Eagle River Flats
(Operable Unit C)
Decision Document

1. PURPOSE OF REMOVAL ACTION

This decision document describes treatment alternatives which are being evaluated to allow the U.S. Army to select a removal action for the Eagle River Flats site at Fort Richardson, Alaska, in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA), the National Contingency Plan (NCP), Resource Conservation and Recovery Act (RCRA), and AR 200-1, as applicable.

This decision document was developed by the U.S. Army in coordination with the Environmental Protection Agency (EPA) and the Alaska Department of Environmental Conservation (ADEC). Documentation of approval and support for these actions by regulatory and resource agencies involved with Eagle Rivers Flats is available at the Directorate of Public Works offices on Fort Richardson. This material also will be obtainable from the Fort Richardson administrative record, scheduled for public availability on 1 April 1996.

Eagle River Flats (ERF) is an 865 hectare tidal flat and salt marsh at the mouth of Eagle River on Knik Arm near Anchorage, Alaska. ERF is a highly productive wetland and serves as an important staging and feeding ground for waterfowl during spring and fall migrations. The Eagle River, which winds through the ERF area, maintains spawning runs of chinook, coho, and pink salmon. ERF has been used as the primary ordnance impact area for Fort Richardson since the late 1940's. Ordnance fired into ERF includes machine gun and rifle rounds, grenades, rockets, and incendiary missiles. Various calibers of artillery and mortar rounds fired into the ERF include smoke obscurants, illumination flares, and high-explosive rounds.

High waterfowl mortality has been observed at ERF since the early 1980's. The ERF Task Force consisting of U.S. Army (Army), EPA, U.S. Fish and Wildlife Service (FWS), Alaska Department of Fish and Game (ADF&G), and ADEC was formed to conduct studies to identify the cause of the waterfowl mortality and investigate potential remedial solutions. Studies conducted in the early 1990's attributed the mortality to ingestion of elemental white phosphorus used in smoke obscurants.

It was theorized that particles of white phosphorous in shallow pond sediments were picked up either intentionally or inadvertently by waterfowl sifting through the mud in search of seeds or small invertebrates, which these particles closely resemble. From 1991 through 1993, intensive sampling of

sediments enabled scientists to construct a reasonably accurate map of the spatial distribution of white phosphorous in ERF. At the same time, investigators were conducting experiments both in the field and in the laboratory in an effort to find a way to eliminate or neutralize the elemental phosphorous in the sediments. Options such as aeration and chemical treatment with hydrogen peroxide were tried but proved unsuccessful.

Out of these studies, new information was gained regarding the nature and properties of white phosphorous. This information is important in the further pursuit of remedial solutions. Most importantly, it was shown that once soils containing white phosphorous become unsaturated, the white phosphorous begins to oxidize. The rate of oxidation increases as the soils dry and the temperature warms.

With this information, it was surmised that there were basically four removal mechanisms and a no action alternative that should be explored further.

1. Physical removal of white phosphorous from ERF--dredging.

2. Enhanced natural degradation (oxidation) of white phosphorous from ERF--pumping out of ponds.

3. Cap/cover contaminated areas--AquaBlok™ bentonite compound.

4. Removal of birds from exposure--hazing--short term interim.

5. No Action.

Ongoing treatability studies were developed to evaluate the feasibility of these options.

ERF is part of Fort Richardson, which is designated a National Priority List (NPL) site. Criteria developed by EPA for evaluating remedial actions were considered in these treatability studies.

2. SUMMARY OF SITE RISK

A. Human Health Risk Assessment. A limited human health risk assessment was conducted in 1992. This risk assessment consisted of a review of existing toxicity information for the suspected chemicals of concern in explosives and munitions residues. It

also contained possible hazards to hunters from ingesting poisoned birds.

ERF is used as a firing range and has no history of fuels, solvents, or other industrial wastes most commonly associated with contaminated military sites. Munitions residues in sediments, soil, and surface water seem to be localized to areas of explosion craters and the explosive ordnance disposal pad. No evidence of chemicals of concern being transported out of the flats through movement of surface water, sediment, or contaminated waterfowl has been detected to date.

