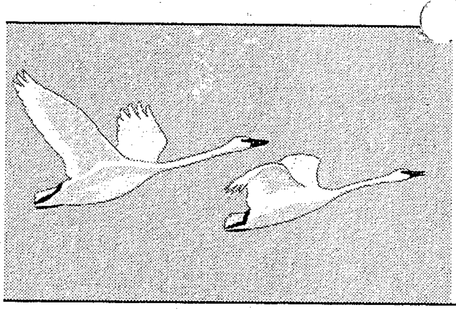


Proposed Plan for Cleanup Action at

OPERABLE UNIT C

Fort Richardson, Alaska

February 1998

This Proposed Plan presents cleanup alternatives for Operable Unit C (OU-C) at Fort Richardson near Anchorage, Alaska. These alternatives are being considered by the U.S. Army, the Alaska Department of Environmental Conservation ***(ADEC)***, and the U.S. Environmental Protection Agency ***(EPA)***. The Army, ADEC, and EPA are soliciting comments from the public on the information and proposed ***cleanup actions*** discussed in this document. For your convenience, this Proposed Plan contains an alphabetical glossary of terms that defines the words and abbreviations printed in ***bold italic*** type.

Although this Proposed Plan identifies a preferred alternative for the Eagle River Flats (***ERF***) site, a final decision will not be made until the public comment period ends and all comments are reviewed and considered. The public is encouraged to review and comment on all alternatives presented in this Proposed Plan. The box titled "How You Can Participate" on page 2 provides details about the public participation process.

Documents produced under the Comprehensive Environmental Response, Compensation, and Liability Act (***CERCLA***), such as the Ecological Risk Assessment (***ERA***), Remedial Investigation (***RI***), and Feasibility Study (***FS***), were prepared in coordination with the Biological Technical Assistance Group (***BTAG***). The BTAG consists of individuals from the Alaska Department of Fish and Game, U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration, and EPA.

The two sites in OU-C are the former Open Burning/Open Detonation ***(OB/OD)*** Pad and ERF, an ***ordnance*** impact area. Site investigations performed at the OB/OD Pad indicate that the contaminants found do not pose a threat to human health or the environment and do not require cleanup action. Therefore, except for ***institutional controls***, no cleanup action is recommended for the OB/OD Pad.

Site investigations performed at ERF found that ***white phosphorus*** particles were causing waterfowl deaths. Results were used to identify 18 ponds for cleanup. The preferred cleanup alternative for ERF includes a combination of (1) monitoring waterfowl use, the presence of contamination, and the changing physical conditions at contaminated ponds at ERF; and (2) temporarily draining contaminated ponds with pumps followed by application of a cap-and-fill material where contamination remains.

SITE BACKGROUND AND SUMMARY OF CONTAMINATION

Site Description and History

Fort Richardson was established in 1940 as a military staging and supply center during World War II. It now occupies approximately 56,000 acres bounded to the north by Knik Arm, the west by Elmendorf Air Force Base, and the south by the Municipality of Anchorage. Figure 1 on page 2 shows the location of Fort Richardson. The current mission of Fort Richardson is to support the rapid deployment of Army forces from Alaska to the Pacific Theater.

In June 1994, the EPA included Fort Richardson on the National Priorities List ***(NPL)***. Following negotiations, the Army, EPA, and ADEC signed a Federal Facility Agreement (***FFA***) for Fort Richardson on December 5, 1994. The FFA outlines the approach for a thorough investigation of suspected historical hazardous-substance sources. It also calls for cleanup activities that will protect public health and welfare and the environment in accordance with state and federal laws.

GLOSSARY

ADEC
Alaska Department of Environmental Conservation.

Administrative Record
A comprehensive reference collection that contains all files, records, and documents associated with the cleanup process for each OU.

ARAR
Applicable or relevant and appropriate requirement. The federal or state laws that pertain to protection of human life and the environment in addressing specific conditions or use of a particular cleanup technology at a CERCLA site.

baseline
The natural or existing state. The condition before implementation of an alternative cleanup action.

breaching
The use of explosives to create a gap in a pond edge that drains the pond.

BTAG
Biological Technical Assistance Group. Consists of individuals from the Alaska Department of Fish and Game, U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration, and EPA.

CERCLA
Comprehensive Environmental Restoration, Compensation, and Liability Act of 1980, also known as Superfund. CERCLA established a nationwide process for cleaning up hazardous waste sites that potentially endanger public health and the environment.

continued on page 9

How You Can Participate

The public is encouraged to participate in the decision-making process affecting OU-C. A 30-day public comment period for this Proposed Plan is scheduled from February 5 to March 6, 1998. You can comment on the proposed actions presented in this Proposed Plan in three ways:

1. Attend the open house public meeting at 7:00 p.m. on February 12, 1998, at Russian Jack Springs Chalet in Anchorage
2. Leave a recorded telephone message at 1-888-343-9460 (toll-free)
3. Write to the following address before the public comment period ends:
   William A. Gossweiler
   Fort Richardson Project Manager
   U.S. Army Alaska
   Attn: APVR-RPW-EV
   730 Quartermaster Road
   Fort Richardson, Alaska 99505-6500

All comments, whether provided at the public meeting, submitted in writing, or recorded on the toll-free telephone line during the public comment period, will be considered by the Army, ADEC, and EPA when reaching a final decision for cleanup. In addition to this Proposed Plan, other documents can be found at the information repositories. See the list of related reports in the box on page 5. Photocopies of these materials can be made at the information repositories, which are listed on the back page. The ***Administrative Record*** is available for the public to view at the Public Works Environmental Resource Office, Building 724, Door 5, Quartermaster Road, Fort Richardson.

The Army, ADEC, and EPA will present their responses to all comments received during the public comment period in a document called a ***Responsiveness Summary***. The decision on cleanup action for OU-C will be presented in a Record of Decision (***ROD***). The Responsiveness Summary will be part of the ROD and will be available for review at the information repositories and in the Administrative Record. Depending on public comments, the actual cleanup actions selected may be the preferred alternatives, a modification to the alternatives, a combination of alternatives, or a different alternative.

The FFA divided Fort Richardson into four ***OUs*** (named with letters A through D) to represent the potential source areas for hazardou substances. The OUs were created based on the amount of existin information, the similarity of contamination, and the level of effor required to complete an RI. As stated earlier, this Proposed Plan focuse on OU-C. Reports about OU-C are listed on page 5.

History of Operable Unit C

OU-C consists of an 8-acre gravel OB/OD pad on the eastern edge of ERI and the 2,160-acre salt marsh that makes up ERF.

The **OB/OD Pad** was used for open burning and open detonation o expired ordnance for more than 30 years. Operations ceased in 1988.

Review of data collected during the RI found that all contaminants identified at the OB/OD Pad were at levels low enough that cleanup is not required. As a result, no action is recommended, and the pad is no discussed in other parts of this Proposed Plan. The use of curren institutional controls will continue. Institutional controls restrict access to the pad with a locked gate. Future development of the pad is prohibited because of the potential of ***unexploded ordnance***.

ERF is a salt marsh where the Eagle River meets tidal waters in Knik Arm It contains approximately 25 targets that have been used for artillery training since 1949. Artillery shells created thousands of craters in the wetlands and associated mud flats. An estimated 10,000 pieces of unexploded ordnance are buried in the shallow subsurface.

A wetland, ERF serves as an important staging ground for migrating waterfowl during spring and fall migrations. It supports local populations of fish, birds, mammals, and ***macroinvertebrates*** (primarily insects, snails, and ***crustaceans***). Its small interconnected ponds provide excellent habitat for ***dabbling*** ducks and other waterfowl. See the explanation of dabbling ducks in a box on page 4.

