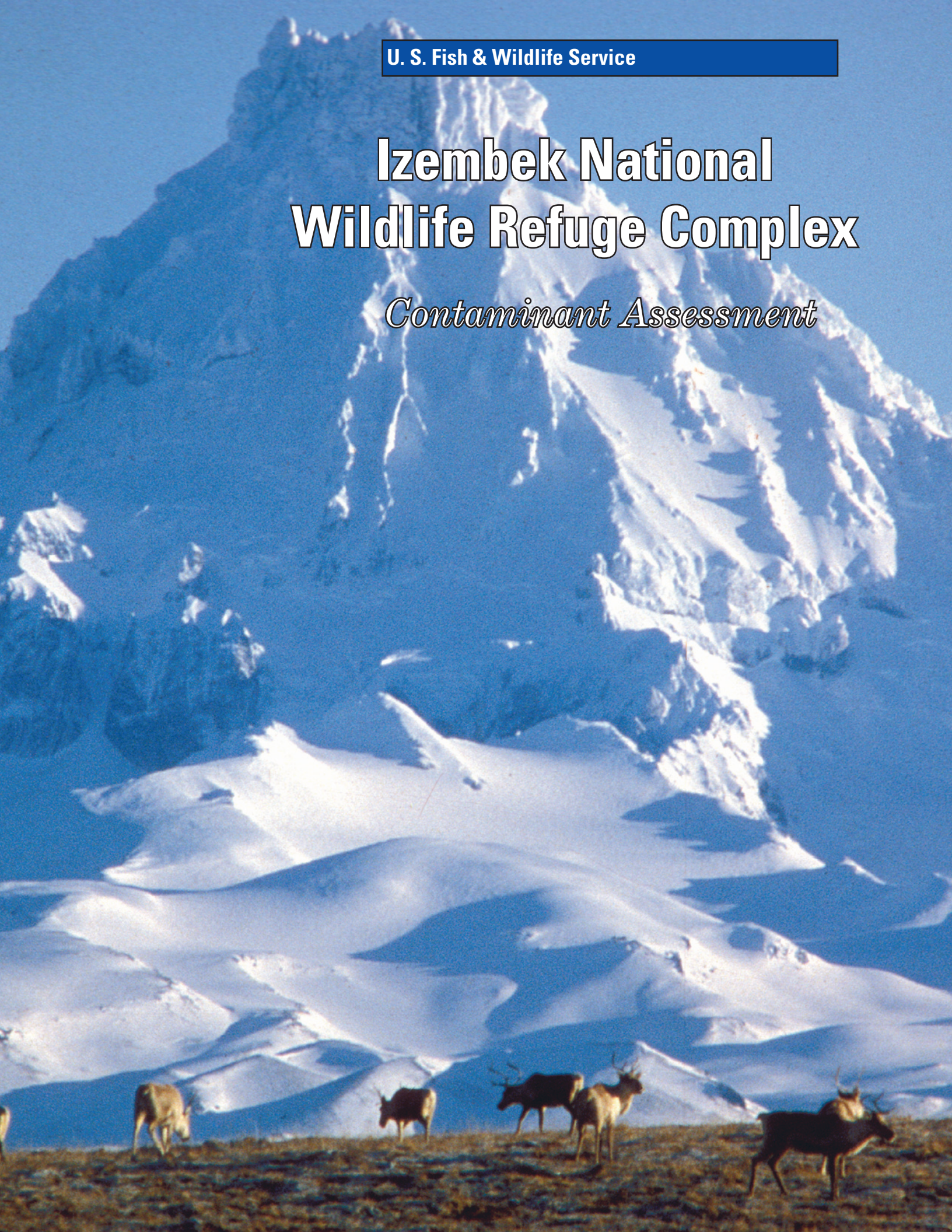
U. S. Fish & Wildlife Service

Izembek National Wildlife Refuge Complex

Contaminant Assessment



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Executive Summary

The purpose of the Contaminant Assessment Process is to compile and summarize known past, present, and potential contaminant issues on National Wildlife Refuges. This report documents contaminant issues on the Izembek National Wildlife Refuge Complex.

Most people regard National Wildlife Refuges as pristine areas reserved for wildlife. Although managing wildlife is a primary management goal, refuges often experience a wide variety of other uses. In Alaska, refuges have also been used for natural resource extraction, military operations, as well as recreational use. These activities may result in contamination of trust resources and require remediation.

Former military installations were the major source of contamination identified within the Izembek National Wildlife Refuge Complex boundary by this assessment. The City of Cold Bay and nearby refuge lands supported a major military base during World War II and several sites within the old complex have contaminant issues. Old and inadequate records have hampered efforts to identify all contaminant sources on the former base, but all known contaminated sites have been or are being remediated. More recently, the United States Air Force operated a White Alice Communications Station within the Refuge at Grant Point. Past disposal practices and frequent spills created a patchwork of contaminated soils at the site. Remediation efforts recently concluded at Grant Point and an annual monitoring and inspection program has been implemented.

Unimak Island is administered by the Refuge Complex and has three sites with contaminant issues; the lighthouse at Scotch Cap and the LORAN and White Alice Communication stations at Cape Sarichef. Elevated concentrations of petroleum products have been detected in soil samples from all three sites, but no clean-up plans have been implemented. In addition, structures at all three sites contain lead paint and asbestos that require removal before buildings are demolished or removed.

Despite its distance from industrialized areas, Izembek National Wildlife Refuge Complex has several contaminant issues that have been highlighted in this report. The Contaminant Assessment Process has gathered information to help Service personnel make informed management decisions about contaminant threats to refuge lands and resources.

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Acronyms and Abbreviations

AAC	Alaska Administrative Code
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish & Game
ADNR	Alaska Department of Natural Resources
AEB	Aleutians East Borough
AFS	Air Force Station
AMNWR	Alaska Maritime National Wildlife Refuge
ANILCA	Alaska National Interest Lands Conservation Act
ANCSA	Alaska Native Claims Settlement Act
AST	Above Ground Storage Tank
BEST	Biomonitoring of Environmental Status and Trends
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
bgs	Below Ground Surface
BLM	Bureau of Land Management
BRD	Biological Resources Division
CAP	Contaminant Assessment Process
CCP	Comprehensive Conservation Plan
CFR	Code of Federal Regulations
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
DERP	Defense Environmental Restoration Program
DEW	Distant Early Warning
DEQ	Division of Environmental Quality
DOD	Department of Defense
DOI	Department of the Interior
DRO	Diesel Range Organics
EO	Executive Order
EPA	United States Environmental Protection Agency
FUDS	Formerly Used Defense Sites
GRO	Gasoline Range Organics
HVE	High Vacuum Extraction

IRP	Installation Restoration Program
LORAN	Long Range Navigation
MAR	Minimally Attended Radar
NORAD	North American Aerospace Defense Command
OCs	Organochlorines
PAHs	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PID	Photoionization Detector
ppm	Parts per Million
ppb	Part per Billion
POL	Petroleum, Oil and Lubricants
POP	Persistent Organic Pollutant
RCB	Risk Based Concentration
Refuge Complex	Izembek National Wildlife Refuge Complex
RRO	Residual Range Organics
Service	United States Fish and Wildlife Service
SVOCs	Semi Volatile Organic Compounds
System	National Wildlife Refuge System
TPH	Total Petroleum Hydrocarbons
USACE	United States Army Corp of Engineers
USAF	United States Air Force
USCG	United States Coast Guard
USGS	United States Geological Survey
UST	Underground Storage Tank
VOCs	Volatile Organic Compounds
WACS	White Alice Communication System

Acknowledgments

Many individuals contributed to this report. The Izembek National Wildlife Refuge staff provided information, logistic support, and reviews that were helpful, particularly P. Gonzales and R. Poetter. P. Johnson provided support and feedback throughout the CAP process. Thanks also go to J. Stout, S. Janis, S. McGee, L. Corin, C. Dau, S. Tarbox, R. Pflum, and L. Smith for reviewing this report.

Author's note

This product is a synthesis of available information on contaminant issues in the Izembek National Wildlife Refuge Complex. Many sources have been used to produce this document and some passages have been reproduced from the Refuge's Annual Narratives, webpage, and fact sheet. When appropriate, specific source of information has been cited and listed in the Literature Cited section of this document. However, the volume of internal memos, Department of Defense documents, and personal observations and conversations precluded the citation of every source used to produce this CAP.

Contaminant Assessment Process

This flying "Blue Goose" (a stylized Canada goose), was designed by renowned cartoonist and conservationist J.N. "Ding" Darling, and has become a symbol of the National Wildlife Refuge System.

"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 (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 (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 United States 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 utilizes 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 actual and potential contaminant issues are entered into CAP's 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 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% 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 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 entire 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 identify and describe "significant problems which may adversely affect the populations and habitats of fish and

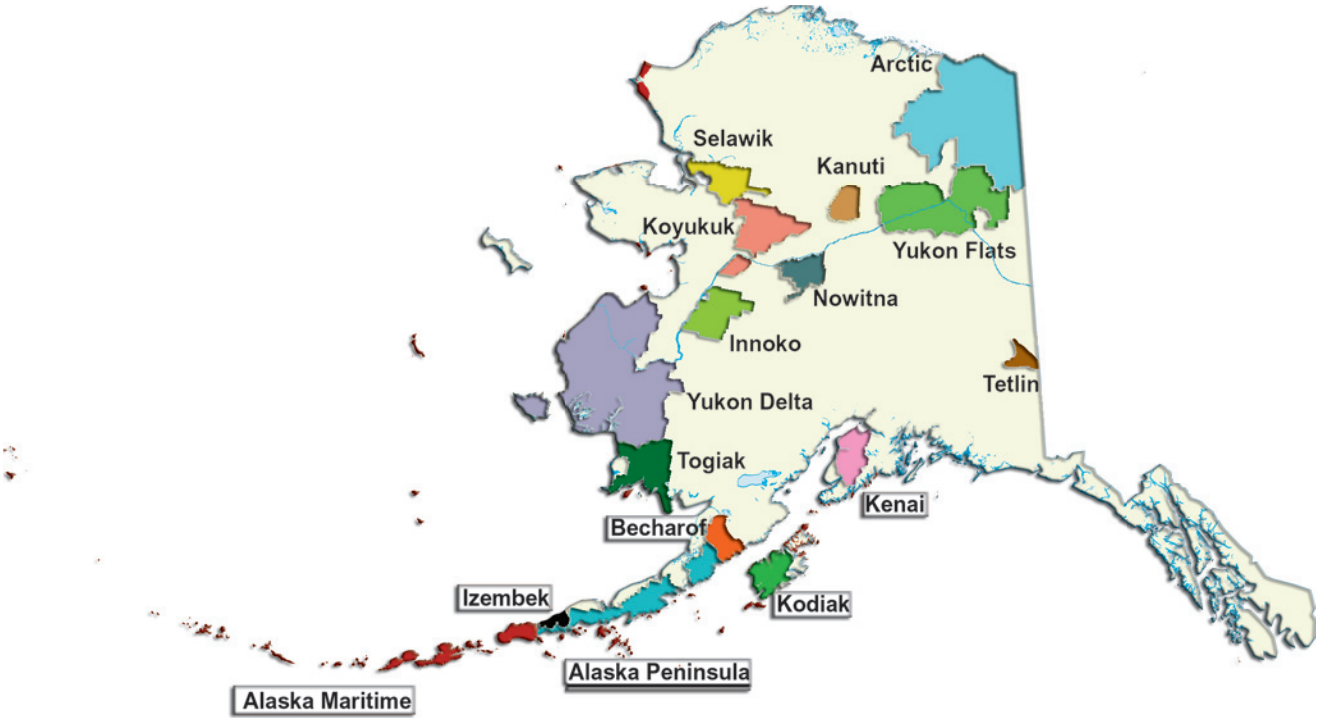


Figure 1. The 16 National Wildlife Refuges in Alaska.

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.

Four refuges in Alaska have received contaminant assessments; Kenai, Alaska Peninsula, Becharof, and Togiak National Wildlife Refuges. The recently completed Togiak CAP helped secure funds from the Service's Refuge Cleanup Fund to conduct a soil cleanup at an abandoned mining site during fiscal year 2004. These comprehensive reports detailing contaminant issues on the refuges are available in hard copy, 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 at 907/786-3520.

