

1. INTRODUCTION

1.1 PURPOSE AND SCOPE

Science Applications International Corporation (SAIC) conducted a Site Investigation (SI) at Fort McClellan, Alabama to determine the presence and nature of potential environmental contamination at 17 sites identified by the U.S. Army Environmental Center (USAEC). The 17 sites were identified for initial investigation as a result of the findings of a 1989 report submitted by Fort McClellan to the U.S. Environmental Protection Agency (EPA) Region IV. The sites that were investigated under the SI program are summarized in Table 1-1. The work at Fort McClellan was conducted at the request of USAEC pursuant to Contract DAAA15-91-D-0017, Task Order 1.

1.2 SITE INVESTIGATION OVERVIEW

SI activities followed site-specific project plans that included field sampling and laboratory chemical analyses using specific quality assurance/quality control (QA/QC) and health and safety protocols. Specific objectives of the SI included identification of the presence and magnitude of environmental contamination at the 17 identified sites at Fort McClellan. The scope of work did not include delineation of the areal extent of detected contamination or detailed geologic/hydrogeologic site characterization.

1.3 REPORT ORGANIZATION

The outline of this SI report follows guidance presented in the EPA document, *Information and Data Requirements for Site Investigations, Federal Agencies* (EPA 1990). Section 1 presents background information for the Fort McClellan area and the 17 individual sites investigated under the SI program. Section 2 describes the investigation activities conducted at Fort McClellan, including geotechnical analyses, field screening and sampling protocols, waste management, test drilling, well installation, waste management, and laboratory investigations. Section 3 discusses the site geology as observed from monitoring well drilling in addition to a data quality assessment of the laboratory analytical results and a summary of the results of investigations and analyses at each of the SI sites. Section 4 contains a preliminary

**Table 1-1. Sites Investigated Under SI Program
Fort McClellan, Alabama**

Site Number and Name	Location
1 Area T-4 Biological Simulant Test Area	Main Post
2 Area T-5 Toxic Hazards Detection and Decontamination Training Area	Main Post
3 Area T-6 Agent Decontamination Training Area	Main Post
4 Area T-24A Chemical Munitions Disposal Training Area	Main Post
5 Area T-31 Technical Escort Reaction Area	Main Post
6 Area T-38 Technical Escort Reaction Area	Main Post
7 Old Toxic Training Area	Main Post
8 Range K Agent Training Area	Pelham Range
9 Range I Agent Shell Tapping Area	Pelham Range
10 Range J Agent Training Area	Pelham Range
11 Range L (Lima Pond) Chemical Munitions Disposal Area	Pelham Range
12 Detection and Identification Area	Main Post
13 Former Landfill #1	Main Post
14 Former Landfill #2	Main Post
15 Former Landfill #3	Main Post
16 HD Spill/Burial Sites	Main Post/Pelham Range
17 Old Water Hole	Pelham Range

risk evaluation consisting of Hazard Ranking System (HRS) scoring for the site determined during the investigation to be the most contaminated. Section 5 summarizes SAIC's conclusions and recommendations based on the results of the SI investigation. Section 6 lists the references used in preparing this SI report. Appendices A through J contain data tabulations and summary field records.

1.4 FACILITY BACKGROUND

Background information pertinent to the Fort McClellan SI was obtained from USATHAMA (1977, 1990) and includes details of the facilities present on Post, site descriptions, regulatory history, and prior environmental activities.

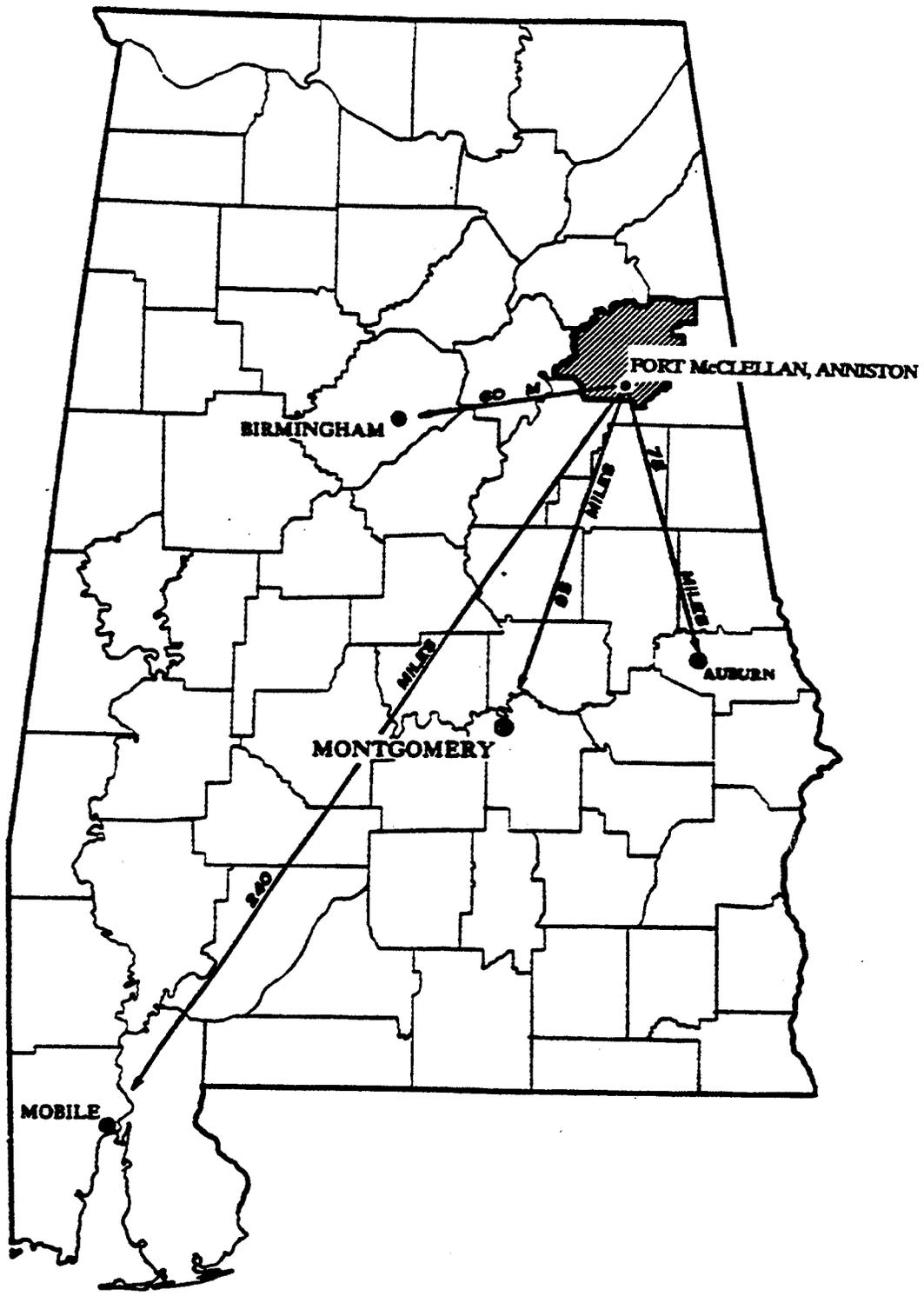
1.4.1 Post Description and History

Fort McClellan is located in northeastern Alabama in Calhoun County, as shown in Figure 1-1. The Post is approximately 60 miles northeast of Birmingham and approximately 75 miles northwest of Auburn, Alabama. The town of Anniston adjoins the main installation on the south and east, and the town of Gadsden lies 28 miles to the north. The Morrisville Maneuver Area, or Pelham Range, is located approximately 5 miles due west of the main installation, and adjoins the Anniston Army Depot. Pelham Range is bordered on the east by U.S. Highway 431.

The Post consists of 45,679 acres of Government-owned and leased land situated in the foothills of the Appalachian mountains of northwest Alabama. The size of each main parcel is as follows:

Main Installation	18,946 acres
Pelham Range	22,245 acres
Choccolocco Corridor (leased)	<u>4,488</u> acres
	45,679 acres

The Main Post includes administrative, mission, housing, and commercial buildings. Pelham Range is used for artillery firing, smoke operations training, and field training exercises.



LOCATION OF FORT McCLELLAN/
ANNISTON, ALABAMA

Prepared for:
U.S. Army Environmental Center
Aberdeen Proving Ground, Maryland



Figure 1-1

Adjoining the Main Post to the east is the Choccolocco Corridor, which is leased to the Federal Government by the Alabama State Legislature to provide an access corridor from the Main Post to the Talladega National Park.

Fort McClellan reports directly to the U.S. Army Training and Doctrine Command (TRADOC) and is under their operational control. The installation houses three major organizations -- U.S. Army Military Police School (USAMPS), U.S. Army Chemical School (USAMCLS), and Training Center (under the direction of the Training Brigade) -- in addition to other support units and tenants.

1.4.1.1 Ownership and Operational History

In 1917, the Federal Government purchased 18,946 acres of land near Anniston for use as an artillery range. Camp McClellan was used to train troops for World War I and served in that capacity until the armistice. The area was then designated as a demobilization center. Between 1919 and 1929, Camp McClellan served as a training area for active army units and other civilian elements. Camp McClellan was redesignated as Fort McClellan in July 1929 and continued to serve as a training area.

In October 1940, the Federal Government acquired an additional 22,245 acres west of Fort McClellan. This tract of land was named Pelham Range in honor of Major John Pelham. In 1941, the Alabama Legislature leased approximately 4,488 acres to the Federal Government to provide an access corridor from the Main Post to Talladega National Forest. From August 1945 until August 1946, Fort McClellan served as a separation point. After a 3-month closing period, it was activated as a Recruit Training Center until May 1947 and subsequently was placed in an inactive status until 1951.

The Army reactivated Fort McClellan on January 4, 1951 for operation of the Chemical Corps School and as a replacement center for the Chemical Corps. The Chemical Corps School offered advance training in all phases of chemical, biological, and radiological warfare to students from all branches of the military service until the school was deactivated in 1973. The

Army Combat Development Command Chemical/Biological Radiological Agency moved to Fort McClellan in 1962 and performed its mission until it also was deactivated in 1973.

The mission of the installation was changed in 1966 and Fort McClellan was renamed the U.S. Army School/Training Center and Fort McClellan. An Advanced Individual Training Infantry Brigade was activated in 1966 to meet requirements for the Vietnam War. Because of continued force reductions in Vietnam, the Brigade was deactivated in 1970 after training more than 30,000 men. The 3rd Army NCO Academy also was stationed at Fort McClellan from 1967 to 1972.

On July 11, 1975, the U.S. Army Military Police School was moved from Fort Gordon, Georgia to Fort McClellan. In December 1979, the U.S. Army Chemical School was relocated to Fort McClellan from Aberdeen Proving Ground, Maryland.

1.4.1.2 Regulatory History

The following information is provided in accordance with *Information and Data Requirements for Site Investigations, Federal Agencies* (EPA 1990) and is taken from USATHAMA (1990).

Resource Conservation and Recovery Act Facilities — The Main Post (EPA ID No. AL4 210 020 562) contained an interim status storage area and several hazardous waste generation points. Fort McClellan has closed the interim status container storage area under the Resource Conservation and Recovery Act (RCRA), and as referenced in a letter (3 November 1988) to the Alabama Department of Environmental Management (ADEM), the facility will store and handle hazardous waste under a generator status at the Main Post. Pelham Range is used for the open demolition of unexploded ordnance (UXO). A RCRA Part B Subpart X permit application for the Open Burn Area was submitted on 13 December 1988. Unless otherwise noted, the permits mentioned below have been issued by the State of Alabama.

National Pollutant Discharge Elimination System (NPDES) Permits — Wastewater generated at the Post is treated in the Fort McClellan Wastewater Treatment Plant (4.5 million

gallons per day [gpd] capacity), which has been leased by the Army to the city of Anniston since 1974. The NPDES permit (No. AL0024520) is maintained by the Water Works and Sewer Board of the city of Anniston. Concern over degradation of nearby Cane Creek due to the age (constructed in 1941) and capacity of the treatment plant and violation of the permit conditions led the ADEM to enter into a Consent Order (No. 90-039-WP) with the Water Works and Sewer Board of the city of Anniston. Various solutions to the current wastewater treatment system overload have been considered. However, since Fort McClellan's activities account for approximately 90 percent of the influent to the wastewater treatment plant. Fort McClellan has recently completed the design for the upgrade of the wastewater treatment plant and is expected to start construction of the plant in early 1993.

Point source discharges were covered by NPDES Permit No. AL003803, April 1976, including 6 vehicle wash racks, blowdown from 10 cooling towers, blowdown from 2 boiler plants, and filter backwash from 4 swimming pools.

The Army currently maintains two NPDES permits for Fort McClellan and Pelham Range. Permit No. AL0055999 covers storm water runoff via oil/water separators (OWSs) from petroleum storage and handling areas that discharge to Cane Creek and South Branch. This permit also includes the OWSs at the fog oil drum storage areas located at Ranges 4A and 24A. Permit No. AL0057665 covers discharge from the Unit Training Equipment Site (UTES) #1 at Pelham Range via a sedimentation basin equipped with a float block and an oil skimming device and discharges the water to an unnamed tributary of Cane Creek.

Air Permits — Air permits maintained for Fort McClellan and Pelham Range are covered under Permit Approval Data Sheet - Facility Number 301-0017 and include:

- Boiler Plant 1, Building 3176, Main Post. Four gas/oil-fired boilers (one 9.279-MM Btu/hr and three 28.0-MM Btu/hr). Permit No. 301-0017-008.
- Boiler Plant 2. Two gas/oil-fired boilers (51,500,000 Btu/hr). Permit No. 301-0017-002.
- Boiler Plant 3. Three gas/oil-fired boilers (40,626,000 Btu/hr). Permit No. 301-0017-001.

- Boiler Plant 4, Building 1876. Grandfathered.
- Five gasoline storage tanks (12,000 gallons each), Facility T-265. Permit No. 301-0017-003.
- Two JP-4 storage tanks (12,000 gallons each), Facility T-263. Permit No. 301-0017-004.
- Five propane storage tanks (30,000 gallons each), Facility 3217. Permit No. 301-0017-005.
- Chemical Decontamination Training Facility Incinerator with wet scrubber. Permit No. 301-0017-007.
- Noble Army Hospital infectious waste incinerator (30 pounds per week).

Solid Waste Permits — Solid waste (i.e., household refuse and commercial waste) generated at the Post is landfilled at a permitted on-Post facility. The landfill is regulated under Permit No. 08-02R for Military Reservation Fort McClellan. The permitted landfill location is described as South half of the North half, Section 10, township 15 South, Range SE, located in Calhoun County, Alabama. Waste approved for disposal under Permit No. 80-02R includes household garbage and rubbish, and commercial solid waste (i.e., wooden pallets, paper, and demolition waste). The permit was issued 1 May 1987 and expired 30 April 1992. An extension of the presently expired permit has been given to Fort McClellan by the Alabama Department of Environmental Management (ADEM) until October 9, 1993.

Water Supply Permits — Water supply permits maintained for Fort McClellan and Pelham Range include:

- Facility location — Anniston, Alabama, Permit No. 86-860; water system consists of two storage tanks combined capacity of 2,500,000 gallons; 15,350 customers, approximately 93 miles of water main.
- Facility location — Range 57, Permit No. 87-742; consists of a 70-gpm well with hypochlorinator and a 100-gallon pressurized tank.
- Facility location — Range 44, Permit No. 87-743; consists of a 5-gpm well with hypochlorinator and a 15,000-gallon elevated storage tank.
- Facility location — Rideout Hall, Building 8801, Permit No. 84-744; consists of a 5-gpm well with hypochlorinator and a 500-gallon pressurized tank.

1.4.1.3 Process and Waste Disposal History

Historical information regarding the activities conducted at the sites investigated under the SI program was obtained from USATHAMA (1990) and Environmental Science and Engineering (1984). This information is summarized in Table 1-2.

The chemical and biological agent training sites under investigation during the SI were used for the controlled training of personnel in various facets of chemical and biological warfare decontamination, detection, and munitions/agent disposal. Training at these sites occurred at various times between the early 1950's and 1973, with operations involving various agents, some of which may have been used on the individual sites. Limited, controlled usage of fixed quantities of chemical warfare agent was typical during the training exercises. Usage included establishment of identification stations where agent samples were set up for field identification, in addition to contaminating field equipment with limited quantities of agent for identification and decontamination training. Evidence of widespread dispersal or usage of training materials at the sites of concern was not identified by SAIC based on review of records at the U.S. Army Chemical Museum at Fort McClellan and discussions with site personnel who were present during the training exercises. The chemical agents included mustard (HD), the nerve agents O-ethyl-S(diisopropylaminoethyl)-methylphosphonothiolate (VX) and Sarin (GB), and the biological simulants *Bacillus globigii* (BG) and *Serratia mercesans* (SM). HD is the predominant agent thought to have been used at Fort McClellan. HD readily undergoes hydrolysis to form thiodiglycol, a relatively nontoxic compound. The HD also may polymerize on its surface in aqueous situations to form a protective insoluble coat, thus inhibiting further hydrolysis.

