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December 1994

EPA Superfund Record of Decision:

USA Aberdeen Proving Ground Operable Unit 2, MD 10/11/1994

Interim Remedial Action
U.S. ARMY ABERDEEN PROVING GROUND
OLD O-FIELD SOURCE AREA
(O-Field Operable Unit 2)

Aberdeen Proving Ground, Maryland

RECORD OF DECISION

FINAL DOCUMENT

September 1994

In accordance with Army Regulation 200-2, this document is intended to comply with the National Environmental Policy Act (NEPA) of 1969.

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Old O-Field Source Area, Edgewood Area, U.S. Army Aberdeen Proving Ground, Maryland.

STATEMENT OF BASIS AND PURPOSE

This decision document presents a selected interim remedial action for the Old O-Field Source Area, which is Operable Unit 2 (OU2) of the O-Field Area at Aberdeen Proving Ground, MD. The selected remedial action was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR 300). This decision document explains the factual basis for selecting the remedy for OU2 and the rationale for the final decision. The information supporting this remedial action decision is contained in the Administrative Record for this site.

The State of Maryland Department of the Environment concurs with the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from the site, if not addressed by implementing the response actions selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

This operable unit is the second of four that are planned for the site. The first operable unit (OU1) addresses the contaminated groundwater emanating from Old O-Field, and the remedy for OU1 is currently under construction. This Record of Decision has been developed for Operable Unit 2 (OU2) of the O-Field area. This remedy addresses the principal threat posed by the site, which is the potential for an accidental release of chemicals into the air. The function of this operable unit is to reduce the risk of an accidental release of chemical warfare materials (CWM) from the site by minimizing the possibility of a fire at the site, reducing the likelihood and potential effects of an unplanned detonation of ordnance, and minimizing both the likelihood and the potential effects of evaporative release of CWM from a subsurface release. The selected remedial action is an interim remedy, and will allow for continued investigation into a more permanent remedy.

The major components of the selected remedy include:

- A Permeable Infiltration Unit (PIU) will be constructed on top of the site. The PIU will be constructed principally of sand and other granular materials. Construction of the PIU will reduce the threat of a release of CWM by covering the site with non-flammable materials, which will serve to cut off the air flow to the surface of Old O-Field, stop erosion and stabilize the soil, provide a blast-resistant layer on top of the ordnance, and provide a vapor barrier to reduce the emission of CWM from an underground release.

- An air monitoring system will be installed within the PIU to detect the presence of CWM within the pore spaces of the sand.

- A sprinkler system will be constructed on top of the PIU that will be capable of quickly spraying water or other solutions on the PIU. If a CWM release is detected by the air monitoring system, then the sprinkler system will be activated. The water sprayed onto the PIU will form a vapor barrier within the sand to prevent an air release of CWM and will also hasten the degradation of CWM.

- Treatability studies will be performed using the sprinkler system to apply water or other solutions to the PIU. The results of these studies will be used to evaluate the feasibility of enhanced leaching of the contaminants from soil and buried containers to the groundwater. In addition, the surface of the PIU will be monitored to evaluate the rate of subsidence of Old O-Field.

- The ability of the groundwater extraction and treatment system that is under construction for OU1 (contaminated groundwater emanating from Old O-Field) to capture and treat the contaminated groundwater emanating from Old O-Field will be verified. In addition, the effectiveness of the groundwater monitoring program to detect changes in the site hydrogeology and groundwater chemistry will be verified.

The remedy specified herein will be one component of the overall remedy for the O-Field area. This action will be consistent with any current or planned future remedial actions for the site to the extent practicable.

STATUTORY DETERMINATIONS

This selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to this remedial action, and is cost effective. Although this action is not intended to fully address the statutory mandate for permanence and treatment to the maximum extent practicable, this interim action is in furtherance of that statutory mandate. Because this action does not constitute the final remedy for OU2, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element, although partially addressed by this remedy, will be addressed more fully by the final response action. Subsequent actions will address the threats posed by the conditions at the site to the maximum extent practicable.

Because this action will result in hazardous substances remaining on-site above health-based levels, a review will be conducted within five years after implementation of this remedy to ensure that the remedy continues to provide adequate protection of human health and the environment. Because this is an interim action, review of this site and of this remedy will continue as the Army and the U.S. Environmental Protection Agency (EPA) continue to develop final remedial alternatives for the O-Field area.

Richard W. Fragemann — 16 Sep 94

Richard W. Fragemann
Major General, U.S. Army
Commander, U.S. Army Aberdeen Proving Ground

Date

Lewis D. Walker — 9/28/94

Lewis D. Walker
Deputy Assistant Secretary of the Army
(Environment, Safety, and Occupational Health)

Date

10/11/94

Peter H. Kostmayer
Regional Administrator
U.S. Environmental Protection Agency, Region III

Date

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1.0 SITE NAME, LOCATION, AND DESCRIPTION

The U.S. Army Aberdeen Proving Ground (APG) is a 72,516-acre installation located in southeastern Baltimore County and southern Harford County, Maryland, on the western shore of the upper Chesapeake Bay (Figure 1-1). The installation is bordered to the east and south by the Chesapeake Bay; to the west by Gunpowder Falls State Park, the Crane Power Plant and residential areas; and to the north by the towns of Edgewood, Magnolia, Perryman, and Aberdeen. APG is divided into two areas by the Bush River: the Edgewood Area of APG lies to the west of the river and the Aberdeen Area lies to the east.

The O-Field area is an area of approximately 259 acres located on the Gunpowder Neck peninsula in the Edgewood Area (Figure 1-2). It is bordered on the north and east by Watson Creek, on the south by H-Field, and on the west by the Gunpowder River. Watson Creek drains into the Gunpowder River through a narrow culvert under Watson Creek Road. The Gunpowder River, in turn, drains into Chesapeake Bay.

The O-Field area contains two (2) known disposal areas and one (1) suspected disposal area (Figure 1-3). The northern disposal area is designated as Old O-Field, and this area was used for disposal activities from the late 1930s to 1953. Old O-Field is located adjacent to Watson Creek and east of Watson Creek Road. South of Old O-Field and east of Watson Creek Road is the second area, known as New O-Field. New O-Field was used from the mid-1950s to the early 1980s as a destruction and disposal area. The suspected disposal area known as the "Pit Site" is on the west side of Watson Creek Road near the Gunpowder River. The "Pit Site" was reportedly used from the late 1930s to mid-1950s as a disposal area.

Old O-Field is a 4.5-acre site that was used by the Army for the storage, handling, disposal, and destruction of chemical warfare materials (CWM), decontaminating chemicals, ordnance, laboratory samples, and contaminated equipment. The site is located within a restricted area of APG, and access to the site is strictly controlled. The site is surrounded by a chain-link fence, which is supplemented by other physical security countermeasures, and is patrolled on a 24-hour basis.

Old O-Field is located on a local topographic high, approximately 15 feet above sea level. There is approximately 4 to 6 feet of relief across Old O-Field. The terrain slopes toward the east, to Watson Creek, and toward the west, to the Gunpowder River. The area around Old O-Field is wooded, and much of the area around Watson Creek is a marsh. The groundwater underlying Old O-Field flows toward the east and northeast, and discharges to Watson Creek.

At present, the construction of the Operable Unit 1 (OU1) groundwater extraction and treatment system is underway, so workers are present at Firing Position 5 (located to the immediate northwest of Old O-Field). In addition, workers are present at H-Field (south of New O-Field) and M-Field (north of Old O-Field). Large numbers of civilian and military personnel work on the northern Gunpowder Neck and within the industrial areas of Edgewood Area.

The residential areas closest to Old O-Field lie approximately 2.7 miles north (on-post military housing within the Edgewood Area of APG), 3 miles to the west (Graces Quarters, Maryland) and 4.5 miles to the north-northwest (Edgewood, Maryland, and Joppatowne, Maryland). In addition, Kent County, Maryland, lies 6 miles west of Old O-Field.

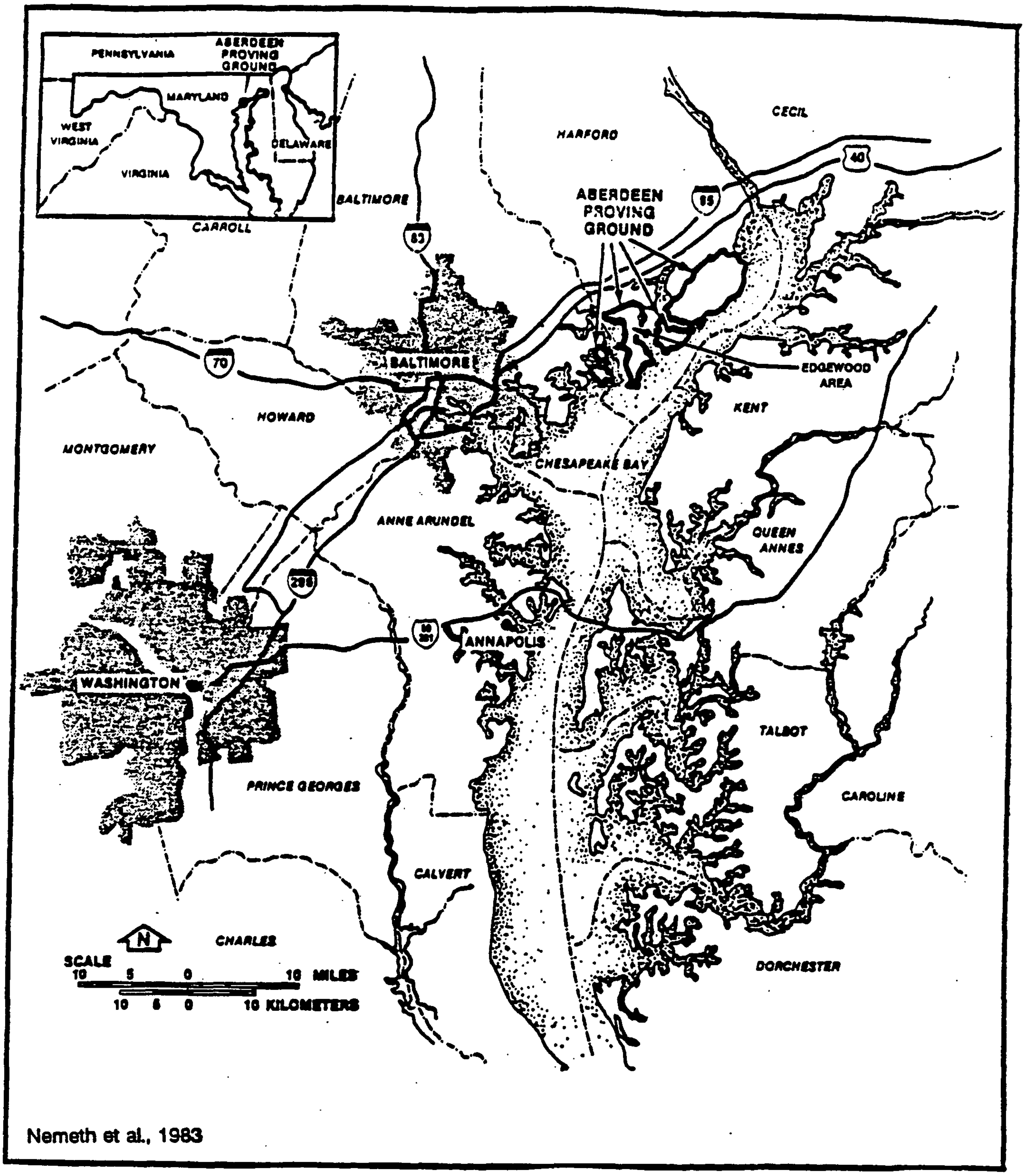

Figure 1-1
Location of U.S. Army Aberdeen Proving Ground

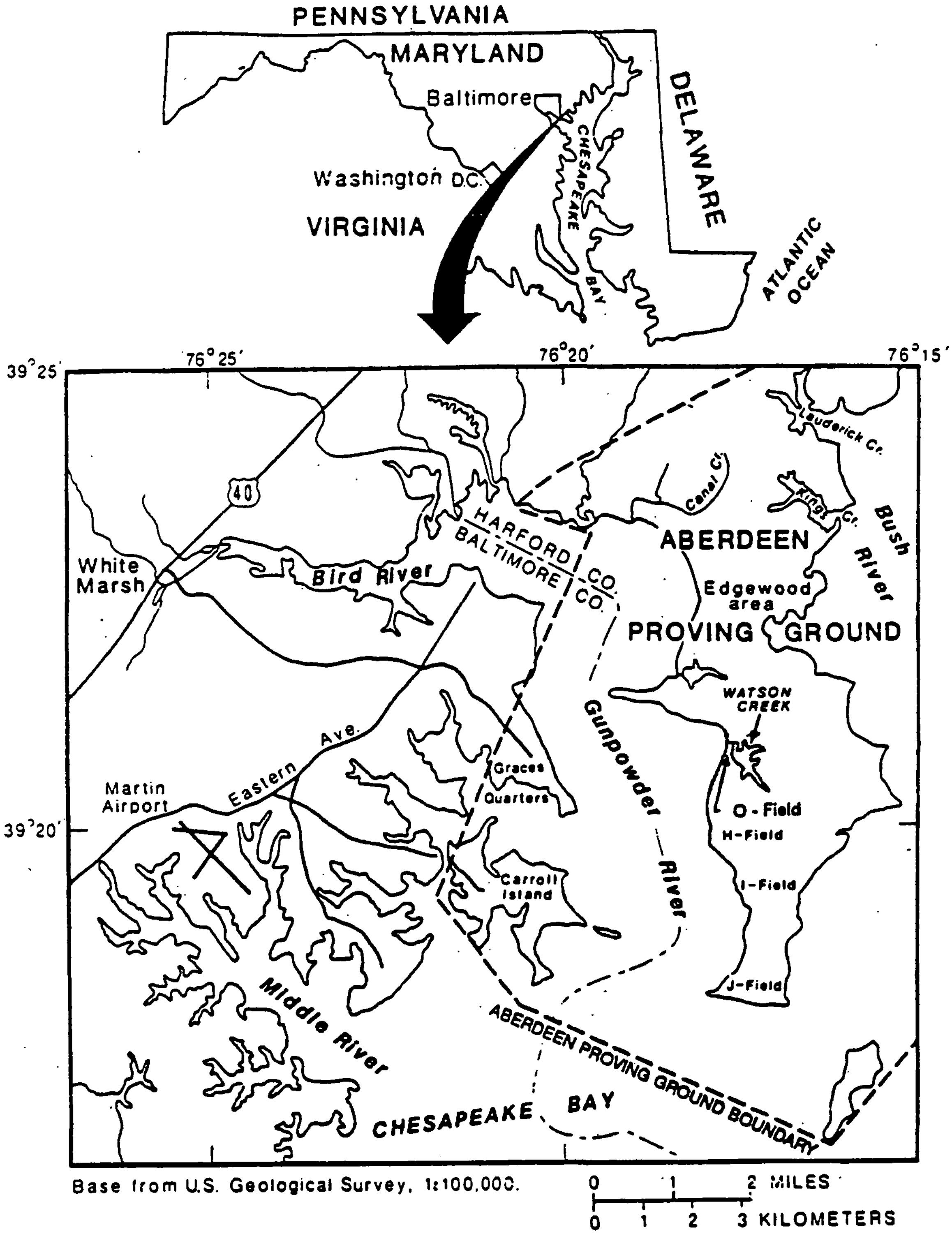

Figure 1-2
Location of the O-Field Area Within the Edgewood Area of APG

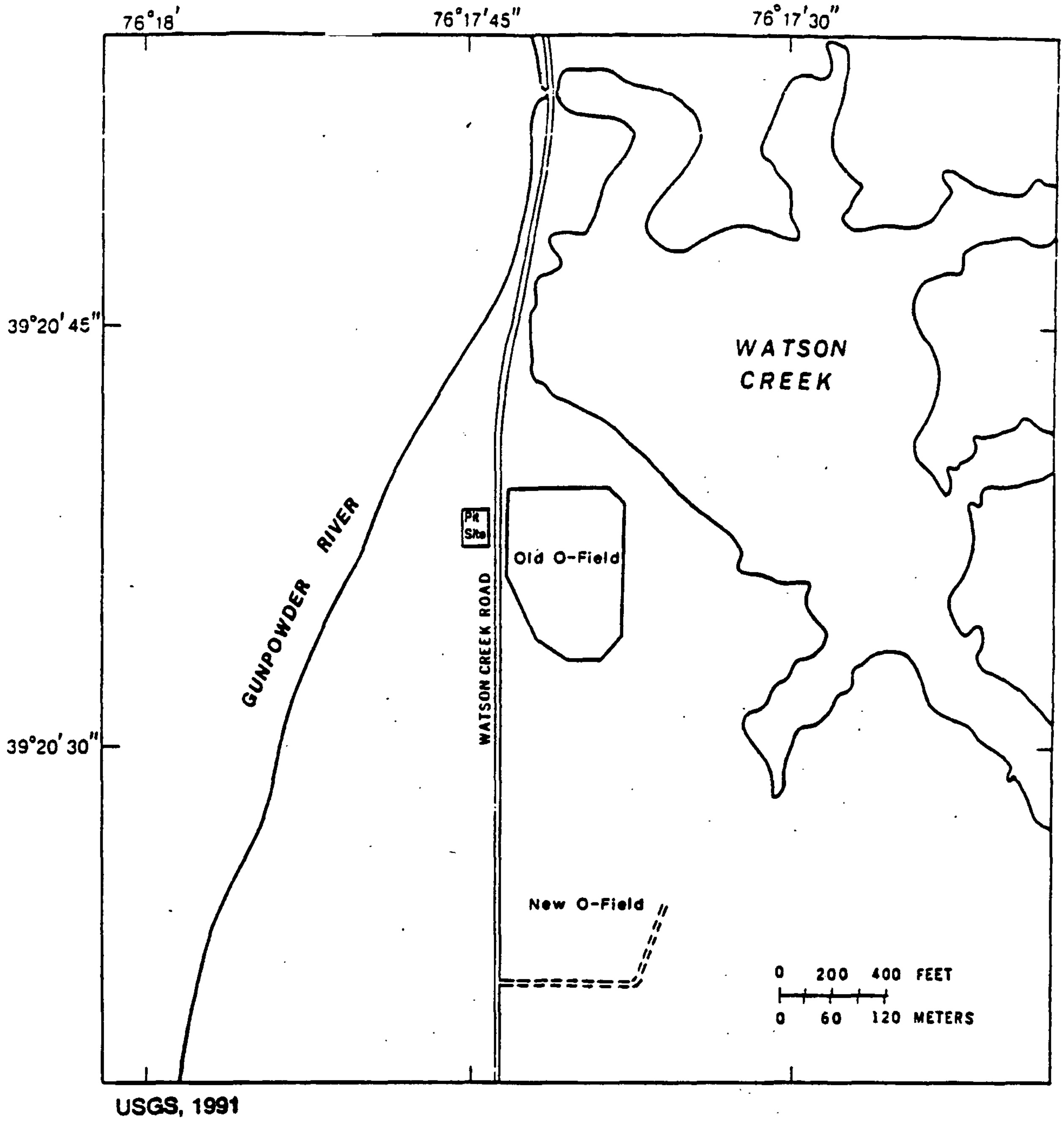

Figure 1-3
Location of O-Field Disposal Sites

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

APG was established in 1917 as the Ordnance Proving Ground and was designated a formal military post in 1919. Testing of ammunition and other equipment and operation of training schools began at APG in 1918. Between this time and the onset of World War II, activities at APG included research and development and large-scale testing of a wide variety of munitions, weapons, and other equipment. Immediately prior to and during World War II, the pace of testing increased greatly. During the war, personnel strength at APG exceeded 30,000. Similar but smaller-scale increases in development and testing activities were experienced during the Korean and Vietnam conflicts.