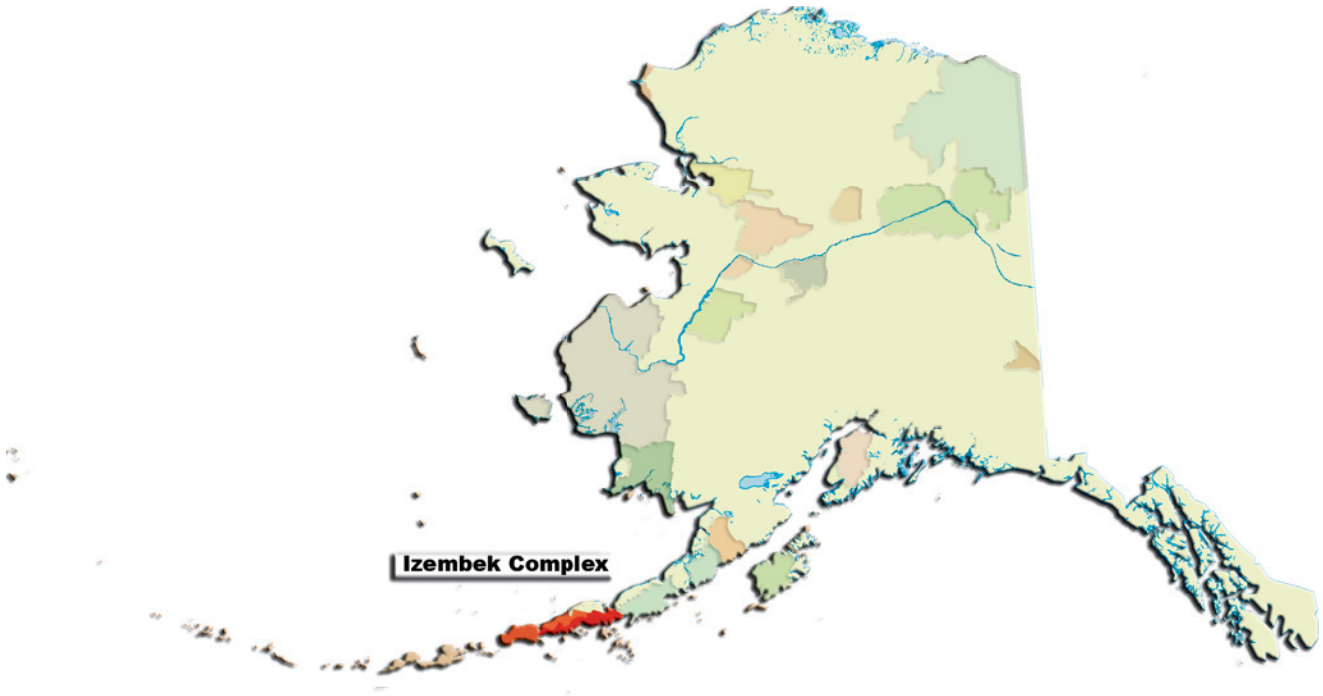
Frosty Peak, one of the Refuge's many volcanos. USFWS.

Izembek National Wildlife Refuge Complex

Izembek National Wildlife Refuge Complex (Figures 2 and 3) span the western end of the Alaska Peninsula and was established in 1960 to protect the habitat of the Pacific black brant (*Branta bernicla nigricans*). Izembek National Wildlife Refuge Complex is approximately 630 air miles (over 1000 km) southwest of Anchorage and is bordered by the Bering Sea to the north and the Pacific Ocean to the south. The Refuge Complex can be reached only by boat or plane.

Izembek National Wildlife Range was established in 1960 by Public Land Order 2216 and redesignated the Izembek National Wildlife Refuge with the passage of ANILCA in 1980. It is the smallest Alaska refuge with 417,533 acres, but since 1982 Izembek National Wildlife Refuge has managed three additional administrative units, the Pavlof and North Creek units of the Alaska Peninsula National Wildlife Refuge and Unimak Island in the Alaska Maritime National Wildlife Refuge. Combined, these areas comprise almost three million acres of total managed area for the Refuge and is referred to as the Izembek National Wildlife Refuge Complex (Refuge

Figure 2. Location of the Izembek National Wildlife Refuge Complex.



Complex). Approximately nine hundred thousand acres within the Refuge Complex are designated as wilderness (ANILCA [16 U.S.C. § 702 (1)(6), 1980]).

The landscape includes volcanoes, glaciers, valleys, and tundra uplands sloping into lagoons of the Bering Sea and Pacific Ocean. The congressionally designated Izembek and Unimak Wilderness areas contain over a million acres of lands with unique geologic features. Ninety-three percent of the nearly one million acres of Unimak Island are designated as wilderness. Unimak Island has three active volcanoes, including Shishaldin Volcano, which at 9,372 feet is the highest peak in the Aleutian chain. The Unimak coastline is characterized by steep bluffs and offshore sea stacks that are frequented by seabirds and marine mammals. Shoreline wetlands provide nesting, feeding, and resting habitat for waterfowl and shorebirds. Over one million acres of wilderness make up the Pavlof Unit, which features one of the most recently active volcanoes in the state, Pavlof Volcano.

Izembek Lagoon is designated as a Wetland of International Importance and as a Globally Important Bird Area .

The Refuge Complex protects the watershed of Izembek Lagoon, a State Game Refuge containing one of the largest eelgrass (*Zostera marina)* beds in the world and supports important food resources for migrating waterfowl. This estuary is critically important for migratory waterbirds that undertake transoceanic flights to the lower North Pacific coast or southern Pacific islands. Izembek Lagoon, which is surrounded by Izembek National Wildlife Refuge and Izembek State Game Refuge, was designated as a Wetland of International Importance in 1986 and, in 2001, designated as a Globally Important Bird Area by the American Bird Conservancy.

Pacific black brant foraging on eelgrass in Izembek Lagoon. USFWS.

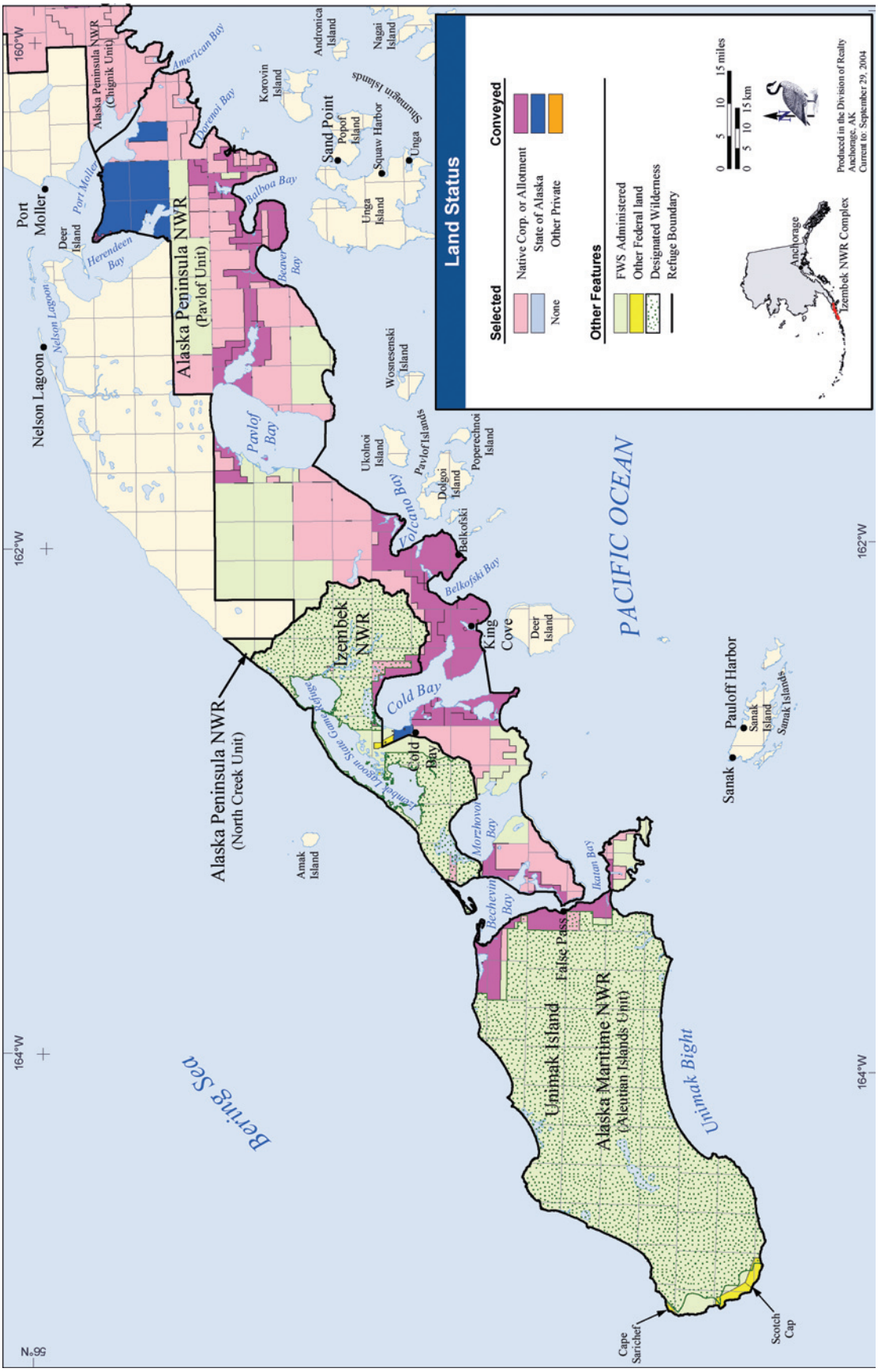


Figure 3. Generalized land status of the Izembek National Wildlife Refuge Complex.
USFWS Division of Realty.

Emperor geese during migration. D. Dewhurst/USFWS.

Izembek Lagoon was also designated critical habitat for threatened Steller's eiders (*Polysticta stelleri*) in 2001 (66 FR 8850). The lagoon provides a spring and autumn staging area that hosts almost the entire population of Pacific black brant. In addition to brant, each spring and fall the entire population of emperor geese (*Anser canagica*) migrates through Izembek Lagoon and most of the world's Steller's eiders molt on Izembek Lagoon in fall, making it the most common wintering duck. The Refuge Complex also provides the final opportunity for more than 30 species of migrating shorebirds to feed and rest before their long over-water flights to wintering areas. Izembek Lagoon also provides important habitat for marine mammals, particularly sea otters (*Enhydra lutris*), harbor seals (*Phoca vitulina*), and endangered Steller's sea lions (*Eumetopias jubatus*). The subspecies of sea otter (*E. l. kenyoni*) that inhabits Izembek Lagoon and southwest Alaska was proposed as threatened in 2004 (69 FR 6603).

The Refuge Complex is also home to many species of land birds and mammals. Tundra swans (*Cygnus columbianus*), ptarmigan (*Lagopus spp.*), and bald eagles (*Haliaeetus leucocephalus*) inhabit the uplands along with snow buntings (*Plectrophenax nivalis*), gray-crowned rosy finches (*Leucosticte tephrocotis*), lapland longspurs (*Calcarius lapponicus*), and other migratory songbirds. Brown bear (*Ursus arctos*) are abundant, feeding at streams rich with thousands of spawning sockeye (*Oncorhynchus nerka*), chum (*O. keta*), pink (*O. gorbusha*) and coho (*O. kisutch*) salmon. Other mammals on the Arctic-alpine landscape include caribou (*Rangifer*

Two yearling cubs roughhousing on the Refuge. M. Vivion/USFSW.

tarandus), wolves (*Canis lupus*), red fox (*Vulpes vulpes*), river otter (*Lontra canadensis*), mink (*Mustela vison*) and wolverine (*Gulo gulo*). Small mammals such as arctic ground squirrels (*Spermophilus parryii*), voles (*Microtus spp.*), and shrews (*Sorex spp.*) flourish in tundra habitats.

The management of each Alaskan refuge is dictated, in large part, by the legislation that created them. ANILCA [16 U.S.C. § 303 (3) (B) states "[t]he purposes for which the Izembek National Wildlife Refuge is established and shall be managed include--

(i) to conserve fish and wildlife populations and habitats in their natural diversity including, but not limited to, waterfowl, shorebirds and other migratory birds, brown bears and salmonoids;
(ii) to fulfill the international treaty obligations of the United States with respect to fish and wildlife and their habitats;
(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 manner consistent with the purposes set forth in paragraph (i), water quality and necessary water quantity within the refuge."

Blooms of tundra wildflowers near Izembek Lagoon. J. Sarvis/USFWS.

Lands now within the Refuge Complex were near the southern end of the Bering land bridge about 9,000 years ago and probably played an important role in the migration of Asiatic peoples to North America. Archeological evidence suggests that this area was once inhabited by a relatively large population (about 14,000 individuals) of native people. Russians conducted the first coastal explorations in 1827 and named the region "Izembek" after a crew member.

World War II and the Japanese occupation of the outer Aleutian Islands prompted considerable military activity on the Alaska Peninsula. A strategic military base was constructed at Cold Bay in the early 1940s that served over 20,000 people during the Aleutian Campaign. The base was abandoned after the war and the community of Cold Bay declined; the current year-round population is less than 100 individuals. Cold Bay has one of the longest runways in Alaska and serves as a refueling stop for aircraft enroute to the Aleutian Islands and Asia, as well as a destination for hunters and sport fisherman. The nearest native villages of King Cove, False Pass, Nelson Lagoon and Sand Point also serve as commercial fishing centers equipped with canneries and boat harbors.