Surface water and near surface ground water is highly saline because of the estuarine nature of the site. These waters are not currently used as potable water supplies and are not expected to be used in the future.

The presence of unexploded ordnance and the present designation of ERF as a firing range will continue to restrict human use of the area to occasional army ordnance and research personnel. The proposed remedial actions discussed in section 3 contain health and safety plans for each task. Offsite human exposure may only occur when hunters eat contaminated waterfowl that migrate offsite.

The only exposure pathway qualitatively evaluated at ERF was the potential risk to hunters if they ingested contaminated birds. The risk analysis concluded that the potential for any adverse health effect to a hunter or person consuming waterfowl obtained by hunters is extremely low because of the following factors:

1. Relatively small numbers of waterfowl are affected, compared to all waterfowl in the area.

2. The data indicate that poisoned waterfowl are incapacitated or die in a relatively short time after ingestion of elemental phosphorous.

3. Low levels of elemental phosphorous are found in the tissues of dead birds.

4. Exposure calculations based on sample data indicate that a human lethal dose would require the consumption of 3,333 teals.

B. Ecological Risk Assessment. An ecological risk assessment of areas potentially affected by chemicals of concern in sediments, water, or biota within ERF is being conducted. Preliminary results indicate that white phosphorous ingestion causes mortality of waterfowl and probably some species of shorebirds, which ingest white phosphorous particles directly while sifting

through pond sediments. Predators and scavengers such as bald eagles, gulls, and coyotes may be at risk as secondary receptors, although there is no evidence of that to date.

The degree of exposure for other predators and scavengers (especially mammals) is not known, although dead mammals have not been found along survey transects. Also, exposure of fish, including those in ponds and in Eagle River, is not well documented.

3. SUMMARY OF REMOVAL ALTERNATIVES

A brief description of each individual remedial study is intended to provide understanding of the data collection and the issues of concern.

A. Physical Removal of White Phosphorous from ERF--Dredging. The objective is to investigate the feasibility of using a small remote-controlled dredge to remove sediments from contaminated ponded areas and to treat the spoils in an open retention basin. Conventional dredging methods would pose a threat to the equipment operator due to an unknown amount of various unexploded ordnance. The dredged material will be sampled and analyzed for white phosphorous concentrations. Cost $247,494.00

B. Pond Draining Treatability Study. White phosphorous is extremely toxic, but it has the potential to form nontoxic phosphates. In the sediments of the permanently ponded areas of ERF, phosphate formation from solid millimeter-size particles is limited by the rate at which these particles dissolve. In stagnant, saline sediments, this rate is extremely slow. Data collected in 1994 indicate that some natural reduction in white phosphorous contamination occurs when the sediments of intermittent ponds and mudflats are subaerially exposed long enough for the sediment moisture to decrease below saturation. The purpose of this study is to assess whether pond draining is a viable option for remediating white phosphorous laden ponds in ERF. This proposal includes:

1. Installation of a dewatering pump system to lower water levels within a specific pond.

2. Monitoring of sediment temperature and moisture conditions within pond bottom sediments.

3. A detailed study to determine the effect of pond pumping on ground water and surface water levels in adjacent bulrush marsh and small pond complexes.

A 6-inch discharge dewatering pump capable of pumping 0.14 cubic meters per second (2,200 gallons per minute) will be used. The total volume proposed to be pumped is 16,300 cubic meters of water. The discharge will be pumped to a gully north of the pond. Cost $202,160.00

C. AquaBlok™ Treatment Monitoring. AquaBlok™ is a blend of calcium bentonite/organo clays, gravel, and polymers that bind together to form a sealant. AquaBlok™ could prevent foraging ducks from encountering contaminated sediment by forming a physical barrier.