APG's primary mission continues to be the testing and development of weapons, munitions, vehicles, and a wide variety of support equipment. Within the Edgewood Area, chemical warfare research, development, and related activities have occurred. Specific activities at Edgewood have included laboratory research, field testing of chemical munitions, pilot-scale manufacturing, and production-scale chemical agent manufacturing.

Many areas of the Gunpowder Neck of the Edgewood Area have been used as impact areas for the testing of ordnance; as such, ordnance have been tested and fired into various areas and there is the potential for encountering unexploded ordnance (UXO) and/or intact or leaking liquid-filled rounds deposited during testing and firing. Disposal and testing activities have also taken place in areas along the Gunpowder Neck. O-Field and J-Field were the major disposal areas (the disposal history of O-Field is discussed in more detail below). Currently, testing of combat tracked vehicles occurs at H-Field (to the south of O-Field), and testing of obscurants (e.g., smoke screens) takes place at M-Field (immediately north of O-Field).

2.1 HISTORY OF OLD O-FIELD

Periodic disposal of waste materials at the O-Field area began before World War II; the first documented usage of Old O-Field occurred in May 1941 (Yon et al., 1978), although other records suggest that disposal activities occurred in the late 1930s. Disposal consisted of placing the items in excavated trenches and then covering the trenches with soil. Records indicate that some of the burial trenches were 100 yards long, 10 feet deep, and 10 feet wide; however, most known trenches are much shorter. The existence of 35 trenches is documented in the historical records (Yon et al., 1978). However, inspection of survey notes and historical aerial photographs reveals that the trenches and pits are not distinct. As disposal activities continued, trenches were created which appear to overlay and intersect other trenches. Because of this, the total number of trenches and their locations is not known. The last pit used for disposal of materials within Old O-Field was closed in June, 1953.

During the period of 1941 to 1949, tons of chemical-filled/explosive-loaded munitions, contaminated plant equipment, pipes, and tanks were buried or placed on the ground surface in the area of Old O-Field. Interviewed personnel stated that the area contained 55-gallon drums of mustard and lewisite (blistering agents); items filled with chloroacetophenone, chloroacetophenone in chloroform (tear agents), and adamsite (vomiting agent); munitions containing explosive charges; and munitions filled with white phosphorus and other CWM.

During August 1946, the unloading and decontamination operations of the SS Francis L Lee, a Liberty ship containing mustard-filled German munitions captured during World War II, were conducted at Edgewood Arsenal. The ship was anchored in the eastern channel of the Chesapeake Bay between Worton Point and Stoops Point. The material was then loaded onto barges and towed up the Bush River to the Edgewood dock. Contaminated empty German bombs (formerly mustard-filled), contaminated wood, and dunnage were placed at Old O-Field for disposal.

In June 1949, a spontaneous ignition occurred in one of the disposal pits at Old O-Field where a large variety of chemical-filled/explosive loaded munitions had been buried. As a result of this explosion, a broad area was contaminated with CWM, and unexploded ordnance was dispersed around the area. Immediately after this incident, an inspection was conducted by the Armed Services Explosive Safety Board. A directive was issued calling for a thorough cleanup of the contaminated area. In November 1949, the responsibility for the disposal and cleanup operations at Old O-Field was given to the Command of the Technical Escort Detachment at Edgewood Arsenal.

2.2 CLEANUP ACTIVITIES AT OLD O-FIELD

2.2.1 LTC Dean Dickey's Affidavit

The source of the information concerning early cleanup activities at Old O-Field is a testimonial prepared by LTC Dean Dickey (Yon et al., 1978), who was Officer-In-Charge of cleanup at Old O-Field, and who later returned to the Edgewood Area as Commander of the U.S Army Technical Escort Unit (TEU).

Between September, 1949, and the early 1950s, LTC Dickey's team performed a surface sweep and clearance of Old O-Field. The following activities were performed:

- Fuzes, bursters, and boosters were gathered, placed in drums, and detonated. The handling of items and drums in Old O-Field was slowed down by the quantity of white phosphorus in the ground, which ignites and burns when exposed to air.
- Several hundred drums, mustard-filled rounds (including German mustard-filled 250-kg and 500-kg rounds), and tear gas-filled rounds were recovered from the surface of Old O-Field. The mustard-filled rounds and white phosphorus rounds were destroyed by placing them in a pit with lumber and napalm and burned.
- Old O-Field was also used for the destruction of leaking mustard and lewisite one-ton containers. The agent was destroyed by pouring it into flat steel pans and igniting it in the presence of lime.
- During the recovery activities, the surface of Old O-Field was decontaminated by pouring Decontaminating Agent Non-Corrosive (DANC, which contains approximately 95% 1,1,2,2-tetrachloroethane) and lime (calcium hydroxide) on the field. Approximately 1,000 barrels of DANC were used. Contaminated soil was then scooped up and put on top of Old O-Field. The trees were decontaminated by placing TNT under cans of lime and detonating the cans to spread the lime.
- The Old O-Field pits and their contents were then burned. Hundreds of gallons of fuel oil were pumped into the pits. The entire field was then sprayed with fuel oil. Time fuzes were placed in the pits. The pits and the entire area burned for two days and numerous explosions occurred. The date for this phase of the cleanup is not given, but is presumed to have occurred during the early 1950s.
- During these cleanup activities, a number of unplanned detonations occurred. These explosions resulted in the release of mustard to the surface of Old O-Field and the surrounding trees and surface water bodies.

Other portions of LTC Dickey's affidavit indicate that, although a large quantity of disposed materials have been recovered from the surface of Old O-Field and some of the pits, a much larger quantity of munitions, bulk containers, and other items potentially remain buried at the site.

2.2.2 U.S. Army Technical Escort Unit Surface Sweeps of Old O-Field

From the late 1960s to the early 1970s, the U.S. Army Technical Escort Unit performed surface sweeps of the area. A number of suspect CWM-filled rounds were recovered from Old O-Field, temporarily stored in Conex containers at Old O-Field, and then transported and stored in the storage bunkers at N-Field.

2.3 PRESENT CONDITION OF OLD O-FIELD

At present, Old O-Field is heavily vegetated. Some of the trees have diameters as large as 8 inches and are more than 20 feet in height; this indicates that their tap roots probably extend through the upper confining unit. Smaller bushes cover and obscure the remainder of the field. Small animals such as foxes have been observed inside the fenced area.

The surface of the field is highly irregular; there are areas where deep subsidence has occurred. This indicates that the trenches and pits are eroding and collapsing. Currently, the remains of four trenches are visible in the field. A large number of ordnance items, drums, pipes, ammunition crates, canisters, and miscellaneous scrap metal items are visible on the surface of the field and within the open trenches.

In addition to the items present within the fenced area of Old O-Field, a large number of UXO items were encountered outside of Old O-Field during the construction of access roads in support of the Operable Unit 1 groundwater treatment system project. The presence of these items outside of Old O-Field is most likely due to the "kick-out" of items during past detonation events and to past disposal activities. These items pose a hazard to workers engaged in any project in the vicinity of Old O-Field, and an accident involving these items may have an impact on Old O-Field, including the initiation of fires or detonations.

2.4 PREVIOUS INVESTIGATIONS

This section summarizes the results of the environmental studies that have been conducted at Old O-Field. Because this ROD is focused on the source area of Old O-Field, existing groundwater and surface water quality data are not presented in this summary.

2.4.1 Environmental Survey

An Environmental Survey of the Edgewood Area of APG was conducted in 1977 and 1978 by the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA), now known as the U.S. Army Environmental Center (AEC) (Nemeth et al., 1983), to determine if chemical contamination from past operations was presenting a hazard to the off-post environment. Analysis of a groundwater sample collected from a monitoring well located immediately east of Old O-Field contained arsenic, volatile organic compounds (VOCs), and 1,4-dithiane (a thermal breakdown product of mustard) at concentrations above 1,000 μg/L; semi-volatile compounds were detected at lower levels. These results indicate that VOCs and chemical agent degradation products are being released by Old O-Field into the groundwater.

2.4.2 Records Review

A records review (Yon et al., 1978) used available documents and personnel interviews to reconstruct a general history of site operations at O-Field. The investigation found that Old O-Field contained 35 disposal pits, and 3 additional pits exist on the west side of Watson Creek Road. A later review of historical survey notes showed that only one pit may have been west of Watson Creek Road, whereas two of the suspected pits were within Old O-Field (Parks, 1986).

2.4.3 Surface Water Quality Study

The U.S. Army Environmental Hygiene Agency (AEHA) conducted a surface water quality and biological study of Watson Creek and nearby creeks (U.S. Army Environmental Hygiene Agency, 1977). Due to a lack of tidal flushing in Watson Creek, unusually high organic loading was detected.

2.4.4 Hydrogeologic Investigation

In 1984, the U.S. Geological Survey (USGS) began a study to investigate the source, extent, and possible migration of contaminants from the Old O-Field site. The final report by Vroblesky et al. (USGS, 1991) presents a preliminary characterization of the contamination of the groundwater, surface water, and bottom sediment in the O-Field area of APG, and describes the probable hydrologic and chemical effects of relevant remedial actions on the groundwater at the site.

2.4.5 RCRA Facility Assessment

In 1986, while the USGS study was ongoing, the U.S. Environmental Protection Agency (EPA) issued a Resource Conservation and Recovery Act (RCRA) permit to APG to address Solid Waste Management Units (SWMUs) with potential to release hazardous wastes to the environment. A RCRA Facility Assessment (RFA) report by Nemeth (1989) documents historical activities at the Edgewood Area of APG related to solid waste management, and identifies and describes SWMUs. One of the recommendations of the report is that consideration be given to additional investigative work addressing the New O-Field area (Nemeth, 1989).

2.4.6 Focused Feasibility Study of Old O-Field Source Removal Options

In 1987, the Army performed an engineering study for Old O-Field that addressed the feasibility of implementing source control (ICF Technology, 1987). This work was performed for the Environmental Management Office of Aberdeen Proving Ground (now part of the Directorate of Safety, Health, and Environment [DSHE]). The study identified remedial alternatives that included source removal, in-place destruction, and permanent isolation. More than a dozen remedial alternatives were evaluated in this study; in addition, a variety of innovative excavation techniques were considered and screened. The technologies evaluated as being potentially implementable and effective are the following:

- In-situ vitrification of the entire mass of soil and materials contained within the limits of burial sites at Old O-Field;
- Entombment of all wastes and hazardous materials at the site;
- Mechanical excavation, sorting, and disposal or treatment of hazardous items at the site using remote-controlled equipment; and
- Hydraulic excavation of wastes and munitions at the field.

The following conclusions were reached about the condition of Old O-Field and the need for a source control action such as would be accomplished by the above technologies:

- Based on the current state of understanding of Old O-Field, the total risk posed by the site to human health and the environment is lower than the risks posed by any corrective action at the site that involves destruction or removal activities.
- There are significant short-term risks posed by implementation of any of the considered technologies.
- None of the technologies considered is sufficiently developed to allow immediate selection and implementation at Old O-Field. Research, development, and proof-testing of the technology would be required prior to implementation.

2.4.7 Old O-Field Groundwater Treatment Remedy

A Focused Feasibility Study (FFS) was performed to evaluate remedial alternatives for the groundwater (OU1) at Old O-Field (USATHAMA, 1990). As part of this study, aquifer tests were performed to aid in designing a groundwater extraction system (USATHAMA, 1991b). Treatability tests were conducted to evaluate the implementability of various groundwater treatment technologies. A number of promising technologies were tested at both the bench- and pilot-scale.

The data obtained from the treatability tests were used to select a preferred remedial technology. Groundwater extraction and treatment using chemical precipitation for removal of the inorganic analytes followed by ultraviolet oxidation for removal of the organic contaminants was selected as the proposed remedial treatment technology (USATHAMA, 1991c). Treated groundwater will be discharged to the Gunpowder River. Based on the results of the FFS, the aquifer tests, and the treatability studies, a Proposed Plan was developed which addresses groundwater extraction and treatment for the Old O-Field area (U.S. Department of the Army, 1991a). A Record of Decision which documents the remedy selection was signed by the Army and U.S. EPA Region III in September 1991 (U.S. Department of the Army, 1991b).

The Army then developed the Conceptual Design for the groundwater extraction, treatment, and discharge system (USATHAMA, 1991d). Construction of the treatment plant is currently underway. Based on data gathered after completion of the Conceptual Design, air stripping and carbon adsorption units have been added to the treatment train to provide greater flexibility in treating the organic compounds. When completed, this system will intercept and treat the contaminated groundwater emanating from Old O-Field. The purpose of the action is to prevent loading of contaminants into Watson Creek.

2.4.8 Groundwater and Surface Water Sampling, Fall 1991

In November 1991, the Army collected groundwater samples from all existing monitoring wells. Surface water samples were also collected from Watson Creek and the Gunpowder River. The purpose of the investigation was to obtain information regarding present levels of contamination for use in completing the design of the OU1 treatment plant.

2.4.9 O-Field Area Remedial Investigation/Feasibility Study

Presently, the Army is performing an RI/FS of the entire O-Field study area. The RI consists of the installation of monitoring wells and the collection and analysis of samples from surface water, sediment, groundwater, air, and soil. Extensive soil gas surveys and geophysical surveys were also performed. Surface soil samples were collected immediately outside the fence surrounding Old O-Field (due to safety restrictions on Old O-Field, personnel were not allowed inside the fence).

Because the toxicity of the military-specific compounds is not well known, toxicity tests were conducted to evaluate potential impacts to aquatic life. Macroinvertebrates were collected in sediment in Watson Creek and the Gunpowder River and analyzed to evaluate the potential for bioaccumulation of contaminants. Further hydrogeologic investigation of the area has been performed through aquifer testing and groundwater flow modeling. Additional information concerning the RI/FS may be obtained from the RI/FS Work Plan (USATHAMA, 1992) and the Phase I RI Report (APG, 1994a).

A Focused Feasibility Study for the Old O-Field Source Area was developed (APG, 1994b). This report evaluated the risks posed by Old O-Field and the potentially applicable remedial technologies for mitigating these risks. The Proposed Plan for the Old O-Field source area (APG, 1994c) and this Record of Decision are based on the results of the Focused Feasibility Study report.

3.0 HIGHLIGHTS OF COMMUNITY PARTICIPATION

The Focused Feasibility Study Report and Proposed Plan for OU2 were released to the public in June 1994. Both of these documents are available in the Administrative Record and the information repositories maintained at the Harford County Library - Aberdeen Branch, Aberdeen, MD; Harford County Library - Edgewood Branch, Edgewood, MD; Washington College - Miller Library, Chestertown, MD; and, Essex Community College Library, Baltimore, MD. The notice of availability of these documents was published in the *Aegis* (Harford County) on June 22, 1994; the *Baltimore Sun* on June 26, 1994; the *Avenue* (Baltimore County) on June 30, 1994; and the *Kent County News* on June 29, 1994.

The 45-day comment period was extended an additional 30 days based on a timely request. This 75-day public comment period was held from June 22, 1994 through September 5, 1994. In addition, a public meeting was held on July 14, 1994. At this meeting, representatives from APG, EPA, and MDE presented a summary of the site conditions and remedial alternatives under consideration. A response to the comments received during this period is included in the Responsiveness Summary, which is part of this Record of Decision.

This decision document presents the selected remedial action for OU2 of the Old O-Field area, Aberdeen Proving Ground, Maryland. The remedy has been chosen in accordance with CERCLA, as amended by SARA, and, to the extent practicable, the National Contingency Plan. In addition, this decision incorporates the findings of the FFS, which evaluated the remedial alternatives for OU2. The decision for this operable unit is based on the Administrative Record.

4.0 SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

Past disposal operations at the Old O-Field area has led to contaminated soil and groundwater at and near Old O-Field. The Army has decided to manage the environmental contamination in the different media at the Old O-Field area in a phased approach. This separation of environmental media into Operable Units allows the U.S. Army to begin remediation prior to full assessment of the O-Field area. Section 300.430(a)(1)(ii)(A) of the NCP, 40 CFR 430(a)(1)(ii)(A), provides that CERCLA NPL sites "should generally be remediated in operable units when early actions are necessary or appropriate to achieve significant risk reduction quickly, when phased analysis or response is necessary or appropriate given the site or complexity of the site, or to expedite the completion of a total cleanup." The Army's phased approach to O-Field is consistent with these objectives.

An Operable Unit (OU) is defined by the National Oil and Hazardous Substance Pollution Contingency Plan (40 CFR 300.5) as a discrete action which is an incremental step toward comprehensively mitigating site problems. The Operable Units for the O-Field area at APG have been defined as follows:

- OU1: Contaminated groundwater beneath and immediately downgradient of the Old O-Field disposal trenches which has been contaminated from past disposal practices;
- OU2: Contaminant source area within the trenches at Old O-Field;
- OU3: Contaminated surface water and sediment within Watson Creek; and
- OU4: Contaminated soil and groundwater at New O-Field.

The Army has already selected a remedy for OU1. The contaminated groundwater is a potential threat at this site because of the high levels of solvents and chemical agent degradation products detected in groundwater samples collected downgradient of Old O-Field. Lower levels of explosives compounds and toxic metals have also been detected in downgradient groundwater. This project is in the construction phase and startup and operation of the groundwater extraction and treatment system is scheduled to begin in December, 1994. OU3 and OU4 require additional investigations and will be handled in separate actions.