Contaminant Sources and Issues

Prior to and since its establishment, the Refuge Complex has experienced a variety of activities that have introduced contaminants into the environment. Several military facilities (both active and abandoned) lie within the boundary of the Refuge Complex, including U. S. Coast Guard, U.S. Army, and U.S. Air Force installations. During World War II, a major military base was built on lands that are now within the boundaries of the Refuge Complex. Nearly all World War II structures were abandoned, many containing hazardous wastes. Although the majority of known contaminant issues on the Refuge Complex are a result of former military sites, marine oil spills, atmospheric contaminant transport, and recreational activities may also contribute to contamination on the Refuge Complex.

Entrance to Refuge on Grant Point Road. D. Rocque/USFWS.

Formerly Used Defense Sites

Fort Randall, Cold Bay

In 1929, Cold Bay, Alaska became a naval reservation by Executive Order 5214 but remained undeveloped until 1940 when the construction of the east-west runway began. The importance of this runway increased after the attack on Pearl Harbor, and the U.S. Army took over construction of the airport. The completed runways supported patrol and combat activities in the Pacific theater and supplied other bases in the Aleutian Islands and Alaska Peninsula. Cold Bay also provided a deep water harbor that sheltered large ships for naval operations throughout the Aleutian Archipelago.

Quonset huts left over from World War II were still present in 1979 and later on the Refuge. S. Dauenhauer/USFWS.

Fort Randall Army Base was activated in 1942 to defend Kodiak Island and Dutch Harbor military bases. The compound included a 400-bed hospital, 150,000 ft^2 warehouse, fuel storage tanks and piping systems, various storage buildings, hangars, machine shops, mess halls, recreation halls, and over 1,000 Quonset huts. At its peak, Fort Randall housed over 8,500 men, including 244 seabees, and 43 aircraft. This site was also briefly used as a training center for Russian soldiers, at one point housing 6,500 Russians. At the height of operations, Fort Randal was supplied with 4,000 to 5,000 55-gallon drums of heating oil, lubricants, solvents, pesticides, and volatile fuels. After the capture of Attu and the occupation of Kiska in 1943, Fort Randall was gradually closed. In 1944, it was put in caretaker status and by 1953 Fort Randall was officially deactivated and abandoned. Most of the buildings, utilities, and large stockpiles of oil drums were left in place and by the mid-1970s had collapsed, rusted, or decayed.

World War II remains on the Refuge circa 1980. USFWS.

The Defense Environmental Restoration Program was adopted to accomplish environmental restoration of Formerly Used Defense Sites

In 1974, the Water Resources Development Act (Pub. L 93-251 § 35) was passed, which authorized removal and disposal of debris and obsolete buildings that were a result of military construction in WWII, in the vicinities of Cold Bay and other areas in Alaska. A report issued in 1977 identified hundreds of Quonset huts, 300 acres of trash and 3,000 fuel drums that required removal. In 1983, the Defense Environmental Restoration Program (DERP) was established (P.L. 98-212) to consolidate and expand environmental restoration at active installations and Formerly Used Defense Sites (FUDS), such as Fort Randall. The Department of Defense (DOD) is responsible for environmental restoration of properties that were formerly owned by, leased to, or otherwise possessed by the United States and under the jurisdiction of the Secretary of Defense. The Army is the executive agent for the FUDS program and the U.S. Army Corps of Engineers (USACE) manages and directs the program's administration. Currently, the USACE is restoring the Fort Randall sites at Cold Bay. The sites currently requiring restoration are on lands transferred to the State of Alaska by quitclaim deed (Figure 4). However, their close proximity to Refuge boundaries and the potential impact on trust resources warrants their inclusion in this report.

Incinerator

The Fort Randall incinerator was located on land that was originally withdrawn for the military during World War II and later withdrawn for the Federal Aviation Administration (FAA) in 1961. The BLM subsequently accepted responsibility from the FAA in 1964 and, in 1978, reported that the lands were unchanged in character and undisturbed from their original state. In 1996, the Secretary revoked PLO 2451 for the FAA withdrawal and primary jurisdiction for 26 acres, including the incinerator, were transferred to the Service, which now has management responsibility and accountability over these lands. Despite being recognized as a building of historic importance, the Service determined that in its present condition, the incinerator was a safety concern and required demolition. Limited contaminant screening was conducted in 1997 on ash from the incinerator to establish whether risk existed for demolition workers and to identify cleanup needs (1). Four samples were collected from the firebox clean-outs and firebox stoking doors and analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), heavy metals, and organochlorines (OCs). Although dioxins exceeded EPA Region III screening criteria levels, risk from contaminants was considered negligible based on a risk assessment scenario for worker exposed during cleanup. Asbestos was not detected in the one sample that was analyzed. The incinerator was razed in September 1998, and buried on site in a monofill permitted by Alaska Department of Environmental Conservation (ADEC).

The Fort Randall incinerator was razed due to safety concerns, despite being a building of historic importance. USFWS.

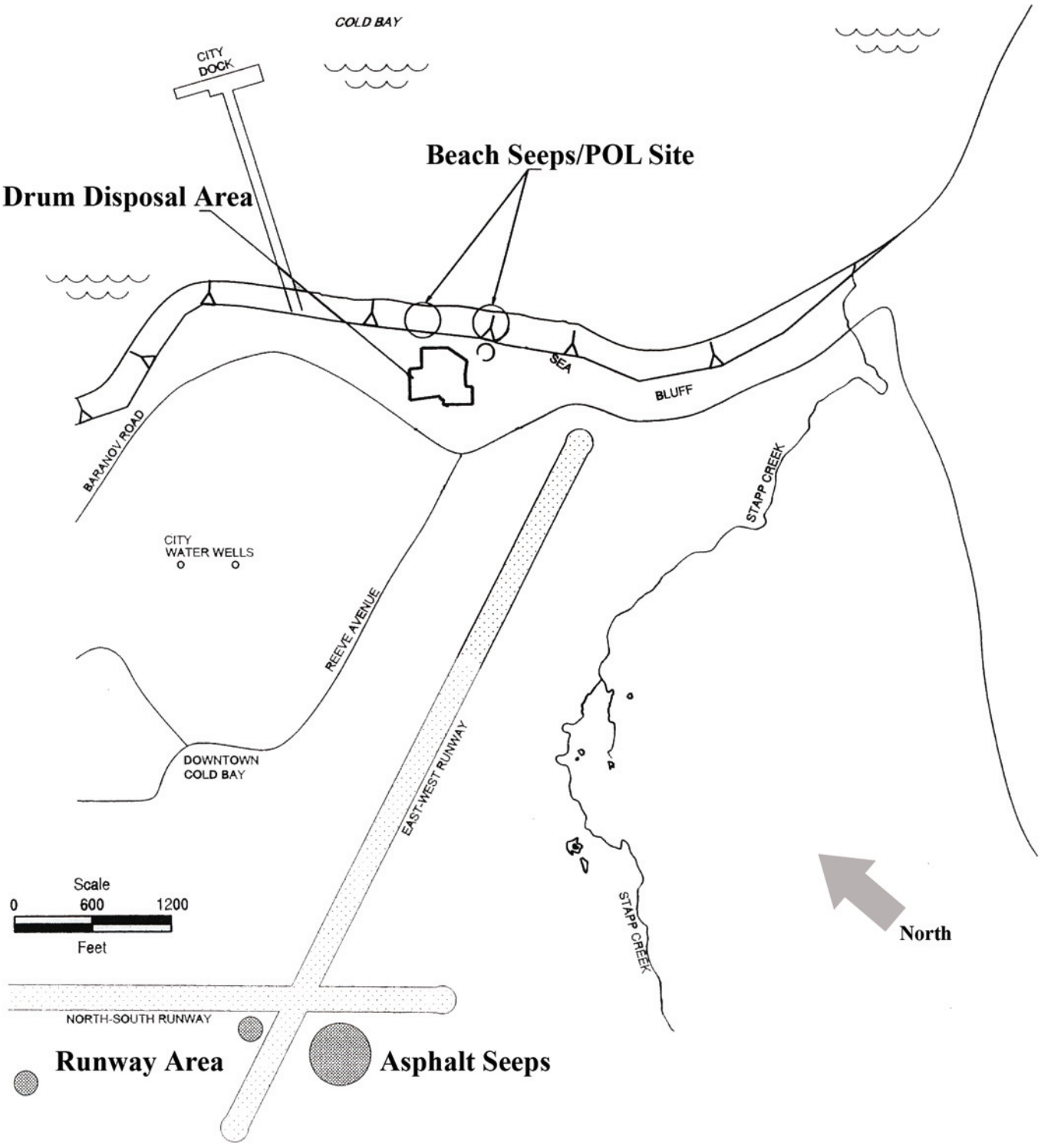


Figure 4. FUDS at Fort Randall on State of Alaska owned lands. *Map adapted from USACE site map.*

Beach Seep and Drum Disposal Area

The Beach Seep Area is located on State of Alaska owned lands on a bluff overlooking Cold Bay just south of the City Pier and is in the same general area that early investigations referred to a POL (petroleum, oil, and lubricants) site. The Beach Seep Area includes the footprint of a 210,000 gallon diesel above-ground storage tank (AST) that was removed in 1985 and a large hydrocarbon seep that is present on the beach below. The POL site consisted of two 70,000-barrel ASTs (a total capacity of over 5.8 million gallons), a pump house, fueling island, and associated piping that were removed in 1994. The Drum Disposal Area is located approximately 200 ft west of the Beach Seep Area. Although these sites are not within Izembek National Wildlife Refuge, contaminants from the Beach Seep/POL site, and to a lesser degree the Drum Disposal Area, have the potential to migrate off-site and impact trust resources.

Soil stained from petroleum products is clearly visible in 2003 at the beach seeps. USACE photo.

Soil samples were collected in 1993, just before the two ASTs were removed, and three samples had gasoline range organics (GRO) ranging from 63 to 663 ppm, which exceeds ADEC's cleanup level for GRO of 50 ppm. Six soil samples also exceeded ADEC cleanup level of 230 ppm for diesel range organics (DRO); the highest concentration was detected in a sample collected near the fueling island (30,000 ppm).

In 1995, samples were collected from seven soil boring holes and four monitoring wells at the Beach Seep site (2). Nineteen soils samples were collected at varying depths from the seven borings and analyzed for DRO. A petroleum odor was noticed during sample collection. Diesel range organics exceeded the recommended ADEC cleanup level at six samples from the Beach Seep site (highest concentration was 15,000 ppm). Taking risk to humans and wildlife into consideration, the contractors recommended remediation of surface soils down to a depth that could accommodate a slab-on-grade building. It was estimated that approximately 5,800 cubic yards of soil would require remediation at this site. It was also recommended that this site be restricted as a source for drinking water.

A bioventing system was installed in 1997 to increase soil-oxygen concentrations and bolster heterotrophic bacterial degradation of diesel fuel in the soils at the Beach Seep Area (3). Initial plans for the system to run for 18 months were extended due to low numbers of bacteria. Nutrients were added in 1999 to aid soil microbes in the breakdown of DRO. Despite the added nutrients, data indicated that the system was not achieving the project cleanup goals. In 2000, the bioventing system was removed and 2,014 cubic yards of

soil was excavated to a depth of 10 feet below ground surface. Clean fill was backfilled into the excavated area.

In 1998, a high vacuum extraction (HVE) system was installed to reduce the discharge of free petroleum product to the beach. By 2004, approximately 6,200 gallons of diesel fuel contamination was removed from the soil. Although no remaining sources of contamination have been discovered at these sites, free product continues to cause surface staining and sediment contamination along the coast which may introduce contaminants to trust resources.

Over 2,250 buried drums and 6,200 gallons of diesel fuel have been removed from the site.

Over 2,250 buried drums have been removed from three trenches in the Drum Disposal Area. The surrounding, grossly contaminated soil was removed from pits and stockpiled in six lined containment cells. A total of 5,460 cubic yards of contaminated soil from this and the runway area (see below) were stockpiled in the containment cells. These soils were thermally remediated in 2000 and 2001 and returned to the excavated area.

Runway Areas

Four 25,000 gallon underground storage tanks (USTs) were removed from the end of the runway in 1999 on state owned lands. Approximately 35,000 gallons of oily water was recovered from the tanks. The water, sludge, and scale were treated and disposed of properly. Contaminated soil was removed and transported to lined containment cells at the Drum Disposal Area. In addition, 225 drums were removed from a collapsed wooden building in the area.

Remediation is currently ongoing at the Runway Areas. Areas of isolated contamination still remain, and current efforts include continued UST removal, soil excavation, and thermal treatment or disposal of contaminated soil.

Asphalt Seeps

Although on state lands, the Asphalt Seeps abut the boundary of Izembek National Wildlife Refuge and are of particular contaminant concern due to their proximity to Refuge lands. Located southwest of the runway intersection, the seeps are believed to have originated from asphalt tanks that were buried after construction of the runway.

