on-site landfills; following burial, the entire site was graded to match the surrounding contour. At one time, over 200 drums containing unused product and waste oils may have accumulated at the site. A garage on the site also contained numerous leaking drums of oil. There may have been considerable oil drainage from electrical equipment at the site. Drainage may have been directed to a sump excavated into rock on the mountain side. In 1984, soil samples were collected around the former building; all were negative for PCBs. The 1989 field team could not locate the debris landfill, and there were no indications of any visible contamination. The site was closed, with no further action, by ADEC in 1993. If additional contamination is discovered at this site in the future, further investigation and/or remedial actions may be required by ADEC.

Over 110 rusted drums emerging from the tundra were observed below the Lower Camp on the north side of the road.

During our site visit, present site staff told us heavy equipment and other debris were also bulldozed under rock rubble in this area. We noted gravel fill and metal debris across the road from LF03. Miscellaneous pieces of heavy equipment were also found in the area. Over 110 rusted drums emerging from the tundra were observed below the Lower Camp on the north side of the road.

http://www.dec.state.ak.us/spar/csp/search/IC_Tracking/Site_Report.aspx?Hazard_ID=1346 (Accessed 3 September 2009).

Current Status

Cape Romanzof Contaminant Migration and Subsistence Receptor Study

An ecological assessment, *Cape Romanzof Contaminant Migration and Subsistence Receptor Study*, was funded by the USAF for the YKHC to determine contamination effects to the ecosystem. Sampling emphasis was on subsistence foods. YKHC solicited input from core local community members on the type of subsistence foods they eat and specific areas where they harvest their subsistence foods. Analyses were performed on a collection of 156 water, sediment, and tissue (fish, shellfish, plant) samples. The assessment report was completed in 2005.

Data were used to develop risk-based screening values; consumption rate limits were calculated for each tissue sample. Risk-based screening values

were taken from EPA Fish Advisory Guidance. Benchmark consumption rate values were obtained from the USEPA Exposure Factors Handbook (1990). Specific results are discussed in detail in the report summary on the ADEC Web site database. Included here are some of these discussion points with italics added for emphasis of major points.

The 2005 report of the Cape Romanzof Contaminant Migration and Subsistence Receptor Study (OASIS Environmental, Inc. 2005),presents the results of the work conducted by the YKHC. Native communities surrounding the CRLRRS have voiced concerns about the health of area wildlife and fish that they depend on for subsistence. Fishing for resident and migrant species, including blackfish, whitefish, tomcod, herring, and salmon, occurs in the waters on or adjacent to the beach area and in nearby Kokechik Bay. Bird eggs, plants, and berries are collected from the area for subsistence use. Underlying the concern for chemical contaminants in subsistence species is the concern that chemical contaminants are having an adverse effect on the people who consume a subsistence diet or drink the potentially contaminated waters from CRLRRS. The primary objective of the project was to determine if chemicals are present in fish, mammals, shellfish, and other ecological receptors at CRLRRS at concentrations that may pose unacceptable risk to humans consuming contaminated biota during subsistence activities.

Approximately fifteen sites at CRLRRS have been contaminated by past military site operation and maintenance activities.

Secondary objectives included an evaluation of potential migration of contaminants from CRLRRS into the surrounding environment and potential hazards to ecological receptors. Approximately fifteen sites at CRLRRS have been contaminated by past military site operation and maintenance activities. The list of COCs, agreed upon by all interested parties (i.e., local villagers and agencies), includes fuel components such as DROs and PAHs, PCBs, and the heavy metals lead and cadmium. Sediment, water, animal tissue, and plant tissue samples were collected by local volunteers (trained villagers and a qualified person) and analyzed for COCs. Data were evaluated to test four specific hypotheses established to meet project objectives and included both quantitative and qualitative data evaluation. A primary focus of the study was comparison of the presence and concentration of chemicals potentially related to the CRLRRS at different geographic locations, including 1) areas that are highly unlikely to have been impacted by chemicals from CRLRRS and are many miles away (a distant reference site); 2) areas that are in the vicinity of CRLRRS but unlikely to be impacted (an on-site reference); and 3) areas directly downgradient or in water bodies receiving drainage from CRLRRS (on site).

Hypothesis A: COCs originating from the CRLRR site are not moving via the creeks. a) This hypothesis is true based on statistical tests comparing sediment and water data at On Site locations with Reference/On-Site Reference locations. b) With the exception of PCBs in water, for which minimal conclusions can be drawn, the data support the inference that there is little significant difference between the mean concentrations of COCs from On Site samples compared with Reference samples. Lack of a statistically significant difference infers that some of the biota contamination may be resulting from a non-point source such as regional atmospheric deposition. c) *Statistics were not performed on PCBs in water samples due to the low number of detections; however, the detection limit*

Contaminant warning signs at the Cape Romanzof LRRS are posted in both English and Yup'ik. D. Rudis/USFWS photo

was above the screening level used to protect human health. This means that PCBs in water could be present in concentrations that may be deleterious to human health and overall site risk may be underestimated.

Hypothesis B: COCs from the CRLRR site are not moving offsite into the surrounding environment. a) The data support the conclusion that the hypothesis is true for certain COCs, namely PCBs and lead. b) *PCBs have accumulated in biota onsite to a greater extent than offsite. In particular, 26 of the PCB congeners detected in animal tissue were unique to On Site locations. Additionally, the metal analyte lead was detected at a much higher frequency in animal tissues from On Site locations (77 percent) compared to Reference locations (29 percent). c) PAHs and cadmium do not exhibit this pattern and do not support this hypothesis. DRO was not evaluated in animal tissues.*

Hypothesis C: COCs known to have been released from CRLRR site do not occur in species using Kokechik Bay at the same statistical distributions. a) This hypothesis is supported as true for certain COCs and tissues. *Specifically, total PCBs are higher in bivalves at On Site locations compared to Reference locations; total PAHs, phenanthrene, cadmium, and total metals are higher in herring roe at On Site locations; three of the PCB congeners are higher in tomcod liver at On Site locations; and two of the PCB congeners are higher in tomcod tissue at On Site locations.*

Hypothesis D: COCs found in species consumed by people are below levels hazardous to health. a) Data support the conclusion that with the exception of tomcod and Labrador tea, there are no anticipated noncarcinogenic (chromic) health effects from consumption of foods taken from the site. b) *The data support the conclusion that carcinogenic effects from contaminants in subsistence foods may be of concern for most species taken from anywhere within the study area (On Site or Reference) at the consumption rates estimated by USEPA and the Alaska Traditional Diet Survey.* For example, while there are no statistical differences between On Site and Reference concentrations of PCBs in tomcod and tomcod liver, consumption of either would result in a risk level exceeding federal and ADEC management standards at the presumed subsistence consumption rates. c) The issue of PCBs, PAHs, and metals in subsistence foods is of concern in the State of Alaska and all over the world. The Alaska Division of Public Health and/or other health professionals should be consulted for more detailed information about carcinogenic risks from consuming subsistence foods reported in this study. Additional information about this topic can be obtained from ADEC's Division of Public Health Fish Monitoring Program Web site (http://www.dec.state.ak.us/eh/vet/fish.htm) (Accessed 7 April 2008).

Pesticide concerns - The following conclusions are based on chemical analytes that were detected in the study area but were not identified as

There is evidence of higher concentrations of certain metal analytes in herring roe and blackfish tissues taken from On Site locations, including arsenic, chromium, copper, mercury, nickel, selenium, strontium, and zinc.

specific COCs for the CRLRRS and not associated with the hypotheses in the Work Plan. A variety of organochlorine pesticides were detected in sediment, water, fish and shellfish tissue, and plant tissues in this study. The presence of these pesticides may represent background levels that have been widely documented to occur in arctic and subarctic regions. *There is some limited evidence indicating that certain pesticides may originate from the CRLRRS and may have migrated to the surrounding environment. In sediment, five of the 12 pesticide analytes detected were unique to On Site locations, including Dieldrin, alpha-Chlordane, 4,4'-DDT, Pentachloroanisole, and Endosulfan sulfate, although concentrations of sediment pesticides were not higher at On Site locations compared to Reference locations based on statistical tests. The high (maximum) values of pesticides in sediment were from On Site locations, possibly suggesting that certain pesticides may be associated with the CRLRRS. In fish and shellfish, total pesticide concentrations are statistically higher in bivalve and blackfish tissue samples at On Site locations compared to Reference locations. One pesticide analyte was unique to animal tissue from On Site locations, 1,2,3,4- tetrachlorobenzene. Six of the 25 pesticides detected in fish and shellfish are statistically higher in concentration at On Site locations compared to Reference sites in selected tissues. In plant tissues, total pesticides were detected at higher frequencies at On Site locations compared to Reference locations, but only one pesticide analyte was detected in plant tissue from On Site locations, Endosulfan sulfate. Concentrations were not statistically different between locations for this analyte.* There is evidence of higher concentrations of certain metal analytes in herring roe and blackfish tissues taken from On Site locations, including arsenic, chromium, copper, mercury, nickel, selenium, strontium, and zinc. Total metal are also higher in herring roe at On Site locations. These metals were not identified as COCs for the CRLRRS and the elevated concentrations may be a result of local geological conditions and associated water quality conditions.

Recommendations - A limited and focused monitoring effort at CRLRRS to evaluate the presence of specific PCB congeners and pesticide analytes that are unique to fish and shellfish collected in the Cape Romanzof area may be warranted to confirm that the facility is or is not the source of these chemicals.

http://www.dec.state.ak.us/spar/csp/search/csites_report.asp?Hazard_ID=1329 (Accessed 10 April 2008).

Cape Romanzof - U.S. Fish and Wildlife Service Concerns

The USAF released the *Proposed Plan for Closure of Six Environmental Restoration Program (ERP) Sites at Cape Romanzof Long Range Radar Site (LRRS)* in May 2006. The Service submitted comments and expressed concerns about this Proposed Plan in June 2006; they are summarized below.

Because the CRLRRS may eventually return to the Refuge, the Service should have reservations about accepting landfills, particularly those with hazardous materials, back into the Refuge System. The six sites planned for closure include two waste accumulation areas and two landfills.

Future Land Use and Risk Assessments
Page 5 of the Plan states that CRLRRS is located within a "federally protected environment." That is correct at present (restricted airspace and access associated with the military installation), but that will change if/when the DoD mission is completed. In Alaska, ANILCA requires National Wildlife Refuges to provide the public open access. Page 5 also assumes that the future land use will be the current use. When and if the DoD mission is done, future use of the site as Refuge land will not be the same as the current DoD use. Residents of nearby villages use the surrounding lands and waters for subsistence purposes. Subsistence use would likely expand with DoD departure from the area. We are concerned that subsistence users could be exposed to any remaining contaminants through their food harvest activities and consumption of subsistence species. The 1992 RI/FS does not discuss the default consumption values used when conducting the risk assessment. Because subsistence level consumption values are higher than the typical lower 48 consumption levels used in most risk assessments, these values greatly inf uence the risk assessment calculations.

We are concerned that subsistence users could be exposed to any remaining contaminants through their food harvest activities and consumption of subsistence species.

In addition, ecological risk evaluation is mentioned on page 10 of the Proposed Plan and discussed in section 4.5, Site Risk Screening, in the 1992 RI/FS. The only discussion of risk to native wildlife species included in the RI/FS is proximity of sites to biological receptors. The 2005 YKHC study reports some analytes were elevated above background levels in some tissue samples. Although the closure plan states that the analytes detected were unrelated to the six proposed closure sites, the analytes listed, PCBs, PAHs, and metals, are contaminants discussed in the closure plan as present at a number of the six sites proposed for closure. It is therefore unclear why these contaminants were dismissed in the closure plan as they relate to the risk assessment. Further, the 1992 RI/FS does not include information on the species used and assumptions made in the site risk screening section. The YKHC study analyzed tissue from a variety of fish, shellfish, and plant species. It would be useful to summarize the species that had elevated contaminants.

Landfills and Waste Accumulation Areas - Since this site may eventually return to the Service, we have reservations about accepting landfills, particularly those with hazardous materials, back into the National Wildlife Refuge System, as these may be found to be incompatible with the purposes for which the Refuge was established. The six sites planned for closure include two waste accumulation areas and two landfills.

Liquid wastes, including oils and solvents, and fuel spills were documented at SS001; surface soil removal and cover by a clean cap addressed primary soil contamination. Sampling has not detected contaminants above cleanup levels downgradient of the site. A solvent plume is associated with Site SS015, adjacent to SS001. Because SS015 is not listed for closure, it is anticipated that remediation of SS015 will capture any remaining petroleum hydrocarbon contamination from SS0001. If work is delayed on remediation of SS015, this may not occur soon. Given the proximity of these two sites, it may be most appropriate if site closure decisions are made concurrently at SS001 and SS015 once all remedial work is complete.

The SS08 landfill contained drums and also incurred major fuel spills. If drums were not buried onsite and were stored above ground, then soil

Barrel dumps are found throughout the Cape Romanzof LRRS. D. Rudis/USFWS photo

sampling conducted should have adequately characterized soil contamination. If drums remained subsurface, closure would not be complete until these drums are removed. Contaminated soil excavation occurred and soil was remediated in a biocell, allowing it to be later used as cover material for the site. Contamination is known to be below cleanup levels at this site, based on results from 21 confirmation samples taken in 1994, additional excavation, and final sampling. The USAF should specifically note if any drums were buried at this site and if remedial excavations were adequate to find any buried drums.

If drums or other intact waste containers were present at any of these landfills, subsurface soil or water sampling would not detect contamination unless a drum was punctured with a drill or auger. Drums and other containers will eventually fail, allowing contents to leak and contaminate the area. Presence of buried wastes (including containerized wastes that may result in future releases) would be a significant concern for the Refuge, should the USAF wish to return these lands to Service management in the future.

The site restoration history section of the Plan emphasizes that PCB-containing equipment was shipped offsite to Elemendorf in 1987, but that section does not mention PCB-contaminated soils. If PCB-contaminated soils were found at any of the six sites earmarked for closure, the Service needs to know the location(s) and whether sampling for PCBs was conducted at those locations.

White Alice Site - The White Alice site (OT006) is proposed to be closed out and a ROD issued. This entire facility was buried on site. However, page 3 of the Plan states that hazardous material was shipped to Elmendorf AFB. Sampling should be conducted in this location to determine if there were any PCB laden soils, equipment, or buildings buried on site. Because PCBs are ubiquitous at former White Alice sites, the USAF needs to clearly describe the sampling history for PCBs in this area prior to reaching any closure decisions. Lack of sufficient sampling at this and other closure sites would be a significant issue for the Service when considering potential return of areas that have been withdrawn for military purposes.

On page 3 of the Plan, there is a discussion of 1300–1500 drums in Towak Mountain East Valley where accessibility issues have constrained the removal of the drums. We would like to know if there has been any attempt to collect samples from intact barrels. Given potential hazards associated with sampling on the steep, rocky slope, we recommend sampling

groundwater and any soil present at the base of the slope to determine if any contaminants have moved down slope from the hillside and collected in depositional areas.

Three sites were exempted from the RI/FS (page 7 of the Plan), including the landfill (LF02), and the White Alice site (OT006), due to lack of contamination evidence. Because this closure plan does not discuss what testing was done prior to exempting these from more detailed consideration, we ask that that information be presented in this plan.

Road Oiling OT005 – Road oiling is of potential concern, particularly if any of the oils used for dust control contained PCBs, as has occurred elsewhere in Alaska. The plan stated that only two samples were taken to represent the entire road. The description states that liquid industrial wastes were commonly applied to adjacent drainage ditches and road surfaces for dust control. Two samples are not adequate to fully characterize approximately five miles of road and adjacent ditches at the site. We recommend additional soil or ditch sediment samples be taken at depositional areas along the road for further evaluation of potential road oiling impacts prior to reaching a closure decision.

Debris covers the hillside near the Towak Mountain tower at the Cape Romanzof LRRS. D. Rudis/USFWS photo

Background Concentrations - Soil metal concentrations at the sites were compared to western U.S. samples as background. Using background samples from areas with dissimilar geology does not seem pertinent to this site. Preferable background samples would be collected away from human development in other areas of the Y-K Delta and Bering Sea coast.

Cleanup Levels - Method II cleanup levels protect human health, but potential effects to the environment, specifically plants and wildlife, are not included in this methodology. Wildlife present in the area would have more continuous exposure to residual contamination and could be more sensitive than humans who have infrequent exposure to contaminants in the area.

Cumulative Impacts - We are concerned that by considering these six sites in isolation, the full scope of contaminants issues at CRLRRS may not be well understood by reviewers, including agencies and the public. While we recognize that the approval actions being considered are limited to these sites, all such sites at Cape Romanzof share many of the same contaminants and exposure potential, and thus the cumulative impacts of these releases should be considered. We suggest that this information be presented in an appendix.

In June 2007, the US Fish and Wildlife Service provided comments on the proposed plan, *Final Actions for Four Environmental Restoration*

Abandoned equipment is found throughout the Cape Romanzof LRRS. D. Rudis/USFWS photo

Program (ERP) Sites at the Cape Romanzof Long Range Radar Station (LRRS). The main points made were:

1. To provide context, the text should include a general summary of contamination issues found at the CRLRRS, including sites not covered by this Proposed Plan. The evaluations for the sites included here do not adequately address several concerns of the Service, including inadequate characterization of a large barrel dump at DP011.

2. The Plan should provide citations for documents from previous restoration actions on the CRLRRS.

3. There is no data provided in the plan on potential toxicity to fish and wildlife, since PCB data noted in the plan did not indicate a measure of environmental risk. We suggest that an environmental risk assessment be conducted at the CRLRRS.

4. We have concerns regarding potential migration of contamination to freshwater and marine habitats and the need for additional monitoring to evaluate these concerns. Sites with monitoring well concerns include SS07, ST009 and SS014.

5. Previously identified wells have not been found during subsequent survey work, and the Service wants to ensure that these wells are properly capped.

6. Statements related to subsistence use may be inaccurate and should ref ect the closure of the facility by the USAF, rather than suggesting that subsistence use in the area is limited because of other factors such as proximity to local communities.

7. While anticipated future land use is expected to be the same as its current use, should the USAF wish to relinquish its withdrawal in the future, complete cleanup of the site will be required.

In addition, the Service noted that the Huson Dam and reservoir had not been discussed as a possible contaminant source or waste dump site. No records of a SI there were included in the plan.

Mineral Resources

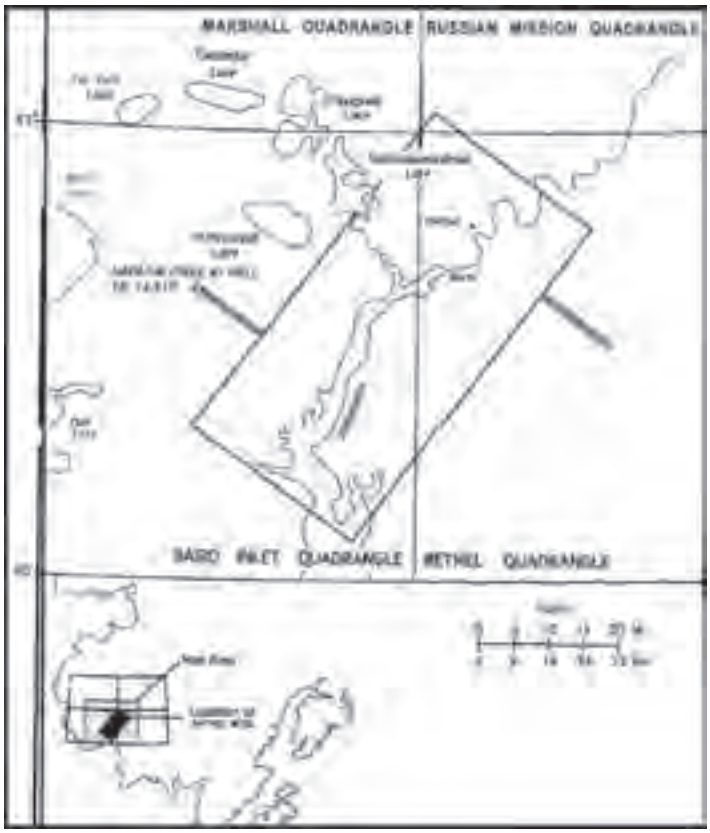
Mining

Oil & Gas - Napatuk Creek Wells

Three exploratory oil and gas wells were drilled in the early 1960s on lands that are now managed by the Refuge. Napatuk Creek Well Number 1, Site Number 35, was drilled in 1961 by Amoco, formerly Pan American Petroleum Corporation. This 15,000-foot well, drilled in low porosity sediments, was unsuccessful and abandoned as a dry hole. It is located approximately 47 miles southwest of Bethel and 50 miles east of Nelson Island. The drill site was a raised pad about 50 feet by 100 feet. The terrain is gently rolling tundra with numerous shallow waterways and marshes. The drilling waste reserve pit remained abandoned until 1996.