This remedy for OU2 addresses the principal threat posed by the site, which is the potential for an accidental release of CWM into the air. The function of this operable unit is to reduce the risk of an accidental release of CWM from the site by minimizing the possibility of a fire at the site, reducing the likelihood and effects of an unplanned detonation of ordnance, and minimizing both the likelihood and the potential effects of evaporative release of CWM from a surface or subsurface spill. The primary CWM at the site are believed to be mustard, phosgene, lewisite, and white phosphorus.

Access to the Old O-Field area is currently restricted by a number of physical security countermeasures. Institutional controls are in place to preclude the possibility of trespassers and residential or industrial use of the area.

This interim remedial action will eliminate surface soil exposure pathways within the Old O-Field area and reduce the threat of a catastrophic event due to an explosion and subsequent CWM release. It will also allow for continued study and testing of approaches to reducing or eliminating the toxic contaminants at the site. The final remedy will be selected after an appropriate technology is identified or developed. The interim action will be consistent with future actions.

5.0 SUMMARY OF SITE CHARACTERISTICS

This section provides a summary of the nature and extent of contamination at Old O-Field, a discussion of potential routes of contaminant migration and routes of exposure, the population and environmental areas that could be affected by a release at the site, and site-specific factors that may affect remedial actions at the site.

5.1 CONTAMINANTS AT OLD O-FIELD

The available historical records concerning disposal and recovery of items at Old O-Field have been evaluated to identify the types and quantities of chemical agents expected to be in place at Old O-Field. This information has been supplemented with data regarding the range of chemical agents contained in ordnance during the time period in which disposal took place at Old O-Field.

Based on available historical information regarding disposal activities at Old O-Field, it is likely that mustard is the predominant CWM at Old O-Field (Yon, 1994). Mustard was the most widely-deployed chemical agent during World War II, and historical records indicate that mustard was disposed at Old O-Field both in ordnance and in bulk quantities. Phosgene (a choking agent) was also commonly used, and historical records verify its disposal at Old O-Field. The disposal of lewisite, tear agents, and adamsite (a vomiting agent) at Old O-Field has also been documented.

There are no data to indicate that nerve agent-filled ordnance were disposed at Old O-Field. However, this does not rule out the possibility that nerve agents were disposed at Old O-Field in lab containers or other non-ordnance containers. Organophosphorus compounds have been detected in groundwater downgradient of Old O-Field, indicating the presence of nerve agent-related materials; this may be due to disposal of waste sludge from a pilot plant, disposal of nerve agent simulants, or the disposal of nerve agents. It is considered likely that the number of nerve agent-filled containers at Old O-Field is very small because these items were produced at the Edgewood Area only for field testing, and items which did not function in testing were routinely destroyed in place on the test ranges.

In addition to the above, it is believed that white phosphorus exists at Old O-Field both in ordnance and other containers. Because white phosphorus spontaneously ignites and burns when exposed to air, the presence of white phosphorus leads to an elevated risk of spontaneous fire at Old O-Field, which may result in detonation or other types of release.

The primary non-CWM chemicals disposed or used at Old O-Field include DANC (principally 1,1,2,2-tetrachloroethane), lime, and fuel oil used in decontaminating activities.

5.2 POTENTIAL ROUTES OF CONTAMINANT MIGRATION AND ROUTES OF EXPOSURE

The analysis of groundwater samples collected from monitoring wells downgradient of Old O-Field indicate that high levels of chemical agent degradation products and VOCs exist at these locations. Lower levels of explosives compounds and toxic metals have also been detected in downgradient groundwater. These results imply that the buried containers are leaking, and the contaminants are percolating to the water table and migrating in groundwater toward Watson Creek.

The construction and operation of the groundwater extraction and treatment system (as part of the OU1 remedy) will eliminate this pathway of contaminant transport by intercepting the contaminated groundwater, treating it, and discharging the treated groundwater to the Gunpowder River.

The types of CWM disposed at Old O-Field hydrolyze readily when in contact with water, and the hydrolysis products are far less toxic than the original compounds. Therefore, the leaking of CWM from Old O-Field into the groundwater presents no threat to human health.

The potential route of contaminant migration that poses the principal threat to human health and the environment is an air release of CWM resulting from fire, accidental detonation of ordnance, or evaporative release.

5.3 POPULATION AND ENVIRONMENTAL AREAS THAT COULD BE AFFECTED BY THE CONTAMINANTS AT THE SITE

The construction of the Operable Unit 1 (OU1) groundwater extraction and treatment system is presently underway, so workers are located at Firing Position 5 (immediately northwest of Old O-Field). After construction is complete, full-time operators will be present at Firing Position 5 to operate the treatment plant. These personnel will be within 100 yards of Old O-Field.

In addition, workers are present at H-Field (south of New O-Field) and M-Field (north of Old O-Field). These workers are within 1/2 mile of Old O-Field. Large numbers of civilian and military personnel work on the northern Gunpowder Neck and in the industrial areas of the Edgewood Area, which is within 2 miles of Old O-Field.

The residential areas closest to Old O-Field lie approximately 2.7 miles to the north (on-post military housing within the Edgewood Area of APG), 3 miles to the west (Graces Quarters, Maryland) and 4.5 miles to the north-northwest (Edgewood, Maryland, and Joppatowne, Maryland). In addition, Kent County, Maryland, lies 6 miles west of Old O-Field.

5.4 SITE-SPECIFIC FACTORS THAT MAY AFFECT REMEDIAL ACTIONS AT THE SITE

The existence of both live ordnance and CWM at Old O-Field presents serious safety and security concerns. The protection of site workers and the community is of primary importance in this action.

- Ordnance may be shock- or pressure-sensitive, so actions that involve handling of ordnance and direct contact with the field must be minimized and carefully planned. Invasive activities present the risk of accidental detonation and/or evaporative release of CWM.
- White phosphorus is known to be present within Old O-Field. White phosphorus will burn if exposed to air. Therefore, clearing and grubbing of the Old O-Field surface should be minimized.
- Because the disposal and recovery activities have resulted in the creation of underground pits and trenches which may overlap, the surface soil at Old O-Field is believed to be susceptible to collapse. Trench collapse could result in the shearing or puncturing of ordnance or bulk containers, and potential release of CWM. To prevent this, the weight placed on Old O-Field should be minimized and controlled to the extent possible.

6.0 SUMMARY OF SITE RISKS

This section contains an evaluation of human health and environmental impacts associated with contamination in the Old O-Field source area. The Old O-Field source area poses a challenge to risk-based decision making because of the unconventional hazards at the site. The risks cannot be quantified by standard risk assessment techniques. Nonetheless, the existence of a large volume and large variety of unexploded ordnance items, CWM in ordnance and bulk containers, and other items (contaminated equipment and lab samples) pose potential risks to human health and the environment.

The hazard posed by a situation consists of a combination of the probability of an event occurring and the effects of that event, as follows:

Hazard = Probability X Effect

In other words, if an event is not likely to occur (small probability) but the potential effects are very large, then that event may still dominate the total risk posed by the site. In this section, the following information is presented and evaluated:

- Potential explosive risks associated with unexploded ordnance;
- Potential risks posed by the CWM;
- Summary of risks.

6.1 EVALUATION OF EXPLOSIVE HAZARD AT OLD O-FIELD

The expected frequency and magnitude of a potential explosive event is evaluated in this section. An explosive event consists of the unplanned detonation or burning of an explosive. The key factors that may lead to an explosive event are shock/pressure, condition of the explosive, thermal effects, and time.

The historical data concerning Old O-Field include documentation of a number of explosive/thermal events. In addition, it is likely that a number of undocumented events have occurred, and the explosive reaction of a small item of ordnance may go unnoticed. However, based on available data and judgment concerning the stability of the field, it has been estimated that the expected frequency of explosive events at Old O-Field is 1 to 3 events per ten-year period (APG, 1994b).

6.2 EVALUATION OF CWM HAZARD AT OLD O-FIELD

Historical data regarding disposal and recovery activities at Old O-Field have been evaluated to assess the relative amounts of CWM currently within Old O-Field. Because the data may be incomplete, quantitative estimates cannot be derived with total accuracy. However, based on the Old O-Field historical records and the Army records on testing and use of CWM-filled munitions, the following estimates on the relative amounts of CWM at Old O-Field have been made:

- Approximately 90% of the CWM-filled ordnance and bulk containers at Old O-Field may contain mustard;
- Between 5 to 10% of the remainder of the CWM-filled ordnance and bulk containers may contain phosgene;

- The remainder of CWM-filled ordnance and bulk containers may contain lewisite and other materials. These other materials may include cyanogen chloride, tear agents, and adamsite.

- A conservative estimate for the potential number of nerve agent-filled ordnance is 0.3% of the total number of ordnance items.

The majority of ordnance items have been buried for more than 40 years.

6.3 RISKS ASSOCIATED WITH ACUTE EXPOSURES TO CHEMICAL AGENTS RELEASED AS A RESULT OF AN EXPLOSION OR SPILL

The history of Old O-Field indicates that explosions and fires have occurred in the past. The nature of the site indicates that, in the absence of site remediation, it is likely that explosions or fires may occur in the future. Furthermore, the potential presence of CWM in ordnance and bulk containers poses the possible hazard of a release of chemical agents to the atmosphere with resulting airborne migration to nearby areas.

Because of the large number of uncertainties concerning the quantity, condition, and location of ordnance within Old O-Field, definitive statements regarding the effect that fires and explosions would have on human health and the environment cannot be made. However, a qualitative assessment of the CWM hazards posed by the field in the event of a fire or explosive release was performed.

If a release occurs, individuals working at the nearby fields (H-Field, M-Field, and New O-Field) would be the most likely receptors. However, human populations in areas considered relatively remote to Old O-Field could potentially be exposed to a vapor cloud. These populations include the following:

- Workers on the Gunpowder Neck and nearby ranges;

- Personnel working within the industrial areas of Edgewood Area and civilians and troops housed at Edgewood Area;

- People involved in commercial or recreational fishing or boating activities on the Gunpowder River or Upper Chesapeake Bay; and

- People living off-post near Graces Quarters and the towns of Edgewood and Magnolia.

The magnitude and duration of exposures depend on the specific situation (e.g., type of release, amount of agent released, type of agent, wind speed and direction, and weather conditions). However, even under worst-case weather conditions, the effects of a release at Old O-Field would most likely not be detected in areas beyond H-Field and M-Field. The more remote off-site locations would not be affected by an explosion or fire event at Old O-Field unless a large quantity of CWM-filled rounds detonate under stable weather conditions, which is highly unlikely.

Even though the likelihood that an explosion or fire would cause adverse human health effects in off-site communities is small, the hazards posed to on-site workers and the environment may be significant.

6.4 SUMMARY OF HAZARDS POSED BY OLD O-FIELD

The contaminant transport pathway that poses the highest risk to human health and the environment consists of a release of CWM as the result of fire or explosion. The probability of such an event is low but not insignificant, and the history of Old O-Field includes a number of unplanned explosion and fire events. In addition, the potential results of a catastrophic event are of such a high magnitude that the possible consequences must be addressed.

The presence of both CWM and ordnance presents the possibility of an explosion with ensuing dispersal of toxic chemicals into the atmosphere. This possibility poses high risks to nearby populations and ecosystems. From numerous discussions with experts knowledgeable about the condition of Old O-Field, the following are potential causes of an explosion at Old O-Field:

- Fire. The exposed rounds on the surface and/or rounds which are just below the surface may detonate if subjected to fire. Because Old O-Field is heavily vegetated and there is a substantial amount of organic detritus on the ground, it is expected that Old O-Field will burn vigorously and that a fire started on any side could consume the field. Although the field is surrounded by a road, the gap (approximately 12 feet on the north, east, and south sides) may not be enough to stop a brush fire. The proximity of Old O-Field to H-Field, where active testing of combat tracked vehicles occurs and where brush fires occasionally are started accidentally, increases the possibility of a fire. The recent addition of a narrow access road along the perimeter of the existing road most likely will not significantly reduce the spread of a fire because in many places, there is no gap between the branches of trees on opposite sides of the road. In addition to the possibility that a fire may start outside the field, it is also possible that a fire could start inside the field. This is due to the presence of white phosphorus and other incendiary materials. When exposed to air (e.g., during trench collapse or soil shifting), white phosphorus will spontaneously ignite. Recent observations suggest that items continue to be exposed through erosion, frost heave, or other mechanisms. The most likely stimulus for explosive release or rupture would be from fires.

- Shock or pressure. Fuzes and initiating devices are far more sensitive to shock or pressure than high explosives. The stockpile configuration of many ordnance items was with a burster and point-detonation fuze. While most of these fuzes would be unarmed, it is possible that a small number of items in Old O-Field have been armed by forces such as historical detonations. Any item with an armed fuze would be very hazardous and sensitive to shock and pressure. In addition, LTC Dickey reported that some of the Japanese munitions originally disposed at Old O-Field used picric acid as bursters. When the picric acid deteriorates into picrate salts, they are shock sensitive. LTC Dickey also reported that there were many metal boxes filled with fuzes; one was accidentally dropped and detonated as a result of the shock from impact with the ground.

- Ordnance Exposure. The processes of erosion, corrosion, and waste settling has resulted in the formation of voids and the structural weakening of portions of the buried waste volume. With continual action of these processes, there will be collapse of material into voids and settling/consolidation of wastes. Erosional holes to the surface may form, exposing white phosphorus ordnance to oxygen and providing a pathway for CWM vapor release. It is also possible that movement of wastes and soil may result in impact, shearing, and crushing of the buried items, which may result in release of CWM from corrosion-weakened items and which could initiate detonation of ordnance items that are sensitive; however, this initiation source is less likely than the thermal ignition hazard. The other possible causes of ordnance exposure at the surface are the following:

• Honeycombing of trenches. The historical aerial photographs show that as available space became more scarce at Old O-Field, the trenches began to overlap. This would result in very unstable soil conditions.

• Density differences. The difference in densities between some types of ordnance and soil sometimes allows munitions to work their way up through the soil, resulting in eventual exposure to the atmosphere.

• Presence of animals. If animals are burrowing through the soil or are allowed to run on top of the filled trenches, their movement may cause the soil to shift.

• Frost/thaw cycles may aid in trench erosion and the mobilization and movement of munitions to the surface.

• Time. The historical records indicate that numerous surface clearance activities have taken place at Old O-Field. However, as documented by the recent surface survey of Old O-Field (Section 2.3), a number of ordnance items are now exposed at the surface of the site due to erosion and trench collapse. As more items become exposed to the air, the threat of white phosphorus-initiated fire and the possible consequences of a fire initiated by any source may be heightened.

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

7.0 DESCRIPTION OF ALTERNATIVES

During the technology screening conducted as part of the Focused Feasibility Study (APG, 1994b), applicable remedial technologies were identified, evaluated, and assembled into remedial alternatives. These remedial alternatives address the following general response actions:

- No Action;
- Limited Action;
- Containment (two alternatives); and
- Permeable Infiltration Unit (PIU).

This section describes the alternatives that were considered for remediating OU2.

7.1 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

As required by the NCP, the selected alternative must be in compliance with all applicable or relevant and appropriate requirements (ARARs). ARARs are the cleanup standards, standards of control, and other substantive environmental requirements, criteria, or limitations promulgated under Federal or State law that specifically addresses a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance of a Superfund site.

Chemical-specific ARARs include State of Maryland standards for air releases of hazardous substances, including some substances which can potentially be emitted from Old O-Field. The State of Maryland also has requirements for particulate emissions in air and the discharge of organic and inorganic analytes to surface water.

Capping involves covering a site to reduce direct human and animal exposure to contaminants and to minimize infiltration of precipitation and subsequent vertical migration. Federal and State regulations set standards for cap requirements when a landfill is permanently closed. These standards would apply to any final remedy in which buried materials are allowed to remain at the site, but would not apply to an interim remedy.

7.2 ALTERNATIVE A: NO ACTION

Under this alternative, no action would be taken to address the source of contamination at Old O-Field. The No Action alternative is intended to serve as a baseline with which to compare the risk reduction effectiveness of the other alternatives that are under consideration. Continued maintenance of existing institutional controls (access restricted by the existing fence system and other institutional controls) are not assumed under this alternative. The land-use condition assumed under the No Action scenario includes unrestricted land use. Because Old O-Field contains munitions, chemical agents, chemicals associated with decontamination activities, and other hazardous materials, the risks associated with the unrestricted land use scenario is unacceptably high. Over a long period of time, the chemical concentrations in the soil may decline due to natural biodegradation, hydrolysis, and leaching, but the site will still pose risks due to UXO and chemical contamination.

The No Action alternative would not involve active treatment or containment. Therefore, there would be no reduction in toxicity, mobility, or volume of contaminants at Old O-Field. There would be no implementation time or cost associated with the No Action alternative because no additional remedial activities would be implemented at the site. Because of the likelihood of an eventual air release of CWM or other air pollutants, this alternative would not comply with chemical-specific ARARs.

7.3 ALTERNATIVE B: LIMITED ACTION

The Limited Action alternative would continue the current restrictions at the site, and would include implementation of the following actions:

- Institutional restrictions;
- Maintenance of existing physical security countermeasures;
- Public education programs; and
- Continued monitoring of site conditions and five-year reviews.

Institutional controls include access restrictions, deed restrictions, and land use restrictions. Access restrictions include long-term maintenance of the existing fence system, use of supplemental physical security countermeasures, and regulations and enforcement to prevent trespassing. Deed and land use restrictions would limit the future uses at the site and require permits, qualified supervision, and health and safety precautions for any activities conducted near Old O-Field. Education programs would be developed to inform workers and local residents of the potential site dangers. Five-year reviews are required by the NCP at all sites where hazardous chemicals remain untreated. Such reviews would analyze available monitoring data to make a determination as to whether additional remedial actions or site controls would be required.

This alternative would provide a minimal reduction in human health risks beyond the risks posed by the baseline conditions (No Action) by limiting future use and development of the affected area through written regulations. Limited Action would include no further actions to reduce or eliminate the source, or to reduce migration. This alternative would be protective of human health and the environment only under undisturbed site conditions. However, this alternative would not reduce the risk of a fire or explosive event and would not be protective in the case of a fire or explosive event with associated air release of CWM.

The Limited Action alternative would not involve active treatment or containment. Therefore, there would be no reduction in toxicity, mobility, or volume of contaminants at Old O-Field. Because of the likelihood of an eventual air release of CWM or other air pollutants, this alternative would not comply with chemical-specific ARARs.