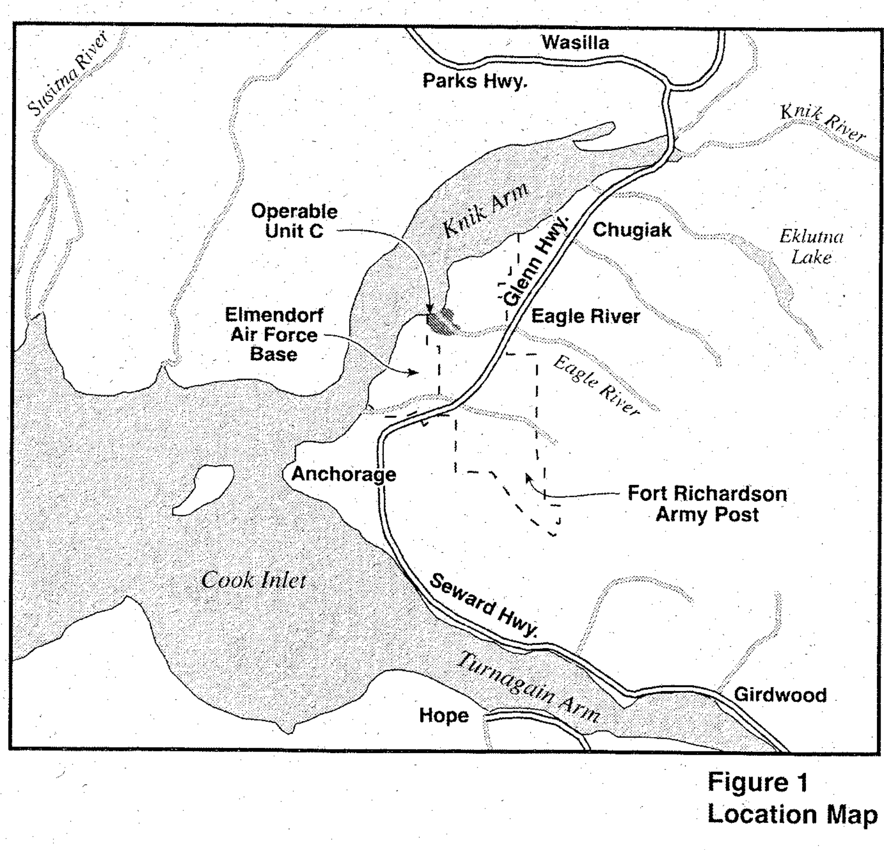


Figure 1
Location Map

In 1982, unusually high numbers of dead waterfowl were discovered in the wetlands of ERF. In 1989, firing at ERF was halted because of the potential that the ordnance was contaminating the environment and causing the waterfowl deaths. In 1990, after extensive investigation, it was discovered that ingestion of particles of white phosphorus, an element in a smoke munition, in the sediments at ERF was and continues to be the cause of waterfowl deaths at ERF. Particles from exploded white phosphorus shells would rain down and become buried in the wet soft muds. The situation was compounded when the ***high-explosive*** rounds fired into the same areas created craters and further scattered white phosphorus particles already present in the sediment. White phosphorus particles tend to be found in highest concentrations in areas with numerous craters.

As a result of the discoveries at ERF, the Army stopped using white phosphorus during training at wetland impact areas nationwide in 1990. In 1991, the ERF impact area was reopened, with restrictions to only conduct test firing during winter months when the ground surface is frozen. The munitions used in winter are high explosives and illumination rounds only; they do not contain white phosphorus.

The distribution of white phosphorus particles is not uniform throughout ERF sediments. The dispersion of the white phosphorus particles was affected by the nature of detonations in an area and whether munitions were detonated on land or over water. Some areas were used more frequently as targets and therefore received higher amounts of white phosphorus. In addition to differences in the distribution of white phosphorus, particle sizes vary greatly, ranging from 0.01 inch to 0.113 inch.

The white phosphorus particles will break down into harmless materials when exposed to air and warm temperatures. By contrast, when white phosphorus particles settle into pond and marsh sediments that remain saturated, they can last for an indefinite time. The processes that break down the white phosphorus particles—***sublimation*** and ***oxidation***—are explained in a box on page 10.

Waterfowl are exposed to white phosphorus at ERF when they sift through sediments to find food on the pond bottoms. Although low-level white phosphorus exposure has been identified in plants, macroinvertebrates, and fish, no significant effects of white phosphorus in these species have been documented.

Extent of Contamination

As shown in Figure 2, ERF was subdivided into nine areas for investigation purposes: A, B, C, C/D, D, Racine Island, Bread Truck, Coastal East, and Coastal West. To define areas most likely to contain white phosphorus, investigations were focused on (1) areas with the most craters, (2) areas preferred by waterfowl, and (3) areas where carcasses were observed. The sediments in the open ponds in these areas were extensively sampled for white phosphorus. Field studies tested the feasibility and effectiveness of using radio tracking to identify duck movement at ERF. (See explanation and illustration of this technology in the box on page 7.) The information obtained enabled researchers to

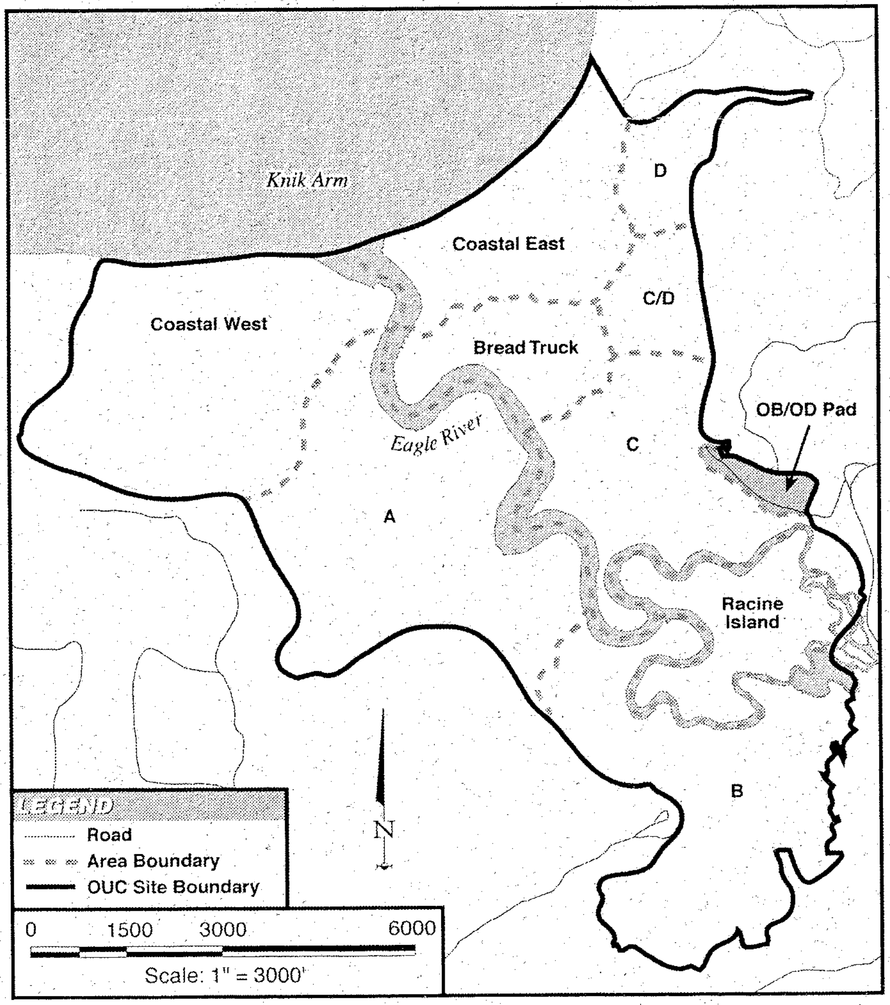
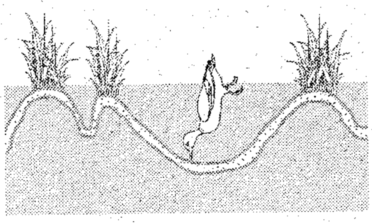


Figure 2
ERF Areas and OB/OD Pad



What Is a Dabbling Duck?

Two groups of ducks are found at ERF:

- **Surface feeding.** Also known as dabbling ducks, these ducks frequent quiet waters such as ponds. Examples are mallard, pintail, and teal.
- **Diving and fish eating.** These ducks typically are found on bays, rivers, and lakes. Examples are canvasback, eiders, and mergansers.

The habitat in ERF provides feeding conditions favored by surface-feeding ducks. One feeding activity of these ducks is called dabbling–repeatedly poking their bills into the muds of shallow ponds. When dabbling, the ducks eat plant seeds and invertebrates that they separate from pond sediments.

Particles of white phosphorus may be similar in size to the larvae and seeds. Ducks that consume white phosphorus particles are believed to confuse them with these sources of food. The white phosphorus affects nervous systems of the ducks. The affected ducks first become sluggish, then begin to vomit, have trouble moving, and convulse. They generally die within 9 hours after consuming the white phosphorus particles.

...entify areas believed to present the highe... risk of white phosphorus exposure to waterfowl.

Sampling results showed that the concentrations of white phosphorus detected were highest in Area C, Bread Truck, and Racine Island. The average depth of white phosphorus is generally within the top 8 inches of sediment, but it has been found as deep as 24 inches. Data collected at all areas of ERF are summarized in Table 1 on page 6. The highest concentration of white phosphorus was found on Racine Island.

In Areas A and C/D, only small amounts of white phosphorus were found. However, bird use and deaths in Area A are high. No white phosphorus was detected in Areas B and D. White phosphorus has not been detected in the water of the gullies or Eagle River. Very limited white phosphorus contamination has been detected in the gully sediments. The movement of white phosphorus through Eagle River to Knik Arm was found to be minimal.

The most significant areas of concern for exposure to white phosphorus are the sediments of ponds and some marshes, for which all of the following conditions apply:

1. White phosphorus presence has been confirmed and/or the number of craters (density) is moderate to high.
2. Moderate to high use by ducks and/or swans has been observed.
3. High numbers of waterfowl deaths have been observed.

The ponds where these conditions exist are the areas believed to present the highest risk of white phosphorus exposure to waterfowl. They have been labeled ***hot ponds***. Twenty-two hot ponds were identified, covering 57 acres in Areas A, C, C/D, Racine Island, and Bread Truck.

ERF HOT PONDS

The 22 hot ponds identified were divided into six geographical pond groups based on physical site characteristics: (1) Northern A (7 ponds); (2) Pond 290 (1 pond); (3) Ponds 183 and 146 (2 ponds); (4) Northern C and C/D ponds (8 ponds); (5) Racine Island (3 ponds); and (6) Bread Truck (1 pond). The characteristics of these pond groups are discussed below. Figure 3 provides an illustration of the pond group locations.