On August 19, 1996, Amoco sent a letter to ADEC stating cleanup work was contracted and that debris, including batteries, drums, and trash, were removed. Soil samples were collected, and analytical results were approved by ADEC. One surface water sample was collected from a large pond northeast of the wellhead. It is unknown if there is groundwater contamination by petroleum fuels, and no sediment samples were taken from the pond. An undated letter from the Refuge to ADEC, probably written in 1996, mentions attachments to an ADEC letter of June 5, 1996, from J. Chatham to R. Britton, with seven sample sites showing high levels of petroleum hydrocarbons. The ADEC letter states that low levels of contaminants were reported in the soil and water samples. An Amoco report on 1990 sampling efforts includes results from 22 test holes at this site. This report was included as an attachment to July 29, 1996, Service correspondence from R. Britton to M. Reardon. All 21 samples had petroleum hydrocarbon concentrations, ranging from 60 to 7,010 mg/kg, but these results were considered suspect due to the analytical method used, producing false positives. Field observations detected hydrocarbon odors in 8 of the 21 borings. Based on field observations and the BTEX data alone, contaminated soils appeared to occur at a low marshy area adjacent to the drill pad and draining to the pond east of the site, and to occur at the small trash pit located far south of the pad near the old camp. No surface water samples had petroleum hydrocarbon or heavy metal contamination. Barium concentrations were also higher than background at test holes south and east of the drill pad or primarily within the main drainage way to the east. Some other metals (cadmium, chromium, lead, and zinc) were also elevated in these samples. Barium concentration was reported at 3,480 mg/kg at one test hole northwest of the pad.

Figure 10. Napatuk Creek Well Number 1 is located on the lower Kuskokwim River and the area of a 1994 survey for oil and gas.



The Amoco report conclusions state that these data suggest that petroleum hydrocarbon–contaminated soils are limited to soils above the permafrost within the low, marshy area draining to the east of the drill pad, and near the trash pit of the old camp located south of the pad. Barium and other metals that were elevated and hydrocarbons are likely from the drilling mud additives, lubricants, and fuels used during the original drilling operation. The report concludes that remediation of the existing soil contamination would be more destructive than natural degradation, so Amoco has no plans to remediate soils at this site.

After the scheduled cleanup by Amoco, a September 1996 site visit to Hole Number 1 by the Refuge manager found debris remaining onsite, including the wellhead, trash, pilings, and other debris. An onsite berm was found to have hydrocarbon odors. The Service is unaware of any additional site cleanup or sampling at this site.

Interest in the hydrocarbon potential of the Yukon-Kuskokwim delta region has resulted in studies by various agencies and the oil industry.

Napatuk Creek Core Hole Number 2 was drilled in 1960 to a depth of about 13,000 feet. Napatuk Creek Core Hole Number 2A was drilled the same year to 20,200 feet and was also abandoned as a dry hole. No shows or oil or gas were reported for either of these core holes. The Amoco report includes information on results from eight test holes at this site. These samples had petroleum hydrocarbon concentrations ranging from 58 to 334 mg/kg, but are considered suspect due to the analytical method used, producing false positives, and field observations did not detect any hydrocarbon stains or odors. No surface water samples had petroleum hydrocarbon contamination.

Napatuk Creek Core Hole Numbers 1 and 2 were closed out by ADEC, based on their permit requirements. Service correspondence from R. Britton to M. Reardon (August 28, 1996) documented concerns with Core Hole Number 1 but determined there was no reason for Service concern related to Number 2 and 2A, especially with the photo documentation indicating solid waste removal.

We did not locate records of any further correspondence regarding Napatuk Creek Core Hole Number 1 or additional cleanup activities.

An oil seep was reported and considered plausible but unconfirmed near Whitefish Lake, south of the Kuskokwim River. Other oil seep reports on file with the USGS are considered doubtful. There are numerous oil and gas seeps located around Kotlik. These were recently summarized in a USGS report (Troutman and Stanley 2004).

Future petroleum interests

Interest in the hydrocarbon potential of the Yukon-Kuskokwim delta region has resulted in studies by various agencies and the oil industry. Data analyses from exploration in this area by the USGS and Minerals Management Service suggested that the Y-K Delta area had relatively low potential for major petroleum reserves, as did the adjacent offshore areas in the Bering Sea (Mull et al. 1995). The report, Hydrocarbon Potential of Calista Regional Corporation Lands (Petrotechnical Resources of Alaska, LLC 1999) described evidence of a Tertiary sediment layer that would be attractive for future oil exploration efforts. Additional data evaluation and seismic work followed by exploratory drilling were proposed. In addition, in 2004,

USGS released an estimate of 173 million barrels of oil and 5.5 trillion cubic feet of natural gas within the Bethel Basin. Maximum estimates are much greater at 592 million barrels of oil and 14.6 trillion cubic feet of gas.

Gold and Mercury Mining

Over 25 mineral occurrences were mapped by the USGS in the Kuskokwim River area. Most of these sites are not on the YDNWR but are areas that drain into the Refuge.

Placer Mining
Placer mining in the upper Tuluksak River drainage upstream of the eastern boundary of the Refuge has not had detectible adverse effects on water quality or fish populations, based on Service investigations in 1987 and 1990 (Crayton 1990). River sediments in and below mining operations were found to be accumulating heavy metals and trace elements. If water quality were to change in alkalinity or pH, these metals could be released into the water column and become bioavailable.

Columbia Creek and Canyon Creek Mines
Two former gold placer mining sites are located on the Refuge. The Columbia Creek mine was operated by the Dobnick Mining Company and closed in 1986. The Canyon Creek mine site was last owned by a private individual, closing in 1980. Both these sites were classified as abandoned and vacant by the BLM in 1987. Since these abandoned sites were on public lands within the Refuge boundaries, they are now part of the YDNWR.

The Columbia Creek and Canyon Creek Mine sites were cleaned up by the Service between 1990 and 1992. Mine-related debris and crushed clean drums were buried onsite.

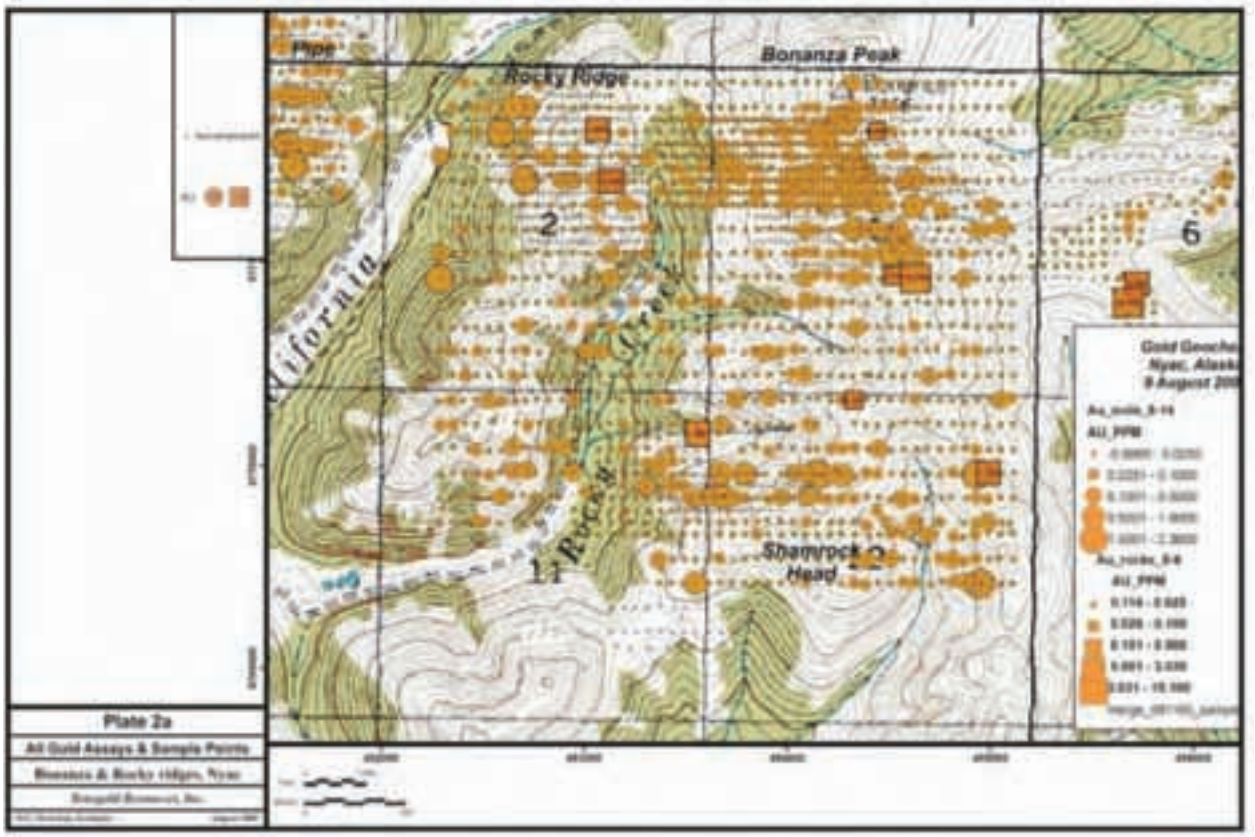
The Columbia Creek and Canyon Creek Mine sites were cleaned up by the Service between 1990 and 1992. Mine-related debris and crushed clean drums were buried onsite. Contaminants removed from the site during the cleanup included 19 drums containing petroleum products and a supply of explosives, including a total of 137 sticks of Kinestik 1/3 solid component, and 185 tubes of Kinestick 1/3 liquid component. A 1989 memorandum for this site also mentions several 55-gallon drums labeled "hydraulic f uid."

No active mining claims exist on the Refuge, and given provisions of ANILCA, no such claims are anticipated in the future.

Nyac Project
The 57,600-acre Nyac Project is situated in the Nyac District, Tuluksak River area of southwestern Alaska. This project is immediately east of Refuge lands. Located in the Kilbuck Mountains, the Nyac District lies within the Kuskokwim Gold Belt, the southwestern extension of the Tintina Gold Belt. From the early 1900s to 2000, the Nyac District produced more than 500,000 ounces of placer gold, whose lode source has yet to be clearly identified.

The Nyac Project surface and subsurface rights are currently owned by Calista Calista. Founded in 1972, Calista is the second largest of the 13 regional Native corporations formed under the ANCSA in 1971 to settle aboriginal land rights issues.

Figure 11. Tonogold Resources, Inc., has mapped gold ore reserves in the Nyac District immediately to the east of Refuge lands.



Tonogold Resources graphic.

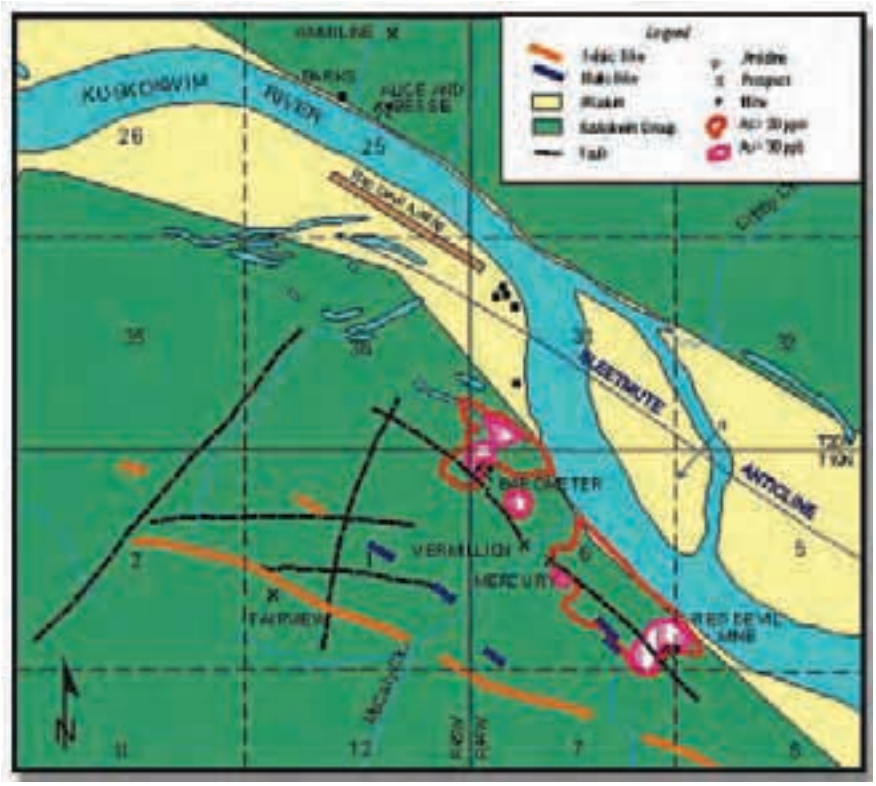
The Red Devil District

The Red Devil Mineral District is known for its mercury production. About 2.7 million pounds of mercury were produced, primarily from the Red Devil Mine, between 1933 and 1963. This mine closed in 1971. Although outside of Refuge boundaries, Red Devil Creek f ows into the Kuskokwim River. Mercury was identified as the site's primary hazardous substance in a 1999 site review by ADEC. Other hazardous substances include arsenic, lead, antimony, PCBs from electrical transformers, petroleum hydrocarbons, and various containers of mineral processing chemicals, waste solvent, and antifreeze crystals. In 1999, BLM conducted waste identification and removal actions; additional work was scheduled for at least the next five or more years.

Other past mercury production at small scale sites include the Willis, Ammiline, Alice and Bessie, Barometer, Vermillion, and Mercury prospects.

Mercury is no longer an economic commodity in western Alaska. However, prospects where gold is variably associated with arsenic, antimony and mercury in siliceous igneous rocks exist at numerous locations in the Red Devil Mineral District. These include Juninggulra Mountain, Decourcy Mountain, Georgetown, Kolmakof, Fairview, Red Mountain, Barometer, Rhyolite Mountain, New York Creek, and other locations. Most of these occurrences are too small to be considered economic, but large areas remain unexplored.

Figure 12. Red Devil ore body as mapped by the Calista Corporation indicates ore on both sides of the Kuskokwim River.



Calista Corporation graphic

Calista determined the Red Devil Mineral District's gold potential in the 1980s and signed an exploration lease with BHP Minerals (BHP) in 1988. BHP conducted exploration for gold in the Red Devil Mineral District, identifying several areas of anomalous arsenic and gold in soils at several mercury prospects. BHP concluded that the Red Devil-Barometer area is prospective for a significant concealed gold resource and sited three drill holes to test this model at Red Devil, but the company withdrew from Alaska without drilling the property.

Figure 12a. The Red Devil Mineral District is known for mercury production and for mercury, arsenic, and antimony contamination.

USFWS graphic

Calista continues to market the Red Devil Mineral District for its gold potential and seeks an industry partner to complete the test drilling outlined by BHP. Gold and silver bearing veins at Red Mountain, 12 miles southeast of Red Devil, require additional work to expand the area of known mineralization. This information was current from Calista as of December 2003.

In early 2008, the U.S. Environmental Protection Agency reevaluated the Red Devil Mine, determining that the site's Hazard Ranking Score was high enough to make the mine site eligible for placement on the Superfund National Priorities List. BLM photo.

USGS looked at water quality in the Kuskokwim River mainstem and some of the tributaries such as Red Devil Creek. They did not see an inf uence on the mainstem from mining activities due to the relative size/dilution but did find effects in tributaries. The highest concentrations of total mercury, dissolved antimony, and arsenic were found in Red Devil Creek. The higher concentrations from Red Devil Creek did not affect the mainstem mercury transport because the tributary was small relative to the Kuskokwim River. In Red Devil Creek, total mercury exceeded the concentration at which the USEPA indicates that aquatic life is affected. Dissolved arsenic exceeded the USEPA's drinking water standard of 0.10 ppm. Background mercury and antimony concentrations in bed sediments ranged from 0.09 to 0.15 ppm for mercury and from 1.6 to 2.1 ppm for antimony. Background arsenic concentrations were greater than 27 ppm. Sites near the Red Devil mercury mine had mercury and antimony concentrations greater than background concentrations. These concentrations probably ref ect the proximity to the ore body and past mining. Crooked Creek also had mercury concentrations greater than the background concentration. The transport of suspended sediment-associated trace elements was lower for all elements in the lower river than in the upper river, indicating storage of sediments and their associated metals within the river system.

http://ak.water.usgs.gov/Publications/Abstracts/1999.Abstracts/kuskokwim_abs.htm (Accessed 22 April 2008). Also see: http://www.springerlink.com/content/gp38333401x28511/ (Accessed 22 April 2008)

Stuyahok Gold Prospect

The Stuyahok prospect is located in the Marshall Mining District in the Illivit Mountains, a region just north of the Refuge boundary. This gold-lode exploration area is adjacent to the historic Stuyahok placer gold mine that produced about 30,000 ounces of gold. The Stuyahok prospect is buried beneath surficial deposits and has been explored through shallow auguring methods by Calista and Teck Resources, and, more recently through trenching by Placer Dome. Adjacent to the Stuyahok placer mine on Flat Creek, the soil-geochemical anomaly is associated with dikes that are the same rock type and age as mineralized dikes at Donlin Creek. The gold-arsenic zone is approximately 3,000 feet by 1,500 feet. An airborne magnetic survey displays a prospective extension of the zone towards the southwest. Calista completed a shallow drilling program during the 2001 field season and is analyzing the data acquired from 21 drill holes.

http://www.calistacorp.com/land/minerals/stuyahok_gold.html (Accessed 4 September 2009).

Donlin Creek Mine Project

Donlin Creek is an advanced exploration project currently undergoing feasibility studies. In June 2008, a preferred project design for the Donlin Creek project was announced; plans are to complete and approve a feasibility study by the first quarter of 2009. As estimated in February 2008, the Donlin Creek property contains a measured resource of 29.4 million ounces of gold and an inferred estimate of 3.5 million ounces of gold. The Donlin Creek project is expected to have a throughput design of approximately 55,115 tons per day using on-site diesel and wind cogeneration for power. Using this design, Donlin Creek would operate for 25 to 30 years and produce potentially 1 to1.5 million ounces of gold annually. Permitting would start in early 2009 with construction targeted for 2012.

The Donlin Creek Mine property, if developed, will be a mammoth open pit gold mine. It is located outside of Refuge boundaries but is adjacent to Crooked Creek, which could carry any released contaminants downstream into the Kuskokwim River. Donlin Mine graphic.

This major gold occurrence prospect is located on land under lease from two Native Alaskan corporations, Calista and the Kuskokwim Corporation. In 1995, Placer Dome entered into a 20-year lease with Calista for the Donlin Creek property, with the right to indefinitely extend the lease as long as mining or processing efforts continue in good faith. Calista can acquire up to a 15 percent interest in the project by making pro-rata share payments of the project's capital costs. Donlin Creek is managed by a new limited liability company, Donlin Creek LLC, which is jointly owned by NovaGold and Barrick Gold Corporation on a 50/50 basis. The 27,000-acre property is located outside of the Refuge. It is 12 miles north of commercial barge access on the Kuskokwim River, adjacent to Crooked Creek, a tributary of the Kuskokwim, and is north of the Village of Crooked Creek.

Because the current resource is contained within only a small portion of the overall property, NovaGold believes there is considerable potential to expand the gold resource at Donlin Creek. Numerous other targets have been identified along the five-mile mineralized gold trend, defined by surface sampling and various historical drill holes containing significant gold values.