Because no measures to treat or contain the contaminated soil would be implemented, risks would not be reduced beyond the current risks posed by the site. However, the chemical concentrations in the soil may be reduced over many years by natural degradation mechanisms and the continued operation of the groundwater treatment system. The institutional controls proposed for this alternative would not as effective as active engineering controls because these controls could be ignored by individuals unfamiliar with them; however, continued maintenance of the existing fence system and warning signs may provide effective long-term control of human contact with soil contaminants and the surface of the field. Although this alternative would prevent direct contact with the site, it would not mitigate potential impacts of air releases from the site. Because air releases are a possibility, the long-term effectiveness of the Limited Action alternative is uncertain.

Aside from the natural attenuation discussed above, there would be no further reduction in the toxicity, mobility, or volume of the contaminant source at Old O-Field because removal and/or treatment of contaminated materials are not components of this alternative. Mobility of contaminants in bulk or in soil at Old O-Field is uncertain and uncontrolled under this alternative. The potential would remain for spontaneous white phosphorus ignition or UXO detonation with resulting release of contaminants from the site.

In addition, because the surface of Old O-Field would not be covered under the Limited Action alternative, animal intrusion may occur with the potential for the collapse of trenches or the exposure of white phosphorus.

Most components of Alternative B have been implemented and are being maintained at the site. Institutional controls and other provisions of this alternative would likely be effective in minimizing short-term risks. However, given the unpredictable nature of the site, and its past history of spontaneous detonations, this is not certain. Exposures to airborne contaminants could occur if there is a detonation or fire at the site.

All components of Alternative B are feasible and easily implemented. All necessary equipment and materials required for implementation of this alternative are readily available. Administrative implementation of this alternative would require coordination between APG, the State of Maryland, and the EPA to ensure continuity of the long-term management and monitoring of the site.

The cost estimate for this alternative is based on the assumption that groundwater and surface water monitoring at O-Field will be performed as part of the OU1 groundwater remediation and the ongoing RI for O-Field. Capital costs are estimated to be $690,000, and annual O&M costs are $180,000. Total present worth costs for this alternative based on a 30 year (5% discount rate) implementation period are $2,168,000. Maintenance of the existing fence system is included in the annual operating cost for this alternative. Contingencies associated with the alternative would be minimal because the alternative does not include any treatment or design components. Costs could be affected significantly if periodic groundwater or surface water monitoring is included in this alternative.

7.4 ALTERNATIVE C: PERMEABLE INFILTRATION UNIT (PIU)

Under this alternative, the surface of Old O-Field would be overlain with materials that would reduce releases due to fires or explosions, but would be permeable to water. The layer would be designed to allow infiltration of water or the application of solutions through the wastes, thus allowing further testing of processes to treat the soil and wastes. This alternative would work in conjunction with the downgradient groundwater treatment system to promote leaching of contaminants and produce an ultimate reduction in the volume of the wastes.

The PIU would be constructed using sand or other granular materials to reduce the risks from vapor emission caused by fire or explosions, and to act as a barrier between ordnance, wastes, and contaminated soil and the surface environment. A permeable layer of moderate thickness would attenuate the effects from exploding munitions and reduce CWM emissions from the burial pits and trenches. In addition, the layer would tend to flow and fill in gaps if an explosion or collapse of a trench occurs, so repair of the PIU would be simpler than repair of other types of covers. The buried materials would be insulated from the effects of surface fires by the sand or other granular material. In addition, the possibility that exposed white phosphorus would serve as an ignition source would be reduced by isolating the wastes from air contact.

Sand or other mineral-based granular materials would provide resistance to fire/explosive releases, and the layer design would include erosion control layers to prevent wind and water erosion. The permeable structure would not lower the water table and would keep the subsurface moist, which would reduce the possibility of igniting buried white phosphorus.

Other components of this alternative include:

- An air monitoring system would be installed within the PIU to detect the presence of CWM within the pore spaces of the sand.

- A sprinkler system would be constructed on top of the PIU that would be capable of quickly spraying water or other solutions on the PIU. If a CWM release is detected by the air monitoring system, then the sprinkler system would be activated. The water sprayed onto the PIU would form a vapor barrier within the sand to prevent an air release of CWM and would also hasten the hydrolysis of CWM.

- Treatability studies would be performed using the sprinkler system to apply water or other solutions to the PIU. The results of these studies would be used to evaluate the feasibility of enhanced leaching of the contaminants from soil and buried containers to the groundwater. In addition, the surface of the PIU would be monitored to evaluate the rate of subsidence of Old O-Field.

- The ability of the groundwater extraction and treatment system that is under construction for OU1 (contaminated groundwater emanating from Old O-Field) to capture and treat the contaminated groundwater emanating from Old O-Field would be verified. In addition, the effectiveness of the groundwater monitoring program to detect changes in the site hydrogeology and groundwater chemistry would be verified.

The chemical-specific ARARs that apply to this remedial action are surface water criteria and air pollution standards. The quality of surface water in Watson Creek and the Gunpowder River would be protected during the construction of this alternative by implementing proper runoff controls and sediment and erosion control measures. Airborne emission of particulates during the PIU construction would be managed by controlling the moisture content of the sand and gravel. However, there could be a potential for releases of chemical agents and other contaminants from Old O-Field during implementation. Although all pertinent air monitoring requirements would be met and all measures for preventing such releases would be taken, the unpredictable nature of the site does not allow certainties in estimating effects of placing the PIU on Old O-Field.

The PIU would comply with ARARs after implementation. Runoff and erosion from the site would be controlled, thereby protecting nearby surface water quality. ARARs governing atmospheric release of contaminants (especially agents) would be met through the use of an integral air monitoring system combined with emergency response capability (i.e., the sprinkler system) to detect and minimize potential agent releases to the atmosphere.

Implementation of this option would take approximately 12 to 18 months for the design phase and approximately 24 months for the construction phase. These time estimates include regulatory review of the design.

The total capital costs for installation of the PIU (assuming construction as stated) is estimated at $11,041,000. The total annual costs are estimated at $269,000, and the total present worth of these costs, calculated with a 5% discount rate over a lifetime of 30 years, is $15,175,000. Earthen materials, such as sand and gravel, are expected to be brought on site rather than borrowed from elsewhere at APG.

7.5 ALTERNATIVE D: FOAM CAP

This alternative would stabilize the soil and prevent human and animal contact with munitions and contaminated material buried in the disposal pits at Old O-Field by covering the field with spray-on foam, such as a polymerizing urethane foam. A polysulfide coating could be sprayed on the top surface of the foam to prevent degradation of the foam by sunlight. The low density of the foam would result in a relatively small amount of pressure on the trenches and buried items. The foam surface would allow foot traffic and light equipment with minimal pressure applied to the buried materials. This remedy could be accomplished remotely, without excavation or soil compaction, thereby minimizing exposure of workers to the field and the disturbance of the surface and subsurface soil. In addition, the foam cap would prevent air from reaching the buried materials, thus reducing the fire hazard posed by ignition of incendiary materials, such as white phosphorus. The principal drawback of the foam cap is that it would provide little shrapnel resistance in the event of a detonation; however, the likelihood of an accidental explosion or fire occurring is minimized by this alternative.

This alternative would not by itself provide complete protection of human health and the environment. A foam cap would prevent vertical infiltration of water through the contaminated soil and reduce release of vapors to the atmosphere. It is expected that this remedy would greatly reduce, but not eliminate, the mass loading of contaminants into the aquifer. The foam cap would reduce the risks of atmospheric releases of contaminants from the surface of Old O-Field by stabilizing the soil, preventing human and animal access to the field, preventing air contact with the soil, and eliminating infiltration of stormwater through the contaminated soil. In addition, the cap would be constructed of a lightweight material which would reduce the risk of trench and/or thin-walled shell collapse.

Other components of the foam cap alternative would include:

- Air monitoring within the foam/soil interface; and
- Stormwater runoff control.

Implementation of this remedy would prevent the release of CWM and other contaminants to the atmosphere because of the low gas permeability of the cap material, except in the case of a detonation. In this event, containment of the detonation and contaminant vapors would be doubtful because of the likelihood that the foam cover would be breached. The risk, however, of accidental detonation of the munitions would be reduced because the surface soil of the field would be stabilized and the flow of oxygen to the surface of the field would be cut off. The risk of fire at the site would also be reduced, but the effects of a subsurface detonation are unknown. Construction and disposal of the cap would result in the release of VOCs to the atmosphere.

The chemical-specific ARARs that apply to this remedial action are surface water criteria and air pollution standards. The quality of surface water in Watson Creek and the Gunpowder River would be protected during the implementation of this alternative by proper runoff control and implementation of sediment and erosion control measures. Although all pertinent air monitoring requirements would be met and all measures for preventing air releases would be taken, the unpredictable nature of the site does not allow certainties in estimating effects of placing a cap on Old O-Field. Once the cap is safely constructed, it would ensure compliance with air quality ARARs by providing an impermeable boundary to vapor transport from the current surface of Old O-Field, and prevent any contaminated surface runoff to nearby surface water.

If properly maintained, this option would provide long-term soil stabilization and reduction of contaminant mobility. Maintenance would consist of inspecting and periodically repairing the foam layer, maintaining the perimeter fence system, and continued use of the groundwater extraction and treatment facility.

Implementation of this option would take approximately 12 to 18 months for the design phase and 48 months for the construction phase.

For the installation of the foam cap, the costs were estimated considering the use of remotely operated, robotic equipment. The total capital costs are estimated to be $18,421,000, and the total annual costs are estimated at $275,000. With a 5% discount rate, the present worth of total capital and annual costs is $22,647,000.

7.6 ALTERNATIVE E: MULTI-MEDIA CAP

This remedy would consist of the construction of a multi-media cap to cover the surface of Old O-Field. The highly-engineered cap structure would consist of several layers of crushed stone, synthetic fabric sheets, a clay liner, a drainage layer, low-permeability soil fill, and topsoil to support vegetation. Construction of this cap would stabilize the soil and trenches; prevent stormwater infiltration through the source area; eliminate human and animal contact with the surface of the field; reduce the possibility of a fire by cutting off oxygen to the current field surface; and reduce the likelihood and potential effects of accidental detonation and evaporative release. To reduce the overall weight of the cap, a combination of natural and synthetic materials may be used in cap construction. Construction methods would also be tailored to minimize the disturbance of the field, although soil compaction would be needed to form the upper topsoil layer.

Other components of the multi-media cap alternative include:

- An air monitoring system within the foundation layer; and
- Stormwater runoff control and drainage control;

The relatively large weight of this cap would pose a safety concern. Because of the instability of the trenches and the presence of thin-walled munitions and containers within the landfill, it is possible that cap construction would cause collapse of trenches or buried drums within the field. This event, should it occur, could possibly result in shell rupture and release of its contents or may result in the triggering of a pressure-sensitive fuse and detonation of the round. The use of heavy earthmoving equipment on the field may compound this risk. However, if the cap can be constructed without an incident, then it should be capable of providing the desired protection.

The chemical-specific ARARs that apply to this remedial action are surface water criteria and air pollution standards. The quality of surface water in Watson Creek and the Gunpowder River would be protected during the implementation of this alternative by proper runoff control and implementation of sediment and erosion control measures. The air emission of particulates during cap construction would be managed by controlling the moisture content of the multi-media cap construction materials. However, potential releases of chemical agents and other contaminants from Old O-Field during implementation may not be prevented. Although all pertinent air monitoring requirements would be met and all measures for preventing such releases will be taken, the unpredictable nature of the site does not allow certainties in estimating the potential releases and effects of constructing a multi-media cap on Old O-Field. Agent releases to air would be controlled except in the case of detonation or subsidence in which the cap is breached.

If properly maintained, this option would provide long-term soil stabilization and reduction of contaminant mobility. Maintenance would consist of mowing and repairing the topsoil, maintaining the existing fence system, and continued use of the groundwater extraction and treatment facility. Additionally, subsidence caused by settlements in the landfill would be addressed. If the impermeable layers of the cap are breached by ground motions caused by subsidence, the cap would require repair. In this case, contaminants may be released to the air. Effective repair is uncertain and would subject workers to additional risks.

Implementation of this option would take approximately 12 to 18 months for the design phase and 24 months for the construction phase.

If the cap is completed, additional actions, such as maintaining erosion control, or periodic maintenance of the vegetative cover, would not be difficult to implement, although repairing the multiple layers may be difficult if the cap is breached by subsidence or detonation. Periodic monitoring and maintenance would include visual inspection of the entire cap to ensure it is intact, and that erosion controls are functioning properly. Growth of grasses and other vegetation on the top layer of the cap must be controlled to prevent deep root growth, which could compromise the cap effectiveness.

The total capital cost for installation of the cap, assuming construction as stated, is estimated at $11,215,000. The total annual O&M costs are estimated at $460,000. The total present worth of capital and annual O&M costs are estimated at $18,285,000, calculated over 30 years at a discount rate of 5%. Earthen materials, such as sand and gravel, are expected to be brought on site rather than borrowed from elsewhere at APG.

8.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

This section evaluates and compares each of the alternatives described in Section 7.0 with respect to nine criteria used to assess remedial alternatives as outlined in Section 300.430(e) of the NCP. Each of the nine criteria are briefly described below. All of the alternatives were evaluated for their ability to meet the threshold criteria of protection of human health and the environment and compliance with ARARs. The alternatives meet the other criteria to varying degrees. To aid in identifying and assessing relative strengths and weaknesses of the remedial alternatives, this section provides a comparative analysis of alternatives. As previously discussed, the alternatives are as follows:

- Alternative A, No Action
- Alternative B, Limited Action
- Alternative C, Permeable Infiltration Unit
- Alternative D, Construction of Foam Cap
- Alternative E, Construction of Multi-Media Cap

These five alternatives are compared to highlight the differences between the alternatives and to identify trade-offs in meeting the criteria.

8.1 NINE EVALUATION CRITERIA

Section 300.430(e) of the NCP lists nine criteria by which each remedial alternative must be assessed. The acceptability or performance of each alternative against the criteria is evaluated individually so that relative strengths and weaknesses may be identified.

The detailed criteria are briefly defined as follows:

- **Overall Protection of Human Health and the Environment** is used to denote whether a remedy provides adequate protection against harmful effects and describes how human health or environmental risks are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

- **Compliance with ARARs** addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of Federal and State environmental statutes or provides a basis for invoking a waiver.

- **Long-term Effectiveness and Performance** refers to the magnitude of residual risk and the ability of a remedy to maintain reliable protection of human health and the environment, over time, once clean-up goals have been met.

- **Reduction of Toxicity, Mobility, or Volume through Treatment** is the anticipated performance of the remedial actions as employed for each alternative.

- **Short-term Effectiveness** refers to the speed with which the remedy achieves protection, as well as the remedy's potential to create adverse impacts on human health and the environment that may result during the construction and implementation period.

- **Implementability** is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the chosen solution.

- **Cost** includes both capital and operation and maintenance costs.

- **State Acceptance** indicates whether, based on its review of the FS Report and Proposed Plan, the State concurs with, opposes, or has no comment on the preferred alternative.

- **Community Acceptance** assesses the public comments received on the FS Report and the Proposed Plan for the Operable Unit.

The NCP (Section 300.430(f)) states that the first two criteria, protection of human health and the environment and compliance with ARARs, are the "threshold criteria" which must be met by the selected remedial action. The next five criteria are the "primary balancing criteria", and the trade-offs within this group must be weighed. The preferred alternative is that alternative which is protective of human health and the environment, is ARAR-compliant, and provides the best combination of primary balancing criteria attributes. The final two criteria, state and community acceptance, are "modifying criteria" which are evaluated following comments from the FS report and the Proposed Plan.

8.2 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Alternative A, No Action, would allow for unrestricted future land use. For this alternative, no actions would be taken to eliminate, reduce, or control exposures to hazardous materials and contaminants. An unacceptably high level of risk would result. The threshold criterion of protection of human health and the environment would not be achieved by Alternative A.

Alternative B, Limited Action, would provide some protection from contaminants and hazards at the site by maintaining a high level of physical security. These actions would continue to limit site access and direct exposures. Alternative B would pose no additional risks during implementation because no additional construction activities would be undertaken at the site. However, Alternative B would not prevent future releases due to fires, explosions, or even slow leakage from buried containers. Alternative B would result in unacceptable human health and environmental risks to site workers and surrounding populations if a release occurs. Therefore, Limited Action would not meet the threshold criterion of protection of human health and the environment.

Implementation of Alternative C, Alternative D or Alternative E would reduce the potential for release of vapors (CWM and other volatile contaminants) to the atmosphere. Any of these alternatives would prevent direct human and animal contact with Old O-Field, and reduce transport of contaminants in windblown dust or surface runoff. Alternatives D and E would make use of non-flammable or flame-retardant materials and would cut off oxygen to the field, which would decrease the probability of fires. Alternative C would reduce the probability of fires by minimizing the oxygen supply to burnable materials and by maintaining a moist subsurface environment. Under all three of these alternatives, the risk of spontaneous ignition, as well as the effects of a fire, would be reduced. Erosion of the field surface would also be reduced. These alternatives would result in some short-term risks during construction, but these risks could be minimized and controlled by selection of proper construction techniques during the concept design phase. The overall long-term risks would be reduced. Both the extraction system and the treatment system would be evaluated to ensure overall compliance with the groundwater treatment goals.

Alternatives D and E include impermeable cover layers and would prevent vertical infiltration of water through the contaminated soil. Either of these capping remedies would stop or reduce leaching and reduce the transport of contaminants into the aquifer. However, the impermeable covers would lower the water table beneath the field and could potentially interfere with operation of the groundwater extraction system.

Alternative C, the permeable infiltration unit, would enhance degradation and leaching of the wastes. Short-term risks during construction could be controlled by properly selecting application methods during the concept design phase. The permeable layer would stabilize the existing surface of the field and offer increased protection against fires and explosions. The layer would allow infiltration of precipitation and additional water provided by a sprinkler system. Saturation of the permeable layer would reduce CWM vapor emissions. Treatment processes could be tested by adding chemical reagents to the applied water. Continued or accelerated leaching of contaminants would occur, and the leachate would be collected by the groundwater extraction and treatment system. Although somewhat greater flow into the extraction system would be expected, the groundwater treatment plant was designed with the reserve capacity and backup systems to handle the greater flows and potentially higher concentrations of contaminants.

The self-healing properties of the sand is an advantage of Alternative C over Alternatives D and E. Both Alternatives C and D would allow easier repair compared to Alternative D.

In addition, construction of Alternative C would allow greater flexibility in the overall remedial action by allowing for treatability studies to evaluate enhanced degradation of the wastes. Such studies would be difficult or impossible under Alternatives D and E. Alternative C also allows monitoring and evaluation of the rate of subsidence of the landfill.

