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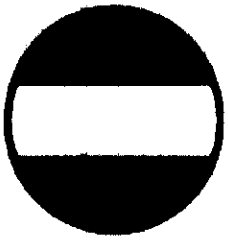

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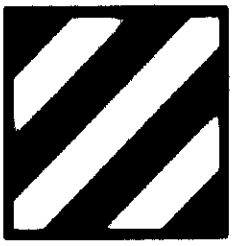
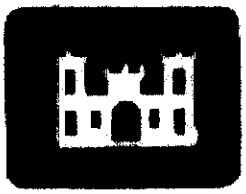


3d Inf Div (Mech)

Inactive EOD Area North of Garrison Area (SWMU 10) at Fort Stewart, Georgia

Prepared for



U.S. ARMY CORPS OF ENGINEERS
SAVANNAH DISTRICT

Contract No. DACA21-95-D-0022
Delivery Order 0037

July 2001

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FINAL

CORRECTIVE ACTION PLAN
FOR THE
INACTIVE EOD AREA NORTH OF GARRISON AREA (SWMU 10)
AT
FORT STEWART MILITARY RESERVATION
FORT STEWART, GEORGIA

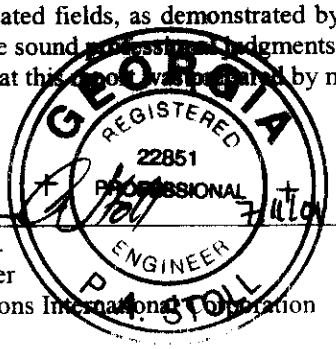
REGULATORY AUTHORITY
Resource Conservation and Recovery Act
40 CFR 264, Title II, Subpart C, Section 3004;
42 USC 6901 et seq.

Prepared for
U.S. Army Corps of Engineers
Savannah District
Under Contract DACA21-95-D-0022
Delivery Order Number 0037

Prepared by
Science Applications International Corporation
800 Oak Ridge Turnpike
Oak Ridge, Tennessee 37831

July 2001

The undersigned certifies that I am a qualified groundwater scientist who has received a baccalaureate or postgraduate degree in the natural sciences or engineering and that I have sufficient training and experience in groundwater hydrology and related fields, as demonstrated by state registration and completion of accredited university courses, to enable me to make sound professional judgments regarding groundwater monitoring and contaminant fate and transport. I further certify that this report was prepared by myself or by a subordinate working under my direction.



Patricia Stoll, P.E.
Technical Manager
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SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

contributed to the preparation of this document and should not be considered an eligible contractor for its review.

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ACRONYMS

amsl	above mean sea level
bgs	below ground surface
BMP	Base Master Plan
CAP	Corrective Action Plan
DERP	Defense Environmental Restoration Program
DoD	U.S. Department of Defense
DPW	Directorate of Public Works
EOD	explosive ordnance disposal
EPA	U.S. Environmental Protection Agency
FSMR	Fort Stewart Military Reservation
GEPD	Georgia Environmental Protection Division
O&M	operations and maintenance
OE	ordnance and explosives
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
SAIC	Science Applications International Corporation
SRC	site-related contaminant
SWMU	solid waste management unit
USACE	U.S. Army Corps of Engineers
UXO	unexploded ordnance
VOC	volatile organic compound

1.0 INTRODUCTION

1.1 SCOPE

This report documents the Corrective Action Plan (CAP) for the Inactive Explosive Ordnance Disposal (EOD) Area North of the Garrison Area, Solid Waste Management Unit (SWMU) 10 located at Fort Stewart, Georgia. The revised final Phase II Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Report for 16 SWMUs (SAIC 2000) determined that SWMU 10 requires a CAP to evaluate appropriate remedial actions to eliminate or minimize potential risks associated with the site. Implementation of the remedy selected in this CAP is required for SWMU 10 to protect the health and safety of humans coming in contact with the site. This report has been prepared by Science Applications International Corporation (SAIC) for the U.S. Army Corps of Engineers (USACE), Savannah District, under Contract DACA21-95-D-0022, Delivery Order No. 0037.

Based on the findings presented in the revised final Phase II RFI Report for 16 SWMUs issued by SAIC in April 2000, a no-further-action-required status has been assigned to SWMU 10. As recommended by the Phase II RFI Report and as concurred to by the Georgia Environmental Protection Division (GEPD), a CAP has been prepared for SWMU 10 because surface and subsurface ordnance and debris and associated surface soil contamination will remain in place. Implementation of the selected remedies documented by this CAP is necessary to control intrusive activities at SWMU 10, to be protective of the health and safety of humans potentially coming in contact with contaminants or exploded ordnance debris, and to prevent the use of groundwater as a drinking water source. As concurred to by GEPD, this CAP has been prepared to evaluate the use of institutional controls to protect human health and safety. A "no action" alternative is also presented and evaluated to provide a comparison to the institutional controls alternative.

The CAP describes and provides designs for the selected remedies and includes plans for their implementation, along with a plan for operations and maintenance (O&M) of the remedy selected for SWMU 10. Also included in this plan are a detailed cost estimate and a schedule of implementation for the selected corrective action.

1.2 SITE BACKGROUND

A RCRA Facility Assessment (RFA) was performed and submitted to GEPD in June 1990. The June 1990 RFA listed 24 SWMUs at the Fort Stewart Military Reservation (FSMR) that required some type of RFI action (Geraghty and Miller 1992). SWMU 10 was among these 24. A Phase I RFI was conducted at SWMU 10 to determine if a release to the environment had occurred and to decide if the site had the potential for a release to the environment (Rust 1996). Based on the results, SWMU 10 was recommended for a Phase II RFI. The Phase II RFI was performed in January 1998, and the results were documented in the revised final Phase II RFI Report (SAIC 2000).

The objectives for the Phase II RFI for SWMU 10, as defined by the Work Plan (SAIC 1997) approved by GEPD, included the following:

- determine the horizontal and vertical extent of contamination;
- determine whether contaminants present a threat to human health or the environment;
- determine the need for future action and/or no further action; and
- gather data necessary to support a CAP, if warranted.

Site background information for SWMU 10 is presented below.

SWMU 10 is actually comprised of two areas, one with an area of 1.48 acres and the other with an area of 0.27 acre. SWMU 10 is reported to be inactive. The original RFA (USAEHA 1988) indicated that the craters in the ground contained no solid waste other than small bits of shrapnel and that there was no evidence of ashes or charred ground from explosions. The RFA analytical results showed the existence of various levels of arsenic, barium, mercury, and lead in all the surface soil samples. Potential contamination due to disposal of exploded ordnance and unexploded ordnance (UXO) was investigated in 1993 during a Phase I RFI for the 24 SWMUs at Fort Stewart. The Phase I RFI (Rust 1996) analytical results indicated the existence of various levels of metals, including arsenic, barium, chromium, and lead, which were detected above reference background criteria in surface soil. No volatile organic compounds (VOCs) or explosive residues were detected in surface soil samples during the Phase I RFI. Based on these findings, GEPD instructed the Fort Stewart Directorate of Public Works (DPW) to conduct a Phase II RFI.

The scope of the Phase II fieldwork for SWMU 10 included the activities described below.

- Initial screening consisted of using direct-push technology techniques to collect groundwater samples from Geoprobe borings for explosives analysis. Eight Geoprobes were installed around the perimeter of the EOD area. The results of the Geoprobe screening were used to determine the extent of potential contamination and the location of a vertical-profile boring (if necessary). Based on the lack of contamination observed in the Geoprobe borings and with the concurrence of GEPD, a vertical-profile boring was not installed at the site. In addition, with the concurrence of GEPD, no monitoring wells were installed at the site during the Phase II RFI activities.

- Three surface soil samples were collected from within the boundary of SWMU 10 and analyzed for explosives and RCRA metals.

- Two surface water and two sediment samples (one upstream and one downstream) were collected from Taylors Creek and analyzed for explosives and RCRA metals. The upstream location was south-southwest of the site, and the downstream location was west of the site. Conductivity, temperature, pH, dissolved oxygen, oxygen-reduction potential, and turbidity were measured in the field during sampling.

1.3 REGULATORY BACKGROUND

Executive Order 12088, signed in 1978, requires federal facilities to comply with federal, state, and local pollution requirements. The Defense Environmental Restoration Program (DERP) was formally established in fiscal year 1984 to promote and coordinate efforts for the evaluation and cleanup of contamination at U.S. Department of Defense (DoD) installations. Executive Order 12580, signed January 23, 1987, relates to Superfund implementation and assigns responsibility to the Secretary of Defense for carrying out the DERP. The Installation Restoration Program was established as part of the DERP. This program was established to assess potential contamination at DoD installations and formerly used properties and to address site cleanups, as necessary. With the promulgation of RCRA and the subsequent approval of the Georgia Hazardous Waste Management Act by the U.S. Environmental Protection Agency (EPA), the state was granted RCRA permitting authority. In accordance with RCRA, the state issued to Fort Stewart, in August 1987, a Hazardous Waste Facility Permit [Georgia Environmental Division Permit No. HW-045 (S&T)]. The permit was renewed in August 1997. SWMU 10 is a listed SWMU in Fort Stewart's Subpart B Permit (Appendix A) and, therefore, is subject to investigation according to Title 40, *Code of Federal Regulations*, Part 264.101(c) [as reported in

Section 10.4 of the revised final Phase II RFI Report for 16 SWMUs dated April 2000 (SAIC 2000)] and to corrective action (the subject of this CAP), if necessary.

1.4 REPORT ORGANIZATION

This CAP report is divided into six chapters. Chapter 1.0 ("Introduction") provides an explanation of the scope of the CAP, presents general background information on the FSMR and specific background information on SWMU 10, and provides regulatory background information. Chapter 2.0 ("Site Characterization and Remedial Investigation Results") provides an overview of the site; physical and environmental descriptions; and nature and extent of contamination, contaminant fate and transport, and preliminary risk evaluation information. Chapter 3.0 ("Justification/Purpose of Corrective Action") presents remedial response objectives and the purpose for corrective action and identifies and describes the corrective action alternatives under evaluation for SWMU 10. Chapter 4.0 ("Screening of Corrective Actions") presents an evaluation of corrective actions and screens the corrective actions against established objectives and balancing factors. Chapter 5.0 ("Conceptual Design and Implementation Plan") identifies the selected corrective action, presents design and implementation details, and provides a cost estimate and schedule for the selected remedy for SWMU 10. Reference information is presented in Chapter 6.0. Appendix A presents the results of the EOD survey performed at SWMU 10 in May 2001. The O&M Plan for the selected remedy for SWMU 10 is presented in Appendix B. Appendices C, D, and E, respectively, contain the Base Master Plan (BMP) and deed recordation requirements; the site description, directions to the site, and survey plat; and the cost estimate for SWMU 10.

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2.0 SITE CHARACTERIZATION AND REMEDIAL INVESTIGATION RESULTS

Fort Stewart (then known as Camp Stewart) was established in June 1940 as an antiaircraft artillery training center. Between January and September 1945, the Installation operated as a prisoner-of-war camp. The Installation was deactivated in September 1945. In August 1950 Fort Stewart was reactivated to train antiaircraft artillery units for the Korean Conflict. The training mission was expanded to include armor training in 1953. Fort Stewart was designated a permanent U.S. Army installation in 1956 and became a flight training center in 1966. Aviation training at the Fort Stewart facilities was phased out in 1973. In January 1974 the 1st Battalion, 75th Infantry was activated at Fort Stewart. Fort Stewart then became a training and maneuver area, providing tank, field artillery, helicopter gunnery, and small arms training for regular Army and National Guard units. The 24th Infantry Division, which was reflagged as the 3d Infantry Division in May 1996, was permanently stationed at Fort Stewart in 1975. Training and maneuver activities comprise the Installation's primary mission today.

The FSMR is located in portions of Liberty, Bryan, Long, Tattnall, and Evans counties, Georgia, approximately 40 miles west-southwest of Savannah, Georgia (Figures 2-1 and 2-2). The cantonment, or garrison area, of the FSMR is located within Liberty County, on the southern boundary of the reservation. SWMU 10 is located outside the garrison area to the north (Figure 2-3).

2.1 SITE LOCATION AND HISTORY

SWMU 10 is located 4 miles north of the garrison area and 1 mile east of Georgia Highway 119 (see Figure 2-3). This EOD site is located in an area designated as B-8 on the Fort Stewart Installation Map, near firing point 101. The EOD area operated from 1975 to 1980, with open detonation of UXO taking place (Geraghty and Miller 1992). The site is located approximately 1,500 feet east of Taylors Creek. This EOD area is reported to be inactive.

The original RFA (USAEHA 1988) indicated that the craters in the ground contained no solid waste other than small bits of shrapnel and that there was no evidence of ashes or charred ground from explosions. The RFA was performed on only the larger of the two areas that comprise this SWMU. The larger area encompasses approximately 1.48 acres.

An additional area of SWMU 10 was identified after the Phase II RFI (Figure 2-4). This area is located approximately 1,400 feet southwest of the original area identified as SWMU 10. The area encompasses approximately 0.27 acre and consists of a burial trench. A single line of barbed wire segregates the area from the surrounding property. The site features and estimated boundaries of both areas of SWMU 10 are presented in Figure 2-4.

Adjacent to the north of the site is an abandoned Methodist religious campground known as the Taylors Creek Campground. The campground encompasses approximately 10 acres and was used between 1820 and 1941. The property is eligible for the National Register of Historic Places.

2.2 TOPOGRAPHY/PHYSIOGRAPHY/CLIMATE

The FSMR occupies a low-lying, flat region on the coastal plain of Georgia. Surface elevations range from approximately 20 feet to 100 feet above mean sea level (amsl) within the FSMR and generally decrease from northwest to southeast across the reservation. Terraces dissected by surface water drainages