- **Northern A Pond Group**. Seven ponds in Area A comprise this group. The 14.3-acre area has uneven topography and a medium to high number of craters. The ponds are believed to be interconnected by a small to medium-sized area of surrounding marsh. Thirteen percent of samples collected in Area A contained white phosphorus at elevated concentrations. In 1996 birds being tracked spent more than 60 percent of their time in Area A. In addition, 23 percent of the dead ducks found at ERF in 1996 were found in Area A.
- **Pond 290.** Pond 290 is in Area A and is 2.2 acres in size. This pond does not appear to be connected to other ponds in the area and, therefore, is addressed separately. White phosphorus contamination was detected in the north end of this pond. In 1997 numerous dead ducks were found in Pond 290.
- **Ponds 183 and 146.** Ponds 183 and 146 are in Area C. Pond 183 is 7.2 acres in size, and Pond 146 is 13.6 acres in size. These ponds have a high number of craters. Pond 183 is connected to Pond 146. In 1996, birds that were tracked by radio spent 10 percent of their time in Area C. Thirty-five percent of the dead ducks found at ERF in 1996 were found in Area C. More than 50 percent of the samples collected in Area C contained white phosphorus, and many of these samples had elevated concentrations.
- **Northern C and C/D Ponds.** Eight ponds totaling 8.9 acres comprise the Northern C and C/D pond group. This pond group has a medium to high number of craters. The ponds are believed to be interconnected to a large area

of permanent ponds and marsh... which provide constant sources of water ... or *recharge.* Ten percent of the samples collected in Area C/D had detectable concentrations of white phosphorus. In 1996, birds being tracked spent 8 percent of their time in Area C/D, and 16 percent of the dead ducks among those being tracked were found in Area C/D.

Table 2 on page 6 identifies the 18 ponds described above and provides information on duck use and deaths in these areas.

The following hot ponds have undergone some treatment during the investigation and treatability study phase at ERF.

- **Racine Island Ponds.** The Racine Island ponds include Ponds 285, 293, and 297, which together total about 2.5 acres in size. Pond 285 is 1 acre, and Ponds 293 and 297 together are 1.5 acres. These ponds contain high numbers of craters. Elevated white phosphorus concentrations, including some of the highest concentrations of all samples collected at ERF, were detected in 73 percent of samples collected in these ponds. In 1996, 16 percent of the dead ducks found in ERF were found in the Racine Island ponds.
- **Bread Truck Pond.** Pond 109 is about 8.2 acres in size and contains a high number of craters. Elevated white phosphorus contamination was detected in 45 percent of samples collected in this pond. In 1996, 5 percent of the dead ducks found at ERF were found at this pond.

Treatability Studies

To identify feasible ways to treat contamination at ERF, numerous methods were examined. The following list notes treatment methods that were tested at ERF and

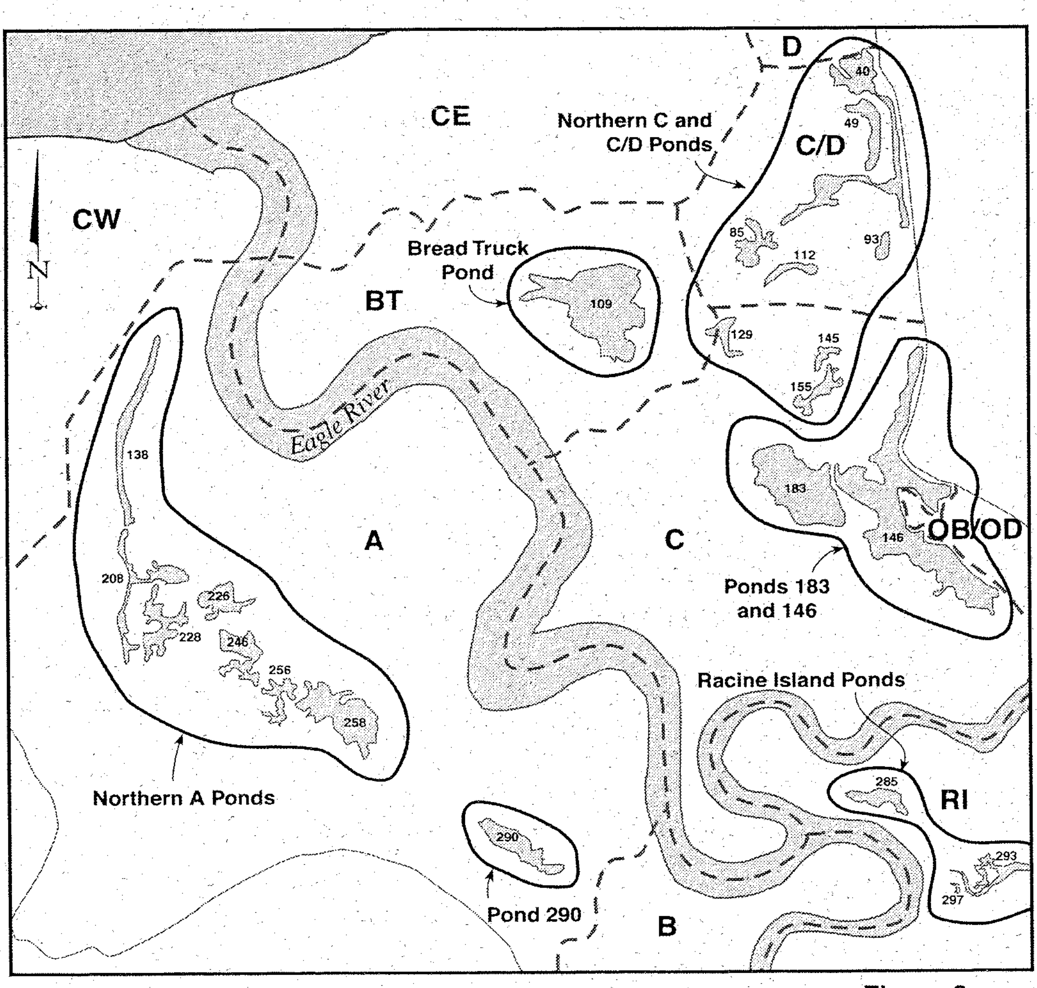


Figure 3
Pond Groups

Related Reports

Numerous reports have been prepared to document studies of OU-C. The following reports and work plans are available at the information repositories. Addresses of the information repositories are provided on the last page of this Proposed Plan.

OUC Final Feasibility Study Report, September 1997.

OUC Final Remedial Investigation Report, May 1997.

OUC Final Remedial Investigation/Feasibility Study Management Plan, April 1996.

OUC OB/OD Pad Site Investigation Work Plan, 1996.

ERF Final 1995 Work Plan, June 1995.

ERF Comprehensive Evaluation Report, July 1994.

deemed to be feasible or unfeasible for eliminating white phosphorus or preventing waterfowl from coming into contact with white phosphorus.

Unfeasible Methods

- Dredging–removal and drying of sediments that contain white phosphorus from permanently flooded areas. This technology was not retained because it was only moderately effective, altered duck habitat, and cost as much as 10 times more than other technologies.
- Geosynthetics–use of textile material as liners for the bottoms of ponds. The material acts as a physical barrier. This technology was not retained because a large-scale implementation method has not been developed. In addition, the use of geosynthetics altered duck habitat and installation of the material presented high risks to human safety.

Table 1
Summary of 1996 Data

Area	Number of Sediment Samples Collected	Number of WP Detections	1996 Duck Use (%)	1996 Duck Death (%)	Number of Craters
A	195	26	62	23	medium to high
B	43	0	11	5	low
C	520	267	10	35	high
C/D	42	4	8	16	medium to high
D	36	0	<1	0	low
Bread Truck	85	38	<1	5	high
Racine Island	62	45	2	16	low
Coastal East	30	1	1	0	low to medium
Coastal West	6	0	3	0	low
Total	1,019	381			

Note:
1996 duck use and deaths are based on information from radio-collared birds.

Table 2
Identification of ERF Areas, Pond Groups, and Ponds Requiring Cleanup

Hot Pond Group	Size (acres)	ERF Area	1996 Duck Use (%)	1996 Duck Death (%)	Number of Craters
Northern A: *Pond Numbers 138, 208, 226, 228, 246, 256, 258*	14.3	A	62	23	medium to high
Pond 290	2.2				
Ponds 183 and 146	20.8	C	10	35	high
Northern C and C/D: *Pond Numbers 129, 145, 155, 40, 49, 85, 93, 112*	8.9	C/D	8	16	medium to high

Note: 1996 duck use and death percentages are based on birds that were radio collared in 1996. Percentages do not add up to 100 percent because areas with low percentages of deaths were not selected for cleanup.

- Methyl anthranilate–applicatio.. of this bird repellent. Methyl anthran..e settles to the bottom of ponds and deters waterfowl from feeding. This technology was not retained because its long-term effectiveness was marginal, and it was very costly.