An asphalt seep was discovered in 1996, after Service personnel rescued a bald eagle and discovered a dead fox that were stuck in the asphalt (4). An additional seep was later discovered approximately 300 feet to the northwest and these sites became part of the Fort Randall FUDS in 1998. There are two distinct drum

trenches associated with the seeps that require remedial action (Figure 5). A geophysical survey conducted in 1999 indicated that each trench was approximately 125-feet by 25-feet and contained an estimated 2,800 drums to a depth of 15-feet. Test pits dug at the northern drum trench indicate that some of the drums contain petroleum compounds and that surrounding soils are above risk-based soil cleanup standards. During the 2002 remedial investigation, an additional burial pit that had been a permitted landfill during cleanup efforts in the 1980s was detected. This pit (referred to as Bury Pit No. 2) is approximately 230-feet long by 90-feet wide to a depth of 15-feet and likely contains other debris in addition to buried drums.

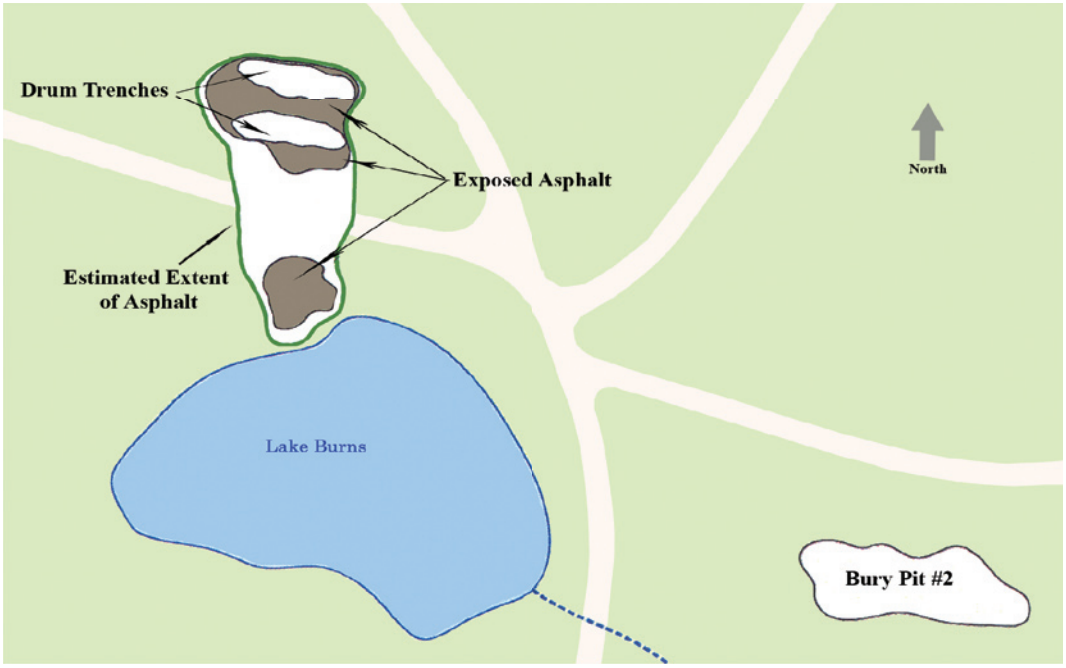


Figure 5. General location of asphalt seeps on state land adjacent to Refuge. *Adapted from USACE.*

Soil samples were collected in 2002 from the seeps and the drum burial pits. Elevated concentrations of organic compounds in most samples indicated that the underlying, downgradient, and immediately upgradient soils are contaminated from 0.5 to 15 feet below ground surface (bgs). Although lead was consistently detected in the majority samples, concentrations were low and within the range of background lead concentrations for the area. Risk-based screening identified two soil samples that exceeded the ADEC Method Two migration to groundwater criteria for DRO (250 ppm). The same two samples also exceeded ADEC Method Two ingestion criteria for RRO (10,000 ppm).

Hole revealing a wooden trench near the asphalt seeps. D. Rocque/USFWS.

A close-up of one pool of asphalt as it appeared in Spring 2004. D. Rocque/ USFWS.

Although new areas of asphalt become exposed each year and wildlife has become entrapped in exposed asphalt, the USACE claims that the seeps are immobile, and therefore do not pose a risk to human health or the environment. The current USACE preferred action for the Asphalt Seeps site is to place a permeable soil cap over the seeps, rather than remove the material, thereby causing less impact to the tundra than would result from asphalt removal (5). Remedial actions will also include removal of drums from the two drum trenches. Rather than excavate Bury Pit No. 2, monitoring wells would be installed around the pit to monitor groundwater quality. It has been assumed that drums in this pit were empty when buried and therefore do not pose a hazard that warrants excavating the debris and impacting the surrounding tundra. Comments on the proposed plan were addressed and the Decision Document should be completed by the end of 2004.

Several pools of asphalt in the southernmost area of exposed asphalt. D. Rocque/USFWS.

Other World War II sites

Abandoned World War II debris, collapsed buildings, rusted drums, and bunkers can be found throughout the Refuge Complex. Service personnel visited several of these sites in 2004, which ranged from collapsed wooden structures built into hillsides to areas containing multiple structures.

Empty drums rusting in a pile on Mount Baldy. D. Rocque/USFWS.

An old wooden cistern from World War II still stands on Frosty Peak. D. Rocque/USFWS.

A collapsed World War II building on Mount Baldy. D. Rocque/USFWS.

The areas with the most debris were located on Mount Baldy and Frosty Peak. The Mount Baldy site consisted of several collapsed buildings and a drum pile. The Frosty Peak site had a wooden cistern, an old World War II shower facility that is still standing, and a collapsed building. Interestingly, the radar dish that was present at the Frosty Peak site the previous year was not located in 2004. It is unknown whether the dish was removed by contractors or succumbed to strong winds and/or avalanches that occur regularly in the area. Service personnel saw no soil staining or other evidence that indicated POL contamination at these sites. However, both areas are in designated Wilderness Areas and the occurrence of solid debris is incompatible with this designation. Responsible Parties and the Refuge Complex may want to investigate compatible (non-mechanized) ways to remove debris in Wilderness Areas.

World War II shower facility still stands on Frosty Peak Road. R. Poetter/USFWS.

Another area with World War II debris is located at mile 2.5 on the road to Grant Point. The remains of three buildings are within Refuge boundaries on the northeast side of the road. This site consists of wooden and rusted metal. Service personnel saw no signs of POL or other contamination at this site.

One of three collapsed World War II buildings on the Grant Point Road. R. Poetter/ USFWS.

Summary

Although the majority of FUDS in and around Cold Bay do not occur on Refuge lands, contaminants associated with these sites have the potential to impact trust resources through contact with wildlife or by offsite migration through soil or groundwater. Remedial activities at the Fort Randall sites have removed the majority of known contamination and ongoing monitoring and subsequent soil treatment continues to remove pollutants. The Asphalt Seeps are located adjacent to Refuge lands and the extent of the contamination has not been determined. Wildlife that has come in contact with the seeps has been impacted and the additional seeps that appear every year have the potential to affect additional trust resources. Some abandoned World War II sites are present on the Refuge Complex and it is possible that additional sites remain undiscovered within or adjacent to Refuge lands. Known sites appear to consist of solid wastes and are not presently a contaminant issue and high removal costs likely preclude the removal of much of the solid wastes on the Refuge Complex.

Military Sites

A 92-acre Air Force facility at Grant Point is located on the southern shore of Izembek Lagoon, 11 miles west of the community of Cold Bay. Constructed in 1958-59 as part of the extension of Distant Early Warning (DEW) line into the Aleutian Islands, Cold Bay AFS was converted to a North American Air Defense Command (NORAD) surveillance station in 1969. A White Alice Communications System (WACS) provided communications from 1959-1978 and was replaced by a commercially owned and operated satellite communications system (Alascom). The WACS site at Grant Point was demolished in 1987 by crushing and burying the buildings in trenches dug at the southern end of the site.

A new Minimally Attended Radar (MAR) facility was built six miles inland from Izembek Lagoon to minimize future bird strikes. The MAR is on FAA withdrawal lands within Izembek National Wildlife Refuge four miles north of Cold Bay. The MAR became operational in 1985 and is maintained by contract personnel.

The White Alice Communication station on Grant Point in 1980 with Frosty Peak in the background. J. Sarvis/USFWS.

Under the Air Force's Installation Restoration Program (IRP), cleanup was initiated in the early 1980s by conducting an initial comprehensive record search to document activities at the Cold Bay AFS. Two areas of potential contamination were identified as a result of the records search and consultants to the USAF recommended that the landfill and the spill/leak area undergo field sampling and contaminant analyses. A preliminary assessment by the USACE identified other potential contaminated sites, including the WACS site, road oiling areas, and the landfill/gravel pit (Figure 6). These sites are addressed separately.

White Alice Communications Station

The White Alice Communications Station was located on a bluff next to Izembek Lagoon, near Grant Point on the USAF withdrawal. The station consisted of a composite facility, four antennae, two diesel underground storage tanks (USTs), an above ground gasoline dispensing tank, above ground storage tanks, a solid waste incinerator, a landfill, a Quonset hut, and four residential trailers. All structures but the Quonset hut were demolished in 1987, pushed into trenches with heavy equipment, and buried onsite in 1987-8 in accordance with an ADEC permit. The two USTs were drained of fuel, filled with sand, and left in place.

In 1991, Service personnel noticed a sinkhole had developed that had accumulated water with a petroleum sheen near the USTs. A preliminary site investigation did not occur until early 1994, which confirmed the presence of sink holes with protruding buried debris, but no soil staining was observed (6). Quantitative sampling was not done during this visit, but estimates of potential contamination was calculated based on findings at similar installations (Table 1).

Table 1. Estimated potential contaminants released at WACS site[a]

Product	Usage (gal/yr)	19 -year total	Spillage %	Total spillage (gallons)
POLs				
Diesel[b]	280,000	5,320,000	0.10	5,320
Mogas[b]	6,000	114,000	0.10	114
Oil and lubes[b]	2,000	38,000	10	3,800
Antifreeze[c]	100	1,900	10	190
Paint thinner[c]	50	950	10	95
Pesticides[c]	50	950	10	95
Solvents[b]	100	1,900	10	190
Batteries[c]	20 (ea)	360 (ea)	50	180 (ea)
PCB Liquids[c]		2,000	50	200

[a] *Adapted from (6).*
[b] *Based on documented storage capacity, assuming entire capacity is used each year.*
[c] *Estimated quantities.*