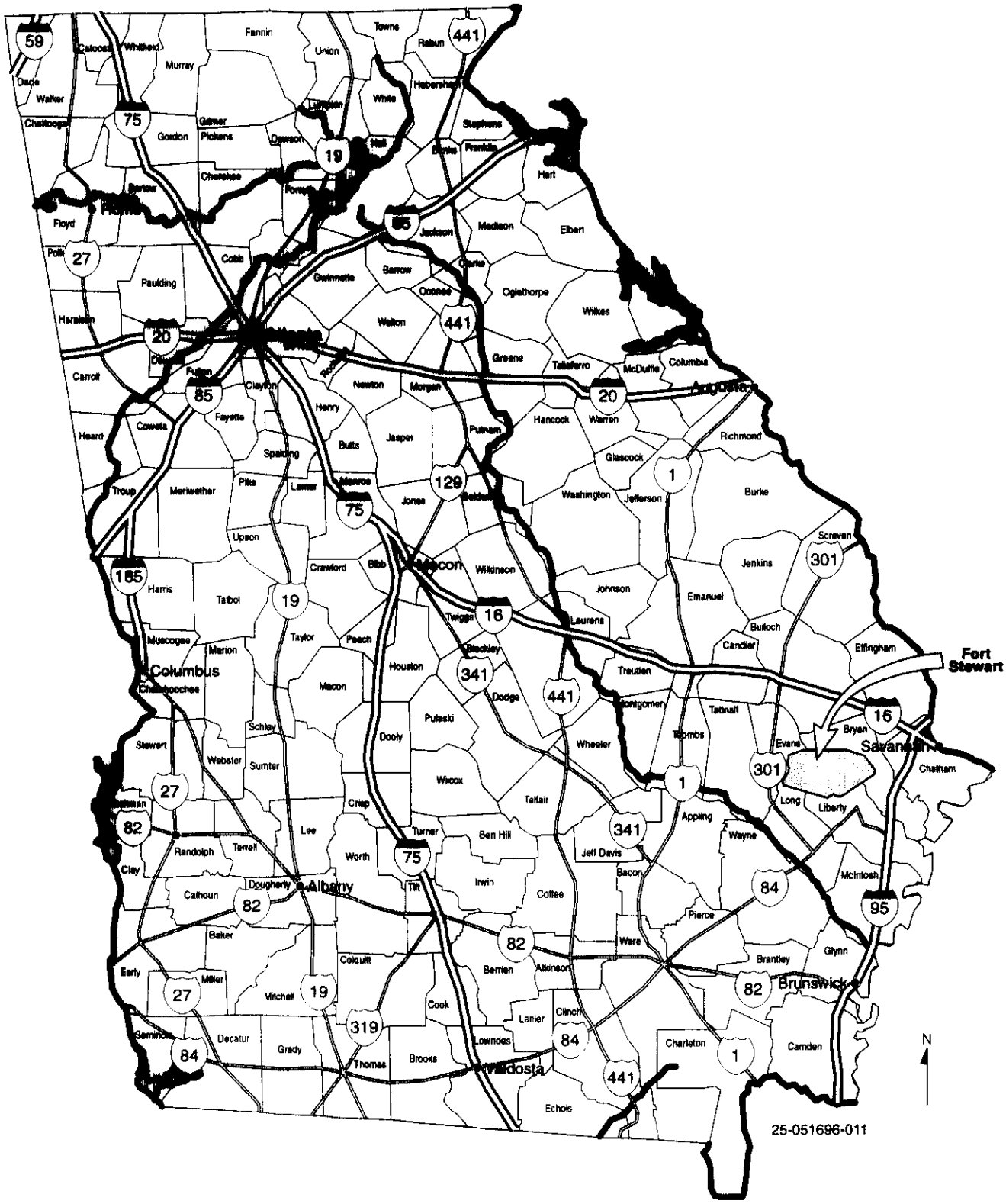

Figure 2-1. Regional Location Map for Fort Stewart Military Reservation, Georgia

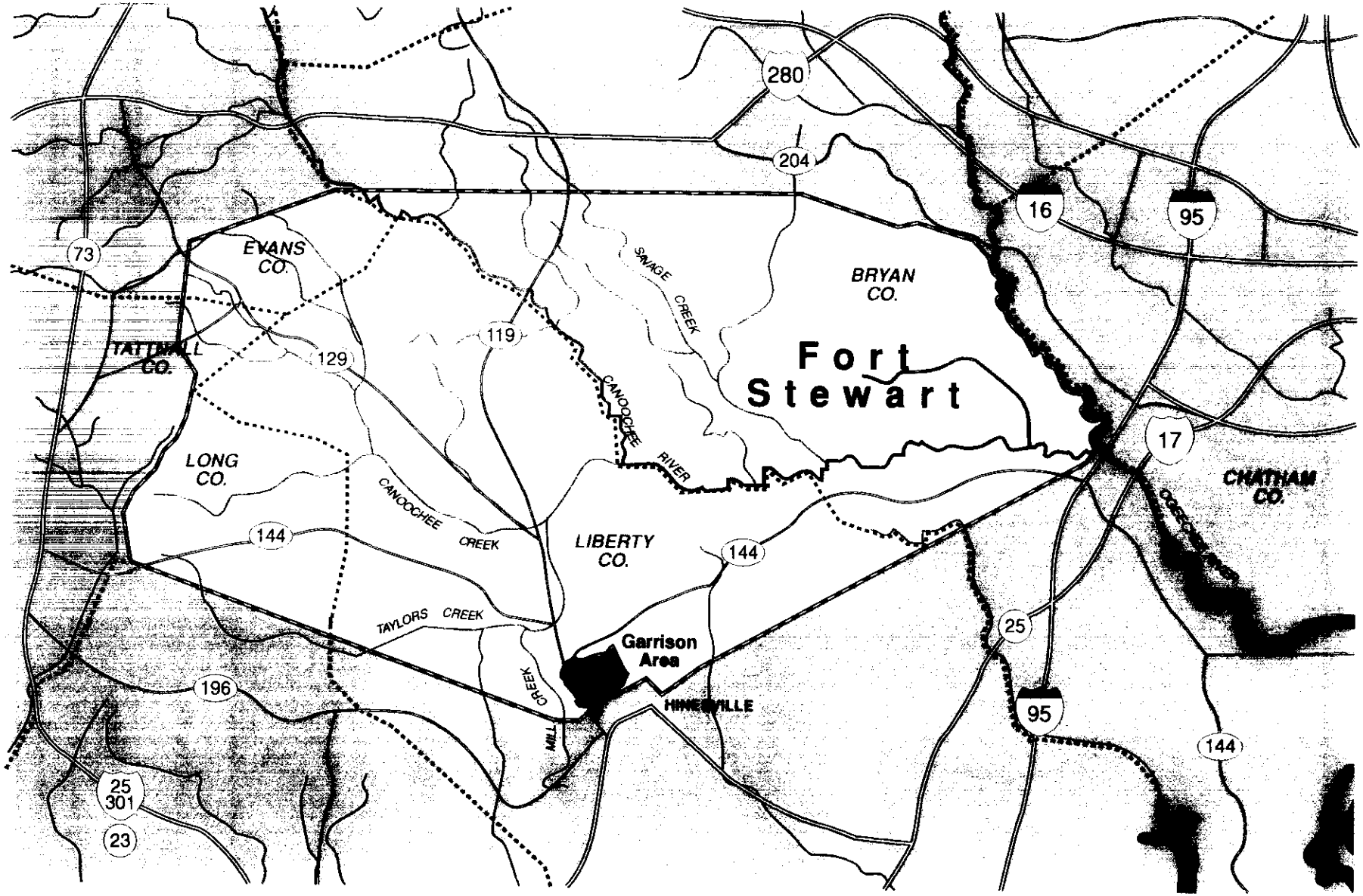

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Figure 2-2. Location Map for Fort Stewart Military Reservation, Georgia

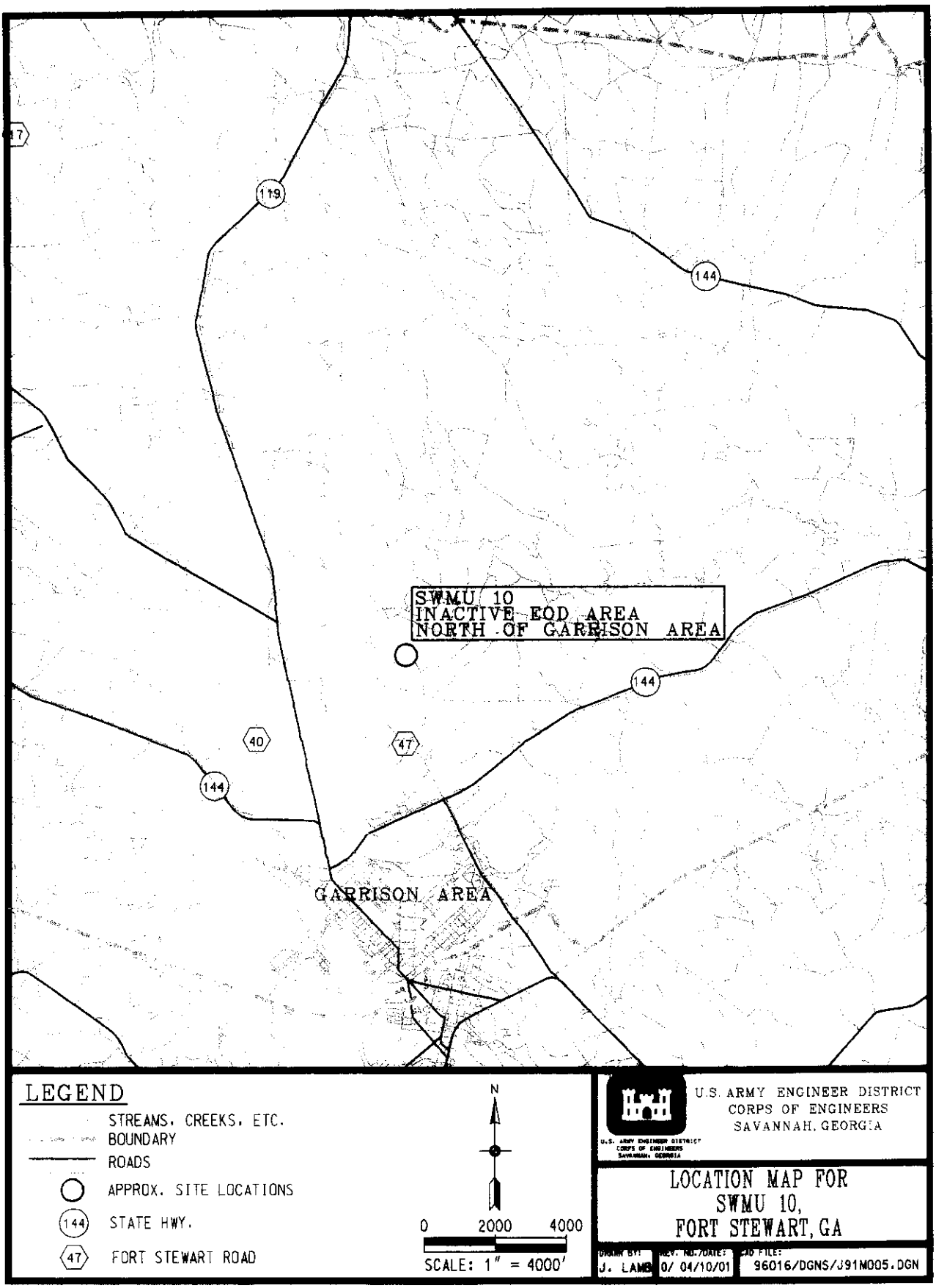

Figure 2-3. Location for SWMU 10, Fort Stewart, Georgia

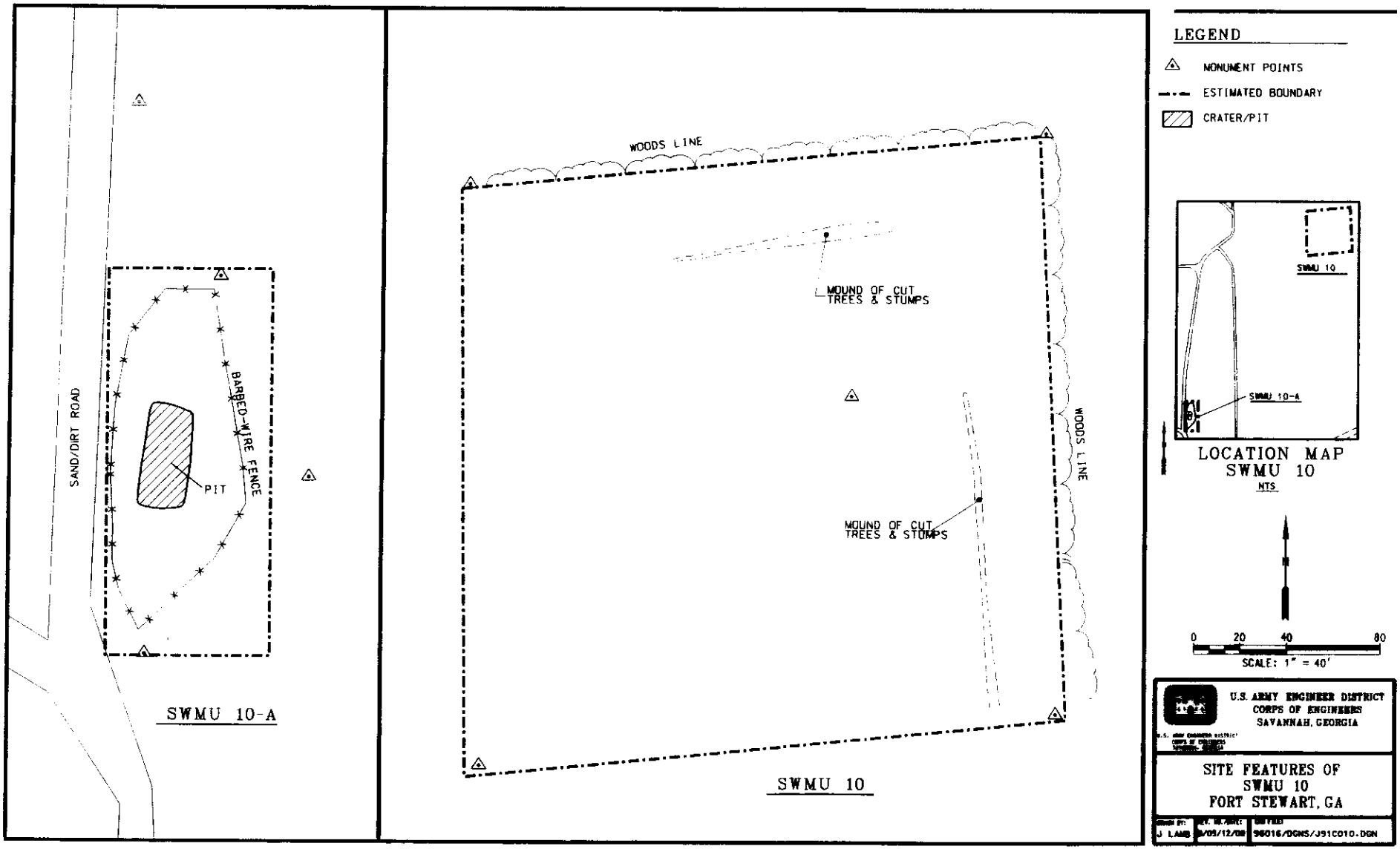

Figure 2-4. Site Features of SWMU 10, Fort Stewart, Georgia

dominate the topography. The terraces are remnants of sea level fluctuations. The four terraces present within the FSMR are the Wicomico, Penholoway, Talbot, and Pamlico (Metcalf and Eddy 1996).

Fort Stewart has a humid, subtropical climate with long, hot summers. Average temperatures range from 50°F in the winter to 80°F in the summer. Average annual precipitation is 48 inches, with slightly more than half falling from June through September. Prolonged drought is rare in the area, but severe local storms (tornadoes and hurricanes) do occur. Under normal conditions wind speeds rarely exceed 5 knots, but gusty winds of more than 25 knots may occur during summer thunderstorms (Geraghty and Miller 1992).

There are approximately 3 feet of relief across SWMU 10. The elevation of the site is approximately 67 feet amsl along the eastern boundary and slopes gently downward to approximately 64 feet amsl along the western boundary.

2.3 SITE GEOLOGY

The FSMR is located within the coastal plain physiographic province. This province is typified by southeastward-dipping strata that increase in thickness from 0 feet at the fall line (located approximately 155 miles inland from the Atlantic coast) to approximately 4,200 feet at the coast. State geologic records describe a probable petroleum exploration well (the No. 1 Jelks-Rogers) located in the region as having encountered crystalline basement rocks at a depth of 4,254 feet below ground surface (bgs). This well provided the most complete record for Cretaceous, Tertiary, and Quaternary strata.

The Cretaceous section is approximately 1,970 feet thick and is dominated by clastics. The Tertiary section is approximately 2,170 feet thick and is dominated by limestone, with a 175-foot-thick cap of dark green phosphatic clay. This clay is regionally extensive and is known as the Hawthorn Group. The interval from approximately 110 feet to the surface is Quaternary in age and composed primarily of sand with interbeds of clay or silt. This section is undifferentiated.

State geologic records contain information regarding a well drilled in October 1942, 1.8 miles north of Flemington at Liberty Field of Camp Stewart (now known as Fort Stewart). This well is believed to have been an artesian well located approximately 0.25 mile north of the runway at Wright Army Airfield within the FSMR. The log for this well describes a 410-foot section, the lowermost 110 feet of which consisted predominantly of limestone, above which 245 feet of dark green phosphatic clay typical of the Hawthorn Group were encountered. The uppermost 55-foot interval was Quaternary-age interbedded sands and clays. The top 15 feet of these sediments were described as sandy clay.

Site-specific subsurface soil characterization was not performed at these sites. There were no soil cuttings associated with the Geoprobe installation, so soil samples were not collected for classification. However, the soil present at these sites is expected to be similar to that at other sites at Fort Stewart, which means it should consist of silty and clayey sands.

2.4 SITE HYDROLOGY

The principal surface water body accepting drainage from the FSMR is the Canoochee River, which joins the Ogeechee River (part of the northwestern boundary of the reservation). Canoochee Creek is a tributary of the Canoochee River that drains much of the western portion of the FSMR. Taylors Creek, which is a tributary of the Canoochee Creek, is the nearest surface water body to SWMU 10.

Taylors Creek is located approximately 1,500 feet southwest of SWMU 10. Based on topography, the surface water flow direction is to the west toward Taylors Creek. Drainage occurs as overland flow; there are no surface water features in the immediate vicinity of (fewer than 1,500 feet from) the former EOD area.