Donlin Creek, if developed, will be a mammoth open pit mine using a combination of froth f otation, pressure-oxidation, and cyanide leaching to recover the gold. Similar to the existing Fort Knox gold mine near Fairbanks, Donlin Creek will consist of one or more open pits from which ore will be excavated, a series of waste rock dumps, an ore processing mill, and a tailings impoundment. Ore will be crushed and finely ground, then fed to the f otation plant that will collect the gold-bearing sulfide minerals. Concentrate will then be oxidized before passing onto the carbon-in-leach cyanidation circuit. Resulting tailings will be treated to remove residual cyanide, buffered to lower pH, and then deposited in the tailings impoundment. Project infrastructure will include roads, maintenance shops, living quarters, drinking water supply, and domestic sewage disposal.

http://www.novagold.com/section.asp?pageid=3359

Table 1. Mines Located in the Yukon Delta National Wildlife Refuge

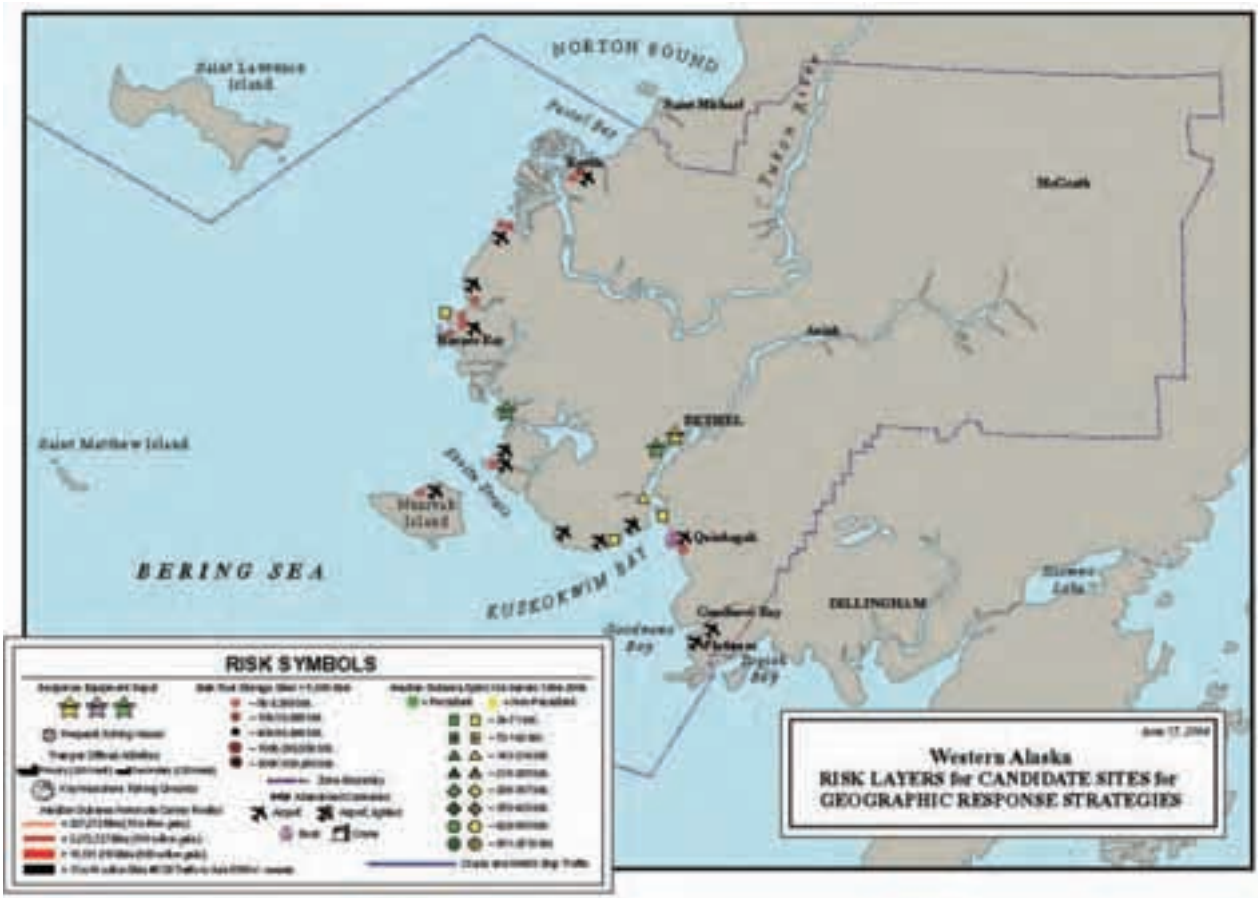
ARDF No.	Site Name	Latitude	Longitude	Mineral	Work	Date	Status
BH001	Arsenic Creek	60.000	160.13	Hg, As	exploratory trenching	1947	inactive
BH002	Rainy Creek	60.01	160.14	Au, Hg	placer mining	1920 - 1946	inactive
BH003	Canyon Creek	60.18	159.97	Au	2.5 mi placer mined most of creek	1913 ~ 1948	present use unknown
BH004	unnamed	60.49	160.19	Cu	occurrence only	1959	inactive
BH005	Golden Gate Falls	60.5	160.17	Au	placer prospect	no date	inactive
BH006	Fisher Dome	60.82	159.72	Sb	none	no date	inactive
BH007	Cripple Creek	60.071	159.54	Au	mile+ of f ood plain placer mined	1911 - ?	undetermined
BH008	Cripple Creek (lower)	60.74	159.57	Au	tunnels and placer workings	1911 - ?	undetermined
BH009	Fisher Creek	60.82	159.84	Au	prospect shafts, 15-30 ‘ depth	1915+	inactive
BH010	Marvel Creek	60.91	159.62	Au	~3 mi placer mined, most of creek	1920’s - 1940 post WWII to 1970	active
BH011	Dominion Creek	60.96	159.4	Au	placer claims	? 1915	inactive
BH012	Dominion Creek (upper)	60.98	159.51	Au	placer claims and some exploration	? 1915	probably inactive
BH013	unnamed (south side of Tuluksak river)	60.99	159.97	Cu	prospect	? 1959	probably inactive
BH014	Tuluksak River	60.99	159.99	Ag, Au, Pt	placer mine ~ 3 mi x 0.4 mi	1909 - 1964	undetermined
BH015	Granite Creek	60.98	160.09	Au	3/4 mi placer mine	1938-1940, 1946	undetermined
BH016	Tuluksak River (below Granite Creek)	60.97	160.15	Au	prospect, 50’ deep shaft dug	? 1915	inactive
BH017	Columbia Creek	60.61	160.75	Au	prospected by drill churning	1949 or 1950	inactive
BH018	Eureka Creek	60.98	159.55	Au	exploration	?	inactive
BH019	Rocky Creek	60.44	159.63	Au	reconnaissance surface exploration	?	inactive
BH020	Kapon Creek	60.11	160.16	Au, Hg	placer mining	1914-1915	inactive
BH021	Kisaralik River	60.40	159.6	Au Sn ?	occurrence only	1919	inactive
BH022	Robin Creek	61.00	159.560	Au	placer claims staked and some probable exploration	? 1915	inactive
BH023	Gold Lake	60.28	159.440	Ag, Au,Pb, Sb, W	occurrence only; reconnais-sance surface sampling	1990	inactive
BH024	Bell Creek	60.78	159.500	Au	placer gold claims staked	1911	inactive
BH025	unnamed (lower Slate Creek)	60.93	159.930	Hg	reconnaissance surface exploration	1990	inactive
BH026	unnamed (Kipchuk River area)	60.82	159.290	Au, Cu, Hg, Pb, Zn	reconnaissance surface exploration	1990	inactive
BH027	unnamed (west of Aniak Creek)	60.72	159.120	Au, Cu, Hg, Pb, Sb, Zn	occurrence	1990	inactive
BH028	unnamed (north of Kisarilik Lake)	60.34	159.300	Au	occurrence, reconnaissance surface work	1990	probably inactive

http://www.calistacorp.com/land/minerals/donlin_creek.html (Accessed 4 September 2009).

Coal

Known coal mineral resources are limited to a few thin coal beds on Nelson and Nunivak islands. These beds are considered non-commercial (Dobey and Hartman 1973), as they are estimated to be only about two feet thick.

Figure 13. Western Alaska Risk Layers for Candidate Sites for Geographic Response Strategies



Western Alaska Risk Layers for Candidate Sites for Geographic Response Strategies. Map includes locations of spill response equipment, bulk fuel storage, major oil spill events, and logistic facilities. ADEC graphic

Oil Spills

The threat of oil and fuel spills is significant for Refuge lands, particularly due to the number of fuel transport barges and other large vessels traveling on the Yukon and Kuskokwim, the two major rivers within the Refuge, as well as smaller rivers such as the Kwikluak and Ninglick. Barge companies and landing craft vessels are of major concern due to the large volume of home heating fuel they transport upriver to villages. Fuel for this region comes primarily from either North Pole (loaded onto barges at Nenana) or up the Yukon and Kuskokwim from the Tesoro Refinery in Nikiski. The Yukon and Kuskokwim rivers are the main transportation routes for much of southwest and interior Alaska. A rough estimate of the annual fuel amount transported for the Bethel census area on the Yukon and Kuskokwim Rivers is over 24,000 tons.

The Kuskokwim Shoals area has been identified as Critical Habitat for Steller's eiders, especially during molting, and is also important habitat for other waterfowl species, particularly other seaducks. Thus, even moderately large spills could have significant resource consequences.

Because spills in riverine systems can quickly move with the current, spilled petroleum and other products can rapidly impact many miles of shoreline. Unless there are observers during the spill event, effects to downstream resources may never be known.

Fuel transport vessels and commercial fishing vessels also travel along the Refuge's coast along Norton Sound and the Bering Sea. In both river and marine transport, if an oil spill occurs in this region, there is often difficult access to remote areas. Spill response can be problematic or delayed, increasing the risk of injury to Refuge resources. Some of the marine waters adjacent to the Refuge are extremely important for endangered eiders, other waterfowl, and shorebirds. Critical habitat identified for spectacled eider nesting is the coastal region from Kokechik Bay south to the northern tip of Nelson Island. The Kuskokwim Shoals area has been identified as Critical Habitat for Steller's eiders, especially during molting, and is also important habitat for other waterfowl species, particularly other seaducks. Thus, even moderately large spills could have significant resource consequences.

Subsistence and commercial fisheries activities contribute to vessel traffic in the Yukon and Kuskokwim rivers. There were over 400 commercial permit holders in 2003 for salmon harvest in the Kuskokwim area, and almost 600 permit holders in the Yukon River drainage. Subsistence fishing is also important in these areas, but as the vessels are usually smaller, spill potential is generally lower. Subsistence households totaled 1,180 in the Yukon River drainage in 2006 (excluding Hooper and Scammon Bay), adding to vessel use on these waterways.

http://www.cf.adfg.state.ak.us/region3/yukhome.php (Accessed 21 April 2008).

Commercial salmon fisheries within the Refuge are concentrated in the mainstem rivers along the western coastline and Nunivak Island for Pacific herring and halibut. The commercial harvest of salmon in the Kuskokwim River began in the early 1900s and has grown dramatically from 1960 to the present. Commercial salmon fishing occurs along the entire 1,200-mile length of the Kuskokwim River. The majority of commercial effort (approximately 75 percent in the Yukon and 90 percent in the Kuskokwim) occurs within the lower sections of each river, which lie within the Refuge's external boundary. The 10-year average is 539 fishermen for this area.

There is a long standing directed commercial fishery on the Lower Yukon within the boundaries of the Refuge. Pacific herring are harvested in four commercial districts along the Refuge coast: Cape Avinof, Cape Romanzof, Nelson Island and Nunivak Island, all of which are within the Refuge.

Spills also occur from failure of onshore fuel lines and tanks, affecting terrestrial and both freshwater and estuarine habitats.

Major Spill Incidents

BIA Administrative Site in Bethel: In 1992–1993, there was a fuel spill estimated at 106,000 gallons that impacted a seasonal creek and a tundra lake. A Level I survey was completed by the Service in 1993, and 4,000 cy of petroleum-contaminated soil were removed. A 1998 E&E site assessment completed for ADEC reported 63,000 gallons were recovered through ADEC emergency response, 15,900 gallons evaporated, and 27,00 gallons were unaccounted for.

Emmonak: In June 2005, abandoned vessels had tanks of fuel and oily water aboard; 3,050 gallons of diesel fuel was recovered, as well as 10,000 gallons of oily waste. An additional 18,000 gallons of oily water was recovered in decant tanks used to separate oil from water. These vessels were located along the edge of the Kwiguk River, a tributary into the Yukon River.

Kipnuk: In July 2006, a ruptured fuel line led to an estimated 7,000 gallons of diesel spilled. Fuel entered Kugkaktlik River and an unnamed creek, both tidally inf uenced water bodies. Sheen and emulsified oil was found 4–5 miles upstream and downstream from the facility. Approximately 550 gallons of diesel were recovered. Wind, rain, and agitated river conditions contributed to product dispersion and emulsification. Salmon were present in the river, and other species in the area included waterfowl. There is also seasonal use of this area by shorebirds, herring, and Steller's eider. The fuel cleanup report did not note impacts to wildlife or other resources.

The ADEC spill incident records from 1996–2006 list over 900 incidents in the area encompassed by the Refuge. These range from reports of one gallon spills of gasoline or diesel fuel to large tank farm and oil terminal spills of 1,000–8,000 gallons.

Akiachak: A November 2005 spill at the power plant released an estimated 500 gallons of fuel oil from a broken underground pipe. Although the emergency shut-off was activated a short time later, notification to authorities was not until 12 days after the spill. The spill did not threaten the Kuskokwim River, approximately 300 yards to the south.

Alakanuk: In May 2006, Yukon River f ooding and ice overf ow displaced 12 fuel tanks ranging in size from 7 to 10,000 gallons. Spilled fuel was estimated at 1,216 gallons and was contained within the secondary containment area. No product was observed outside of the secondary containment.

Other non-persistent spills in or near waterways include diesel fuel spills in Kwigillingok, Kuskokwim Bay near Eek Island, and at Cape Romanzof. In 1996, a 214-barrel gasoline spill occurred at the Tuntutuliak Tank Farm.

The ADEC spill incident records from 1996–2006 list over 900 incidents in the area encompassed by the Refuge. These range from reports of one gallon spills of gasoline or diesel fuel to large tank farm and oil terminal spills of 1,000–8,000 gallons. The greater Bethel area had about 240 reported incidents during this 10-year period. Most spills are diesel or

gasoline; other spilled products include used oil, hydraulic f uids, aviation gas, engine oil, ethylene and propylene glycol, and creosote. While spills of hazardous materials are less common, one chlorine spill was reported. Sources include vessels, residence tanks, tank farms, other tanks, vehicles, fuel pumps, pipelines, oil terminals, drums, and mining operations. Causes range from intentional releases, accidental spills, tank failure, corrosion, structural and mechanical failure, to human error and even sabotage!

Population growth in these areas is increasing at nearly twice the rate of the state's population as a whole. Studies indicate that this strong growth will continue during the next 20 years. This growth will place substantial new demands on the region's transportation systems.

The data in Table 1 demonstrate the range of reported oil and chemical spills in communities throughout the Refuge area from 1996 to 2006. Smaller spills are frequently associated with village fuel supplies. Most of the spills are diesel fuel and other common fuel products, including gasoline, hydraulic oils, engine oils, used oils, aviation fuel, propylene glycol, and ethylene glycol. One small creosote spill was reported. The ADEC spill records do not include information on whether adjacent water bodies were affected by spilled chemicals.

Present Fuel Use

Statistics for the Bethel census area for 2000–2001 reported 100 percent of the power generation was from diesel fuel, using 4,873,148 gallons. This area includes 35 communities in addition to Bethel.

From Bethel, smaller river barges bring fuel, supplies and construction materials to Kuskokwim River villages. Three-fourths of the area's communities use barge services for cargo supplies. For the 2000–2001 Bethel census area, barge/freight tonnage was 54,400 tons. Summer barge traffic consisted of roughly 45 percent bulk fuel and 55 percent dry goods. Additionally, the small-boat harbor in Bethel is used as a base for inter-village travels, recreation, and subsistence fishing.

The Wade Hampton area, which encompasses 13 communities, including Hooper Bay, Chevak, Emmonak, Mountain Village, Marshall, and St. Mary's, imports and stores 100,000–200,000 gallons of diesel each year for power production. All diesel fuel for this area is barged up the Yukon River. Wade Hampton census area energy statistics for 2000–2001 reported that 100 percent of energy generation was from diesel fuel, totaling 1,520,560 gallons.

Wade Hampton census area communities depend on barge transfer sites for commercial freight purposes. Barge shipments for the Wade Hampton communities typically consist of 45 percent bulk fuel and 55 percent dry cargo. Barge/freight was reported at 14,000 tons per year.

Population growth in these areas is increasing at nearly twice the rate of the state's population as a whole. Studies indicate that this strong growth will continue during the next 20 years. This growth will place substantial new demands on the region's transportation systems. Emerging transportation patterns for the near term emphasize air and water modes. Some wind power may have been installed in some villages, and this is likely to grow, but for the foreseeable future diesel will still be the primary fuel source for this region.

http://www.commerce.state.ak.us/dca/commdb/CIS.cfm

Table 2. Oil and Chemical Spills from the ADEC Database for Western Alaska Locations within the Refuge, 1996 – September 2006.

Location	No. of Incidents	Gallon Range	Average No. Gallons	Geometric Mean of Gallons	Products[1]
Alakanuk	17	7-900	103	52	D, G
Aniak	15	1–1,886	174	18	D
Akiachak	11	6-400	152	58	D
Akiak	6	10-250	118	76	D, EO, UO
Cherfornak	7	5-250	82	45	D
Chevak	23	1-2,000	163	17	D, G, EO, EG HO
Crooked Creek and Donlin Mine	54	1–500	22	5	D,G, HO, UO, EO
Eek	4	10–3,000	1,011	122	D, UO
Emmonak	30	2–1,100	215	49	D, AF, UO, EO
Hooper Bay	28	1–500	61	29	D, G, PG
Kasiguluk	7	2–5,000	791	59	D, G
Kipnuk	18	1–7,000	515	33	D, G, UO, EO
Koniganak	7	1–1,800	326	80	D, EO
Kotlik	17	4–500	113	41	D, UO
Kwethluk, Kwillingok, Kalskag	15	5–1,000	119	36	D, HO
Marshall City	17	2–1,200	168	27	D, G, HO
Merkoryuk and Mountain Village	27	1–1,500	104	21	D, UO
Newtok	13	1–580	103	34	D, G
Nightmute	13	5–225	38	16	D, HO, Cl, creosote
Napiak and Napaskiak	12	10–600	109	30	D, HO
Nunapitchuk	11	1–8,000	762	41	D, HO, EO, UO
Russian Mission	8	1–150	37	15	D, UO
Scammon Bay	8	5–1,000	183	36	D, G
Tuluksak	10	1–1,900	223	32	D, G, creosote
Tuntutuliak	6	55–9,000	1701	332	D, G
Bethel	243	1–5,000	76	13	D, G, UO, HO, AF, PG, BO
Other locations	100+	1–1,500	-	-	D, G, HO, EO

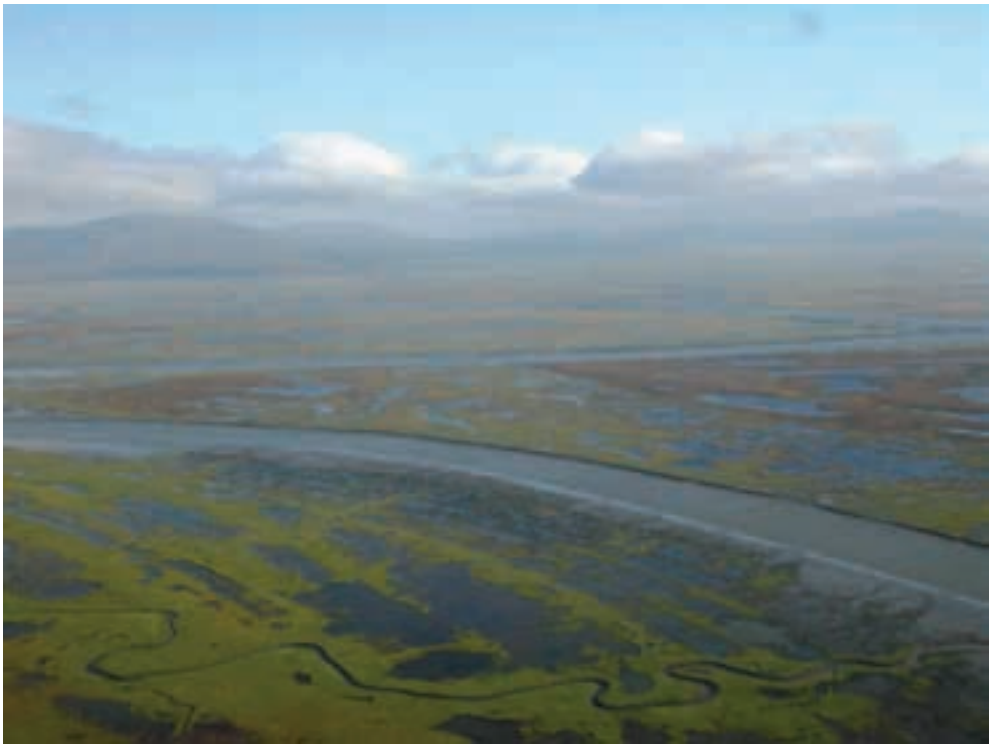
[1] Product abbreviations: D – diesel, G – gasoline, BO – bilge oil, EO – engine oil, HO – hydraulic oil, UO – used oil, AF – aviation fuel, EG – ethylene glycol, PG – propylene glycol, Cl – chlorine

http://www.commerce.state.ak.us/dca/commdb/CF_BLOCK.cfm (accessed 9 September 2009).

http://www.commerce.state.ak.us/dcra/AEIS/AEISMainFrame.cfm?CensusArea=Bethel&Industry=Transportation&IndexItem=TransportationOverview

http://www.commerce.state.ak.us/dcra/AEIS/AEISMainFrame.cfm?CensusArea=WadeHampton&Industry=Energy&IndexItem=EnergyOverview

http://www.commerce.state.ak.us/dcra/AEIS/AEISMainFrame.cfm?CensusArea=WadeHampton&Industry=Transportation&IndexItem=TransportationOverview (accessed 23 April 2008).