Two ponds of about 0.5 hectares were selected for treatment in 1994. One pond included a 3,200 square meter control pen. Approximately 141,200 kilograms of AquaBlok™ were spread over the area ranging from 4.3 to 9.1 centimeters on the ground and from 11.9 to 25.4 cm unevenly covering the craters. The objectives of the study were to evaluate the longevity of AquaBlok™ and measure its effects on waterfowl foraging behavior and mortality. The objectives for the 1995 effort are to continue to evaluate the effectiveness of the 1994 AquaBlok™ application on sediments to provide a physical barrier to feeding waterfowl; to determine plant recovery on the 1994 AquaBlok™ application; to evaluate the effectiveness of the barrier in reducing waterfowl mortality after one year of weather, tidal and animal impacts on the AquaBlok™ ; and measure individually the impacts of ice and tides on the AquaBlok™ to determine how each affects the longevity of the barrier. Cost $100,162.70

D. Protecting Waterfowl from Ingesting White Phosphorous. The objective of this task is to prevent waterfowl from frequenting white phosphorous contaminated "hot spots" at ERF, thereby reducing the overall number of waterfowl exposed to white phosphorous and the subsequent potential of poisoning. Methods of hazing include deployment, use, and daily maintenance of propane exploders, pyrotechnics, scarecrows, flagging, balloons, and other visual, acoustic, and behavioral devices designed to frighten birds. Cost $185,538.00

E. No Action Alternative. Studies have indicated that white phosphorus particles will oxidize naturally under the right conditions (soil temperature above about 20° C and moisture below saturation). In addition, natural sedimentation will continue to occur, slowly covering over the white phosphorous contaminated substrate. The possibility exists that if no action is taken to remove or establish conditions for white phosphorus attenuation, natural process will, in time, remediate the site. The no-action

alternative may take considerable time, and fish and wildlife resource losses will continue.

4. PREFERRED/SELECTED ALTERNATIVES

The following alternatives are selected for remediation purposes on Eagle River Flats: Physical Removal (Dredging); Pond Draining; Aquablok™ (Capping); Waterfowl Protection (Hazing). This decision is based on supporting documentation in the FY94 Eagle River Flats Cold Regions Research and Engineering Laboratory (CRREL) Report and the Eagle River Flats Comprehensive Evaluation Report.

5. PUBLIC/COMMUNITY INVOLVEMENT

A Community Relations Plan (CRP) was prepared because of known and suspected hazardous wastes sites identified under the CERCLA, as amended by SARA. Fort Richardson was listed on EPA's National Priority List on June 1, 1994, because of known soil and ground water contamination.

The CRP identifies current issues of community concern regarding known and potential contamination at Fort Richardson and includes proposals for community involvement activities to address these concerns. These activities will be conducted by the Army in consultation with EPA and the Alaska Department of Environmental Conservation and will occur during ongoing environmental investigation and cleanup activities at Fort Richardson's four operable units. Operable Unit C is Eagle River Flats Impact Area.

The Army at Fort Richardson will undertake specific community relation activities to assure compliance with the appropriate regulations and to involve the community as early as possible in the process. The following communication tools will be used:

1. Fact Sheets and Updates. Fact sheets will be used whenever new information is available and whenever a public comment period is required.

2. Proposed Plan. A proposed plan is a document that summarizes the preferred cleanup strategy and analysis of alternatives.

3. Information Repositories. Information repositories will be established off and on post to provide general information about the remediation program.

4. Public Meetings. Public meetings will be conducted in easily accessible and convenient locations.

5. News Releases. News releases will be issued at important points in the investigation and remedial process to assure community awareness.

6. Public Notices. These will provide official announcements of agency activities and plans that will encourage public involvement in agency decisions.

7. Public Comment Period. Fort Richardson will schedule a 30-day public comment period upon release of the Proposed Plan for each Operable Unit including ERF.

5. DECLARATION

The four remedial mechanisms discussed above appear to be protective of human health and the environment, attain Federal and State requirements that are applicable or relevant and appropriate to this removal action, and are cost effective. It is speculated that these remedies satisfy the statutory preferences for remedies that employ treatments that reduce toxicity and mobility or volume as a principal element, and utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. It is with the objective of formulating a remedial option which best meets these goals that the remedial mechanisms will be studied as described above. The final remedial mechanisms will be selected based on their performance during treatability studies.

**Approval for the foregoing Operable Unit C,
Eagle River Flats, Fort Richardson, Alaska
Removal Action by the United States Army**

Thomas H. Needham

THOMAS H. NEEDHAM
Major General, U. S. Army
Commanding

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DATE