The potential persistence of subsurface contamination in soils and groundwater for the agents, agent degradation byproducts, decontaminant DS-2 (70 percent diethylenetriamine, 2 percent sodium hydroxide, and 28 percent ethylene glycol monomethyl ether) and supertropical bleach (STB) constituents, and byproducts from the reactions of agent with decontaminants has been evaluated (Small 1983). Based on the solubility, volatility, toxicity, and formation potential of the compounds evaluated, it was concluded that the only toxic compounds likely to persist in the subsurface soils at Fort McClellan are HD and bis(2-diisopropylaminoethyl) disulfide (DES)₂.

**Table 1-2. Summary of Process and Waste Disposal Activity
Site Investigation Sites, Fort McClellan, Alabama**

Range	Range Size	Probable Date Opened	Last Used	Agents Used	Process and Waste Disposal History
T-4	0.3 acres	1965	1971	BG, SM, HD**, VX**	Testing biologic simulants BG, SM.
T-5	11.4 acres	1961	1973	HD, GB, VX, BG, SM	Training for detection and decontamination of HD, GB, VX agents and simulants BG, SM. 110-gallon HD spill.
T-6	7.3 acres	Unknown	1973	HD	Training for decontamination of chemical agents, including HD. Chemical munitions disposal training for CG, BZ, HD, GB agents. Two square (256 sq ft) decontamination burn pits, depth possibly 6 feet. Possible HD spill (unconfirmed).
T-24 Alpha	1.5 acres	Unknown	1973	HD, GB*	Training with HD, GB agents. Onsite chemical storage. Possible spills.
T-31	3.4 acres	1957	1969	HD, GB	Training in elimination of toxic hazards for chemical munitions and storage of HD, GB, VX agents. STB, DANC, DS-2 decontaminants used.
T-38	6.0 acres	1961	1972	HD, GB, VX	Training exercises for identification and detection of HD agent. Other agents possible. Agent placed directly on ground surface.
Old Toxic Training Area	484 sq ft	early 1950s	Unknown	HD	Chemical/biological agent (GB, HD) training; shell tapping area for GB, CG rounds.
Pelham Range K	2.0 acres	Unknown	Unknown	HD**	Chemical agent shell tapping — HD, GB agents.
Pelham Range I	0.5 acres	Possibly 1963/1964	Possibly 1963/1964	HD**, GB	Training and chemical/biological agent disposal, possibly HD. Possible HD spill disposal area.
Pelham Range J	0.1 acres	Unknown	1963	HD**	Testing and training with chemical/biological agents HD, GB, CK, GC, CX, AC. Training aids burned in pit onsite.
HD Spill/Burial Sites	Varied	Unknown	Unknown	HD	HD spill/burial sites.
Pelham Range L	0.5 acres	Unknown	Unknown	HD**	Disposal of captured WWII munitions, including chemical munitions (Lima Pond).
Former Landfill 1	2 acres	1945	1947	None	Sanitary landfill disposal.
Former Landfill 2	4 acres	1947	Unknown	None	Waste disposal during deactivation of installation
Former Landfill 3	22 acres	1946	1967	None	Sanitary landfill disposal.
Old Water Hole	2,975 sq ft	Unknown	Unknown	Unknown	Disposal site (possible sinkhole), chemical agents, munitions.

* Other simulants also used
 ** Assumed HD or VX used
 BG Bacillus Gobi
 SM Serratia Marcescens

Reference: Solid Waste Study No. 99-056-73/76, Fort McClellan, AL, Jul 73-Aug 75

The latter compound is the principal byproduct formed from the decontamination of VX with DS-2. The limited quantities of VX used on these sites essentially eliminates the potential for sufficiently large quantities of DES₂ to be of significance as an environmental contaminant in the soil.

Based on similar considerations, it was concluded that the only toxic compounds with the potential to persist in groundwater are divinyl sulfide (DVS), mustard sulfoxide (HO), DES₂, and S-(diisopropylaminoethyl) methylphosphonothioate (DESMP). DVS is formed from the alkaline hydrolysis of HD with DS-2, and HO is formed from the oxidation of HD with STB. DESMP is formed from the hydrolysis of VX. Although the potential exists for these compounds to be present in groundwater, it is unlikely they will be detected due to the limited quantities of agents used and decontaminated during training exercises.

1.4.1.4 Previous Environmental Studies at Fort McClellan

Several environmental studies have been published on Fort McClellan and Pelham Range. Nine facility-wide studies are available and some are discussed below.

The U.S. Army Environmental Hygiene Agency (USAEHA 1975) documented a 2-year investigation into the status and historical use of chemical, biological, and radiological (CBR) training areas. Based upon a limited records review and interviews, USAEHA (1975) identified 12 areas at Fort McClellan and Pelham Range that were investigated and cleared for surface contamination by the U.S. Army, but that were possibly contaminated in the subsurface. Restricted access and inclusion in future land restoration and recovery programs were recommended for these areas.

A second investigation consisting of records reviews, personnel interviews, and field inspections was conducted in 1977 (USATHAMA 1977). During this investigation, burial grounds and training areas were identified within the facility in which chemical or radiological contamination existed or was suspected. In addition, records indicated that UXO may be present in several training areas. This study also concluded that CBR contamination has not been

detected in surface water at the site and that a potential may exist for groundwater contamination from documented landfill operations.

Based upon a literature review of fate and transport of chemical agents, decontaminants, agent decontaminant byproducts, and past onsite CBR training practices, a 1983 study identified the most probable groundwater and soil contaminants that could still be present at Fort McClellan and Pelham Range. A second review of facility operations and their effects on the environment also was published in 1983. This study was compiled for the facility's Installation Planning Board.

A 1977 records search conducted by USATHAMA was re-evaluated and integrated with subsequent data in 1984. This study was limited to chemical agents and restricted compounds and resulted in 21 site-specific contamination assessments.

The USAEHA conducted an investigation at Fort McClellan in 1986 to identify all solid waste management units (SWMUs) on Post. USAEHA (1986) formally identified 41 SWMUs on Fort McClellan and Pelham Range. Each SWMU was located, described, and evaluated to the extent possible. Five monitoring wells were installed by the Agency at Former Landfill #3 as part of the investigation.

An enhanced Preliminary Assessment (PA) was conducted by Roy F. Weston, Inc. in 1990 (USATHAMA 1990) to evaluate the status of active non-Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and inactive CERCLA sites potentially impacting the U.S. Army's planned closure of Fort McClellan. The PA identified 67 active and inactive sites on the Main Post and Pelham Range.

1.4.1.5 Previous Remedial/Removal Actions

Historical information regarding previous activities conducted at the SI sites to mitigate environmental contamination was obtained from USATHAMA (1990). Table 1-3 summarizes the available information for the 17 SI sites.

**Table 1-3. Summary of Previous Remedial/Removal Actions
Site Investigation Sites, Fort McClellan, Alabama**

Range	Range Size	Probable Date Opened	Last Used	Agents Used	Process and Waste Disposal History
T-4	0.3 acres	1965	1971	BG, SM, HD**, VX**	Decontamination of agents and surface soils using STB and DS-2. Surface soil sampling and analysis.
T-5	11.4 acres	1961	1973	HD, GB, VX, BG, SM	Training sites decontaminated and tested at end of each exercise, using STB and/or DS-2. Contaminated soil possibly removed and disposed of at Range J. Surface soil sampling and analysis.
T-6	7.3 acres	Unknown	1973	HD	Decontaminants STB and DS-2 used during exercises. Random surface soil sampling and analysis.
T-24 Alpha	1.5 acres	Unknown	1973	HD, GB*	Pits filled with soil. Decontamination of agents on soils using STB and DS-2. Surface soil sampling and analysis.
T-31	3.4 acres	1957	1969	HD, GB	Training aids moved to Site T-38. Soil possibly decontaminated using STB and DS-2.
T-38	6.0 acres	1961	1972	HD, GB, VX	Extensive decontamination for reported spills and contaminated training aids. Surface soil sampling and analysis.
Old Toxic Training Area	484 sq ft	early 1950s	Unknown	HD	Surface soil decontaminated using STB and DS-2.
Pelham Range K	2.0 acres	Unknown	Unknown	HD**	Site was physically rearranged (bulldozed). Surface monitoring conducted.
Pelham Range I	0.5 acres	Possibly 1963/1964	Possibly 1963/1964	HD**, GB	Area physically rearranged with upper 2 feet of soil removed to unknown location.
Pelham Range J	0.1 acres	Unknown	1963	HD**	Limited onsite monitoring.
Detection and Identification	1.1 acres	Early 1950s	1973	HD, GB*	Decontaminants STB and DS-2 used on surface soils. Training aids burned in open, onsite pit and subsequently buried.
HD Spill/Burial Sites	Varied	Unknown	Unknown	HD	Some areas may have been paved.
Pelham Range L	0.5 acres	Unknown	Unknown	HD**	Sampled and analyzed surface water and soil samples (Lima Pond).
Former Landfill 1	2 acres	1945	1947	None	Visual inspection.
Former Landfill 2	4 acres	1947	Unknown	None	Visual inspection.
Former Landfill 3	22 acres	1946	1967	None	Installed 5 groundwater monitoring wells. Sampled and analyzed groundwater samples.
Old Water Hole	2,975 sq ft	Unknown	Unknown	Unknown	Visual inspection.

* Other simulants also used
 ** Assumed HD or VX used
 BG Bacillus Gobi
 SM Serratia Marcescens
 STB Supertropical Bleach

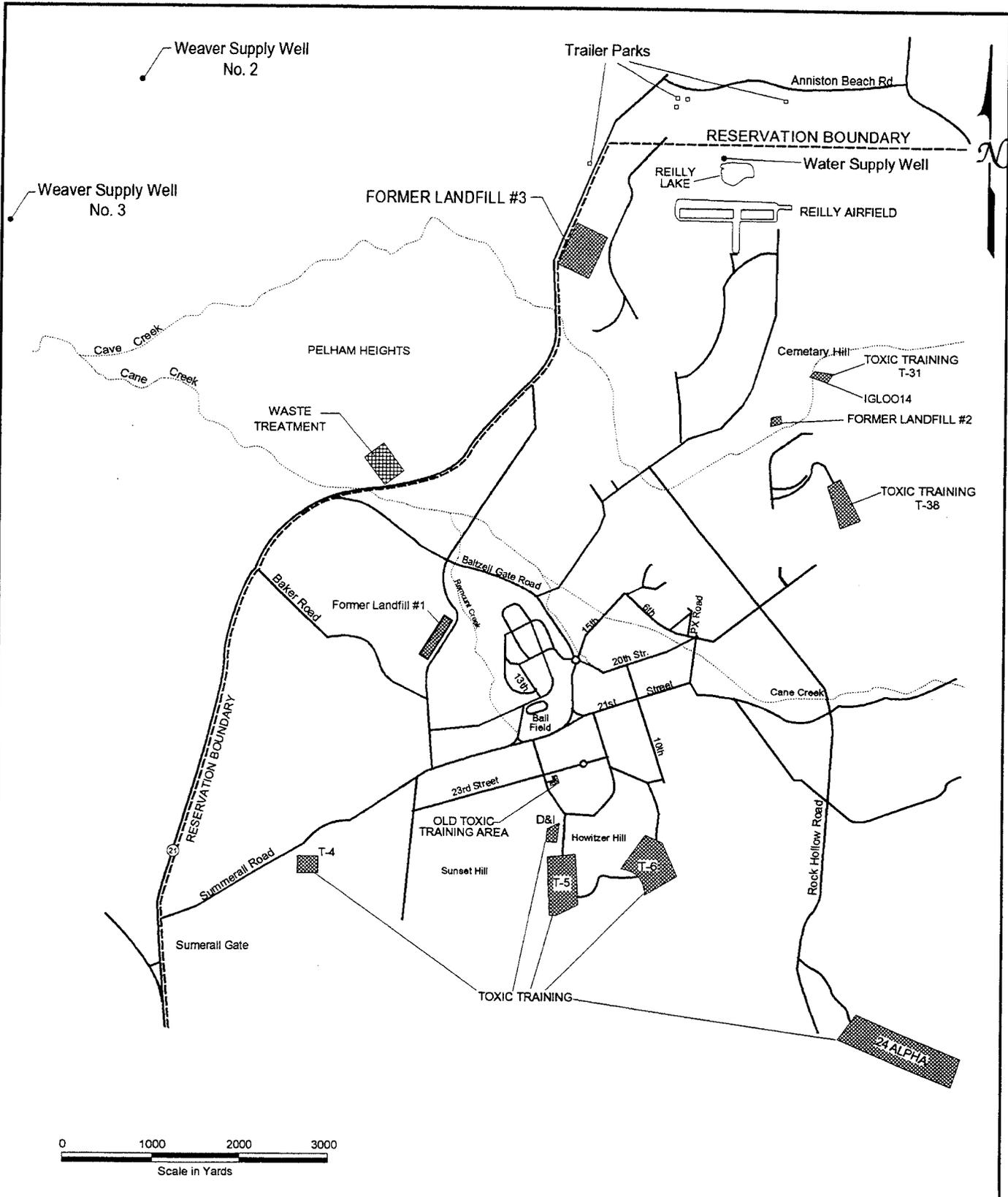
Reference: Solid Waste Study No. 99-056-73/76, Fort McClellan, AL, Jul 73-Aug 75

1.4.2 Site Descriptions

The 17 sites investigated under the Fort McClellan SI are summarized below. Information pertinent to the sites was obtained from USATHAMA (1990), Environmental Science and Engineering (1984), USAEHA (1986), and site visits conducted by SAIC in 1991 and 1992. These sites are shown collectively in Figures 1-2 and 1-3. SAIC's original scope of work for the SI program included 17 sites identified by USAEC, as described in the SI Sampling and Analysis Plan (SAIC 1992). Prior to the initiation of field work in April 1992, USAEC and SAIC conducted site visits to the various locations in October 1991 and April 1992. During the October 1991 visit, it was concluded that further sampling activities would not be conducted at Site 1 (Area T-4) and Site 12 (HD Spill/Disposal Sites) because the sites could not be adequately located and in some instances the appropriate locations were underneath developed areas. Biological simulants reportedly used at Area T-4 are not environmentally persistent and were used in minimal quantities.

1.4.2.1 Site 1 - Area T-4

Site 1 - Area T-4 was reportedly a Biological Simulant Test Area located on the Main Post (Figure 1-2). Records indicate that a 0.25-acre site was used between 1965 and 1971 for biological simulant (BG and SM) training. Decontamination of the simulants on the surface soils was performed by adding STB and DS-2. Contamination from HD was not detected in surface soil samples collected by the Army in April and July 1973; however, subsurface soil samples were not collected at that time. The use of the area was limited to surface activity in the unlikely event that some HD may have been used at the site, and because subsurface sampling had not been conducted at the site. The identified area of the former site had been extensively re-worked and no evidence of a former site was observed at the location identified by the Base during the October 1991 site visit by USATHAMA and SAIC. Based on the inability to locate the former site and the fact that biological simulants are not persistent in the environment, additional investigative activities were not conducted at Area T-4 during the SI. SAIC recommends that additional efforts be made to locate Site 1 and that sampling be conducted before the site is eliminated from further study.