Alternative D, the impermeable foam cap, would provide some protection of human health and the environment, but would not provide the same level of protection against explosive releases as Alternatives C or E. Construction of this cap would have relatively low short-term risks from explosive hazards because it can be remotely installed. However, construction of the foam cap would release ozone-depleting fluorocarbons and other air pollutants. The foam cap would contain vapors released by leakage of wastes within the disposal site, but would offer little protection against an explosive event below the cap or a large fire.

Alternative E, an impermeable multi-media cap, would provide blast protection similar to that provided by Alternative C. Alternative E would contain vapors and reduce the frequency and severity of fires and explosions. However, construction of a multi-media cap would have higher short-term risks than Alternative C because it would require compaction of materials on Old O-Field. The multi-media cap also would be more difficult to repair because of the more complex structure. Overall, this alternative provides protection of human health and the environment, but to a lesser degree than Alternative C.

8.3 COMPLIANCE WITH ARARS

Compliance with ARARs is a threshold criterion which must be met by the selected remedial action. Alternatives A and B (No Action and Limited Action scenarios) do not meet this criterion because releases due to fires or explosions, with resulting air releases, would not be prevented.

The three remaining alternatives are capable of meeting ARARs. The quality of nearby surface water would be protected by proper runoff control and implementation of sediment and erosion control measures. The emission of particulates during construction would be managed by controlling the moisture content of earthen materials that are placed for Alternatives C and E. Release of VOCs during foam application would be a concern for Alternative D, and will be managed by controlling the amount of spraying per day. Alternatives D and E would meet all applicable requirements for impermeable covers at closed hazardous waste landfills. This ARAR does not apply to Alternative C because it is an interim action to minimize air releases and explosive hazards at the site and is not final site closure.

8.4 LONG-TERM EFFECTIVENESS AND PERMANENCE

Alternatives A and B would not provide long-term effectiveness and permanence. The No Action alternative provides minimal protection of human health and the environment. The Limited Action alternative provides some protection through continuous control of human contact with the source area. However, Limited Action would not stabilize the field, and the possibility of releases by fire/explosion would continue, because the field would remain in an unstabilized and uncontrolled condition.

Alternatives C, D, and E provide varying degrees of long-term effectiveness and permanence. These alternatives would assist in preventing an explosive event, and also would help control the adverse effects if a fire or explosion occurs. Each of these alternatives would stabilize the current surface of Old O-Field and provide a more stable working surface for future investigations and remedial actions. The layers placed over the field surface would minimize the risks of fire from outside sources or from exposed white phosphorus. Each alternative would curtail the supply of oxygen to the wastes, reducing the possibility of white phosphorus ignition. Alternative C also would maintain a moist subsurface environment, which would further reduce the chances of white phosphorus ignition.

Alternative C would provide the best long-term effectiveness in stabilizing the field conditions and reducing the probability of a fire or explosion. This option would provide better stabilization of the field surface than the cap alternatives. Because Alternative C would use granular material as the cover, breaches caused by trench settlements or collapses would be largely self-healing and easily repaired. Once settlement has stabilized, the permeable layer could become the base for a permanent cover or cap. Alternative D (foam cap) would place the lowest loading on the field and would stabilize the surface. Both the foam cap and the multi-media cap may fail if large settlements or collapses occur, although the foam cap would be easier to repair. If settlement occurs and the multi-media cap is damaged, repair of the multi-media cap would be very difficult.

If a significant explosion occurs, Alternative C would provide the best long-term effectiveness and permanence. The sand used in Alternative C would better absorb explosive energy than the rigid materials used in Alternatives D and E. For Alternative E, explosions could seriously damage the layers of this cap, destroying its effectiveness in preventing air releases. Repairing this cap would be very difficult because of the complex layering system and the specialized materials used. Alternative D would be ineffective in containing releases caused by explosions. The foam will melt or burn in the event of a large fire or explosion, potentially destroying major portions of the cap. Repairing smaller damaged areas would be a relatively simple process, but large breaches will be more difficult to repair.

Overall, Alternative C results in the best long-term effectiveness of the three active alternatives. The permeable system would promote degradation of the wastes, and would work well with the groundwater treatment system. The permeable structure would be easier to maintain than the cap alternatives, and would be less affected by settlements or explosions.

8.5 REDUCTION OF TOXICITY, MOBILITY OR VOLUME THROUGH TREATMENT

If possible, alternatives that reduce the toxicity, mobility or volume of wastes through treatment are preferred. Alternatives A and B provide no reduction in contaminant toxicity, mobility, or volume. Alternatives C, D and E will reduce mobility by exercising control over air releases and surface runoff. Alternatives D and E also will reduce mobility by stopping or reducing the leaching of contamination into groundwater, but these actions would not reduce the toxicity or volume of wastes. Alternative C potentially results in reduced toxicity or volume, by promoting interaction of water or added chemicals with the waste materials. However, at this time, the extent to which this will occur is not known.

8.6 SHORT-TERM EFFECTIVENESS

Alternatives A and B do not create any additional risks during implementation because neither alternative would require direct operations within Old O-Field. Alternative A would require no implementation time because no actions are taken. Alternative B could be implemented in a very short time because most of the provisions are already in place at the site.

For Alternatives C, D and E, protection would be achieved as soon as the actions are completed. Alternative C would require 12 to 18 months to design, and approximately 24 months to prepare the site and construct the sand cover. Alternative D would require about 12 to 18 months to design and 48 months to construct the foam cap. Alternative E would require 12 to 18 months for design, and approximately 24 months to prepare the site and construct the multi-media cap.

During construction, each alternative would create disturbances and additional pressure on the field, which would increase the risk of initiating a fire or explosion. This would increase the short-term risks for site workers and surrounding communities. There is an added risk that CWM and other contaminants could be released from Old O-Field during implementation of any of these options. Under Alternative D, workers could be subjected to fluorocarbon exposures during foam application, and the environment would be subjected to the deleterious effects of fluorocarbons.

In terms of loading on the field, Alternative D would create less short-term risk than Alternatives C or E because lighter-weight materials would be used. Alternatives C and E would have potentially significant short-term risks because they require moving and placement of earthen materials above the present surface of Old O-Field. Alternative E would create higher short-term risks than Alternative C because of the larger quantity of material placed and the need for compaction with mechanical earthmoving equipment. It may be possible to place materials under Alternative C without using equipment directly on the field, although this is not possible for Alternative E.

The development of safe and effective ways to construct the remedial action would be an important part of the concept design phase. Site safety, health, and emergency response plans would be developed which minimize all potential exposures to site workers. Although measures for preventing releases and exposures would be incorporated into the remedial design, the unpredictable nature of the site does not allow certainties in estimating effects of constructing any of these alternatives at Old O-Field. These short-term risks must be weighed against the longer-term risk reduction offered by each alternative.

8.7 IMPLEMENTABILITY

Alternative A would be the most easily implemented alternative because it requires no actions at the site and does not require maintenance of existing institutional controls. Alternative B would require no more than continuation and upgrade of the access controls and air monitoring equipment that are in place at Old O-Field. Construction of Alternatives C, D or E at Old O-Field would be complicated by the unique and unknown hazards posed by the site. The stability and foundation conditions of the site are uncertain. Site preparation and construction activities would be necessary in the presence of unexploded ordnance, CWM, and white phosphorus, which may cause dangerous construction conditions.

Between Alternatives C, D, and E, Alternative C would be the easiest to implement and would require the least amount of specialized materials and equipment. All materials required for construction are readily available. Materials placement would require less sophisticated equipment than Alternatives D or E. Required maintenance would be relatively simple, consisting of filling in depressions that form in the sand layer and maintaining the air monitoring and sprinkler systems.

Alternative E would also be implementable. All materials and equipment required for the multi-media cap (foundation materials, synthetic layers, top soil, low ground pressure earthmoving equipment, etc.) could be readily obtained near APG. Maintenance of the multi-media cap would be the most complicated of the three cover alternatives due to the relative complexity of the layering system.

Alternative D would be the most difficult of the alternatives to implement. A foam cap of this size and specialized use has not been previously attempted. The remote and robot-controlled construction methods that have been assumed will enhance safety, but are not readily available. These methods would require development and testing prior to implementation. The foam cap also would require a longer time to construct than Alternatives C or E because of the remote-controlled and innovative equipment used.

8.8 COST

Table 8-1 provides a comparison of the costs of the five alternatives that are under consideration. Total capital, annual O&M costs, and present worth (discount rate of 5%) for each alternative are presented. The progression of total present worth from least expensive to most expensive alternative is: Alternative A (no cost), Alternative B, Alternative C, Alternative E, and Alternative D. Alternative C is the least costly of the three containment alternatives because it requires the least specialized equipment. Alternative E is similar to Alternative C in methods of construction and in some of the materials, but more materials are required for Alternative E. Alternative D is the most costly because of the large quantities of specialized materials and equipment that have been assumed for remote construction of the foam cap and the longer construction time.

8.9 STATE ACCEPTANCE

The Maryland Department of the Environment (MDE), Waste Management Administration, concurs with the selection of Alternative C, Permeable Infiltration Unit (PIU), as an interim action for the Old O-Field source area (Operable Unit 2) at Edgewood. The acceptance of this option is based on the PIU system's resistance to potential explosive events and its ability to detect and mitigate the release of CWM. Additionally, the PIU will provide the opportunity to conduct and evaluate in situ treatment alternatives, monitor long-term stability of the waste, and evaluate the rate of subsidence and physical dynamics of the fill area.

In conjunction with the groundwater treatment system currently being constructed (Operable Unit 1), the PIU will provide isolation of the waste, effectively controlling inhalation and ingestion of contaminated material and the discharge of contaminated groundwater to Watson Creek. Furthermore, the Department considers the permeable material, principally sand, to provide an acceptable "first" layer of cover for the foundation of an impermeable cap, should such an option be considered more practical at a future date.

TABLE 8-1
Comparison of Costs for Old O-Field Remedial Alternatives

Alternative	Description	Costs in 1994 Dollars		
		Capital Cost	Annual O&M Cost	Present Worth (30 years, 5%)
B	• Limited Action	$690,000	$180,000	$2,168,000
C	• Permeable Cover	$11,041,000	$269,000	$15,175,000
D	• Foam Cap	$18,421,000	$275,000	$22,647,000
E	• Multi-Media Cap	$11,215,000	$460,000	$18,285,000

8.10 COMMUNITY ACCEPTANCE

Comments and responses from the July 14, 1994, Public Meeting were transcribed and are included in the Responsiveness Summary (Appendix A). In addition, all written comments received from the community are addressed in the Responsiveness Summary.

8.11 SUMMARY OF DETAILED EVALUATION

Based on the comparison of alternatives that has been conducted in this chapter, the following general conclusions may be drawn:

- Alternatives A and B would not meet the threshold evaluation criteria. Alternative A would provide no protection of human health and the environment. Implementation of Alternative B (continue existing institutional controls, public education, continuous air monitoring, and periodic review of site conditions) would provide incomplete long-term protection of human health and the environment.

- Alternatives C, D, and E would achieve the remedial action objectives by stabilizing the surface, cutting off oxygen to the field, and reducing the risk of fire and explosions at the site. Alternatives D and E would not actively treat the contamination at the site, but would rely on isolation of waste materials within the site to reduce the potential risks.

- Alternative C would provide the best long-term protection of human health and the environment and the best protection against potential agent releases from the site. In addition, Alternative C includes the potential for treatment as a component of the remedy.

9.0 SELECTED REMEDY

Based upon consideration of the requirements of CERCLA, the detailed analysis of the alternatives, and public comments, the U.S. Army, with the concurrence of the USEPA and MDE, has chosen Alternative C, the construction of a Permeable Infiltration Unit, as the most appropriate remedy for OU2 at the Old O-Field source area of Aberdeen Proving Ground, Aberdeen, MD.

The Permeable Infiltration Unit will be composed of sand or other granular materials. This sand layer will cover the entire surface of Old O-Field and be of sufficient depth to reduce both the likelihood and potential effects of an explosive or evaporative release of CWM from the site. The thickness of the PIU would be determined during the remedial design phase to balance the blast-resistant and vapor attenuating properties of the cover versus the risk posed by excess weight on Old O-Field. An air monitoring system will be built into the PIU to allow monitoring for CWM within the pore space of the PIU. A sprinkler system will be constructed that will be capable of quickly wetting the surface of the PIU. In case significant levels of CWM are detected within the PIU, the sprinkler will be activated. In addition, the sprinkler system will be used to conduct a series of treatability studies to evaluate the feasibility of enhanced leaching of the contaminants to groundwater, where they will be captured by the OU1 groundwater extraction system and treated. The subsidence of the field will be monitored to evaluate the stability of Old O-Field and its ability to bear a load.

The OU1 groundwater extraction and treatment system will be reevaluated to ensure that contaminated groundwater emanating from Old O-Field will continue to be captured and treated.

Institutional controls will be implemented to limit access to the site, prevent disturbance of the sand layer, and provide long-term maintenance of the PIU. Land use restrictions will be implemented to limit the future land use of the site and require permits, qualified supervision, and health and safety precautions for any activities conducted at the site.

9.1 REMEDIATION GOALS

The purpose of this interim response action is to control the risks associated with exposure to CWM and other chemicals within the Old O-Field surface and subsurface soil. This response action will control these risks by covering the site with non-flammable materials, minimizing the air flow to the surface of Old O-Field, stopping erosion and stabilizing the soil, providing a blast-resistant layer on top of the ordnance, and providing a vapor barrier to reduce the concentration of CWM from an underground release. Existing conditions at the site have been determined to pose a hazard to human health and the environment at an unacceptable level. Although the possibility of a CWM release is small, the potential effects of a release are large enough to justify the need for an interim remedial action at this time.

To evaluate the feasibility of enhanced in-situ leaching, treatability studies will be performed using the sprinkler system and the OU1 groundwater monitoring system. In addition, the subsidence of the PIU will be monitored to evaluate the ability of Old O-Field to bear a load. These data will be used to evaluate the final remedy for the site.

9.2 COST OF SELECTED REMEDY

The total capital costs for installation of the PIU is estimated at $11,041,000. The total annual costs are estimated at $269,000, and the total present worth of these costs, calculated with a 5% discount rate over a lifetime of 30 years, is $15,175,000. These costs are outlined in Table 9-1. The time and cost estimates for this alternative are highly dependent on several factors, including:

- construction methods;
- health and safety considerations;
- assumptions made for stability/settlements of Old O-Field surface;
- amount of time required for surface investigations/clearance prior to construction;
- assumptions made for topography; and
- delays due to clearance or other range operations.

TABLE 9-1
Summary of Costs for the Selected Remedy
Alternative C: Permeable Infiltration Unit

ITEM	COST
Capital Costs	
Administrative Actions	$50,000
Site Preparation and General Actions	$1,097,000
Surface UXO Clearance	$700,000
Permeable Infiltration Unit Construction	$3,847,000
Long-Term Monitoring	$485,000
Contingencies (60% of Capital Subtotal)	$3,708,000
Engineering & Design (25% of Capital Subtotal plus Contingencies)	$962,000
Permitting & Coordination	$192,000
Annual Operation and Maintenance Costs	
Program Oversight	$78,000
Long-Term Monitoring & Five-Year Reviews	$137,000
Contingencies (25% of Annual Subtotal)	$54,000
Present Worth of Annual O&M (30 years, 5% discount rate)	$4,134,000
Total Present Worth (Capital and Annual Costs, 30 years at 5% discount rate)	$15,175,000

10.0 STATUTORY DETERMINATIONS

The Army's primary responsibility at its NPL sites is to undertake remedial actions that achieve adequate protection of human health and the environment. When complete, the selected remedial action for this site must comply with applicable or relevant and appropriate environmental standards established under Federal and State environmental laws unless a statutory waiver is justified. The selected remedy also must be cost-effective and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Finally, the statutory preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous waste as their principal element should be satisfied, if feasible. The following sections discuss how the selected remedy meets these statutory requirements.

10.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected interim remedy protects human health and the environment by reducing the probability and severity of releases due to fire or explosions, while maintaining a moist subsurface and enhancing degradation and leaching of the wastes. Short-term risks during construction could be controlled by properly selecting application methods during the concept design phase. Alternative C will therefore not present unacceptable short-term risks when weighed against the risks posed if additional action is not taken. The permeable layer would stabilize the existing surface of the field and offer increased protection against fires and explosions. The layer would allow infiltration of precipitation and additional water provided by a sprinkler system. Saturation of the permeable layer would reduce CWM vapor emissions. Treatment processes could be tested by adding chemical reagents to the applied water. Continued or accelerated leaching of contaminants would occur, and the leachate would be collected by the groundwater extraction and treatment system.

10.2 COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The selected remedy, construction of a PIU, will comply with all applicable or relevant and appropriate chemical-, action-, and location-specific requirements (ARARs). The remedy will achieve the chemical-specific ARARs through the use of surface water runoff controls and use of construction methods that minimize the generation of dust. There are no location-specific or action-specific ARARs for this interim remedial action. The ARARs are presented below.

10.2.1 Chemical-Specific ARARs

The State of Maryland has promulgated surface water quality standards and use classifications for surface waters (COMAR 26.08.02) (applicable).

The State of Maryland regulation which sets the primary standard for particulate matter (COMAR 26.11.03) (applicable).

The State of Maryland regulation establishing ambient air quality standards to protect public health and welfare (COMAR 26.11.15) (applicable).

10.2.2 Location-Specific ARARs

None.

10.2.3 Action-Specific ARARs

None.

10.2.4 Other Criteria, Advisories, or Guidance To Be Considered for the Remedial Action (TBCs)

Institutional controls will be implemented to limit access to the site, prevent disturbance of the sand layer, and provide long-term maintenance of the PIU. Land use restrictions will be implemented to limit the future land use of the site and require permits, qualified supervision, and health and safety precautions for any activities conducted at the site.

10.3 COST EFFECTIVENESS

The selected remedy is cost-effective because it has been determined to provide overall effectiveness proportional to its costs, the net present worth being $15,175,000. The estimated costs of the selected remedy are less than the cost of the foam cap and multi-media cap.