The Yukon Delta National Wildlife Refuge wetland complex provides nesting and rearing habitat for thousands of waterfowl. D.Rudis/USFWS photo

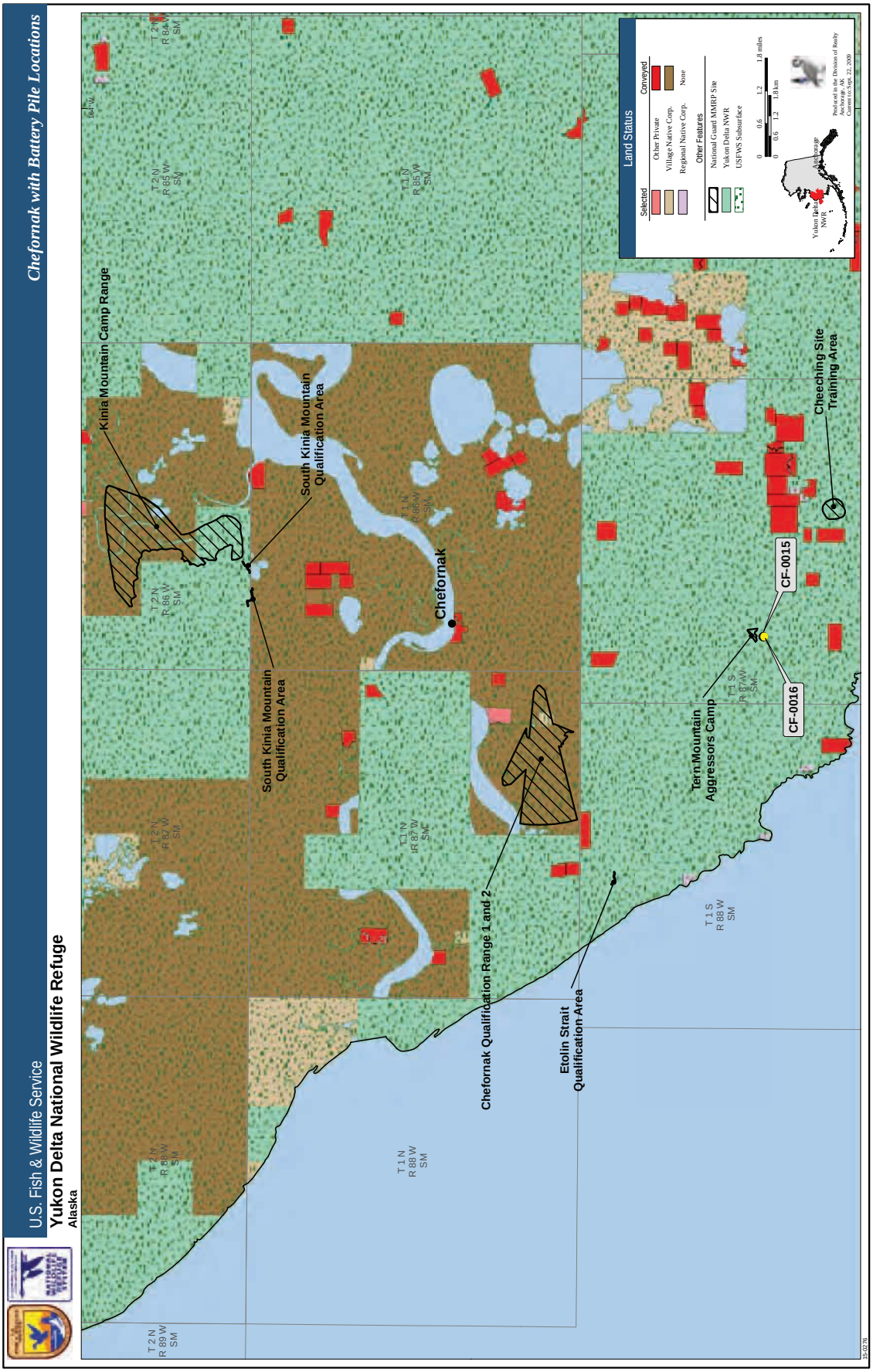
Miscellaneous Sites

Bethel Hospital
A one-acre trailer site required a Level II survey in December 1989.

Chevak Airport
The Service owns the subsurface estate under the Chevak Airport. The Service offered a land exchange for the subsurface estate to Alaska Department of Transportation (ADOT) but this was not pursued by ADOT. Dave Allen, USFWS Regional Director, (letter to Anton K. Johansen, Regional Director, Alaska Department of Transportation and Public Utilities, January 14, 1999) said that since the land exchange was not pursued," your agency will also be responsible and liable for any future contamination problems that might occur on the site from operation of the airport, including damage to the subsurface estate."

Chefornak
This site was just reported to the Service in September 2009. Debris and barrels were reported to be left behind by the USAF.

Debris left on Tern Mountain, Chefornak, Alaska. USFWS photos


U.S. Fish & Wildlife Service
Yukon Delta National Wildlife Refuge
Alaska
Chefornak with Battery Pile Locations
Kinia Mountain Camp Range
South Kinia Mountain Qualification Area
South Kinia Mountain Qualification Area
Chefornak
Chefornak Qualification Range 1 and 2
Etolin Strait Qualification Area
Tern Mountain Aggressors Camp
CF-0015
CF-0016
Cheeching Site Training Area
Land Status
Selected
Conveyed
Other Private
Village Native Corp.
Regional Native Corp.
None
Other Features
National Guard MMRP Site
Yukon Delta NWR
USFWS Subsurface
Yukon Delta NWR
Anchorage
Produced in the Division of Realty Anchorage, AK
Current to Sept. 22, 2009
T 2 N R 89 W SM
T 2 N R 88 W SM
T 2 N R 87 W SM
T 2 N R 86 W SM
T 2 N R 85 W SM
T 2 N R 84 W SM
T 1 N R 88 W SM
T 1 N R 87 W SM
T 1 N R 86 W SM
T 1 N R 85 W SM
T 1 S R 88 W SM
T 1 S R 87 W SM

Future Threats

A road project for Nelson Island that would link the villages of Toksook Bay, Nightmute, and Tununak with a spur road to Unkumiut, initiated by the ADOT in 2003, is still in the planning stages. The surface estate is all owned by the village corporations. A permit was issued in 2004 to ADOT to conduct soil coring along the proposed route. This work was completed. The road project is estimated to cost $30–60 million.

The current plan for the Donlin Creek Mine (SRK Consulting September 20, 2006, Preliminary Assessment Donlin Creek Gold Project) involves shipping five million gallons of diesel per year during the operational phase of the project.

Calista has proposed an 80-megawatt power line from Bethel to the Donlin Creek mine northeast of Aniak. As proposed, the power line would cross several miles of Refuge land bordering the Kuskokwim River. A feasibility plan for a Bethel based coal-fired power plant was recently completed. Large construction projects such as these may result in fuel spills or other unintended contaminant-related impacts. A coal-fired power plant would produce air emissions, which potentially could affect Refuge resources.

The current plan for the Donlin Creek Mine (SRK Consulting September 20, 2006, Preliminary Assessment Donlin Creek Gold Project) involves shipping five million gallons of diesel per year during the operational phase of the project. This would involve 25 barges traveling up the Kuskokwim during the ice-free period of June 1–September 30. During the mine's operational phase, 16 million gallons of fuel would be required per year, with fuel transportation requiring 80 barges. In addition to fuel, the explosives, mine and mill consumables, and other materials are estimated at 146,000 tons, requiring 170 barges during each year of construction. Operational period estimates are for 157,000 tons of fuel and materials and 198 barges per year.

Ocean transportation of most materials will end at a f oating lightering station at Johnson Crossing, to be established at the mouth of the Kuskokwim River. River transport barges will have a 200,000-gallon capacity. A 13-million gallon diesel tank farm will store nine months' diesel fuel supply for the site.

These data show that expanded resource development in interior Alaska could result in greatly expanded shipping of fuel and possibly other hazardous materials up these key waterways that run through the Refuge.

Sites with Unknown Status for Contaminant Issues

In 1969, the Alaska Village Electric Cooperative was given permission for rights-of-way for transmission lines and/or power plant sites in the following locations: Huslia; Nunapitchuk; Shismaref; Toksook Bay to Tununak; St. Mary's to Mountain Village; St. Michael to Stebbins; Lower Kalskag to Upper Kalskag; Emmonak to Alakanuk; Nunapitchuk to Kasigluk. At power plant sites, there are usually oil storage platforms and generators.

Other sites where contaminant history is unknown but not suspected are the Old Chevak field station, where there were storage buildings, an office, shop and generator shack, and the Refuge residences in Bethel. The Muskox facility on Nunivak Island was confirmed to have no lands which contained or previously contained hazardous materials, according to a 1983 letter from U.S. Fish and Wildlife Service Region 7 Division of

Realty Office to BLM. These lands (eight acres) continue to be held by the Refuge. There are no current activities at this site. The Muskox facility acreage is Section 3(e) lands.

Kokechik Bay is a small inlet south of Cape Romanzof where residents of Hooper Bay and Scammon Bay have traditionally harvested fish, clams, and other foods. In recent years, local citizens have noted increased abnormalities in fish, shellfish, and bird eggs in the Kokechik Bay region (Horton 2004). In 2002, salmon began turning up dead with skins and fins having a 'burnt' appearance and riddled with holes, conditions that had not been previously seen. In recent years, some eggs of nesting waterfowl had unusual, "soft, leathery eggshells,"

Recreation and Subsistence

The Refuge is used for a variety of recreational and subsistence purposes. Some of these may pose potential contaminant concerns for the Refuge. Recreational activities include hunting, fishing, trapping, snowmobile use, aviation, and boating.

The most likely risk from any of the Refuge's recreational activities is small fuel spills from motorized transport and the associated fuel caches.

Recreational activities such as backpacking, boating, camping, hiking, birding, photography, and river f oating occur to a small extent on the Refuge. Power boating and camping are generally associated with subsistence hunting and fishing. Since the Refuge is so remote and costly to access, this use is low in comparison to that of many other refuges.

The most likely risk from any of the Refuge's recreational activities is small fuel spills from motorized transport and the associated fuel caches. Additionally, solid waste, including discarded batteries, may be left behind as a result of recreational activities. Aircraft accidents can also cause small localized spills.

Lead shot is no longer allowed for waterfowl hunting. A federal ban has been in effect since 1991, but spent shot and residual lead from fishing weights may persist in the environment. Lead is a well documented contaminant issue on the YDNWR, particularly for waterfowl, as they may ingest small pieces of lead when they ingest small pebbles for use as grit in the gizzard.

Off-road Vehicle Use (ORV)

Transportation on the Refuge is limited to aircraft, boats, and snow machines. Snow machines are used heavily, both for recreational and subsistence uses. Snowmobiles are a source of pollutant emissions, releasing hydrocarbons, particulates, VOCs, nitrogen oxides, and carbon monoxide. According to a study by the National Park Service (2000), comparison with automobile emissions showed operation of a snowmobile for four hours using a conventional two-stroke engine can emit between 10 and 70 times more carbon monoxide and between 45 and 250 times more hydrocarbons than an automobile driven 100 miles.

Four wheeler use is common in and around villages but is not permitted on Refuge lands. However, they are used illegally on the Refuge, and there are at least several instances where ORVs have been or are beginning to be a problem.

Snow on the Yukon Delta Refuge. USFWS photo

Snow machine use in the spring, after much of the snow has melted, damages the surface vegetation, leaving ruts and many obvious trails. The regulations state, in essence, that snow machines are allowed as long as there is adequate snow cover to prevent resource damage. Snow machine travel is a way of life in villages throughout Alaska, where they provide necessary transportation between villages or for winter and spring hunting and trapping. When spring arrives, it is not uncommon to have snow machines traveling on trails or overland when there is less than 50 percent snow cover. Some 20,000 residents live in villages surrounded by over 19 million acres of Refuge land.

Hunting and Fishing

With an estimated 500,000 lakes and ponds and the two largest river systems in the state running through the Refuge, sport, commercial, and subsistence fishing are very important activities for many of the region's residents. Although only a small number of non-local residents travel to the Refuge for sport fishing, this contingent is expected to increase at less used fishing waters. During the winter months, ice fishing occurs on many of the region's lakes and rivers to fulfill subsistence needs.

Muskox hunts occur on Nunivak Island. Most hunts last only a day or two, and hunters reach their destination via charter boat transport. Caribou and moose hunters travel via air or boat to their hunting destinations. Waterfowl hunting is primary done by local residents. A recent Refuge reports notes that on a spot inspection, no hunters were found to be using lead shot.

Lead Poisoning

Lead poisoning has been documented in spectacled and common eiders on the Refuge (Flint and Grand 1997; Franson et al. 1995; Franson et al. 1998). A value equal to greater than 0.2 ppm in blood indicates lead exposure. Franson et al. (1998), found 20 percent of adult females sampled on the YDNWR had blood lead concentrations greater than or equal to 0.5 ppm wet weight. The maximum blood lead concentration in a female spectacled eider was reported at 14.37 ppm wet weight. Detectable lead was present in blood in at least 60 percent of spectacled eiders sampled on the Y-K Delta in 1995 and 1996; in addition, blood lead concentrations were higher than those reported by Flint from an earlier study (Flint et al. 1997, Grand et al. 2002).

A herd of 31 muskox were established on Nunivak Island in 1935 and 1936. USFWS photo

Lethal lead concentrations in spectacled eider livers ranged from 26 to 38 ppm wet weight, and 52 ppm in the liver of a common eider. One moribund spectacled eider had a blood lead concentration of 8.5 ppm wet weight (Franson et al. 1995).

Grand et al. (1998) work on the Y-K Delta suggested that lead exposure inf uenced adult female spectacled eider survival. Adult females exposed to lead prior to egg hatch had a much lower survival rate (0.44 plus/minus 0.10) compared to those females not exposed to lead (0.78 plus/minus 0.05). They suggested that most of the mortality occurred over winter, and that this reduced survival may be impeding recovery of local populations. Their study estimated a 34 percent reduction in annual survival of lead-exposed females. They also estimated that about 29 percent of the annual mortality at the Kashunuk River was directly attributable to lead poisoning, and over one-third of that mortality occurs during brood rearing.

Flint and Grand (1997) suggested lead shot was a source of mortality in adult females and ducklings. They estimated that seven percent of successful breeding females died during brood rearing, and half of that mortality resulted from lead poisoning.

Lead shot poisoning was also documented in a Pacific loon at Kigigik Island, the only documented lead poisoning incident in Alaska for this species (Wilson et al. 2004). Lead exposure in Emperor geese is less than that observed

in sympatrically nesting spectacled eiders and other diving ducks, likely ref ecting differences in foraging strategy (Franson et al. 1999).

The village of Hooper Bay petitioned the Alaska Board of Game to restrict use of lead shot in Game Management Unit 18, which encompasses the Yukon-Delta region. The Service supported this regulatory change. Lead isotope work conducted by the U.S. Fish and Wildlife Service Environmental Contaminants Program and field studies conducted by USGS contributed to the technical justification for adopting this change. The changes were filed April 21, 2008, and are effective July 1, 2008.

A new paragraph amends 5 AAC 92.080 as follows:

> (14) taking game in Unit 18 with a shotgun using any shot other than nontoxic material approved by the United States Fish and Wildlife Service, that is size t, .20 caliber or smaller, including loose shot used in muzzle loading firearms, and while in immediate personal possession of lead shot.

Reducing lead shot deposition in the Y-K Delta will benefit listed species and other waterfowl. Flint (1998) suggested that lead shot remains available in sediment to feeding waterfowl for many years, and exposure to lead shot will likely occur for more than three years after the use of lead shot is curtailed.

Fishing – Sport and Subsistence

Sport fishing pressure on the Refuge is currently low. Some of the tributaries feeding the Kuskokwim and Yukon rivers are just now being discovered by people from outside the region. Favored rivers for sport fishing include the Aniak, Kwethluk, Kasigluk, Kisaralik and Andreafsky. Anglers reach their fishing destinations by air and/or boat.

Isolated residents rely on float plane or boat for summer travel. USFWS photo

The population of the Y-K Delta is among the largest of any similar Native/aboriginal occupied region in Alaska. It is estimated that over 50 percent of all of the state's rural subsistence fishing activities occur within the Yukon and Kuskokwim River drainages, much of which are located within the Refuge's boundary. Approximately 1,300 families participate in the annual harvest of salmon in the Kuskokwim drainage alone. The subsistence schedule for the lower Yukon going into the 2007 season was two 36-hour periods per week.

http://csfish.adfg.state.ak.us/newsrelease/view.php?year=2007&dist=YUS&species=400&num=1 (Accessed 28 April 2008).

Mercury Contamination

In Alaska, mercury occurs due to atmospheric transport, primarily from coal-fired plants and waste incinerators (AMAP 1997); from naturally-occurring mercury deposits and abandoned mines; and into aquatic ecosystems through erosion of soils following forest fire deforestation.

Organic, boreal soils have been an accumulation hotspot for mercury and the transformation to methylmercury (MeHg) (Turetsky et al. 2006). Peat wetlands sequester mercury from the atmosphere, keeping it from cycling through the food web. Wildfire activity releases mercury from these cold, wet soils to the atmosphere, exacerbating mercury toxicities for northern food chains. Drier climate regimes and more severe fire weather under future climate change are expected to increase fire severity across much of the boreal region (Flannigan et al. 2005). Climate projections predict larger, more frequent, and more severe wildfires. Estimates of fire emissions from Canadian boreal peatlands ranged from 1.5–7.01 mg mercury/m2 (Turetsky et al. 2006). Global mercury emissions are estimated to be 15-fold greater than previously determined due to mercury stored in northern peat soils that had not been accounted for

Mean mercury concentrations in northern pike from Alaska and Arctic Canada equal or exceed those from the lower 48 states (USEPA 1992).

http://www.usgs.gov/newsroom/article.asp?ID=1550 (Accessed 29 April 2008).

MeHg is the most toxic form of mercury. Mercury is methylated by specific bacteria present in sediments, streams, and ocean waters. In the food chain, mercury tends to biomagnify, concentrating in the highest level predators. Exposure to low concentrations of mercury in food is associated with an increased risk of neurochemical or cardiovascular damage and acts as an endocrine disruptor in humans and wildlife (Jewett and Duffy 2007). Populations with a high intake of fish or fish products have the highest risk of chronic mercury exposure.

Mercury is also a COC in fish, particularly in long-lived predatory fish such as northern pike, a seasonally important subsistence resource in western and interior Alaska. A summary article that reviewed existing data for mercury in 41 species of Alaska fish found that mercury concentrations were generally low, with the notable exception of northern pike (Jewett and Duffy 2007). Mean mercury concentrations in northern pike from Alaska and Arctic Canada equal or exceed those from the lower 48 states (USEPA 1992). Elevated mercury concentrations have been observed in northern pike from the Y-K Delta region (Jewett et al. 1999; Jewett et al. 2003; Jewett and Duffy 2007). Duffy et al. (1999), reported that 36 percent of the pike sampled in a subsistence fish study on the Y-K Delta had mercury in muscle tissue that exceeded the U. S. Food and Drug Administration action level for human consumption of fish tissue (the concentration at which fish sales are restricted) of 1.0 mg/kg wet weight.

In a 2000 study, northern pike from the Yukon and Kuskokwim rivers had mean concentrations of total mercury in muscle of 1.506 and 0.628 mg/kg wet weight, respectively (Jewett et al., 2003). The FDA action level is 1 ppm wet weight for human consumption of edible fish.

The Service and USGS have undertaken a number of mercury contamination studies in northern pike on several Alaska refuges: Koyukuk, Kauti,

Nowitna, Selawik, and Innoko (Gray et al. 1996; Mueller et al. 1991; Mueller et al. 1993; Mueller et al. 1995; Mueller and Matz 2002; Snyder-Conn et al. 1992). A study was initiated in 2005 that will create a data set for subsistence management and consumptive decisions on Y-K Delta and other northern refuge lands. This multiple-year study is presently in progress (Matz 2008), and preliminary information from that investigation follows.