2.5 HYDROGEOLOGY

The hydrogeology in the vicinity of the FSMR is dominated by two aquifers, referred to as the Principal Artesian and the surficial aquifers, that are separated by a confining unit, the Hawthorn Group.

The Principal Artesian Aquifer is the lowermost hydrologic unit; is regionally extensive from South Carolina through Georgia, Alabama, and most of Florida; and is regionally known as the Floridan Aquifer. This aquifer is subdivided into upper and lower hydrogeologic units. The upper hydrogeologic unit is composed primarily of Miocene-age argillaceous sands and clays and Oligocene- to Eocene-age limestones (including the Ocala Group and the Suwannee Limestone, where present) at the top. The upper hydrogeologic unit ranges in thickness from 200 feet to 260 feet and is most productive where it is thickest and where secondary permeability is most developed. The lower hydrologic unit is comprised of the Eocene-age Avon Park Limestone at the base. The transmissivity of the aquifer in the Savannah area ranges from about 28,000 square feet/day to 33,000 square feet/day (Krause and Randolph 1989). Groundwater from this aquifer is primarily used for drinking water (Arora 1984). Thirteen groundwater production wells are used for potable water supply on the FSMR, and one additional production well is used for fire protection.

The confining layer for the Principal Artesian Aquifer is the phosphatic clays of the upper Hawthorn Group. These sediments are regionally extensive and range from 60 feet to 80 feet in thickness at the FSMR. There are minor occurrences of aquifer material within the Hawthorn Group; however, they have limited utilization (Miller 1990).

The uppermost hydrologic unit is the surficial aquifer, which consists of widely varying amounts of sand, silt, and clay ranging from 35 feet to 150 feet in thickness. Well yields from this aquifer would range from 2 gallons to 180 gallons per minute based on geotechnical data from the monitoring wells installed during the Phase II RFI performed at other SWMUs across the Installation.

The water level was measured from temporary piezometers at SWMU 10 during the Phase II RFI. The resulting data were used to determine flow direction and the placement of possible permanent monitoring wells around the sites. Based on the analytical results from the temporary piezometers and with the concurrence of GEPD, permanent wells were not installed at SWMU 10.

Groundwater was encountered from approximately 5.5 feet bgs or 61.6 feet amsl at the southeastern corner of the site to approximately 7.4 feet bgs or 57.3 feet amsl at the northwestern corner of the site. The shallow groundwater flow direction across the site is estimated to be toward the southwest.

2.6 SITE ECOLOGY

Approximately 7.8 square miles of the 436.8 square miles at the FSMR comprise the garrison area. The remainder is used for ranges and training areas (approximately 11 percent) or held as non-use areas.

Eighty-four percent of the land is forested (approximately 367.2 square miles). Sixty-six percent of the forest area is pine, with the major species including the slash, loblolly, and longleaf pines. Thirty-four

percent of the forest is composed of river bottomlands and swamps whose major species include the tupelo, other gum trees, water oak, and bald cypress trees. The open range and training areas comprise 11 percent of the Installation and consist of grasses, shrubs, and scrub tree (oak) growth.

Aquatic habitats on the FSMR include a number of natural or man-made ponds and lakes, the Canoochee River, Canoochee Creek and its tributaries, and a number of bottomland swamps and pools. The Ogeechee River borders the Installation along its northeastern boundary. Organic detritus content is high, and dark coloring of the water is not unusual. Dense growths of aquatic vegetation are also typical, especially during the summer months.

Two types of terrestrial habitats occur at SWMU 10: unmanaged grasslands and forestlands. These two habitat types are common and widespread in the FSMR surrounding the cantonment area. These habitat types are briefly described below based on observations made by SAIC personnel during field investigations conducted January through March 1998.

Unmanaged grasslands at the FSMR are typically formerly managed grasslands that have undergone succession into meadows of native grasses and weeds because they are no longer mowed or otherwise disturbed. As is the case with SWMU 10, most of these areas are bordered on one or more sides by forest. Many of these areas have more sand on the surface than vegetation. Immature pine trees are commonly found growing sporadically throughout unmanaged grasslands along with sweetgum (*Liquidamber styraciflua*) and blackgum (*Nyssa sylvatica*). Unmanaged grasslands bordered by forests are optimal animal foraging sites and support a diverse fauna, including a large number of small mammals such as shrews, voles, and mice as well as birds and groundhogs (*Marmota monax*). Predators frequent these areas to prey upon the resident fauna. These areas are transitional in nature and would be expected to revert to the surrounding forest type if left undisturbed.

Except for the garrison area, the FSMR consists mainly of managed pine forests of two types: palmetto-pine and pine-oak forest. The forestlands in the vicinity of SWMU 10 are pine-oak forests. Characteristic flora of the pine-oak forest or mixed pine/hardwood forest type includes slash pine (*Pinus elliottii*), long-leaf pine *(P. palustris)*, loblolly pine *(P. taeda)*, sweetgum, blackgum, live oak (*Quercus virginiana*), Southern red oak (*Q. falcata*), and white oak (*Q. alba*). Saw-palmetto *(Serenoa repens)* is commonly found as one of several understory plants. Common species include white-tailed deer (*Odocoileus virginianus*), feral hogs (*Sus scrofa*), wild turkey (*Meleagris gallopavo*), nine-banded armadillos (*Dasypus novemcinctus*), and gray squirrels (*Scurius carolinensis*).

The habitats at SWMU 10 are classified as "unmanaged grasslands." Pine-oak forest surrounds all sides of the site. The boundary is marked mainly by hardwoods and immature pine. Many shallow depressions are scattered throughout the site. These depressions may collect water after rainfall events; however, the water quickly percolates into the subsurface. No evidence of aquatic life was present in the ephemeral bodies of water during the field investigation. This site is adjacent to a very active firing point, which may explain the many depressions.

2.7 NATURE AND EXTENT OF CONTAMINATION

Results of chemical analyses performed during the Phase I and Phase II RFIs indicate that soil, groundwater, sediment, and surface water contain organic and metal contaminants at concentrations greater than their reference background concentrations.

The reference background criteria for the inactive EOD areas have been developed based on data from background samples collected across the FSMR for SWMUs under Phase I and/or Phase II RFIs. In

general, reference background samples were collected in each medium at locations upgradient or upstream of each site so as to be representative of naturally occurring conditions at SWMUs under investigation. In addition, soil collected during the Phase I RFI [from Burn Pits (SWMUs 4A–4F), the Active EOD Area (SWMU 12A), etc.] was included in the background data set if it was determined to come from upgradient of the site and to be of sufficient quality to be representative of natural background conditions at the FSMR. A summary of the sample locations by medium at each SWMU and the source of the data (Phase I and II RFI analytical data) are presented in Table 5-1 of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000).

EPA Region IV methodology (EPA 1996) was used as guidance for the development of the background data set for screening metals data. In cases in which enough samples (i.e., more than 20) are collected to define background, a background upper tolerance level can be calculated. In cases in which too few samples (i.e., fewer than 20) are collected to define background, background can be calculated as two times the mean background concentration (EPA 1996). Given that fewer than 20 background samples were collected for the FSMR, the latter method was used for calculating reference background concentrations.

The reference background concentrations for surface soil, subsurface soil, groundwater, surface water, and sediment were calculated as two times the average concentration of all of the locations selected to be in the background data set. If a chemical was not detected at a site, then one-half the detection limit was used as the concentration when calculating the reference mean background concentration.

Inorganics were considered to be site-related contaminants (SRCs) if their concentrations were above the reference background concentrations. Organics were considered to be SRCs if they were simply detected because organic constituents are considered to be anthropomorphic in nature.

Appendix G of the revised final Phase II RFI Report for 16 SWMUs (SAIC 2000) presents the summary of background data as well as the two-times-mean background concentrations. Given the limited background data, the mean concentration for soil in the eastern United States is also presented for comparative purposes. Because of the limited number of background samples, the screening value for background may be heavily skewed as a result of an outlier in the sampling data.

A tabular summary of SRCs for SWMU 10 addressed by this CAP is provided in Table 2-1.

2.7.1 Surface Soil

As part of the Phase I RFI, six surface soil samples were collected from various locations within each of two blast craters at depths of 1.0 foot to 1.5 feet bgs and analyzed for VOCs, RCRA metals, and explosives residue. During the Phase II RFI, surface soil samples were collected from three surface soil locations within the boundary of the EOD area and were analyzed for explosives and RCRA metals. No explosives were detected in the surface soil samples. Arsenic, barium, chromium, and lead were detected above the reference background criteria in surface soil from the Phase I RFI (Table 2-1). Also, lead was detected in one of the samples collected during the Phase II RFI at a concentration that exceeded the FSMR reference background criterion. Table 2-1 presents the maximum concentrations of the SRCs by medium for SWMU 10. Arsenic, barium, chromium, and lead were considered to be SRCs in surface soil; however, the maximum concentrations of these metal SRCs were within the range established by the U.S. Geological Survey for element concentrations in soil of the eastern United States (USGS 1984). Given that the concentrations of these metals in surface soil were within the range of naturally occurring concentrations, the potential impacts to human health and the environment are likely to be minimal, and further investigation and/or evaluation of these metals in surface soil is not required.

Table 2-1. Summary of Site-related Contaminants, SWMU 10

Analyte	Maximum Concentration (mg/kg)			Maximum Concentration (µg/L)	
	Surface Soil	Subsurface Soil	Sediment	Groundwater	Surface Water
Arsenic	6.02[a]	NC[b]	1.3	NA	ND
Barium	42.0[a]	NC[b]	22.3	NA	BRBC
Cadmium	ND	NC[b]	BRBC	NA	0.97
Chromium	38.9[a]	NC[b]	BRBC	NA	1.5
Lead	51.6	NC[b]	15.5	NA	ND
Mercury	ND	NC[b]	ND	NA	0.16

[a]Phase I RFI data.

[b]In accordance with the GEPD–approved Work Plan (SAIC 1997), subsurface soil was not collected because subsurface soil sampling in an EOD area requires approval by the Secretary of the Army.

BRBC = Below reference background criteria.

NA = Not analyzed.

NC = Medium not collected based on screening results.

ND = Not detected.

2.7.2 Subsurface Soil

In accordance with the approved Work Plan (SAIC 1997), no subsurface soil samples were collected. Approval is required from the Department of the Army before subsurface drilling can be implemented at a former EOD site. In addition, potential contamination would primarily be associated with the surface soil at a former EOD site.

2.7.3 Groundwater

Groundwater samples were collected from eight Geoprobe locations and were screened for explosives. No explosives were detected in any of the eight groundwater samples. The horizontal and vertical extent of contamination was determined from the Geoprobe groundwater data; therefore, in accordance with the GEPD–approved Work Plan (SAIC 1997) and with GEPD concurrence, the proposed vertical-profile and three monitoring wells were not installed.

2.7.4 Surface Water

Two surface water samples were collected from Taylors Creek as part of the Phase II RFI. The surface water samples were analyzed for explosives and RCRA metals. No explosives were detected in the surface water samples. Cadmium (0.97 µg/L), chromium (1.5 µg/L), and mercury (0.16 µg/L) were detected in the downstream surface water sample (SWS2) at concentrations exceeding site-specific reference background criteria and are, therefore, considered to be SRCs (see Table 2-1).

Taylors Creek is located approximately 1,500 feet from SWMU 10 and is separated from it by forest and grass habitat. Cadmium and mercury were not detected in surface soil from SWMU 10 at concentrations above the reference background criteria. Chromium was detected above the reference background criterion in only two of eight surface soil samples. The chromium concentrations in surface soil were within (at the low end of) the concentration range (1 mg/kg to 1,000 mg/kg) of chromium observed in the eastern United States (USGS 1984). Thus, it is unlikely that the cadmium, chromium, and mercury observed in Taylors Creek surface water are associated with SWMU 10, but probably are the result of naturally occurring background concentrations. Therefore, the potential impacts to human health and the

environment are likely to be minimal, and further investigation and/or evaluation of these metals in surface water is not required.

2.7.5 Sediment

Two sediment samples were collected from Taylors Creek. The sediment samples were analyzed for explosives and RCRA metals. No explosives were detected in the sediment samples. Arsenic (1.3 mg/kg), barium (22.3 mg/kg), and lead (15.5 mg/kg) were detected in the downgradient sediment sample (SWS2) at concentrations exceeding site-specific reference background criteria and are, therefore, considered to be SRCs (see Table 2-1).

Arsenic, barium, and lead were not detected in the associated surface water samples at concentrations above the reference background criteria (see Table 2-1). The reason may be that the topography between the site and Taylors Creek is relatively flat, and the soil in the FSMR is typically sandy, with relatively high porosity, so it is likely that runoff from precipitation events would percolate into the adjacent surface and subsurface soil; therefore, potentially contaminated runoff would be unlikely to impact the distant stream (i.e., 1,500 feet from SWMU 10).

Arsenic, barium, and lead were detected in surface soil above the reference background criteria (see Table 2-1); however, the observed arsenic, barium, and lead concentrations were all within the concentration ranges for the eastern United States (USGS 1984). In addition, Taylors Creek is separated from the site by forest and grass habitat. Migration of these metals in soil would be highly retarded by their physicochemical properties. Thus, it is unlikely that arsenic, barium, and lead in sediment in Taylors Creek are associated with SWMU 10, but instead are probably the result of naturally occurring background concentrations. Therefore, the potential impacts to human health and the environment are likely to be minimal, and these constituents in sediment do not warrant further investigation and/or evaluation.

2.8 ORDNANCE AND EXPLOSIVES SURVEY OF SWMU 10

An ordnance and explosives (OE) survey and identification operation was performed by American Technologies, Inc., May 1 and May 3, 2001, at SWMU 10. The OE survey consisted of a visual sweep of the surface of both areas of SWMU 10. In addition, a sweep using a magnetometer was attempted at the smaller area of SWMU 10 to locate OE–related items under pine needles covering parts of the site. The complete OE survey report is presented in Appendix A. The findings of the OE survey at SWMU 10 are summarized below.

2.8.1 Large Area (1.48 acres) of SWMU 10

The OE survey indicated no UXO or OE–related items at the larger area of SWMU 10. Approximately 4 pounds of steel fragmentation were found and removed from the site.

2.8.2 Small Area (0.27 acre) of SWMU 10

The OE survey found spent small arms ammunition cases, shell fragments, fuze parts, and remnants of 81-millimeter illumination round fin assemblies in the washed out portion of the smaller area of SWMU 10. Because of the high metal content of the smaller area, the magnetometer was unable to accurately locate any one metal item. Fort Stewart EOD personnel indicated to the OE survey team that the pit in the smaller area of SWMU 10 was a dumping site for 90-millimeter armor-piercing projectiles (solid shot).

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3.0 JUSTIFICATION/PURPOSE OF CORRECTIVE ACTION

3.1 PURPOSE

EPA has established corrective action standards that reflect the major technical components that should be included with a selected remedy (EPA 1988). These include the following: (1) protect human health and the environment; (2) attain media cleanup standards set by the implementing agency; (3) control the source of releases so as to reduce or eliminate, to the extent practicable, further releases that may pose a threat to human health and the environment; (4) comply with any applicable standards for management of wastes; and (5) other factors.

3.2 REMEDIAL RESPONSE OBJECTIVE

Based on the findings of the site characterization at SWMU 10, the primary goal and purpose for implementing corrective measures at the subject former EOD area is limited to protection of human health and safety. To achieve this goal, the following remedial response objective has been established for SWMU 10: to prohibit the disturbance of subsurface soil to prevent contact with buried exploded ordnance debris and/or contaminated media. Any corrective measures that pose a significant threat to human health and safety during implementation (e.g., methods that would involve disturbance of subsurface soil within the SWMUs' boundaries) will not be evaluated. Implementation of the selected remedial responses will achieve the best overall results with respect to such factors as long-term reliability and effectiveness, short-term effectiveness, implementability, and cost.

3.3 IDENTIFICATION OF REMEDIAL LEVELS

Based upon the current status and results of the investigations at SWMU 10, remedial levels have not been established for this inactive EOD site. No SRCs were detected in groundwater at SWMU 10; metals in surface soil, sediment, or surface water were the only SRCs identified at the site. Given that the concentrations of these metals are within the range for naturally occurring concentrations, the potential impacts to human health and the environment are likely to be minimal, and further evaluation and establishment of remedial levels are not warranted.