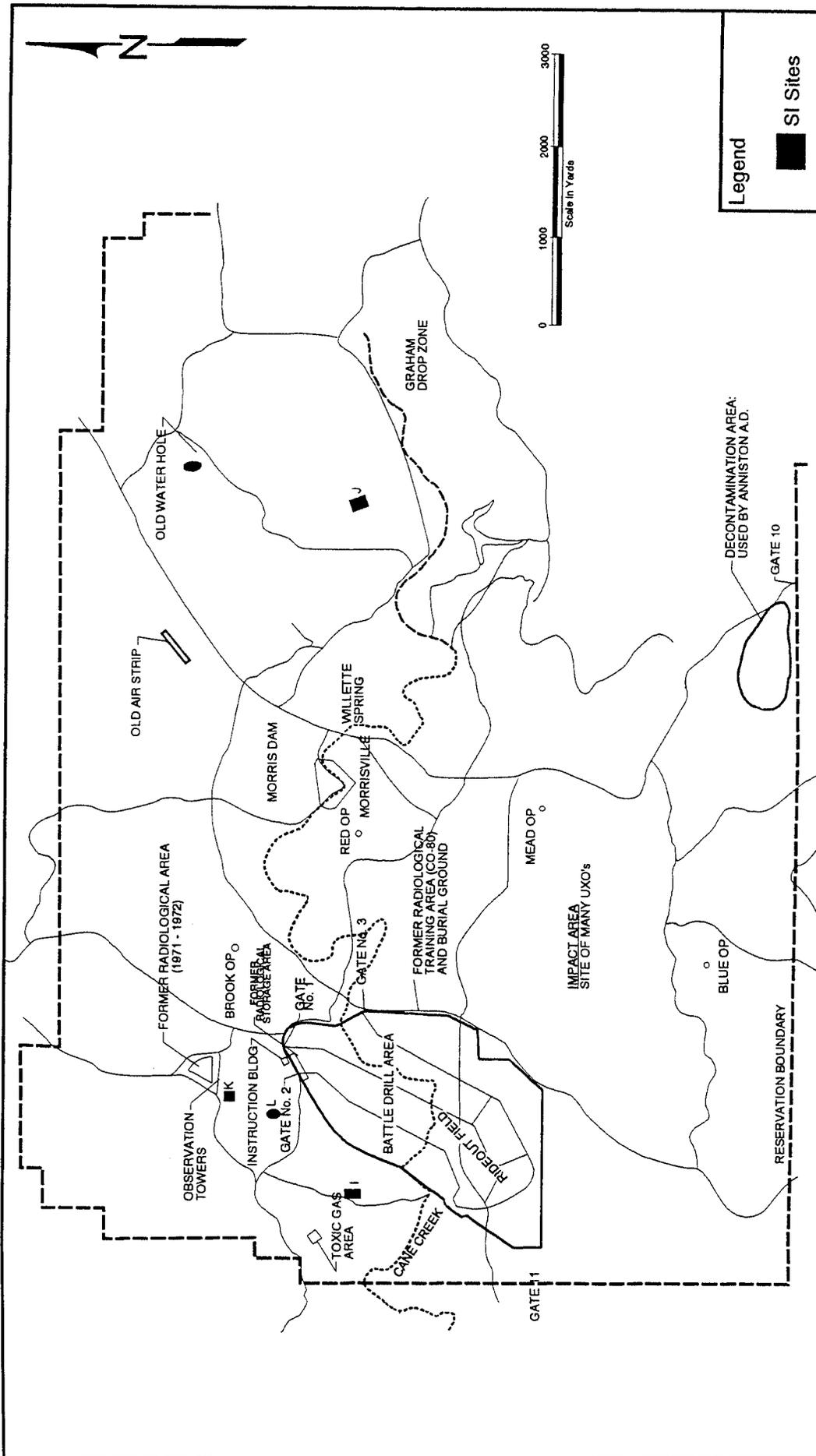


**SITE LOCATION MAP - MAIN POST
FORT McCLELLAN, ALABAMA**

Prepared for:
U.S. Army Environmental Center
Aberdeen Proving Ground, Maryland



Figure 1-2



**SITE LOCATION MAP - PELHAM RANGE
 FORT McCLELLAN SI**

**Prepared for:
 U.S. Army Environmental Center
 Aberdeen Proving Ground, Maryland**



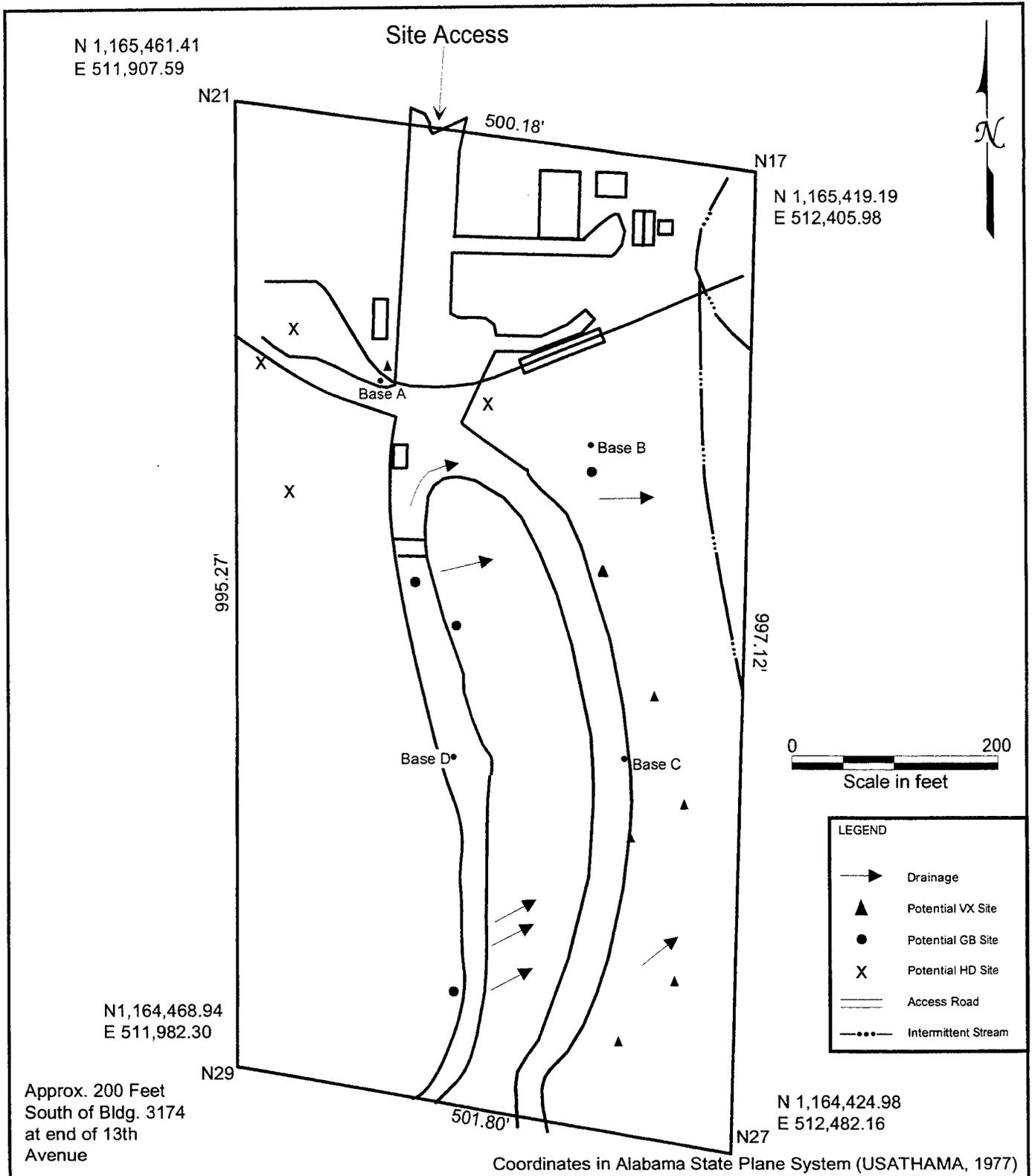
Figure 1-3

1.4.2.2 Site 2 - Area T-5

Site 2 - Area T-5 is the Toxic Hazards Detection and Decontamination Training Area located between Sunset Hill and Howitzer Hill. The locations of suspected or potential chemical warfare agent training sites are shown in Figure 1-4. The 11.4-acre wooded site was used between 1961 and 1973 to train students in the methods of detecting and decontaminating toxic agents, including HD, GB, and VX. The quantities of agent used for training purposes ranged from 20 to 40 milliliters per exercise. The training sites were decontaminated and checked at the end of each exercise. Decontamination of the agents on residual soils was performed by adding STB and/or DS-2. In addition to HD, GB, and VX used during training, Site 2 may have been the location of a 110-gallon HD spill. Available evidence indicates that the contaminated soil was chemically decontaminated, removed, and ultimately disposed of at Range J (Pelham Range). The Army collected surficial soil samples in December 1972, April 1973, and July 1973 and analyzed the samples for the chemical agents HD, GB, and VX. Chemical warfare agents were not detected in these samples. The area was permitted for surface use because subsurface sampling had not been conducted. Survey monuments "C" and "D" were located in the field during the October 1991 site visit. Additional building foundations and an asphalt pad also were observed at this time. A projectile casing was observed in the eastern portion of the site during the site visit.

1.4.2.3 Site 3 - Area T-6

Site 3 - Area T-6 was an Agent Decontamination Training Area (also referred to as Naylor Field) located near the base of the eastern slope of Howitzer Hill (Figure 1-5). The 7.5-acre site was used until 1973 for training in techniques of decontaminating chemical agents, including HD. The area contained eight training sites that consisted of concrete pads on which equipment was parked. The equipment was contaminated with not more than 40 milliliters of HD during each exercise. The decontaminants STB and DS-2 were used during the exercises. Random surface soil samples collected by the Army in March 1973 revealed no agent contamination, and the area was cleared for surface activity. Several concrete pad structures and a small metal hut were located on the heavily wooded site during the October 1991 site visit.

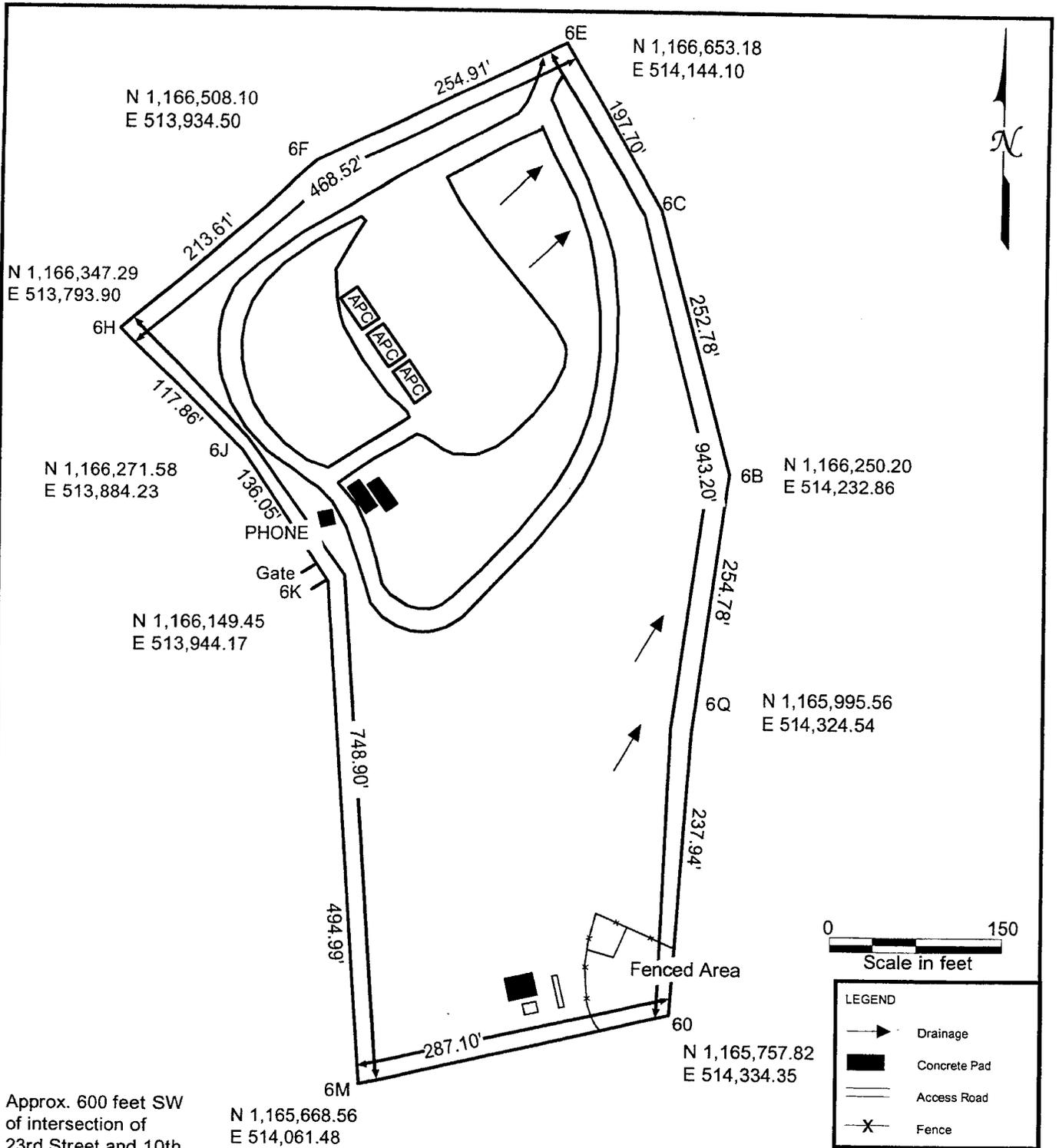


**T5 CHEMICAL AREA - MAIN POST
FORT McCLELLAN, ALABAMA
EOD REACTION AREA**

Prepared for:
U.S. Army Environmental Center
Aberdeen Proving Ground, Maryland



Figure 1-4



Approx. 600 feet SW
of intersection of
23rd Street and 10th
Avenue and West of
Cane Creek.

Coordinates in Alabama State Plane System (USATHAMA, 1977)

**T6 CHEMICAL AREA (HOWITZER HILL)
FORT McCLELLAN, ALABAMA
AGENT DECONTAMINATION AREA**

Prepared for:
U.S. Army Environmental Center
Aberdeen Proving Ground, Maryland



Figure 1-5

1.4.2.4 Site 4 - Area T-24A

Site 4 - Area T-24A was a Chemical Munitions Disposal Training Area located on the Main Post south of Holloway Hill (Figure 1-6). The 1.5-acre site was used until 1973 for chemical munitions disposal training with CG, BZ, GB, and HD. During each training exercise, approximately 4.46 kilograms of HD were reportedly used; however, first hand observers reported that as much as 2 gallons of HD was poured on six howitzers and later on APCs during training exercises. In addition, 40 milliliters of CG, one M-6 canister of BZ, and 740 grams of GB were used per exercise. Two square burning pits, each 16 feet on a side, were used for training exercises and were enclosed by a fenced area measuring 40 by 80 meters. The depths of the pits are unknown; however, standard operating procedures (SOPs) recommended a depth of 6 feet. At closure, the pits reportedly were filled with soil, although some depressions were observed in 1988. Decontamination of agents on residual soils was performed with STB and DS-2. A large HD spill may have occurred at this site, but has not been confirmed. The agents HD, CG, BZ, and GB were not detected in the surface samples collected by the Army in April and July 1973 in the proximity of the pits. Sample depths ranged from 3 to 10 centimeters, and may not represent the depths at which agents were used in the training pits. An unauthorized dump was identified in 1990 at the western end of the fenced area. The enclosed site area was heavily overgrown during SAIC's October 1991 site visit. A survey marker was located within the enclosure showing the location of a former burn pit. Two 81-mm mortar shells also were discovered at the site in October 1991. Portions of Area T-24A are located within the target area (fan) of two currently operating firing ranges.

1.4.2.5 Site 5 - Area T-31

Site 5 - Area T-31 (Technical Escort Reaction Area) was a toxic hazard training area located on the Main Post (Figure 1-7) near Range 31. The 3.4-acre site was used between 1957 and 1969 for training with GB and HD in quantities of 20 to 40 milliliters. Six different locations within Area T-31 were used for training exercises. Training aids used at the site were moved to Area T-38. Area T-31 was used to store undetermined types and quantities of chemical agents. Several spills reportedly occurred onsite from these stored materials. Information regarding the quantities of materials spilled is unavailable. The types and quantities of decontaminants used to treat residual soils contaminated with agents are unknown, but are