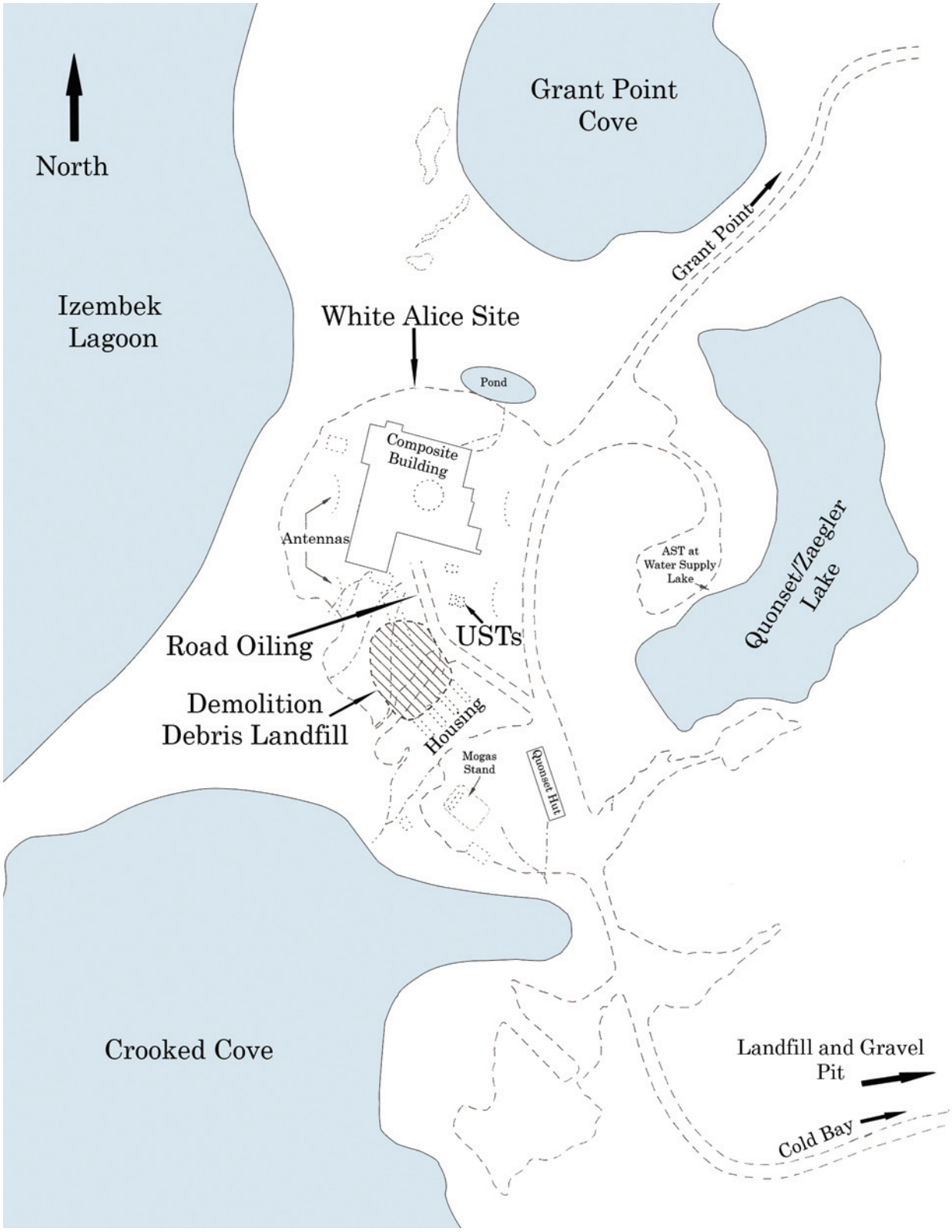


Figure 6. Site map for White Alice Communication Station. *Adapted from (3).*

Contaminant analyses were conducted later in 1994 (2). Soil samples were collected along suspected offsite migration pathways and at likely contaminated locations within the WACS site by USAF contractors. Three soil borings were drilled near the USTs and soil samples were collected every five feet and screened with a photoionization detector (PID) to determine the extent of petroleum hydrocarbons in the soil. Samples with the highest PID readings were sent out for laboratory analyses. Diesel range organic concentration were 4.4 (25 ft bgs), 140 (10 ft bgs), and 15,000 (4 ft bgs) ppm in the three borings, the highest (15,000 ppm) of which was from the boring closest to a large sinkhole. No GRO, BTEX (benzene, toluene, ethylbenzene, and xylenes), or polychlorinated biphenyls (PCBs) were detected in samples from the dispensing tank area. Total petroleum hydrocarbons were detected in nine of ten samples analyzed to assess off-site migration. The highest concentration was detected in a down-gradient soil sample to the north of the WACS complex (21,474 ppb). The other eight samples had concentrations ranging from 367 to 1,225 ppb total polycyclic aromatic hydrocarbons (PAHs). The most frequently detected PAHs were flouranthere (eight detects), pyrene (seven detects), and phenanthrene (six detects). No contaminants were detected in offsite locations to the east or south of the WACS site and analyses of samples collected to the north and west only detected DRO that was deemed "not typical product." Several sinkholes were also observed at the WACS site, some as deep as five feet.

The final report used EPA's risk based concentrations (RBC) to determine the potential impact of contaminant concentration on humans and wildlife (2). Based on RBCs, only one site within the WACS complex was identified as having ecological and human health risks. However, using a conservative assumption regarding future site usage, the contractors concluded that the extent of the contamination was limited and the site was within the range of acceptable risk. The USAF subsequently submitted a Draft No Further Response Action Planned Document for comment to ADEC in 1995 for the WACS site.

Three follow-up borings were drilled around the sinkhole in 1995 (2). Of the eight samples collected and analyzed, only one had a detectable DRO concentration (2,680 ppm at 20 ft bgs). The larger sink holes were filled with gravel in 1997 in response to Service requests. Small pieces of protruding rebar were cut off at ground level and larger (2-inch) pieces were flagged. A second gravel capping operation in 1998 covered the remaining rebar debris.

Lack of vegetation at the former WACS site provides good habitat for this semi-palmated sandpiper. D. Rocque/USFWS.

In 2001, USAF proposed and carried out the removal of the USTs, excavated diesel contaminated soil around the tanks to a depth of 15 ft, and remediated the soils through thermal desorption (remediation goal of 1,000 ppm DRO). Groundwater monitoring wells were installed around the landfill to determine whether contaminants were migrating offsite. Natural attenuation was used to achieve concentrations of less than 1.5 ppm of DRO in groundwater. Physical hazards were eliminated by filling sinkholes, adding additional cover material over the demolition debris landfill (2-3 feet cover), and grading and re-vegetating the area. Analytical results from soil samples collected from the WACS site met the cleanup standard and no further soil treatment was required.

Groundwater samples collected in August 2003 did not contain DRO contamination above site-specific cleanup levels. However, one of the four samples collected in May 2004 contained DRO contamination above the site cleanup level. In September 2004, additional wells were installed and groundwater samples were obtained. The analytical results of the most recent samples were not available at the time this report was completed. As stated in the Declaration of Decision, annual inspections of the WACS site will continue through 2006 and groundwater sampling will be conducted until DRO levels reach cleanup level. In addition, inspections and necessary remedial activities will be performed annually for five years. The grading was completed and disturbed areas reseeded in 2003 and Service personnel detected no signs of erosion in spring 2004.

Two USTs that were removed in 2001. R. Poetter/USFWS.

Nylon net used to keep soil and seeds in place was blown away in places in spring 2004. D. Rocque/USFWS.

Landfill/Gravel Pit

The USAF landfill is located about six miles outside of Cold Bay on Complex Land and sits at an elevation higher than the immediate surroundings (Figure 7). The landfill was operated from 1971 – 1976 under a special use permit from the Service. According to the USAF, the landfill primarily received domestic waste. It is unknown what, if any, hazardous wastes from Cold Bay AFS were deposited in the landfill. Records indicate that hazardous wastes generated from Cold Bay AFS included contaminated fuel (200 gal/yr), petroleum based fluids from power generators and vehicle maintenance (1,900 gal/yr), small quantities of ethylene glycol (22 gal/yr), battery acid (3 gal/yr), and paint thinners (2 gal/yr). These waste liquids were either shipped off base, used in fire training exercises, road dust control (until the late 1970s), or deposited in the landfill (7).

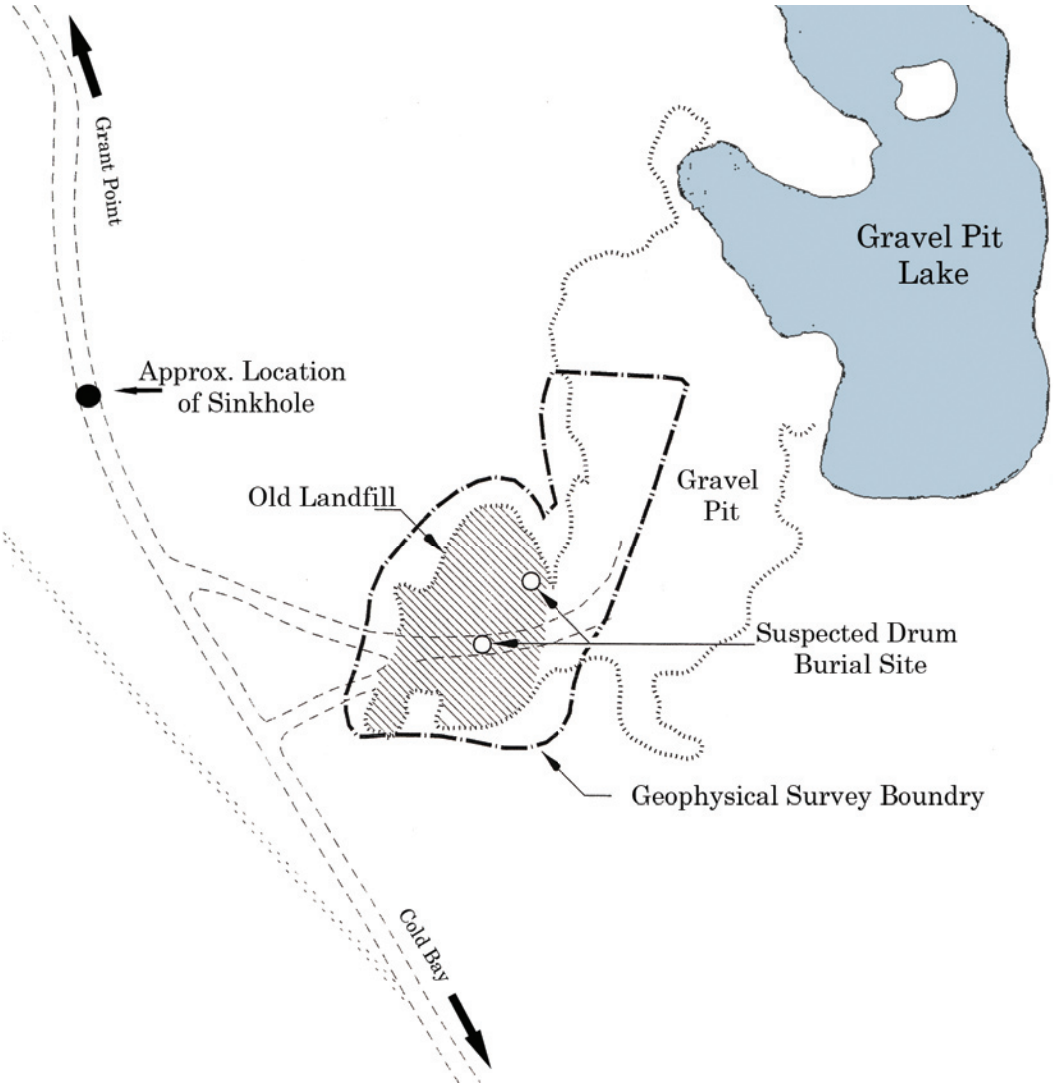


Figure 7. Site map for landfill/gravel pit and sinkhole. *Adapted from (3).*

The landfill was physically closed in 1976 by covering remaining debris, grading, and reseeding of the area. After the closure, installation refuse was disposed of in the town landfill. Five monitoring wells were installed around the landfill in 1986 by USAF consultants (8). No visible contaminants or odors were detected during drilling and installation. Analyses of water samples from these wells found no detectable concentrations of petroleum hydrocarbons, purgeable aromatic hydrocarbons, purgeable halocarbons, or PCBs, and the site was determined to have no discernible contamination. At the request of Service personnel, the monitoring wells were capped after sampling. In 1988, the Service conducted contaminant analyses on four soil samples collected near the monitoring wells (9). No organochlorines or PAHs were detected in any samples. Although some trace metals were detected in concentrations above those considered background (As, Cd, Be, Hg, Pb, Zn), no analyte was detected at concentrations that posed an "environmental threat." In 1989, the landfill site was classified as a Category I site by the USAF (10). A subsequent report in support of No Further Action Decision was submitted to and approved by ADEC in 1991 (11).

Shishaldin Volcano, on Unimak Island, is an historic landmark and the most active volcano in the area. On a clear day it is visible from Grant Point. J. Sarvis/USFWS.

In 1994, a magnetometer survey was conducted in response to reports that more than 200 drums had been buried at the landfill (2). Several strong magnetic anomalies were detected in the northern part of the landfill and under the current access road where the cache was reported to have been disposed. Eight test pits were dug in areas with magnetic anomalies in 1997 and a soil sample from each pit was analyzed; no buried drums were found (3). Only two soil samples had elevated concentrations of DRO (520 mg/kg) and cadmium (43 mg/kg), respectively. These samples were considered uncharacteristic of the area and deemed "hot spots." No pesticides or PCBs were detected in any sample. Concentrations of five metals (As, Ba, Cd, Cr, and Hg) exceeded ADEC's RBCs, but none of these metals exceeded EPA's industrial RBCs. All arsenic and barium samples exceeded ADEC's RBCs, but were within site-specific background ranges. A single detection of cadmium and mercury, were above background. All detections of chromium and most detections of lead were above background, but lead did not exceed RBCs. The USAF recommended no further action at the Landfill/Gravel Pit site based on lack of contaminant concentrations above analytical detection limits, the lack of potential for human contact with the contaminants, the lack of hazardous materials at the landfill, and the fact that landfill debris was below ground surface. No further action was approved for this site in 2001 and the site was capped in accordance with state landfill regulations in 2003. Annual surveys will be conducted to check for the development of sinkholes and the presence of adequate cover at the landfill (12). Although the site was sparsely vegetated at the time of a site visit in 2004, Service personnel saw no evidence of erosion or sinkholes.

Road Oiling/Sinkhole

The road from Cold Bay to the USAF Grant Point withdrawal is built on a 100-foot, 44LD513, right-of-way issued to the USACE for the USAF, which has primary jurisdiction. Despite the right-of way, the Service unnecessarily issued the USAF a permit in 1979 to allow the use of waste oils to reduce road dust on there own withdrawal gravel roads within Izembek National Wildlife Refuge. The permit restricted the use to not more than 300 gallons/month of waste oils for this purpose and further restricted that waste oils could not be applied within 300 yards of any water body. Although originally identified as a potential source of contamination, a visual inspection of road surfaces detected no oil staining on gravel roads and contractors concluded that road oiling had minimal potential to create environmental contamination (11). Two samples were collected during the 1994 site investigation and analyzed for VOCs, SVOCs, pesticides, and PCBs (2). Concentrations for all analytes were below detection limits in both samples. No further action was approved in 2001 for this site by ADEC (12).