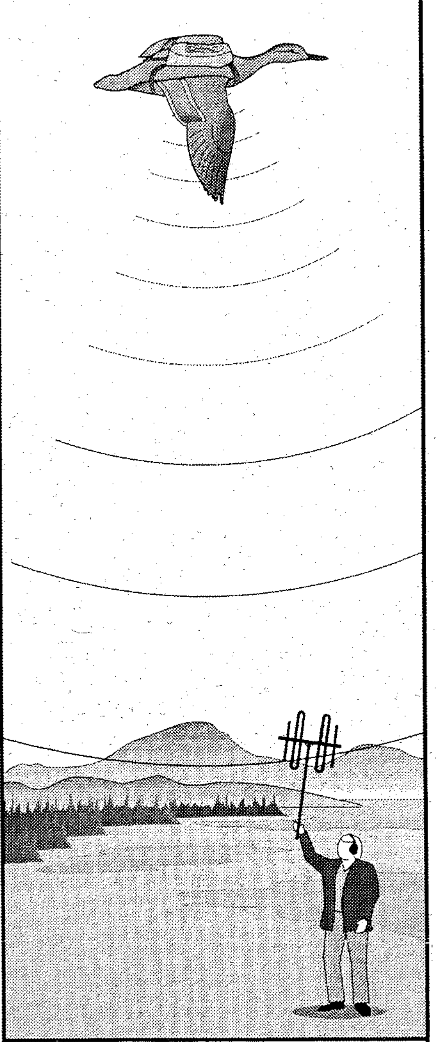
Feasible Methods

- Capping and filling–application of a material to act as a physical barrier to the white phosphorus in the sediments of pond bottoms. A composite material of gravel and clay that expands in water to form an impenetrable blanket over contaminated areas was tested. This technology was retained and incorporated into Alternatives 3, 4, and 5.
- ***Hazing***–use of visible objects and sounds to deter waterfowl from use of an area, thereby preventing exposure to white phosphorus. Hazing was conducted with propane exploders, pyrotechnics, scarecrows, hovercrafts, flagging, balloons, and other visual, acoustic, and behavioral devices designed to frighten birds. This technology was retained as an interim response action, until the final remedy is in place. It has been incorporated into Alternatives 2, 3, 4, and 5. (Hazing also occurs unintentionally when human activity and equipment operations deter birds.)
- Pond draining by ***breaching***–use of explosives to create a channel from a pond containing white phosphorus, which allows the water to drain into a gully or Eagle River. The draining activity permits the sediments of pond bottoms to dry. This technology was found to be successful in discouraging birds from feeding in breached ponds. Draining by breaching was retained and incorporated into Alternative 4.
- Pond draining by pumping–use of pumping systems to draw water from ponds containing white phosphorus. The draining activity permits the sediments of pond bottoms to dry. This technology was found to be successful in removing white phosphorus. Draining by pumping was retained and incorporated into Alternatives 3 and 4.

Treatability studies were implemented at four heavily contaminated ponds. Before treatment, the ponds in this group were frequently used by waterfowl. Sampling at these ponds consistently detected significant amounts of white phosphorus. In addition, high percentages of deaths were observed at these ponds. The four ponds where treatability studies were conducted are described below.

- At the Racine Island Area, capping and filling technology was tested at Pond 285 in 1995. This pond was filled with a gravel-clay mixture that prevented ducks from feeding in the contaminated sediment. The mixture also supported the growth of vegetation.
- At the Bread Truck Area, pond draining by breaching was tested at Pond 109 in 1996. Pond 109 was heavily contaminated with white phosphorus. The draining technology removed the duck feeding habitat at Pond 109, which resulted in less duck use.
- Ponds 293 and 297 in the Racine Island Area, also were drained by breaching in 1997. (Draining of Pond 297 will continue in 1998 until completed.) These ponds were highly contaminated. Draining by breaching has discouraged waterfowl use. The treatability study was conducted as a time-critical removal action because the breaching needed to be completed before the ground melted in spring to protect the people performing the work from explosive hazards.

To ensure success of these technologies at Ponds 285, 109, 293, and 297, monitoring of waterfowl deaths and sediment sampling would continue to be conducted regardless of the alternative selected by the Army. The ponds are considered to be high priority until monitoring results indicate that they have been cleaned up.



Note: The backpack and the duck are oversized for illustration purposes.

Radio Tracking Obtains Important Data

One technology used to gather information at ERF is radio tracking of birds. It enables researchers to study the activities of ducks carrying transmitters that send radio signals.

The birds are caught and fitted with identification leg bands and tiny backpack transmitters. To identify bird locations, researchers use directional antennas at fixed and mobile stations. By receiving radio signals from the ducks with transmitters, the researchers are able to observe increased or decreased use of specific areas, movement patterns, and deaths.

SUMMARY OF ECOLOGICAL RISKS AT ERF

An ERA was prepared to address the current and future impacts and potential risks posed by white phosphorus contamination to the plants and animals of ERF in the absence of cleanup action. Potential risks to individuals of a species identified during the ERA were then evaluated within a larger context to determine their ecological significance.

Ducks and swans that feed on the bottom of ponded areas are the primary receptors for white phosphorus from contaminated sediments in ERF. The waterfowl eat white phosphorus particles, which are about the same size and shape as typical waterfowl food such as seeds and ***invertebrates***. Almost 97 percent of the recorded bird deaths from white phosphorus are associated with three duck species: northern pintail, green-winged teal, and mallard. These species also are among the most prevalent species in ERF, and their numbers increase during the spring and fall migrations.

During peak migration periods, as many as 2,300 ducks have been observed in ERF within a 1-hour period. It is estimated that about 5,000 ducks use ERF during their fall migration and that more than 80 percent of these ducks, or about 4,000, rest and feed in white phosphorus-contaminated areas. Radio tracking studies of birds were conducted in 1996 when no intentional hazing was being conducted. Those results showed deaths of 35 percent (about 1,000) during the fall, a value probably more representative of current risk at ERF without cleanup.

Studies of plants, macroinvertebrates, fish, shorebirds, and predators have shown detectable levels of white phosphorus, in a few individuals, but deaths in these species account for a minor percentage of overall deaths in ERF. The following conclusions were reached about ecological effects on plant and animal groups:

- *Water birds–ducks, swans, and shorebirds.* Death has been related to exposure while feeding in contaminated sediments.
- *Scavengers and predators–coyotes, fox, mink, and bald eagles.* As indicated by studies of bald eagles, no effect from direct exposure to white phosphorus was observed in the field. Studies concluded that no mammals were affected. Deaths from feeding on poisoned ducks, an indirect effect, should disappear as the deaths of water birds decrease.
- *Other mammals, birds, and amphibians–moose, beaver, muskrat, cranes, grouse, wood frogs, and others.* No significant effects were observed.
- *Plants in ERF and Knik Arm.* Aquatic plants growing in contaminated sediments contained only low levels of white phosphorus, indicating that they do not create a risk through food-chain contamination.
- *Invertebrates and fish.* No significant accumulations of white phosphorus were found during sampling. No evidence of adverse effects on invertebrates in ERF were identified.
- *Fish and wildlife in Knik Arm.* Adverse effects in Knik Arm are considered to be insignificant because only minimal transport of white phosphorus particles from ERF has been identified.

In addition to the lethal effects of white phosphorus, laboratory studies did record other effects of exposure to white phosphorus that did not lead to death–called chronic effects. If acute effects are reduced or eliminated by preventing exposure of ducks to white phosphorus, the chronic effects will be addressed.

SUMMARY OF HUMAN HEALTH RISKS AT ERF

A ***baseline*** Human Health Risk Assessment (***HHRA***) was prepared to evaluate estimated human health effects that could result if contamination at ERF is not cleaned up. The HHRA was based on the location and amount of contamination, toxicity of each contaminant, current and potential future use of the site, and pathways by which people could be exposed to contaminants.

At both ERF and OB/OD Pad, the presence of unexploded ordnance does pose a danger of physical harm to authorized and unauthorized personnel. As noted earlier, an estimated 10,000 pieces of unexploded ordnance exist at ERF. The Army controls access. To restrict entry, the Army maintains a locked gate at the entrance to OU-C, posts signs next to Eagle River for boaters, and regulates admission to OU-C through monitoring activities of the ***Range Control***.

To minimize risks to workers from unexploded ordnance, all personnel who work in ERF are required to participate in 40 hours of health and safety training and attend daily site safety meetings. They also receive briefings from the staff of Range Control and the 176th Explosive Ordnance Disposal (***EOD***) Detachment. In addition, all walking pathways that are needed for personnel to conduct specific monitoring or cleanup activities are visually or electronically cleared by unexploded ordnance specialists before entry by personnel. The program to clear areas of unexploded ordnance has been implemented at ERF since 1996.

Potential risks were evaluated for onsite workers and trespassers to the site. The HHRA identified ways that people working or living on or near the site could be exposed: touching and ingesting sediment, inhaling vapors and dust released from the sediment, and using groundwater for drinking water.

Human exposure at ERF is limited because the Army will continue to control access to OU-C. There are no physical barriers that totally prevent access to ERF. The scenarios for human-health risk included onsite recreation by trespassers as well as offsite hunting. Previous assessments had found little risk to human health from eating contaminated duck. For example, exposure calculations indicate that a human lethal dose would require consumption of more than 3,000 teals. The probability of an offsite hunter harvesting a contaminated bird from ERF was estimated to be very low.

