

Proposed Plan for

REMEDIAL ACTION

ABERDEEN PROVING GROUND

CARROLL ISLAND/GRACES QUARTERS (OPERABLE UNITS B: CWM AND OTHER HAZARDOUS SUBSTANCES; SERVICE AREA AND WIND TUNNEL AT CARROLL ISLAND; AND SERVICE AREA AND DISPOSAL AREA AT GRACES QUARTERS)

Aberdeen Proving Ground, Maryland

April 2000

This document is intended to comply with the National Environmental Policy Act in accordance with Army Regulation 200-2

INTRODUCTION AND PURPOSE

The U.S. Department of the Army at Aberdeen Proving Ground (APG), the U.S. Environmental Protection Agency (EPA), and the State of Maryland Department of the Environment (MDE) invite public comment on this Proposed Plan for remedial action for Carroll Island's and Graces Quarters' Operable Units B: **Chemical Warfare Materiel (CWM)*** and Other Hazardous Substances. Carroll Island and Graces Quarters are located in the Edgewood Area of APG, Maryland. In addition, the public is also invited to comment on the adequacy of removal actions conducted at the Service Area and Wind Tunnel at Carroll Island, and the Service Area and Disposal Area at Graces Quarters. The proposed remedial actions for Operable Units B are discussed in Section I of this document, and the removal actions are discussed in Section II.

I. PROPOSED REMEDIAL ACTIONS FOR OPERABLE UNITS B

The Proposed Plan describes the alternatives analyzed for Operable Units B, identifies the preferred alternative to reduce the risks posed by the areas, and provides justification for this initial recommendation. An operable unit is a discrete part of an entire response action. It can be defined as a certain geographic portion of the study area or as one environmental medium at the study area. The plan is intended to summarize, for public review, the conditions at these sites and the comparative analysis

of different methods for site remediation. It provides the public with information necessary to participate in selecting the most appropriate remedy for Carroll Island's and Graces Quarters' Operable Units B (hereinafter referred to as the Operable Units B).

The remedial alternatives evaluated were Alternative 1, No Action; Alternative 2, Public Access Controls with Land Use Restrictions; and Alternative 3, Public Access Controls, Land Use Restrictions, and Erosion Controls. The preferred alternative is Public Access Controls, Land Use Restrictions, and Erosion Controls. Alternative 3 is protective of human health and the environment; provides long- and short-term effectiveness; reduces the mobility and volume of hazardous constituents; and complies with all **Applicable or Relevant and Appropriate Requirements (ARARs)**. The Army is the Lead Agency for this Action. This document is issued by the Army (the site owner) with the concurrence of EPA (the lead regulatory agency for site activities) and MDE (the support agency for the sites). Following public review and comment, the Army and EPA, in consultation with MDE, will select a remedy for the Operable Units B in a **Record of Decision (ROD)**.

The Army issues this Proposed Plan as part of its public participation responsibilities under Section 117(a) of the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)** as amended by the **Superfund Amendments and Reauthorization Act (SARA)**, commonly known as the "Superfund Program" and the **National Environmental Policy Act (NEPA)**.

* This document includes a glossary of terms in bold type.

The Proposed Plan summarizes information that can be found in greater detail in the **Feasibility Study (FS) Report**, the FS Addendum, and other documents contained in the **administrative record**. The public is encouraged to review these documents to gain a more comprehensive understanding of the site and the environmental activities conducted to date. Although the Proposed Plan highlights key information from the FS Report and the FS Addendum, it is not a substitute for these documents.

A previous version of the Proposed Plan was completed in July 1998. The previous Proposed Plan and the FS Report evaluated Alternative 1, No Action, and Alternative 2, Public Access Controls with Land Use Restrictions. The FS Report and the previous Proposed Plan identified Alternative 2 as the preferred remedial alternative. A public meeting on the previous Proposed Plan was held on July 29, 1998. Most public comments received by the Army on the previous Proposed Plan agreed with the selection of Alternative 2 as the preferred remedial alternative. However, several comments requested that other remedial alternatives also be considered. The FS Addendum was subsequently prepared in response to requests by the Aberdeen Proving Ground Superfund Citizens Coalition (APGSCC) and local residents that erosion control measures be considered for reducing the risks associated with buried CWM and other hazardous substances, including unexploded ordnance (UXO). Therefore, Alternative 3, Public Access Controls, Land Use Restrictions, and Erosion Controls was evaluated in the FS Addendum, and compared to the other two alternatives considered in the FS Report and the previous Proposed Plan.

The administrative record, which contains the information used to select the response action, is available for public review at the following locations:

Harford County Library – Aberdeen Branch
21 Franklin Street
Aberdeen, MD 21001
(410) 273-5608

Harford County Library – Edgewood Branch
2205 Hanson Road
Aberdeen, MD 21004
(410) 612-1600

Kent County – Washington College
Miller Library
Chestertown, MD 21620
(410) 778-2800

Based on new information that may become available or on public comments, the Army, in consultation with EPA and MDE, may modify the preferred alternative outlined in this plan. Therefore, the public is encouraged to review and comment on all the alternatives discussed herein.

A public comment period will extend from April 26 to June 10, 2000. This period will include a public availability session during which the Army, EPA, and MDE will present information on the sites and answer questions. The availability session is scheduled for May 11, 2000 at 6:30pm at Oliver Beach Elementary School.

The Operable Units B require remedial action because wastes that pose a threat to human health and the environment are potentially present at these locations. They have been designated for action because there exists the future potential exposure or transport of these wastes to the surrounding environment and the Chesapeake Bay.

SITE BACKGROUND

APG is a 72,500-acre Army installation located in southern Harford County and southeastern Baltimore County, Maryland, on the western shore of the Upper Chesapeake Bay.

The installation is bordered to the east and south by the Chesapeake Bay; to the west by Gunpowder Falls State Park, the Crane Point Power Plant, and residential areas; and to the north by the towns of Edgewood, Joppa, Magnolia, and Aberdeen. The Bush River divides APG into the Edgewood Area to the west of the river and the Aberdeen Area to the east. Carroll Island and Graces Quarters (Figure 1) are located in the Edgewood Area, which is listed on the National Priorities List. The National Priorities List is EPA's list of hazardous waste sites in the United States considered priorities for long-term remedial evaluation and response.

Carroll Island is a low-lying, flat, largely undeveloped island located approximately 1 mile south of Gunpowder Falls State Park. It is separated from the mainland by a dredged channel created for the Crane Point Power Plant located directly west of Carroll Island. A single road and bridge located near the Crane Power Plant provide the only connection between the mainland and the island. Access to Carroll Island is controlled by chain link fences, a locked gate, and patrols by military police. A network of paved and gravel roads run across the island.

FIGURE 1

Carroll Island is approximately 855 acres in size, of which approximately 659 acres (80 percent) is classified as wetlands. The land mass consists of tidal and nontidal wetlands, open fields, and wooded areas. Elevations range from 0 to 13 feet (ft) above sea level. Carroll Island is poorly drained, and ephemeral ponds and isolated marshes form during storm events.

Graces Quarters is a peninsula located approximately 1 mile north of Carroll Island. Access to the property is controlled by chain link fences, a locked gate, and patrols by military police. Paved and gravel roads are present on the peninsula. The only current permanent large structure is an emergency radio transmitter and tower originally constructed by the Federal Emergency Management Agency. Graces Quarters covers 414 acres, of which approximately 151 acres (36%) is classified as wetlands. The land mass consists of tidal and nontidal wetlands, open fields, and wooded areas. Maximum elevation is approximately 40 ft above sea level.

Carroll Island and Graces Quarters were acquired by the Army in 1918, but there is no evidence that military operations took place until 1944. At that time, preparations were made to use portions of Carroll Island and Graces Quarters as impact areas (for testing explosive and pyrotechnic materials) and CWM test sites. Based on the historical uses of Carroll Island and Graces Quarters, the principal contaminants that could be present include CWM, explosives, and associated degradation products. In addition, other contaminants that could potentially be present include volatile organic compounds, semivolatile organic compounds, pesticides/polychlorinated biphenyls, and inorganics. Even though thorough environmental investigations have been conducted at Carroll Island and Graces Quarters, some wastes associated with testing and support activities may not have been located/identified, due to the difficulty of detecting these wastes with existing technology.