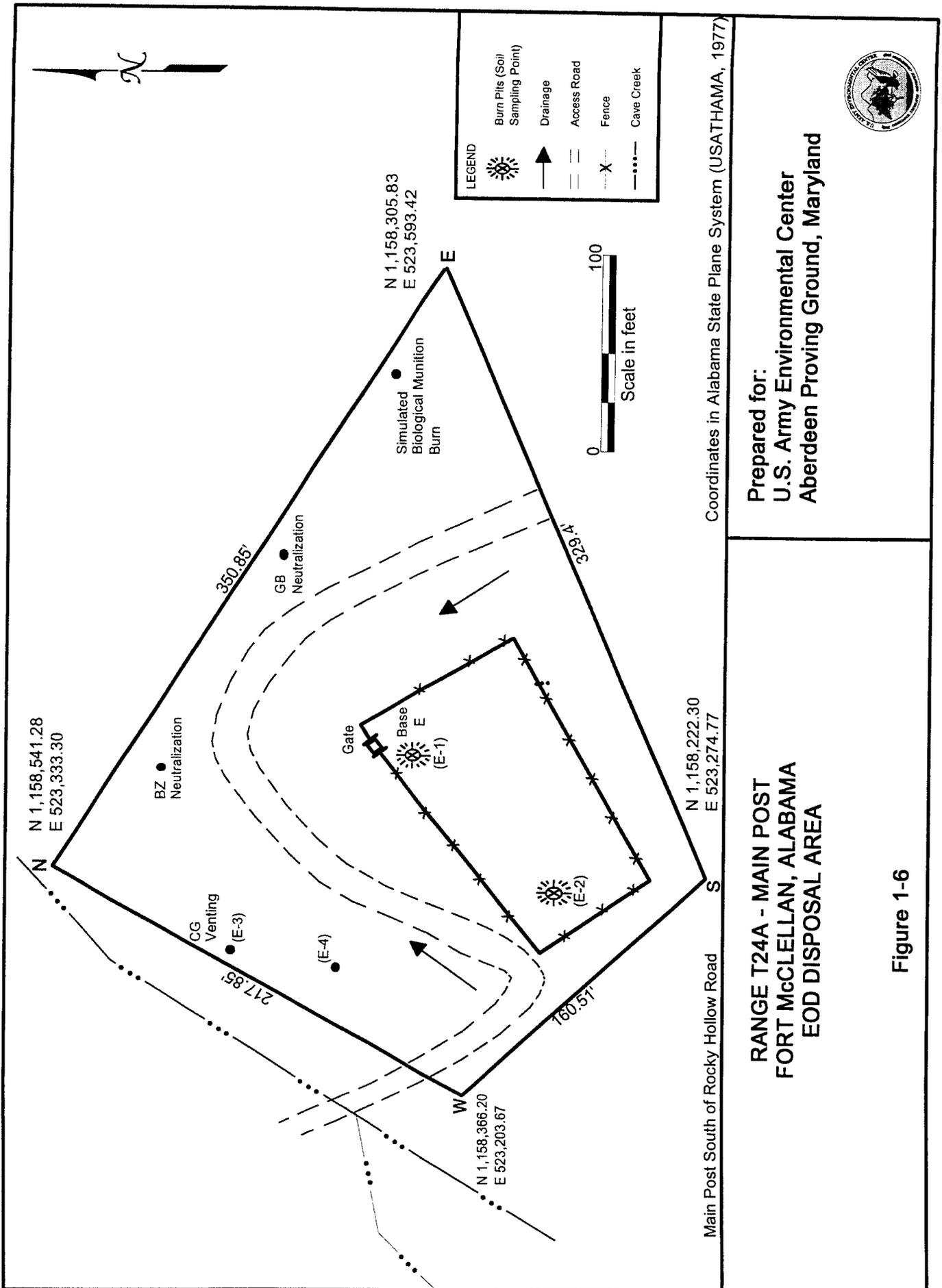
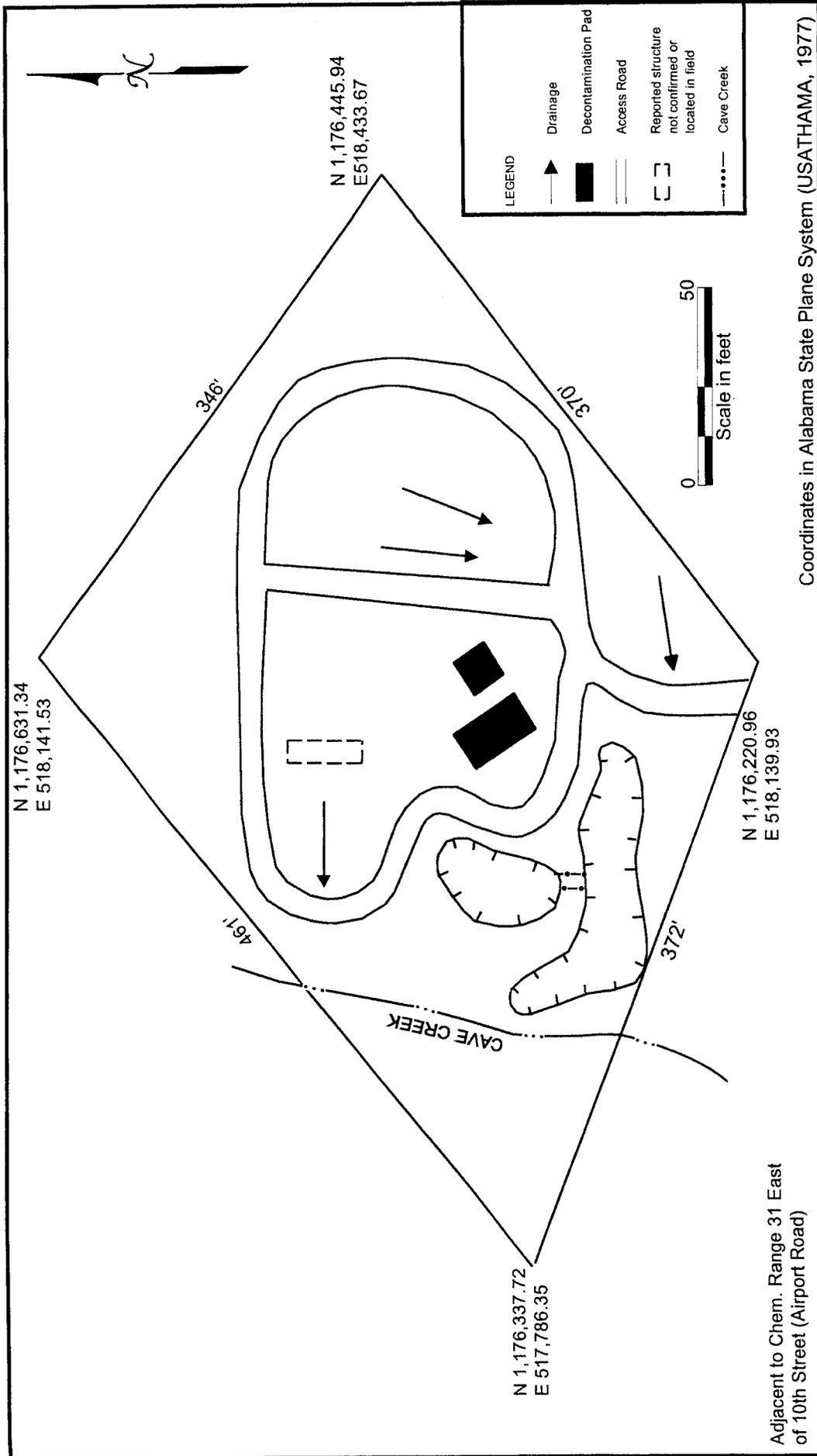


Figure 1-6



**TRAINING AREA T-31 - MAIN POST
FORT McCLELLAN, ALABAMA**

**Prepared for:
U.S. Army Environmental Center
Aberdeen Proving Ground, Maryland**



Figure 1-7

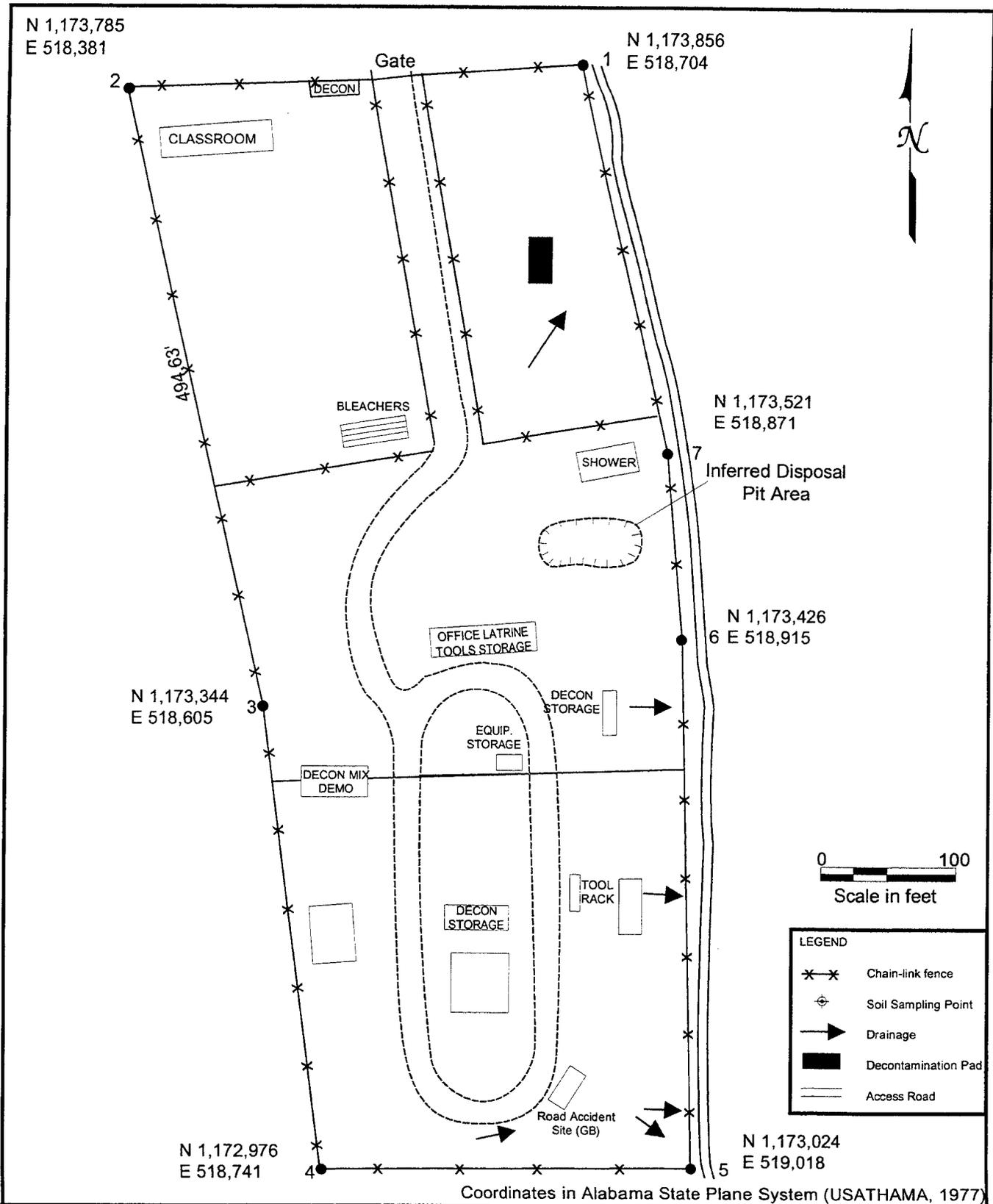
believed to have included STB and DS-2. The site area was heavily overgrown during the October 1991 site visit. Several concrete pads and structures were located at that time.

1.4.2.6 Site 6 - Area T-38

Site 6 - Area T-38 (Technical Escort Reaction Area) is located on the Main Post west of Reservoir Hill (Figure 1-8). The 6-acre site was used between 1961 and 1972 for training escort personnel in techniques of eliminating toxic hazards caused by mishaps to chemical munitions during transport. The area also was used to store toxic agents and munitions, including GB, VX, and HD. Storage included four 1-ton HD containers. In addition, unspecified decontaminants (likely STB and DS-2) were stored on at least two sites and were used for demonstration purposes. Extensive decontamination was conducted on this site for reported spills and contaminated training aids. Residual surface contamination with HD was reported in January 1973. Subsequent sampling in March 1973 indicated that the surface soil at Area T-38 was uncontaminated. A concrete decontamination pad was located in the field during the October 1991 site visit. In addition, there is an unconfirmed report of the burial of a drum of chemical agent (mustard) in the southern portion of the site; however, efforts to determine the precise location of the drum were unsuccessful. A former disposal pit (sump) area approximately 10 by 20 by 10 feet was reportedly used to dispose of decontaminants and other hazardous wastes at the site and was approximately located in the field during the April 1992 site visit (G. Harvey, written communication, October 7, 1992).

1.4.2.7 Site 7 - Old Toxic Training Area

Site 7 - Old Toxic Training Area is located within a fenced area on the Main Post behind Building 3183 (Figure 1-9). The 10,000 square foot ditch area was used during the 1950's for training exercises to identify and detect HD. The quantities of agent used during training are not documented. According to facility personnel, the chemicals were placed on the ground surface. Decontaminants such as STB and DS-2 were likely used on surficial soils.

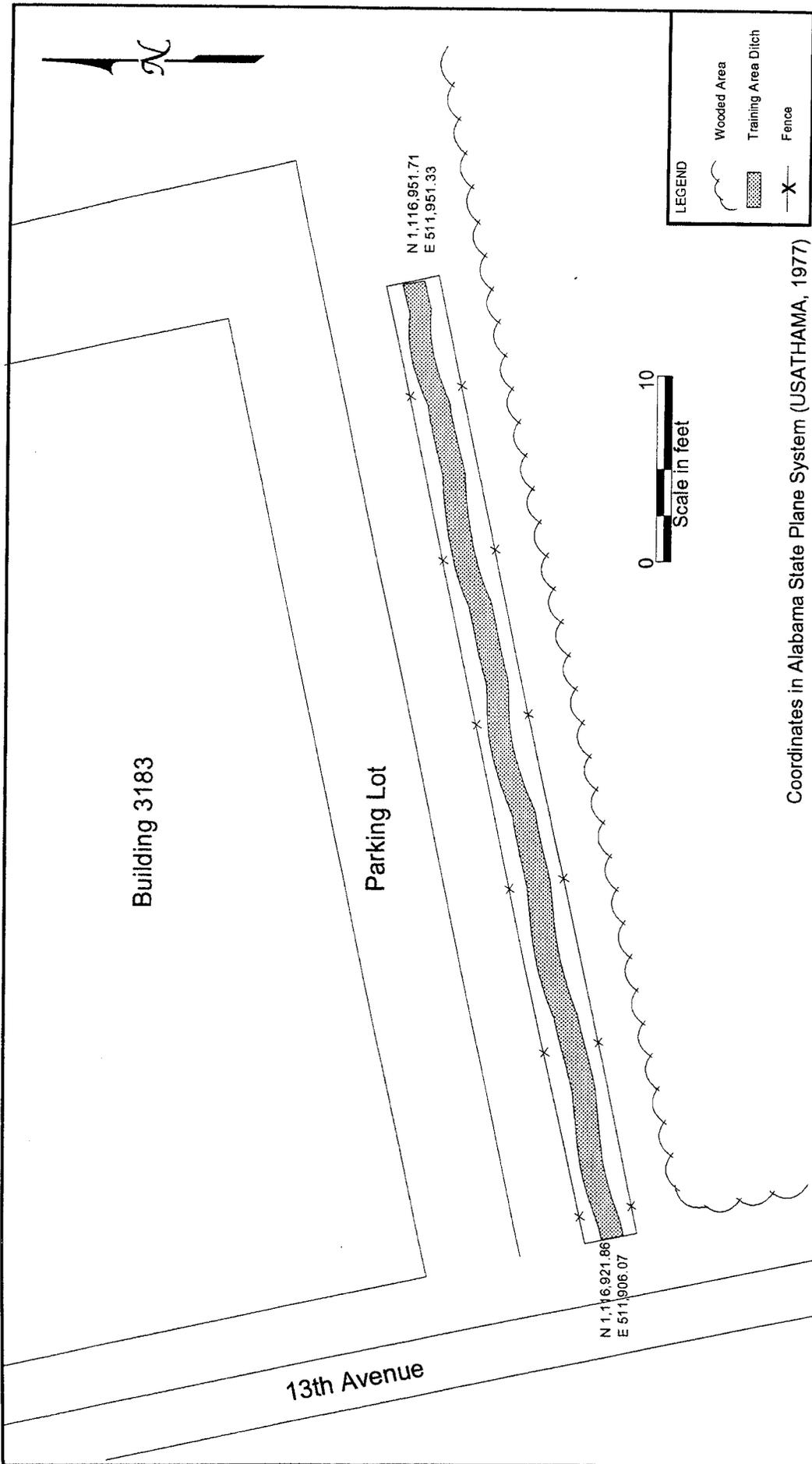


T38 TRAINING AREA - MAIN POST
FORT McCLELLAN, ALABAMA
TECHNICAL ESCORT REACTION AREA

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Figure 1-8



**OLD TOXIC TRAINING AREA - MAIN POST
FORT McCLELLAN, ALABAMA**

**Prepared for:
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Figure 1-9

1.4.2.8 Site 8 - Range K

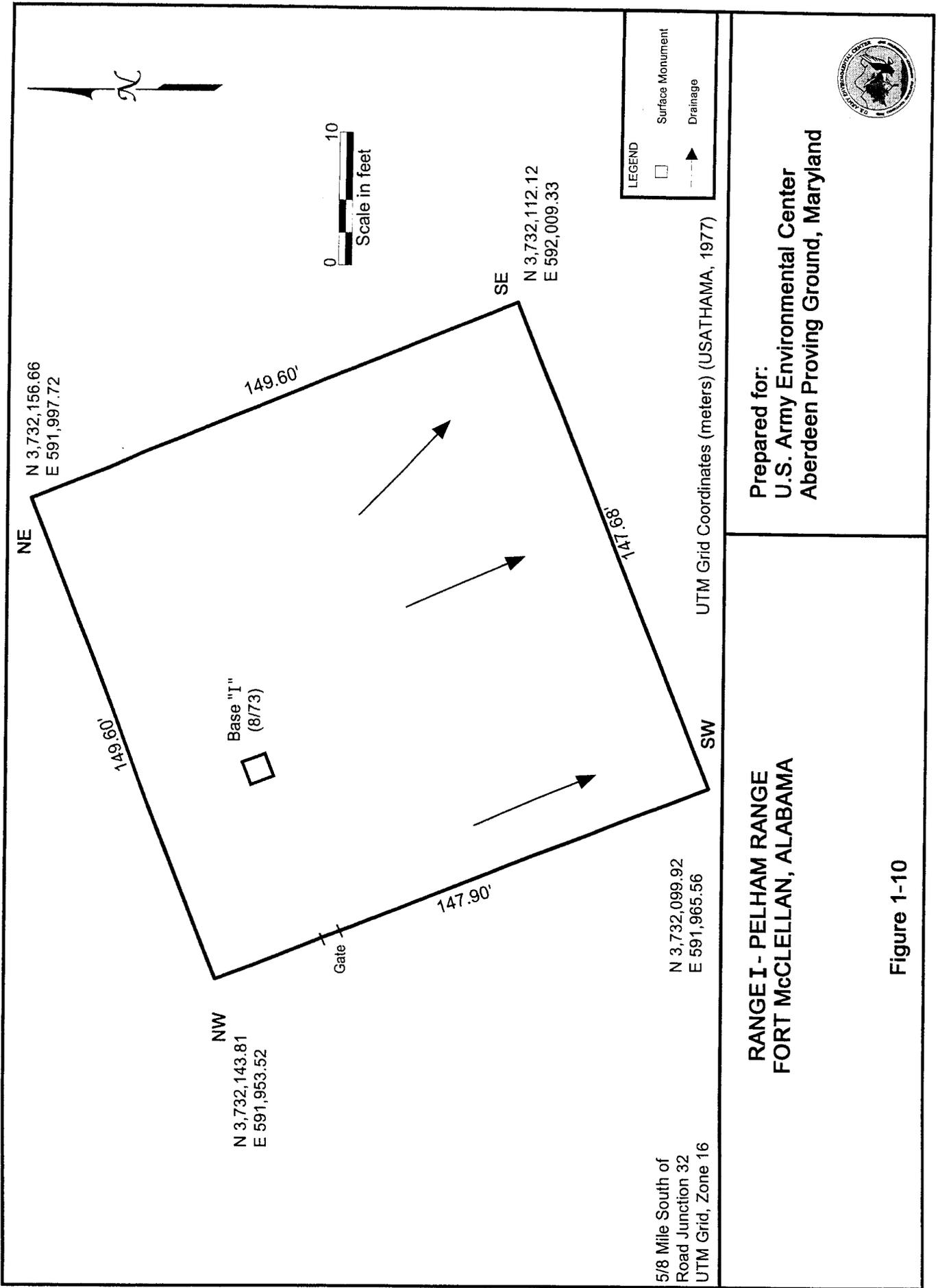
Site 8 - Range K was a 2-acre Agent Training Area located on Pelham Range (Figure 1-3). Limited information on the site is available, including time of operation and agents used. A reported shell tapping area where rounds were opened and decontaminated was operated in Range K prior to 1961 through the summer of 1963. During training exercises breaking open of one 55-mm round of HD, one 105-mm GB, and one 4.2-mortar round of CG was standard practice (G. Harvey, written communication, October 7, 1992). The identified site has been physically rearranged (bulldozed) and records indicate that the area was cleared for surface usage in 1967. The Army conducted surface monitoring in 1980, and no surface contamination was detected. Evidence of a former training area at this site was not observed during SAIC's October 1991 site visit. An approximately 5-foot diameter area of ponded drainage was noted in the site area. In addition, evidence of site usage as a bivouac area was observed.