PURPOSE AND SCOPE OF CLEANUP ACTION

The primary cleanup objective for ERF is to reduce the number of duck deaths attributable to white phosphorus. The Army, EPA, and ADEC have set a short-term (5-year) goal of reducing the death rate documented in 1996 by 50 percent. This death rate was established to be 35 percent based on the deaths of radio-collared birds in 1996. The results of radio tracking and aerial surveys suggest that about 1,000 birds died at ERF in 1996.

The long-term (20-year) goal is to reduce the death rate attributed to white phosphorus poisoning to no more than 1 percent of the total annual ERF duck population. Currently the duck population is approximately 5,000; therefore, the allowable number of duck deaths from white phosphorus would be 50. This number could be adjusted based on population studies to be conducted during the monitoring program. The long-term goal of 1 percent of the total annual duck population is both measurable and attainable. It also addresses relevant provisions of the Migratory Bird Treaty Act of 1972. A review will be conducted in 5 years to determine whether the 20-year goal is achievable with the cleanup technologies selected.

The primary cleanup objective will be achieved by reducing the area of white phosphorus-contaminated media and reducing the white phosphorus ***exposure pathway***. Reducing the exposure pathway will eliminate the availability of white phosphorus to ducks, which in turn will reduce duck deaths.

SUMMARY OF ALTERNATIVES

Many technologies were considered for use in reducing exposure to white phosphorus and its impacts at ERF. The most promising technologies were selected based on their effectiveness, implementability, and relative cost. Another consideration was the dangers posed to onsite workers from UXO. The selected technologies were combined to create alternatives. The proposed alternatives and the technologies used are discussed below.

GLOSSARY

continued from page 1

cleanup action
The actual construction or implementation of the plan chose to clean up a contaminated site.

crustacean
Mostly aquatic invertebrates with external skeletons and antennas. Examples are shrimp, lobster, crabs, and wood lice.

dabbling
The action of waterfowl in which they poke with their bills into the muds and sediment of shallow pond bottoms in search of food.

EOD
Explosive Ordnance Disposal. The operation of disposing of unwanted and expired munitions.

EPA
U.S. Environmental Protection Agency.

ERA
Ecological Risk Assessment. An analysis used to determine the potential risks to plants and wildlife from contaminants at a source area.

ERF
Eagle River Flats. One of two sites at OU-C on Fort Richardson.

exposure pathway
The means of contact by which ar animal or human encounters a contaminant.

FFA
Federal Facility Agreement. A legal document that details the involvement and interaction among the Army, EPA, and ADEC for cleanup activities at Fort Richardson.

FS
Feasibility Study. Analysis of the practicability of proposed alternatives for cleanup at a National Priorities List site. The FS recommends selection of cost-effective alternatives.

continued on page 11

What Are Sublimation and Oxidation?

Sublimation and oxidation of white phosphorus play important roles at ERF because they are naturally occurring and result in white phosphorus removal.

Sublimation is transformation of solids directly to the vapor state without appearing in the intermediate liquid phase. The transformation also may be from vapor to solid under appropriate temperature conditions.

One example of sublimation from solid to vapor phase is the disappearance of snow and ice without melting while the temperature is below freezing. Another example is the disappearance of dry ice. Carbon dioxide in a solid form, dry ice becomes a gas as heat is absorbed. At ERF, sublimation occurs during the transformation of solid white phosphorus particles to a gas that dissipates.

Oxidation is the increase in oxygen content of a compound. It results in the transformation of white phosphorus to other compounds.

At ERF, white phosphorus is removed from sediment following the sublimation and oxidation processes. Sublimation of white phosphorus from a solid to a gas results when white phosphorus in sediment is exposed to warm air and dry conditions. The white phosphorus gas combines with oxygen and is transformed (oxidized) into phosphates and phosphate salts.

For both sublimation and oxidation to occur at ERF, the white phosphorus must be exposed to air and must not be covered by water. It is estimated that sublimation and oxidation of white phosphorus particles (typically 1 millimeter in diameter) would take approximately two to five Anchorage summer seasons. During that time, the sediment could not be wet.

Activities in the Entire ERF

With the exception of Alternative 1, the following monitoring activities would be conducted throughout all of ERF: radio tracking of duck movement and deaths; aerial surveys of bird numbers and patterns of areas used; and aerial photography of physical changes to vegetation. In addition, hazing would be used in ERF to deter waterfowl during the critical migration periods. Hazing would be conducted when monitoring activities are not being performed so that results of the monitoring would be representative of natural waterfowl movements.

Common Elements of Alternatives

All alternatives include use of institutional controls to control access. The Army restricts entry by maintaining a locked gate at the entrance to OU-C, posting signs next to Eagle River for boaters, and regulating admission to OU-C through the Range Control.

Alternative 1: No Action

A no-action alternative reflects current conditions without any cleanup effort. This alternative is used for comparison to each of the other alternatives and does not include monitoring.

Published studies suggest several natural processes occurring at ERF may lead to some natural restoration over time. These processes include white phosphorus sublimation and oxidation (described in a box to the left), gully advancement that leads to natural pond draining, and the covering of white phosphorus with sediment, called ***sedimentation***. Because no monitoring would occur under Alternative 1, the effects of the natural processes on the white phosphorus in pond sediments and its toxic effects on waterfowl that use ERF would not be known. No costs would be associated with this alternative.

Alternative 2: Detailed Monitoring

This alternative expands the monitoring activities in the entire ERF described above. Restoration under the alternative would be achieved through only natural processes. It also adds the activity of monitoring the ERF areas to determine whether natural restoration is occurring and at what rate. The chief additional components of the monitoring program are conducting pond surveys to determine when and where ponds may naturally drain, performing baseline white phosphorus sampling, and taking sedimentation measurements. This monitoring would help document whether previously unidentified areas with white phosphorus need to be cleaned up. Detailed monitoring would be conducted for 20 years or until it is consistently demonstrated that remedial goals are achieved. These activities would be performed at the Bread Truck and Racine Island areas as well as other hot pond areas. The costs for all of these activities are included in the total costs for Alternatives 2 through 5.

Alternative 3: Pumping with Capping and Filling

The objective of this alternative is to temporarily drain ponds to allow the pond sediments to dry. This alternative consists of draining ponds by pumping after flooding cycles and/or rain. After several drying periods and verification sampling (approximately 5 years), capping and filling would be performed in areas where white phosphorus remains.

The pump systems are expected to operate for 5 consecutive years, based largely on tide predictions. Tidal fluctuations affect the ability of the ponds to dry. This alternative includes white phosphorus verification sampling to determine areas that require further cleanup. During the summer of 1997, baseline (before pumping) and verification (after pumping) samplings showed an 80 percent decline in white phosphorus concentrations in the top 3.5 inches of sediments. Alternative 3 also includes the ERF monitoring and hazing activities of Alternative 2. White phosphorus sampling is expected to continue annually for about 5 years.

After 5 years of pumping and monitoring, those pond systems where white phosphorus exposure remains a concern would be capped and filled. A composite material would be applied to areas of the pond systems that do not dry and still contain white phosphorus. The cap-and-fill material is a manufactured gravel and clay mixture called AquaBlok™. This material expands in water, sealing spaces in gravel and creating a barrier to permeability. This material also supports vegetation growth. It provides a barrier between the dabbling waterfowl and the sediment contaminated with white phosphorus.

During treatability studies, the cap-and-fill material was applied from a helicopter. The application was similar to spreading fertilizer. Areas where capping and filling would be performed would be inspected regularly for integrity and thickness. Following cleanup, restoration of the pond systems would occur naturally through precipitation and tidal flooding. Figures 5 and 6 on page 12 show helicopter and truck applications of cap-and-fill material.

Alternative 4: Breaching and Pumping with Capping and Filling

The objective of this alternative is to breach ponds allowing water to flow out and the sediments to dry. Breaching would be done by using explosive charges. Breaching results in the permanent removal of duck habitat.

Alternative 4 includes the use of explosives to create a ditch from a hot pond (or pond system) to the Eagle River or a nearby gully or creek that ultimately would permit the water to drain into Cook Inlet. Areas that do not drain through the breached gully then would be drained with the pump system that is described in Alternative 3. For example, the elevations of some pond bottoms may be lower than the breached gully elevation, and a pump would be needed to fully drain water from the ponds and dry the sediments. Finally, areas that do not dry sufficiently would be capped and filled as described above.