Historical Uses of Carroll Island and Graces Quarters

Carroll Island

In 1944, preparations were made to use portions of Carroll Island as impact areas and CWM test sites. In the 1940s, Carroll Point and the area north of Lower Island Point (referred to as the 1,000-yard impact area) were cleared and prepared for use as impact areas. Carroll Point is reported to have been used as an impact area for white phosphorus (WP) and high

explosives (HE). A portion of the 1,000-yard impact area was constructed with a board effect field, which was used to measure the effects of 4.2-inch (in.) chemical mortar fire. The 4.2-in. mortars likely contained HE and WP.

CWM field testing was conducted at various locations at Carroll Island from the late 1940s through 1969 for lethal agents and through 1971 for riot control agents, simulants, and smoke. An area of Carroll Island later occupied by portions of Test Grid 1 (Site 3, EACI05-A) and Aerial Spray Grid (Site 6, EACI04-A) was cleared of vegetation during the late 1940s (see Figure 2 for site locations). It was referred to as the sand flats and was used as a CWM test area (probably including flame thrower tests) and possibly as an impact area. **Surveillance testing** of mustard-filled munitions was also performed at known and unknown locations on Carroll Island during the 1940s and/or early 1950s. One of these locations may have been in the vicinity of the 3-quinuclidinyl benzilate (BZ) Test Burn Pit (Site 7, EACI04-D). The mustard (HD) Test Area (Sites 15 and 16, EACI07-C) was used for ground contamination studies that included mustard. It is known (through interviews) that some time before 1964 a series of tests involved the release of mustard by detonating land mines in the HD Test Area. Other primary test areas included Wind Tunnel (Site 5, EACI06-A), Test Grid 2 (Site 4, EACI07-B), ortho-chlorobenzolmalononitrile (CS) Test Area (Site 12, EACI06-D), and o-ethyl-s-(2-diiso-propylamino-ethyl) methylphosphonothioate (VX) Test Area (Site 2, EACI07-A). Other testing locations were identified in and around these locations.

Detailed records are available for testing activities at Carroll Island only after 1964; these records are in the form of handwritten notes made by test engineers. According to the notes, all types of agents were tested at the following primary test areas after 1964: Test Grid 1, Test Grid 2, Aerial Spray Grid, and Wind Tunnel.

Wastes from testing activities were decontaminated before being disposed of by dumping or burial at Carroll Island. Procedures specified that no explosive items or items containing CWM were to be disposed of before being decontaminated. Common decontaminating agents used were Super Tropical Bleach and decontaminative agent noncorrosive (DANC). In 1969, the outdoor testing of lethal CWM at Carroll Island (e.g., nerve and blister agents) ended. All outdoor testing at the site ended in 1971. In 1975, decontamination pits for burning items from the decommissioned CWM testing facilities were

FIGURE 2

constructed in the central portion of Carroll Island. No ongoing military testing activities are currently conducted at Carroll Island.

Graces Quarters

Documentation on the use of Graces Quarters before the 1940s is limited. The 1938 aerial photograph shows land use at Graces Quarters as cultivated fields, wooded areas, and tidal marsh. During World War II, Graces Quarters was designated as an impact area for testing 4.2-in. mortars. The area later designated as the Primary Test Area reportedly was used as the impact area (see Figure 3 for site locations). The 1948 aerial photograph shows signs of activity in this area with the presence of two or three buildings, a bare soil area, and a dock near former housing units. Graces Quarters was also used as a firing point for mortar fire toward M-field located to the east across Gunpowder River. A timber and sandbag bunker was constructed in the northern portion of Graces Quarters as a control point during its use as an impact and firing area. The bunker currently is a water-filled depression. It is probable that the testing included only high-explosive and smoke-filled rounds (using WP).

Detailed records of testing at Graces Quarters are available only for the period between 1964 and 1971 in the form of handwritten notes by test engineers. However, it is known that testing was conducted before this time. The outdoor testing of lethal CWM at Graces Quarters ended in 1969. The bulk of the CWM testing took place at the Primary Test Area located in the middle of the peninsula along the eastern shoreline. A small amount of testing was also conducted in the small wooded area Southwest of the Primary Test Area. The HD Test Annuli located north of the Primary Test Area were used in decontamination studies with HD, VX, and fuming nitric acid. Surveillance testing was conducted in the small area southwest of the Graces Quarters Disposal Area. A small amount of testing was also conducted in the Graces Quarters Disposal Area.

Compounds used at Graces Quarters included HD, VX, CS, isopropylmethylphosphonofluoridate (GB), and pinacolylmethylphosphonofluoridate (GD). Wastes from testing activities were disposed of by dumping or burial, primarily at Graces Quarters Disposal Area. As with Carroll Island, no ongoing military testing activities are currently conducted at Graces Quarters.

SCOPE AND ROLE OF OPERABLE UNITS

Separate **Remedial Investigations (RIs)** were conducted at Carroll Island and Graces Quarters. Based on the results of the RIs, two Operable Units were developed for both Carroll Island and Graces Quarters:

- **Carroll Island, Operable Unit A: Disposal Pits**

Thirteen sites were discovered on Carroll Island, which were expected to contain waste from testing activities, based on historical information, visual observations, and geophysical surveys. There was a concern about buried wastes resulting in contaminant migration from these sites to the surrounding environment because of the shallow water table, flooding, and shoreline erosion. Therefore, a **Focused Feasibility Study (FFS)** was conducted to address these disposal pits. The results of the FFS concluded that excavation of the pits was necessary. As discussed further in the following section, removal actions being performed for Operable Unit A: Disposal Pits have been addressed separately from the plan of action for Operable Unit B.

- **Carroll Island, Operable Unit B: CWM and Other Hazardous Substances**

Carroll Island was used for impact areas and CWM test sites from 1944 to 1971. Wastes from testing activities were disposed of by dumping or burial at numerous sites. The likely locations of some of these sites have been identified from historical information, visual observations, and geophysical surveys. As indicated previously, the identified sites that were of greatest concern were included in Operable Unit A for accelerated evaluation. Carroll Island is approximately 80 percent wetlands, and even though thorough environmental investigations have been conducted, all the wastes associated with testing and support activities could not be located/identified because of the marshy areas and heavy vegetation. Operable Unit B encompasses the entire island to ensure protection of human health and the environment from potential CWM and other hazardous substances. Therefore, Operable Unit B includes any unidentified sites that might contain CWM and other hazardous substances, as well as some identified sites with low potential for contaminant migration or significant environmental impacts.

FIGURE 3

- **Graces Quarters, Operable Unit A: Contaminated Groundwater Associated with the Primary Test Area**

Based on the results of the RI and risk assessment, concentrations of chlorinated solvents in the groundwater, primarily 1,1,2,2-tetrachloroethane and carbon tetrachloride in the vicinity of the Primary Test Area (Site 5, EAGQ02-C), warrant remediation. An FFS is being prepared to address the contaminated groundwater.

- **Graces Quarters, Operable Unit B: CWM and Other Hazardous Substances**

The southern portion of Graces Quarters was used as an impact area during World War II. Riot control, CWM, smoke, and simulants were tested on the peninsula from the early 1950s to 1971. Thorough environmental investigations have been conducted; however, Graces Quarters is densely vegetated in some areas and contains wetlands in others, and all the waste associated with testing and support activities from the past could not be located or identified. Operable Unit B encompasses all of Graces Quarters to ensure all CWM and other hazardous substances that have not been located are addressed.

Operable Units B for Carroll Island and Graces Quarters were combined because of the similarity of environments, contaminants, and potential remedial actions. Operable Unit A: Disposal Pits at Carroll Island and Operable Unit A: Contaminated Groundwater at Graces Quarters are being addressed separately from the plan of action for Operable Units B.

This Proposed Plan recommends a plan of action to prevent human exposure to and migration of contaminants from Carroll Island and Graces Quarters. This recommended plan of action has been developed because it is still possible that sporadic contamination exists at both areas (from small disposal areas and individual buried munitions), but could not be found using existing technology. Nevertheless, there are no additional *positively*-identified areas that contain CWM or other hazardous wastes on Carroll Island and Graces Quarters.