In another recent study, northern pike, longnose sucker, and burbot had mercury concentrations that exceeded toxicity thresholds in one or more samples (Hinck et al. 2006).

Northern pike (n = 69)were sampled from six sample sites, the Gweek River (60.860N, 161.588W), Johnson River (60.654N, 162.112W), Tuluksak River (61.101N, 160.966W), Aniak (61.574N, 159.490W), Whitefish Lake (61.370N, 160.026W), and the Eek River (60.218N, 162.029W), all in the Kuskokwim River drainage on the Refuge. Skinless muscle samples were analyzed for mercury (Hg) and methylmercury (MeHg). Mean (+ SD, n) Hg and MeHg concentrations were 1.06 (+ 0.970, 69) and 1.13 (+ 1.07, 18) mg/kg dry weight, respectively. The mean MeHg:Hg ratio indicated that approximately 93 percent of total mercury in pike muscle was methylmercury, the most toxic form. Mercury concentrations were significantly correlated with fork length and fish weight, with larger fish having higher mercury concentrations.

Aniak fish had significantly greater Hg concentrations than all other sites. The two fish from Tuluksak had Hg concentrations in the range of those from Aniak. In 2006 and 2007, additional northern pike muscle samples were collected and mercury analyses are pending.

In another recent study, northern pike, longnose sucker, and burbot had mercury concentrations that exceeded toxicity thresholds in one or more samples (Hinck et al. 2006). When these data were included in a risk analysis, results indicated that these concentrations in fish may represent a risk to piscivorous wildlife throughout the Yukon River Basin.

USGS work in the Kuskokwim River region (Gray et al. 1994; Gray et al. 1996; Gray et al. 2000) found mercury from abandoned mines and mercury lodes to be a source of mercury in stream sediments and freshwater fish. Arctic grayling and Dolly Varden had muscle sample (edible filet) mercury concentrations ranging from 0.26 to 0.62 ppm wet weight. The same fish species from background sites contained as much as 0.2 ppm mercury wet weight in muscle samples. Although mercury concentrations in fish were elevated in comparison to fish from control sites, the mercury concentrations found do not exceed the FDA action level of 1 ppm wet weight for human consumption of edible fish. Mercury in muscle samples was 90–100 percent methylmercury. All creek-water samples had mercury concentrations below the 2 ppb drinking water maximum-contaminant level. Some samples collected below mines had mercury concentrations that exceeded the 0.012 ppb instream concentration that the EPA indicates may result in chronic effects to aquatic life.

Mercury concentrations were also measured in chum salmon from the Kuskokwim and Holokuk rivers and northern pike from the Kuskokwim River. Salmon muscle samples had mercury concentrations of 0.03 to 0.08 ppm wet weight, while northern pike samples had 0.19 to 0.31 ppm. These results were also below the FDA action level for human consumption of edible fish (Jewett and Duffy 2007).

Dr. James Berner, Director of Health for the Alaska Native Tribes Health Consortium in Alaska, has found above normal levels of toxic substances such as cadmium, mercury, and PCBs in blood from infants and their mothers in a number of Y-K Delta villages (Horton 2004).

A contaminants investigation on salmon from the Kuskokwim River was conducted by the Service in 2001 (USFWS unpublished data). They found contaminant concentrations were generally low. The State Department of Health and Social Services, Department of Epidemiology, has recommended unlimited consumption of salmon in Alaska.

Salmon drying in Nightmute. Engineering/USFWS photo

Biotic Sources and Physical Transport

Biotic Sources

Migratory birds, anadromous fish and other migratory species are possible biotic sources of contaminants. Because these species are highly mobile, they may be exposed to contaminants outside of the Refuge boundaries. When these species return to the Refuge, they may transport any accumulated contaminants back to the Refuge where they can become available to other Refuge species and humans. It is currently unknown if biotic transport is a contaminant pathway that could affect Refuge resources.

Migratory birds may be exposed to an array of potentially toxic chemicals on their wintering grounds outside of Alaska, including chemicals that are banned or no longer used in the United States. During spring migration, birds may transport these contaminants to their nesting grounds in Alaska. This migratory transport of contaminants provides a potential exposure pathway to other organisms that would otherwise likely not be exposed to these chemicals.

Several studies have examined the role of salmon in transporting contaminants to Alaska's freshwater ecosystems. A population of sockeye salmon that spawn in the Copper River, accumulated the majority of their contaminant body burden during their ocean life stage and transported low levels of contaminants to their freshwater spawning lakes (Ewald et al. 1998). Grayling from the salmon lake had more than two times higher concentrations of PCBs and organochlorine pesticides than grayling from a lake without anadromous salmon. A study of lakes in Canada and Alaska found that anadromous salmon contaminant pathways can significantly affect the contaminant burden of resident fish (Gregory-Eaves et al. 2007). They found that PCBs and organochlorine pesticides in rainbow trout were from direct consumption of salmon tissues. Concentrations of these chemicals in trout tissues were below the FDA consumption guidelines but not below the EPA's screening values to protect subsistence users. They found 96 percent of the rainbow trout analyzed exceeded the sum PCB value, and 16 percent exceeded the sum DDT values.

Emperor geese are among the many waterfowl species that nest on the Refuge. USFWS photo

Another Alaska and British Columbia, Canada, study found PCBs that are accumulated in oceans and transported by thousands of salmon that spawn and die in

freshwater ecosystems has resulted in an increase in PCB concentrations in lake sediments. In addition, PCB concentrations have shown no sign of recent decrease, as reported in other North American lakes where most contaminants were attributed to atmospheric deposition (Krummel et al. 2005). They also reported that anadromous sockeye salmon provided a more important route of entry for PCBs to some Alaskan nursery lakes than atmospheric deposition.

A study in Nunavut, Canada, found transport of marine-derived contaminants to coastal ponds located under the fulmar nesting cliffs.

Seabirds have been shown to be important biovectors for contaminant transport to the Arctic through guano deposition into lakes (Evenset et al. 2004). In that study on an island off the coast of Norway, the presence of seabird colonies on one lake coincided with high PCB concentrations in resident fish. Polybrominated diphenyl ethers (PBDEs) were also elevated in resident Arctic char from the seabird colony–associated lake (Herzke et al. 2004).

A study in Nunavut, Canada, found transport of marine-derived contaminants to coastal ponds located under the fulmar nesting cliffs. Fulmar guano was deposited into the sediments of these ponds. Sediments had 60 times higher DDT, 25 times higher mercury, and 10 times higher hexachlorobenzene concentrations than nearby control sites (Blais et al. 2005).

Physical Transport

Environmental contaminants from local and distant sources are subject to short- and long-range transport mechanisms. Arctic and subarctic environments are particularly vulnerable to the long-range air and water transport of environmental contaminants. Atmospheric deposition in the Arctic occurs primarily in winter. When chemicals reach arctic regions, they condense and precipitate out of the atmosphere due to increased volatilization in colder climates. Additionally, these chemicals break down at slower rates in arctic climates. Arctic regions essentially serve as a sink for these chemicals.

Some environmental contaminants of particular concern within the Arctic are persistent organic pollutants (POPs), such as PCBs, dioxins, DDT, hexachlorocyclohexane, chlordane, toxaphene, mirex, and dieldrin; heavy metals, such as cadmium, mercury, and lead; PAHs; and radionuclides. POPs are toxic chemicals that are not easily metabolized by organisms and are often passed up the food web, where they biomagnify. This is particularly true in top level predators where these compounds accumulate to harmful levels. A full discussion of physical pathways of contaminant transport can be found on the Arctic Monitoring and Assessment Programme Web site (http://www.amap.no) (Accessed 30 April 2008).

Spectacled eiders are a threatened species. USFWS photo

Male northern pike collected from multiple sites in the Yukon River

Basin had a biomarker, vitellogenin concentrations, that indicated exposure to estrogenic compounds (Hinck et al. 2007). Significant cause-and-effect relationships between contaminant concentrations and biomarker responses could not be determined in this study. Organochlorine pesticides, chlordane-related compounds, and PCBs were detected in most samples but did not exceed toxicity thresholds for fish or piscivorous wildlife. Pike from 3 of 10 sampling locations had toxaphene concentrations that approached protective thresholds for growth and reproduction of freshwater fish.

In addition to fish, birds may also be accumulating contaminants from distant sources. A study of four eider species in Alaska and Russia found that cadmium, copper, lead, and selenium appeared high relative to other waterfowl and may warrant concern (Stout et al. 2002). With the exception of lead, local anthropogenic sources for these elements are unknown. Although adverse physiological responses have not been documented in eiders, these four elements cannot be discounted as contaminants of potential concern for some eider species.

Spectacled eiders leave the Yukon-Kuskokwim Delta after breeding and move out to the Beaufort, Chukchi, and Bering Seas. USFWS photo

Areas of Concern (AOCs) and Future Sampling Needs

This contaminant assessment report analyzed some of the past, present, and future contaminant issues for the Refuge. Prior to and since its establishment, the Refuge has had a variety of activities which have introduced contaminants into the environment. Various parties are responsible for these contaminant sources. Many of these sites may be under another entity or agency's management at the present time, but could potentially revert to the Refuge depending upon outcomes of property ownership transfer. This report documents these potential contaminant sources and issues for the Refuge, including past and present military properties, former BIA structures, mining projects, and oil spills.

Many of the potential contaminant sites, such as the ANG sites, have had minimal or no sampling conducted to determine if there is any contamination. Other sites, such as the old BIA complex in Bethel, are in need of extensive cleanup and remedial actions. Cleanup and remediation activities at USAF-operated CRLRRS are ongoing. Sampling to determine the extent of contamination at this facility may not be adequate to ensure protection of Service resources should the site revert to Refuge ownership.

Due to remoteness of some sites, weather delays, and time and budget constraints, only a limited number of potentially contaminated sites were visited in preparation of this report. Areas that were not visited are included in this document, but the evaluation of these sites is minimal.

The following issues, areas, and/or sites should either undergo further investigation or cleanup if the sites are or may become Refuge property, or be watched for potential future effects to Refuge resources. The Service should remain engaged in reviewing sampling and cleanup plans, and other documents relevant to protection of Refuge lands and other Service resources.

- Army National Guard sites – in particular, building sites due to associated fuel spills, present fuel tanks, fuel lines, and unknown debris.
- MMRP – firing ranges that occur on Refuge lands or allotments.
- BIA Administrative site in Bethel and the associated fuel spill.
- Bethel TACAN site – Bethel City Landfill.
- Jack Todd Army Airfield – Further evaluation is needed to determine if any contaminants that remain at the site warrant additional cleanup.
- Napatuk Creek Well sites should be checked for remaining debris, and adjacent lake sediment samples should be collected for hydrocarbon analysis.
- Donlin Creek Mine – Although this mine project is outside of Refuge boundaries, given the size and scope of the planned development, the Service may wish to be engaged in the planning process for Donlin Creek. It is upstream of the Kuskokwim River, and power generation and/or mineral processing at the site also has the potential to affect air resources.

- Cape Romanzof - The USAF is currently conducting remedial and cleanup activities at this site; the Service should remain engaged in reviewing cleanup and other plans.
- As with most Alaska refuges, few data exist that establish baseline contaminant concentrations in air, soil, sediment, water, and biota. Baseline data would provide a record of present conditions to compare with potential future changes.
- Tracking fuel spills and any associated response and cleanup activities on the Refuge, and on rivers that f ow into Refuge waterways, is recommended.

A variety of wildflowers cover the hillsides during summer. USFWS photo

Conclusion

The Yukon Delta National Wildlife Refuge encompasses a significant portion of the Alaska's wetland habitats used by waterfowl and other water-dependent birds. Because of the number of communities within the Refuge, many of whose 25,000 residents depend upon Refuge resources to support their subsistence lifestyle, discovering and remediating potential contaminants before they become a problem is an important concern. There are significant contaminant issues on the Refuge, some of which have been identified and highlighted in this report. The majority of these problems stem from activities of other agencies or entities. Cleanup of some of these sites is being or has been conducted with potentially mixed success. Post-closure sampling is needed to ensure that site cleanup and remediation efforts were successful. Unfortunately, funds are not available at this time to resolve these issues.

The information gathered during the CAP should help Service personnel make informed management decisions about contaminant threats to Refuge lands and resources. It is the responsibility of the Service to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people. Using CAP is one way in which the Service can ensure that our country's National Wildlife Refuges maintain their environmental health and integrity.

The tundra swan western population has increased at an average rate of three percent per year during the past 10 years. The 2007 Service midwinter survey estimated 109,647 birds in the western population. USFWS photo

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Appendix A. Military Munitions Response Program (MMRP) Site Descriptions

MMRP - AKIACHAK EXPLOSIVES AREA AKCHK-001-R-01 is a transferred range is located southwest of the Village of Akiachak and consists of 81 acres. An interviewee indicated that training with TNT took place on one occasion in this area with Special Forces to break up frozen mud. The estimated date of use was 1965. This area consists of open water on the Kuskokwim River. **Cleanup Strategy:** An installation wide SI and ASR will be assigned to this site. No munitions and explosives of concern (MEC) or munitions of concern (MC) are expected at this site.

MMRP - AKIACHAK WEAPONS QUALIFICATION 1 AKCHK-002-R-01 and MMRP - AKIACHAK WEAPONS QUALIFICATION 2 AKCHK-003-R-01 are transferred ranges located west of the Village of Akiachak and consist of 861 acres. An interviewee indicated that this area was used for weapons qualification with M14s and M16s. Estimated period of use is 1960–1969. The majority of this area is undeveloped, but some of the range overlaps into open water. **Cleanup Strategy:** An installation wide SI will be assigned under AKCHK-001-R-01 and AKCHK-003-R-01, and an installation wide ASR will be assigned under AKCHK-001-R-01. An RI/FS, including the installation of groundwater monitoring wells, will be completed, followed by excavation and offsite waste transportation and disposal.

MMRP - CHEFR-001-R-01 CHEECHING MOUNTAIN TRAINING AREA 1 is a transferred range of 85 acres. According to a former National Guardsman, Guard personnel camped at this range at the northern base of Cheeching Mountain south-southeast of the Village of Chefornak. The guardsman stated that blanks were fired here. Brass at this site was policed; however, there have been no other known munitions response actions at this range. COC at this site is lead. **Cleanup Strategy**: No contamination is expected at this site.

MMRP - CHEFR-002-R-01 CHEECHING MOUNTAIN TRAINING AREA 2 is a transferred range of 32 acres. According to a former National Guardsman, Guard personnel camped at this range at the southern base of Cheeching Mountain southeast of the Village of Chefornak. The guardsman stated that blanks were fired here and that brass at this site was policed. There have been no other known munitions response actions at this range. COC at this site is lead. **Cleanup Strategy**: No contamination is expected at this site.

MMRP - CHEFR-003-R-01 CHEECHING SITE TRAINING AREA This is a transferred range of 75 acres. According to former National Guardsmen, Guard personnel camped and trained during an "Aggressors' Camp" at this range at the "Cheeching Site," which is south-southeast of the Village of Chefornak. Blanks were fired here, and smokes, dummy grenades, and "f ashbangs" were also used. There have been no known munitions response actions at this range. **Cleanup Strategy**: No contamination is expected at this site.

MMRP - CHEFR-004-R-01 CHEFORNAK QUALIFICATION RANGE 1 This is a transferred range of 433 acres. Weapons qualification using small arms was conducted at this range west-southwest of the Village of Chefornak, usually several times a year. There were two firing points at this range, one that fired to the south and another that fired to the southeast, both into nearby bluffs. There have been no known munitions response actions at this range. **Cleanup Strategy**: An RI/FS, including the installation of groundwater monitoring wells, will be completed, followed by excavation and offsite waste transportation and disposal.

MMRP - CHEFR-005-R-01 CHEFORNAK QUALIFICATION RANGE 2 This is a transferred range of 20 acres. Weapons qualification using small arms was conducted at this range southwest of the Village of Chefornak, usually several times a year. The firing direction at this range was roughly to the west, into bluffs. There have been no known munitions response actions at this range. **Cleanup Strategy**: An RI/FS, including the installation of groundwater monitoring wells, will be completed, followed by excavation and offsite waste transportation and disposal.

MMRP - CHEFR-006-R-01 KINIA MOUNTAIN CAMP RANGE This is a transferred range of 1,082 acres northeast of the Village of Chefornak. According some former National Guardsmen, maneuvers conducted in this area during one-week training exercises involved the firing of blanks, as well as the use

of smokes and f ares. Special Forces trained in this area with the National Guard, and "war games" were conducted. An interviewee stated that brass was picked up from this area. No munitions response actions are known to have taken place at this site. In1985, final exercises were conducted. This area includes some open water. **Cleanup Strategy**: No contamination is expected at this site.

MMRP- CHEFR-007-R-01 TERN MOUNTAIN AGGRESSORS CAMP This is a transferred range of 13 acres. According to former National Guardsmen, Guard personnel camped and trained during an "Aggressors' Camp" at this range south of the Village of Chefornak. The guardsman indicated that blanks were fired here, and smokes, dummy grenades, and "f ashbangs" were also used. There have been no known munitions response actions at this range. **Cleanup Strategy**: No contamination is expected at this site.

MMRP - CHEVK-001-R-01 CHEVAK RANGE 1, MMRP - CHEVK-002-R-01 CHEVAK RANGE 2, MMRP - CHEVK-003-R-01 CHEVAK RANGE 3 These three transferred rif e ranges are located south-southwest, north, and northeast, respectively, of the Village of Chevak and comprise approximately 10 acres total. All subsurface estate of the lands outside the town site boundary remains in federal ownership (D. Jerry, letter to Y. Chong, February 15, 2008). Small arms (M14s and M16s) were fired into a bluff or hillsides during weapons qualification training. It was assumed that Range 1 was used from 1953 until 1992, when live fire exercises ended in the area and munitions were removed from the armory. It was also mentioned that smokes were used at this range. DoD has never been owned or controlled theses lands. Although there have been no known munitions response actions at this ranges, it was mentioned that brass was collected after firing. The areas are currently undeveloped. **Cleanup Strategy**: An installation wide SI and ASR are assigned to these sites. At Range 1, an RI/FS, including the installation of groundwater monitoring wells, will be completed, followed by excavation and offsite waste transportation and disposal.

At Range 2, small arms (M16s) were fired into the hillside during weapons qualification training in 1989. The area is currently undeveloped land but also includes some open water. **Cleanup Strategy**: No contamination is expected at Range 2.

At Range 3, small arms (M16s) were fired during weapons qualification training from 1956 until 1992, which was the approximate year that live fire exercises ended in the area and munitions were removed from the armory. **Cleanup Strategy:** An RI/FS, including the installation of groundwater monitoring wells, will be completed, followed by excavation and offsite waste transportation and disposal.

MMRP - EEKSA-001-R-01 EEK AIRSTRIP MANEUVER AREA is a 38-acre transferred range located southeast of the armory, adjacent to the airstrip. According to an interviewee, training maneuvers, wherein snipers were identified and eliminated, were conducted in this area using blanks in approximately 1988.

MMRP - EEKSA-002-R-01 EEK EXPLOSIVES TRAINING AREA This transferred range is in the center of the Village of Eek and consists of approximately two acres. According to two interviewees, Special Forces conducted detonation of TNT, training in a dry lake in this area during the late 1970s or early 1980s. One of the interviewees indicated that at the time of this training, the village was much smaller than present day. Another interviewee also confirmed that the guardsmen from Napakiak trained with the Special Forces in maneuvers with explosives in Eek; however, an exact location and timeframe was not provided.

MMRP - EEKSA-003-R-01 EEK MANEUVER AREA This transferred range is located southeast of the Village of Eek and consists of 385 acres. According to an interviewee, this area was used for bivouac training, with blanks being fired during maneuvers. Since specific dates of use were not provided by the interviewee, the earliest date of service for the interviewee (1965) was used as the beginning date for this range. The ending date was assumed to be when weapons were generally removed from the armories (1992).

MMRP - EEKSA-004-R-01 EEK PATROL AREA This transferred range is located northwest of the Village of Eek and consists of 46 acres. According to an interviewee, this area was used for patrolling and defensive actions using blanks. Although the dates of use for this area were not specified, the interviewee's dates of tenure with the ANG, from 1960 to 1985, were used as estimates.

MMRP - EEKSA-005-R-01 EEK PATROL AREA This transferred range is located northwest of the Village of Eek and consists of 856 acres. According to interviewees, rif e qualification with M16s took place toward the bluff during the winter in this area in the 1980s. Although the majority of this range is undeveloped land, the firing point is on the open water of the Eek River. **Cleanup Strategy:** An RI/FS, including the installation of groundwater monitoring wells, will be completed, followed by excavation and offsite waste transportation and disposal.