3.4 IDENTIFICATION OF UXO AND OE

The results of the OE survey conducted in May 2001 at SWMU 10 indicated no UXO or OE at the larger area (1.48 acres) of SWMU 10. Approximately 4 pounds of steel fragmentation were found at the larger area and removed from the site. In summary, the larger area of SWMU 10 does not contain UXO or OE–related items that may potentially impact the health or safety of FSMR personnel or trespassers.

OE–related items were found on the surface of the smaller area (0.27 acre) of SWMU 10. The high metal content of the smaller area prevented accurate readings of the surface (to approximately 2 feet bgs) using the magnetometer. Fort Stewart EOD personnel have indicated that the pit in the smaller area of SWMU 10 was used for dumping of spent rounds. The smaller area contains OE–related items at the surface and unidentified OE in the near subsurface. In addition, past practices and the high metal content of the area suggested by the magnetometer indicate that the smaller area of SWMU 10 may represent a safety concern to FSMR personnel or trespassers.

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4.0 SCREENING OF CORRECTIVE ACTIONS

This section identifies corrective action technologies applicable to SWMU 10. The technologies that are retained following screening are then presented as corrective action alternatives that address limiting exposure to surface contamination and surface and subsurface OE–related items/debris. These alternatives are then evaluated with respect to protection of human health and life-cycle cost.

4.1 SCREENING CRITERIA

The first step in the development of corrective action alternatives involves the identification and screening of technologies applicable to the site. The purpose of this step is to list and evaluate the general suitability of remedial technologies for meeting the stated corrective action objectives. The options presented here will be evaluated for their general ability to protect and reduce risk to human health and safety.

The technologies will be discussed sufficiently to allow them to be compared using three general criteria that will function as balancing factors: effectiveness, implementability, and cost. The explanation of each criterion is provided below.

4.1.1 Effectiveness

This criterion evaluates the extent to which a corrective action reduces overall risk to human health and the environment. It also considers the degree to which the action provides sufficient long-term controls and reliability to prevent exposures that exceed levels protective of human and environmental receptors. Factors considered include performance characteristics, maintenance requirements, and expected durability.

4.1.2 Implementability

This criterion evaluates the technical and administrative factors affecting implementation of a corrective action and considers the availability of services and materials required during implementation. Technical factors assessed include ease and reliability of initiating construction and operations, prospects for implementing any additional future actions, and adequacy of monitoring systems to detect failures. Technical feasibility considers the performance history of the technologies in direct applications or the expected performance for similar applications. Uncertainties associated with construction, operation, and performance monitoring are also considered.

Service and material considerations include equipment and operator availability and applicability or development requirements for prospective technologies. The availability of services and materials is addressed by analyzing the material components of the proposed technologies and then determining the locations and quantities of materials. Administrative factors include ease of obtaining permits, enforcing deed recordation requirements, or maintaining long-term control of the site.

4.1.3 Cost

Relative costs are included for corrective actions. The estimates are intended to facilitate evaluation and comparison among alternatives; therefore, cost-estimating contingencies common to all alternatives have been excluded from the estimates at the screening level of evaluation because all of the alternatives will have similar contingencies.

4.2 EVALUATION OF CORRECTIVE ACTION TECHNOLOGIES

Three categories of corrective actions were identified for SWMU 10: (1) no action, (2) institutional controls: land use controls, and (3) institutional controls: physical barriers. These corrective action technologies are described in Table 4-1. The technologies were evaluated using the screening criteria of effectiveness, implementability, and cost. Results of the screening evaluations are shown in Table 4-1.

The no action alternative provides a baseline against which other options can be compared. Under the no action alternative, no further action would be taken. No cost would be associated with the selection of this alternative. The acceptability of the no action alternative is judged in relation to the assessment of known site risks and by comparison with other corrective action alternatives.

The no action alternative is not considered to be viable because it provides no reliable or effective method for protecting human health and safety; therefore, the no action alternative will be eliminated from further evaluation.

Institutional controls include actions taken to restrict access to areas with surface contamination and surface and subsurface exploded ordnance debris. These restrictions would consist of establishing legal land use controls or installing physical barriers to restrict access. Physical barriers and/or land use restrictions would provide effective, readily implementable, and cost-effective methods for preventing human exposure to buried exploded debris at the site. Land use controls include deed recordation, existing controls, controls implemented through the BMP, zoning controls, and placement of signs restricting access. Physical barriers include installation of a 6-foot chain-link fence topped with three strands of barbed wire along the boundary of either one or both portions of SWMU 10.

4.3 CORRECTIVE ACTION ALTERNATIVES

The technologies retained following the screening step were used in various combinations to meet the remedial response objective for protection of human health and safety. Three alternatives were identified and subsequently evaluated for SWMU 10.

1. Alternative 1: Institutional Controls: BMP, Deed Recordation, Zoning Controls, Post-mounted Warning Signs, Implementation of O&M Plan.

2. Alternative 2: Institutional Controls: BMP, Deed Recordation, Zoning Controls, Chain-link Fence with Barbed Wire and Fence-mounted Warning Signs around the Smaller Area of SWMU 10 Only, Implementation of O&M Plan.

3. Alternative 3: Institutional Controls: BMP, Deed Recordation, Zoning Controls, Chain-link Fence with Barbed Wire and Fence-mounted Warning Signs around Both Portions of SWMU 10, Implementation of O&M Plan.

4.3.1 Evaluation Factors

Based on the results of the technology screening, each of the retained technologies is considered applicable to the site and implementable for SWMU 10; therefore, two primary evaluation factors were used in selecting the preferred corrective action alternative: protection of human health and safety and life-cycle costs.

Table 4-1. Evaluation of Corrective Actions, SWMU 10

Action	Description	Effectiveness	Implementability	Cost
No Action	The no action alternative provides a baseline against which other actions can be compared. Under the no action alternative, all source materials and groundwater would be left "as is," without implementation of any removal, treatment, or other mitigating actions to reduce existing or potential future human exposure to contaminants or exploded ordnance debris by human disturbance.	This alternative would not address the corrective action objectives for the site. This alternative would not provide protection of human health and safety because there would not be sufficient controls to prevent human exposure to contaminants or exploded ordnance debris.	There would be no implementability issues involved in this alternative because no action would be taken.	There would be no cost associated with the no action alternative.
Institutional Controls: Land Use Controls	Land use controls would reduce potential hazards by limiting exposure of humans to contaminated soil and groundwater and to exploded ordnance debris. Land use restrictions and institutional control requirements that would be enforced would include restrictions through existing land use controls, deed recordation, base master planning and zoning controls, warning signs posted around either one or both portions of SWMU 10, and applicable state land use control management systems in effect at the time of transfer. Activities such as excavation or construction that would disturb surface soil and/or subsurface soil within the site's boundaries would be prohibited under the deed recordation.	Land use restrictions would be effective and provide long-term reliability with respect to preventing human contact with contaminants or exploded ordnance debris within the boundaries of the site. The technology would not provide physical barriers to restrict access to the site; therefore, noncompliance with these land use restrictions could result in contact with contaminants or exploded ordnance debris. The BMP is an effective tool for ensuring establishment of land use restrictions because requirements of the BMP are enforced by the FSMR in accordance with written policies and procedures.	These institutional controls could be readily implemented. The property will remain under federal ownership for the foreseeable future. The BMP is implementable because procedures and policies are in place at the FSMR to facilitate its implementation.	The costs would be low. The cost for deed recordation, the BMP and zoning controls, post-mounted signs, and implementation of the O&M Plan for 30 years would range between approximately $140,000 and $160,000.
Institutional Controls: Physical Barriers	Physical barriers would reduce potential hazards by limiting contact by humans with contaminants and/or exploded ordnance debris. Physical barriers would include chain-link fencing with barbed wire and warning signs around either one or both portions of SWMU 10.	This technology would be effective and provide long-term reliability with respect to minimizing human contact with contaminants and/or exploded ordnance debris within the boundaries of the site by physically restricting access.	Physical barriers would be readily implementable at the SWMU. The property will remain under federal ownership.	Installation of fencing would be expensive, and the cost would be dependent upon the linear feet to be installed. The costs for fencing, including 30 years of O&M, would range between approximately $200,000 and $270,000.

Protection of Human Health and Safety

The effectiveness of each proposed alternative at protecting human health and safety at this site is dependent upon its ability to prohibit human activity associated with disturbance of subsurface soil. For both Alternatives 2 and 3, legal land use controls and warning signs would also prohibit activities associated with disturbance of subsurface soil. In Alternative 2 additional protection would be provided by the use of fencing to restrict access to the smaller area of SWMU 10, which was identified by the OE survey as containing OE–related items on the surface and unidentified OE–related items in the subsurface. In Alternative 3, additional protection would be provided by the use of fencing to restrict access to both areas of SWMU 10.

Life-cycle Costs

The life-cycle cost estimates are budget estimates based on conceptual design and are to be used for comparison purposes. The costs were estimated for capital construction, administration, and O&M. The cost estimates were derived from current information, including vendor quotes and conventional cost estimating guides (e.g., Means 1999 and ECHOS 1998). The actual costs of the project would depend on labor and material costs, site conditions, competitive market conditions, final project scope, and implementation schedule at the time the corrective action is initiated. The life-cycle cost estimates have not been adjusted to present worth costs, and no escalation factors have been applied.

4.3.2 Site-specific Evaluation of Corrective Action Alternatives

The corrective action alternatives for SWMU 10 are summarized in Table 4-2, along with the associated level of protection of human health and safety and associated life-cycle costs.

The alternatives would include the following common features:

- BMP, deed recordation, and zoning controls that establish controls to prohibit intrusion into subsurface soil;
- installation of warning signs; and
- implementation of an O&M Plan to maintain the conditions of the signage.

The paragraphs below summarize the evaluation of the three corrective action alternatives with respect to the primary evaluation factors of protection of human health and safety and life-cycle cost.

Alternative 1: Institutional Controls: BMP, Deed Recordation, Zoning Controls, Maintenance of Existing Physical Barriers, Post-mounted Warning Signs, Implementation of O&M Plan

This alternative would provide for the implementation of land use controls during the period of ownership by DoD through enforcement of the BMP and deed recordation. This alternative would protect human health and safety by preventing human exposure to contaminants or exploded ordnance debris by the establishment of legal land use restrictions. The BMP is an effective tool for preventing the disturbance of subsurface soil at the site. If this property was to be transferred in the future, notification of the property transfer would be made to regulatory authorities. The following provisions would ensure implementation of land use controls subsequent to property transfer: deed recordation; the purchase agreement or lease; zoning controls; applicable state land use control management systems in effect at the time the property is transferred; community, transferee, or governmental notice (if needed); and self-certification (if feasible). To reduce potential exposure to health and safety hazards associated with SWMU 10, warning signs stating restrictions on human activity within the SWMU would be posted at 200-foot intervals around the

Table 4-2. Corrective Action Alternatives, SWMU 10

Corrective Action	Description	Protection of Human Health and Safety	Cost	Comments
Alternative 1: Institutional Controls: BMP, Deed Recordation, Zoning Controls, Post-mounted Warning Signs, Implementation of O&M Plan	This action would require legal and local land use controls and signage to enforce restrictions on land use.	Protection of human health and safety would be primarily dependent upon enforcement of compliance with land use controls. There are no existing natural or man-made barriers to prevent human access.	$155,320	Least expensive providing reduced level of protection.
Alternative 2: Institutional Controls: BMP, Deed Recordation, Zoning Controls, Chain-link Fence Barrier and Fence-mounted Warning Signs around the Smaller Area of SWMU 10, Implementation of O&M Plan	This action would require legal and local land use controls and signage to enforce restrictions on land use. Physical barriers to be installed would include 473 linear feet of 6-foot chain-link fence topped with barbed wire along the smaller area of the site.	In addition to the protection provided by Alternative 1, human access would be further restricted by fencing topped with barbed wire around the smaller area of SWMU 10, the area of SWMU 10 indicated by the EOD survey to contain exploded ordnance debris, which may represent a physical safety hazard at the site. The fencing would be more effective than signs alone in deterring or discouraging unauthorized excavation activities or trespassing on the smaller area of SWMU 10.	$186,839	More expensive, with increase in level of protection compared to Alternative 1. However, due to decrease in level of protection, this alternative is less expensive than Alternative 3.
Alternative 3: Institutional Controls: BMP, Deed Recordation, Zoning Controls, Chain-link Fence Barrier and Fence-mounted Warning Signs around Both Areas of SWMU 10, Implementation of O&M Plan	This action would require legal and local land use controls and signage to enforce restrictions on land use. Physical barriers to be installed would include 1,489 linear feet of 6-foot chain-link fence topped with barbed wire along the entire boundary of the site.	This alternative is similar to Alternative 2; however, this alternative would restrict human access to both areas of the SWMU 10 site. The fencing would be more effective than signs alone in deterring or discouraging unauthorized excavation activities or trespassing.	$248,538	Significantly more expensive, with significant increase in level of protection compared to Alternative 1. However, the increased level of protection justifies the increased cost.

boundary of the larger area of the SWMU (total of four signs) and on each side of the smaller area (total of four signs). The existing one string of barbed wire around the smaller area would remain in place. The placement of signs for Alternative 2 is shown in Figure 4-1. Compliance with warning signs would restrict human access to the site because the warning would discourage any inadvertent or unsuspecting excavation activities. Warning signs and posts would be repaired and/or replaced as needed through implementation of a documented O&M Plan.

This is the least expensive of the three alternatives, with a life-cycle cost of approximately $155,320.

Alternative 2: Institutional Controls: BMP, Deed Recordation, Zoning Controls, Maintenance of Existing Physical Barriers, Fence Barrier and Fence-mounted Warning Signs Around the Smaller Area of SWMU 10, Implementation of O&M Plan

This alternative is similar to Alternative 1 in that land use control provisions would remain the same (BMP, deed recordation, zoning control), and an O&M Plan would be implemented. However, this alternative would additionally provide approximately 473 linear feet of 6-foot chain-link fencing topped with three strands of barbed wire along the boundary of the smaller area of SWMU 10, the area indicated by the EOD survey conducted in May 2001 as containing exploded ordnance surface debris. (The existing one string of barbed wire around the smaller area would be removed.) A 20-foot-wide, double-swing gate would be located on one side of the fenced area to allow access to the smaller area of SWMU 10. Fencing and signs would not be placed around the larger area of SWMU 10 so as to allow use of the area by FSMR personnel because the EOD survey indicated that the larger area does not represent a safety hazard to personnel. Fence-mounted warning signs would be positioned on each side of the smaller area (total of four signs). The placement of signage and fencing for Alternative 2 is shown in Figure 4-2. The effectiveness of Alternative 2 would be significantly greater than that of Alternative 1, with greater protection against inadvertent intruders as a result of the fencing. The O&M Plan would also include maintenance and repair of the chain-link fence and signs.

This alternative is more expensive than Alternative 1, with a life cycle cost of approximately $186,839.

Alternative 3: Institutional Controls: BMP, Deed Recordation, Zoning Controls, Maintenance of Existing Physical Barriers, Fence Barrier and Fence-mounted Warning Signs Around Both Areas of SWMU 10, Implementation of O&M Plan

This alternative is similar to Alternatives 1 and 2 in that land use control provisions would remain the same (BMP, deed recordation, zoning control), and an O&M Plan would be implemented. This alternative would additionally provide approximately 1,489 linear feet of 6-foot chain-link fencing topped with three strands of barbed wire along the entire boundary of each area of SWMU 10. (The existing one string of barbed wire around the smaller area would be removed.) A 20-foot-wide, double-swing gate would be located on one side of each fenced area to allow access to both areas of SWMU 10. The chain-link fence would provide a physical barrier to public access around the entire SWMU. Fence-mounted warning signs would be positioned at 200-foot intervals around the boundary of the larger area of SWMU 10 (total of four signs) and on each side of the smaller area (total of four signs). The placement of signage and fencing for Alternative 3 is shown in Figure 4-3. The effectiveness of Alternative 3 would be significantly greater than that of Alternative 2, with greater protection against inadvertent intruders as a result of the fencing, but would hinder military training activities. The O&M Plan would also include maintenance and repair of the chain-link fence and signs.