1.4.2.9 Site 9 - Range I

Site 9 - Range I was an Agent Shell Tapping Area located on Pelham Range (Figure 1-10). The 0.5- to 1-acre site was used between 1963 and 1964 for chemical agent shell tapping purposes. The agent used onsite is assumed to have been HD. The area has been physically rearranged, with the top 2 feet of soil having been moved to an unknown location. Army field tests showed no evidence of surface contamination. A concrete marker was located at the site during the October 1991 site visit.

1.4.2.10 Site 10 - Range J

Site 10 - Range J was an Agent Training Area located on Pelham Range (Figure 1-11). The 139- by 50-foot fenced area was used until 1963 for training and agent disposal. The agents used at the site are unknown, but are believed to be HD. The site also was reportedly used for disposal of a 110-gallon HD spill that occurred on the Main Post in 1955. Evidence of drummed soil disposed of in a surface pit at the site was observed during the October 1991 and April 1992 site walkovers. The depth at which this material was buried is unknown. Limited monitoring has been conducted onsite by the Army. Available data indicate that surface

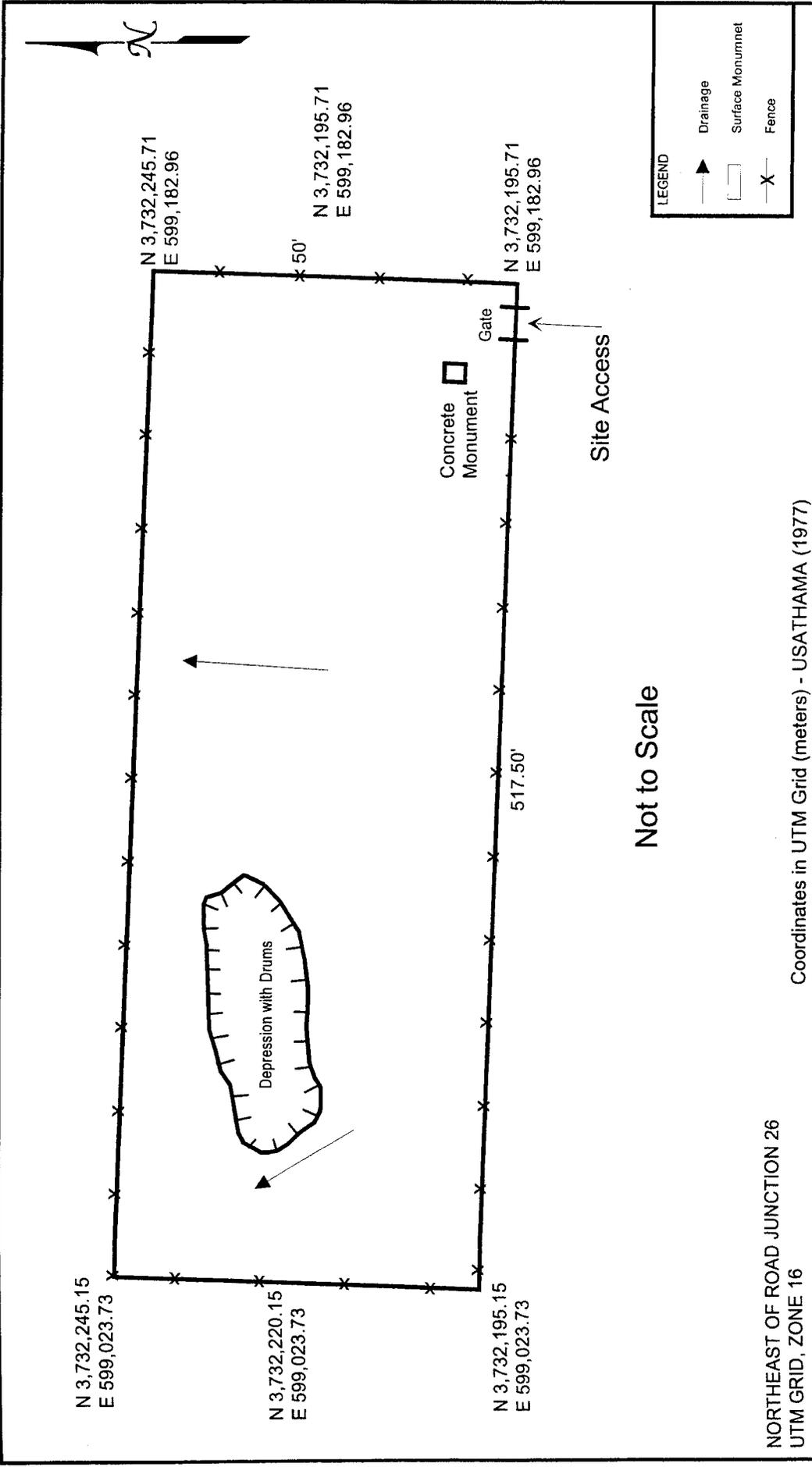


**RANGE I - PELHAM RANGE
FORT McCLELLAN, ALABAMA**

Prepared for:
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Aberdeen Proving Ground, Maryland



Figure 1-10

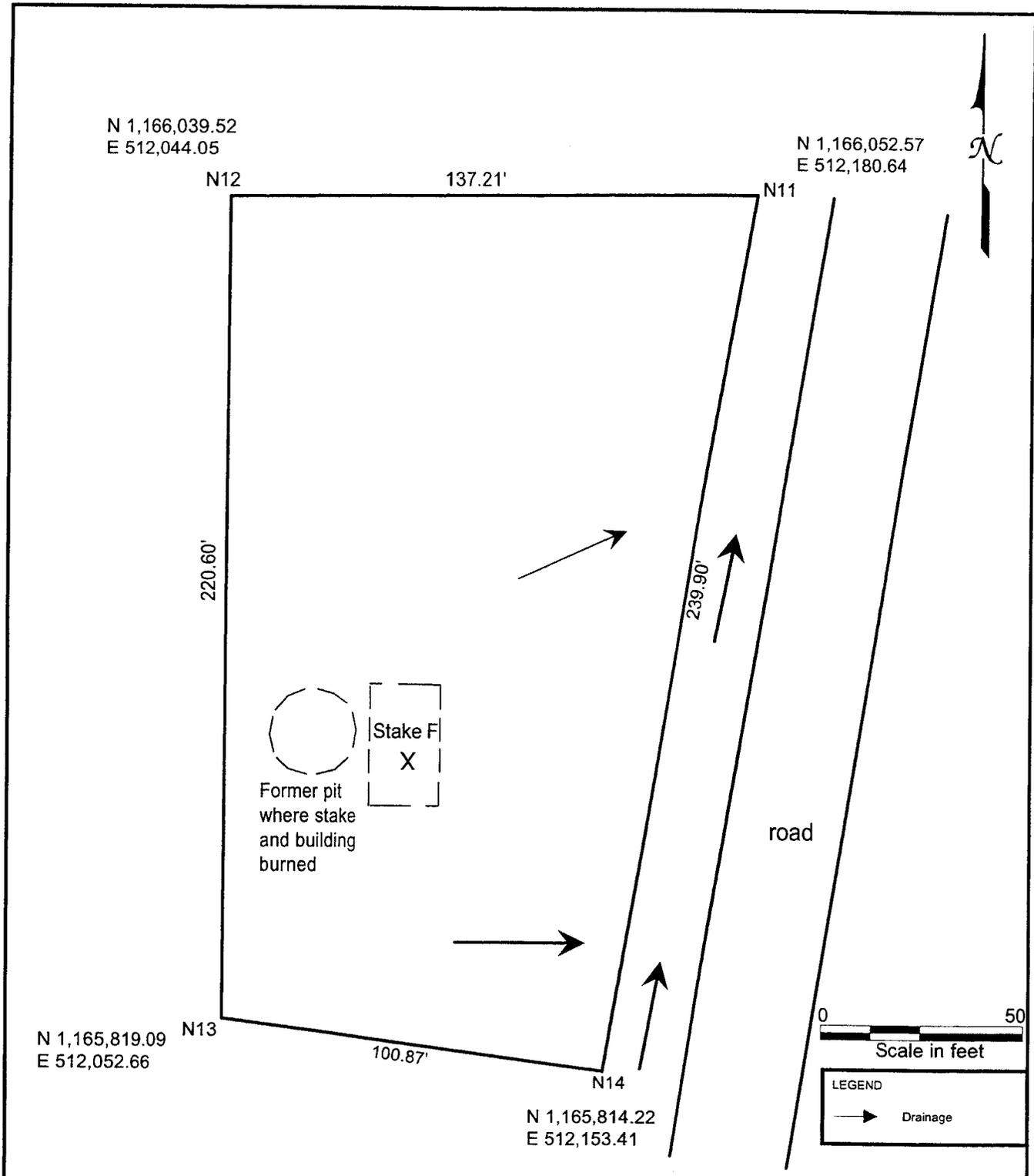


**RANGE J - PELHAM RANGE
FORT McCLELLAN, ALABAMA
REPORTED HD BURIAL SITE**

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Figure 1-11



Coordinates in Alabama State Plane System (USATHAMA, 1977)

**DETECTION AND IDENTIFICATION AREA
- MAIN POST
FORT McCLELLAN, ALABAMA**

Prepared for:
U.S. Army Environmental Center
Aberdeen Proving Ground, Maryland



Figure 1-12

contamination is not present at the site. A survey monument dated August 1973 was located within the fenced area during the October 1991 walkover.

1.4.2.11 Site 12 - Detection and Identification Area

Site 12 - Detection and Identification (D and I) Area is located on the Main Post (Figure 1-12). The 1.1-acre site was used from the 1950's to 1972 for GB training. The Navy may have used HD at the site in the late 1950's for training purposes. Training routinely consisted of application of test kits to detect and identify of agents contained in 40-milliliter vials. Agents often were mixed as a 10 percent solution with water. The agent simulants CK, GC, CX, and AC also were reportedly used in the training area. All training aids from this site and a building from Area T-4 were burned twice in a dug pit and buried. The remains are reportedly still located in the pit. The pit containing the burned materials is identified by stake F which was located during the October, 1991 walkover. The decontaminants STB and DS-2 were used on surface soils and the area was cleared for surface use. The D and I Area is heavily wooded.

1.4.2.12 Site 16 - HD Spill/Burial Sites

A number of HD spills (Figure 1-2) and burial sites have been reported on both the Main Post and Pelham Range, although these activities have not been documented. Areas cited as possible spill locations include:

- Near 6th Street and PX Road
- Along the western side of 10th Avenue on either side of 21st Street
- Along the eastern side of 13th Avenue
- Southeast of the intersection of 13th Avenue and 23rd Street
- Toxic gas area near the western property line of Pelham Range, north of Cane Creek.

Most of these areas have been paved or otherwise developed. Assuming that the decontamination SOP was followed carefully for each spill, the sites would have been decontaminated and cleared for surface usage. Based on the inability to locate the possible sites

and the developed nature of the approximate locations, additional investigative activities were not conducted at these sites.

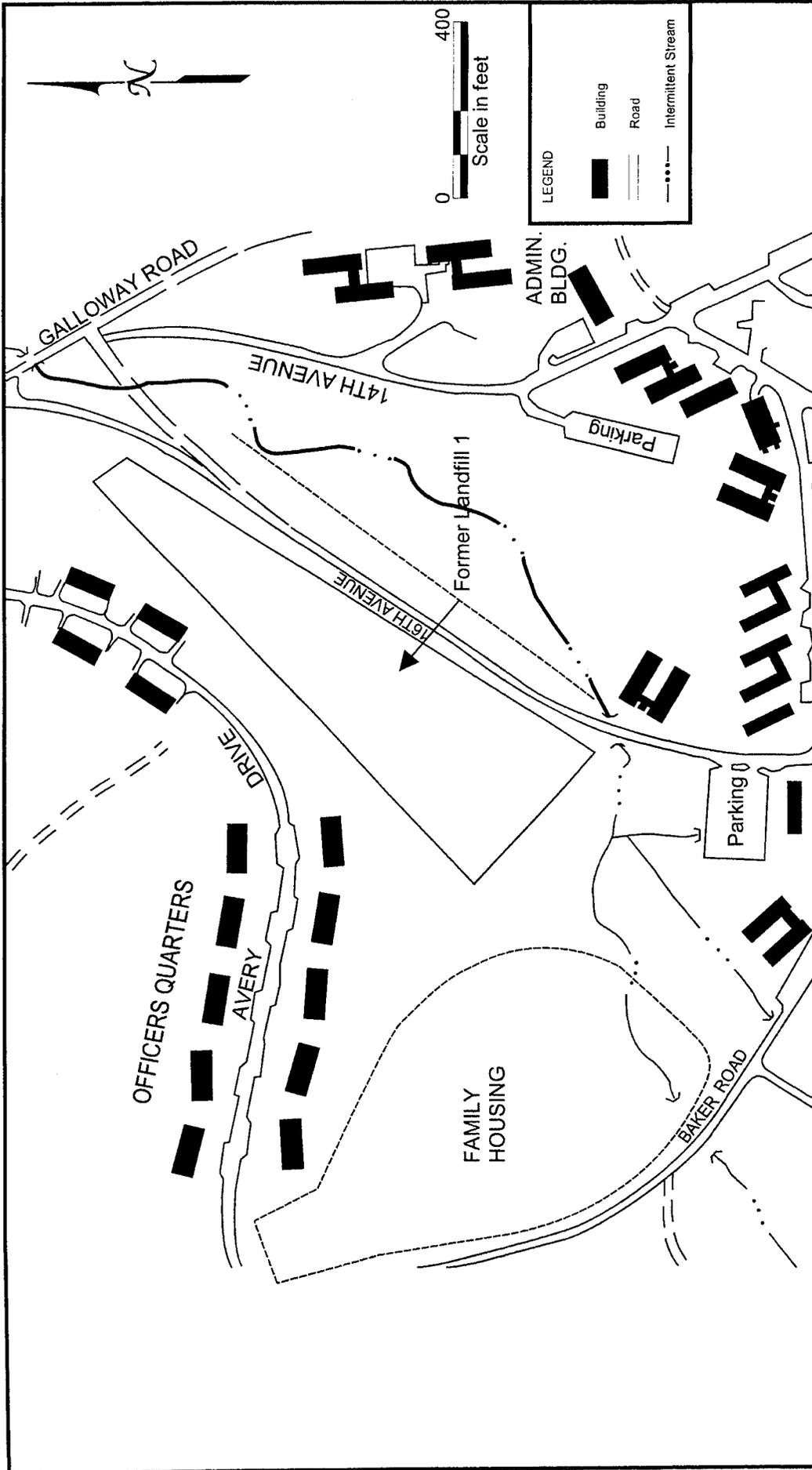
1.4.2.13 Site 11 - Range L (Lima Pond)

Site 11 - Range L was a Chemical Munitions Disposal Area located on Pelham Range (Figure 1-3). The 0.5-acre site reportedly was used to dispose of captured World War II munitions, including chemical munitions. According to Post personnel, a shallow man-made pond (Lima Pond) was used as a dump site for the munitions. The pond is within a bermed area that is approximately 15 feet higher topographically than the surrounding wooded terrain. The pond is estimated to be approximately 30 feet deep, although the actual depth of potential burials below the pit bed is unknown. The USATEU collected three water samples from Lima Pond in 1982 and analyzed the samples for HD, GB, and VX. All analytical results were below detection limits for HD (i.e., 2 mg/L), GB (i.e., 0.5 mg/L), and VX (i.e., 1.14 mg/L). Surface soil sampling at Range L did not detect contaminants above detection limits. The depth of water in the pond was low (<2 feet) during the October 1991 site visit. Although empty ammunition crates were observed along the pond walls, no quantitative determination has been made on the presence or nature of buried munitions at this site.