In 2001, during gravel hauling for remediation of the WACS site, a sinkhole developed at milepost 7.5 (Figure 7). The hole was two feet wide, with a depth of about two feet. The sinkhole contained water with a sheen of oil (13). When the oil sheen was removed with absorbent pads, swishing in the hole caused the appearance of oil again. A metal object could be felt at the bottom of the hole, indicating the road had been built on crushed barrel(s) to provide a solid bottom over the marsh. Nine test pits were excavated to determine the extent of contamination. Soil and liquid samples were taken for analyses from each pit, all of which contained standing water. Floating petroleum product was visible in tests pits located five feet north and south from the sinkhole and very small amounts of petroleum were visible at test pits located 10 feet north and south from the original hole. Test pits located 15 feet in all directions from the sink hole contained no visible oil sheen on the water surface. Analytical results indicated that samples containing petroleum were #4 fuel oil. Wetlands on either side of the road showed no impact and based on results of the pit excavation, it is estimated that 49 gallons of product were floating on top of a perched water table about two feet below ground surface. Test pits and the sinkhole were filled with gravel. Remedial recommendations included removal of the product and impacted soils, but no removal actions have been performed to date.

Oil sheen in a sinkhole that developed during gravel hauling in 2001. R. Poetter/USFWS.

Spill/Leak

Approximately 1,000 gallons of diesel fuel were spilled when an underground tank was overfilled on USAF withdrawal lands near the southwest corner of the composite facility in 1978. The spill originated about 40 ft above Izembek Lagoon when an abandoned pipeline that was never capped off leaked into a drainage channel. The diesel flowed down the channel into the eelgrass beds. Immediate cleanup was conducted with absorbent pads by installation personnel who estimated 90% of fuel was recovered.

In 1986, three test borings were drilled near the spill site and six shallow borings were dug at the base of the bluff near Izembek Lagoon (7). No visible contaminants or odors were detected during drilling and installation. Surface soil samples were analyzed for PCBs and both surface and subsurface soils were analyzed for petroleum hydrocarbons and VOCs. No PCBs were detected in any sample and petroleum hydrocarbons were detected in only one bore sample (633 ppm at 25 ft bgs). Based on these results and the fact that human and wildlife receptors were not expected in this area, the USAF decided that no further action was warranted.

Service employees subsequently analyzed three soil samples from within the spill site and one control sample in 1988 (9). Samples were analyzed for OCs, but these were not detected in any sample. Thirteen PAH compounds were detected at sites within the spill zone, but no PAHs were detected at the control site. Two of the sites within the spill zone were characterized as being of medium concern because "either Service criteria have been exceeded, gross contamination exists, and/or the presence of specific compounds may be indicative of a larger, undefined contaminant problem."

In July 1991, the USAF submitted a No Further Action Decision document for the spill/leak area that was approved by ADEC later that month (11). Later in 1991, the Refuge Manager noted colored liquids seeping and pooling at a debris sinkhole south of the former facility, within 200 meters of the lagoon.

In 1995, three boreholes were drilled around the sinkhole (2). Although the site closest to the sinkhole (HA-07) had DRO concentration of 15,000 ppm at 3.9 feet, the other two samples were not analyzed for DRO. However, three additional soil borings were taken around HA-07 and analyzed for DRO in an attempt to delineate the extent of the contamination. Only one of these samples, located 36 feet southwest of HA-07, had detectable levels of DRO (2,680 ppm). The contractors concluded from these results that DRO contamination was not migrating offsite and was confined to the spill area. No further action was the remedy selected by the

USAF and approved by ADEC for this site in 2001 (12).

Visually, there is no discernible distinction between this site, the WACS site, and the road oiling site now that the entire area has been capped and graded. Service personnel detected no signs of contamination during the 2004 site visit. As stated above, the area is well graded, but with little vegetation. Effort to re-vegetate the area have not been successful and netting used to retain soil and seeds has torn free and become entangled in vegetation along the slope of the hill.

A monitoring well at Grant Point overlooks Izembek Lagoon. D. Rocque/USFWS.

Summary

There are several contaminant issues associated with the Cold Bay Air Force Station. Petroleum products have been detected in several locations and are largely associated with past spills or buried fuel storage tanks. Debris and sinkholes have appeared in graded areas and buried drums, storage tanks, and containers have also been discovered after remedial activities were believed to be complete. Monitoring wells have been installed and a monitoring program implemented. In addition, annual surveys for sinkholes and other debris are conducted. Graded areas are largely unvegetated and may erode without native vegetation. All of sites at the AFS (except the sinkhole) were approved for no further action in 2001 by ADEC.

Unimak Island

Unimak Island is the largest and easternmost island in the Aleutian Archipelago and is part of the Alaska Maritime National Wildlife Refuge (AMNWR) but administered by the Izembek National Wildlife Refuge. Approximately 1,800 acres were identified and withdrawn by Executive Order (EO) in 1901 at Cape Sarichef and 8,852 acres were withdrawn by EO in 1901 and 1902 at Scotch Cap for the U.S. Coast Guard (USCG). In 1913, EO 117.33 withdrew all Unimak Island lands for the inclusion in the Aleutian Island Reservation (the precursor to AMNWR), except lands used for military purposes or existing withdrawn lands. In 1959, the U.S. Air Force received a permit from the USCG to construct a White Alice Communication installation, which stated "upon termination of the permit, the permittee agrees to vacate the premises and remove its equipment." Later that year the USAF entered into a cooperative agreement with the Service which permitted the construction, operation, and maintenance of defense related facilities on refuge lands. The agreement was effective to December 1978 and provided the USAF the obligation to remove any structures within two years of cessation of the facility. It was also stipulated that unless otherwise agreed to by both parties, that any structures not removed within the two year period would become the property of the Service. An analysis by the U.S. General Accounting Office in 1979 found that neither agreement required the removal of the building or other improvements. Numerous communications between the Service, USCG, and USAF from 1979 through 1985 indicate that the agencies were agreeable to transferring the lands back to the Service with the buildings in place. However, a letter to the BLM from the Regional Director in 1986, indicates a reversal by the Service and lists both the USAF and USCG facilities that require removal prior to land transfer. To date, many of these structures are still in place and contribute to contaminant issues at three sites on Unimak Island.

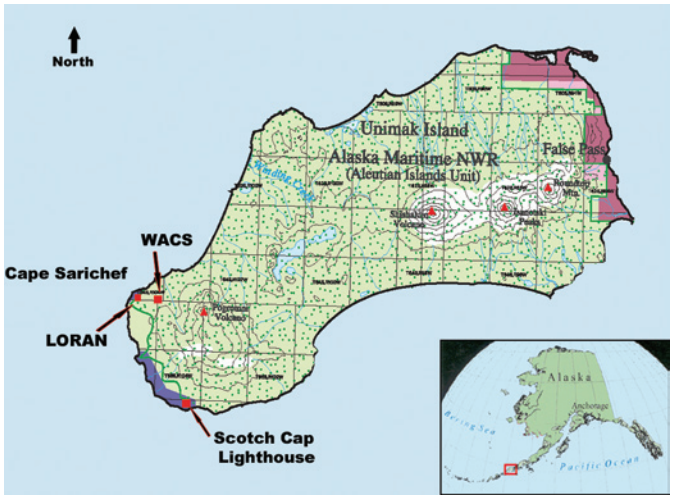


Figure 8. Location of the USCG and USAF sites on Unimak Island.

The original Scotch Cap lighthouse built in 1903.

The newly expanded lighthouse before it was destroyed by a tsunami in 1946.

Scotch Cap

The Scotch Cap lighthouse marked the inside entrance to Unimak Pass and was the first lighthouse constructed on the outside coast of Alaska. The USCG built the original lighthouse on the Pacific side of Unimak in 1903 and updated and expanded the structure in 1940. In 1946, a tsunami destroyed the structure and a new station was built 40 feet above the destroyed lighthouse in 1950. By 1971, the lighthouse was fully automated and unmanned. Presently, this site consists of abandoned and deteriorating structures that contain lead paint and asbestos, a landfill that contains household debris, scrap metal, portions of heavy equipment, and rusted pipes. This site also includes two horizontal 3,000-gallon diesel ASTs and four USTs beneath a concrete vault at the main barracks building (two 10,000 gallon diesel USTs, one 1,000-gallon diesel UST, and one 3,000-gallon gasoline UST).

Under DERP, contractors collected a total of 34 samples from areas of potential concern at the Scotch Cap site in 1989 (14). Based on samples collected, petroleum appeared to be the contaminant of greatest concern at the site. Two soil samples collected from the area of the ASTs had high levels of total petroleum hydrocarbons (TPH; 2,600 and 33,000 ppm) as well as detectable levels of VOCs. Sediment samples collected near the barracks also had high levels of TPH (1,700 and 6,000 ppm), as well as elevated lead in one sample (170 ppm). Eight sub-surface soil samples collected at the landfill had concentrations of TPH ranging from 15 – 2,300 ppm. Only one of seven soil samples collected to evaluate off-site migration had

The remaining foundation of the original Scotch Cap lighthouse in the early 1980s. J. Sarvis/ USFWS.

elevated TPH concentration (500 ppm), originating from the ravine. Samples from within the ASTs indicate the presence of tainted gasoline. Asbestos was detected in samples collected from the barracks at the entrance, head, and generator room.

A site visit and sampling in 1997 detected lead paint and asbestos at the Scotch Cap site (15). Sixteen paint samples were taken from various rooms in the barracks and analyzed for lead. Seven samples exceeded regulatory thresholds for lead and based on the area covered by like colored paint, it was estimated that 12,000 ft^2 has paint that exceeds the regulatory limit (5,000 ppm) for lead (40 CFR 745.220). Analyses detected friable asbestos containing material in pipe insulation and insulation on the hot water heater in the barracks. The condition of this material was generally damaged. Non-friable asbestos was also identified in roofing material, floor tile, and concrete asbestos board. An initial investigation of potential PCB contamination identified no sources of PCBs at Scotch Cap. The lands remain withdrawn for the USCG, who will be required to remove improvements and clean-up all contamination prior to the Service assuming primary jurisdiction. At present, there are no further investigation or clean-up planed for Scotch Cap.

The lighthouse at Scotch Cap in 1950 before it became fully automated.

Cape Sarichef

The USCG constructed a light station at Cape Sarichef in the early 1900s as part of the network of stations in the North Pacific. The Cape Sarichef Light Station was the most westerly lighthouse in North America and marked the northern entrance to Unimak Pass. After the disaster at Scotch Cap in 1950, a new lighthouse was built on the bluff above the old station. Four years later, a long-range radio navigation (LORAN) station was built adjacent to the lighthouse. In 1979, navigation by LORAN technology had become outdated and the station was closed.

In February 1959, the USAF received a permit from the USCG to construct a Distant Early Warning site on lands originally withdrawn for the USCG. Later that year, the Service and the USAF entered into a cooperative agreement that allowed the USAF to operate and maintain defense related facilities on lands withdrawn from the Refuge Complex indefinitely with the condition that the USAF would remove its equipment and vacate the premises within two years of the cessation of use. The 349 acre site was built approximately two miles east of the LORAN station and became operational in 1959. It was converted to a WACS in 1969 and operated until 1978.

The coastline of Cape Sarichef is a haulout site for endangered Steller's sea lions, barely visible in the fog. Note the debris from the LORAN Station on the steep cliffs in the foreground. P. Johnson/USFWS.

LORAN Station

On July 27, 1979, the USCG served notice to relinquish the improved land at Cape Sarichef. This site consisted of a cinder block and wood-frame two story LORAN station/living quarters building, sheds and workshops, a fuel storage building, fuel tanks, a lighthouse, a water storage tank, an automatic light, and other associated buildings. Two Service personnel and their families moved into the abandoned facility in the summer of 1979, but maintenance to the buildings and generators proved too much for the skeleton crew. The Service terminated its use and occupancy of the buildings in 1985. Although the majority of the furnishings and equipment were removed from the buildings and shipped to Cold Bay, generators, abandoned vehicles, and 55-gallon drums remain at the site. To date, these lands remain withdrawn for the USCG. The Service will not assume primary jurisdiction until all structures are removed and all contamination is remediated.

The LORAN station in 1980, just after it was closed. Keller/USFWS.

The LORAN station in 2004, much in need of a coat of paint. D. Rocque/USFWS.

A physical inventory at both Cape Sarichef sites in 1985 discovered the presence of petroleum products in twenty 55-gallon drums, unknown contents of underground storage tanks, and assumed asbestos in pipe insulation at the LORAN station (16). A preliminary assessment was conducted in 1989 as part of DERP (14). The purpose of the assessment was to generate sufficient data to identify pollutants that may be considered a chronic health threat to humans or the environment. Asbestos containing material (26 samples analyzed) was found throughout the LORAN building and areas with high percentage of asbestos were found in the boiler room and pipe insulation. Surface soil samples indicated that several areas were contaminated with petroleum products, however PCBs and solvents were not detected in any sample. Surface soil samples analyzed for trace elements were not elevated above background concentrations. Highest concentrations of TPH were detected in surface soil samples from the north side of the LORAN building, which had concentrations as high as 460,000 ppm (1,600 – 460,000 ppm). While ADEC does not regulate based on TPH, the maximum allowable concentration for RRO (the least toxic petroleum hydrocarbon) is 22,000 ppm. Sub-surface samples collected next to storage tanks had elevated levels of TPH, up to 4,200 ppm. A soil sample from the wood garage had a TPH concentration of 7,300 ppm. Liquid samples collected from inside underground storage tanks contained leaded gasoline and samples collected from 55-gallons drums contained lubricating oil.