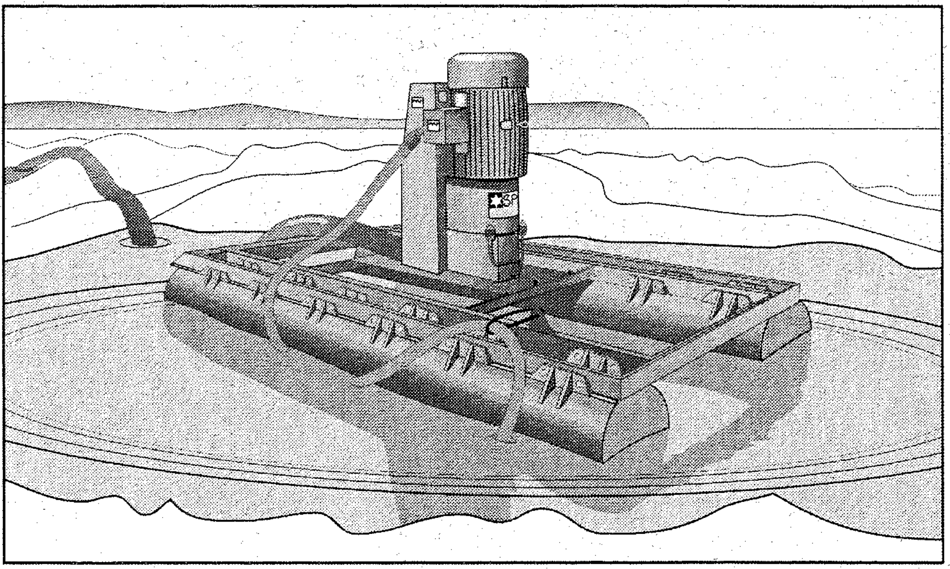


Figure 4
Floating Pump System

GLOSSARY

continued from page 9

hazing
Use of visible objects and sounds to intentionally deter waterfowl from an area, thereby preventing exposure to white phosphorus. Hazing has been performed using propane exploders, hovercrafts, pyrotechnics, scarecrows, flagging, balloons, and other visual, acoustic, and behavioral devices designed to frighten birds. Hazing also occurs unintentionally as a result of human activity and the operation of equipment.

HHRA
Human Health Risk Assessment. An analysis used to evaluate the estimated human health effects that could result if no cleanup action is performed.

high explosive
An explosive that generates gas with extreme rapidity, has a shattering effect, and disperses metal fragments. (High-explosive rounds do not contain white phosphorus.)

hot pond
A pond believed to present the highest risk of exposure to white phosphorus.

institutional control
Land use restriction imposed to decrease human contact with contamination. Examples include fences, gates, and warning signs.

invertebrate
An animal lacking a backbone and internal skeleton. Examples are insects of all sizes.

macroinvertebrate
A larger member of the invertebrates. At ERF, representative animals are insects, snails, and crustaceans.

NPL
National Priorities List. A list maintained by the EPA of the most serious hazardous waste sites identified for possible long-term cleanup response. The list is based primarily on criteria in the Hazard Ranking System. EPA is required to update the list at least once a year.

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Use of explosives would occur in March, when ERF is frozen and access is easier. It is expected that explosives would be strategically placed to create a 20-foot-wide, 6-foot-deep ditch. Pumping operations would be similar to those for Alternative 3, but would require smaller pumps because most of the water is expected to be drained through the breached gully system. The drying season also would be the same as described under Alternative 3.

Operation of Alternative 4 is estimated to require 5 consecutive years based on tide predictions. This alternative also would include monitoring, white phosphorus sampling, and hazing activities of Alternative 2. Selection of areas for capping and filling is expected to occur after 5 years of sampling. Application of the cap-and-fill material would be similar to that for Alternative 3 and would require the same follow-up inspection.

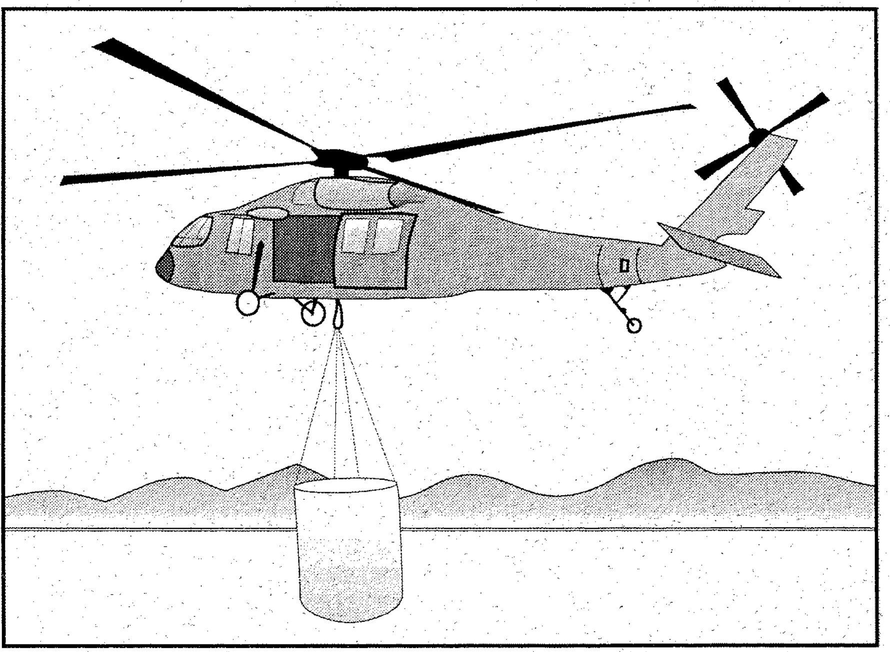

Figure 5
Blackhawk Helicopter Application of Cap-and-Fill Material

Breaching considerations would include preference of gullies that naturally progress toward pond systems, the shortest possible drainage route, and the shallowest possible ditch. These criteria would minimize negative effects on existing habitat.

Alternative 5: Capping and Filling

The objective of this alternative is to cap and fill portions of hot ponds where the presence of white phosphorus has been identified. As mentioned under the discussion of Alternative 3, capping and filling prevents white phosphorus ingestion by ducks. Alternative 5 is particularly well suited for areas that cannot be drained or dried.

Implementation is expected to take 1 to 3 years. The cost of applying cap-and-fill material by helicopter is high. Truck application is about twice as fast as application by helicopter, and the equipment cost for trucks would be as much as one-tenth the cost for helicopter application. Therefore, where capping and filling is required over larger areas, the applications likely would be by vehicles on wheels or tracks during winter. The use of vehicles would require driving heavy equipment on the frozen ground to transport the material. Transport to and spreading at the ponds would be done when ice thickness is sufficient to support the weight without damage to the ground surface. At some ponds, the cap-and-fill material could be spread in a slurry in the spring.

Alternative 5 includes the monitoring activities of Alternative 2, as well as baseline sampling for white phosphorus and inspection of the integrity of areas where capping and filling is performed.

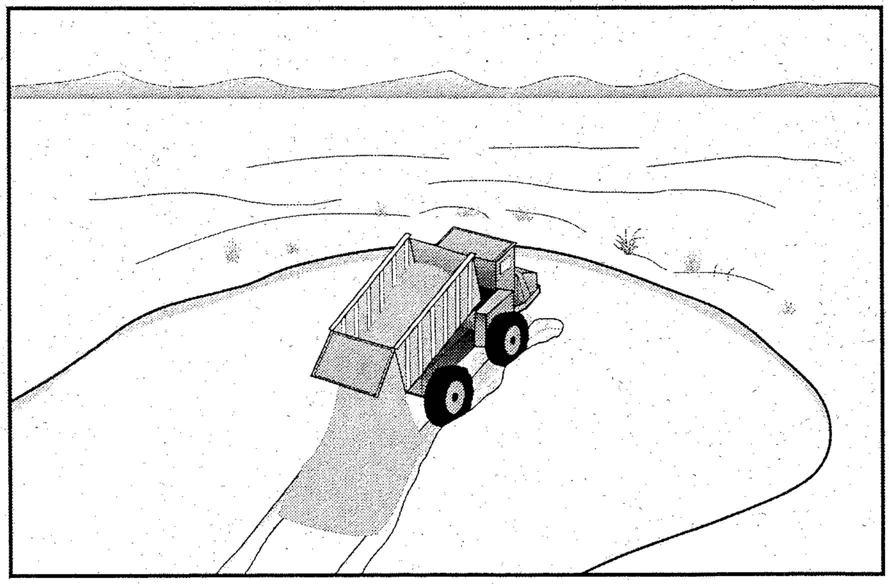

Figure 6
Winter Truck Application of Cap-and-Fill Material

EVALUATION OF ALTERNATIVES

Alternatives were compared based on nine criteria established by CERCLA. These criteria are presented in Table 3. The criterion of community acceptance will not be evaluated until after the public comments are received.

Overall Protection of Human Health and the Environment

Alternatives 1 and 2 are not protective of the environment and therefore will not be further evaluated in this Proposed Plan. Alternatives 3 and 4 would provide similar levels of protection to the environment by blocking the exposure pathway and actively treating the white phosphorus contamination. Although Alternative 4 would treat and remove the white phosphorus, it also would cause permanent, large-scale changes to pond habitats. Alternative 5 would provide protection by blocking the exposure pathway; however, it does not treat or remove the white phosphorus. Alternative 5 also would result in changes to habitat because the elevations of pond bottoms would be raised.

Compliance with ARARs

The following laws are significant applicable or relevant and appropriate requirements (***ARARs***) that may apply to ERF:

- Section 404 of the Clean Water Act, which coincides with Alaska water quality standards, for protection of wetlands
- Provisions in the Migratory Bird Treaty Act of 1972 that prohibit unregulated "taking" of birds, including poisoning at waste sites

Alternatives 3, 4, and 5 are expected to meet all identified ARARs after long-term cleanup goals are achieved.

The monitoring program would measure how and where waterfowl continue to be exposed to white phosphorus. Monitoring results would be used to determine specific areas requiring cleanup and document that implementation of the preferred

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OB/OD
Open burning/open detonation. Activities that are standard practice for disposal of unused ordnance. The OB/OD Pad is one of two sites at OU-C on Fort Richardson.

ordnance
Military munitions and explosives. Includes artillery and mortar projectiles.