This alternative is more expensive than Alternative 1, with a life-cycle cost of approximately $248,538, or more than 1.6 times Alternative 1's life-cycle cost.

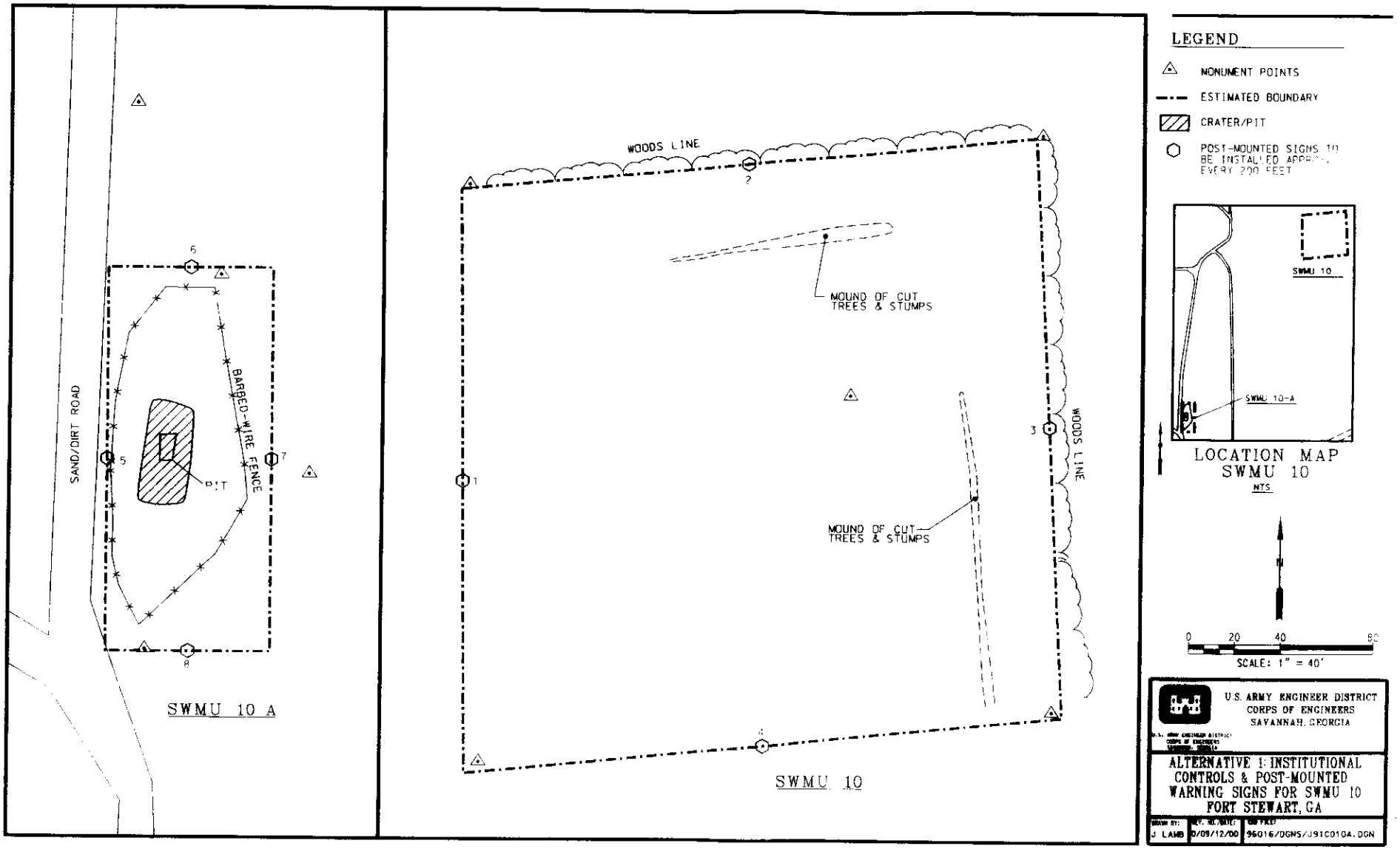

Figure 4-1. Alternative 1: Institutional Controls with Post-mounted Warning Signs, SWMU 10

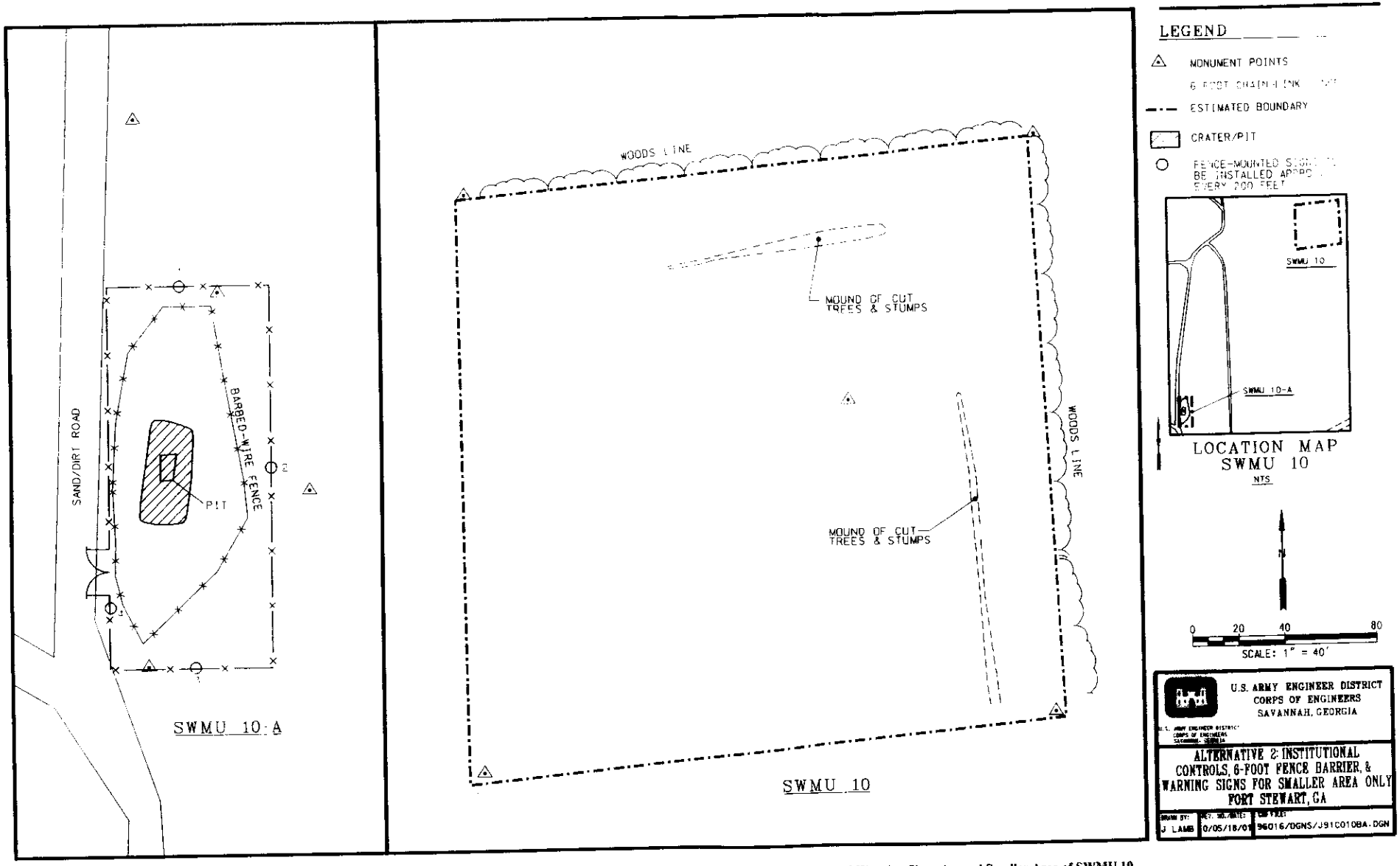

Figure 4-2. Alternative 2: Institutional Controls with Chain-link Fence Barrier and Fence-mounted Warning Signs Around Smaller Area of SWMU 10

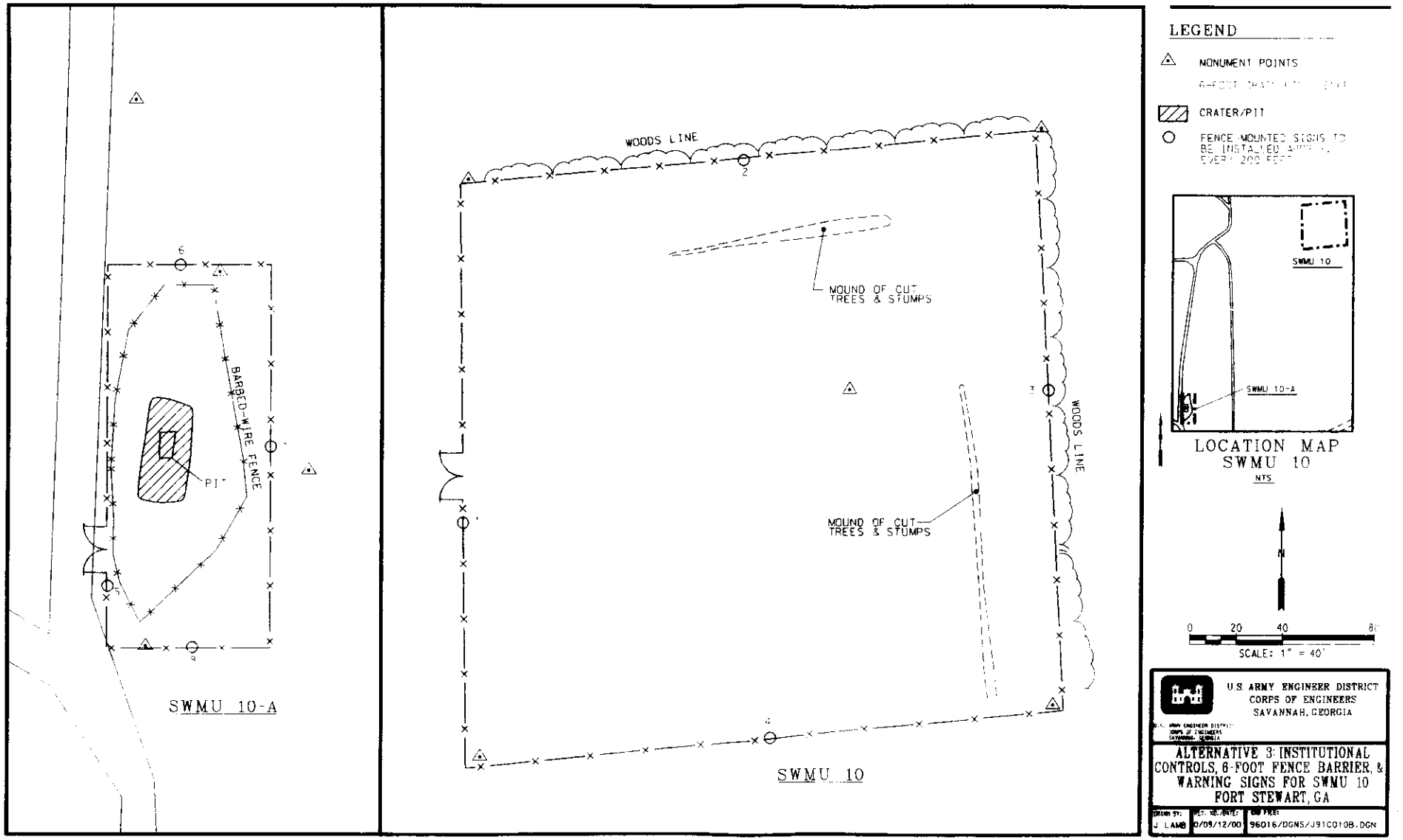

Figure 4-3. Alternative 3: Institutional Controls with Chain-link Fence Barrier and Fence-mounted Warning Signs Around Both Areas of SWMU 10

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5.0 CONCEPTUAL DESIGN AND IMPLEMENTATION PLAN

This section presents a conceptual design and plan for implementation of the selected corrective action alternative for SWMU 10 based on the level and type of soil contamination and the fact that the OE survey conducted in May 2001 indicated that no UXO or OE–related items were located at the larger portion of SWMU 10. The OE survey also indicated that no UXO was located at the surface of the smaller area of SWMU 10; however, the smaller area of SWMU 10 contained OE–related items at the surface and unidentified OE–related items in the near subsurface. A cost-effective corrective action was selected that would adequately protect human health and safety. The technology evaluation presented in Chapter 4.0 compares three different corrective action alternatives for SWMU 10 based on their effectiveness at protecting human health and safety, life-cycle costs, and technical factors. The selected alternative and justification for the given selection are presented in Table 5-1.

Table 5-1. Selected Alternative Summary Table, SWMU 10

Site	Selected Alternative	Summary of Justification
SWMU 10	Alternative 2: Institutional Controls: BMP, Deed Recordation, Zoning Controls, Maintenance of Existing Physical Barriers, Fence Barrier and Fence-mounted Warning Signs around the Smaller Area of SWMU 10 only, Implementation of O&M Plan	High level of protection

5.1 SELECTED CORRECTIVE ACTION

The selected corrective action alternative for SWMU 10 involves a multi-layered approach to restricting human activity within the boundaries of SWMU 10 geared to the potential hazards at the individual areas making up SWMU 10. The selected set of institutional controls comprising this alternative will provide a combination of land use restrictions and prohibitions and physical barriers. Land use restrictions will be documented and/or enforced through deed recordation, the BMP, zoning restrictions, and signage. Six-foot-high chain-link fencing topped with three strands of barbed wire will be provided as a physical barrier to access by humans around the smaller area of SWMU 10, at which OE–related items at the surface may potentially represent a physical safety hazard to FSMR personnel or trespassers.

Justification of Selection

Alternative 2 has been selected because it will provide effective protection of human health and safety. Although the posting of warning signs without fencing would be less expensive, the additional degree of protection provided by the fencing is necessary around the smaller area of SWMU 10 to ensure human safety. The protection that the fence will provide against inadvertent access to the exploded surface debris at the site and unauthorized excavation below the ground surface justifies the moderately greater expense of implementing Alternative 2 rather than Alternative 1. Institutional controls described for Alternative 2 will provide a sufficient level of protection for human health and safety and an adequate degree of long-term reliability and effectiveness as well as short-term effectiveness. The institutional controls under Alternative 2 can be easily and affordably implemented. Justification for selection of this corrective action alternative is further detailed in the following evaluations of effectiveness, implementability, and cost.

Effectiveness. Chain-link, barbed-wire fencing; warning signs; and documented land use restrictions will be highly effective and provide long-term reliability with respect to preventing human exposure to contaminants or exploded ordnance debris within the boundaries of the smaller portions of SWMU 10. The use of chain-link, barbed-wire fencing provides a high degree of both short-term and long-term reliability for the prevention of site access by humans. To maintain an acceptable level of long-term reliability and effectiveness, the BMP will establish land use controls during ownership by DoD. In addition, all construction will be prohibited under the BMP. These land use controls will remain in effect after transfer from DoD ownership by restrictions imposed through deed recordation.

An annual O&M program will be administered to replace or repair warning signs and fencing, which may deteriorate over time (see Appendix B). Implementation of the O&M Plan will ensure the effectiveness of this program. The O&M program for this CAP will involve inspection as well as potential replacement and/or repair of warning signs and fencing.

Providing institutional controls over the short term will be a very effective means of minimizing or eliminating human exposure to buried exploded ordnance and debris within the boundaries of SWMU 10. Posting of warning signs together with existing access restrictions will be most effective over the short term. The site is remote and not being used, so access is already limited.

Implementability. Very few factors limit implementability of the institutional controls under evaluation. On-site personnel or contractors can readily perform fence installation and posting of signs. O&M inspections require few resources with respect to inspection personnel and materials for repair. Establishment of an adequate combination of land use management tools will require additional time and effort for development, preparation, and processing of necessary paperwork. However, the time and resources are available to administer and acquire necessary land use controls because the property is not expected to be sold or leased in the near future. Administrative provisions already exist to facilitate incorporation of land use controls into the BMP and to facilitate deed recordation.