IDENTIFICATION OF ENVIRONMENTAL CONTAMINATION AND SITE RISKS

Initial screening and records review identified 31 sites to be included in the Carroll Island RI, and 17 sites in the Graces Quarters RI. These sites are listed below, together with their Site and Cluster

identification numbers presented in the RI reports, and their Defense System Environmental Restoration Tracking System (DESERTS) numbers. The sites investigated in the Carroll Island RI, which are shown on Figure 2, are as follows:

- Bengies Point Road Dump (Site 10, Cluster 1, EACI01-A)p
- AOC Associated With Bengies Point Road Dump (Site 10, Cluster 1, EACI01-D)
- Bengies Point Road Farmhouse (Site 18, Cluster 1, EACI01-B)
- Old Carroll Island Road Dump Site (Site 19, Cluster 1, EACI01-C)p
- Service Area (Site 13, Cluster 2, EACI02-A)p
- AOC Associated With Service Area (Site 13, Cluster 2, EACI02-C)p
- Dredge Spoil Site (Site 14, Cluster 2, EACI02-B)
- EPG Dump Site (Site 9, Cluster 3, EACI03)p
- Aerial Spray Grid (Site 6, Cluster 4, EACI04-A)
- AOC Associated With Aerial Spray Grid (Site 6, Cluster 4, EACI04-A)p
- BZ Test Burn Pit (Site 7, Cluster 4, EACI04-D)p
- Decontamination Pits (Site 8, Cluster 4, EACI04-B)p
- AOC Associated With Decontamination Pits (Site 8, Cluster 4, EACI04-C)
- Adamsite Burial Site (Site 20, Cluster 4, EACI04-C)
- Hawthorn Cove Road (AOC, Cluster 4, EACI04-C)
- Test Grid 1 (Site 3, Cluster 5, EACI05-A)
- AOC Associated With Test Grid 1 (Site 3, Cluster 5, EACI05-E)p
- Magazine Area (Site 11, Cluster 5, EACI05-B)
- Animal Shelter (Site 17, Cluster 5, EACI05-C)
- Test Grid 1 Disposal Area (Site 21, Cluster 5, EACI05-A)p
- Woods East of Test Grid 1 (AOC, Cluster 5, EACI05-D)
- Wind Tunnel (Site 5, Cluster 6, EACI06-A)
- UST at Wind Tunnel (Site 5, Cluster 6, EACI06-C)
- CS Test Area (Site 12, Cluster 6, EACI06-D)
- AOC Associated With CS Test Area (Site 12, Cluster 6, EACI06-E)
- Woods North of Wind Tunnel Road (AOC, Cluster 6, EACI06-B)
- VX Test Area (Site 2, Cluster 7, EACI07-A)
- Test Grid 2 (Site 4, Cluster 7, EACI07-B)
- HD Test Areas (Sites 15 and 16, Cluster 7, EACI07-C)

- Woods South of Wind Tunnel Road (AOC, Cluster 7, EACI06-B)p
- Animal Shelter Woods (AOC, Cluster 7, EACI06-B)p
- Lower Island Disposal Area (Site 1, Cluster 8, EACI08).p

Thirteen of these sites at Carroll Island (designated by an asterisk) were included in Operable Unit A for accelerated evaluation, due to the likelihood that they contained CWM or other hazardous substances, based on historical information, visual observations, and geophysical surveys. As discussed further below, these 13 sites have been remediated. The results of the Baseline Human Health RA presented in the Carroll Island RI indicated that no unacceptable risks or hazards are associated with any of the other 18 sites, and that no further action would be required for those individual sites. However, all 31 sites investigated in the Carroll Island RI were incorporated into Operable Unit B, due to the *potential* presence of CWM or other hazardous substances throughout Carroll Island.

The 17 sites investigated in the Graces Quarters RI, which are shown on Figure 3, are as follows:

- Graces Quarters Disposal Area (Site 1, Cluster 1, EAGQ01-A)
- AOC Associated with Graces Quarters Disposal Area (Site 1, Cluster 1, EAGQ01-A)
- Graces Quarters Dump (Site 4, Cluster 1, EAGQ01-B)
- AOC Associated with Graces Quarters Dump (Site 4, Cluster 1, EAGQ01-F)
- HD Test Annuli (Site 6, Cluster 1, EAGQ01-G)
- Secondary Test Area (Site 7, Cluster 1, EAGQ01-I)
- The Bunker (Site 9, Cluster 1, EAGQ01-C)
- Test Huts (Site 12, Cluster 1, EAGQ01-H)
- FEMA Service Area (Site 13, Cluster 1, EAGQ01-D)
- FEMA Bunker (Site 14, Cluster 1, EAGQ01-E)
- Northern Perimeter Dump (Site 2, Cluster 2, EAGQ02-A)
- Southern Perimeter Dump (Site 3, Cluster 2, EAGQ02-B)
- Primary Test Area (Site 5, Cluster 2, EAGQ02-C)
- Southwest Perimeter Dump (Site 10, Cluster 2, EAGQ02-B)
- Service Area (Site 8, Cluster 3, EAGQ03-A)
- AOC Associated with Service Area (Site 8, Cluster 3, EAGQ03-C)

- Dugway Proving Ground Test Site (Site 11, Cluster 3, EAGQ03-B)

Based on the results of the Baseline Human Health RA, the Graces Quarters RI concluded that no further action would be required for these individual sites. However, all of the above 17 sites were incorporated into Operable Unit B at Graces Quarters, due to the *potential* presence of CWM or other hazardous substances throughout Graces Quarters.

The Graces Quarters RI also recommended that additional soil samples be collected at the Test Huts (Site 12, Cluster 1, EAGQ01-H) to “delineate a mercury soil hot spot”, and that a bioaccumulation study be conducted at this site to assess the potential impact of mercury in the soil on ecological receptors. These recommendations have been implemented in a bioaccumulation study conducted by the University of Maryland, using mercury-contaminated soil from the Northeast Test Hut at this site. In this study, the bioaccumulation of both total mercury and methyl mercury were investigated in a series of experiments on earthworms exposed to the mercury-contaminated soil. The daily doses of total and methyl mercury ingested by robins and shrews consuming these earth worms were then calculated and compared to risk assessment derived values. The study concluded that the mercury-contaminated soil at Site 12 would not have adverse ecological impacts, and that no further action is required at this site.

RI activities consisted of historical searches, wetlands delineation, ecological investigations, well installations, geophysical and soil gas surveys, environmental sampling, and archeological surveys. An explosive ordnance survey was also conducted along portions of the boundaries of Carroll Island and Graces Quarters in April 1997. Operable Units B were developed based on the knowledge of Carroll Island and Graces Quarters through the RI process and known historical uses of the areas. Since the time environmental restoration activities were started by the Army in 1977, many surface and subsurface disposal areas containing CWM and other hazardous substances have been found through investigations and visual observations. Even though thorough environmental investigations have been conducted, some wastes associated with testing and support activities from past activities may not have been located or identified. Many disposal areas that were not originally reported have been found by visual observation or magnetometry, or both. However, Carroll Island and Graces Quarters contain highly vegetated areas, such as wetlands, that can hide or cover surface or subsurface disposal areas from both

visual or magnetometric detection. In some cases, wastes that had not previously been identified were observed after they became exposed as a result of shoreline erosion or frost heaving.