Ceiling tile and pipe insulation that likely contains asbestos. D. Rocque/USFWS.

Five-gallon cans of aluminum asbestos were left at the LORAN site. USFWS.

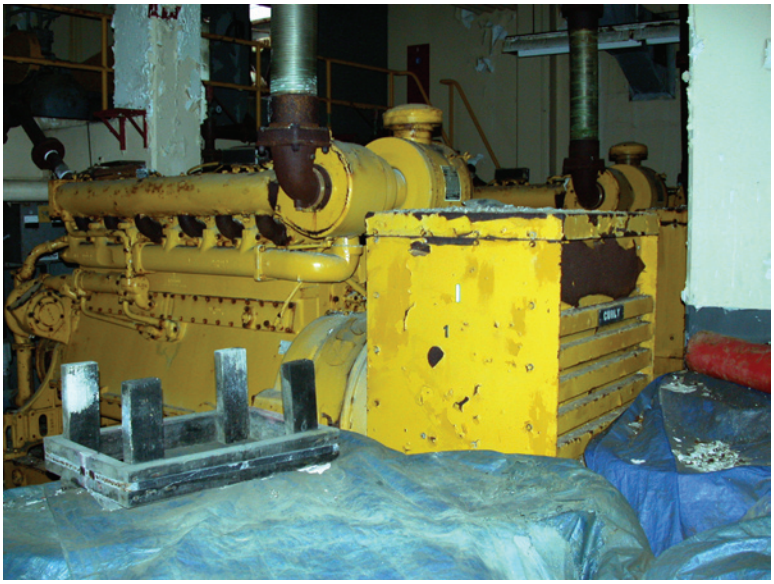
Additional samples collected in 1997, detected friable asbestos on pipes and insulation (15). The amount of asbestos present at the LORAN site and the Scotch Cap lighthouse (see above) was estimated at over 60,000 ft^2 and included insulation, vinyl floor tile, mastic, concrete asbestos board, and roofing material. Surface soil analyses found presence of DRO and assuming a contamination depth of one foot, the volume of contaminated soil was estimated to be 270 cubic yards. Although seven fuel storage tanks were evaluated during this site visit, only flash points of the sampled liquids were determined to aid in evaluating disposal alternatives. Similar analyses were conducted on the contents of the 55-gallon drums located near the POL storage area. Of the 53 drums that were located and inventoried, only 10 drums had their flash points determined. Due to time constraints during this visit, paint was not analyzed for lead. However, based on the results from Scotch Cap paint analysis, it is likely that well over 10,000 ft^2 have lead levels that exceed regulatory limits.

Leaking lube oil drum left at the LORAN station after it was closed. USFWS.

Peeling ceiling and wall paint at the LORAN station. D. Rocque/USFWS.

During the site visit in 2004, Service personnel found the LORAN station in a general state of decay. The majority of the windows were broken and ceiling tiles were decaying and falling down. Large areas of paint were peeling off the walls and ceiling. Debris, including foodstuffs, oil filters, and furniture was scattered throughout the building and rusted and empty 55-gallon drums were stored in a generator room. Overpacks of 55-gallon drums and assorted smaller containers were stored in the former garage and outside the building and were not protected from the weather. The lighthouse was empty and not in as poor condition as the LORAN station, but years of abandonment was evident. Abandoned vehicles and metal and wooden debris were scattered outside the buildings. At present, no plans to remove the buildings and restore the site are underway.

The lighthouse at the LORAN station in 2004. D. Rocque/USFWS.



A generator that remains at the LORAN station. D. Rocque/USFWS.

White Alice Communication Station

The White Alice Communication Station is located on USCG withdrawal land under primary jurisdiction by USCG, making both the USCG and USAF primary responsible parties. The USAF site consists of storage buildings, runways, fuel storage and maintenance facilities, large (60 ft^2) antennas, and housing and operations buildings. In September 1978, the USAF closed the facility and performed a general cleanup, which included the removal of PCB transformers. The site was officially closed on December 30, 1978 and listed as excess property. A second general cleanup that included the removal of 84 batteries and 31 PCB containing capacitors was conducted in 1985 when the USCG cancelled the USAF use permit for the site. A physical inventory was also carried out in 1985, and asbestos and suspected fuel residue inside storage tanks were cited as the contaminants of concern at this site (16).

The former White Alice Communications site in spring 2004. P. Johnson/USFWS.

A preliminary assessment was also conducted at the WACS in 1989 under DERP (14). Samples from the WACS site also indicated elevated levels of TPH in several areas. Two surface soil samples from the north side of the operations building had TPH concentrations of 14,000 and 26,500 ppm. These samples also had elevated concentrations of PAHs and lead. All sub-surface samples collected around the UST at the north end of the operations building had elevated TPH concentrations (3,000 – 6,000 ppm). Samples from the north and south UST contained diesel fuel. No detectable levels of asbestos were detected in samples collected from the HVAC (heating, ventilation, and air conditioning) and compressor rooms, but the remaining samples had asbestos concentrations ranging from 5% to 55%.

An underground storage tank at the WACS that has become exposed. D. Rocque/USFWS.

A subsequent site visit in 1998 confirmed the presence of asbestos and lead in the WACS operations building (17). Lead concentrations were highest in the floor drains (1,250 ppm), but averaged 0.54 ppm in paint samples collected in the building. Surface soils from outside the WACS building had 4,4'-DDT concentrations as high as 51 ppm and one sludge sample from the floor drains had a DDT concentration of 298 ppm. A different sludge sample had a 4,4'-DDE concentration of 513 ppm. Bulk fuel, battery caches, and resonant capacitors, which likely contain PCB oil also contributed to hazardous wastes in the area. Eight fuel storage tanks were

surveyed and estimated to contain 20,000 gallons of fuel. Of this, approximately 19,900 gallons were suspected to be weathered diesel; the remaining 100 gallons appeared to be MOGAS. Analysis also confirmed 3.8 ppm PCBs present in an AST. In addition, approximately 39,300 gallons of fuel-contaminated water were identified in the tanks. There also exists a network of piping associated with the fuel tanks. Although most of the pipes were assumed to be empty, some residual fuel may remain in some of the systems.

In 1999, a fuel transfer was conducted at the WACS site (18). Contents of eight USTs were examined and recoverable product was pumped into 55-gallon drums that were transported and stored in the WACS garage. In all, only six 55-gallon drums of liquids were generated during this operation. Drums were properly labeled, placed inside a lined impoundment inside the garage, surrounded by the unused drums and tied together for protection until they could be transported off-site. During the transfer operation, the majority of liquid pumped out of the USTs consisted of water. The source of the discrepancy in estimated content of the USTs from 1998 and 1999 is not known, however one explanation provided in the 1999 report was "that the fluids in [UST #6] during the 1998 site visit could have been from high water table from excessive precipitation, which then leaked out of the UST when the water table subsided" (18). Wastewater from the USTs was also characterized to aid in disposition decisions during future removal actions. No wastewater contained PCBs or RRO, but DRO was present in each sample. In addition to the fuel transfer, samples were also collected from soil, surface water, and inside storage tanks. Generally, the soil samples had DRO and RRO concentrations above ADEC Method One petroleum hydrocarbon soil cleanup levels, with the highest concentrations in samples collected near the garage and generator room. Surface water and sediment samples collected from the former water supply dam were not contaminated except for one sample in which the PAH constituent crysene was detected (8.8 ppb). No soil sample had detectable levels of PCBs. All tasks that were scheduled for the 1999 field season were completed. A plan has been in place since FY-00 to burn fuel and contaminated soil on site, remove USTs, demolish buildings, ship other hazardous wastes

Six 55-gallon drums containing liquid surrounded by empty drums in the WACS garage in 2004. D. Rocque/ USFWS.

off-site for disposal, and dispose of debris in an on-site monofill, however adequate funding to implement these activities has not been obtained.

Service personnel found buildings intact and in fair condition during a site visit in 2004. The 55-gallon drums of liquid that were generated during the 1999 fuel transfer were still in place inside the garage. The large WACS antennae were in place and were providing structure for a raven (*Corvus corax*) nest. Several debris piles surrounded the facility and USTs were protruding through the tundra. At present, no site restoration activities are scheduled.

A debris pile containing empty drums, canisters, and wood located near the WACS site. D. Rocque/USFWS.

Summary

Unimak Island has three sites of contaminant concern; the Scotch Cap lighthouse, the LORAN Station at Cape Sarichef, and the WACS site. The lighthouse and LORAN Station are administered by the USCG and the WACS site is under USAF jurisdiction. The USACE determined that approximately 60,000ft^2 of asbestos and 22,000ft^2 of lead painted surface is present at the lighthouse and LORAN station. High levels of TPH were found in soil samples from the Scotch Cap site. There were also extraordinarily high TPH concentrations in soil samples taken from the LORAN site (1,600 - 460,000 ppm). Petroleum products likely remain in fuel lines at both sites, but several storage tanks have been drained into drums that are being stored onsite at the LORAN Station. Petroleum products were also the primary contaminant at the WACS site. Soil samples had concentrations of TPH as high as 26,500 ppm and the highest lead concentrations were found in samples from the floor drain (1,250 ppm). High concentrations of DDT were also detected near the floor drain. Fuel was removed from some of the storage tanks at the WACS site and stored in six 55-gallon drums onsite, but a large amount of fuel may still be present in storage tanks. Although a plan to remove debris and contamination is currently in place for the WACS site, no funding has been secured to carry out these tasks. In FY03, the USCG sites did not have work scheduled due to lack of funding. The lack of funding and low priority status for these sites precluded the scheduling of work in FY04-05. Meanwhile, the harsh Aleutian climate continues to degrade the remaining infrastructure (and hazardous waste containers) and increase the logistical difficulty in removing contamination and debris.

Oil Spills

In September 1989, a routine beach survey turned up several patches of beached oil at the head of Cold Bay in Kinzarof Lagoon. Samples were collected and submitted for analyses. Oil was also reported in Unimak pass in 1989, but the source of the oil was not determined in either case.

The threat of a spill of oil, other petroleum products, or hazardous materials is, and will continue to be, a potential contaminant issue for the Refuge Complex given the extensive coastline and vessel traffic in the area. Petroleum releases from distressed vessels occur each year in the heavily traveled Unimak Pass. Wildlife resources such as fish, marine mammals, and birds are at risk from any spill event. The frequency, timing, and magnitude of these events are unpredictable and emergency response efforts are contingent upon weather and location of the event.

"Tar balls" and a dead shearwater on the beach at Kinzarof Lagoon in 1989. M. Chase/USFWS.

Alaska statute divides the state into ten regions for oil and hazardous substance spill planning and preparedness. The Refuge Complex is part of the Aleutian Subarea Contingency Plan. The plan contains information applicable to pollution response within the entire state of Alaska and meets the pollution response contingency planning requirements applicable to the federal and state governments. The plan provides broad policy guidance and describes the strategy for a coordinated federal, state and local response to a discharge, or substantial threat of discharge, of oil and/or a release of a hazardous substance within the boundaries of Alaska and its surrounding waters.

Future Development

Development near or within Refuge boundaries has the potential to present future contaminant issues and adversely affect wildlife habitats. Although current legislation allows oil and gas leases on National Wildlife Refuges, the Refuge Complex's CCP prevents oil and gas exploration and development on Refuge lands. However, oil and gas development could occur on private and state lands adjacent to the Refuge, including continental shelf areas. Oil and gas reserve potential has been rated as low to moderate for most of the Refuge Complex and current interest in this resource is low.

The Aleutians East Borough (AEB) proposed a transportation system, consisting of a road and hovercraft link, between the towns of King Cove and Cold Bay, Alaska (Figure 9). The one-lane gravel road will extend 17.2 miles from the King Cove Airstrip to the Northeast Corner Hovercraft Terminal. The road will create a 152-acre footprint on surface lands owned by the King Cove Corporation (the Native village corporation for King Cove) of which 117 acres are located within the Alaska Peninsula National Wildlife Refuge and 35 acres within the Izembek National Wildlife Refuge. King Cove Corporation lands within the Refuge Complex are subject to provisions of Secton 22(g) of ANCSA because they are located on Refuge lands that were established prior to the passage of ANCSA in l971. Section 22(g) of ANCSA requires that conveyances made under ANCSA remain subject to refuge rules and regulations governing the use and development of refuges. The sub-surface estate of lands subject to Section 22(g) of ANCSA was retained by the United States. A Special Use Permit required by Section 22(g) was issued by the Service to mine sub-surface gravel for the construction of the road. The AEB received approval for this plan from the U.S. Corps of Engineers in January 2004. The road is currently under construction and activities associated with the building and use of this transportation system have the potential to introduce contaminants, through fuel spills and leaks, into sub-surface or ajoining Refuge lands, as well as adversely impact wildlife that utilize nearby waterbodies.