Cost. The estimated total life-cycle cost of installation of fencing and warning signs, administrative activities associated with acquisition of legal controls, O&M activities, and management and oversight is $186,839. Although Alternative 1 is less expensive ($155,320), Alternative 2 provides a significantly higher level of protection with respect to preventing access by humans to the smaller area that actually represents a safety hazard.

5.2 CONCEPTUAL DESIGNS

During the period of DoD's ownership, institutional controls will be recorded in the BMP to ensure implementation. Notification of transfer will be made to regulatory authorities upon transfer of the property. Land use restrictions and institutional control requirements that are expected to be enforced subsequent to property transfer include the following: deed recordation; the purchase agreement or lease; zoning controls; applicable state land use control management systems in effect at the time the property is transferred; community, transferee, or governmental notice (if needed); and self-certification (if feasible). To reduce potential exposure to human health and safety hazards associated with the smaller area of SWMU 10, 6-foot-high chain-link fencing topped with three strands of barbed wire will be installed around the boundary of the smaller area of the site. Warning signs stating restrictions on human activity within SWMU 10 will be mounted on the fencing (see Figure 4-2). No warning signs will be installed around the larger area of SWMU 10.

All activities within the boundaries of SWMU 10 that would involve disturbance of the subsurface will be prohibited in accordance with all land use control mechanisms. Activities that will be prohibited include

hunting, recreational activities, and construction. However, the following activities, conducted in a manner that would minimize disturbance of the subsurface, will be permitted: use for military training exercises/training, performance of wildlife studies, and provision and maintenance of feed lots for deer.

Establishment of Institutional Controls

Prior to installation of fencing and posting of warning signs around the smaller area of SWMU 10, land use and "zoning-like" requirements for the entire area of SWMU 10 will be incorporated into the BMP, which will include all restrictions and provisions documented in Appendix C of this report. The BMP will include a description of institutional controls as provided in this CAP. The appropriate implementing document(s) will include land use prohibitions and restrictions, including those related to activities that disturb the subsurface and to construction of new buildings. The appropriate implementing document(s) will also provide allowances for those activities that do not impact the subsurface, as described above. Reference to documents relevant to the corrective actions performed at SWMU 10 will also be included in the BMP.

Deed recordation and the purchase agreement or lease agreement upon property transfer will also incorporate land use controls. Deed recordation provisions and requirements are described in Appendix C. The deed recordation will, in perpetuity, notify any potential purchaser of the property that SWMU 10 has been used as an EOD area. The purchase agreement(s) and deed recordation or lease agreements will reference this CAP and other environmental documents that contain the rationale for the restrictions. As required by the DoD policy "Responsibility for Additional Environmental Cleanup after Transfer of Property," the property disposal agent will ensure that the transfer documents for real property reflect the land use controls. The legal office of USACE and its telephone number will be included as a point of contact in the purchase agreement and deed in case a problem arises with a use control, additional contamination is found, or the transferee wishes to revise or terminate a land use control. All applicable and appropriate state land use control management systems in effect at the time of transfer will also be implemented. Additional land use control mechanisms related to property transfer (e.g., notices, media use restrictions, self-certification) will be evaluated and implemented as necessary and appropriate.

A survey plat has been prepared by a professional land surveyor certified in the state of Georgia (Appendix D). The plat will be included in the BMP. The survey plat indicates the location and dimensions of SWMU 10 with respect to permanently surveyed benchmarks. The plat contains a prominently displayed note that states Fort Stewart's obligation to prohibit disturbance of SWMU 10 in accordance with this CAP.

A 6-foot-high, industrial chain-link fence constructed of 6-gauge galvanized steel topped with three strands of barbed wire will be installed around the perimeter of the smaller portion of SWMU 10 (473 linear feet). Fencing will include 2-inch-diameter galvanized posts set a minimum of 2 feet bgs in concrete on 10-foot centers. Four-inch-diameter galvanized posts will be installed at each corner and as the supports at each swing gate. One 20-foot-wide (total), double-swing gate will be installed along one side of the fenced area of SWMU 10 (see Figure 4-2). A strip of fluorescent orange reflective tape (2 inches wide) will be placed on the outside surface and along the aboveground length of each galvanized post to increase the visibility of the fence to military personnel. Two strips will be placed on the 4-inch corner posts. The minimum specifications for the chain-link fencing and gates are presented Figure 5-1.

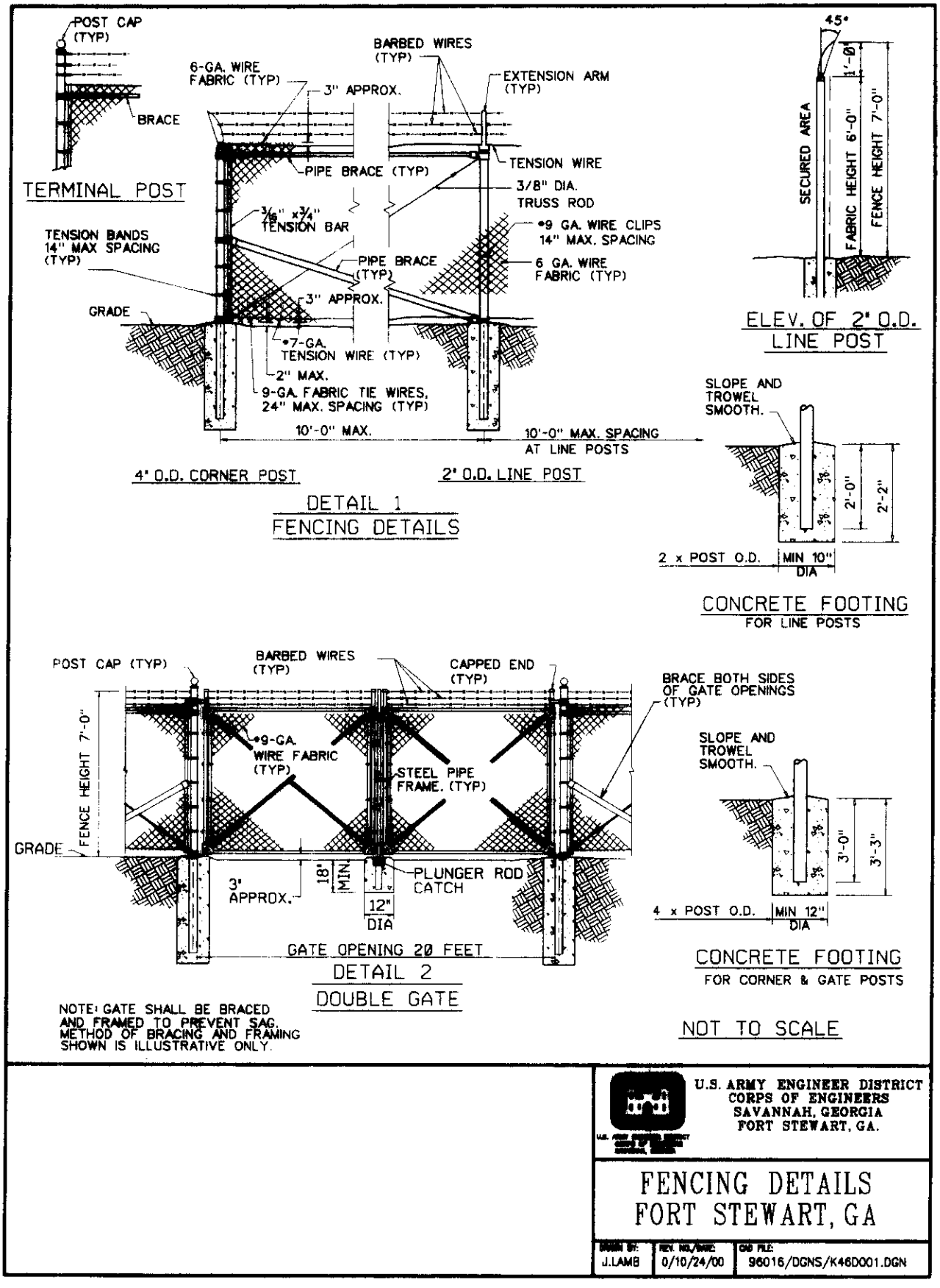

Figure 5-1. Specifications for Chain-link Fencing and Gates, SWMU 10

Four fence-mounted warning signs will be posted on each side of fencing surrounding the smaller area, as shown in Figure 4-2. These signs will be worded as follows:

CAUTION:
FORMER EXPLOSIVE ORDNANCE DISPOSAL AREA
NO TRESPASSING
CONTACT DPW
REGARDING USE RESTRICTIONS
767-2010

Each sign will have the dimensions of 24 inches by 24 inches. Warning signs will be metal plates with reflective painting and weather-resistant construction. The signs will have a brown background and white lettering.

Signs will be permanently mounted to chain-link fencing. All signs will be permanently labeled (for identification purposes) on the back with a numerical identification number as shown on Figure 4-2.

The warning signs and fencing at SWMU 10 will be inspected annually in accordance with the O&M Plan. Damaged fencing will be repaired as needed. Damaged signs will also be repaired or replaced as needed. Repair or replacement of signs or fencing will occur within 1 month of inspection. Should damage be observed between inspections, repair or replacement will occur within 1 month of observation.

5.3 COST ESTIMATES

Detailed cost estimates are provided in Appendix E for implementation of institutional controls at SWMU 10. The life-cycle cost estimates for the selected institutional controls alternatives for SWMU 10 are provided in Table 5-2.

Capital costs include materials and labor associated with installation of fencing and/or mounting or posting of 24-inch by 24-inch aluminum signage according to the quantities provided in Table 5-3.

Table 5-2. Estimated Cost for Selected Alternative, SWMU 10

Site	Capital Costs	O&M	Other[a]	Total
SWMU 10	$27,863	$92,678	$66,297	$186,839

[a]Includes engineering management, contingency, health and safety, and contractor profit.

Table 5-3. Summary of Primary Physical Components of the Selected Alternative, SWMU 10

Site	Fencing (feet)	Number of 20-Foot Gates	Number of Signs
SWMU 10	473	1	4

Four signs for the smaller area at SWMU 10 are included in the cost for SWMU 10. The cost of a single 20-foot-wide, double-swing gate is included for the fenced area. Costs that would be associated with the deed recordation are also included.

O&M costs include the prices of annual inspections and fence and sign repair/replacement every 5 years for 30 years. The cost for sign repair/replacement every 5 years was assumed to be equivalent to 25 percent of the cost of initial installation. In addition, the cost for fence repair/replacement every 5 years was assumed to be equivalent to 10 percent of the cost of initial installation.

5.4 IMPLEMENTATION SCHEDULE

Implementation of the corrective action will begin at SWMU 10 once approval of this CAP is received from GEPD. The schedule presented in Table 5-4 has been established for implementation of institutional controls at this site.

Table 5-4. Corrective Action Implementation Schedule, SWMU 10

Task	Frequency of Action or Time from GEPD Approval of CAP (days)
Procure fencing, signs, and materials	90
Record institutional controls in BMP and any other approved implementing document	120
Install fence and post signs around smaller area of SWMU 10	120
Perform inspections (implement O&M Plan)	Annually[a]
Repair/replace signage and repair fencing	As needed
Notify GEPD of property transfer	Prior to property transfer
Establish appropriate legal land use controls for property transfer (e.g., deed recordation, lease or purchase agreements)	Prior to property transfer

[a]The first O&M report will be submitted to GEPD 455 days after the installation of the fencing and signs, with subsequent reports submitted annually thereafter.

6.0 REFERENCES

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Geraghty and Miller 1992. *RCRA Facility Investigation Final Work Plan, Fort Stewart, Georgia*, June.

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APPENDIX A

ORDNANCE AND EXPLOSIVES SURVEY REPORT
FOR
INACTIVE EOD AREA NORTH OF GARRISON AREA (SWMU 10)

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Final Report
Solid Waste Management Unit (SWMU) 10
Fort Stewart, Georgia

CONTRACT OFFICER

Jeffery J. Longaker
Science Applications International Corporation
P.O. Box 2501
151 Lafayette Drive TEL: (865) 481-8784
Oak Ridge, TN 37830 FAX: (865) 482-7257

INTRODUCTION

The work covered under this Statement of Work (SOW) will consist of providing ordnance and explosives (OE) survey and identification of surface OE to develop a removal and disposal plan for the site. The subcontractor will safely locate, and identify any potential OE and ordnance-related scrap hazards. found in the Solid Waste Management Unit (SWMU) 10 area. Locations of OE will be flagged. The Subcontractor shall be responsible for providing sufficient certified unexploded ordnance (UXO) specialists to perform survey, as needed, of the site within 5 days. Characterization and removal of OE is not included in this scope of work.

SITE DESCRIPTION AND HISTORY

SWMU 10 is located 4 miles north of the garrison area and 1 mile east of Georgia Highway 119. This former explosive ordnance disposal (EOD) site is located in an area designated as B-S on the Fort Stewart Installation Map, near firing point 101. The former EOD area operated from 1975 to 1980, with open detonation of UXO taking place (Geraghty and Miller 1992). The site is located approximately 1,500 feet east of Taylors Creek. This EOD area is reported to be inactive.

The original Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) (USAEHA 1988) indicated that the craters in the ground contained no solid waste other than small bits of shrapnel and that there was no evidence of ashes or charred ground from explosions. The RFA was performed on only the larger of the two areas that comprise this SWMU. The larger area encompasses approximately 1.48 acres. There is approximately 3 feet of relief across the site. The elevation of the site is approximately 67 feet amsl along the eastern boundary and gently slopes downward to approximately 64 feet amsl along the western boundary.

An additional area of SWMU 10 was identified after the Phase II RCRA Facility Investigation (RFI). This area is located approximately 1,400 feet southwest of the original area identified as SWMU 10. The area encompasses approximately 0.27 acre and consists of a burial trench. Spent shells were observed on the ground surface at this smaller area of SWMU 10. A single line of barbed wire segregates the area from the surrounding property.

WORK PERFORMED

Large Area. On 1 May, 2001, two American Technologies, Incorporated UXO Technicians (Wayne Evans and Jim Haynie) started an OE survey and identification operation at the former EOD site, located in an area designated as B-S on the Fort Stewart Installation Map, near firing point 101, in support of remediation/closure activities for the site (Figure 1). The team conducted a visual survey of the entire 1.48-acre site. No UXO or OE-related items were found. Approximately 4 pounds of steel fragmentation were found (Figure 2).

Small Area. On 3 May, 2001, the team conducted an OE survey and identification operation on the small area located in an area designated as B-S on the Fort Stewart Installation Map, near firing point 101, in support of remediation/closure activities for the site (Figure 3). In the washed out area of the site the team found spent small arms ammunition (SAA) cases (Figures 4 and 5), shell fragments, fuze parts and remnants of 81-mm illumination round fin assemblies (Figure 6). The team tried to use a Schonstedt GA-52Cx, Magnetic Locator, to locate any possible UXO or OE items under the pine needles in the big hole (Figures 7 and 8). The metal content of the area is so great the team could not get an accurate reading on any one item. (During discussions with a former member of the Fort Stewart EOD team, we learned the hole was a dumping site for 90-mm armor piercing (AP) projectiles (solid shot). As this was only a surface sweep, the team did not attempt to investigate the area further.

RECOMMENDATIONS

Large Area..... NONE

Small Area..... In coordination with Fort Stewart EOD personnel, perform a surface clearance to remove the scrap and frag to prevent possible confusion about items reported in the area in the future. This type of clearance should take four UXO Technicians approximately 3 days, longer if they have to go 2 or 3 feet below surface.