10.4 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES (OR RESOURCE RECOVERY TECHNOLOGIES) TO THE MAXIMUM EXTENT PRACTICABLE (MEP)

The Army, EPA, and the State of Maryland have determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner for the source control interim action at Old O-Field. Of those alternatives that are protective of human health and the environment and comply with ARARs, the Army, EPA, and the State of Maryland have determined that this selected remedy provides the best balance of tradeoffs in terms of long-term effectiveness and permanence, reduction in toxicity, mobility, or volume achieved through treatment, short-term effectiveness, implementability, cost, also considering the statutory preference for treatment as a principal element and considering community acceptance. The PIU will allow continued migration of contaminants to the groundwater treatment system, and offers flexibility in the overall remedial action by allowing the performance of treatability studies and subsidence monitoring that will lead to a final remedy for the site.

Excavation and treatment options were considered in the Feasibility Study for this project, and these alternatives were judged as being too dangerous to implement at this time, due to unknown conditions and the risk of release of CWM during invasive activities. Therefore, the alternatives considered in the detailed evaluation consisted of containment options, in addition to No Action and Limited Action.

Without the construction of this remedy, Old O-Field poses the potential threat of an explosion and air release of CWM or the rupture of a buried container and evaporative release of CWM. The possibility of this occurring is small, but not insignificant, while the effects of such an event, should it occur, could be severe. The construction of a PIU will minimize the potential for an air release to occur and will also reduce the effects of such a release.

10.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

The statutory preference for remedies that employ treatment as a principal element is satisfied by this remedial action. Treatability studies of in-situ enhanced leaching will be performed to evaluate the ability of water and other solutions to flush the contaminants from soil. The construction of a permeable infiltration unit will allow rainwater and applied solutions to percolate to the buried materials and continue the natural degradation of the buried materials. Further treatment may be addressed by the final remedy.

11.0 SELECTED REMEDY

The proposed plan for Operable Unit Two, Old O-Field, Aberdeen Proving Ground, Aberdeen, MD, was released for public comment on June 22, 1994. The Proposed Plan identified Alternative C, the Permeable Infiltration Unit, as the preferred alternative. The U.S. Army, USEPA, and the State of Maryland Department of the Environment reviewed and considered all comments received during the public meeting and during the public comment period. Upon review of these comments, it was determined that no significant changes to the remedy, as it was originally identified in the Proposed Plan, were necessary.

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APPENDIX A
RESPONSIVENESS SUMMARY

I. TRANSCRIPT OF THE PUBLIC MEETING

II. RESPONSES TO COMMENTS RECEIVED AT THE PUBLIC MEETING

III. RESPONSES TO WRITTEN COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD

   A. COMMENTS RECEIVED FROM THE ABERDEEN PROVING GROUND SUPERFUND CITIZEN'S COALITION

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RESPONSIVENESS SUMMARY

I. TRANSCRIPT OF THE PUBLIC MEETING

The transcript of the Public Meeting (July 14, 1994) for the Proposed Plan is attached. During the question and answer session, Army, EPA, and State of Maryland representatives responded to questions from the audience.

ABERDEEN PROVING GROUND

PUBLIC MEETING

FOR

OLD O-FIELD SOURCE AREA

MAGNOLIA ELEMENTARY SCHOOL

901 TRIMBLE ROAD

JOPPA, MARYLAND

July 14, 1994

6:30 p.m.

Reported by:

Heather R. McLauchlin

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PROCEEDINGS

BARBARA FILBERT: Welcome to our public meeting tonight. We appreciate your taking the time to learn more about our environmental program. The purpose of this particular meeting is to discuss one of the proposed cleanup actions at the Old O-Field area, which is on the Gunpowder Neck peninsula in Aberdeen Proving Ground's Edgewood area.

I'm Barbara Filbert from the Aberdeen Proving Ground Public Affairs Office. First, I'd like to introduce several people here tonight who can answer questions you might have about this project or others: Mr. Joe Craten, who's Director of APG's Directorate of Safety, Health and Environment; Ken Stachiw, who's Chief of the Environmental Restoration and Conservation Division; John Paul, who's project officer for risk assessments; Cindy Powels, who's the project engineer for O-Field.

Also with us this evening is Steve Hirsh and Kathy Davies from the US Environmental Protection Agency and John Fairbank from the Maryland Department of the Environment. I would also like to point out that Chris Grochowski of the APG Superfund Citizens Coalition is here this evening. The citizens coalition is an active citizens group involved in our environmental cleanup program.

Since this is a required meeting, we have a court reporter present to record all of our proceedings. The transcript from tonight's meeting will be available for your review at the Aberdeen and Edgewood branches of the Harford County Library, Washington College in Chestertown, and Essex Community College in Essex.

After Cindy Powels completes her presentation, we will open the meeting for questions and comment. We have index cards at the entrance of the room. If you didn't already receive one, we'd be glad to give you one. And you can write questions on the card, and we'll collect them at the end of the presentation. However, of course, we will still try to address your verbal questions or comments.

I hope everyone picked up one of the fact sheets that was at the demonstration table back here. It more or less gives an overview of the proposed cleanup actions that we're going to present tonight.

If you have questions on other areas of our environmental program, please see myself or any of the individuals from Aberdeen Proving Ground that I introduced. We will be glad to answer your questions. And if we don't have the answer, we'll certainly get back to you. We also have an information line available twenty-four hours a day. If you're not aware of the number, the local number is 272-8842. For Kent and Baltimore County residents, we have an 800 number. It is 800-APG-9998.

Now I will turn the meeting over to Ken Stachiw, who will give you an overview of APG's installation and restoration program.

KEN STACHIW: Good evening again and welcome to our presentation about Old O-Field. What I'd like to do is perhaps give a setting of what we're talking about to bring the big picture into a narrow focus. Aberdeen Proving Ground has a fairly comprehensive environmental program which we more or less define with four pillars. It is defined by prevention, conservation, compliance and restoration.

Prevention is our attempt to try -- our attempt before a project begins such as to do a test or to do an operation or to build a building or something of this nature. We're increasing the mission capacity of APG. We study it and determine its environmental impact before we actually complete the task.

Conservation is our attempt to manage wildlife and other types of our ecosystem at APG. Frequently the environmentalists get so hung up on hazardous materials that we can't see the forest for the trees so to speak. And we feel that it's very important that we manage life as opposed to just having a sterile environment, you know, chemical free.

We're trying to create something that enhances life and allows life to propagate, you know, both in the Chesapeake Bay and on the terrestrial areas of APG. That's the ultimate goal of the environmental program. It should be the ultimate goal of the environmentalists in general.

Compliance is part of the program that is dedicated toward having all of the emissions and concerns of this nature in compliance with regulations. Things like air pollution control, permits from incinerators, permits from existing landfills, the management and regulation of existing facilities. That's pretty much what compliance is dealing with.

Within the realm of this, things such as the Chem Demil facility falls under this realm. Tonight's topic will not discuss things like the Chem Demil or the stockpile disposal. We're not here to address that particular issue tonight, but if there is sufficient interest, we can always get those people together to have a meeting and discuss that further.

Things such as the UNDEX pond or some other concerns have been raised in the past, or radiation, they are all various topics which are not really what this evening was scheduled for. We don't have the experts assembled for that. We're here to focus on restoration tonight. I'll speak a little bit about that program and then narrow the focus down from that to Old O-Field.

Now, restoration is a program that's designed to take past contamination and restore it back to -- as best we can -- conditions in accordance with various laws and so forth.

Just to give you a history of APG, the Aberdeen area here was first established in 1917-1918 time frame and was dedicated to the use of -- for testing military equipment, testing weapons and the like, as you're probably familiar with, those who live in this area. The Edgewood area was devoted primarily to research and development, testing and production of chemical warfare and related materials, chemical warfare agents. Both, as you can imagine, are highly industrial activities. Both required the use of lots of hazardous materials. And, obviously, both resulted in the use and disposal of various types of hazardous waste, both in the Aberdeen area and the Edgewood area, different types perhaps, but still hazardous.

Back in 1917 through roughly 1970, okay, the environmental laws were not that many. There wasn't that much in the way of regulations for the disposal of hazardous materials at that time. So people did what they thought best at that time in terms of burial or other means of disposal. As time went on and environmental science grew, we began to realize that some of the past activities were not good enough.

They did what was best, and I don't judge their intentions of their hearts. But as it turns out, some of the way they managed their waste products at that time ended up in contamination.

In roughly the mid-80s to late-80s, the EPA charged us to look back in our history and determine what kinds of contamination may have resulted from all our past operations. And we did that, and we did a two-and-a-half year study in both areas.

With the studies -- and you can find these studies in the libraries we talked about at Edgewood and Aberdeen, you can read these studies. And there are the two major studies. They determine in total three hundred eighteen -- roughly -- solid waste management units.

By a "solid waste management unit," I mean a unit with solid -- a location where solid waste was managed, not necessarily disposed, but managed. Okay. A place where they may have stored a rack of drums of solid waste, a place where they may have disposed of something, incinerated something. Primarily the idea being that while solid waste was managed there, the potential exists for there being a release of hazardous materials in that location.

So some of these sites may be no bigger than this table, and some of the sites are as big as this room, and some of the sites are as big as a 30-acre landfill. So there is a whole variety. They are not the same size. Some you couldn't get them on a map because they are so small.

But we do have these, and all of them by regulation, by law, have to be addressed. We don't know whether anything has been released into the environment because of these things or not. But we have to at least investigate, go back, look into them and make a determination as to whether or not something took place that needs to be fixed.

For the sake of management, okay, these were sort of clustered into thirteen study areas. Here's a map of -- you can't tell completely by this map, but it's color coded, the whole map is divided up into thirteen particular units. At each of them we're going to have to do a fairly detailed investigation, and we're regulated by the EPA to come up with a set of documents that defines the problems, okay, presents solutions, works with the public to come up with a final decision, and then an implementation of that decision, and then monitoring. Let me show you a diagram of this.

This is the process by law that we have to go through for these thirteen study areas. The first step is preliminary assessment and site investigation. This is primarily handled by the documents that I talked about that are in the library that identify them.

The next step is what is termed "remedial investigation." And that's where we do in-depth environmental sampling. We sample the ground water. We look at the site, and we determine was there a release to the environment. If there was a release, how far did it go and where is it going to go in the future.

We also do what's termed a "feasibility study." And in this feasibility study, we're determining, okay, now that we know what the contamination is, what is a proper solution to this problem. Will it solve itself. Do we need to dig it up. Do we need to put a barrier around it to contain it. What's the proper solution to this. That's called a "feasibility study."

The feasibility study and remedial investigation also include a thing called a "risk assessment," which helps us determine exactly what we need to do to clean up. It determines the risk involved so we can determine if cleanup is necessary or not.

The end result, of these documents is called the "proposed plan." The feasibility study makes a recommendation and says, We think this is what should happen at this site. The proposed plan tells the world, This is what we propose to do. Does anyone want to change this? Do you have any objections to this? If you do, please speak now and put input into this particular decision-making process.

Once a meeting is held like tonight, information is gathered together, the material comes back to ourselves and the EPA and APG and a decision is made based upon all these things together as to what is the wisest solution to that particular problem and that leads to what is termed a "record of decision." The decision is published in the newspapers saying, Based upon all the studies and input, we think this is the best thing to do in this situation.

At that point, a design is made on whatever the decision is. It's called a "remedial design." That has public review time as well. Once the design is completed and the design is put into place, built, constructed, the remedial action begins.

This could take place in all of six months and be completed. It may take fifteen years for the action to be totally completed. During that time, monitoring is done, as well as a five-year assessment, to see, you know, we thought this was the right move, was it correct indeed. We go back and reevaluate it and make sure the contamination that we proposed to manage in this way is being effectively managed.

If not, then we have to go back and begin the process all over again so to speak, at least to make a determination as to what we need to do to amplify or enhance the system.

If it's working, we bring it to completion. If the site seems to be totally cleaned up, we make a proposal that the thing be considered done.

Now, we're supposed to do this for all of the thirteen study areas. Unfortunately, they are so big and complex, all right, that sometimes it would take years and years and years before we come to a final decision on the entire piece of property that we're trying to deal with.

So the laws allow us to do what are termed "interim actions." Actions which make sense to do now. It's not necessarily the final solution, the most comprehensive solution, but it's something that makes sense to do now while you're coming to grips with the final solution. And that's what we're going to be talking about tonight when we talk about an interim action. It's something that makes sense to do now for environmental protection so that further degradation of the environment and safety is promoted while we're continuing to make a full determination as to what the final solution should be.

The law allows us to do what are termed "interim RODs," and "early action RODs." And that's part of this process. Right now we're in the process of coming to a recommendation decision about a location called O-Field. Cindy is going to describe this to you in depth, but for now, we're just focused on this. And I want to make a point that this is not the only problem here at APG. There are lots of study areas. There are lots of decisions to be made, but this is only one. And we're focusing on this effort tonight. It doesn't mean we're not going to look at what's going on up here, it means we're focusing on this red dot that's Old O-Field tonight.

We're going to try to focus our discussion on that tonight itself. If for some reason you have questions about some of the other sites, we're more than happy to address those perhaps on the side after the meeting or perhaps in our offices later on. We're more than happy to address those. As Barbara said, we have an information line. All you have to do is pick up the phone and ask the question, and we'll get back to you with an answer. So, once again, we'll focus on Old O-Field.

Cindy, are you ready to go now? Okay.

BARBARA FILBERT: As Ken said, Cindy will be giving us an overview of the cleanup actions that are proposed for this particular site. She's been an environmental engineer for over thirteen years, and she joined Aberdeen Proving Ground in 1985. She is responsible for overseeing all actions at O-Field as well as the Westwood area of APG. Now she will give a presentation.

CINDY POWELS: If we leave these lights on, can everyone see okay to read these? If not, just please let me know. If you can't hear me, please let me know.

For my presentation, what I'd like to do is briefly go through a little bit about the location and history of the site and then get into what we've done as far as our feasibility study to look at the hazard assessment, the goals that we want our proposed actions to accomplish, and then look at the alternatives that we evaluated. And then I'll briefly go through a schedule of some of our future activities that we're planning for this site.

As Ken mentioned, the site that we're going to be talking about is called Old O-Field. The O-Field area is, again, located in the Edgewood area about two-thirds of the way down the Gunpowder Neck. We right now are located here at the Magnolia Elementary School. It's about five miles from O-Field to where we are now, just to give you an idea of some distances there.

This shows the O-Field study area, and the O-Field area has two major disposal sites. The Old O-Field area, which is what we're going to talk about today, and then the New O-Field area. Historically these areas were used -- this Old O-Field area was used from the late 1930s until 1953. It's a four-and-a-half acre landfill. It was used for disposal of chemical munitions, chemical warfare agents, wastes from the research and development operations that were conducted in Edgewood. Contaminated equipment was disposed of at the site, and other miscellaneous hazardous wastes. There was also some burning and some detonations that were done in the Old O-Field area.

After this area closed in the early '50s, the New O-Field area was established to get rid of some of the wastes that were being taken out of here, they were being taken here and were being disposed and detonated and open burned. There was also some limited disposal at the new area. We know that the ground water has been contaminated, and it's migrating towards Watson Creek and will then be discharged into the Gunpowder River.

In 1991 we went through this exact process that we're going through now, and we made the decision to treat the contaminated ground water as it's migrating from Old O-Field toward Watson Creek. And the way we're doing that is by installing extraction wells along here in between the landfill site and where the water discharges into Watson Creek. So we're basically stopping that water, taking it out of the ground. We then run it through the ground water treatment plant to remove all the contamination, and that clean water will then be discharged into the Gunpowder River.

Right now we're also continuing environmental studies of the whole area, principally focusing on New O-Field and Watson Creek, and those studies will continue. Today, again, I want to focus on this landfill site here and the feasibility study that we've recently just accomplished.

As I mentioned, the Old O-Field area here, there have been several attempts in the past to clean up this area; however, they have been very limited to mostly disposal and cleaning up of surface debris. There hasn't been a lot of excavation. So a lot of those munitions are still in place out there.

We know there have been several unplanned detonations and fires out there, one of them as late as 1984 where there was a fire. One of the munitions caught fire and set the field on fire.

Because we feel that there is a continuing risk from detonations and from fires on the site, we feel that we need to do something to control those risks, and that's why we conducted this feasibility study to further reduce the risks from these areas.

The first step in the process was to conduct a hazard analysis, and what we did is we used the worst case scenarios and calculated the risk. So any actual risk would be much less than the risk that we calculated. The bottom line is that there is a risk from a fire, from a detonation causing effects to nearby workers and on-post residents. It would take a very large event to occur to actually effect off-post citizens; however, any risks, we feel, are unacceptable. And that's why we want to take these actions to try to protect the public as much as possible.

The chances of a catastrophic event happening are very low. You would have to have the right conditions. You would have to have exact weather conditions to have off-post releases, but, still, we feel we need to do something to prevent those from occurring.

Currently we're addressing the hazard at the site by restricting access to the area. No one has access to the area without going through a lot of health and safety plans being prepared. Security at the area has been upgraded quite a bit recently, and we've got a lot of security measures out there now.

Also, we're installing some air monitoring systems out there around the perimeters of the field. We've got five units that are being installed, one is also already on line. And they will run continuously taking samples every eleven to fifteen minutes. They will be monitoring for nerve agents as well as mustard. Once that's running smoothly, we plan to upgrade that system for other types of chemicals as well. And emergency response procedures are, of course, in place in case there was an incident.

In order to further reduce the risks, our feasibility study established some goals that we want each alternative to meet, and those goals are shown here. Basically we want to make sure we reduce the risks from allowing a fire or a detonation to occur. We want to prevent these things as much as possible. We also want to reduce the risk from evaporation. If something starts to surface out there, we want to prevent evaporation from that leak occurring. Further, we also want to reduce or eliminate any effects if there was a fire or if there was a detonation. So we have not only prevention of a fire or detonation but also a way to try to contain it or control it.

Our next step in our feasibility study was to perform an initial screening of alternatives. We looked at quite a few, and two key factors that we used to evaluate them were whether or not they would protect the public, the workers here, and the environment, not only over time but also during implementation. This is where we construct or implement one of the alternatives and see is it going to protect human health to the workers and to off-site residents and then make sure that the technology was reliable in meeting the goals that we just discussed.

We looked through quite a few alternatives, and some of the ones that we screened out I'm going to go through just briefly. Basically they were eliminated either because they had unacceptably high short-term risks for implementation or because they had questionable or uncertain effectiveness in whether or not they'd be able to meet the goals that I discussed.

Excavation is one option I think all of us would like to see. We'd like to see that thing dug up and go away. But, unfortunately, we feel the risks of doing that are just much too great. And we can't subject either the workers or the off-site residents to the risks involved in trying to excavate this area. You've got munitions which could be explosive. You've got chemical warfare agents. If you had a fire and a release during the excavation, we would be concerned with off-post migration of the chemical agent.