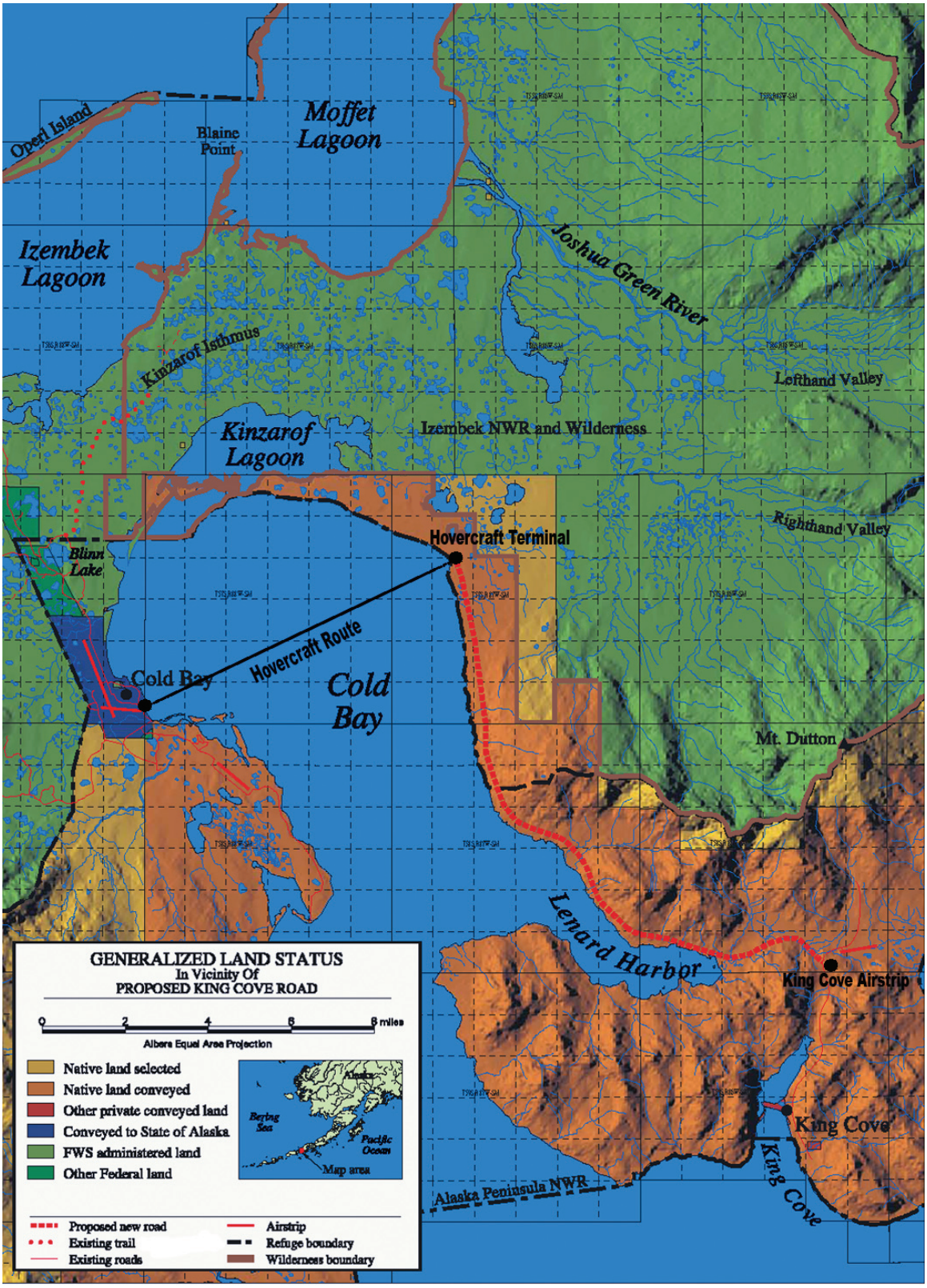


Figure 9. Generalized land status map of proposed King Cove Road and Hovercraft terminals.
USFWS Graphic.

Recreation

The wooden backdrop that forms the shooting range at the Refuge. D. Rocque/USFWS.

Hunting and fishing

Birds, especially waterfowl, are susceptible to lead poisoning from shot and lead poisoning has been documented in spectacled and common eiders on the Yukon Delta National Wildlife Refuge (19, 20, 21). Waterfowl and big game hunting in the Refuge Complex are renowned and the resource is enjoyed by residents and non-residents alike. A federal ban on lead shot for waterfowl has been in effect since 1991 however, lead shot is still available for upland game hunting and may be used at times on the Refuge Complex.

A small shooting range exists on Izembek National Wildlife Refuge and is used for training and by hunters sighting in rifles. The range is a former military shooting range that had multiple berms, but only the biggest berm in currently used. A small pond is located downhill from the shooting range. Given the environmental characteristics of the area, it is unlikely that this shooting range poses a significant risk to wildlife. However, lead shot from this range has the potential to leach into soils and ground or surface waters. It is recommended that a seasonal cleanup be performed at this site to minimize the accumulation of lead at this site.

People also visit the Refuge Complex to enjoy the sport fishing opportunities and residual lead from fishing weights and jigs may pose potential contamination issues. In areas of high fishing pressure some states have implemented restrictions on lead use for fishing to help alleviate lead toxicity from fishing gear. Additionally, the Service has established lead-free fishing areas in a number of National Wildlife Refuges and Waterfowl Production Areas. (http://policy.fws.gov/library/99fr43834.pdf).

Pacific black brant are popular among waterfowl hunters. USFWS.

Aviation

Many aircraft accidents have occurred over the years on the Refuge Complex. Logistical constraints due to the remote location of crashes can preclude aircraft recovery, but the majority of crashes on the Refuge Complex are removed. Crashed aircraft likely pose more of a solid waste than contaminant issue however, spilled fuel and lead from batteries may present minor localized contamination issues.

Recreational Vehicles

Primary access to the Refuge Complex is via air or water. Snow machines provide infrequent access to remote areas off the road system; ATVs are restricted to established roads. Although emissions from two-stroke engines are higher than four-stroke engines, it is unlikely that these vehicles pose significant air quality issues. However, the EPA estimates that one hour of operation by a 70-horsepower two-stroke motor emits the same amount of hydrocarbon pollution as driving 5,000 miles in the average automobile.

Sea kayaking provides a good, non-motorized, view of the pinnacles. J. Sarvis/USFWS.

Biotic Sources and Physical Transport

Several species of shorebirds refuel on the Refuge during migration. J. Sarvis/ USFWS.

Biotic Sources

Migratory birds and fish may serve as two possible biotic sources of contaminants. Because these species are highly mobile, they could be exposed to contaminants outside, as well as within, the Refuge Complex boundaries. When these species return to the Refuge Complex, they may transport any accumulated contaminants back to the Refuge Complex to become available to other Refuge species and humans.

Two 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, Alaska accumulated the majority of their contaminant body burden during their ocean life stage and transported low levels of contaminants to their freshwater spawning areas (22). A more recent study conducted in Alaska found that while contaminant residues in each fish is relatively low, PCBs accumulated in oceans and transported by thousands of salmon that spawn and die in freshwater ecosystems has resulted in a tenfold increase in PCB concentrations in lake sediments over lakes that do not support spawning salmon (23). It is currently not known whether biotic transport is a contaminant pathway affecting Refuge Complex resources.

Resident species may also accumulate and bioconcentrate lipophilic contaminants in their fatty tissue. Non-migratory rock sandpipers (*Calidris ptilocnemis*) from Cold Bay had elevated levels of mercury with respect to other rock sandpiper from the Aleutian islands (24). Mercury in these birds was hypothesized to come from a anthropogenic or natural mercury deposit point sources in the area.

Physical Transport

At the regional scale, the most notable physical pathway of contaminants to high-latitude environments is long-range atmospheric transport. Atmospheric deposition in the Arctic occurs mainly in the winter when the Aleutian Low pressure cell drives much of the atmospheric circulation of the Northern Hemisphere. Airborne contaminants are drawn to high-latitudes from industrial areas in Europe and Asia by circulation patterns where, due to colder temperatures, the contaminants condense and precipitate out

of the atmosphere (25). Once chemicals reach colder climates typical of high-latitudes, they are less likely to revolatilize as in warmer climates, and therefore accumulate in Arctic regions (26). Several contaminant studies conducted on avian populations in the Aleutians Islands point to long range transport as one source of pollutants in the Aleutian Islands food web (24, 27, 28).

Rivers and ocean currents are also important contaminant pathways. Contaminants in terrestrial environments are carried by snow-melt, surface water, groundwater, and rivers. Eventually contaminants end up in the oceans unless they degrade, volatilize, are sorbed to sediment, transformed, or accumulated by biota. The fate of ocean contaminants is determined by circulation patterns and by the stratification of the ocean waters. Although the ocean is the ultimate sink for contaminants, the seasonal mixing of deep and surface ocean layers can extend the long-term exposure potential of a contaminant. Once in the ocean, compounds can revolatilize into the atmosphere, be incorporated into aquatic food webs, or sink to deeper ocean layers.

Persistent organic pollutants (POPs) are toxic chemicals that are not easily metabolized by organisms and are often passed up the food web where they biomagnify and, especially in top predators, accumulate to harmful levels. POPs, along with some trace metals such as cadmium, mercury, and lead, PAHs, and radionuclides are of particular concern in the Arctic. 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/).

This Pacific black brant family will stop at Izembek Lagoon in the fall before completing their migration to Baja California and Mexico. J. Wasley/USFWS.

Areas of Concern and Future Sampling

This contaminant assessment report summarizes some of the past, present, and future contaminant issues for the Izembek National Wildlife Refuge. Several areas have been identified in this report that require cleanup and/or future sampling. However, the inaccessibility of some remote areas of the Refuge Complex made it impossible to assess all potential contaminant issues and subsurface habitats in many impacted areas have not been evaluated. The following areas and actions are recommended for the Refuge Complex.

- Unimak Island: Removal of fuel from storage tanks and drums. There is an estimated 18,500 gallons of fuel in ASTs at the WACS site and an unknown quantity of fuel at both USCG sites (capacity at the two site exceeds 500,000 gallons of fuel storage in ASTs and USTs). The potential of a leak from a UST or a spill from an AST is high. According to a 1998 document "[t]he most significant environmental concerns at Cape Sarichef and Scotch Cap include the presence of USTs, ASTs, and 55-gallon drums that contain product waste" (15). At a minimum, all fuel should be removed from the three sites as an interim removal action.

- Unimak Island: Updated site characterization reports are required for all three Unimak Island sites before respective cleanup plans can be approved. These reports should include comprehensive field investigations that also determine applicable cleanup levels. Due to the remoteness of each site, it is recommended that investigations and subsequent cleanups be carried out as unified efforts, despite differing responsible parties. The three sites require that similar contaminant issues be addressed; high levels of petroleum products in soils, removal and/or closure of USTs and other fuel storage tanks, asbestos and lead paint removal, and removal or proper burial of buildings.

- Cold Bay Air Force Station: Capped and graded areas need to be re-vegetated to avoid erosion of soils. Seed mats used to re-vegetate and control erosion have blown free and pose a hazard to wildlife. Caps to the landfill and other areas require annual inspection and continued monitoring of ground water via monitoring wells is required. It is also recommended that periodic soil samples be collected and

analyzed in areas of previous fuel spills and leaks.

- Asphalt Seeps at Fort Randall: The source of the asphalt seeps needs to be determined and removed. The extent of the asphalt seeps expands annually with each new freeze/thaw cycle and pose a threat to trust resources. Seeps should be capped and monitored.

- Shooting Range: Refuge personnel should perform an annual or semi-annual cleanup of slugs as well as request that shooters perform a minimal cleanup after using the range.

- As with most refuges in Alaska, little data exist for establishing baseline contaminant concentrations in air, soil, sediment, water, and biota. These data would provide information from a remote area that could be compared with data from other regions (e.g. Arctic Monitoring and Assessment Programme) and provide information for trend analyses.

Federally listed as threatened, Steller's eiders remain on the Refuge throughout the winter. J. Wasley/USGS..

Conclusion

The Izembek National Wildlife Refuge Complex encompasses a remote area on the Alaska Peninsula and eastern Aleutian Islands. Despite its distance from industrialized areas, the Refuge Complex has significant contaminant issues, some of which have been identified and highlighted in this report. The majority of contaminant issues on the Refuge Complex stem from past and current military operations on withdrawal lands. Cleanup of former military installations is ongoing adjacent to and throughout much of the Refuge Complex. This Contaminant Assessment Process has gathered information to help Service personnel to make informed management decisions about contaminant threats to the Refuge Complex 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. Utilizing the CAP is one way in which the Service can ensure that our country's National Wildlife Refuges maintain their environmental health and integrity.

A rock sandpiper in winter plumage foraging along Refuge shores. USFWS.

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