1.4.2.14 Site 13 - Former Landfill #1

Site 13 - Former Landfill #1 reportedly operated as the Post sanitary landfill between 1945 and 1947. The assumed site covers approximately 2 densely wooded acres and is located between 16th Avenue and Avery Drive adjacent to the floodplain of an unnamed intermittent stream draining into Remount Creek (Figure 1-13). The site slopes to the southeast toward 16th Avenue. No information exists concerning the operation or content of the landfill.

Known or suspected releases have not been documented and evidence of releases (leachate seeps) was not observed during the site PA (USATHAMA 1990) or the October 1991 site visit. Aerial photographs of the site dated 1944 suggest that portions of the area may have been cleared, although the purpose for the clearing is unknown. A site walkover in October 1991 showed no evidence of previous landfilling at this location.



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**FORMER LANDFILL 1 - MAIN POST
 FORT McCLELLAN, ALABAMA**

SITE LOCATION MAP

Figure 1-13

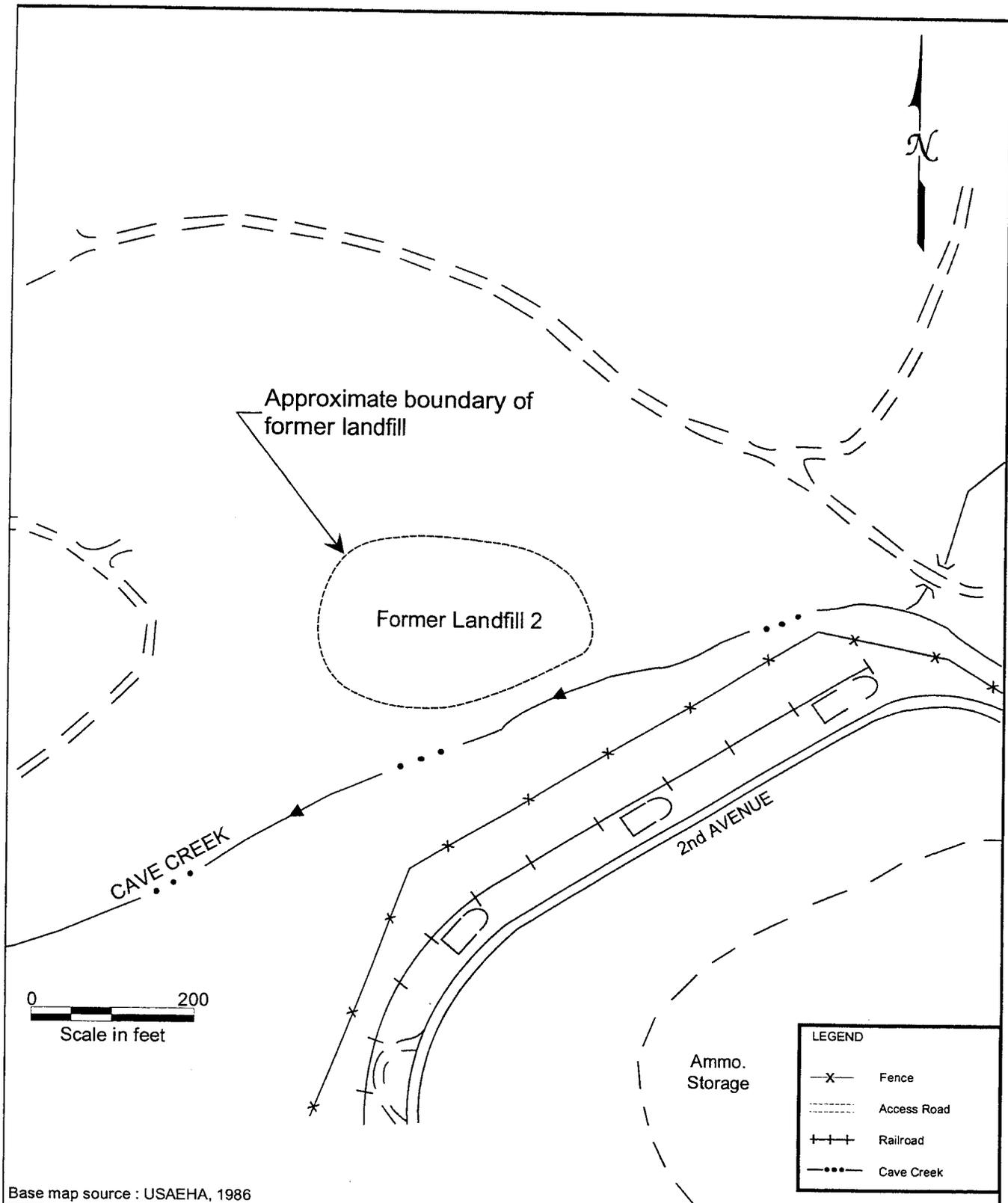
1.4.2.15 Site 14 - Former Landfill #2

Site 14 - Former Landfill #2 reportedly was used as the Post sanitary landfill after the closure of Former Landfill #1 and was active from 1947 to an unknown date. The landfill covers approximately 4 acres and is located west of the southern tip of Cemetery Hill, between 2nd Avenue and 10th Street. This site is heavily wooded and is located in the floodplain of Cave Creek, which is an intermittent stream flowing south-southeast of the landfill (Figure 1-14). Shallow weathered bedrock was observed in the creek bed. The landfill reportedly was used to dispose of waste during deactivation of the installation. Rusted drums, metal, small containers (5-gallon cans and bottles), assorted building materials, and machinery parts were observed at the site in October 1991. Known or suspected releases have not been documented and evidence of releases (leachate seeps) was not observed during SAIC's October 1991 site visit.

1.4.2.16 Site 15 - Former Landfill #3

Site 15 - Former Landfill #3 was the Post sanitary landfill in operation between 1946 and 1967. The landfill was operated using the trench and fill method, with trenches trending northwest to southeast. Traces of the trenches due to settling over the old landfill cells has been noted in the past, and were observed during the SI field work. The linear depressions probably result in the ponding of water and accelerate leachate generation. The landfill covers approximately 22 wooded acres and is located east of State Route 21 and north of Cane Creek. This location is northwest of and adjacent to active Sanitary Landfill #4 (Figure 1-15). Access to the landfill area is obtained along unpaved perimeter roads.

USAEHA (1986) installed five monitoring wells (OLF-1 to OLF-5) within or adjacent to Former Landfill #3 in 1986. Water levels measured at that time indicate northwestwardly groundwater flow exiting Fort McClellan toward State Route 21. Groundwater sampling of these wells was initiated in 1986 by USAEHA. Groundwater samples were collected and analyzed for pesticides and polychlorinated biphenyls (PCBs), semivolatile organic compounds (SVOCs), volatile organic compounds (VOCs), metals, and standard inorganic and water quality parameters (chloride, sulfate, nitrate/nitrite, total dissolved solids [TDS], specific conductivity [umhos/cm], chemical oxygen demand [COD], phenols, and pH). The initial (1986)



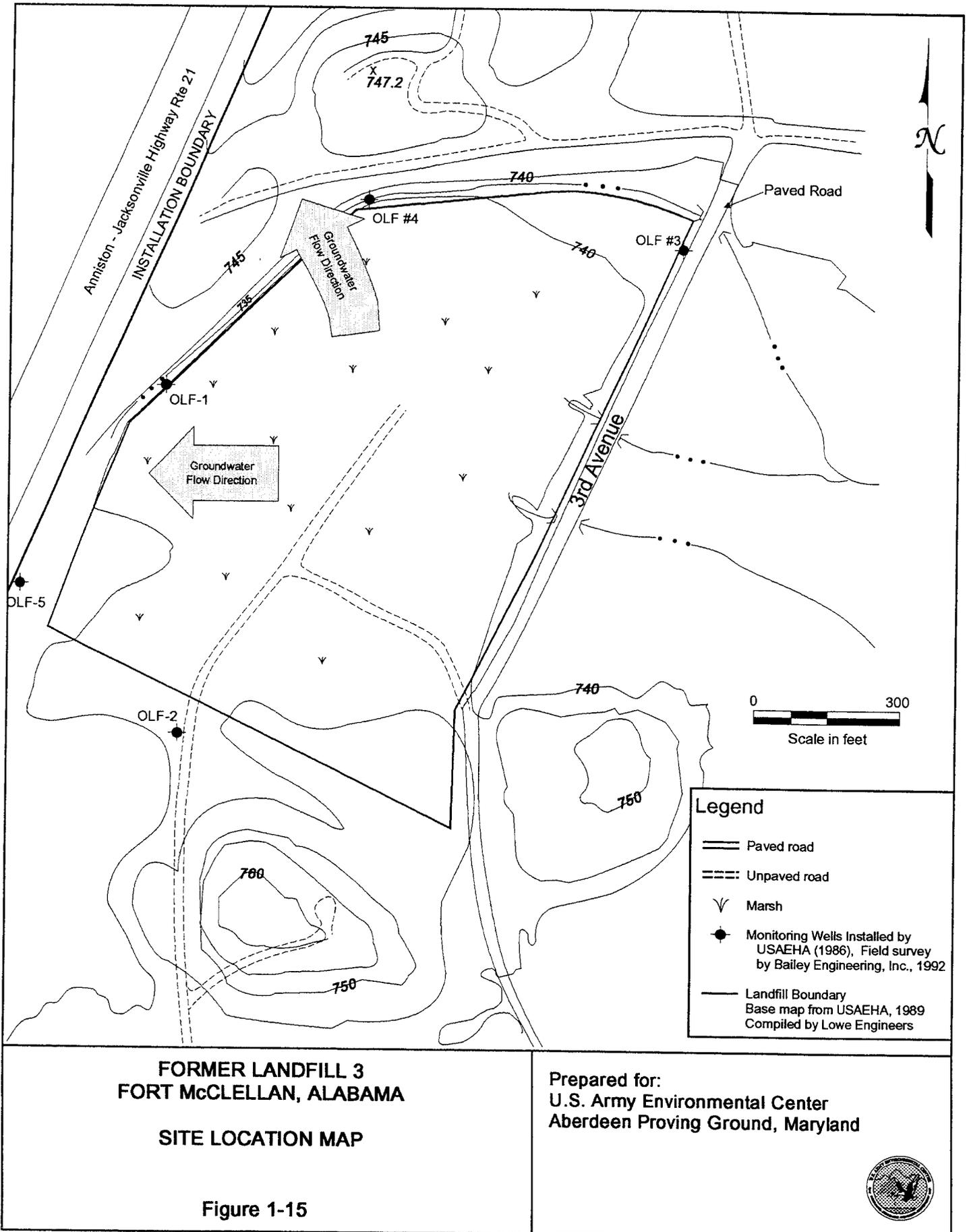
Base map source : USAEHA, 1986

**FORMER LANDFILL 2 - MAIN POST
FORT McCLELLAN, ALABAMA**

Figure 1-14

Prepared for:
U.S. Army Environmental Center
Aberdeen Proving Ground, Maryland





groundwater sampling results indicated limited groundwater contamination. These results show that iron, manganese, and low pH were in excess of National Secondary Drinking Water Regulation criteria. In addition, the following six organic compounds were detected: tetrachloroethene (12 to 110 $\mu\text{g/L}$), methylene chloride (9 $\mu\text{g/L}$), 1,1-dichloroethane (18 $\mu\text{g/L}$), trans-1,2-dichloroethene (24 $\mu\text{g/L}$), benzene (4 $\mu\text{g/L}$), and bis(2-ethylhexyl)-phthalate (10 to 40 $\mu\text{g/L}$) (USATHAMA 1990).

1.4.2.17 Site 17 - Old Water Hole

Site 17 - Old Water Hole is a site located between New Mt. Sellers Cemetery and the prisoner of war (POW) camp on Pelham Range that reportedly was used for the disposal of a variety of munitions, including chemical agents (Figure 1-3). The site is reportedly a sinkhole, which would not have any release controls. A rectangular, shallow, topographic depression approximately 35 by 85 feet was located by Fort McClellan Department of Environmental Health personnel in the approximate area between the cemetery and the POW camp. An additional circular depression was located near the main depression in this area. Fort McClellan personnel indicate that the depression periodically fills with water, although it was dry during SAIC's October 1991 site visit. The depression was under water during SAIC's April 1992 site visit. Several small-caliber bullet shells were found at the site.

1.5 ENVIRONMENTAL/REGIONAL SETTING

The environmental setting at Fort McClellan is summarized in this section as a reference framework for the site-specific investigations at the facility. The information was obtained from the installation assessment of Fort McClellan (USATHAMA 1977) and updated where appropriate.

1.5.1 Demographics and Land Use

Fort McClellan is composed of three parcels of land totaling 45,679 acres and is situated within the Appalachian Valley and Ridge and Piedmont Provinces. The installation is located in northeastern Alabama and lies in the center of Calhoun County near the city of Anniston. The city of Anniston (population 26,623; 1990 census) is located between the Main Post and

Pelham Range, while the town of Weaver (population 2,715; 1990 census) is located to the north. The Anniston Army Depot bounds Pelham Range to the south, and the Choccolocco Corridor connects the Post to the Talladega National Forest to the east. The Choccolocco Corridor is leased from the State of Alabama and designated for bivouac maneuvers by foot troops, wheeled vehicles, and tracked vehicles.

The Anniston area, of which Fort McClellan is a part, is one of two major population concentrations (25,000 or more) in the region. Fort McClellan contributes to the population of Anniston and surrounding areas. Besides the military personnel living off Post, retired military personnel and their dependents live in the area surrounding Fort McClellan. Fort McClellan provides family housing units, Bachelor Officer Quarters (BOQ) units, and Bachelor Enlisted Quarters (BEQ) to military personnel and their dependents.

1.5.2 Sensitive Environments

Information on the sensitive species and habitats of Fort McClellan, Pelham Range, and the Choccolocco Corridor is provided below.

1.5.2.1 Wetlands

Wetlands are protected by the Federal Government primarily through Section 404 of the Clean Water Act. This act empowered the U.S. Army Corps of Engineers (CE) and EPA to regulate most forms of wetlands destruction. Fort McClellan, Pelham Range, and the Choccolocco Corridor have an abundance of wetlands representing important habitats for a wide variety of plants and animals as well as providing a wealth of other values for the public, including:

- Flood control
- Water quality maintenance
- Erosion buffers
- Groundwater recharge and stream flow maintenance
- Timber production.

The landscape is dominated by dry ridges composed of sandstone and chert and by valleys and stream terraces that are made up of alluvium over limestone and shale. Fort McClellan's wetlands are found in the valley along creek floodplains, near stream terraces, and in depressions.

Thirteen types of wetlands plant communities have been described on the Post. These communities and their National Wetlands Inventory (NWI) designations are as follows:

- Mixed bottomland hardwoods: first bottoms (Palustrine, forested [deciduous], seasonally flooded wetlands)
- Mixed bottomland hardwoods: second bottoms (Palustrine, forested [deciduous or deciduous-evergreen], temporarily flooded wetlands)
- Stream terrace hardwoods (Palustrine, forested [deciduous or deciduous-evergreen], temporarily flooded wetlands)
- Creekbank hardwoods (Palustrine, forested [deciduous], seasonally flooded wetlands)
- Water oak flat (Palustrine, forested [deciduous], temporarily flooded wetlands)
- Sweetgum/bulrush community (Palustrine, forested [deciduous], seasonally flooded wetlands)
- Sweetgum depression (Palustrine, forested [deciduous], temporarily flooded wetlands)
- Mixed shrub community (Palustrine, scrub/shrub [deciduous], temporarily and seasonally flooded wetlands)
- Mixed shrub/bulrush/needlerush community (Palustrine, scrub/shrub/emergent [persistent], seasonally flooded, impounded, or seasonally flooded wetlands)
- Buttonbush/bulrush community (Palustrine, shrub/scrub [deciduous], semipermanently flooded wetlands)
- Bulrush/needlerush/cattail community (Palustrine, emergent [persistent], temporarily and seasonally flooded wetlands)
- Nonforested creekback community (Palustrine, emergent [persistent and nonpersistent], seasonally flooded wetlands)
- Mud flat community (Palustrine, emergent [nonpersistent], seasonally flooded and semipermanently flooded wetlands).