CWM and other hazardous substances, including UXO, have also been discovered during fieldwork as a result of clearing areas of UXO to conduct RI activities. During the RI fieldwork conducted at Carroll Island, two 40-millimeter HE rounds were uncovered near the Lower Island Disposal Area. Fieldwork conducted at Graces Quarters uncovered 2.36-in. rockets at the Primary Test Area, and 4.2-in. mortar rounds were found on the beach area adjacent to the Northern and Southern Perimeter Dumps. In addition, ordnance wastes that potentially contain CWM and explosive substances have been identified during the removal actions performed at the Operable Unit A disposal pits on Carroll Island. Most of the wastes recovered from these pits consists of non-hazardous military testing equipment such as metal, glass, and plastic vessels and components; non-hazardous construction rubble such as building debris and pieces of concrete; and non-hazardous soil. Approximately 50 glass and steel containers filled with unknown liquids were also removed from the pits, and transported to the Chemical Transfer Facility at APG to test for the possible presence of chemical agents. In addition to these wastes, over 1,200 intact ordnance items and 15,000 ordnance components were recovered from the pits. Approximately 40 percent of these ordnance items and components are estimated to potentially contain chemical agents or their residues. Because these ordnance wastes and disposal sites have been found during these other activities, it is likely that CWM and other hazardous substances, including UXO, are present at other areas on Carroll Island and Graces Quarters.

RISK ASSESSMENT

Risk assessments are usually performed on sites that contain measurable levels of contaminants in environmental media such as soil or groundwater. Using concentrations of contaminants, an estimated risk to human health and the environment can be quantified. Because this Proposed Plan is addressing contamination that may potentially exist but has not been identified, a quantitative risk assessment could not be performed. However, there are known health effects of the contaminants that may be present. Based on the historical uses of Carroll Island and Graces Quarters, the principal categories of contaminants that could be present include CWM, explosives, and associated degradation products. In

addition, other contaminants that could potentially be present include volatile organic compounds, semivolatile organic compounds, pesticides/polychlorinated biphenyls, and inorganics.

CWM may cause a variety of toxic effects when either inhaled, absorbed through the skin, or ingested with contaminated food or water. These effects may include breathing difficulty, convulsions, vision difficulties, eye and skin blisters, or even death. Explosives, in addition to posing explosion hazards at high concentrations, may cause health effects at lower concentrations including irritated eyes, skin, throat, and lungs; liver and kidney damage; nerve damage; and convulsions. The other categories of contaminants listed above can also have a wide range of potential health effects, depending on the specific types and concentrations of contaminants that might be present.

Given current land use and the fact that the wastes have not been identified, there are no known complete exposure pathways. In addition, there are several mitigating factors that may reduce the potential risks posed by any CWM or other hazardous substances present at Carroll Island and Graces Quarters. Any CWM entering the environment due to leakage from munitions at Carroll Island or Graces Quarters would be subject to hydrolysis reactions, which are generally effective in degrading most chemical agents and reducing the hazards that they pose. However, some of the byproducts of these hydrolysis reactions may also be toxic. It should also be noted that the CWM and other hazardous substances present at Carroll Island and Graces Quarters have been there for several decades, as a result of the testing, dumping, and burial activities that occurred approximately 30 to 50 years ago. While some shoreline erosion has continued to occur since that time, no noticeable permanent damage to the Chesapeake Bay or other ecological resources has been observed. Therefore, the potential for significant future harm to human health or the environment due to possible exposure to CWM or other hazardous substances appears to be low.

Nevertheless, because some CWM and other hazardous substances are still likely to be present at Carroll Island and Graces Quarters, the potential for future exposure to receptors remains a concern unless appropriate remedial actions are taken. Potential human receptors might include outdoor maintenance workers, security workers, construction/excavation workers, nearby off-site residents, nearshore fishermen, consumers of fish caught near Carroll

Island or Graces Quarters, hunters and trappers, consumers of game from these areas, nearshore swimmers, and trespassers or visitors. Potential receptors could be exposed to contamination via incidental ingestion or direct dermal contact with soil, surface water, sediment, or exposed wastes. In addition, the rupture of chemical containers could also result in chemical releases to the air and thus expose potential receptors via inhalation. Actual or threatened releases of hazardous substances from this site, if not addressed by appropriate remedial measures, may therefore present a current or potential threat to public health or the environment.

REMEDIAL ACTION CLEANUP OBJECTIVES

This Proposed Plan addresses the selection of a remedial alternative for the sites that satisfies specific **Remedial Action Objectives (RAOs)** that were determined based on a review of available data and all ARARs. RAOs consist of medium-specific goals for protecting human health and the environment. These objectives can be achieved by reducing exposure (e.g., capping an area or limiting access) as well as by reducing the level of constituents of concern.

CWM and other hazardous substances at Carroll Island and Graces Quarters present a risk to human health and the environment. UXO that exists from the testing and impact areas also presents a safety hazard to human health. Quantitative RAOs are not appropriate for these areas because of the lack of discernable chemical contamination; therefore, qualitative objectives are developed. The RAOs for addressing CWM and other hazardous substances at Carroll Island and Graces Quarters are to:

- reduce the potential for direct human contact with CWM and other hazardous substances, and
- reduce the potential for release and migration of CWM and other hazardous substances.

SCREENING OF POTENTIAL CLEANUP ACTIONS

Based on initial screening, the following actions were considered for the Operable Units B:

1. No action (required for comparison)
2. Institutional controls
 - Public access control
 - Posting warning signs

- Security patrols
- Administrative control
 - Land use restrictions
- 3. Detection
 - Nonintrusive detection
 - Magnetometry/electromagnetic conductivity (EM)
 - Ground-penetrating radar (GPR)
 - Visual observation
- 4. Removal
 - Detection (nonintrusive)
 - Excavation
 - Manual excavation
 - Conventional excavation
 - Telerobotic excavation
- 5. Disposal
 - Detection (nonintrusive)/Removal
 - On-post disposal
 - **Resource Conservation and Recovery Act (RCRA)**-permitted facility
 - Off-post disposal
 - RCRA-permitted facility
- 6. Erosion Controls
 - Wetlands development
 - Offshore breakwater
 - Shoreline revetment.

Because of the environmental setting of Carroll Island and Graces Quarters, cleanup actions that could have been used for remediation at other sites could not be implemented at these areas. Magnetometry/EM and GPR are not technically feasible for detecting CWM and other hazardous substances over large portions of Carroll Island and Graces Quarters. Magnetometry/EM and GPR each require clearing of most of the vegetation on the island and peninsula. Wetlands comprise approximately 80 percent of Carroll Island and 36 percent of Graces Quarters. In addition, geophysical surveys are hindered in wetlands because of the inability to access much of the area on foot. Magnetometry/EM surveys will not detect nonmetallic objects (such as glassware, which could contain CWM), and GPR is ineffective in areas with saturated and high-clay-content soils. Therefore, magnetometry/EM and GPR were eliminated as potential options for detecting CWM and other hazardous substances. Because the Removal Cleanup Action would be used together with magnetometry/EM and GPR (Detection), it has also been eliminated from further consideration.

The remaining cleanup actions were retained to develop the remedial alternatives. The following section summarizes the alternatives.

**SUMMARY OF REMEDIAL
ALTERNATIVES FOR OPERABLE
UNITS B**

The cleanup options that were not eliminated in the previous phase were combined into two action alternatives to be compared to each other and the no action alternative. The following components comprise the alternatives:

Alternative 1: No Action

- For comparison purposes only.

Alternative 2: Public Access Controls with Land Use Restrictions

- Land use restriction to a **Natural Resource Management Area** through APG’s Real Property Master Plan, and preparation of a **Land Use Control Assurance Plan (LUCAP)**.
- warning signs,
- land and boat patrols,
- visual observation, and
- on- and off-post disposal of CWM and other hazardous substances exposed at the surface by erosion.

Alternative 3: Public Access Controls, Land Use Restrictions, and Erosion Controls

- Land use restriction to a **Natural Resource Management Area** through APG’s Real Property Master Plan, and preparation of a LUCAP.
- warning signs,
- land and boat patrols,
- visual observation,
- on- and off-post disposal of CWM and other hazardous substances exposed at the surface by erosion, and
- erosion controls

The costs and brief descriptions of each of these three remedial alternatives are as follows:

Alternative 1: No Action

Capital cost	\$0
Operation and Maintenance cost	\$0
Net Present Worth	\$0

The EPA feasibility study process requires that a “no action” alternative be evaluated as a basis for

comparing alternatives. Although security patrols are presently conducted at APG and warning signs exist, no “additional” action is taken. Therefore, no efforts are undertaken to locate or prevent exposure to CWM and other hazardous substances. This alternative is used for comparison purposes to evaluate other alternatives.