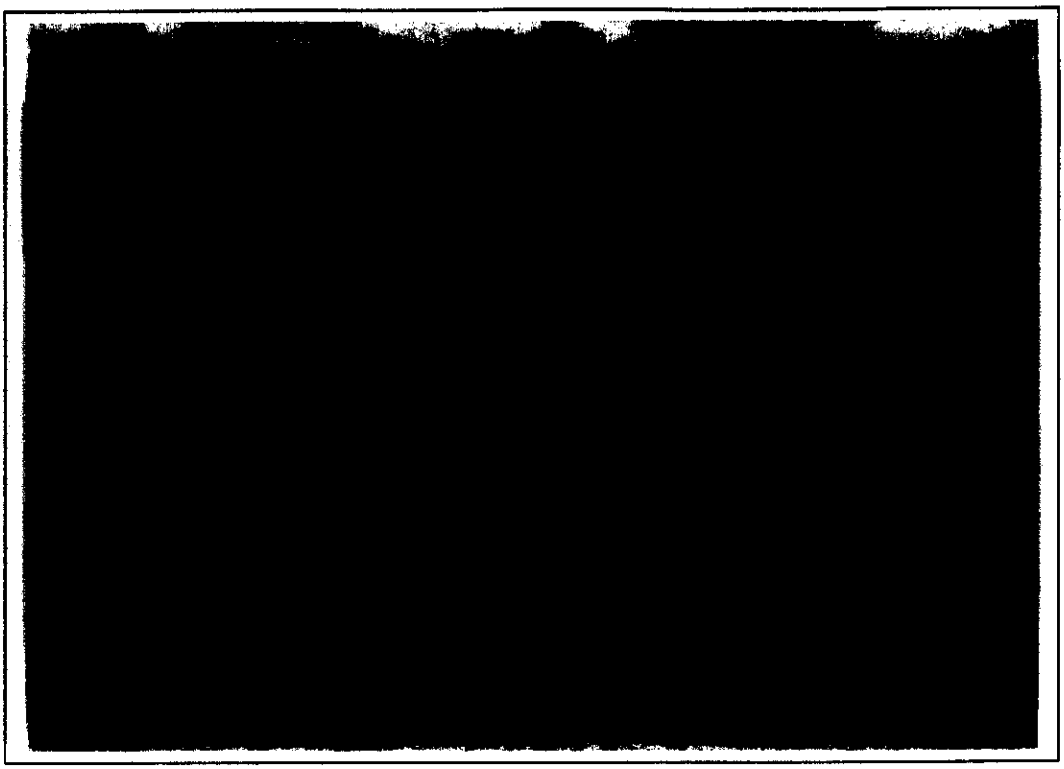

Figure 1. Large Section of SWMU 10

Figure 2. Scrap Found in the Large Area of SWMU 10

Figure 3. Small Area in SWMU 10

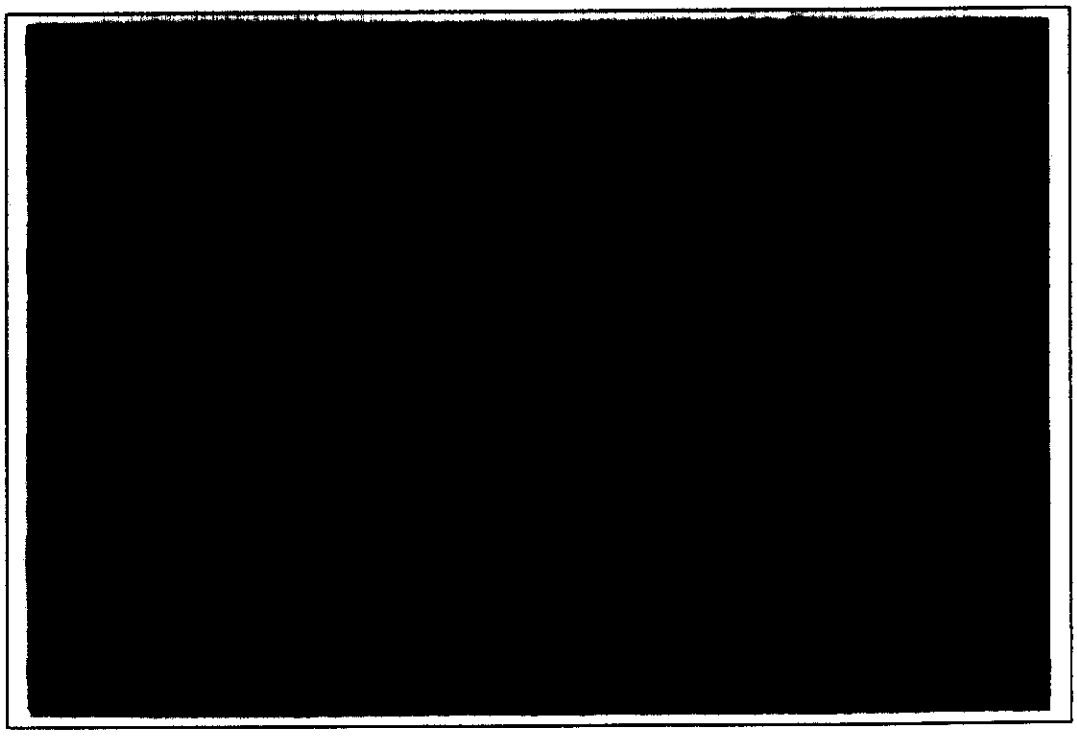

Figure 4. Small Arms Brass in the Small Area of SWMU 10

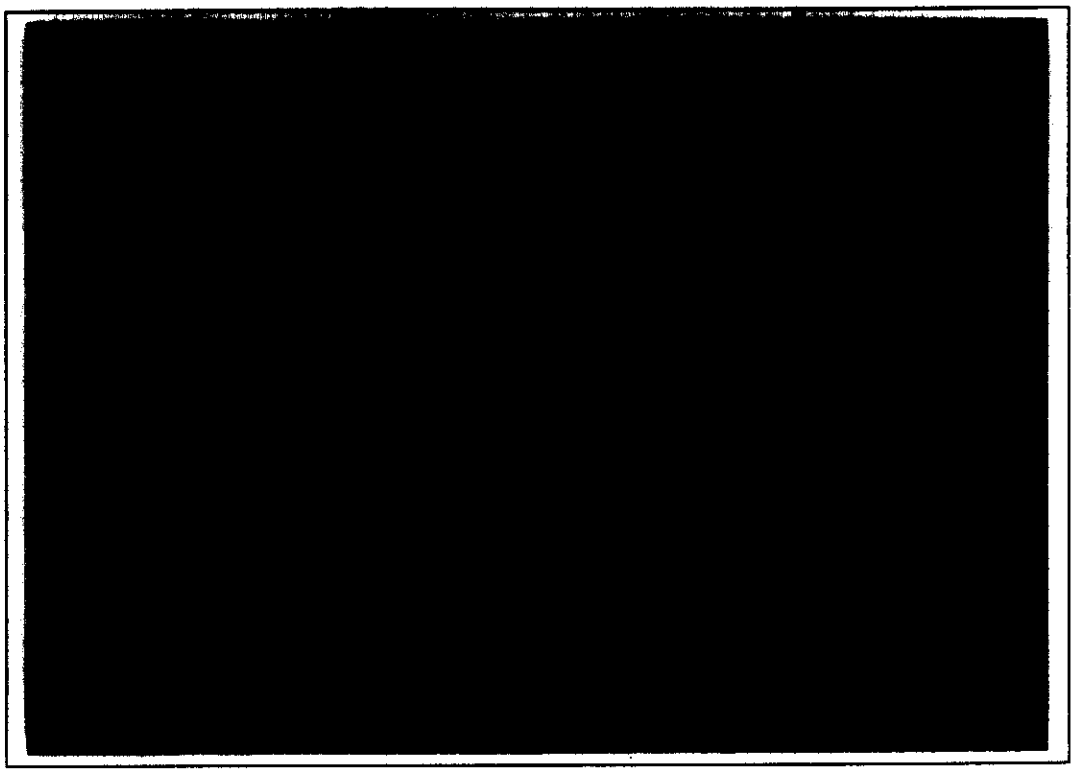

Figure 5. Small Arms Brass in the Small Area of SWMU 10

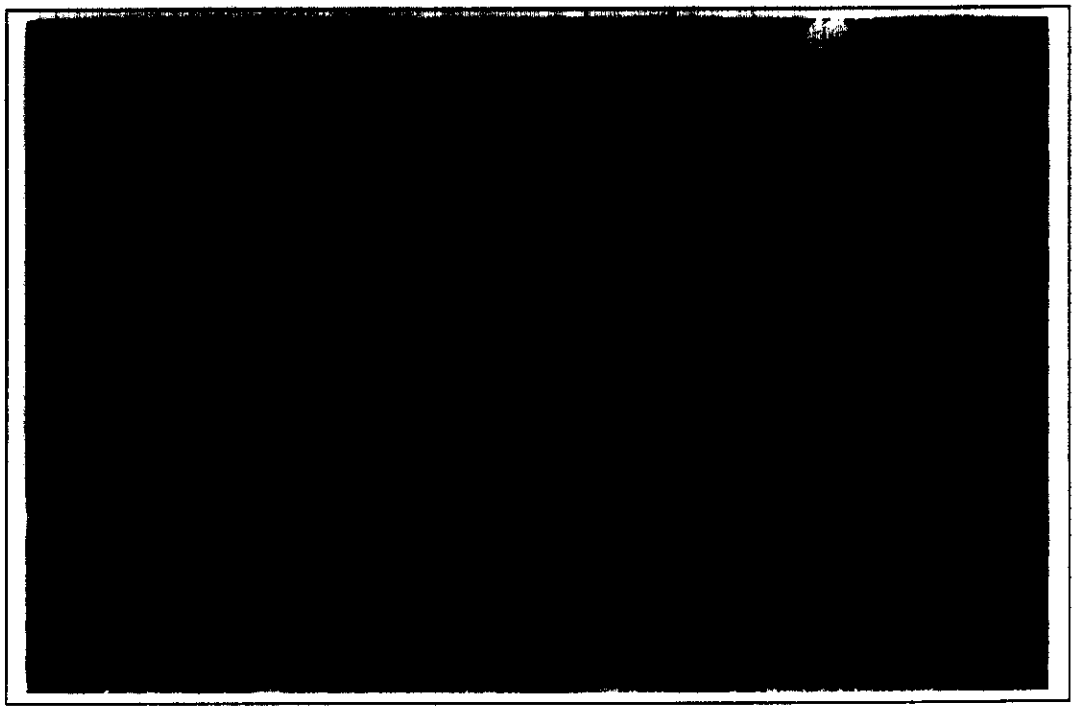

Figure 6. Frag and Scrap in the Small Area of SWMU 10

Figure 7. Large Hole in the Small Area of SWMU 10

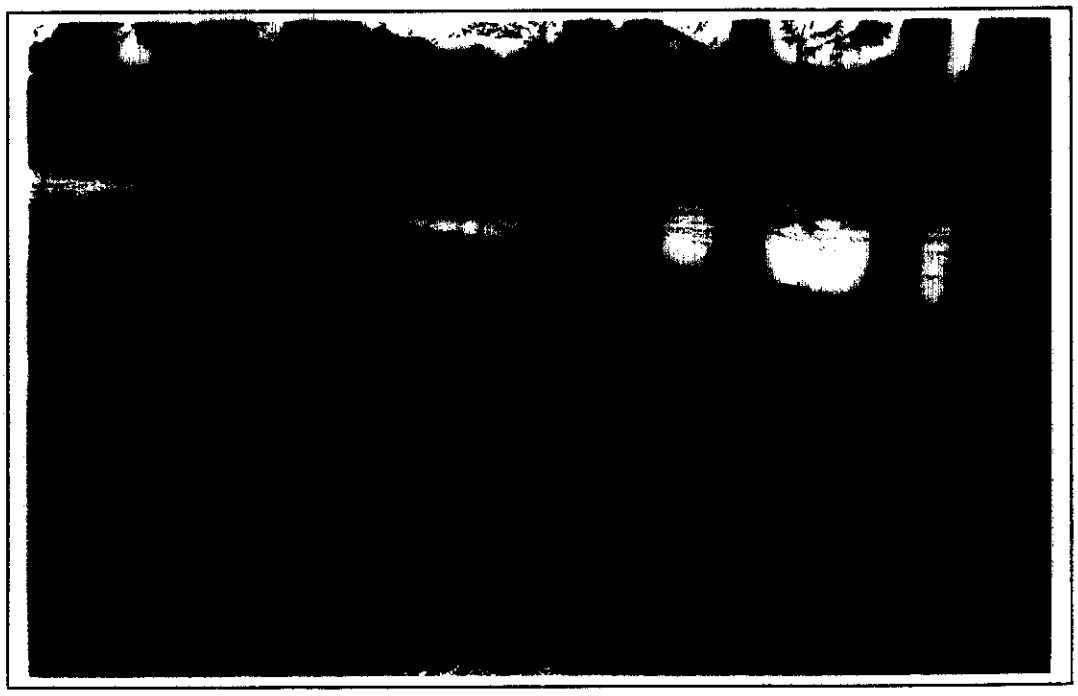

Figure 8. Large Hole in the Small Area of SWMU 10

APPENDIX B

OPERATIONS AND MAINTENANCE PLAN
FOR
INACTIVE EOD AREA NORTH OF GARRISON AREA (SWMU 10)

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Operations and Maintenance Plan
for
Inactive EOD Area North of Garrison Area (SWMU 10)

The following Operations and Maintenance (O&M) Plan will be implemented for a period of 30 years to ensure that signs and barriers remain in good condition. O&M will include documented inspections as well as any necessary repairs to or replacement of materials (e.g., signs, fencing). This plan outlines the roles and responsibilities for O&M (Table B-1) and provides a detailed description of O&M requirements for this site.

Table B-1. O&M Roles and Responsibilities

Role	Responsibilities
Inspection and Maintenance Supervisor	• Facilitate assignment of qualified personnel to perform inspections. • Provide instruction to qualified personnel. • Establish dates for annual inspections. • Collect, sign, and maintain field inspection and maintenance logs. • Facilitate acquisition and provision of materials for repair or replacement of warning signs and/or fencing. • Acquire maintenance support to make any necessary repairs or replacements of warning signs and/or fencing by preparing work requests. • Provide any necessary instruction to maintenance personnel regarding repair or replacement of warning signs and/or fencing. • File documentation associated with repairs/replacements. • Prepare and submit annual O&M reports to the Georgia Environmental Protection Division.
O&M Inspector	• Walk/drive around perimeter of both areas of the site. • Observe any damage to warning signs and/or fencing and any signs of human activity within the boundary of the solid waste management unit. • Document all findings and repair/replacement recommendations on Inspection and Maintenance Logsheet. • Submit Inspection and Maintenance Logsheet and Site Inspection Map to Inspection and Maintenance Supervisor. • Verbally clarify findings to Inspection and Maintenance Supervisor as needed.
Maintenance Personnel	• Acquire materials necessary for repair/replacement of warning signs and/or fencing. • Perform repairs or replace signs and/or fencing as described by work request. • Document that work request has been performed. • Provide documentation of completed work to Inspection and Maintenance Supervisor.

Detailed Description of O&M Activities

General. An Inspection and Maintenance Supervisor will be assigned to provide oversight and administration of O&M activities performed at Solid Waste Management Unit (SWMU) 10. The supervisor will ensure that qualified and trained personnel are selected to perform inspection and maintenance activities. Inspections and maintenance will be performed annually beginning 1 year after installation of fencing and warning signs at SWMU 10. All activities associated with field inspections and maintenance activities will be recorded in field inspection logs and maintenance documentation.

Inspections. The O&M Inspector will walk or drive the perimeter of both areas of SWMU 10 and observe any damage to or deterioration of fencing and warning signs. Any evidence of human activity within the boundaries of SWMU 10 will also be noted. Information from the field inspection observations shall be documented in the Inspection and Maintenance Logsheet (Figure B-1) and the Site Inspection Map (Figure B-2). Information to be documented in the log will include the year of inspection, the number of signs to be repaired/replaced, the identification number of signs that require repair or replacement, an indication of damage to fencing, and the signature of the inspector. The inspector will present the field logs and Site Inspection Map to the Inspection and Maintenance Supervisor within 24 hours of inspection. The inspector will also verbally report any findings that require clarification.

The inspector will use the Site Inspection Map (Figure B-2) to document which sections/areas of fencing will require repair. The Site Inspection Map will also be used to document which signs will require repair or replacement, as well as which signs were checked but will not require repair or replacement. Markings on the Site Inspection Map shall be made in accordance with the instructions provided.