There is a lot of a substance called white phosphorous out there. White phosphorous was used by the military to create smoke. When it's exposed to air, white phosphorous will start burning. It was also used by the military for its effectiveness at causing fires. We don't want white phosphorous starting to become exposed and being in contact with air and catching fire.

There are also other items out there that could be shock sensitive and cause explosions. To excavate, unfortunately, right now would be much too much risk that we wouldn't be able to implement.

Some of the other alternatives that we looked at included various types of explosion resistant caps as well as vertical barriers. The ones that we screened out had unacceptable short-term risk or we are uncertain about their effectiveness.

Other options included cutoff floors, entombment, containment structures. Again, these had questionable effectiveness and/or unacceptable short-term risks.

In-situ treatment was another alternative that we looked at that was screened out. That would be trying to treat the waste in place. And that was screened out because of unacceptable short-term risks and effective technology currently being unavailable.

Off-site treatment was also considered; however, that would have required excavation.

And, finally, ex-situ treatment was considered. That's treatment on-site, but that would, again, require this being dug up. That would require excavation and involve high short-term risks.

The alternatives that we came down to for our detailed evaluation are shown here, and we've got five alternatives here. And I'm going to go through each one in further detail just a little.

The no-action alternative is required by law to be evaluated primarily as a base line for the other alternatives. The limited-action alternative is basically what we already have. It would require long-term monitoring, access restrictions similar to what we have, and land-use restrictions as far as future use.

The next alternative that I want to talk about is what we call a "permeable infiltration unit." It would basically consist of covering the surface with sand which would provide a barrier to animal intrusion, a barrier to oxygen getting to white phosphorous and possibly causing fires. It would help give protection if there was a fire.

Plus, the key feature here that is different than the other two options I'm going to talk about next, is it would allow water to infiltrate or permeate through the sand and through the waste material underneath. And the water then that would go through the sand would then be captured by our ground water treatment plant which is now being installed. And the positive feature here that's a little different than the other two alternatives I'm going to go through is that this would allow us to perform further studies to evaluate, can we do enhanced leaching or enhanced degradation by applying water or solutions on top of the sand to percolate through the waste to encourage the natural degradation that's currently taking place.

Based on what we see now in the ground water, we can see that a lot of these agents are naturally degrading and then going into the ground water, and we're going to pick that up through our treatment system.

This would be considered an interim action because it would require us to further study treating the waste in place through enhanced leaching and enhanced degradation.

This is a cross-section to give you an idea of what this might look like -- and this is just an initial idea. You would have several feet of sand on top of the landfill. The sand would be allowed to fill in the voids where there are trenches, holes, erosion. The sand would tend to fill in these areas and stabilize the surface of the field. We would have the air-monitoring system in here where we would be able to pick up any vapors if there were any in the area. So we would be able to pick them up early and detect them right away.

Then we have more sand. Then we have a geotextile fabric followed by gravel or crushed stone to prevent wind or soil erosion on top of the sand. And then we would have a sprinkler system which we would use so if there is an air release or fire we could quickly quench it by getting a barrier to the site. Plus we could use this to further study ways to treat the waste in place and to encourage the waste to degrade. But that would have to be studied in further detail after we've got the cover installed.

The next option that I want to talk about would be considered a final action, and this would be covering the field with an impermeable foam cap that would not allow water to get through the waste. Basically we would spray a thin layer of polymerizing urethane foam over the surface of the field. This would give us very similar protection as far as preventing a fire or preventing an explosion, but it would not contain a fire or explosion as the sand cover would. We would then have a polysulfide coating applied to the top so that it would not break down.

This would provide the same good protection that the permeable infiltration unit would. The foam would basically cover the field followed by the lining to prevent sun from degrading the foam.

One of the benefits or positive features of the foam is that it's very light weight. It won't create a high load on the field as far as weight. Plus, this is something that could be sprayed on. We won't have to have heavy equipment running over the top of the field, and we would remotely apply that using robotics. However, we would have to remove the vegetation from the site similar to what we would do with the permeable infiltration unit. The short-term risk here would be less because you would not have so much direct work on the field surface itself.

The last alternative that we looked at is a hazardous waste landfill cap which would be constructed to be impermeable, again, to prevent water from infiltrating into the site. This one, again, as the other ones, would help prevent fires and help prevent explosions. This would give us better blast protection than the foam cap but not quite as good as the sand does because the complex layering system would be a little easier to breach than the thick layers of sand.

To give you an idea of what a cross-section might look like through the hazardous waste landfill cap, you would have several feet of crushed sand and gravel at the bottom, followed by geograde for stabilization, and then some more sand. And this would basically be your impermeable layer. You would also have gas venting strips and a drainage system to collect any water that would get through this upper layer which would be soil. And that would be followed by vegetation along the top.

The five alternatives were then evaluated against nine criteria which are already established in the EPA's regulations on conducting feasibility studies. The first one is the most important, which is the overall protection to human health and the environment. The second one we looked at is whether or not the alternative complies with environmental laws and regulations, both state and federal. We also thirdly looked at long-term effectiveness and whether or not it would be a permanent solution to our problem.

Another important criteria was whether or not the alternative would reduce the toxicity and mobility and volume of waste through treatment. Short-term effectiveness was probably one of our most critical criteria we looked at because we don't want to make the risks any greater than they already are. And then, finally, we looked at whether or not we could implement the alternative, whether or not it was feasible.

We also looked at cost. We looked at whether or not the state accepted the alternative. And, finally, we're at this stage which is community acceptance. And that will be evaluated at the end of the public comment period.

We've got a quick summary here which shows the alternatives -- which helps to show the alternative and how we evaluated it against some of the criteria. Of course the no action and limited action are not acceptable because they don't meet the first criteria which is the protection of human health. So they didn't need to be evaluated any further.

The permeable infiltration unit and hazardous waste landfill cap would both meet the criteria because it would give you that blast protection. The impermeable foam cap partially met the requirement because it would not give you as much blast protection. It would still give you good protection as far as preventing a fire or an explosion, but it would not give you the blast protection.

And one of the things that I should have mentioned earlier -- I forgot -- is that any of these options would not only address the imminent explosion hazards, but it would also address the hazards associated with the low levels of contamination that would be in soil, that would be induced in the animals that might be exposed here. I'm not discussing that in great detail because the real high risks would be if there was a fire or an explosion.

As far as federal and state laws, all the alternatives meet those requirements. With regard to short-term risks and short-term effectiveness, all of them have drawbacks. The foam cap would have the least amount of short-term risk because it would be sprayed on by remote techniques without heavy equipment directly on the field.

Next, the permeable infiltration unit which would have some short-term risks but not quite as much as the hazardous waste landfill cap which would have more short-term risk than the other two primarily because it's a more complex layering system, and it would be a little more difficult to install.

The permeable infiltration unit, because we would be applying sand, there would be a lot of techniques that would be evaluated in the concept design that we would be able to evaluate the risks on how best to apply that sand so we could control the short-term risks. For example, we might want to use water to slurry the sand on the field so we wouldn't have to have heavy equipment out on the field. We could use low ground pressure vehicles which would have less direct pressure on the field by distributing the weight more evenly. In addition, we would also consider putting the sand on in layers where you push the sand out before you actually drive out onto the field to apply it.

With regard to long-term effectiveness, the permeable infiltration unit would give you the best blast protection but similar protection as far as prevention. The foam cap would give you the least amount because it would not give you blast protection. And the hazardous waste landfill cap would be somewhere in the middle as far as blast protection, not quite as much as the permeable infiltration unit, but better than the foam cap.

With regard to reducing toxicity and volume of the waste, we felt that the foam cap and the hazardous waste landfill cap only partially meet these requirements because they would reduce the mobility of the waste, but it would not help reduce the toxicity or the volume as would the permeable infiltration unit.

As far as implementation, the permeable infiltration unit would be the simplest and easiest to install. Next would be the hazardous waste landfill cap which is a little more complex because of the layering system. And the foam cap would be very implementable but would only partially meet the criteria because you would have an extra six months involved in developing the technology.

Cost effectiveness, this just shows the capital costs. There would also be operation and maintenance costs, and those would be in the fact sheets for the feasibility study.

Based on our evaluation, we feel that the permeable infiltration unit is our preferred alternative because it gives us the best balance of features with regard to the overall protection of human health and the environment. It would reduce the risk of fires as we've discussed, and it would reduce the risk of detonation as we've discussed. And it would reduce the risks associated with a fire or detonation if one would occur. Plus it would reduce the risk of evaporation.

Also, an added feature to this option would be the fact that you've got an air monitoring system. So if there was an air release, we could try to contain that vapor release. Plus it would allow us to treat the waste in place by encouraging the natural degradation and breakdown of the waste in place.

Our original comment period was scheduled to end September 5th. We've received a request to extend that comment period, and it will be extended to at least September 6th at this point. We'll review the comments as they come in. We plan to try to make our decision early this fall and publish a record of the decision. The immediate remedial design would then be conducted this fall, this winter, and into the summer. And we would hope to get a remedial action -- start accomplishing that in the fall of '95.

Some of the activities which would have to be conducted as part of the design would include some field activities. Of course we'd have to have a health and safety plan prepared in order to go out there which would insure the safety of the on-site workers as well as the community. The types of data to be collected would include topographic surveys, site inspection, soil sampling, as well as physical parameters.

Some of the components of the concept design that

I want to touch on so people are aware of what they should expect when we go to design would be a detailed evaluation of the specific risks that would be involved with each stage of the construction process. We have to look at the risks and say "What is the safest way to do what we need to do?"

I think we would also then select our cap materials and the actual thickness of the cover system based on looking at the hazards and the risk at the site. We would also then select the method for how are we going to remove the vegetation and things like that. Those would all be part of the concept design. We would also do a preliminary work plan to look at how we treat the waste in place and also to look at how the landfill is shifting over time.

Then, finally, the final design would cover any responses that we would get to the concept design as well as the specifications, the cost estimates, the construction schedule, the engineering report and final health and safety plan for implementing that.

In addition to the information that we've gone through today, as Barbara mentioned, there are some documents that are out there in the public libraries, and there is a lot out there. We would encourage you, if you've got questions, to go through those documents, call our information line. We've got information displayed in the back. This is just some more of the information that is in the public record. We've got a fact sheet, and we've got the proposed plan which is a nice concise summary of what we're proposing, and a summary of the feasibility study and the rationale that we went through to come up with this preferred alternative.

Again, those are at the back. I would encourage anyone who's interested to please take one and please give us your input. Public input is very critical to our decision-making process. And that basically concludes my formal presentation. I'll now turn it over to Barbara. I think we want to allow the state and EPA to make a comment.

STEVE HIRSH: The EPA has been working with the Army with Edgewood since about 1986. In 1987 we saw the first feasibility study for the source at Old O-Field, and basically it looked at all the options that Cindy had up here, and the decision at that time was that none of these were developed enough to do anything about O-Field at that time. In 1991, as Cindy said, our ground water ROD was written. At that time it seemed like that was the most critical threat to health and the environment. So a ROD was written and a decision was made to put in that treatment plant. And I want to tell you that the construction of that is ongoing and completion of that is rather close, sometime early in the fall.

Again, in '87 they first looked at this and the Army looked at it again, and we did the hazard assessment. We reviewed all that data, and the EPA believes that the most significant threat for O-Field right now is the explosion threat or a vapor release. We evaluated the excavation option, and something that Cindy didn't mention is that if we could excavate all this waste out of there, we would still have an explosion problem. Right now there is no way to do that. There is no system. There is no off-site disposal facility for that waste.

So at this time the EPA agrees with the Army that this is the right action to take. We concur with it, and we look forward to evaluating the comments that you'd like to submit.

JOHN FAIRBANKS: I'm John Fairbanks. I'm with the State of Maryland. As you can see from Cindy's presentation, O-Field is a very complex and difficult site to work on. The state has been working with the Army and the EPA since 1990. We took a little bite at the ground water. The state views this as a little bite at the source. We've concurred with what the Army wants to do. But like the EPA, we'll certainly consider any of the comments that you have.

BARBARA FILBERT: Now we'll take any comments or questions you might have. Please raise your hand if you'd like an index card to write the question on and get back to us. Or, to make it easier for the court reporter, we do ask that you need to stand up when you state the question and state your name and where you're from before you ask your question. I'd also ask that just one person speaks at a time so the reporter can take everything down. Does anyone have any questions?

CHARLES GRACE: Charles Grace. G-r-a-c-e. I live over in the Joppa area on Joppa Road and Fountain Road. You know, it seems to me in driving here I don't get over into the east side of Pulaski Highway quite as much as the west; however, I see new developments. I see this school. We're setting off like a Love Canal. And it's incredible to me that all the years up through what we are today since 1954, that that existed and that any time we could have had an explosion, we could have had a fire. And all of this is reinforced by what we received from Harford County emergency evacuation plan.

And we're talking about now you're looking at options. Options that may or may not be something that's prudent, and we're looking at the state. They are agreeing to something that they don't know will work. And I guess I'll close on my horn here, but I don't really trust the Army. We had several years ago, you might recall, a chemical area building that was just horrendous in as far as any protection to workers, environment and/or containment.

The Army let two of our Harford Countians hang in the wind, and you might all recall this, right. From that, when I hear this presentation, when I see now that they are going to come and make a decision, how can we possibly at this point -- we, speaking for myself, not say an expert, you know, in design, but how can we possibly confute or refute anything that you have there.

And my ultimate question, those three options, have they been tested? Are they new technology? So I think what I'm saying is that we in Harford County, we honestly, although we love this county, we honestly have been sitting on a powder keg here, and the Army has allowed it.

They have not done one earthly thing, obviously, from their testimony here. And if we may have explosions -- unplanned explosions -- vapors or phosphorous or whatever, then I suggest we all look at that emergency evacuation plan. I think that it should be more than what we have, and we should have a critical analysis from someone that is not connected with the Army, not connected with the state and not connected with the EPA.

CINDY POWELS: Thank you for your comments. I appreciate that input.

BRIAN FEENEY: I have a question. Brian Feeney. F-e-e-n-e-y. And my involvement in this is as the technical adviser to the Aberdeen Proving Ground Citizens Coalition. I hope to allay some of the gentleman's concerns that we are independent of the Army and EPA, and we represent the citizens' concerns. And I will have written comments later.

I just have one simple question now, and that is, the operation and maintenance portion of units one and two may go on for a very, very long time. Have any contingencies been developed or considered for the possibility of global warming causing sea-level rises which might increase the trench area of Old O-Field and might also inundate the treatment system at operable unit one?

CINDY POWELS: I don't know how to say it except that we have not considered that.

BRIAN FEENEY: And would the Army consider that worth looking into and responding to?

CINDY POWELS: At this point in time, it's hard to say whether or not it is. I'd have to talk to our consultants as well and evaluate, you know, what the risks would be if we did have such climate changes, how it would affect the system. I don't know if Nora can add anything more. It's just something brand new.

BRIAN FEENEY: I would like to emphasize that while this may sound out of left field, it's something that the Army Corps of Engineers is already analyzing as relevant to maintaining the superstructure of the United States, the roadways and rails and so forth.

CINDY POWELS: That's a brand new idea that we have not considered. I would imagine that we have not considered that for the other study areas that we're looking at. But I'd certainly like to talk about it some more because I'd like to learn more about it and see how it would apply to some of our study areas.

JOHN PAUL: Cindy, it might be useful for you to tell people how high above sea level the actual O-Field site is.

CINDY POWELS: O-Field is a local high there.

It's about ten to fifteen feet above sea level.

BRIAN FEENEY: What's the elevation of the waste water treatment system?

CINDY POWELS: Similar. I'll say about fifteen feet. I couldn't say for sure, but both that and the ground water treatment system are local highs in the area.

BRIAN FEENEY: A related question is: It's fairly well known as a concern related to sea-level rise, the inundation of hazardous waste dumps up and down the East Coast. And this, of course, would be one of those. And what happens when you have inundation, you have a brand new site of hydrological effects that may affect that site.

CINDY POWELS: It would totally change the ground water treatment system because right now we are influenced by the surface water because it's shallow.

BRIAN FEENEY: And it would have a lot of very complicated effects.

KEN STACHIW: Let me address that. We view this as one of the remedies for a planning stage scenario that projects options that would be either to dig it out and move it, or some sort of institution for utilization. We view this particular step as an interim phase in that direction. Once we're able to put a cap on it, it allows us to be able to maneuver on top of it. The possibility to institute further work or for that matter even in the future having a dig out of that, is much more feasible under any of these scenarios than it is in the current position. So we see that as an interim step in that direction if that's what we end up doing.

BARBARA FILBERT: Are there any other questions? If there are no more questions, I would like to remind you, as Cindy said, the public comment period which began on June 22nd ends on September 6th. Written comments must be postmarked no later than September 6th. They can be sent to Ms. Cindy Powels, Directorate of Safety, Health and Environment, U.S. Army, Aberdeen Proving Ground Support Activity. The complete address is in the fact sheet.

BRIAN FEENEY: I was going to ask you, there was an overhead with a series of task completion dates on them, and it would be helpful if we could see that again.

CINDY POWELS: I think this is what you wanted. If there are no further questions or comments, then this will conclude our meeting. We'll be available afterward at the information display for anyone who has further questions.

BARBARA FILBERT: And there is a short evaluation form in the back of the room, or at the entrance, rather. And we would appreciate if you could just take a minute to fill it out before you leave. Again, thank you for your interest and time in the Proving Ground's installation and restoration program.

(Proceeding was concluded at 8:30 p.m.)

RESPONSIVENESS SUMMARY

II. RESPONSES TO COMMENTS RECEIVED AT THE PUBLIC MEETING

Response to Mr. Grace:

The Army will continue to seek and incorporate the participation of the public in decisions related to the Installation Restoration Program at APG. The Army desires to gain the confidence of the public that their best interests have been considered. Also, the Army wishes to emphasize that the overall protection of human health and the environment is the principal goal of all Army environmental actions.

The remedy proposed for the Old O-Field source area, construction of a Permeable Infiltration Unit, is a new technology that has been developed specifically for this unique site. Based on our best understanding of the physical characteristics of the site and the risks posed by the site, this remedy will greatly reduce the possibility that dangerous chemicals will be released from the site in the future. The remedy will accomplish this by stabilizing the site, minimizing the possibility of a fire of explosion, providing blast protection, and attenuating any vapors that could be released from the site. This remedy also allows the Army to continue to test more permanent remedial technologies by evaluating the stability of the site and the effect of enhanced leaching of the contaminants from soil. This remedy, although not tested at other sites, offers many advantages over the other technologies considered because it offers better protection of human health and the environment with smaller short-term risks.