**Alternative 2: Public Access Controls with
Land Use Restrictions**

Capital cost	\$106,000
Annual Operation/Maintenance cost	\$155,000
Net Present Worth for 30 years (based on a discount rate of 7 percent)	\$2,030,000

Land use would be restricted to a **Natural Resource Management Area** where access and future development and use would be limited to activities that are compatible with the preservation of natural resources. Such activities would include military training that does not adversely impact natural resources. All site restrictions and designation as a **Natural Resource Management Area** would be input into APG’s geographic information system (GIS), which is used in developing APG’s Real Property Master Plan. These land use restrictions/prohibitions would be incorporated into any real property documents necessary for transferring ownership from the Army in the unlikely event the Army sells this property. These and other appropriate land use restrictions will be included in the LUCAP to be prepared by the Army and submitted to the regulators for approval. The LUCAP will ensure the effectiveness and reliability of the required land use restrictions. In addition, a land use control implementation plan (LUCIP) for Carroll Island and Graces Quarters will be developed and submitted to the regulators after approval of the ROD. The LUCIP will describe in detail how the Army will implement, maintain, and monitor the land use restrictions included in the LUCAP. The LUCAP and LUCIP will be prepared in accordance with EPA guidance provided in a memorandum prepared by Jon D. Johnston (Chief, Federal Facilities Branch of EPA) for “Assuring Land Use Controls at Federal Facilities”.

Land and boat patrols would be increased to deter public trespassing. Land access would be controlled by the Army. Security patrols by boat and land would be conducted by Army-designated security agents to aid in controlling unauthorized site access. Beach inspections would be conducted along the shorelines twice per month to check for CWM and other debris. In addition, beach inspections would be

conducted after 25-year storm events or greater. If CWM or UXO are found, they would be disposed of on-site at a RCRA-permitted facility. If other hazardous substances are found, they would be disposed of off-site at a RCRA-permitted facility. Warning signs would be posted at least every 200 ft along the entire shoreline to deter public trespassing and reduce possible contact with CWM and other hazardous substances.

The incorporation of land use restrictions through APG's Real Property Master Plan into the CERCLA process and eventually into a ROD helps to ensure that the land will be restricted as a **Natural Resource Management Area**. As with any other ROD, APG is required to comply with and implement the approved alternative. By implement-ing this alternative, exposure to CWM and other hazardous substances would be prevented and the potential for release reduced.

Alternative 3: Public Access Controls, Land Use Restrictions, and Erosion Controls

Capital Cost	\$3,230,000
Annual Operating/Maintenance Cost	\$156,400
Net Present Worth for 30 Years (based on a discount rate of 7 percent)	\$5,170,000

Alternative 3 has been developed by adding shoreline erosion controls to the remedial measures included in Alternative 2. Thus, Alternative 3 is similar to Alternative 2, with the addition of erosion control measures at portions of the Carroll Island and Graces Quarters shorelines where significant amounts of erosion have occurred in the past, and where CWM and other hazardous substances are potentially present. The remedial measures included in Alternative 2 are summarized above. In addition to the erosion control measures included in Alternative 3, the only other difference between these two alternatives is the reduced frequency of beach inspection in Alternative 3 as a result of the lower risk of CWM and other hazardous substances becoming exposed by erosion. In Alternative 3, the beach inspection would be conducted semi-annually (as opposed to semi-monthly). The remainder of this discussion focuses on the erosion control methods considered for use at the Carroll Island and Graces Quarters shorelines.

In the FS Addendum, three erosion control technologies were concluded to be potentially applicable to various portions of the Carroll Island and Graces Quarters shorelines. These technologies included: wetlands development, which is effective

in areas with low wave energy; offshore breakwaters, which are effective in areas with low to moderate wave energy; and shoreline revetments, which are effective for wave energies ranging from low to high. Detailed analysis of environmental conditions along the Carroll Island and Graces Quarters shorelines indicated that wetlands development is not applicable to the Carroll Island shoreline, due to relatively high wave energies or the presence of high quality submerged aquatic vegetation (SAV), which would be destroyed by creating new wetlands. Offshore breakwaters and shoreline revetments are applicable to different portions of the Carroll Island shoreline. Wetlands development is applicable to the portion of the Graces Quarters shoreline identified for erosion control, due to low wave energies and the absence of valuable SAV.

Figures 4 and 5 show the portions of the Carroll Island and Graces Quarters shorelines that have been identified for erosion control, based on the suspected presence of buried CWM and other hazardous substances, and historical erosion at these locations. Alternative 3 will prevent additional loss of land due to erosion, and will preserve natural resources in the vicinity of Carroll Island and Graces Quarters, including valuable upper bay habitat. The environmental control measures selected for each portion of the shoreline will be designed to provide adequate protection against a 25-year storm event while minimizing any adverse impacts to SAV, fish or wildlife habitats, or other environmental resources. The actual technology to be used will be selected in the design phase of the remediation process.

As discussed previously for Alternative 2, future land use at Carroll Island and Graces Quarters will be restricted as a **Natural Resource Management Area** after implementation of Alternative 3.

EVALUATION OF REMEDIAL ALTERNATIVES FOR OPERABLE UNITS B

In evaluating the remedial alternatives for Operable Units B, the potential performance of each alternative is evaluated in terms of the nine evaluation criteria required by the **National Contingency Plan (NCP)**:

- protection of human health and the environment;
- compliance with ARARs;
- long-term effectiveness;
- reduction of toxicity, mobility, and volume of chemicals throughout treatment;
- short-term effectiveness;

FIGURE 4

FIGURE 5

- implementability; and
- cost,
- state acceptance, and
- community acceptance.

The nine criteria are categorized into one of three groups: **threshold criteria**, **primary balancing criteria**, or **modifying criteria**. (These criteria and the nine sub-criteria are defined at the end of this document).

The alternative selected must satisfy the threshold criteria, which are of primary importance. The primary balancing criteria are used to weigh the major tradeoffs among the alternatives, and the modifying criteria are considered after the public has commented on the Proposed Plan.

Threshold Criteria

Overall Protection of Human Health and the Environment

Of the three alternatives, Alternative 1 (No Action) does not achieve adequate protection of human health and the environment. Therefore, Alternative 1 will not be considered further in this evaluation. Alternative 2 (Public Access Controls with Land Use Restrictions) provides a high level of protection of human health and the environment. Alternative 3 (Public Access Controls, Land Use Restrictions, and Erosion Controls) provides the highest level of protection of human health and the environment, because of the additional protection resulting from the shoreline erosion controls. Therefore, Alternative 3 is considered most desirable with regard to overall protection of human health and the environment, followed by Alternative 2.

Compliance with Applicable or Relevant and Appropriate Requirements

Alternatives 2 and 3 comply with all ARARs. The following federal and state requirements were evaluated as ARARs:

Chemical-Specific

- Federal Clean Water Act (40 CFR Part 131)
- Maryland Water Pollution Control Regulations-Surface Water Criteria (COMAR 26.08.02.03)

Location-Specific

- Maryland Natural Resources Code annotated, Sections 8.1801 to 8.1816
- Response in a Flood Plain or Wetlands (40 CFR Part 6, Appendix A, and Executive Orders 11988 and 11990)

Action-Specific

- Council on Environmental Quality's National Environmental Policy Act of 1969 (NEPA) Regulations (40 CFR Parts 1500-1508)
- Conservation of Wildlife Resources (Fish and Wildlife Coordination Act; 50 CFR Part 402)
- Maryland Threatened and Endangered Species Regulations (COMAR 08.03.08)
- Maryland Erosion and Sediment Control (COMAR 26.09.01)
- General Water Quality Certification for Placement of Riprap (COMAR 26.08.02.13)
- Maryland Stormwater Management (COMAR 26.09.02)
- Guidelines for Specification of Disposal Sites for Dredged or Fill Material (40 CFR Part 230)
- U.S. Army Corps of Engineers Regulations for Dredge and Fill Operations (33 CFR Part 323) and Construction in Waterways (33 CFR Part 322).
- Clean Water Act, Section 404
- Nontidal Wetlands (COMAR 26.23.01-.05)
- National Historic Preservation Act (Section 106 and AR 420-40)
- Munitions Rule (40 CFR Section 266.200)
- Federal Occupational Safety and Health Administration Specifications for Accident Prevention Signs and Tags (29 CFR Section 1910.145), and HAZWOPER Requirements (29 CFR Section 1910.120)
- U.S. Department of Transportation Regulations (49 CFR Parts 171-179)