OU
Operable Unit. A unit in which source areas have been grouped together based on similarities of contaminant types, source locations, or anticipated cleanup actions.

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Table 3
Criteria for Evaluation of Alternatives

THRESHOLD CRITERIA: Must be met by all alternatives.

1. **Overall protection of human health and the environment.** How well does the alternative protect human health and the environment, both during and after construction?
2. **Compliance with requirements.** Does the alternative meet all applicable or relevant and appropriate state and federal laws?

BALANCING CRITERIA: Used to compare alternatives.

3. **Long-term effectiveness and permanence.** How well does the alternative protect human health and the environment after completion of cleanup? What, if any, risks will remain at the site?
4. **Reduction of toxicity, mobility, and volume through treatment.** Does the alternative effectively treat the contamination to significantly reduce the toxicity, mobility, and volume of the hazardous substances?
5. **Short-term effectiveness.** Are there potential adverse effects to either human health or the environment during construction or implementation of the alternative?
6. **Implementability.** Is the alternative both technically and administratively feasible? Has the technology been used successfully at similar areas?
7. **Cost.** What are the relative costs of the alternative?

MODIFYING CRITERIA: Evaluated as a result of public comments.

8. **State acceptance.** What are the state's comments or concerns about the alternatives considered and about the preferred alternative? Does the state support or oppose the preferred alternative?
9. **Community acceptance.** What are the community's comments or concerns about the alternatives considered and the preferred alternative? Does the community generally support or oppose the preferred alternative?

remedial alternative achieves remediation goals and meets the migratory bird protection ARAR.

Long-term Effectiveness and Permanence

Alternatives 3 and 4 would involve treatment and removal of the white phosphorus contamination and, therefore, would provide long-term effectiveness and permanence. ***Residual*** risk of future exposure to white phosphorus would remain in some areas because capping and filling would not treat and remove white phosphorus. Under Alternatives 3 and 4, cap-and-fill material would be applied to areas of pond bottoms that do not dry.

It is expected that draining ponds by pumping and breaching (Alternatives 3 and 4) would alter, and in some cases temporarily or permanently destroy, some wetlands at ERF. Alternative 4 would have the most destructive impact on wetlands, because it would permanently eliminate habitat. Under Alternative 3, impacts to the ERF wetlands habitat would be temporary. Under both Alternatives 3 and 4, the procedures for conducting activities that may disturb wetlands would be established and followed during the cleanup to minimize impacts. Monitoring would be conducted to determine impacts on wetlands that occur as a result of cleanup action.

Alternative 5 would not provide permanent removal of the white phosphorus, but it would block the exposure pathway. Residual risk would remain in the entire area of the pond that is covered under Alternative 5, because capping and filling does not actively treat and remove the white phosphorus in sediments.

Reduction of Toxicity, Mobility, and Volume Through Treatment

Alternatives 3 and 4 would treat the largest area of white phosphorus-contaminated sediment by reducing water level, drying pond sediment, and causing white phosphorus removal by sublimation and oxidation. Alternative 5 does not involve treatment to reduce toxicity and volume of white phosphorus-contaminated sediment, although it would prevent exposure by reducing the mobility of white phosphorus.

Short-term Effectiveness

It is estimated that the cleanup objective of reducing duck deaths by 50 percent in 5 years would be met by Alternatives 3 and 4. Cleanup levels would be achieved faster under Alternative 3, but exposure pathways would be removed slower. The slower removal of exposure would occur under Alternative 3 because bird habitat would still be available until all pond water is removed by pumps. Once the water is removed (1 to 2 weeks), the pond would remain dry and would only become wet again during heavy rains or high tides. Although the ***threshold elevation*** of breached ponds would be lowered to allow a large volume of water to initially drain to Eagle River, the ponds then would flood more frequently during lower tides. The frequent refilling of the pond system under Alternative 4 would not allow pond sediment to dry quickly.

The criteria of short-term effectiveness also would be met under Alternative 5, when capping and filling were completed. Application of cap-and-fill material throughout ERF is estimated to take 2 to 3 weeks.

Alternatives 4 and 5 may result in permanent changes and Alternative 3 would result in temporary changes to pond bottoms, habitat, and bird use. The limited application of cap and fill material in Alternative 3 is not expected to result in large-scale permanent habitat changes. Short distances of vegetation or uneven topography may restrict water movement within and between ponds. To enhance draining of the ponds, Alternative 3 also may include limited use of explosives to clear small drainage channels that radiate from the pump location. The effects from use of explosives to create the small drainage channels is expected to be very short term.

All alternatives would pose some short-term potential risk to onsite workers during monitoring activities and during setup, operation and maintenance, and removal of monitoring and cleanup equipment. These potential risks could be minimized by engineering and institutional controls. The most significant risk to workers is from the existence of unexploded ordnance at ERF. To reduce this risk, all areas where workers would be exposed would be cleared of unexploded ordnance either visually or electronically. This activity as well as training and briefings are described in the "Summary of Human Health Risks at ERF" section of this Proposed Plan.

The community would not experience any significant effects from the alternatives. The explosions produced for pond breaching in Alternative 4 may affect the community through impacts such as noise and vibration. Use of explosives on clear weather days would reduce these impacts, and a community relations program would alert the public in advance of these activities.

Implementability

Alternatives 3 and 4 would use readily available technologies and would be feasible to construct and operate. Alternative 5, which includes a containment technology only, also would use readily available materials. Minor technical difficulties are anticipated during application of cap-and-fill material because of the presence of craters throughout ERF. Visual inspections of caps to assess their integrity would be performed under Alternatives 3 to 5. Plans for testing the feasibility of large-scale capping and filling are currently being developed.

Alternatives 3 through 5 involve unexploded ordnance hazards to onsite field personnel. Steps previously described, including having work areas and pathways cleared by unexploded ordnance specialists, would be taken to minimize risk.

Costs

The estimated costs for each alternative evaluated are provided in Table 4 on page 16. The estimates are based on the information available at the time the alternatives were developed. The costs projected over 20 years are estimated for purposes of comparison and are considered to be accurate to within -30 percent to +50 percent. Costs are described using the present worth methodology with a discount rate equal to 5 percent. Capital cost includes the purchase price of the pump, monitoring equipment, cap-and-fill material, and explosives. It also covers the labor and transportation associated with initial setup of equipment.

Annual operation and maintenance cost includes startup and dismantling activities, routine maintenance, refueling, pump system setup and removal, and annual monitoring. Also included are the activities conducted in the entire ERF that are described on page 10 and sampling of sediments for white phosphorus. In addition, annual operation and maintenance cost covers labor, transportation, and clearance of work areas by unexploded ordnance specialists associated with these activities.

Under Alternative 4, costs do not include restoring breached ponds to reestablish habitat.

State Acceptance

The ADEC has been involved with the development of the cleanup alternatives for the pond groups. Concurrence of the ADEC for the preferred alternative will be given after evaluation of public comments.

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oxidation
The transformation of a compound through an increase in oxygen content. At ERF, when the white phosphorus particles that have been buried in sediment are exposed to warm air and dry conditions, white phosphorus combines with oxygen and is transformed to phosphates and phosphate salts.

Range Control
A division of the U.S. Army Alaska that maintains access and safety standards at all firing and training ranges on Fort Richardson. Range Control also monitors activities at landing zones and obstacle courses.

recharge
The process by which water is added to a ponded area either directly or indirectly from another area.

residual
Amount of a contaminant remaining in the environment after a natural process or technological action has taken place. (The concentrations of residual contaminants would be expected to be high in areas covered by capping and filling. Although exposure pathways would be blocked, contaminants still would be present.)

Responsiveness Summary
A compilation of oral and written public comments received during the public comment period and the responses to those comments. The Responsiveness Summary is included in the Record of Decision.

RI
Remedial Investigation. An in-depth study designed to gather data needed to determine the nature and extent of contamination at a CERCLA site; establish site cleanup criteria; identify preliminary cleanup alternatives; and support analyses of alternative remedies.

ROD
Record of Decision. Documentation of the selected remedy for a site and the rationale for its selection. This legally binding document is signed by the Army, ADEC, and EPA.

sedimentation
The accumulation of sediment. At ERF, one of the naturally occurring processes that blocks an exposure pathway to white phosphorus.

sublimation
Transformation of solids directly to the vapor state without passing through a liquid phase. At ERF, the transformation of solid white phosphorus particles to a gas.

threshold elevation
The lowest level along the perimeter of a pond that would permit water to flow in (flood) or out (drain).

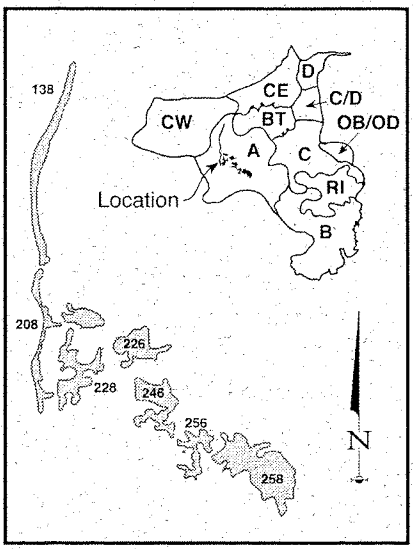
unexploded ordnance
Munitions that have not been detonated. About 10,000 pieces of unexploded ordnance are estimated to remain throughout ERF.

white phosphorus
The contaminant of concern at ERF in OU-C.