Maintenance. The Inspection and Maintenance Supervisor will ensure procurement of any additional materials and supplies needed to repair or replace warning signs or fencing using work requests. The supervisor will ensure that maintenance personnel are assigned to perform any needed repairs or replacements. The Inspection and Maintenance Supervisor shall provide a detailed description of the needed repairs or replacements to the maintenance personnel. The maintenance personnel will acquire the necessary supplies to make repairs or replace signs and/or fencing. The maintenance personnel, in accordance with the schedule requested by the supervisor, will perform the repair and/or replacement of warning signs and/or fencing. The maintenance personnel will document the repairs and replacements on the Inspection and Maintenance Logsheet provided by the Inspection and Maintenance Supervisor (see Figure B-1). The completed maintenance log will be signed and dated by the maintenance personnel and submitted to the Inspection and Maintenance Supervisor for review and approval. All documentation associated with maintenance will be filed and maintained by the supervisor.

Reporting. Inspections and maintenance activities will also be summarized in an annual report entitled Corrective Action Plan (CAP) Progress Report for SWMUs 8, 9, 10, and 11. Inspection and maintenance activities for the Inactive Explosive Ordnance Disposal (EOD) Area Located Approximately Nine Miles Northeast of Garrison Area (SWMU 8); Inactive EOD Area in Red Cloud Range, Hotel Area (SWMU 9); and Inactive EOD Area Located Approximately Three Miles Northeast of Garrison Area (SWMU 11), an inactive EOD area evaluated under a separate stand-alone CAP, will also be included in the Progress Report. The Inspection and Maintenance Supervisor will be responsible for preparing the report based on information provided in the Inspection and Maintenance Logsheets. The Inspection and Maintenance Supervisor will prepare and submit the initial CAP Progress Report for SWMUs 8, 9, 10, and 11 to the Georgia Environmental Protection Division (GEPD) for review and approval within 455 days of the installation of the fencing and warning signs at SWMU 10.

INSPECTION AND MAINTENANCE LOGSHEET
WARNING SIGNS AND FENCING AT SWMU 10

Year	Signs Requiring Repair		Signs Requiring Replacement		Fencing Requiring Repair?[a]	Inspector Signature	Maintenance Personnel Signature	Supervisor Approval Signature	Comments
	Qty	Identification Numbers	Qty	Identification Numbers					

[a]Describe areas requiring fence repair/replacement in the column provided for comments.

Figure B-1. Inspection and Maintenance Logsheet for SWMU 10

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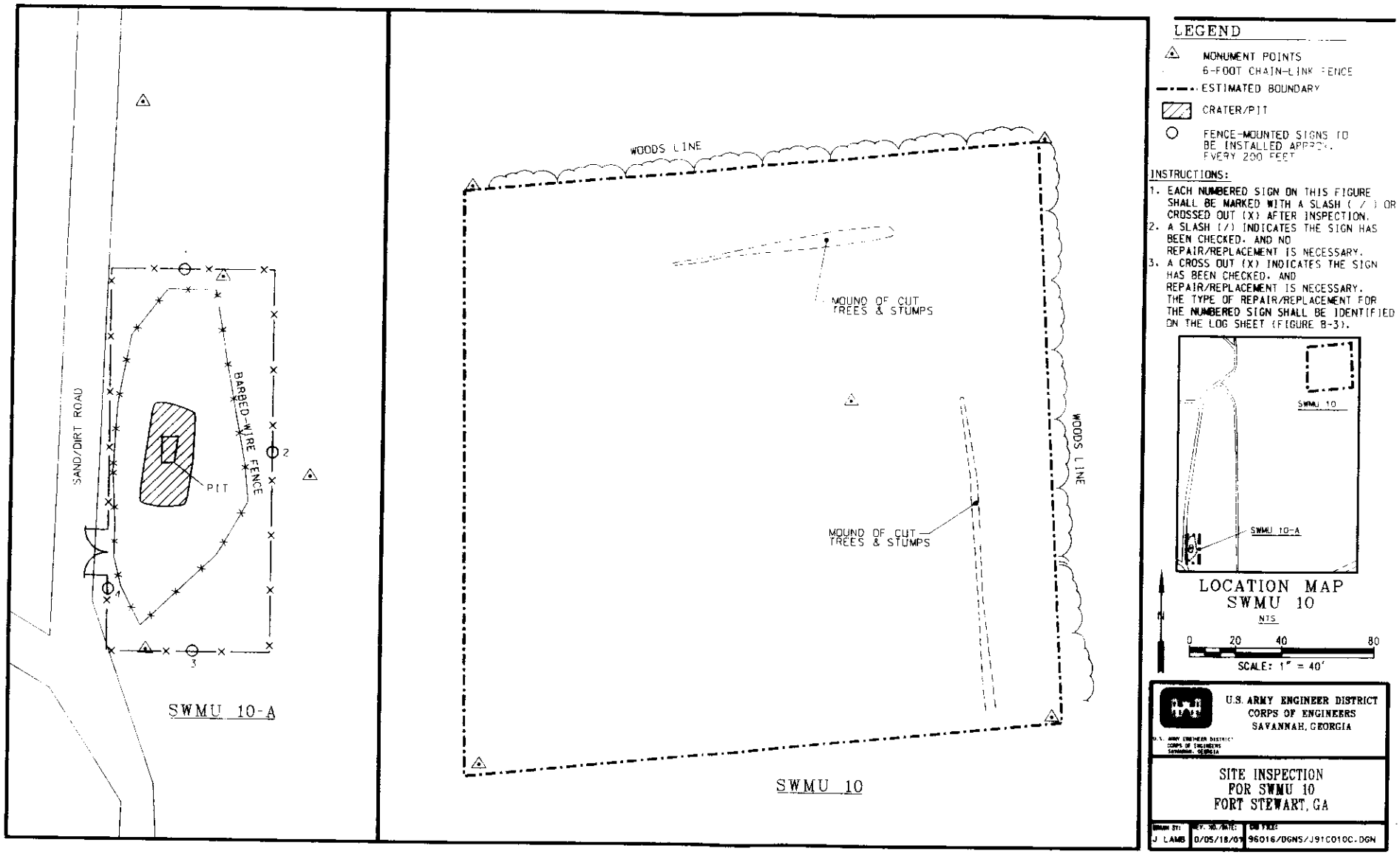

Figure B-2. Site Inspection Map for SWMU 10, Fort Stewart, Georgia

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APPENDIX C

BASE MASTER PLAN AND DEED RECORDATION REQUIREMENTS FOR INACTIVE EOD AREA NORTH OF GARRISON AREA (SWMU 10)

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Introduction

This appendix presents the requirements for the Base Master Plan (BMP) and deed recordation for the implementation of the selected remedial alternative for the Inactive Explosive Ordnance Disposal (EOD) Area North of the Garrison Area [Solid Waste Management Unit (SWMU) 10].

The selected remedial alternative for SWMU 10 is protective of human health and safety and includes the following features:

- BMP, deed recordation, and zoning controls that establish controls to prohibit intrusion into subsurface soil;
- installation of chain-link fencing and warning signs around the smaller area of SWMU 10; and
- implementation of an Operations and Maintenance (O&M) Plan to maintain the conditions of the fencing and signage.

The selected alternative is fully described in Chapter 5.0 of this report.

The requirements for the BMP identify land use restrictions and requirements specific to SWMU 10 to be incorporated into and enforced by the Fort Stewart Military Reservation BMP until transfer of ownership of the aforementioned properties from the federal government. The requirements for deed recordation identify the present (i.e., as of December 2000) applicable requirements for the areas identified above upon their future transfer out of government ownership.

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I certify that I have read and concur with the land recordation requirements presented in the BMP for the Inactive EOD Area North of Garrison Area (SWMU 10).

_____ _____

Principal Executive Officer or Authorized Agent — Date
Fort Stewart Military Reservation

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Base Master Plan
for
Inactive EOD Area North of Garrison Area (SWMU 10)

The following information/items and restrictions will be included in the BMP, which will be effective until the transfer of ownership of the SWMU 10 property.

1. The following information will be documented in the BMP:

   a. All activities on the property that may result in disturbance of subsurface soil and/or substantially interfere with implementation of the O&M Plan are prohibited.

   b. Although use of groundwater beneath the subject property is not expressly prohibited, installation of groundwater wells, including monitoring wells, within the boundaries of this property is expressly prohibited.

   c. Hunting and recreational activities are expressly prohibited within the boundaries of SWMU 10. Military exercises/training are expressly prohibited within the smaller area of SWMU 10.

   d. All construction within the property boundaries is expressly prohibited.

   e. The O&M Plan for SWMU 10, which requires maintenance of fencing and permanent markers (signs) approximately every 200 feet around the smaller area of SWMU 10 to delineate the restricted area, is to be implemented. The BMP shall reference the O&M Plan or include the plan as an attachment or appendix.

   f. The BMP will also document the following specific activities that will be permitted within the boundaries of the subject site:

      (1) performance of wildlife studies,

      (2) provision and maintenance of feed lots for deer,

      (3) military exercises/training only around the larger area of SWMU 10.

2. Site Survey:

   a. The BMP will include a written description of the boundaries of the site according to the survey plat included in this CAP. Both the written description and the survey plat are presented in Appendix D of this report.

   b. A copy of the survey plat, which indicates the location and dimensions of the disposal unit with respect to permanently surveyed benchmarks, will be included in the BMP. The survey plat is presented in Appendix D of this report.

Deed Recordation
for
Inactive EOD North of Garrison Area (SWMU 10)

Deed recordation will be provided at the time of transfer out of government ownership and will comply with *DoD Guidance on Land Use Controls for Property Transferred Out of Federal Ownership* (Working Draft). Deed recordation for SWMU 10 will conform to the requirements listed below.

1. Deed recordation will be made through the execution of a restrictive covenant for the property. The covenant will be recorded with the clerk of the superior court for the county of Liberty. The language will be consistent with applicable state property and environmental laws in effect at the time of transfer.

2. A copy of the restrictive covenant should be provided to the zoning or land use planning authority that has jurisdiction over this property. Such restrictions should run with the land and be binding on the owner's successors and assignees.

3. The restrictive covenant will be written by the Real Estate Office of the Savannah District of USACE. As required by the Real Estate Office, the following items will be provided to facilitate preparation of the deed:

   a. a survey plat (see Appendix D of this CAP),

   b. a legal description of the property, and

   c. use restrictions and other provisions (see Item 4 below).

4. The following restrictions/provisions may be documented in the restrictive covenant:

   a. The subject area will be limited to industrial use only.

   b. Activities on the property that may result in disturbance of subsurface soil and/or substantially interfere with implementation of the O&M Plan will be prohibited.

   c. Installation of groundwater wells, including monitoring wells, is expressly prohibited within the boundaries of SWMU 10.

   d. Maintenance of fencing and permanent markers (signs) approximately every 200 feet to delineate the restricted area of the smaller area of SWMU 10 will be required.

   e. The legal office of USACE and its telephone number will be included as the point of contact and documented in the deed in case a problem arises with a use control, additional contamination is found, or the transferee wishes to revise or terminate a land use control.

5. After the language is drafted, the disposal agent should coordinate with GEPD for verification that the restrictions reflect the environmental concerns of the site.

6. The property disposal agent's office should also provide a copy of the deed to local offices such as the Building Permits Division and the Water Resources Branch.

APPENDIX D

SITE DESCRIPTIONS, DIRECTIONS TO SITES, AND SURVEY PLATS FOR INACTIVE EOD AREA NORTH OF GARRISON AREA (SWMU 10)

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SITE DESCRIPTION AND DIRECTIONS TO SITE FOR THE INACTIVE EOD AREA NORTH OF GARRISON AREA (SWMU 10) AS OF DECEMBER 2000

Site Description

The Inactive Explosive Ordnance Disposal (EOD) Area North of the Garrison Area [Solid Waste Management Unit (SWMU) 10] is located 4 miles north of the garrison area and 1 mile east of Georgia Highway 119. This EOD site is located in an area designated as B-8 on the Fort Stewart Installation Map, near firing point 101. The EOD area operated from 1975 to 1980, with open detonation of unexploded ordnance (UXO) taking place, and is now inactive. The site is located approximately 1,500 feet east of Taylors Creek. SWMU 10 consists of two areas. The larger area encompasses approximately 1.48 acres. A smaller area is located approximately 1,400 feet southwest of the original area. The smaller area encompasses approximately 0.27 acre and consists of a burial trench. As of October 2000, a single line of barbed wire segregates the smaller area of SWMU 10 from the surrounding property. Four topographic survey control points define the northwest, northeast, southeast, and southwest corners of the larger area of SWMU 10. Three topographic survey control points define the north, south, and east sides of the smaller area of SWMU 10. Adjacent to the north of the site is an abandoned Methodist religious campground known as the Taylors Creek Campground. The campground encompasses approximately 10 acres and was used between 1820 and 1941. The Taylors Creek Campground property is eligible for the National Register of Historic Places. The enclosed plat, based on a survey performed in July 2000, defines the current site features of SWMU 10.

Directions to Site

From the intersection of Georgia Highways 119 and 144, drive north on Georgia Highway 119 for 3.3 miles. Turn right (east) onto Fort Stewart Road 144 (tank trail). Drive on Fort Stewart Road 144 until the road forks, then stay to the left at the fork. Take the first dirt road on the left (north) after the fork in the road (0.9 mile from Georgia Highway 119). The smaller area of SWMU 10 is a patch of trees (~0.1 mile from the left fork). Stay to the right (north) at the fork for SWMU 10 [~0.25 mile on the right (east)]. The smaller area of SWMU 10 will be enclosed within a 6-foot chain-link fence topped with three strands of barbed wire after the implementation of the controls recommended in this CAP.

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(Survey plat on two oversized sheets.)

(Survey plat on two oversized sheets.)

APPENDIX E

COST ESTIMATE
FOR
INACTIVE EOD AREA NORTH OF GARRISON AREA (SWMU 10)

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COST ESTIMATE FOR THE INACTIVE EXPLOSIVE ORDNANCE DISPOSAL AREA NORTH OF GARRISON AREA (SWMU 10)

	SWMU 10 Cost Estimate	Alternative 1 Institutional Controls: Land Use Controls with Signs	Alternative 2 Institutional Controls: Land Use Controls with Signs and Fence
1.0	**Capital Costs**		
1.1	Engineering Services		
1.1.1	Work Plan/Site Safety and Health Plan	$2,000	$3,000
1.1.2	Contracting/Procurement	$1,000	$1,000
1.1.3	Engineering Oversight	$1,200	$1,200
1.1	**Total Costs for Engineering Services**	**$4,200**	**$5,200**
1.2	**Installation/Establishment of Institutional Controls**		
1.2.1	*Tree Clearing*		
	Allowance*	--	$5,000
1.2.2	*Signs and Posts Installation*		
	Warning Signs	$3,367	$3,367
	Posts (includes shipping)	$191	--
	Sign/Post Installation Labor	$800	$200
1.2.2	*Chain-link (6' high, 3 strands barbed wire) Fence with Two Swing Gates*		
	Chain-link Fence Installation	--	$32,161
	Gate Installations	--	$2,912
1.2.3	*Deed Recordation*		
	Allowance*	$3,000	$3,000
1.2	**Total Installation/Establishment of Institutional Controls**	**$7,358**	**$46,640**
1.0	**Total Capital Costs**	**$11,558**	**$51,840**
2.0	**Operations and Maintenance (30 years)**		
2.1	Replacement/Repair of Warning Signs and/or Posts**	$6,537	$5,351
2.2	Replacement/Repair of Fencing***	--	$21,044
2.3	Annual Inspection and Reports	$77,111	$77,111
2.4	Administration of Operations and Maintenance Plan Requirements	$5,000	$5,000
2.0	**Total Costs for Operations and Maintenance**	**$88,648**	**$108,506**
	Subtotal Project Costs	$100,206	$160,347
	Engineering Management (10 percent of subtotal)	$10,021	$16,035
	Contingency (20 percent of subtotal)	$20,041	$32,069
	Health and Safety (15 percent of subtotal)	$15,031	$24,052
	Contractor Profit (10 percent of subtotal)	$10,021	$16,035
	Total Project Costs	**$155,320**	**$248,538**

* Allowance based upon estimate using best professional judgment.
** Assumes sign and/or post repair/replacement allowance of 25 percent of total installation cost every 5 years for a period of 30 years.
*** Assumes fence repair/replacement allowance of 10 percent of total installation cost every 5 years for a period of 30 years.

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