- Resource Conservation and Recovery Act, Subtitle C Requirements: Identification and Listing of a Hazardous Waste (40 CFR Part 261), and Land Disposal Restrictions (40 CFR Part 268)
- Maryland Hazardous Waste Management Regulations (COMAR 26.13); Identification and listing of hazardous waste (COMAR 26.13.02); Standards applicable to generators of hazardous waste (COMAR 26.13.03); Hazardous waste determination (COMAR 26.13.03.02); Manifest (COMAR 26.13.03.04); Pretransport requirements (COMAR 26.13.03.05); Standards applicable to transportation of hazardous waste (COMAR 26.13.04)
- National Ambient Air Quality Standards (40 CFR Part 50)
- Maryland Air Quality Regulations (COMAR 26.11.06)
- Maryland Noise Pollution Control Regulations (COMAR 26.02.03.02(A)(2) and 26.02.03.03A)
- Well Abandonment Standards (COMAR 26.04.04.11)

Primary Balancing Criteria

Long-Term Effectiveness and Permanence

Alternative 2 provides long-term effectiveness and permanence. The ROD will help ensure that the land use restrictions to a Natural Resource Management Area in APG's Real Property Master Plan for Carroll Island and Graces Quarters are enforced. Access will be limited and future development prevented unless compatible with the Natural Resource Management Area designation. Alternative 3, which also provides long-term effectiveness and permanence, is rated somewhat higher than Alternative 2 with respect to this criterion because of the additional reduction in risk to human health and the environment that would result from the shoreline erosion controls.

Reduction of Toxicity, Mobility, or Volume of Contaminants Through Treatment

Alternative 2 reduces the volume of hazardous constituents at Carroll Island and Graces Quarters by removing detected CWM and other hazardous substances, when exposed at the shoreline. However, some of these exposed substances could migrate offshore or pose a human health and safety hazard

before they are detected. Alternative 3 also achieves a small reduction in the volume of hazardous constituents, but the volume of hazardous substances removed from Carroll Island and Graces Quarters in Alternative 3 is less than in Alternative 2, because the shoreline erosion controls will reduce the amount of these substances that will become exposed. However, Alternative 3 also reduces the mobility of these hazardous substances by burying them directly beneath wetlands fill, or by protecting them from wave action that could cause erosion and bring them to the surface. Alternative 3 is rated higher than Alternative 2 with respect to this criterion because of the reduced mobility of hazardous substances resulting from the erosion controls.

Short-Term Effectiveness

Alternative 2 is the most desirable alternative with respect to this criterion because there is minimal impact to workers, and the public is protected. Alternative 3 is less desirable than Alternative 2 with respect to this criterion because of the construction activities associated with implementing the shoreline erosion controls. UXO surveys and related clearance activities, and other health and safety precautions such as the use of personal protective equipment will be required in Alternative 3 to protect workers; in addition, surface water controls, soil erosion controls, and other temporary environmental controls will be required to minimize environmental impacts due to construction.

Implementability

Alternative 2 is easily implementable, because all resources required for the public access controls and for management of the land are readily available. Alternative 3 is also not expected to be difficult to implement, but several implementation issues need to be considered, including the length of time required to fill and develop the wetlands (if selected as a technology), which is expected to be approximately two to five years, and maintenance requirements associated with the offshore breakwater and revetments. In addition, the substantive requirements of any applicable permits, including Section 404 of the Clean Water Act, will have to be met to implement the construction activities in Alternative 3.

Cost

The net present worth of Alternatives 2 and 3 is approximately \$2,030,000 and \$5,170,000, respectively, for both Carroll Island and Graces Quarters. A detailed breakdown of these costs is

presented in the FS Addendum. For Carroll Island, the present worth costs are approximately \$1,000,000 and \$2,750,000 for Alternatives 2 and 3, respectively. For Graces Quarters, the present worth costs are approximately \$1,030,000 and \$2,420,000 for Alternatives 2 and 3, respectively. These present worth costs are based on an operating period of 30 years and a discount factor of 7 percent.

Modifying Criteria

State Acceptance

It is anticipated that the MDE, Waste Management Administration would concur with the selection of either Alternative 2 or Alternative 3 for Carroll Island and Graces Quarters.

Community Acceptance

The community will play an integral role in the selection of remedial alternatives for Operable Units B at Carroll Island and Graces Quarters. As discussed previously, the Army received public comments on the previous version of this Proposed Plan, which was dated July 1998. Based on these public comments, it is expected that the local community would prefer the selection of Alternative 3 for Carroll Island and Graces Quarters.

CONCLUSION: RECOMMENDED REMEDIAL ALTERNATIVES FOR OPERABLE UNITS B AT CARROLL ISLAND/GRACES QUARTERS

Alternative 2 provides adequate protection of human health and the environment; provides long- and short-term effectiveness; reduces the volume of hazardous constituents; complies with all applicable or relevant and appropriate requirements; and is easy to implement. Alternative 3 provides higher levels of protection of human health and the environment and long-term effectiveness than Alternative 2, due to the additional protection resulting from the shoreline erosion controls; has greater short-term impacts than Alternative 2 due to the construction activities associated with the shoreline erosion controls, and therefore requires more measures to protect workers and the environment; reduces the mobility and volume of hazardous constituents; complies with all applicable or relevant and appropriate requirements; and is somewhat more difficult to implement than Alternative 2. Either Alternative 2 or Alternative 3 is expected to be acceptable to MDE. However, based on public comments received by the Army, the local

community is expected to prefer Alternative 3. The principal tradeoffs between Alternatives 2 and 3 are the enhanced protection of human health and the environment and long-term effectiveness resulting from the shoreline erosion control measures included in Alternative 3, versus the lower costs associated with Alternative 2. Alternative 3, Public Access Controls, Land Use Restrictions, and Erosion Controls is recommended for implementation at Carroll Island and Graces Quarters for addressing CWM and other hazardous substances due to the enhanced protection of human health and the environment and long-term effectiveness resulting from the shoreline erosion controls.

II. REMOVAL ACTIONS

The Army has implemented removal actions at the Service Area and the Wind Tunnel that were formerly used on Carroll Island, and the Service Area and Disposal Area that were formerly used on Graces Quarters.

REMOVAL ACTION AT SERVICE AREA ON CARROLL ISLAND

The Service Area, which is designated as Site 13 (Cluster 2, EACI02-A) on Figure 2, was originally identified as a possible source of environmental contamination during the RCRA Facility Assessment conducted in 1989. The site consisted of two Quonset huts and several small facilities for water supply and wastewater management in support of testing activities on Carroll Island. The remains of the wastewater treatment plant consisted of a small metal unit on a grate over a concrete sump.

During the Carroll Island RI, volatile organic compounds, semi-volatile organic compounds, pesticides, polychlorinated biphenyls (PCBs), and metals were detected in sediment samples in the sump. The measured concentrations of these contaminants did not exceed any state or federal regulatory standards, but did exceed RI comparison criteria, which were based on previous background sampling conducted in 1993. The Baseline Human Health Risk Assessment indicated no risks or hazards. The Ecological Risk Assessment did reveal potential effects to aquatic organisms living within the sump. The walls of the cement-lined sump were elevated approximately 2 feet above the ground, and the sump was covered by steel plates. This habitat was expected to be capable of supporting a very limited number of benthic invertebrates. Adverse

effects, if occurring, would have been limited to these species. Based on the ecological risks, and the possibility that contaminated sediment might be disturbed in the future and released to other media, a removal action was recommended in the RI for the sump at the Service Area. EPA and MDE concurred with the RI's recommendation of a removal action at this site.

The removal action, which was completed in July 1999, consisted of removing the contaminated contents of the sump while leaving the sump in place. The following measures were performed during this removal action: dewatering the sump, removing the sediments, high pressure washing, plugging all outgoing lines, and filling the sump with a fill material.