MMRP - EEKSA-006-R-01 EEK SMALL ARMS FIRING RANGE This transferred range is located northwest of the Village of Eek and consists of 857 acres. According to an interviewee, firing of M16s and M1s occurred in this area near the rif e qualification range in 1988. The majority of this area remains undeveloped with a small portion extending over the Eek River. **Cleanup Strategy:** An RI/FS, including the installation of groundwater monitoring wells, will be completed, followed by excavation and offsite waste transportation and disposal.

MMRP - EMMNK-001-R-01 KWIGUK PASS NORTH INLET RANGE This transferred range is located west of the Village of Emmonak, in an inlet on the north side of Kwiguk Pass. According to a former National Guardsman, training involved firing small arms such as M16A1s and M60s, zeroing in rif es, and firing practice rif e grenades toward the east across the inlet. It was assumed that the firing occurred from 50 feet back on the western shoreline and into a bank on the east side. Estimated activity dates are from 1958 to the 1982. The size of this site has been estimated at 11 acres. The interviewee stated that ammunition, including spent cartridges, was removed from the area after training exercises. **Cleanup Strategy:** An MEC Site Characterization and Removal Assessment will be completed to confirm that a concentrated area of contamination does not exist. The site will then be closed out.

MMRP - EMMNK-002-R-01 KAWOKHAWIK RANGE The firing point for this small arms range is located at the mouth of Kwiguk Pass, west of the Village of Emmonak. As described by a National Guardsman, the range fan extends west out over the Bering Sea and the mouth of Kwiguk Pass. Firing points included locations on the northern and southern sides of Kwiguk Pass, as well as along a north-south line between those two locations on Kwiguk Pass in the winter. Estimated range use dates of 1980–1988 were used based on the approximate date that the interviewee joined the National Guard and the date when firing activities ended in this area. The size of this site has been estimated at 1,915 acres. **Cleanup Strategy:** An installation wide SI is assigned to this site. No contamination is expected at this site.

MMRP - EMMNK-003-R-01 KWIGUK PASS JOINT EXERCISE RANGE This transferred range was located west of the Village of Emmonak. According to a National Guardsman, training was conducted once a year with Alakanuk personnel in this area and involved firing small arms munitions such as 5.56mm and 7.62mm ammunition. Firing occurred from the southwest riverbank to the northeast. This range was used from 1984 to 1988. The size of this site has been estimated at 2,454 acres. **Cleanup Strategy:** An installation wide SI is assigned to this site. No contamination is expected at this site.

MMRP - EMMNK-004-R-01 KWIGUK PASS RANGE This transferred range was located west of the Village of Emmonak, on Kwiguk Pass and is estimated at 118 acres in size. According to a former National Guardsman, training involved firing small arms into a river bank and setting off f ares. The interviewee recalled firing M16s, M1s, and M14s here, and that training at this range occurred approximately once per year. It was assumed that munitions were fired from 50 feet back of the shoreline and went 50 feet into the opposite bank of the river. Estimated use dates are 1968 to 1973. The guardsman stated that munitions were picked up after the training exercises and not left in the area. **Cleanup Strategy:** An installation wide SI is assigned to this site. No contamination is expected at this site.

MMRP - EMMNK-005-R-01 KWIGUK PASS BANKS RANGE This transferred range, estimated at 10 acres, was located west of the Village of Emmonak. According to a National Guardsman, training here involved firing small arms into targets at the river bank. It was assumed that firing occurred from the south river bank of this inlet and that the munitions went as far back as 50 feet on the north shore of the inlet.

Estimated dates of use are from1961 to 1985. **Cleanup Strategy:** An installation wide SI is assigned to this site. An RI/FS will be completed, followed by excavation and offsite waste transportation and disposal.

MMRP - EMMNK-006-R-01 NORTH EMMONAK TRAINING AREA This transferred range was located northeast of the Village of Emmonak. According to a National Guardsman, training at this range was conducted once per year for two weeks at a time and involved the use of pyrotechnics, dummy grenades, practice mines, smokes, trip wires, and parachute f ares. Although the specific dates of use are unknown, estimated dates of 1979 and 1988 were used based on the year that the interviewee began serving in the National Guard (1979) and the year that live firing in the area generally ended (1988). The size of this site has been estimated at 67 acres. The interviewee stated that everything, including cartridges and casings, were picked up in this area after use. **Cleanup Strategy:** An MEC Site Characterization and Removal Assessment will be completed to confirm that a concentrated area of contamination does not exist. The site will then be closed out.

MMRP - EMMNK-007-R-01 BUGOMOWIK PASS TRAINING AREA This transferred training area is located at Bugomowik Pass, northeast of the Village of Emmonak. According to a former National Guardsman, small arms were fired here during annual training exercises. The interviewee stated that M1s, M14s, and AR15s were fired during approximately once-a-month bivouacking exercises in this area. Another National Guardsman recalled the same exercises, except that the exercises were conducted approximately twice a year and involved the use of practice grenades. The interviewee recalled that AR-223s were used at this range. The dates of construction and use for this range were estimated to be the same as the earliest and latest times of the interviewees experience: between 1959, when one interviewee began his service, and approximately 1985, when the other interviewee ended his service. However, because only one interviewee recalled grenade use, the years of use for grenades are limited to his tenure, from 1959 to 1979. The size of this site has been estimated at 1,419 acres. **Cleanup Strategy:** An MEC Site Characterization and Removal Assessment will be completed to confirm that a concentrated area of contamination does not exist. The site will then be closed out.

MMRP - EMMNK-008-R-01 KAKAHKITULI PASS RANGE This transferred small arms range was located west of the Village of Emmonak. According to a National Guardsman, M16A1s and M60s were "zeroed out" toward the Bering Sea during weapons training exercises. Although the specific dates of use are unknown, estimated dates of 1979 to 1988 were used based on the date when firing activities ended in this area. The interviewee stated that all expended munitions, cartridges, and casings were picked up after use. The size of this site has been estimated at 2,350 acres. **Cleanup Strategy:** An installation wide SI and ASR are assigned to this site. No contamination is expected at this site.

MMRP - HOOPR-001-R-01 AIRSTRIP RANGE This transferred rif e range of 2,336 acres is located west-southwest of the Village of Hooper Bay airstrip. This range is comprised of two areas formerly used as firing points, both of which ran along the beach. According to several interviewees, M16s and M14s were fired towards the east into sand berms for weapons qualification at the more northern of the two firing points. Firing also took place towards the west into the ocean from this location. The southern firing point was located to the south of the village airstrip and oriented towards the water; it was used for weapons qualification with M14 rif es. The majority of this range is open water, although the firing points are located on undeveloped land. It was assumed that years of use for the northern part of this range spanned from approximately 1950 to 1986. The southern firing point was used from approximately the late 1950s until the early 1960s. Although there have been no known munitions response actions at this range, it was noted that brass was collected after firing. **Cleanup Strategy:** An installation wide SI is assigned to other sites. An installation wide ASR is assigned to HOOPR-002-R-01. An RI/FS will be completed followed by excavation and off-site waste transportation and disposal.

MMRP - HOOPR-002-R-01 This transferred rif e range is located outside and to the north of the Village of Hooper Bay and comprises approximately five acres. Small arms (M16s) were fired during weapons qualification training. It was assumed that this range was used from 1958 until 1991. DoD has never owned

or controlled this land. Although there have been no known munitions response actions at this range, it was mentioned that brass was collected after firing. The area is adjacent to a cemetery but is otherwise undeveloped. **Cleanup Strategy:** See prior site entry.

MMRP - HOOPR-003-R-01 CREEKSIDE RANGE 1 This transferred training area is located north-northwest of the Village of Hooper Bay airstrip and comprises approximately 84 acres. Small arms (M14s, M16s, and M60s) were fired at this range between 1950 and 1985. DoD has never owned or controlled this land. Although there have been no known munitions response actions at this range, it was noted that brass was collected after firing. The area is currently undeveloped land but also includes some open water. **Cleanup Strategy:** See entry for MMRP - HOOPR-001-R-01.

MMRP - HOOPR-004-R-01 CREEKSIDE RANGE 2 This transferred rif e range is located south of the Manayagavik Slough to the northwest of the Village of Hooper Bay and comprises approximately 87 acres. Small arms (M16s) were fired during weapons qualification training toward the east into the sand dunes. It was assumed that this training took place from 1950 until 1992, the approximate year when munitions were removed from the armory and live fire ended in the area. DoD has never owned or controlled this land. Although there have been no known munitions response actions at this range, it was noted that brass was collected after firing. The area is currently undeveloped land but also includes some open water. **Cleanup Strategy:** See entry for MMRP - HOOPR-001-R-01.

MMRP - HOOPR-005-R-01 VILLAGE HILL This transferred rif e range is located at the west end of the Village of Hooper Bay and comprises approximately five acres. Small arms (M16s) were fired in berms during weapons qualification at this range. It was assumed that this range was used from 1958 to 1991. DoD has never owned or controlled this land. Although there have been no known munitions response actions at this range, it was noted that brass was collected after firing. The area is located near housing units but also includes some open water. **Cleanup Strategy:** See entry for MMRP - HOOPR-001-R-01.

MMRP - HOOPR-006-R-01 VILLAGE TRAINING AREA This closed training area is located within the Village of Hooper Bay, includes the area comprising the entire armory complex, and consists of approximately 0.96 acres. Small arms (M16s) with blanks and smokes were fired during training exercises with the Special Forces. It was assumed that these training exercises occurred from 1950 to 1992, the latter being the approximate year that munitions were removed from the local armory and live exercises ended in the area. The land comprising this area is leased by the ANG from the village corporation. Although there have been no known munitions response actions at this range, it was noted that brass was collected after firing. The area is comprised of the armory complex and lies entirely within the Village Training Area TD range within the village. **Cleanup Strategy:** No contamination is expected at this site.

MMRP - HOOPR-007-R-01 VILLAGE TRAINING AREA (TD) This transferred training area is located in and around the Village of Hooper Bay and comprises approximately 74 acres. Small arms (M16s) were fired with blanks and smokes during training exercises with the Special Forces. It was assumed that these training exercises occurred from 1950 to 1992, the latter being the year that munitions were removed from the local armory and live exercises ended in the area. DoD has never owned or controlled this land. Although there have been no known munitions response actions at this range, it was noted that brass was collected after firing. The area lies within the village and completely surrounds the Village Training Area. Medical facilities, residences, schools/child care facilities, and open water are all located on this range. **Cleanup Strategy:** No contamination is expected at this site.

MMRP - KSGLK-001-R-01 KASIGLUK KYIGAYALIK LAKE RANGE This is a transferred range of 69 acres. According to a former National Guardsman, weapons qualification was conducted at this range approximately eight miles northwest of the village. The dates of construction and use of this range were 1972 to 1985. The interviewed guardsman indicated a firing point on the map but not a firing direction. It was assumed that the firing was conducted toward the bluffs to the west. Because the firing point identified by the interviewee for this range was on water, it was assumed that firing took place here on the winter ice.

According to the guardsman, the range was always cleaned up after use. DoD has never owned or controlled this area. This area currently consists primarily of open water and a small amount of undeveloped, open land. **Cleanup Strategy:** An installation wide SI and ASR are assigned to this site. An RI/FS will be completed, followed by excavation and offsite waste transportation and disposal.

MMRP - KIPNK-002-R-01 KIPNUK OLD VILLAGE NORTH RANGE This is a transferred range of 1,085 acres located to the west of Kipnuk. According to a retired National Guardsman, firing of M1 rif es by the Old Village was conducted once a year. The firing was toward 25-meter targets, and the direction was toward the ocean. This range was assumed to be used from 1969 to 1989. There have been no known munitions response actions at this range. DoD has never owned or controlled this area. This area currently consists of undeveloped land and some open water. **Cleanup Strategy:** An installation wide SI is assigned to this site. An installation wide ASR is assigned to KIPNK-004-R- 01. No contamination is expected at this site.

MMRP - KIPNK-003-R-01 KIPNUK TUNDRA RANGE This is a transferred range of 854 acres located southwest of the village of Kipnuk. According to an active National Guardsman, weapons qualification was conducted here using M16s—but just once. It was assumed that firing at this range was toward the southwest away from the village. The guardsman did not state when this range was used, only that it was used once. He has been in the National Guard for 29 years, so it was assumed that this range was used at the midpoint of his experience in mid-1988. There have been no known munitions response actions at this range. DoD has never owned or controlled this area. This area currently consists of undeveloped land and some open water. **Cleanup Strategy:** An installation wide SI is assigned to this site. An installation wide ASR is assigned to KIPNK-004-R-01. No contamination is expected at this site.

MMRP - KIPNK-004-R-01 KIPNUK WEAPONS QUALIFICATION RANGE This is a transferred range of 855 acres located southwest of the Village of Kipnuk. According to several former and active National Guardsmen, this range was used for small arms weapons qualification training approximately twice a year until 1985. M1s, M14s, and M60s and M16A2s were fired here at targets placed 25 meters away. The interviewees indicated that firing occurred toward the southwest. This range was assumed to be used from 1951 until 1985, when the guardsmen stated that this range stopped being used. There have been no known munitions response actions at this range. DoD has never owned or controlled this area. This area currently consists of some open water and some undeveloped land. **Cleanup Strategy:** An installation wide SI and ASR are assigned to this site. An RI/FS, including the installation of groundwater monitoring wells, will be completed, followed by excavation and offsite waste transportation and disposal.

MMRP - KIPNK-005-R-01 KIPNUK KUGUKLIK RIVER RANGE This is a transferred range of 15 acres. According to a current National Guardsman, this area east of the village of Kipnuk was used for the firing of blank 5.56s and blank 7.62s in February 1987. There have been no known munitions response actions at this range. This area is currently undeveloped land. **Cleanup Strategy:** An installation wide SI is assigned to this site. An installation wide ASR is assigned to KIPNK-004-R- 01. No contamination is expected at this site.

MMRP - KNGIG-002-R-01 KONGIGANAK QUALIFICATION RANGE This is a transferred range of 861 acres located northeast of the Village of Kongiganak. According to former National Guardsmen, annual weapons qualification using M16s occurred here in the winters. "Zeroing" of weapons occurred here as well. Firing was to the north toward the bluffs, and at targets placed 25 and 50 meters away, according to the guardsman. It was assumed that this area was used from 1959 until 1984. There have been no known munitions response actions at this range. DoD has never owned or controlled this range. This area is currently undeveloped land but also includes some open water. **Cleanup Strategy:** An installation wide SI is assigned to other sites. An installation wide ASR is assigned to KNGIG-004-R-01. An RI/FS, including the installation of groundwater monitoring wells, will be completed, followed by excavation and offsite waste transportation and disposal.

MMRP - KNGIG-003-R-01 KONGIGANAK RECORD RIFLE RANGE This is a transferred range of 861 acres. According to a former National Guardsman, this record rif e range northeast of the Village of

Kongiganak was used for firing M16s. The rif es were fired to the northeast into a bluff. It was assumed that this area was used from 1970 until 1989, based on knowledge that the range was used in the 1970s and 1980s. There have been no known munitions response actions at this range. DoD has never owned or controlled this area. This area is currently undeveloped land but also includes some undeveloped land. **Cleanup Strategy:** An installation wide SI is to this site. An installation wide ASR is assigned to KNGIG-004-R-01. An RI/FS, including the installation of groundwater monitoring wells, will be completed, followed by excavation and offsite waste transportation and disposal.

MMRP- KNGIG-004-R-01 KONG-KWIG TRAINING AREA This is a transferred range of 126 acres located west of the Village of Kongiganak. According to a former National Guardsman, this area was used for field training exercises. He stated that only blanks were fired here. It was assumed that this area was used from 1990 until 1999, based on the fact that the guardsman stated that the range was used in the 1990s. There have been no known munitions response actions at this range. DoD has never owned or controlled this area. This area is currently undeveloped land but also includes some open water. **Cleanup Strategy:** An installation wide SI and ASR are assigned to this site. No contamination is expected at this site.

MMRP - KOTLK-001-R-01 LITTLE KOTLIK RANGE This range encompasses a small tract of Refuge land (D.Jerry letter to M. Eichler, February 15, 2008). This land is selected but not yet conveyed. According to a former National Guardsman, this area was used for small arms training from approximately 1961 to 1963. He stated that M1s and M14s were fired into targets in this area. **Cleanup Strategy:** An installation wide SI is assigned to other sites. An installation wide ASR is assigned to KOTLK-006-R-01. An RI/FS, including the installation of groundwater monitoring wells, will be completed, followed by excavation and offsite waste transportation and disposal. A visual survey and soil samples will be collected by Clarus Technologies, LLC.

MMRP - KOTLK-002-R-01 OKWEGA PASS TRAINING AREA According to a former National Guardsman, weapons firing north toward the ocean was conducted in this area north of the village of Kotlik. The small arms included M1s, M16s, and M60s. In addition, smokes were set off, and practice grenade launchers were fired. He stated that all expended munitions and blanks were removed from this area after training exercises. **Cleanup Strategy:** An installation wide SI is assigned to other sites. An installation wide ASR is assigned to KOTLK-006-R-01. An MEC Site Characterization and Removal Assessment will be completed. An MEC removal action will follow. MEC monitoring will occur every 5 years for 30 years.

MMRP - KOTLK-003-R-01 KULMOGON SLOUGH RANGE A According to a former National Guardsman, small arms were fired into cut banks in Kulmogon Slough after 1963 for training purposes. This range was used after training ended at the Little Kotlik range in 1963, and firing occurred from the south side of the slough into the north side of the slough. **Cleanup Strategy:** An installation wide SI is assigned to other sites. An installation wide ASR is assigned to KOTLK-006-R-01. An RI/FS will be completed, followed by excavation and offsite waste transportation and disposal.

MMRP - KOTLK-004-R-01 KULMOGON SLOUGH RANGE B According to an anonymous former National Guardsman, weapons qualification was conducted at this range once a year. The exercises involved the firing of M16s across the river, from south to north. **Cleanup Strategy:** An installation wide SI is assigned to this site. An installation wide ASR is assigned to KOTLK-006-R-01. An RI/FS will be completed.

MMRP - KOTLK-005-R-01 TATLALINGUK PASS RANGE A former National Guardsman who served from 1974 to 1994 stated that M16s were fired toward the ocean at this range. This was confirmed by two other former guardsmen. All three of the interviewees stated that exercises were conducted once or twice a year. **Cleanup Strategy:** An installation wide SI is assigned to this site. An installation wide ASR is assigned to KOTLK-006-R-01. No contamination is expected at this site.

MMRP - KOTLK-006-R-01 PASTOLIK VILLAGE RANGE According to a guardsman, training exercises at this "ghost town" involved the live firing and firing of blanks from M1s and M16s toward the mountains to the west once or twice a year. **Cleanup Strategy:** An installation wide SI and ASR are assigned to this site. No contamination is expected at this site.

MMRP - KWETH-001-R-01 KWETHLUK QUALIFICATION RANGE 1 This transferred range is located northwest of the Village of Kwethluk and consists of approximately 25 acres. According to an interviewee, this area was used for weapons qualification with M16s and M21s in 1974 or 1975. The area remains undeveloped, and there have been no known munitions response actions at this range. DoD has never owned or controlled this property. **Cleanup Strategy:** An installation wide SI is assigned to other sites. An installation wide ASR is assigned to KWETH-005-R-01. An RI/FS will be completed, followed by excavation, and offsite waste transportation and disposal.

MMRP - KWETH-002-R-01 KWETHLUK QUALIFICATION RANGE 2 This transferred range of approximately 89 acres is located southeast of the Village of Kwethluk within a local training area known as Moravian Children's Home. According to interviewees, this area was used for rif e qualification with M16s and M60s. One interviewee indicated that the annual training that occurred at the Children's Home included blanks, live fire, smokes, and f ares. Another interviewee indicated that no weapons were fired near the Children's Home during annual training, but camp sites with tents and a mess hall were set up in an area about the size of two football fields near the Moravian Children's Home. One interviewee indicated that this area was used from the late 1970s through the 1990s and then later indicated that the area was used in 1988 and 1989. Since the dates were imprecise, the dates of use were assumed to be 1975 through 1992. This area remains undeveloped, and there have been no known munitions response actions at this range. DoD has never owned or controlled this property. **Cleanup Strategy:** An installation wide SI is assigned to this site. An installation wide ASR is assigned to KWETH-005-R-01. No contamination is expected at this site.

MMRP - KWETH-003-R-01 KWETHLUK TRAINING AREA 1 This transferred training area of approximately 143 acres is located northeast of the Village of Kwethluk. According to an interviewee, this area was used for training with blanks on a couple of occasions. The earliest date of service for the interviewee (1973) was used as the beginning date for this range, and the ending date was assumed to be when weapons were generally removed from the armories (1992). The majority of this area remains undeveloped, and a small portion is on open water. There have been no known munitions response actions at this range. DoD has never owned or controlled this property. **Cleanup Strategy:** An installation wide SI is assigned to this site. An installation wide ASR is assigned to KWETH-005-R-01. No contamination is expected at this site.