Community Acceptance

Community acceptance of the preferred alternative and other alternatives will be evaluated after the public comment period is conducted and all comments are considered.

RATIONALE FOR SELECTION OF THE PREFERRED ALTERNATIVE



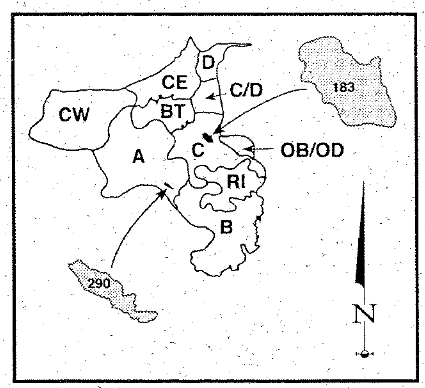
Northern A Pond Group

Alternative 3 is the preferred alternative for all of ERF. It was determined that for all hot ponds, attainment of cleanup objectives would best be accomplished by Alternative 3, pumping to drain ponds, followed by capping and filling for areas that do not dry sufficiently. Draining ponds and drying contaminated sediments to the maximum extent practicable before application of cap-and-fill material is preferred because it would produce a significant, and potentially total, reduction in risk. Through the results of pumping and the natural processes that would follow, residual risk would decrease because the source of contamination would be permanently removed. Capping and filling would break the exposure pathway to the white phosphorus that may remain in sediment. Alternative 3 would have minimal short-term destructive impacts on the wetlands at ERF.

The rationale for selection of Alternative 3 is summarized below for each pond group.

Northern A Ponds–Pumping under Alternative 3 is expected to sufficiently drain the majority of these ponds to permit sediments to dry and to cause the white phosphorus to sublimate and oxidize. Very limited follow-up capping and filling is assumed to be necessary. A pumping treatability study currently planned for Area A in 1998 is expected to reduce the amount of future treatment needed in these ponds.

Pond 290–Pumping under Alternative 3 is expected to completely drain and dry sediments and cause the white phosphorus in Pond 290 to sublimate and oxidize. No capping and filling is anticipated.



Ponds 290 and 183

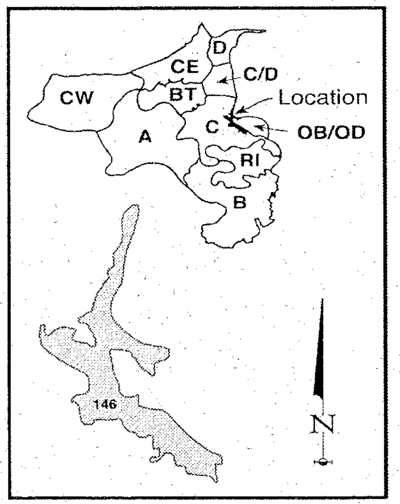
Pond 183–On the basis of treatability tests performed at Pond 183 in 1997, pumping under Alternative 3 is expected to completely drain and dry sediments and cause the white phosphorus to sublimate and oxidize. No follow-up capping and filling is anticipated.

Table 4
Cost Estimate for Cleanup Action Alternatives

Location	Capital Cost ($000)	Average Annual O&M[1] Present Worth ($000)	20 Year O&M Present Worth[2] ($000)	Total Cost–20 Year O&M[3] ($000)
Alternative 1–No Action	0	0	0	0
Alternative 2–Detailed Monitoring	150	286	5,700	5,850
Alternative 3–Pumping with Capping and Filling	325	282	5,634	5,959
Alternative 4–Breaching and Pumping with Capping and Filling	2,111	351	7,020	9,132
Alternative 5–Capping and Filling	4,390	243	4,850	9,210

Notes:
[1] O&M = Operation and maintenance
[2] Present worth means costs are expressed as U.S. dollars in 1998. The amount indicates monies needed in 1998 to complete the project over 20 years. The majority of these costs will be used to achieve the 5-year cleanup goal. A discount rate of 5 percent is used.
[3] Costs include ERF-wide long-term monitoring.

Pond 146–The dredging treatability study performed at this pond in 1996 removed some contaminated sediment. A pumping treatability study at this pond in 1998 is expected to further reduce white phosphorus in sediment. Sampling would be performed after the treatability study. If additional treatment is needed, a combination of pumping with capping and filling under Alternative 3 would be implemented. Pumping is expected to drain the majority of Pond 146 to dry sediments and cause the white phosphorus to sublimate and oxidize. It is assumed that capping and filling may be necessary for the portion of the pond bottom that does not sufficiently dry.

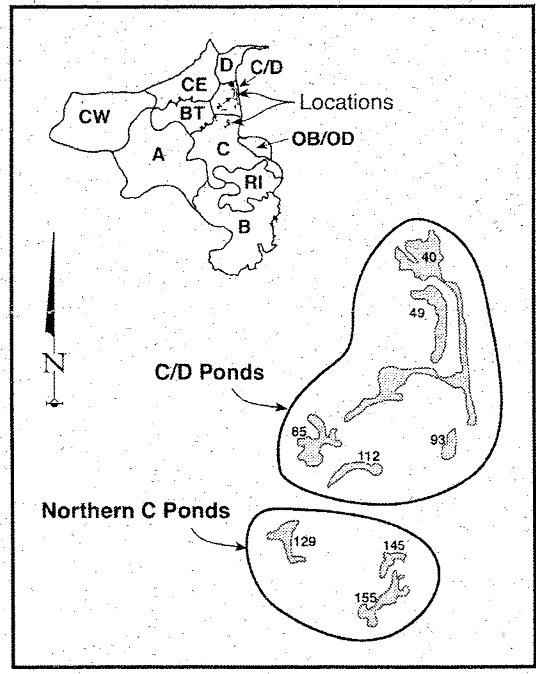


Pond 146

Northern C and C/D Ponds–This pond group has been divided into the following two portions based on physical properties, extent of white phosphorus contamination, and expected performance under each alternative: (1) the Northern C portion, which includes Ponds 129, 145, and 155, and (2) the C/D portion, which includes Ponds 40, 49, 85, 93, and 112.

Pumping is expected to drain and dry a majority of the Northern C pond bottoms. These ponds are separated from the larger C/D pond area by vegetation. It is assumed that capping and filling would be necessary for the portion of the pond bottoms that do not dry sufficiently. It is expected that Ponds 129, 145, and 155 in the Northern C portion of this pond group may be successfully drained without affecting Area D ponds.

The C/D ponds would be sampled to determine whether areas with white phosphorus exist. To date, high levels of white phosphorus have not been found in the C/D ponds. In addition, draining these ponds may cause negative impacts to adjacent Area D ponds because ponds in the two areas are connected. Area D is a very important waterfowl use area, and negative impacts to that area should be avoided.



Northern C and C/D Pond Group

Summary

Alternative 3 is the preferred alternative because it would meet cleanup objectives and would have the least impact on the natural wetlands at ERF.

The preferred alternative for OU-C is subject to public comment and participation. No alternative will be selected until the public comment period ends and all comments are reviewed and addressed.

PUBLIC INVOLVEMENT

A public meeting is scheduled from 7:00 p.m. to 8:30 p.m. on February 12, 1998, at the Russian Jack Springs Chalet in Anchorage. Representatives from the Army, ADEC, and EPA will discuss the Proposed Plan and answer questions.

The public meeting also will provide an opportunity for interested parties to submit written or verbal comments on this Proposed Plan. A 30-day comment period is scheduled from February 5 to March 6, 1998. (See the box on page 2 for more information on ways to add your comments.)

The Army, ADEC, and EPA will respond to all comments on the Proposed Plan in the Responsiveness Summary. After consideration of all public comments, a final cleanup decision will be made for OU-C. The document that will detail the decisions made during the CERCLA cleanup process is the ROD. The ROD will include a Responsiveness Summary containing the public comments received and will be added to the information repositories. The locations of the information repositories are shown in the shaded box on the next page.

CONTENTS OF THIS PROPOSED PLAN

For More Information

Copies of site documents, fact sheets, and other supporting reports are available for public review at the following locations:

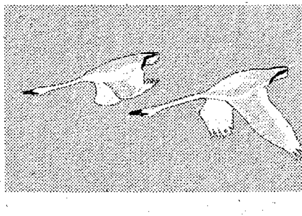
University of Alaska Anchorage
Consortium Library
3211 Providence Drive
Anchorage, Alaska 99508-8176
(907) 786-1845

Alaska Resources Library
3150 C Street, Suite 100
Anchorage, Alaska 99503
(907) 272-7547

Fort Richardson Post Library
Building 636, B Street
Fort Richardson, Alaska 99505
(907) 384-1648

Directorate of Public Works
Quartermaster Road
Building 724, Door 5
Fort Richardson, Alaska 99505
(907) 384-3175

Ms. Jennifer Roberts
Remedial Project Manager
Alaska Dept. of Env. Conservation
555 Cordova Street
Anchorage, Alaska 99501



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