1.5.2.2 Flora and Fauna

Fort McClellan and its ancillary grounds are composed of a variety of aquatic, riparian, and terrestrial habitats that provide for numerous species of game and nongame animals. An estimate of populations and habitats based on surveys performed in 1986 is as follows:

- Approximately 38,361 acres (government-owned or leased from the State of Alabama) are suitable for wildlife habitat; this includes 16,915 acres in Pelham Range, 18,946 acres in the Main Post, and 2,500 acres in the Choccolocco Corridor.
- Range conditions are generally good, with the exception of numerous areas where dense growth prohibits the production of certain wildlife foods.
- The popular game species at Fort McClellan are white-tailed deer, northern bobwhite, turkey, mourning dove, eastern cottontail, gray squirrel, raccoon, wood duck, and opossum.

The military mission at Fort McClellan supersedes fish and wildlife management and associated recreational activities, and such activities must in all instances be compatible with the military mission and the provisions of the Endangered Species Act or other applicable statutes. A study conducted from April through October 1979 concluded that the only federally recognized endangered species known to occur on Fort McClellan is the red-cockaded woodpecker (*Picoides borealis*). A recent survey conducted in June 1992 indicated that the Red Cockaded Woodpecker colonies were no longer active at Fort McClellan (Red Cockaded Woodpecker survey, June 1992). A flora and fauna survey is currently being conducted under the Alabama Heritage Program. Tennessee Yellow Eyed grass, which is a listed endangered species is known to occur on Pelham Range.

1.5.3 Meteorology

Fort McClellan is situated in a temperate, humid climate. The average annual temperature is 63° Fahrenheit (F) with summer temperatures usually reaching 90°F or higher about 70 days per year, but temperatures above 100°F are rare. Freezing temperatures are common, but are usually of short duration. The first frost may arrive by late October. At Anniston, the average date of the first 32°F temperature is 6 November and the last is 30 March. Snowfall averages 0.5 to 1 inch per year.

1.5.4 Physiography and Surface Drainage

Pelham Range and all but the easternmost portion of Fort McClellan lie within the Valley and Ridge Province of the Appalachian Highlands. The portion of Fort McClellan west of Choccolocco Creek lies within the Piedmont Province. Local relief on Fort McClellan is in excess of 1,320 feet. The lower elevations (700 feet above mean sea level [MSL]) occur along Cane Creek, near Baltzell Gate Road, while the maximum elevations (2,063 feet above MSL) occur on Choccolocco Mountain, which traverses the area in a north/south direction, with the steep easterly slopes grading abruptly into Choccolocco Valley. The western slopes are more continuous, with the southern extension maintaining elevations up to 900 feet above MSL near the western reservation boundary. The northern extension decreases in elevation in the vicinity of Reilly Heliport. The central portion of Fort McClellan is characterized by flat to gently sloping land.

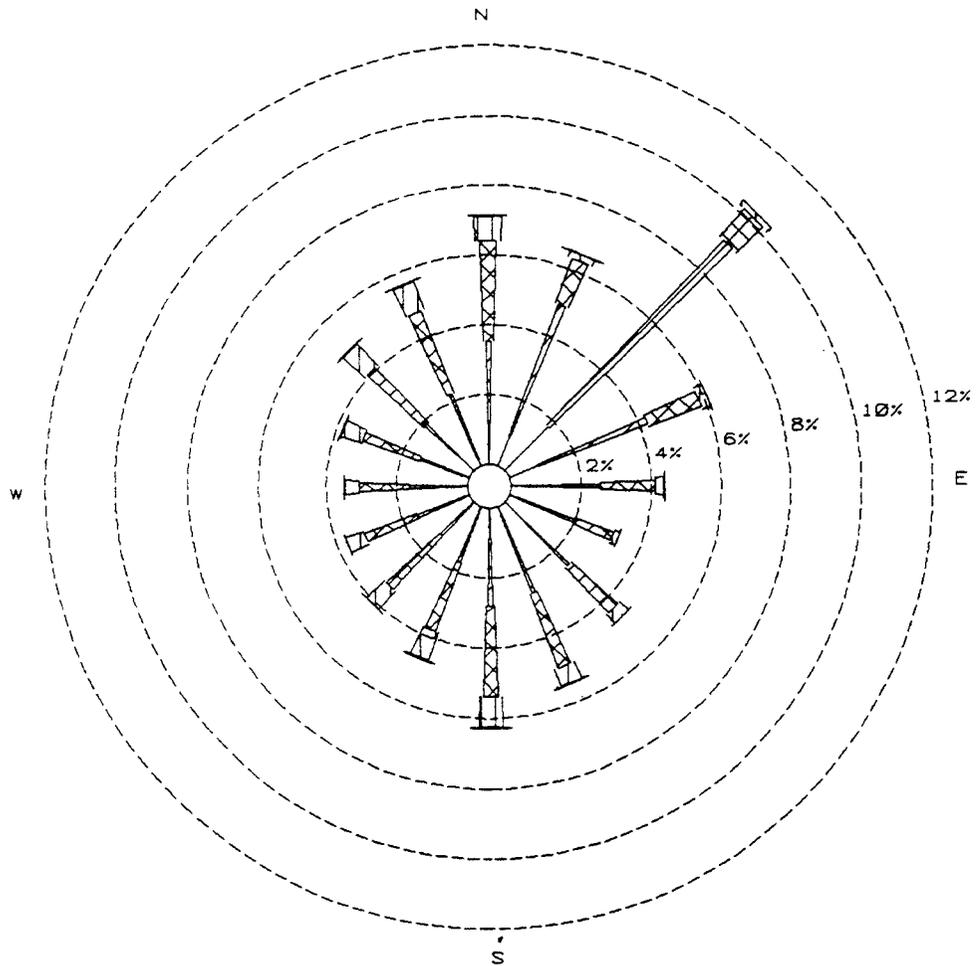
The topographic relief at Pelham Range is on the order of 445 feet. The minimum elevation is 500 feet above MSL, which occurs at the exit of Cane Creek from the range, and the maximum is 945 feet above MSL, near the southeastern boundary. The northern sector contains broad rolling topography capped with isolated round knobs rising 75 to 90 feet above the surrounding terrain. A large, relatively flat area called Battle Drill Area is situated near the western boundary.

The Choccolocco Mountains, located in the eastern portion of the Post, form a major surface water divide. East of this divide, the reservation consists of a relatively narrow strip called Choccolocco Corridor, which extends approximately 3.5 to 4 miles from the mountains across the floodplain of Choccolocco Creek, to the base of Rattlesnake Mountain. Choccolocco Creek and its tributaries drain this portion of Fort McClellan and flow southward to the Coosa River.

The entire central portion of Fort McClellan west of the drainage divide is drained by three major creeks and their tributaries. South Branch receives runoff from the south-central portion, then joins Cane Creek before leaving the reservation on the western boundary. Cane Creek receives surface runoff from the central section. The north-central section of the Post is

Birmingham 1985-1989

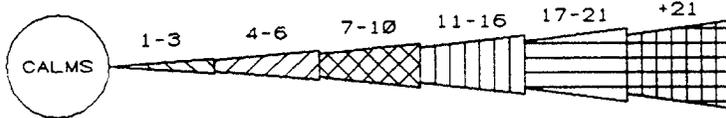
January 1-December 31; Midnight-11 PM



WIND SPEED (KNOTS)

CALM WINDS 15.27%

NOTE: Frequencies indicate direction from which the wind is blowing.



WIND ROSE OF 1985 - 1989 WIND CONDITIONS FOR BIRMINGHAM, ALABAMA

Prepared for:
U.S. Army Environmental Center
Aberdeen Proving Ground, Maryland



Figure 1-16

The average annual rainfall is approximately 53 inches and is fairly well-distributed throughout the year, as indicated in Table 1-4. The more intense rains usually occur during the warmer months and some flooding occurs nearly every year. Approximately 80 percent of the flood-producing storms are of the frontal type and occur in the winter and spring, lasting from 2 to 4 days each. Summer storms are usually thunderstorms with intense precipitation over small areas, and these sometimes result in serious local floods. Occasionally, several wet years or dry years occur in series.

Table 1-4. Average Precipitation by Month at Anniston Airport, Anniston, Alabama

Month	29-year Average 1951 - 1980 Inches ^a	1990 Inches ^b
January	5.36	7.56
February	4.82	8.99
March	6.82	8.65
April	5.35	1.90
May	3.99	2.94
June	3.89	2.63
July	4.23	3.37
August	3.80	.58
September	4.15	.58
October	2.50	2.65
November	3.35	3.03
December	4.99	2.47

^aData obtained from *Climatology of United States No. 20, Anniston FAA AP, Alabama.*

^bData obtained from *Climatological Data Annual Summary, Alabama, 1990, Vol. 96, No. 13, NOAA.*

A brief study of wind velocity, duration, and direction reveals that winds in the Fort McClellan area are seldom strong and frequently blow down the valley from the northeast. However, there is no truly persistent wind direction. Most of the time, only light breezes or calm prevail, except during passages of cyclonic disturbances, when destructive local wind storms can develop into tornadoes, with winds of 100 miles per hour (mph) or more. Figure 1-16 is a wind rose of 1985-1989 wind conditions for the Birmingham, Alabama area. Northeast winds occur most frequently, with north winds being the second most common.

drained by Cave Creek, which leaves the Post on the northwestern boundary. Other surface water features within Fort McClellan include Lake Yahou (13.5 acres), Reilly Lake (8.5 acres), Cappington Ridge (0.3 acres), Duck Pond (0.5 acres), and an aqueduct. Surface drainage is collected in small, independent networks that drain areas varying from 20 to 60 acres.

The 100-year floodplain for stream drainage on Fort McClellan includes sanitary Landfills 2, 3, and 4; the Alabama Military Academy facilities; and a portion of the golf course area. Other facilities within the 100-year floodplain include the training aids and temporary Military Police (MP) academic facilities; transportation motor pool yard; industrial storage areas along Baltzell Gate Road; Directorate of Industrial Operations and Supply warehouses; Post Engineer facilities; facilities along Seventh Avenue, 21st Street, and 22nd Street; as well as the main training ranges within the Ingram Creek system.

1.5.5 Surface Water

The Cane/Cave Creek watershed is among the six major watersheds occurring within Calhoun County. Cane Creek, with its tributaries (Remount, South Branch, and Ingram Creeks), originates on the Fort McClellan Reservation. Cave Creek, which occurs as a separate body while on installation lands, also originates on Post. The on-Post drainage area of this system covers approximately 20 square miles. Dothard Creek has headwaters originating both on and off the installation. These creek systems originate in the Choccolocco Mountains on the eastern boundary of the installation and flow west through the main cantonment. They are fed by springs originating from underlying limestone strata. Cane Creek also passes through the entire length of Pelham Range, but its size and volume are greatly increased by the time it reaches this land area. One other major watershed, the Choccolocco Creek, occurs to the east of the Choccolocco Mountains, passing in a northerly to southerly direction through the Choccolocco Corridor.

Cane Creek, which flows westwardly across the center of Pelham Range, and its tributaries drain almost all of Pelham Range. Drainage entering the range from the south originates in the Anniston Army Depot, which joins Pelham Range to the south. One drainageway located in the southwestern corner flows in a northerly direction and empties into

a large topographic low (Battle Drill Area). Cane Creek traverses this low some 800 yards to the north, and all water collected in the low eventually drains into Cane Creek. Other surface water features include Lake Contreras (27 acres), Cane Creek Lake (7.5 acres), Willet Springs (0.8 acres), and Blue Hole (0.2 acres). All drainage from Fort McClellan and Pelham Range ultimately empties into the Coosa River. Floodplains up to 2,500 feet wide traverse this sector and slope toward the center of the range. The wide floodplains are absent in the southern portion of the range.

The streams of Fort McClellan are of good chemical quality and are in good biological condition. The State has classified these systems as suitable for fish and wildlife use. Averaged profiles at 16 stations (from a one-time study discussed below) over the Main Post and Pelham Range indicate that at an average temperature of 17.8°C, the dissolved oxygen is 9.3 and the pH is 7.5. These and other parameters are regularly measured by stationary probes at the exit of Cane Creek on Main Post, and just past the UTES at Pelham Range.

1.5.5.1 Ponds, Lakes, and Springs

The named water bodies on the Main Post include Lake Yahou (13.5 acres), Reilly Lake (8.5 acres), Cappington Ridge (0.3 acres), and Duck Pond (0.5 acres), or approximately 23 acres of named water bodies. Pelham Range includes Lake Contreras (27 acres), Cane Creek Lake (7.5 acres), Willet Springs (.8 acres), and Blue Hole (.2 acres), or approximately 36 acres of named water bodies. Fresh water springs occur abundantly on installation lands, often appearing along the trace of thrust faults. This is especially true of Pelham Range. All described water bodies are at least in part spring fed with the exception of Lakes Yahou and Contreras.

1.5.5.2 Fresh-water Marshes

Expansion of the installation over the years has altered the drainage patterns of the flats on the Main Post. Although many fresh-water marshes are located along Cane Creek, most are limited to the cumulatively larger downstream watershed of Pelham Range. Only one major area, the 25-acre marsh near Reilly Lake, occurs on the Main Post. The drainage area of Cane Creek on Pelham Range has an abundance of riparian flora and fauna. Areas include the 75-acre marsh beginning to the right of Gate 3 entrance; a 75-acre area to the right of Cane Creek on

the Battle Drill Area; a seasonal area surrounding Blue Hole Pond; an area south of the impact area road; and a large block from Gate 13 to the Battle Drill Area where flats occur.

A comprehensive water quality biological study of installation receiving waters was conducted by the USAEHA (1976) to determine the impact of industrial and domestic wastes generated by activities at Fort McClellan. The condition of receiving waters was assessed through analyses of benthic diatom and macroinvertebrate communities and fish and bacterial populations, as well as chemical analyses for metals and other compounds. Average diatom diversity at Fort McClellan is 4.0, and average macroinvertebrate diversity is 3.1. Diversity in clean streams commonly ranges between 3 and 4, while polluted streams are usually less than 1 unit.

1.6 REGIONAL GEOLOGY AND HYDROGEOLOGY

The regional geologic and hydrogeologic conditions in the Fort McClellan area are summarized below.

1.6.1 Regional Geology

Fort McClellan and Pelham Range lie within the Appalachian fold and thrust belt where southeastward-dipping thrust faults with associated minor folding are the predominant structural features. Geologic contacts in this region generally strike parallel to the faults and repetition of the lithologic units is common in vertical sequences. A stratigraphic column for the Fort McClellan area is shown in Table 1-5. Geologic formations within Fort McClellan and Pelham Range vary in age from Precambrian to Mississippian (Figures 1-17 and 1-18). On the eastern boundary of Fort McClellan, Talladega Slate crops out in a narrow band between the county line and the easternmost exposure of the Paleozoic rocks.