REMOVAL ACTION AT THE WIND TUNNEL ON CARROLL ISLAND

The Wind Tunnel, which is identified as Site 5 (Cluster 6, EACI06-A) on Figure 2, was constructed in 1953 for use in testing CWM in an enclosed test chamber. The facility consisted of the Wind Tunnel building, a control room, a scrubber system, and a 250-gallon underground storage tank (UST) for storage of an ethylene glycol/water mixture used in the scrubber. Use of the Wind Tunnel was terminated in 1973.

The Wind Tunnel Site is located on the eastern half of Carroll Island at Carroll Point. It is bordered by a low lying field to the north, marsh to the west, and the Gunpowder River to the south. The area sometimes becomes flooded during storm events. Field inspections of the site in 1993 revealed the structure was in poor condition. There was also evidence trespassers had gained access to the building. Because of the deteriorating condition of the building and the potential for residual chemical contamination of the equipment inside, the site was considered to be a physical hazard and suspect source area for contamination, which – if present – could enter the environment. A decision was therefore made to dismantle the facility. During the summer of 1993, the Army removed the building, all of the equipment associated with the Wind Tunnel, and the scrubber system, including the stack. The structures and equipment associated with the Wind Tunnel were disassembled, cut into smaller pieces, and placed in wooden boxes. The air inside the crates was sampled, and no CWM was detected. Holes in the building slab were sealed with concrete.

Based on the air sampling results, the crates were classified as "3X." This is the designation for items that have been potentially exposed to CWM and have been surface decontaminated, if required, by locally approved procedures; and then bagged or contained. This classification also means that appropriate tests or monitoring have verified that no vapor concentrations are above U.S. Army specified detection limits. The material was then transported to the Edgewood Area of APG, thermally treated at the decontamination/detoxification facility to "5X," which is the designation that indicates the material is clean and may be released from government control without precautions or restrictions. The treated material was then recycled through the Army's Defense Reutilization and Marketing Office (DRMO).

In August 1995, the 250-gallon UST was removed from the Wind Tunnel Site. Liquid remaining in the UST was analyzed for CWM, which was not detected. The liquid was then pumped out of the tank prior to the initiation of the UST excavation activities. No holes were observed in the tank. Soil samples collected during the removal showed no visual contamination, and no ethylene glycol was detected during laboratory analyses. The tank was cleaned, cut up, and recycled as scrap metal. The excavated area was filled with gravel, and the excavated soil was spread on the surface of the site as a means of disposal, as approved by MDE.

REMOVAL ACTION AT THE SERVICE AREA ON GRACES QUARTERS

The Quonset hut at the Service Area (Site 8, Cluster 3, EAGQ03-A) was dismantled in 1993 to safely remove ventilation equipment that was believed to be a potential source of CWM contamination. The Quonset hut was cut up, and pieces of the hut and material from inside the hut were placed in wooden crates lined with plastic. After a minimum of 4 hours at 70 degrees Fahrenheit (°F), the air space in each wooden crate was sampled for CWM; none was detected. Based on these results, the crates were classified as "3X." The material was then transported to the Edgewood Area, thermally treated at the decontamination/detoxification facility to "5X," and recycled through the Army's DRMO. A real-time air monitoring platform (RTAP) was used to collect air samples in the vicinity of the hut, and test for the possible presence of chemical agents both before and during the removal actions. No elevated readings were obtained.

In addition to dismantling the Quonset hut, APG also removed and closed two USTs from this site in 1995. These two USTs consisted of a 250-gallon tank that contained a gasoline-water mixture and a 1,000-gallon diesel fuel tank, which were located next to the Quonset hut pad. The contents of the USTs were sampled and tested for chemical agents, which were not detected. The tank contents were then pumped out, and either disposed of or recycled. The two USTs were excavated and removed in May 1995. After the tanks were brought to the ground surface, they were cleaned and transported off-post to be punctured and removed from future use. The tanks appeared to be in good condition, with no obvious leaks or holes.

After removal of the 250-gallon UST, soil was excavated until no staining was observed. Soil samples were collected from the bottom and sidewalls of the excavation, and from the stockpiled soil. The analytical results indicated that the concentrations of total petroleum hydrocarbons (TPHC) in the post-excavation and stockpiled soil were below the cleanup criteria of 100 ppm. Based on these results, no further action was necessary, and the stockpiled soil was backfilled into the excavation.

After removal of the 1,000-gallon UST, soil was excavated until no further staining was observed, and until TPHC levels in post-excavation soil samples collected from the bottom and sidewalls of the pit were reduced below 100 ppm. The excavation was stabilized, and a pond was established at the site. This work was conducted in conjunction with APG's Natural Resources personnel to enhance the natural wildlife habitat at Graces Quarters. Composite samples collected from the stockpiled soil exceeded the 100-ppm limit for TPHC. Therefore, the excavated soil was manifested and transported for treatment at a permitted off-post incinerator.

REMOVAL ACTION AT THE DISPOSAL AREA ON GRACES QUARTERS

Between February 1993 and April 1994, removal actions were undertaken to mitigate the environmental and health hazards presented by debris buried in disposal pits and surrounding areas at the Graces Quarters Disposal Area (Site 1, Cluster 1, EAGQ01-A). Because of rapid shoreline erosion in the immediate vicinity of the pits, at least one pit eroded in the 1960s, exposing wastes to the Gunpowder River. The removal actions were designed to remove the contents of the remaining pits prior to their exposure to the environment.

Prior to initiating the removal actions, UXO surveys were conducted in the vicinity of the suspected disposal pit areas. No UXO was found during these surveys. The locations and dimensions of four disposal pits were then determined by GPR and EM surveys. The four pits ranged in size from approximately 10×20 feet to 40×50 feet, with depths between 1 and 5 feet below ground surface. Following the identification of the four disposal pits, the pit contents were excavated by a combination of hand and mechanical excavation (with an extended boom excavator). The debris removed from the pits included ordnance-related items and miscellaneous debris, including 40-millimeter (mm) rounds, one 1,000-pound GB bomblet shell (empty casing), one nonexplosive rocket, metallic and other debris, and white wax-like material. Three of the 40-mm rounds were determined to be unstable and high explosive, and not to contain liquid. These ordnance items were detonated onsite in accordance with Army protocols. The remaining rounds, which were either stable or dummy rounds, were disposed of at the Edgewood Peninsula in accordance with established U.S. Army protocols.

The other debris and nonexplosive items were placed in wooden crates sealed with a plastic cover or in steel drums. CWM headspace monitoring was then performed for each of the crates and drums. All of the crates and drums exhibited negative results for CWM, and were classified as "3X". The crates were transported to the decontamination/detoxification facility at the Edgewood Area for thermal treatment to "5X" and final disposal. The drums were transported to a permitted offsite disposal facility in accordance with applicable regulations.

Following the removal of the pit contents, post-excavation composite soil samples were collected from the bottom and sidewalls of each pit and from the stockpiled soil excavated from each pit. No CWM or CWM degradation products were detected in any of these samples. With the exception of beryllium, none of the parameters detected in the post-excavation composite soil samples collected from the bottom and sidewalls of the disposal pits exceeded hazardous waste criteria defined in RCRA corrective action standards. While beryllium concentrations in some samples exceeded these criteria, the beryllium was concluded to be naturally occurring. The stockpiled soil from three of the pits was determined to be nonhazardous according to RCRA criteria, and was therefore used for site grading purposes. The stockpiled soil from one pit contained PCBs at concentrations above these criteria, and was therefore manifested and transported

to an offsite disposal facility, together with all drummed materials.

Site closure was conducted by backfilling the four excavations with clean soil. After the pits were backfilled, the site was restored by reseeding and mulching disturbed areas. Based on the documented site history and GPR and EM work conducted during this removal action, it was concluded that no disposal pits remain at the Graces Quarters Disposal Area.