Response to Mr. Feeney:

Global warming may certainly have far-reaching effects on environmental actions at APG in the future. As the implementation of the remedies for OU1 and OU2 continues, the Army will consider the effects of a potential rise in the sea level on both the Old O-Field source area and the OU1 treatment system.

RESPONSIVENESS SUMMARY

III. RESPONSES TO WRITTEN COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD

A. COMMENTS RECEIVED FROM THE ABERDEEN PROVING GROUND SUPERFUND CITIZEN'S COALITION

General Comment

Comment: Although APGSCC concurs with the U.S. Army and the U.S. Environmental Protection Agency (EPA) that the Permeable Infiltration Unit (PIU) appears to be the most protective of human health and the environment of the five proposed alternative actions, members of APGSCC continue to have a number of questions and concerns regarding this proposed action. Old O-Field is a very complex site; not only because of the wide variety of toxic as well as explosive compounds present on the site, but also because of the many uncertainties associated with the site. It is difficult to make accurate predictions on many aspects, including the potential for explosions, the human and ecological risk, and the impact of proposed actions on the stability of the site. Thus, APGSCC believes we must proceed carefully and cautiously, being sure that tax dollars are being spent wisely.

Response: The Army agrees that the action must proceed cautiously and that wise expenditure of public funds is paramount. The Army believes that the risk reduction benefits that will result from construction of the PIU on Old O-Field greatly outweigh the short-term risks associated with the construction process. During construction, the risks will be minimized by selection of the safest construction and monitoring methods. After the PIU has been built, it will stabilize the site and minimize the likelihood of an explosive release from Old O-Field. The conceptual design phase for the PIU will evaluate all possible construction methods to control and minimize the risks during construction.

RESPONSIVENESS SUMMARY

III. RESPONSES TO WRITTEN COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD

Comment 1.

Comment: A primary concern of APGSCC is whether the Army has adequately considered the impact of the proposed action at OU2 (i.e. placement of the PIU) on the OU1 groundwater treatments system that is currently being constructed at Old O-Field. It is important to consider the extent to which placement of the PIU will alter 1) the rate and/or direction of flow of the contaminated groundwater and 2) the types and concentrations of chemicals present in the groundwater. Enlargement of the contaminant plume that presently exists under Old O-Field will most likely occur after placement of the cap due to increased pressure from the weight of the sand and due to the additional water that will be pumped onto the field to maintain the desired level of moisture. Will the OU1 groundwater treatment system be able to capture and adequately treat all contaminants emanating from Old O-Field after installation of the PIU? Have estimates been made of the amount of water that will need to be pumped onto the capped area? The effectiveness of the IRA proposed for OU2 is, in large part, dependent upon the efficacy of the OU1 water treatment system. It is not clear to APGSCC that APG has considered all possible scenarios for changes that might be needed in the OU1 treatment plant after placement of the PIU.

Related to this issue is the fact that the Army may also use the OU1 water treatment facility to treat contaminated groundwater from other source areas at APG (e.g. New O-Field, an unnamed site west of Old O-Field and the J-Field Toxic Burn Pits). Citizens must be assured that the OU1 plant will not be loaded beyond capacity, and that any increases in treated gallons/day will not occur at a faster rate than the plant can be redesigned and enlarged.

APGSCC is also concerned about what affects potential explosions may have on the integrity of the OU1 water treatment system and the monitoring wells surrounding Old O-Field. Has the Army considered possible scenarios in this area? If so, please explain in detail.

Response: The potential impact of the proposed action on the OU1 treatment system is a matter of prime importance to the Army. As noted in the comment, the OU1 groundwater treatment system has been overdesigned purposely, and the treatment facility building has been oversized to allow further increase in plant capacity if necessary. Preliminary assessment of PIU operations (including addition of water) indicates that the design capacity of the treatment system will not be exceeded. However, the OU1 groundwater monitoring and extraction systems will be reevaluated during the design phase for the PIU to assess the need for additional wells. This evaluation will be performed in two ways. First, computer simulations of the PIU are being conducted to model the effect of the application of water to Old O-Field on groundwater flow. The model results will be used to plan the locations and depths of new extraction wells, if any are required. Secondly, data will continue to be collected from the existing monitoring and extraction wells to assess the exact changes to groundwater flow direction and changes in contaminant concentrations when water is applied. These data will be used to confirm that the treatment system capacity is not being exceeded.

The preliminary model scenarios have incorporated application rates of water in the range of 20-40 gallons per minute, without yielding significant impact on groundwater flow direction or the water table. Estimates of probable water application rates and the effect on the existing and expanded extraction system will depend on details of the PIU, which will be considered during the design phase.

With the addition of the air stripping and carbon adsorption units, the OU1 groundwater treatment system has evolved into a very flexible system that is capable of handling high concentrations of organic and inorganic contaminants. At present, the capacity of the system is twice what is needed for the OU1 extraction system. Therefore, the Army expects that the OU1 system will be capable of handling the additional load resulting from the addition of the PIU. To ensure that the OU1 system will operate within its limits, the design phase for OU2 will include an evaluation of all credible scenarios and potential effects on the OU1 treatment system. Any required upgrades or changes to the extraction and treatment system will be considered in the OU2 design and implementation.

The Army has considered the possible effects of explosions on the integrity and operation of the groundwater treatment system. For the current condition of the field, it is conceivable, although unlikely, that an explosion could damage the wells or piping systems and temporarily interfere with operation of the system. One of the primary benefits of the PIU is that it will reduce the likelihood that an explosion will take place at Old O-Field. The primary potential cause of an explosion at Old O-Field is fire, and the chance of fire will be minimized by greatly reducing the flow of air to the buried materials through construction of the PIU. Shock or pressure on ordnance are other potential causes of an explosion at the site, and this will be eliminated by placement of the sand, which attenuates transmission of applied forces to the ordnance items. In addition, the design of the PIU will attenuate fragment velocities and blast pressure if an explosion does occur, which reduces or eliminates the damage such an event would cause. Therefore, the PIU will afford protection to the treatment system and wells from an explosive event. During construction of the PIU, contingency plans will be in effect to address any potential effects on the OU1 treatment system.

Comment 2.

Comment: It is very important that a good monitoring program be established following this interim action to assure that placement of the PIU does not cause contaminants to escape from Old O-Field in higher concentrations or via different pathways than those currently under investigation. Groundwater from monitoring wells around Old O-Field and the wells pumping water to the treatment plant must be tested on a regular basis for the full suite of possible contaminants and for all forms of radioactivity to be sure that changes in groundwater contamination are detected early. Additional monitoring wells and piezometers might well be needed to adequately monitor groundwater flow and contaminant migration. Sediments, benthic organisms and pore water from Watson Creek and the Gunpowder River should also be monitored to measure changes in contaminant inputs in areas near Old O-Field. These results will safeguard against increased environmental contamination which could result from changes in the rate or direction of groundwater flow or from a greater release of contaminants from ruptured vessels within the landfill.

Response: The Army believes that a comprehensive program to monitor groundwater, surface water, air, and PIU stability is a critical part of the proposed interim action. As discussed in the response to Comment 1, the ability of the existing groundwater extraction system to capture all of the contaminated water emanating from Old O-Field will be assessed. If needed, the extraction system will be upgraded to ensure capture of the entire contaminated plume, which will be verified by regular performance monitoring of the OU1 system. There is less need to continue monitoring of sediment, benthic organisms, and pore water from Watson Creek and the Gunpowder River because the only transport pathway from Old O-Field to these media, after completion of the PIU, is via groundwater and therefore contaminants will no longer continue to migrate to Watson Creek. In addition, potential contamination within these media is being investigated as part of the overall RI/FS for O-Field.

III. RESPONSES TO WRITTEN COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD

Comment 3.

Comment: APGSCC is concerned about potential radiation contamination within the fenced area of Old O-Field. Historical documents indicate that radioactive waste in the form of animal carcasses were once buried at Old O-Field. Has past sampling in this area included monitoring for radioactivity? If so, what monitoring wells were tested and when did this sampling take place? Was radioactivity ever detected in either soil or groundwater at Old O-Field? If so, what were the levels of radiation found and what background levels were they compared to? APGSCC would like to know whether the Army has ever conducted a thorough search of its Atomic Energy Commission (AEC) or National Radiation Commission (NRC) licenses to determine where radioisotopes were used, stored and disposed of on base.

Response: The historical information indicates that the animal carcasses were removed from Old O-Field shortly after burial there to prevent other animals from digging them up. Therefore, there is no reason to suspect radiological contamination. During the USGS investigation of Old O-Field conducted in 1985-1986, groundwater samples were collected from monitoring wells OF6A, OF6B, OF6C, and OF17A (located downgradient of Old O-Field) and analyzed for gross alpha, gross beta, tritium, and cesium-137. These analytes were not detected at significant levels.

III. RESPONSES TO WRITTEN COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD

Comment 4.

Comment: The stability of the cap placed on Old O-Field is an important issue in the selection of the best alternative as the interim remedial action for the Old O-Field source area. One reason for selecting the PIU cap over the foam and RCRA caps is that damage due to settling, trench collapses, and explosions can be repaired most easily. What consideration has been given to the general stability of the PIU cap? The sand cap will be much more prone to erosion and will probably require a significant amount of 'routine' repair. Has this been adequately calculated into maintenance costs? Will the sand cap be stable enough to function as intended?

Response: The PIU is expected to require smaller amounts of care and maintenance than the other caps under consideration because of its 'self-healing' capability. In the event of a trench collapse or other subsurface movement, the sand will tend to flow and fill in depressions. During construction of the PIU, it is likely that hydraulic compaction will be used, where the sand layer is alternately wetted and allowed to dry. Hydraulic compaction will greatly increase the stability of the PIU. Erosion control will be an integral part of the PIU design. One option under consideration is the use of a geotextile layer on top of the sand to prevent erosion by wind and water, and a layer of gravel on the geotextile to protect it and allow drainage into the PIU. The estimated costs for maintenance of the cap have been included in the cost estimate presented in the Focused Feasibility Study Report.

III. RESPONSES TO WRITTEN COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD

Comment 5.

Comment: APGSCC is concerned that health risks associated with the Old O-Field Source Area (OU2) have not been properly estimated because of the inability of the Army to collect soil samples from within the fenced-in area. The difference in contaminant levels between outside the fence and the center of the 4.5 acre area could be very large. Could robotics sampling methods be used to obtain samples from within Old O-Field? If so, is there a danger that the robotics device might ignite a fire or initiate an explosion that could release chemical agents into the atmosphere? If robotics are not used, what is the degree of danger faced by site workers walking on the surface of Old O-Field?

Response: As discussed in the Focused Feasibility Study Report, the risks posed to human health and the environment by the contaminants in surface soil within Old O-Field are far less than the risks posed by the potential for an explosive release of CWM from Old O-Field. In addition, any action taken to mitigate the explosive risk would also mitigate the risk posed by contaminants in soil. By constructing the PIU on Old O-Field, humans and animals would not be directly exposed to the contaminants. Leaching of contaminants from soil into the groundwater would not pose risks because the groundwater extraction and treatment system would remove the contaminated water from the aquifer and treat it to levels safe for discharge to the Gunpowder River. Therefore, the need to directly sample the field (with the corresponding risks associated with such an invasive activity) is eliminated by construction of the PIU.

The risks associated with direct sampling of soil within the field, even using robotics, are not justified, given that the data collected by such sampling will pertain to the less serious risks (posed by the contaminants in soil), which will be mitigated by the PIU concurrently with the more serious risk of an explosion or fire.

Comment 6.

Comment: APGSCC would like to have the Army make new data that is derived through the ongoing RI/FS process for Old O-Field available to the public in a timely manner. Any changes in the logic of this alternative selection or changes in the implementation of this selected alternative that are suggested by new data must be made known to citizens in time to be included in the public process. For example, APGSCC would like to know more about the contributory role of the other two contaminated O-Field areas, the New O-Field and the unnamed area, and whether the groundwater treatment system will intercept contaminants from these areas.

Response: The Army will continue to make every effort to keep the community and APGSCC informed of new findings at the O-Field area. For example, the draft RI report for Phase I of the ongoing RI/FS effort has been sent to Army, EPA, and State of Maryland reviewers and will be released to the public as soon as review comments have been received by DSHE and addressed. The Focused Feasibility Study report for Old O-Field was sent to APGSCC reviewers immediately after comments by the Army, EPA, and State were incorporated.

The "pit site" is under investigation, initially by performing geophysical surveys and sampling of nearby monitoring wells. From available data, it appears that the groundwater emanating from the "pit site" is not contaminated at levels of concern and is flowing toward the Gunpowder River. The groundwater from the "pit site" will not be captured by the OU1 extraction system as currently designed.

The nature and extent of contamination at New O-Field has been the focus of the Phase I RI effort. Groundwater from New O-Field flows toward the east and discharges into Watson Creek. The current OU1 groundwater extraction system will not capture contaminated groundwater emanating from New O-Field.

Comment 7.

Comment: In the APG fact sheet on Old O-Field, the Army mentions the human population that could potentially be exposed to contamination present at the Edgewood Area of APG. There is no mention of the 10,000+ population in the Joppatowne area, despite the fact that APGSCC has continually brought this oversight to the attention of the Army. The Joppatowne area has a large population that is, in some instances, closer to the contaminated areas at APG than either Edgewood or Magnolia. One cannot help but wonder whether this community is considered when the Army conducts its studies. Such an oversight casts doubt on the thoroughness and thus the credibility of the investigations. Also, without mention of the community in the APG public fact sheet, many citizens in this area may be misled into believing that they are not a potentially exposed population.

Response: In the Record of Decision for OU2, Joppatowne, Edgewood, Magnolia, and Graces Quarters are denoted as the off-post areas closest to Old O-Field. All nearby communities are considered in the risk assessments performed by the Army.

In the Focused Feasibility Study report for Old O-Field (APG, 1994b), preliminary air modeling was performed to assess the risks posed by an explosive release at Old O-Field. It was concluded that the chance that off-post communities could be affected by an event at Old O-Field is very small. It is more likely that nearby on-post areas such as H-Field, N-Field, and J-Field would be impacted due to proximity to Old O-Field.

RESPONSIVENESS SUMMARY

III. RESPONSES TO WRITTEN COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD

Comment 8.

Comment: This interim action, as with so many others, is a "cap it and wait" action because our hazardous waste technologies are not sufficiently developed to handle the chemical wastes present at this site. This is a very important issue that must be addressed immediately. We must place every effort on developing new techniques for treating hazardous wastes if we are to do more than just "contain" our problems. At this time it appears that the Army is willing to wait until the private sector develops new techniques, but there is little incentive for private industries to spend money on treatment systems that are suitable for Army specific chemicals. It is time for the U.S. government to take responsibility and devote resources to this need. In the past, the U.S. government was more than willing to spend money developing, designing and manufacturing the various munitions needed to defend our country. They must now commit their resources to developing final solutions to our hazardous waste problems.

APGSCC would like total clean-up and remediation of APG's hazardous waste sites, not interim, less than ideal solutions.

Response: The Army prefers remedies that effectively mitigate the risks in the long term, and will choose such final remedies where possible. The Army has established research and development programs to develop technologies potentially applicable to CWM and ordnance disposal sites, such as robotic excavation, in situ remediation techniques, incineration of CWM, and others. However, the currently available permanent-treatment technologies pose short-term risks that the Army believes are unacceptably high for application at the Old O-Field site. O-Field poses unique hazards to remedial workers because of the presence of potentially live ordnance and CWM. Although construction of the PIU would not eliminate the risks posed by an explosive release, it will reduce the likelihood that such an event would occur in the future, as well as the possible effects. Many contaminant release and exposure pathways (vaporization of CWM to air, explosive releases, direct exposure to the wastes, and exposure to contaminated groundwater) are removed or minimized by construction of the PIU and the OU1 interim action. For this site, selection of the PIU represents the use of risk management decision-making, whereby the short-term risks have been weighed against the potential long-term risk reduction that would result from stabilizing Old O-Field.

In addition, unlike other capping actions, this interim action includes active elements. The design of the PIU specifically allows and promotes testing of both in-situ treatment and degradation of the buried materials and geotechnical evaluation of Old O-Field to assess future excavation options.

RESPONSIVENESS SUMMARY

III. RESPONSES TO WRITTEN COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD

B. COMMENTS RECEIVED FROM MR. GAIBROIS

Comment 9.

Comment: Question 5 Comments - Alt C 'install a permeable infiltration unit' It is noted that this 'unit' is not specified as a semi permeable barrier which would only infiltration of material in one direction, that the item as described could allow gross transfer of gases and liquids through the barrier. the identification of a infiltration " means that materials can pass through the system. That is not containment of a hazardous waste by RCRA. The use of 'unit' implies a mechanical/chemical device to use top process material. That may be 'treatment' of a hazardous waste IAW RCRA for which a permit would be required.

Response: The PIU has been designed to allow the flow of water down through the unit. This will allow rainwater and other solutions to percolate through the unit and into the buried materials. This process will allow the natural degradation of the buried materials to continue.

For on-site treatment under a CERCLA response action, a permit is not required, although all substantive requirements of such a permit, if issued, would be met by any remedy selected by the Army.

Comment 10.

Comment: Comments and Suggestions - I would recommend a combination of alt ,D. and E. Alt A - no action, and B-limited action are totally not appropriate. With the rejection of Alt A and B, unlimited or full action has already been agreed to by APG, EPA, and the State no matter which alternative is used.

Response: The Army believes that selection of Alternative C (construction of the PIU) offers significant advantages over those offered by Alternatives D (foam cap) and E (multi-media cap). The PIU would stabilize the surface of Old O-Field, minimize the likelihood of a fire and explosive release, and allow the natural degradation of the buried materials to continue. The PIU also offers advantages in ease of construction and maintenance, which reduces the long-term risks even further. Therefore, the Army, with the concurrence of EPA and the State of Maryland, will implement Alternative C.

RESPONSIVENESS SUMMARY

IV. RESPONSES TO SURVEY FORM SENT TO CITIZENS ON THE APG MAILING LIST

Survey forms were sent to over 300 citizens on the APG Installation Restoration Program (IRP) mailing list of interested community members. A total of 45 responses were received during the Public Comment Period. Of the 45 responders, 33 people supported the selection of Alternative C. Several community members indicated no preference among the remedial alternatives, and several people preferred Alternative E.

RESPONSIVENESS SUMMARY

V. RESPONSES TO SURVEY FORM SENT TO ALL TECHNICAL REVIEW COMMITTEE MEMBERS

A total of five responses were received from Technical Review Committee Members during the Public Comment Period. All five responders fully support the proposed action.