The Cambrian Weisner Formation consists of interlayered shale, siltstone, sandstone, quartzite, and conglomerate and is the basal formation of the sedimentary rock sequence. The Weisner Formation, locally sandstone and quartzite with thin-bedded shale, underlies a large portion of the Main Post at Fort McClellan and occurs beneath SI Sites T-4, T-5, T-6, Detection and Identification Area, T-24A, Former Landfill #1, and the Old Toxic Training Area. The

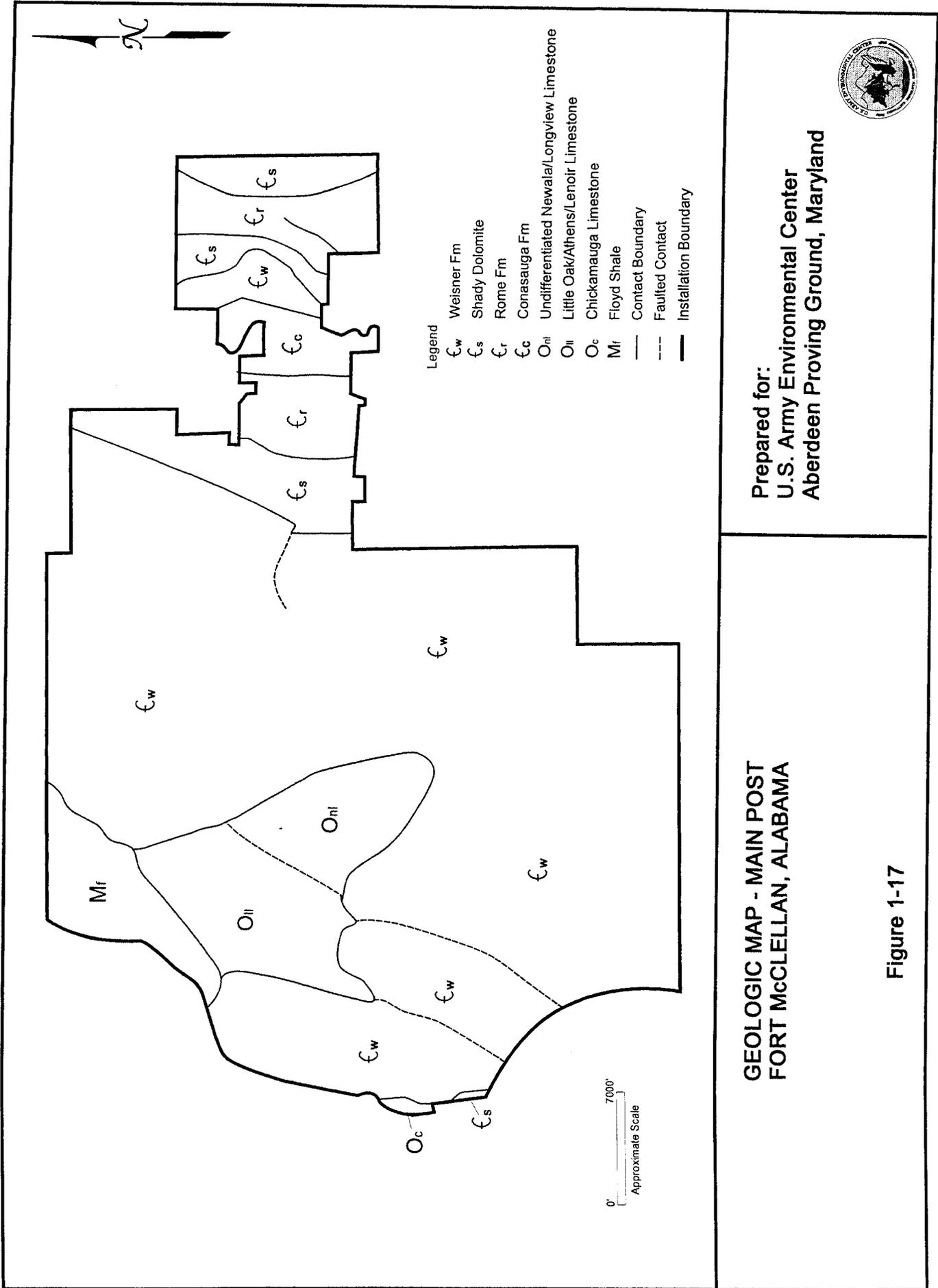
Table 1-5. Generalized Section of the Geologic Formations in Calhoun County, Alabama

System	Stratigraphic Unit	Thickness (feet)	Rock Character
Quaternary	Alluvium, colluvium, and undifferentiated deposits	—	Alluvium, sandy to clayey; slope wash, gravel and sand.
Tertiary	Deposits of Paleocene or early Eocene age	10 - 100	Clay, sand, and gravel.
Pennsylvanian	Pottsville Formation	300?	Sandstone, gray and brown with interbedded gray and brown shale.
Mississippian	Parkwood Formation	350	Sandstone, gray, feldspathic, silica - cemented, fossiliferous; and gray clayey shale.
	Floyd Shale	2,000	Shale, black to greenish-black, fissile; interbedded with minor thick to thin, greenish-gray sandstone and clayey limestone beds.
	Fort Payne Chert	100 - 350	Chert, finely broken; includes some dark flint in basal part; highly fossiliferous.
	Maury Formation	2 - 3	Claystone, green, locally red, and phosphate nodules; locally interbedded with red shale.
Devonian	Frog Mountain Sandstone	50	Sandstone, brown, coarse-grained, siliceous cement; locally includes dark, hard siliceous shale or gray very coarse grained thick-bedded friable sandstone.
Silurian	Red Mountain Formation	50	Sandstone, light-gray to white, thick-bedded to massive, 30 feet thick; overlain by 20 feet of light-brown, thin-bedded sandstone interbedded with light-brown shale.
Ordovician	Sequatchie Formation	100	Siltstone and shale, calcareous, maroon and greenish-gray mottled, locally fossiliferous.
	Chickamauga Limestone	275 - 325	Sandstone, white to light-gray, thick- to thin-bedded orthoquartzitic; well-sorted medium to coarse, rounded to well-rounded grains; locally conglomeratic; bentonitic beds in upper part of formation; maroon and orange-brown variegated shale and siltstone, with irregular lenses of thinly laminated, gray to gray-green and maroon sandstone; limestone and calcareous mudstone in lower part; locally fossiliferous.
	Little Oak Limestone	15	Limestone, gray crystalline, medium- to thick-bedded, fossiliferous; black, fissile shale interbedded with dark shaley limestone.
	Athens Shale	200	Limestone, gray, crystalline, medium- to thick-bedded, fossiliferous; black, fissile shale interbedded with dark shaley limestone.

Table 1-5. Generalized Section of the Geologic Formations in Calhoun County, Alabama (continued)

System	Stratigraphic Unit	Thickness (feet)	Rock Character
Ordovian (continued)	Lenoir Limestone	15	Limestone, gray, crystalline, medium- to thick-bedded, fossiliferous; black fissile shale interbedded with dark shaley limestone.
Ordovian (continued)	Newala Limestone and Longview Limestone undifferentiated	400 - 600	Limestone, pearl-gray, dark-gray, and bluish-gray, dense, medium- to thick-bedded; thin beds of coarse-grained dolomite; fine-grained chert common in the Longview.
Ordovician and Cambrian	Chepultepec Dolomite, Copper Ridge Dolomite, and Ketona Dolomite, undifferentiated	2,000	Dolomite, siliceous; abundant chert except in the Ketona.
Cambrian	Conasauga Formation	500	Limestone, dolomitic limestone, and crystalline gray dolomite; thin beds of gray shale that weathers green. Shale is dominant facies to the north and northwest.
	Rome Formation	1,000	Shale and siltstone, red; green shale and red and light-gray sandstone; locally includes lenticular beds of light-gray limestone or dolomite.
	Shady Dolomite	1,000	Limestone and dolomite, yellowish- to light- to dark-gray, crystalline, medium- to thick-bedded; variegated clayey shales in lower part.
	Weisner Formation	2,500	Shale, siltstone, sandstone, quartzite, and conglomerate; forms mountains. Local deposits of bauxite, hematite, and limonite.

Source: Neathery, et al., 1972.

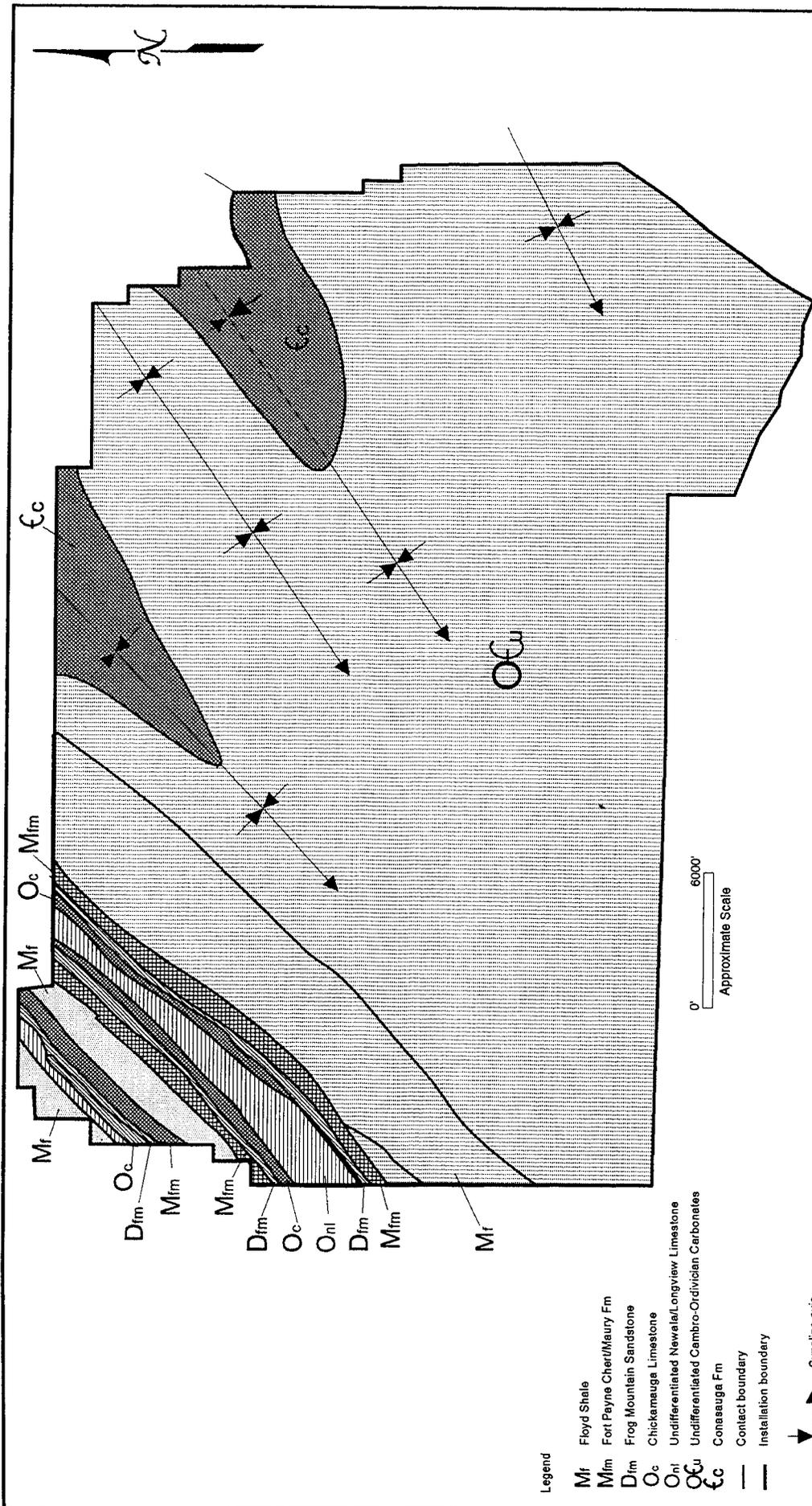


Prepared for:
 U.S. Army Environmental Center
 Aberdeen Proving Ground, Maryland



**GEOLOGIC MAP - MAIN POST
 FORT McCLELLAN, ALABAMA**

Figure 1-17



Legend

- Mr Floyd Shale
- Mfm Fort Payne Chert/Maury Fm
- Dfm Frog Mountain Sandstone
- Oc Chickamauga Limestone
- Onl Undifferentiated Newala/Longview Limestone
- OcU Undifferentiated Cambro-Ordovician Carbonates
- Cc Conasauga Fm
- Contact boundary
- - - Installation boundary



Syncline axis

0' 6000'
Approximate Scale

**GEOLOGIC MAP - PELHAM RANGE
FORT McCLELLAN, ALABAMA**

Prepared for:
U.S. Army Environmental Center
Aberdeen Proving Ground, Maryland



Figure 1-18

Cambrian Shady Dolomite overlies the Weisner Formation east and south of the Main Post and consists of interlayered limestone and dolomite. The Cambrian Rome Formation is composed of red and green shale and siltstone with thinly interbedded light gray sandstone and calcareous layers. The unit locally occurs to the northwest and southeast of the Main Post and underlies Former Landfill #3. The Conasauga Formation comprises the uppermost Cambrian unit and occurs northwest and southeast of the Main Post. The Conasauga Formation is composed of interbedded limestone and dolomite with interbedded shale.

Overlying the Conasauga Formation is the Knox Group, composed of the Copper Ridge and Chepultepec dolomites of Cambro-Ordovician age. The Knox Group carbonates underlie a large portion of the Pelham Range area, including Range I and the Old Water Hole. The Knox Group is overlain by Ordovician limestone and shale formations, including the Newala and Longview Limestones, Lenoir Limestone, Athens Shale, Little Oak Limestone, and Chickamauga Limestone. Ordovician limestone underlies much of the developed area of the Main Post, including Sites T-31, T-38, Former Landfill #2, and several of the unidentified HD spill site areas. The limestone units also underlie sites on Pelham Range, including Ranges I, K, and L, and occur in a narrow, northeast-southwest trending, thrust-fault bounded area underlain by Ordovician carbonates in the western portion of Pelham Range. The Silurian Red Mountain Sandstone unit does not occur in the Fort McClellan area. The Frog Mountain Sandstone, of Devonian Age, is composed of sandstone and quartzitic sandstone and locally occurs in the western portion of Pelham Range.

The Mississippian Fort Payne Chert and the Maury Formation overlie the Frog Mountain Sandstone and are composed of claystone with increasing amounts of calcareous chert toward the upper portion of the formation. These units occur in the northwestern portion of Pelham Range. Overlying the Fort Payne Chert is the Floyd Shale, also of Mississippian Age, which consists of thin-bedded, fissile brown to black shale with thin intercalated limestone layers and interbedded sandstone.

1.6.2 Regional Hydrogeology

Precipitation in the form of rain is the source of most groundwater in Calhoun County, and the thrust fault zones typical of the county form large storage reservoirs for groundwater. Primary controls on groundwater flow are topography and bedrock permeability. Precipitation and subsequent infiltration provide recharge to the groundwater flow system. Points of discharge occur as springs, effluent streams, and lakes. Groundwater on Fort McClellan occurs principally in the quartzites of the Weisner Formation in the Choccolocco Mountains and locally in lower Ordovician carbonates. Bedrock permeability may be locally enhanced by fracture zones associated with thrust faults. Pelham Range groundwater flow has not been mapped due to insufficient control data. It is probable that shallow groundwater flow follows topography, with groundwater movement toward Cane Creek. The general movement of groundwater is southward along the east of the Choccolocco Mountains and then west at the southern end of the mountains. Groundwater in the Weisner Formation predominating the Main Post is typically of good quality. Abundance is dependent upon existence of fractures, and springs typically occur along fault lines. The Jacksonville Fault enters the Post in the vicinity of the Anniston Beach Club, and is generally bounded by the western foothills of the Choccolocco Mountains. Several inferred faults also are indicated across the southwestern part of the installation proper, and one fault occurs through the northeastern ridge of the Choccolocco Mountains. Extensive faulting also occurs in the leased corridor east of the Choccolocco Mountains.

The dolomites of Pelham Range typically provide adequate groundwater and yield springs at fractures or solution channels. The Pelham Faults enter the Range near Gate 6 (north) and along Brook Mountain and exit on the southwestern boundary. A wedge of Consuaga underlies 2.5 miles of Cane Creek at its eastern entrance to Pelham Range, and several large springs occur in this general vicinity, both on and off Government property.

1.6.3 Soils

The soil associations found at Fort McClellan and Pelham Range (SCS 1961) include:

- *Anniston-Allen-Decatur-Cumberland*: alluvium resulting from weathering of older saprolitic soils developed from sandstone, shale, and quartzite; deep, well-drained,

level to moderately steep soils in valleys underlain by limestone and shale; subsoil is dark red sandy clay loam; Cumberland and Decatur soils are dark reddish-brown gravelly loam developed from limestone saprolite source.

- *Clarksville-Fullerton*: well-drained to moderately well-drained stony or cherty soils developed in the residuum of cherty limestone. This association is limited to the Pelham Range. The soils are generally dark brown to dark gray brown silt loam.
- *Rarden-Montevallo-Lehew*: moderately deep or shallow soils on ridgetops and steep slopes and in local alluvium in draws; soils developed from the residuum of shale and fine-grained, micaceous sandstone; reddish-brown to dark gray brown to yellow-brown silt loam, clay, or silty clay.
- *Stony Rough Land*: shallow, steep, and stony soils formed from the weathering of sandstone, limestone, and Talladega Slate; infiltration slow; contains many boulders and fragments with clayey residuum. This association underlies a large portion of the Main Post at Fort McClellan.

In general, the soils are acidic to very strongly acidic with pH between 4.5 and 5.5 units. Table 1-6 summarizes the physical properties and ranges of permeabilities measured for the major soil types of each soil association listed above (SCS 1961). These tests are based on soils sampled throughout Calhoun County.

Table 1-6. Summary of Physical Properties for Soil Associations

Association	LL	PL	USCS	Average Depth to Water (feet)	Average Depth to Bedrock (feet)	Permeability (cm/sec)
Anniston-Allen-Decatur-Cumberland	ND	ND	ML, CL, MH, CH	20+	2 - 20+	5.61E-4 to 1.4E-3
Clarksville-Fullerton	20 - 41	1 - 3	SM, GM, GC	20+	20+	1.4E-3 to 7.0E-3
Rarden-Montevallo-Lehew	12 - 86	3 - 43	ML, CL, MH, CH	20+	1 - 4	1.4E-4 to 7.0E-3
Stony Rough Land	ND	ND	ML, CL, SC, CH, GM, GC	20+	0 - 3	1.4E-3 to 7.0E-3

Data obtained from soil survey of Calhoun County, Alabama, Soil Conservation Service, 1961.

- CH - Inorganic clays of high plasticity, fat clays.
- CL - Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
- GC - Clayey gravels, gravel-sand-clay mixtures.
- GM - Silty gravels, gravel sand silt mixtures.
- LL - Liquid Limit; PL - Plastic Limit
- ND - Not determined.
- MH - Inorganic silts, micaceous or ditomaceous find sandy or silty soils, elastic silts.
- ML - Inorganic silts and very fine sands, rock floor, silty or clayey fine sands, or clayey silts, with slight plasticity.
- SC - Clayey sand, sand clay mixtures.
- SM - Silty sands, sand silt mixtures.
- USCS - Unified Soil Classification System.