* * *

OPPORTUNITIES FOR COMMUNITY INVOLVEMENT

The Army, EPA, and MDE are soliciting input from the community on each of the proposed alternatives for Operable Units B, and the adequacy of the removal actions performed at the Service Area and Wind Tunnel at Carroll Island and the Service Area and Disposal Area at Graces Quarters. The comment period extends from April 26, 2000 through June 10, 2000 (45 days). This period includes an availability session at which the Army, EPA, and MDE will present the Proposed Plan and accept both oral and written comments.

The availability session is scheduled for May 11, 2000. The session will be held at 6:30 pm at:

**Oliver Beach Elementary School
12912 Cumminghill Cove Road**

Comments and responses will be summarized in the ROD, which is the document that presents the selected remedy.

To send written comments or obtain further information, contact any one of the following representatives:

Mr. Kenneth Stachiw, Program Manager
U.S. Army Aberdeen Proving Ground
Directorate of Safety, Health, and Environment
ATTN: STEAP-SH-ER
Aberdeen Proving Ground, MD 21010
(410) 671-3320

Mr. Steve Hirsh
U.S. Environmental Protection Agency
Region III
1650 Arch Street
Philadelphia, PA 19103
(215) 814-3352

Mr. John Fairbank
Maryland Department of the Environment
Waste Management Division
2500 Broening Highway
Baltimore, MD 21224
(410) 631-3497

Written comments must be postmarked no later than the last day of the public comment period, which is June 10, 2000.

ACRONYMS AND ABBREVIATIONS

AOCs	Areas of Concern
APG	Aberdeen Proving Ground
APGSCC	Aberdeen Proving Ground Superfund Citizens Coalition
ARAR	Applicable or relevant and appropriate requirement
BZ	3-quinuclidinyl benzilate
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COMAR	Code of Maryland Annotated Regulations
CS	ortho-chlorobenzolmalonitrile
CWM	Chemical Warfare Material
DANC	decontaminative agent noncorrosive
DESERTS	Defense System Environmental Restoration Tracking System
DRMO	Defense Reutilization and Marketing Office
EM	Electromagnetic conductivity
EPA	U.S. Environmental Protection Agency
°F	Degrees Fahrenheit
FFS	Focused Feasibility Study
FS	Feasibility Study
ft	feet
GB	isopropylmethylphosphonofluoridate
GD	pinacolylmethylphosphonofluoridate
GIS	Geographic information system
GPR	Ground-penetrating radar
HD	mustard gas
HE	high explosives
in.	Inches
LUCAP	Land Use Control Assurance Plan
LUCIP	Land Use Control Implementation Plan
MDE	Maryland Department of the Environment
mm	millimeter
NCP	National Contingency Plan
NEPA	National Environmental Policy Act
NPL	National Priorities List
PCBs	Polychlorinated biphenyls
RAO	Remedial action objective
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
RTAP	Real-time air monitoring platform
SARA	Superfund Amendments and Reauthorization Act
SAV	Submerged aquatic vegetation
TPHC	Total petroleum hydrocarbons
UST	Underground Storage Tank
UXO	unexploded ordnance
VX	o-ethyl-s-(2-diisopropylaminoethyl) methylphosphonothioate
WP	white phosphorus

EXPLANATION OF EVALUATION CRITERIA

THRESHOLD CRITERIA

- **Overall Protection of Human Health and the Environment** refers to whether a remedy provides adequate protection against harmful effects. It calls for consideration of how human health or environmental risks are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.
- **Compliance with applicable or relevant and appropriate requirements (ARARs)** addresses whether a remedy meets all the applicable or relevant and appropriate requirements of other federal and state environmental statutes.

PRIMARY BALANCING CRITERIA

- **Long-term effectiveness and permanence** refers to the magnitude of residual risk and the ability of a remedy to maintain reliable protection of human health and the environment after cleanup goals have been met.
- **Reduction of toxicity, mobility, or volume** through treatment refers to the effectiveness of the treatment technologies in reducing the toxicity, mobility, or volume of contaminants.
- **Short-term effectiveness** refers to the speed with which the remedy achieves protection and to the remedy's potential during construction and implementation to have adverse effects on human health and the environment.
- **Implementability** refers to the technical and administrative feasibility of a remedy, including the availability of required materials and services.
- **Cost** includes capital expenditures and operation and maintenance costs.

MODIFYING CRITERIA

- **State acceptance** indicates whether the state concurs with, opposes, or has no comment on the preferred alternative based on its review of the RI/FS report and Proposed Plan.
- **Community acceptance** is documented in the Record of Decision following a review of public comments on the Proposed Plan.

GLOSSARY OF TERMS

Administrative Record – This is the collection of documents that were referred to or relied upon to support a decision document or enforcement action, including information and reports generated during the site investigation and remediation. It is available for public review.

Applicable or Relevant and Appropriate Requirements (ARARs) – These are requirements set forth by federal and state environmental statutes and regulations which must be met in the implementation of remedial alternatives.

Chemical Warfare Materiel (CWM) – This refers to chemical agents (i.e., chemical compounds such as nerve, blister, blood, choking, and incapacitating agents) that, through chemical properties, produce lethal or damaging effects on humans as well as other chemical compounds such as riot control agents.

Code of Maryland Annotated Regulations (COMAR) – This is a complete listing of state regulations.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) – This federal law was passed in 1980 and amended in 1986, and is commonly referred to as the Superfund Law. It provides for liability, compensation, cleanup, and emergency response in connection with the cleanup of inactive hazardous waste disposal sites that endanger public health and safety or the environment.

Feasibility Study (FS) – This provides a detailed analysis of remedial alternatives for a site. This analysis supports risk management decision processes to select the most appropriate remedy.

Focused Feasibility Study (FFS) – This provides a detailed analysis of remedial alternatives for a selected portion of a larger site. This analysis supports the risk management decision process to select the most appropriate remedy.

Land Use Control Assurance Plan (LUCAP) – A written installation-wide plan that sets out procedures to ensure the long-term effectiveness of land use restrictions required to protect human health and the environment.

National Contingency Plan (NCP) – Officially the National Oil and Hazardous Substances Pollution Contingency Plan, these regulations give the federal government the authority to respond to the problems of abandoned or uncontrolled hazardous waste disposal sites as well as to certain incidents involving hazardous wastes.

National Environmental Policy Act (NEPA) – An act, enacted on January 1, 1970, stating that any federal branch or agency proposing a project that might have a significant effect on the environment must include in the proposal statements concerning potential impacts.

National Priorities List (NPL) – This list, developed by EPA, identifies the uncontrolled hazardous substance release sites in the United States that are considered priorities for long-term remedial evaluation and response.

Natural Resources Management Area – An area where access and future development and use are limited to activities that are compatible with the preservation of natural resources. Such activities may include military training that does not adversely impact natural resources.

Net Present Worth – The amount of money (in 1998 dollars) necessary to secure the promise of future payments, or series of payments, at an assumed interest rate. For example, the net present worth of a loan is the amount of money one would need to invest now to generate the future series of payments.

Remedial Action Objective (RAO) – A medium-specific goal for protecting human health and the environment, which can be achieved by reducing exposure (e.g., capping an area or limiting access) as well as by reducing the level of constituents of concern.

GLOSSARY OF TERMS (cont'd)

Record of Decision (ROD) – This record is signed by the Army and EPA. It provides the cleanup action or remedy selected for a site, the basis for selecting that remedy, public comments on alternative remedies, responses to comments, and the cost of the remedy.

Remedial Investigation (RI) – The purpose of a remedial investigation is to characterize possible contamination and to identify sites that may require remedial action.

Resource Conservation and Recovery Act (RCRA) – An act, enacted in 1976, which established the first comprehensive federal regulatory program for controlling hazardous waste. This act also provided grants and technical assistance to the states to help improve their waste management techniques.

Superfund Amendments and Reauthorization Act (SARA) – This Act amended CERCLA in 1986.

Surveillance Testing – An investigation to determine the response of chemical materials to a variety of environmental conditions, including the stability of these materials under various temperature and humidity conditions.

Unexploded Ordnance (UXO) – Any item that contains explosives or propellant that, when fired, did not detonate (or burn) as designed. It may include mortars, rockets, grenades, chemical warfare material, bombs, artillery shells, landmines, and incendiary and pyrotechnic materials.