MMRP - KWETH-004-R-01 KWETHLUK TRAINING AREA 2 This transferred training area is located southwest of the Village of Kwethluk and consists of approximately 23 acres. According to an interviewee, this area was used for annual training and firing with blanks. The earliest date of service for the interviewee (1973) was used as the beginning date for this range, and the ending date was assumed to be when weapons were generally removed from the armories (1992). This area remains undeveloped, and there have been no known munitions response actions at this range. DoD has never owned or controlled this property. **Cleanup Strategy:** An installation wide SI is assigned to this site. An installation wide ASR is assigned to KWETH-005-R-01. No contamination is expected at this site.

MMRP - KWETH-005-R-01 KWETHLUK TRAINING AREA 3 This transferred training area of approximately 509 acres is located south of the Village of Kwethluk. According to interviewees, this area was used for annual training and firing with blanks in the 1970s. This area remains undeveloped, and there have been no known munitions response actions at this range. DoD has never owned or controlled this property. **Cleanup Strategy:** An installation wide SI and ASR are assigned to this site. No contamination is expected at this site.

MMRP- MKRYK-001-R-01 SHOAL BAY RANGE This transferred rif e range is located on Shoal Bay to the northeast of the Village of Mekoryuk and comprises approximately 91 acres. Small arms (M16A1) were fired during a one-time weapons qualification training exercise in 1992, as stated by an interviewee. Firing was conducted from the winter bay ice. DoD has never owned or controlled this land. Although there have been no known munitions response actions at this range, it was mentioned that brass was collected after firing. Although the majority of this area is currently undeveloped, a portion of this range is open water. This site was determined to be ineligible for the MMRP because of a reported continuing release from the village

resident's use of the site (D. Jerry, letter to Y. Chong, February 15, 2008). The subsurface estate and submerged lands in this area remain in federal ownership under jurisdiction of the Service. **Cleanup Strategy:** An installation wide SI and ASR are assigned to this site. No contamination is expected at this site.

MMRP - MTNVL-001-R-01 MOUNTAIN VILLAGE BLUFFS RANGE This transferred range of two acres located east of the Village of Mountain Village was used for small arms weapons qualifications, according to a former National Guardsman. He stated that the firing exercises occurred toward the bluffs to the north. Estimated use dates are 1986 to 1992. There have been no known munitions response actions at the site. **Cleanup Strategy:** An installation wide SI and ASR are assigned to this site. No contamination is expected at this site.

MMRP - MTNVL-002-R-01 MOUNTAIN VILLAGE YUKON INLET RANGE This transferred range of 856 acres located northwest of the Village of Mountain Village was used for small arms training, using 30-06s and M16s, according to a former National Guardsman. It was assumed that the munitions were fired away from the river, to the northeast. Estimated use dates are 1953 to 1956. There have been no known munitions response actions at the site. This area includes undeveloped land and also some open water. **Cleanup Strategy:** An installation wide SI is assigned to this site. An installation wide ASR is assigned to MTNVL-001-R-01. No contamination is expected at this site.

MMRP - MTNVL-003-R-01 MOUNTAIN VILLAGE/AZACHOROK RANGE This transferred range of 11 acres just west of the Village of Mountain Village was used for small arms training, using M14s and M16s, according to a former National Guardsman. The guardsman stated that personnel stood near the river and fired to the north into Azachorok Hill. Estimated use was from 1968 to 1992. The guardsman stated that brass was always recovered from this range. No other munitions response actions were known to have taken place at this range. **Cleanup Strategy:** An installation wide SI is assigned to this site. An installation wide ASR is assigned to MTNVL-001-R-01. No contamination is expected at this site.

MMRP - NAPAK-001-R-01 NAPAKIAK FIRING RANGE This transferred small arms range is located northwest of the Village of Napakiak and consists of approximately one acre. According to interviewees, target practice occurred in this area, and firing was from the Kuskokwim River into the bluff. The earliest date of service for the interviewees (1960) was used as the beginning date for this range, and the 1992 ending date was assumed to be when weapons were generally removed from the armories. **Cleanup Strategy:** An installation wide SI is assigned to this site. An installation wide ASR is assigned to NAPAK-005- R-01. An RI/FS, including the installation of groundwater monitoring wells, will be completed, followed by excavation and offsite waste transportation and disposal.

MMRP - NAPAK-002-R-01 NAPAKIAK MANEUVER AREA 1 This transferred range is located southwest of the Village of Napakiak on an islet on the Kuskokwim River and consists of approximately 562 acres. According to an interviewee, this area was used for maneuvers (using blanks and simulators), and brass was collected after each training session. 1990 was used as the beginning date for this range, and the 1992 ending date was assumed to be when weapons were generally removed from the armories. **Cleanup Strategy:** An installation wide SI is assigned to this site. An installation wide ASR is assigned to NAPAK-005-R-01. No contamination is expected at this site.

MMRP - NAPAK-003-R-01 NAPAKIAK MANEUVER AREA 2 This transferred range is located northwest of the Village of Napakiak and consists of approximately 1,078 acres. An interviewee indicated that training with Special Forces occurred during the winters between the mid-1960s and the mid-1970s. The interviewee indicated that M10 and M16 rif es with blanks, simulators, and dummy grenades were used during training exercises. The interviewee recalled that all brass was collected after the training sessions. The majority of this area is undeveloped, and a small portion is on open water. **Cleanup Strategy:** An installation wide SI is assigned to this site. An installation wide ASR is assigned to NAPAK-005-R-01. No contamination is expected at this site.

MMRP - NAPAK-004-R-01 NAPAKIAK MANEUVER AREA 3 This transferred range is located southwest of the Village of Napakiak and consists of approximately 1,074 acres. According to an interviewee, this area was used for maneuvers using blanks and simulators, and brass was collected after each training session. Use dates were assumed to be 1990–1992, when weapons were generally removed from the armories. Some of this area is open water. **Cleanup Strategy:** An installation wide SI is assigned to this site. An installation wide ASR is assigned to NAPAK-005-R-01. No contamination is expected at this site.

MMRP - NAPAK-005-R-01 NAPAKIAK MANEUVER AREA 4 This transferred range is located southwest of the Village of Napakiak and consists of approximately 15 acres. An interviewee indicated that maneuvers occurred in this area in 1994 and 1995. The interviewee recalled that blanks were fired, and brass was collected after each training event. The interviewee said that no smokes, pyrotechnics, or simulators were used. This area includes both residential and undeveloped acreage. **Cleanup Strategy:** An installation wide SI and ASR are assigned to this site. No contamination is expected at this site.

MMRP - NAPAS-001-R-01 NAPASKIAK TRAINING AREA This closed training area lies entirely within the Napaskiak Training Area (TD) range. This range comprises approximately one acre and is currently in use as the Napaskiak Federal Scout Armory complex. No contamination is expected at this site.

MMRP - NAPAS-002-R-01 NAPASKIAK TRAINING AREA (TD) This training area is the transferred portion of the Napaskiak Training Area range and comprises approximately 26,257 acres. According to interviewees, defending and aggressor training took place in quadrants assigned to each of the nearby villages of Napakiak, Oscarville, and Kwethluk. The interviewees identified several quadrants on the topographical map that comprised the training area. They indicated that M14, M16, M1, M60, and M106 blanks; smokes; f ares; and "f ash bangs" were used during these training exercises. The interviewees' dates of 1952 to 1975 were used as estimates of active use of the area. Most of the area remains undeveloped but also includes open water and residential areas within the village. There have been no known munitions response actions at this range. DoD has never owned or controlled this property. **Cleanup Strategy:** An installation wide SI is assigned to this site. An installation wide ASR is assigned to NAPAS-001-R-01. No contamination is expected at this site.

MMRP - NIGHT-001-R-01 NIGHTMUTE TRAINING AREA 1 This transferred rif e range is located approximately two miles northeast of the Village of Nightmute and comprises approximately 197 acres. According to a former National Guardsman, small arms (M16s) were fired with blanks during training with the Special Forces. Another former National Guardsman also recalled that blanks were fired at a training camp in this area. The range was assumed to be used from 1959 to 1983, based on the tenure of one of the interviewees. Although there have been no known munitions response actions at this range, it was mentioned that brass was collected after firing. The area is partially open water. **Cleanup Strategy:** An installation wide SI is assigned to this site. An installation wide ASR is assigned to NIGHT-003-R-01. No contamination is expected at this site.

MMRP - NIGHT-002-R-01 NIGHTMUTE TRAINING AREA 3 This transferred rif e range is located five miles southwest of the Village of Nightmute and comprises approximately 160 acres. Small arms (M16s) were fired with blanks during annual training between approximately 1984 and 1990. Although there have been no known munitions response actions at this range, it was mentioned that brass was collected after firing. **Cleanup Strategy:** An installation wide SI is assigned to this site. An installation wide ASR is assigned to NIGHT-003-R-01. No contamination is expected at this site.

MMRP - NIGHT-003-R-01 NIGHTMUTE TRAINING AREA 2 This transferred rif e range is located four miles northeast of the Village of Nightmute and comprises approximately 162 acres. Small arms (M16s) were fired with blanks during annual training. Use of the area was from 1959 to 1983, coinciding with the tenure of the interviewee that recalled use of this range. Although there have been no known munitions response actions at this range, it was mentioned that brass was collected after firing. **Cleanup Strategy:** An installation wide SI and ASR are assigned to this site. No contamination is expected at this site.

MMRP - NIGHT-004-R-01 NIGHTMUTE QUALIFICATION AREA This transferred rif e range is located immediately northwest of the Village of Nightmute and comprises approximately 101 acres. Small arms (M16s) were fired during weapons qualification training. The dates of usage are assumed to be 1984 through 1990. The range of years was assumed, as this type of training would likely occur annually. Although there have been no known munitions response actions at this range, it was mentioned that brass was collected after firing. **Cleanup Strategy:** An installation wide SI is assigned to other sites. An installation wide ASR is assigned to NIGHT-003-R-01. An RI/FS, including the installation of groundwater monitoring wells, will be completed, followed by excavation and offsite waste transportation and disposal.

MMRP - NIGHT-005-R-01 NIGHTMUTE ZEROING AREA This transferred rif e range is located one mile due east of the Village of Nightmute and comprises approximately 34 acres. Small arms (M16s) were fired for the purpose of "zeroing-in" of M16s between approximately 1984 and 1990. The dates of usage are assumed based on the tenure for an interviewee in the National Guard. Although there have been no known munitions response actions at this range, it was mentioned that brass was collected after firing. **Cleanup Strategy:** An installation wide SI is assigned to this site. An installation wide ASR is assigned to NIGHT-003-R-01. An RI/FS, including the installation of groundwater monitoring wells, will be completed, followed by excavation and offsite waste transportation and disposal.

MMRP - NUNAP-001-R-01 NUNAPITCHUK NUNAVAKANUKAKSLAK RANGE This is a transferred range of 854 acres. According to former and active National Guardsmen, this range was used for weapons qualification. Personnel stood on the frozen winter ice of Nunavakanukakslak Lake north-northeast of the village and fired toward the northeast into targets 25 meters away. The interviewees stated that ball ammunition and M16s were fired here. It was assumed that this range was in use from 1978 until 1993, the year that the interviewees stated training generally stopped here. There have been no known munitions response actions at this range. DoD has never owned or controlled this area. This area currently consists of undeveloped land and open water. **Cleanup Strategy:** An installation wide SI and ASR are assigned to this site. No contamination is expected at this site.

MMRP - NUNAP-002-R-01 NUNAPITCHUK SOUTH SMALL ARMS RANGE This is a transferred range of 64 acres. According to a former National Guardsman, this range was approximately five miles southwest of the village of Nunapitchuk and was used for small arms training during the winter. Firing was conducted from the winter ice, with rif es toward the northeast at paper targets placed 100 meters away. The range use period was assumed to be from January 1940 until September 1949, because he stated that he was in the National Guard for nine years and eight months "throughout the 1940s." It was assumed that the firing direction was generally to the northeast into the mountainside. There have been no known munitions response actions at this range. This area currently consists of undeveloped land, as well as inland rivers and lakes. **Cleanup Strategy:** An installation wide SI is assigned to this site. An installation wide ASR is assigned to NUNAP-001-R-01. No contamination is expected at this site.

MMRP - SCAMM-001-R-01 PAIMIUT RANGE This transferred training area is located immediately adjacent to the Village of Paimiut, approximately 10 miles south of Scammon Bay, and comprises approximately 37 acres. Small arms (M16s) were fired with blanks during training maneuvers between approximately 1980 and 1984, according to interviewees. DoD has never owned or controlled this land. Although there have been no known munitions response actions at this range, it was mentioned that brass was collected after firing. The area is near a village site, but is otherwise undeveloped. **Cleanup Strategy:** An installation wide SI and ASR are assigned to this site. No contamination is expected at this site.

MMRP - SCAMM-002-R-01 SCAMMON BAY RANGE EAST This transferred rif e range is located east of the Village of Scammon Bay and comprises approximately 155 acres. Small arms (M16s) were fired during weapons qualification training in approximately 1969. The date of usage was assumed to be 1955–1979, based on the interviewee's tenure with the National Guard. DoD has never owned or controlled this land. Although there have been no known munitions response actions at this range, it was mentioned that brass was collected after firing. The area is currently undeveloped land, although it also includes some

open water. **Cleanup Strategy:** An installation wide SI is assigned to other sites. An installation wide ASR is assigned to SCAMM-001-R-01. No contamination is expected at this site.

MMRP - SCAMM-003-R-01 SCAMMON BAY RANGE WEST This transferred rif e range is located west of the Village of Scammon Bay and comprises approximately 124 acres. Small arms (M14s and M16s) were fired once during weapons qualification training. Firing was conducted toward the south. Use of the range was assumed to be 1975, which is halfway through the combined tenure of the interviewees that recalled the use of this range. DoD has never owned or controlled this land. Although there have been no known munitions response actions at this range, it was mentioned that brass was collected after firing. The area is currently undeveloped land, although it also includes some open water. **Cleanup Strategy:** An installation wide SI is assigned to other sites. An installation wide ASR is assigned to SCAMM-001-R-01. An RI/FS, including the installation of groundwater monitoring wells, will be completed, followed by excavation and offsite waste transportation and disposal.

MMRP - SCAMM-004-R-01 SCAMMON BAY TARGETING RANGE This is a transferred range of 65 acres. According to a former National Guardsman, this range just to the east of the Village of Scammon Bay was used for targeting small arms. The firing direction was toward the south, into the hills. Because he was in the National Guard from 1957 to 1984, it was assumed that this range was used during those years. Currently, the area of the range is undeveloped. There have been no known munitions response actions at this range. **Cleanup Strategy:** An installation wide SI is assigned to other sites. An installation wide ASR is assigned to SCAMM-001-R-01. An RI/FS, including the installation of groundwater monitoring wells, will be completed, followed by excavation and offsite waste transportation and disposal.

MMRP - SCAMM-005-R-01 SCAMMON BAY KIKUKTOK PATROL AREA This is a transferred range consisting of 2,211 acres. According to a former National Guardsman, this area to the southwest of the Village of Scammon Bay was used in the 1970s and 1980s for patrols that involved the firing of blanks and the use of practice grenades, smokes, and pyrotechnics. Included within this range is a training camp from which the training patrols presumably initiated. It was assumed that this area was used from 1970 until 1989. A guardsman interviewee did not clearly delineate the boundaries of this range, providing only general indications as to the scope of the range using arrows and other markers on a topographic map. The final delineation of this range represents an estimate based on his map annotations. Currently, the area of this range is primarily undeveloped but also includes some open water. There have been no known munitions response actions at this range. **Cleanup Strategy:** An installation wide SI is assigned to other sites. An installation wide ASR is assigned to SCAMM-001-R-01. No contamination is expected at this site.

MMRP - STMRY-001-R-01 ST. MARY'S RANGE NO. 1 According to an interviewee, this transferred range, located in a former gravel pit near the airstrip west of the Village of St. Mary's, was used for small arms weapons qualification in approximately 1992. The property is owned by Calista, and has never been owned or controlled by the DoD. The size of this site is estimated at 26 acres. With the exception of the former gravel pit, the area is otherwise undeveloped. There have no known munitions response actions at this range. **Cleanup Strategy:** An installation wide SI is assigned to this site. An installation wide ASR is assigned to STMRY-002-R-01. No contamination is expected at this site.

MMRP - STMRY-002-R-01 ST. MARY'S RANGE NO. 2 This is a transferred range estimated at 393 acres located in an undeveloped area known as Margaret's Slough, which drains into the Andreafsky River. According to interviewees, small arms were used at this range for weapons qualification and to expend excess munitions. Rounds were fired from the frozen slough in a north-northwesterly direction. Interviewees stated that rounds were fired into the high bank or hillside. On one occasion, approximately 3,000 rounds of excess munitions were expended. The dates of use for this site are estimated to be between 1970 and 1992, with the closure date based on the date that munitions were removed from the village armories. The property is owned by Calista, and has never been owned or controlled by the DoD. The site is undeveloped and a portion of the range fan crosses the Andreafsky River. There have been no known munitions response actions at this range. **Cleanup Strategy:** An installation wide SI is assigned to other sites. An installation

wide ASR is assigned to this site. An RI/FS, including the installation of groundwater monitoring wells, will be completed, followed by excavation and offsite waste transportation and disposal.

MMRP - STMRY-003-R-01 ST. MARY'S RANGE NO. 3 According to an interviewee, this transferred range was used for firing practice rif e grenades. The range is located near the north fork of the Andreafsky River, northeast of the village. He estimated that the range was used in 1988–1989. The property is owned by Calista and has never been owned or controlled by the DoD. The size of this site has been estimated at 76 acres and is undeveloped. A small portion of the range covers the Andreafsky River. There have been no known munitions response actions at this site. **Cleanup Strategy:** An installation wide SI is assigned to this site. An installation wide ASR is assigned to STMRY-002-R-01. A MEC Site Characterization and Removal Assessment will be completed. An MEC removal action will follow. MEC monitoring will occur every 5 years for 30 years.

MMRP - STMCH-001-R-01 ST. MICHAEL BLUFFS RANGE This transferred range of 1,345 acres located north of the Village of St. Michael was used for small arms training, according to a former National Guardsman. He stated that personnel stood on the bluffs to the north of the village and fired northward toward the ocean. Estimated dates of use were 1960 to 1979, based on his recollection that the range was used during all of the 1960s and 1970s. There have been no known munitions response actions at the site. This area is owned by the local Native corporation and the federal government; it consists of open water and undeveloped land. DoD never owned or controlled this range. **Cleanup Strategy:** An installation wide SI and ASR are assigned to this site. No contamination is expected at this site.

MMRP - TOKSK-001-R-01 MANEUVER AREA 1 This transferred range is located approximately one mile north of the Village of Toksook Bay and comprises approximately 391 acres. Small arms (M16s) with blanks and f ares were fired during a one-time training maneuver. The date of use (1988) was assumed to be halfway between 1984 and 1992, the approximate year that munitions were removed from the village. DoD has never owned or controlled this land. There are no known munitions response actions at this range, but it was noted that brass was collected after firing. The majority of this area is currently undeveloped land. **Cleanup Strategy:** An installation wide SI is assigned to this site. An installation wide ASR is assigned to TOKSK-005-R-01. No contamination is expected at this site.

MMRP - TOKSK-002-R-01 MANEUVER AREA 2 This transferred range is located approximately 1.5 miles northeast of the Village of Toksook Bay and comprises approximately 883 acres. Small arms (M16s) with blanks and f ares were fired during training maneuvers. It was assumed that this training occurred between 1984 and 1992, the approximate date that munitions were removed from the village. DoD has never owned or controlled this land. There are no known munitions response actions at this range, but it was noted that brass was collected after firing. The majority of this area is currently undeveloped land, although it also includes open water. **Cleanup Strategy:** An installation wide SI is assigned to this site. An installation wide ASR is assigned to TOKSK-005-R-01. No contamination is expected at this site.

MMRP - TOKSK-003-R-01 MANEUVER AREA 3 This transferred range is located approximately one mile northwest of the Village of Toksook Bay and comprises approximately 105 acres. Small arms (M16s) with blanks, smokes, and f ares were fired during training maneuvers. The dates of usage were assumed to be from 1984 to 1991. DoD has never owned or controlled this land. There are no known munitions response actions at this range, but it was noted that brass was collected after firing. The area is currently undeveloped land. **Cleanup Strategy:** An installation wide SI is assigned to this site. An installation wide ASR is assigned to TOKSK-005-R-01. No contamination is expected at this site.

MMRP - TOKSK-004-R-01 NEALRUK MOUNTAIN TRAINING AREA This transferred range is located approximately 1.5 miles west of the Village of Toksook Bay and comprises approximately 311 acres. Small arms (M1s, M14s, and M16s) were fired during weapons qualification training with firing towards the hills to the northwest. Usage dates were assumed to be from 1961 to 1985. This range overlaps with Training Area 2 and received precedence over that range due to the length of time that this range was used. DoD

has never owned or controlled this land. Although there have been no known munitions response actions at this range, it was noted that brass was collected after firing. The area is currently undeveloped. **Cleanup Strategy:** An installation wide SI is assigned to this site. An installation wide ASR is assigned to TOKSK-005-R-01. No contamination is expected at this site.

MMRP - TOKSK-005-R-01 TRAINING AREA 1 This transferred range of about 2,557 acres is a combination of three separate firing areas and is located southwest of the Village of Toksook Bay. According to an interviewee, one area of this range, located approximately 2.5 miles southwest of the village, was used for weapons qualification training with M16 rif es. The firing in this area was oriented towards the water. It was mentioned that the area was used once per year, but no years were specified. According to several interviewees, another firing point was located approximately one mile southwest of the village, south of the village landfill. This second area was used once yearly for weapons qualification with M1, M14, and M16 rif es. Firing at this area was oriented towards the south over the water. A third firing point, located approximately one-quarter mile west of the village, was used for the firing of M16 rif es and oriented towards the water. Because small arms were fired in all three of these areas, and their range fans overlap, the range fans for these three areas were combined into one range. Furthermore, there was a small arms range located on the shoreline with firing oriented northwards towards the bluffs; it was included within the area that comprised the third firing area. Usage dates were assumed to run from 1961 until 1992, the approximate year that munitions were removed from the village. It should be noted that only the second of the three areas was used as early as 1961. Additionally, the first of the three described firing areas was not used until 1984, and the third of the three areas was not used until 1969. The majority of this range is open water; the remainder is undeveloped land. It was noted that brass was collected after firing at these locations. DoD has never owned or controlled the area comprising this range, and no known munitions response actions have been performed. **Cleanup Strategy:** An installation wide SI and ASR are assigned to this site. No contamination is expected at this site.

MMRP - TOKSK-006-R-01 TRAINING AREA 2 This transferred range of about 61 acres is located approximately one-half mile west of the Village of Toksook Bay. Small arms (M16s) were fired during weapons qualification training. Firing was oriented towards the hillside to the northwest, away from the village due to safety considerations. Usage dates were assumed to be from 1984 to 1992, with the closure date based on the approximate year that munitions were removed from the area. This range overlaps with the Nealruk Mountain Training Area. DoD has never owned or controlled this land. Although there have been no known munitions response actions at this range, it was noted that brass was collected after firing. The area is currently undeveloped. **Cleanup Strategy:** An installation wide SI is assigned to this site. An installation wide ASR is assigned to TOKSK-005-R-01. No contamination is expected at this site.

MMRP - TUNTU-002-R-01 TAGAYARAK RIVER FIRING RANGE This is a transferred range of 857 acres located southwest of the Village of Tuntutuliak. According to former National Guardsmen, small arms training was conducted at this range northwest of the old village site, which was known as the Tagayarak Site. The ranges here were 25-meter ranges where M16s were fired to the north. Qualification exercises and "zeroing" of rif es were both conducted here. This range was used between approximately 1986 and 1992, based on a combination of various interviewees' recollections. According to interviewees, brass was always picked up at this range. DoD has never owned or controlled this area. This area is currently undeveloped land but also includes some open water. **Cleanup Strategy:** An installation wide SI and ASR are assigned to TUNTU-001-R-01. An RI/FS, including the installation of groundwater monitoring wells, will be completed, followed by excavation and offsite waste transportation and disposal.

MMRP - TUNUN-001-R-01 MANEUVER AREA 1 This transferred rif e range of about 61 acres is located approximately one-half mile east-southeast of the Village of Tununak. Small arms (M16s) blanks, smokes, and grenade simulators were fired during maneuvers from approximately 1958 until 1989. It was noted that smoke canisters were collected after the training exercises. The area is currently undeveloped land, although it also includes open water. **Cleanup Strategy:** An installation wide SI is assigned to this site. An installation wide ASR is assigned to TUNUN-002-R-01. No contamination is expected at this site.

MMRP - TUNUN-002-R-01 WEAPONS QUALIFICATION AREA 1 This transferred rif e range is located approximately 1.5 miles southwest of the Village of Tununak and comprises approximately 1,644 acres. Small arms (M1s, M14s, and M16s) were fired toward the south into the water during weapons qualification training. It was assumed that this range was used from approximately 1958 to 1992. **Cleanup Strategy:** An installation wide SI is assigned to other sites. An ASR is assigned to this site. An RI/FS will be completed, followed by excavation and offsite waste transportation and disposal.

MMRP - TUNUN-003-R-01 WEAPONS QUALIFICATION AREA 2 This transferred rif e range is located approximately one mile southwest of the Village of Tununak and comprises approximately 1,412 acres. Small arms (M16s) were fired in an area to the north of the village landfill during weapons qualification training. Firing at this range was oriented to the south. This range was used from approximately 1963 to 1992, coinciding with the use of the M16 rif e and the year in which munitions were removed from the village. The area is currently undeveloped land, although it also includes some open water. **Cleanup Strategy:** An installation wide SI is assigned other sites. An installation wide ASR is assigned to TUNUN-002-R-01. An RI/FS, including the installation of groundwater monitoring wells, will be completed, followed by excavation and offsite waste transportation and disposal.

MMRP - TUNUN-004-R-01 WEAPONS QUALIFICATION AREA 3 This transferred rif e range of about 147 acres is located approximately one-half mile north-northeast of the Village of Tununak. Small arms (M14s and M16s) were fired during weapons qualification training, with firing into the hillside from the sea ice between approximately 1959 and 1963. The latter date was based on the year M16s were introduced into service in the ANG and when interviewees stated that weapons qualification was moved to Weapons Qualification Area 2. Although the area near the firing point is currently undeveloped and the majority of the range is land, a portion is open water. **Cleanup Strategy:** An installation wide SI is assigned other sites. An installation wide ASR is assigned to TUNUN-002-R-01. An RI/FS, including the installation of groundwater monitoring wells, will be completed, followed by excavation and offsite waste transportation and disposal.

MMRP - TUNUN-005-R-01 WEAPONS QUALIFICATION AREA 4 This transferred rif e range of about three acres is located approximately one mile north of the Village of Tununak. Small arms (M14s and M16s) were fired into a hillside to the east during weapons qualification training. Range usage dates are assumed to be from 1958 to 1989. The area is currently undeveloped land, although it also includes open water. **Cleanup Strategy:** An installation wide SI is assigned this site. An installation wide ASR is assigned to TUNUN-002-R-01. An RI/FS, including the installation of groundwater monitoring wells, will be completed, followed by excavation and offsite waste transportation and disposal.

Appendix B. Bethel BIA Administrative Site

Site History/Chronology

According to the Formerly Used Defense Sites (FUDS) Program, the site for the Bethel Air Force Station was withdrawn by PLO 1173, dated June 24, 1955.

Site facilities were constructed by the USAF in 1957 as part of the White Alice Communications System (WACS). The WACS linked Radio Relay Stations (RRS), Distant Early Warning (DEW) facilities, and Air Control and Warning (AC&W) sites in a network that communicated with the major Air Force Bases in Alaska; Elmendorf and Eielson. The WACS came online in 1958 and was decommissioned in 1979.

According to FUDS records, the major portion of the withdrawal (1,467.31 acres) was declared excess on 16 July, 1963.

In 1963 the Air Force issued a permit to BIA granting use of the improvements at the AC&W site including the barracks, several outlying buildings, fuel storage tanks, water treatment plant and the sewage lagoon. In 1964, the BIA remodeled the barracks to serve as family living quarters and for an operations and administrative site. At one point, 30 families lived at the site. A 275 acre tract was formally withdrawn for use by the BIA by Public Land Order No. 3956, dated March 15, 1966.

In December, 1971, Section 19 of the Alaska Native Claims Settlement Act (ANCSA) revoked the withdrawal of various reserves for native use or for administration of native affairs. The Bethel BIA site officially returned to Bureau of Land Management jurisdiction until passage of the Alaska National Interest Lands Conservation Act (ANILCA) in November, 1980, when all federal lands in the Bethel area were incorporated into the Yukon Delta NWR.

The size of this withdrawal was reduced to 45 acres (the smallest "practicable tract") in 1985 through an ANCSA Section 3(e) determination, and about 230 acres of the original withdrawal were conveyed to the Bethel Native Corporation.

FUDS records mention a Memorandum of Record dated January 30, 1985 that documented cleanup of friable asbestos and PCBs (6 large transformers) by Koontz-Wagner.

In 1987 the BIA determined the site was no longer needed and filed a revocation & restoration report with GSA and BLM. In 1988, BLM notified the BIA that the site was on FWS lands and they needed to cooperate with FWS on acceptance of the lands and improvements.

In 1989, a DOI Solicitors Opinion found that under CERCLA, the BIA retained cleanup responsibility for the Bethel Administrative Site, even though jurisdiction for the site had previously passed to the Service by statute.

The last BIA staff left the site in 1990.

In 1991, the BIA and USAF agreed that the buildings and site could not be economically decontaminated and the site should be demolished.

In 1992, the BIA and Air Force were prepared to demolish the buildings and the land was to remain with FWS. The Yukon Kuskokwim Health Corporation (YKHC), a non-profit private corporation, wanted the facility for employee housing for the Bethel Public Health Service Hospital. The FWS could not legally dispose of this refuge land, except by exchange, or Act of Congress.

On October 24, 1992, Public Law 102-497 directed the Secretary to convey buildings and 27 acres of the former BIA Administrative Site to YKHC, with 18 acres reserved for the FWS. This law required cleanup of the 27 acre site by the U.S. Air Force and the Bureau of Indian Affairs, prior to conveyance. This legislation

also stated that the Service and BIA *"shall not be liable for any additional response action necessary for asbestos at the property following its conveyance"* to YKHC.

As directed in PL 102-497, the remaining 18.29 acre tract was to remain in Federal ownership, under US-FWS jurisdiction. Since this site was used for military purposes and was abandoned by DOD prior to 1986, cleanup of this site will be the responsibility of the U.S. Army Corps of Engineers, Formerly Used Defense Sites program. This parcel has its own set of contaminants issues.

Another 14.5 acre site, located approximately 1/2 mile from the AW&C facility, contained the Bethel Radio Relay Station. This facility housed three pairs of 60 foot tropospheric scatter arrays that provided a 3-way link between the facilities at Aniak, Cape Newenham and Cape Romanzof. This site is still withdrawn by the USAF and given its past history of contamination/spills, and current use as a landfill, repository for 6,800 cubic yards of petroleum-contaminated soils, and asbestos dump, they likely will retain management for this site for the foreseeable future. Details of this site are not be discussed in this summary.

In 1993, the USAF entered into a Memorandum of Agreement with BIA for asbestos removal and site restoration of the 27 acres.

In 1993 the FWS conducted a Level I Contaminant Survey of the Bethel BIA Administrative Site, and samples were collected in support of a future Level II Contaminants Assessment.

The USAF and BIA contracted to have the site remediated, and various cleanup operations were conducted including removal of 6,800 cubic yards of petroleum-contaminated soil, the sewage lagoons were closed in place by installation of a cap, DDT and PCB contaminated soils were removed, and friable asbestos was abated.

During 1992-93 an estimated 106,000 gallons of diesel fuel leaked from a 300,000 gallon storage tank when an elbow joint leading from the tank ruptured. According to the ADEC, during response actions an estimated 63,000 gallons of fuel were recovered; 15,900 gallons evaporated; and 27,100 gallons were unaccounted for. In 1999 the ADEC approved a risk-based cleanup level of 2,300 mg/kg DRO to be protective of human health. One document put the cost of this cleanup at $1.75 million.

During 1997 and 1998 the Service (Anchorage Ecological Services Field Office) commented to the USAF on the final remedial action plans for the BIA Administrative Site, raising concerns about the adequacy of planned PCB, DDT and hydrocarbon cleanup operations. They also raised concerns about the adequacy of the risk characterization and risk assessment.

According to a briefing statement prepared by the Air Force, they completed their cleanup in 1999. Some asbestos was left in the sub-f oor and other structural areas that would have left the building unusable if they had been removed. All remaining asbestos in the building at this time was contained and suitable for use.

The Alaska Department of Environmental Conservation issued a finding of No Further Remedial Action Required for the 27 acre site in October, 2000. More details of this closure are provided below.

In the years following the end of cleanup operations, the buildings were extensively vandalized. According to a USAF briefing statement, the YKHC indicated they no longer wanted the structures and requested the building be removed down to the foundation.

A fire was set on August 23, 2001, gutting the central portion of the former Composite Building (identified as Building 413 in many of the cleanup documents). This building is very large (approximately 60,000 square feet) and served as housing and an administrative site for the BIA. The fire occurred prior to official conveyance of the property to YKHC, thus the site is still under jurisdiction and control of the Fish and Wildlife Service. My understanding is that federal law enforcement officials were involved in the subsequent investigation. According to a USAF briefing statement, two juveniles were apprehended in connection with this fire. Two wings of the building did not burn, but have deteriorated significantly and they also present a physical hazard.

Following the fire, the YKHC requested that the 27 acre site still be transferred to them, along with the funding to remove the buildings and clean up the site. They worked extensively with Senator Frank Murkowski's staff seeking to secure this funding, and this funding avenue looked promising until the Senator left office to become Governor of Alaska. The Service also advocated for cleanup funding and an appropriation to YKHC to fund this cleanup.

In August, 2004, House and Senate Appropriations Staff inspected the BIA site.

According to available records, the location of this property is approximately 3.6 miles west of the city of Bethel. A site assessment in 1992 determined that 77% of Bethel residents lived more than two miles from the site, with the remaining 23% of residents within 1-2 miles of the site. As of 2005 the population of Bethel, the major regional hub city for a large portion of Southwest Alaska, was estimated to be 6,262 individuals. Thus, this site is near a large population center, so public access is a significant concern.

The site has a locked gate on the main road, but other dirt roads/tracks lead to the site. Following the fire the Refuge hired guards for 24-hour sentry duty, however this was discontinued at some point due to lack of funding.

According to a June 2007 FWS briefing statement, the site has been posted with closure signs and notices were posted in the local paper that the site has been closed, but not funds have been available for securing the buildings or to conduct cleanup operations.

Also according to this briefing statement, the City of Bethel passed a resolution seeking compensation for fighting the fire and has restricted the amount of non-hazardous fire debris allowed in the landfill. This document concludes that lack of access to the local landfill will significantly increase the cost of demolition.

Ironically, the DOI solicitor has previously determined that some federal lands that were incorporated into the Bethel landfill are part of the Yukon Delta NWR.

Bethel is located approximately 340 air miles from Anchorage. Bethel has an active port on the Kuskokwim River, and many goods are shipped to/from the city by barge. Any materials that could not be legally disposed of at the Bethel landfill would need to be shipped out via barge to sites in Anchorage or the Lower 48.

This site is listed on the US Fish and Wildlife Service Environmental and Disposal Liabilities (EDL) list. This process is administered for the Service by the Engineering Division. Information on listing on the Federal Facilities Compliance Docket is available through this Division. It likely is already listed, given the previous CERCLA cleanups at this location.

Existing Environmental Documentation

Considerable information (94 documents) regarding the Bethel BIA Administrative Site and the Bethel RRS have been summarized by the USAF as part of their administrative record for the site and are available at: http://www.adminrec.com/dbtw-wpd/exec/dbtwpub.dll

Many of the documents in the Administrative Record chronicle correspondence between State regulators and the BIA, USAF, and their contractors. Some documents only pertain to the Bethel RRS, not the Bethel BIA. Some of the more significant documents relating to the BIA site are highlighted below:

The BIA contracted with the 611th USAF Civil Engineering Operations Squadron to prepare a Preliminary Assessment and partial Site Inspection (SI) for the site. This 307 page report, dated March 1992, is found in the USAF administrative record at: http://www.adminrec.com/DOCUMENTS/ADMINREC/BETHEL/CD1/DATA/00006002.pdf

EMCON Alaska, a contractor for BIA and USAF completed a final characterization report (379 pages) for the BIA Administrative Site in 1996: http://www.adminrec.com/DOCUMENTS/ADMINREC/BETHEL/CD1/DATA/00009002.pdf

The USAF administrative record for the site contains detailed information regarding the asbestos abatement information in a 1994 report (277 pages). This document presumably will provide information re: what asbestos containing materials (ACM) were removed vs. what was left on-site: http://www.adminrec.com/DOCUMENTS/ADMINREC/BETHEL/CD1/DATA/00007004.pdf

In November, 1999, the EPA weighed in on PCB cleanup and disposal at this site: http://www.adminrec.com/DOCUMENTS/ADMINREC/BETHEL/CD1/DATA/00003003.pdf

Details of the PCB removal effort at Building 413 are documented in a May 2000 technical report prepared by BNC International (214 pages): http://www.adminrec.com/DOCUMENTS/ADMINREC/BETHEL/CD1/DATA/00004002.pdf

In October 2000, the ADEC issued a closure letter determining that the cleanup goals set in the Record of Decision (ROD) were met and classified the site as "No Further Remedial Action Required" within their contaminated sites database. Notable is the fact that significant hydrocarbon contamination (diesel range organics) above the 6,000 mg/Kg action goal set in the ROD were left under the building. The closure letter specifically states that: *"Petroleum contaminated soil remains beneath Building 413 (beneath the former garage area, along the northern wall and possibly beneath other portions of the building). If petroleum contaminated soil is exposed or excavated in the future it needs to be managed in accordance with Alaska laws and regulations existing at that time. A site diagram showing the location of building 413 needs to be attached to the land records notice."* Any demolition work at the site will need to be engineered in such as way as to ensure these requirements are met. This could potentially increase the cost of any demolition work at Building 413.

http://www.adminrec.com/DOCUMENTS/ADMINREC/BETHEL/CD1/DATA/00005003.pdf

On May 17, 2001, the DOI Regional Solicitors Office conveyed a signed memorandum of agreement between BIA and the USAF, stating that the BLM was prepared to process the land transfer to Yukon-Kuskokwim Health Corporation once the cleanup was complete and the property ready for transfer. Since asbestos containing materials were to be left in place in good condition, this document stresses that DOI would not be responsible for asbestos liability following conveyance of the property and improvements.

http://www.adminrec.com/DOCUMENTS/ADMINREC/BETHEL/CD1/DATA/00005008.pdf

A report entitled Assessment of Burned BIA Complex, Bethel, Alaska was prepared by Phukan, Inc., and is dated February, 2002. I have a paper copy of this document, but not an electronic version. The FWS Engineering Division may have this in electronic format. This document includes TCLP metals analysis taken from five sites in the soil below the burned area. One of the five samples exceeded the TCLP lead standard. Eight samples were taken for asbestos testing. 5 of the 8 samples were positive for asbestos, with concentrations of 2%, 25%, 35%, 45%, and 85%, respectively. They also conducted an asbestos survey of the complex and prepared a report that is Appendix D of this document. This report states that the Bethel Landfill will not accept asbestos and there are no approved landfills in Alaska, therefore the Oregon State landfill is the closest known disposal site. The asbestos survey included analysis of eight samples, which found asbestos containing material in cement boards in the f ooring system and associated with ducts, f ange gasket material associated with plumbing in the crawlspace, and pipe elbows in the crawlspace. Some tested materials that were negative for asbestos included wiring insulation, plaster wall in the bathroom, and some pipe insulation n the crawlspace.

The report was reviewed by Philip Johnson, FWS, in March, 2002. The US Army Corps of Engineers, Alaska District, was also asked to provide an independent review of the Phukan report.

The FWS Engineering Division is the appropriate source of information regarding the projected cost of cleanup and demolition at this site.

The Alaska Department of Environmental Conservation has been very engaged in the site cleanup at these USAF and BIA facilities. An entry in the ADEC database mentions the 2003 fire. An entry in 2005 mentions the need to establish institutional controls at the BIA site (since contamination has been left in place). The ADEC chronology is found at: http://www.dec.state.ak.us/spar/csp/search/csites_report_download.asp?Hazard_ID=2899

The ADEC issued a conditional closure for the site, which is noted in their Institutional Controls database: http://www.dec.state.ak.us/spar/csp/search/IC%5FTracking/public_report.aspx?Hazard_ID=2899

Site summary prepared by Philip Johnson, Environmental Contaminants Coordinator, June 15, 2007.

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