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REASSESSMENT OF FORT McCLELLAN, ANNISTON, ALA.
REPORT NO. 110A

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Prepared for:

COMMANDER, Fort McClellan
Anniston, Ala. 36201
and
U.S. ARMY TOXIC AND HAZARDOUS MATERIALS AGENCY
Assessment Division
Aberdeen Proving Ground, Md. 21010

REASSESSMENT

OF

FORT MCCLELLAN

REPORT No. 110R

CONCUR WITH RECOMMENDATIONS: ______________________

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FORT MCCLELLAN

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SUMMARY

In 1977, a records search was conducted by the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) at Fort McClellan (FTMC), Ala., to determine the degree of contamination at the installation by chemical, biological, and radiological material (CBR), and to assess the possibility of contaminant migration beyond the installation's boundaries. The original 1977 assessment concluded that FTMC was contaminated with chemical and radiological materials, although contamination migration beyond installation boundaries was not indicated.

The objective of this reassessment was to reevaluate the findings and conclusions of the original assessment conducted by USATHAMA. The reevaluation encompassed the review of the original 1977 report, the supporting documentation, and new data produced since that report. The reevaluation was restricted to a determination of contamination by chemical agents and related compounds. The reevaluation did not include an onsite visit.

The geohydrology of the FTMC area is very complex due to the presence of many faults, springs, high relief, and numerous rock types. Pathways for contaminant migration via ground water as well as surface water exist.

The reassessment identified the following potentially contaminated training areas and potential contaminants: (1) Area T-24A with HD and its byproducts; (2) Area T-38 with HD, HD byproducts, and VX byproducts; (3) Range J with HD and its byproducts; and (4) Range L with unidentified agents. Several other chemical training areas included in the reevaluation have been decontaminated and can be used for surface activities. In addition, four radiological areas have been decontaminated and can be used for surface or subsurface activities.

An additional potential problem is the landfill area where waste petroleum, oil, and lubricants (POL), and trichloroethylene (TCE) sludge were reportedly disposed of in the past.

It is recommended that FTMC:

1. Allow use of Training Areas T-4, T-5, T-6, T-31, T-38, D and I, and Old Toxic Training Area; and Ranges I and K for surface activity.

2. Allow use of radiological areas (Iron Mountain, Alpha Field, Bromine Field, and Rideout Field) for surface and subsurface activity. Continue to keep the Radiological Facilities containing the Hot Cell and waste storage tanks under controlled use.

3. Take no further action with regard to reported HD spills on Main Post.

4. Further investigate the Old Water Hole and/or the Unidentified Range if they are located.

5. Continue existing surface use at the Anniston Army Depot (AAD) decontamination area.

6. Determine flow direction to ensure proper well location, and expand the existing landfill monitoring program to include additional water quality parameters (oil and grease, phenols, solvents, arsenic) and to encompass the two landfills adjacent to the existing landfill.

7. Fence and post Area T-24A, Range J, and Range L.

8. Investigate Range L by geophysical means to determine the presence of buried munitions. If leaking chemical munitions

are detected, then USATHAMA will conduct sampling and analysis of sediments, subsurface soils, and ground water for agents and byproducts.

The following sampling and analysis by USATHAMA is recommended after the development of adequate analytical techniques and applicable criteria:

1. T-24A for HD-related subsurface soil and groundwater contaminants,
2. T-38 for HD- and VX-related subsurface soil and groundwater contaminants, and
3. Range J for HD-related subsurface soil and groundwater contaminants.

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

A reassessment of the 1977 records search of Fort McClellan (FTMC), Ala., was conducted to reevaluate potential contamination resulting from use, storage, and disposal of chemical, and biological, and radiological material (CBR) in past training activities. The reassessment did not include an onsite visit. Based on the findings of this reassessment, recommendations were made regarding land use of former training areas and the need to conduct sampling and analysis in certain of these areas.

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Based on these and other concerns, the following assumptions were used in determining the contamination potential:

1. Surficial agent contamination below part-per-million range (analytical detection limits) does not present an acute exposure hazard for surface use.
2. SOPs for training and decontamination exercises were followed and were effective.
3. All sampling and analytical methods for agents are valid.
4. Agent use and associated decontaminants were limited to training exercise quantities unless storage, burning, or other disposal activities took place.

Residual agent contamination potentially impinges upon two environmental settings: (1) surficial soils, and (2) subsurface soils and ground water. Previous discussions (Sec. 2.0) have indicated that small spills associated with normal training activities are not likely to result in surficial soil contamination, but could result in subsurface contamination with small quantities of agent or byproduct. Larger spills may result in both surface and subsurface soil contamination as well as groundwater contamination with agents and/or byproducts.

The following discussion assumes that small spills of chemical agent will not produce residual surface contamination, but could produce small isolated pockets of agent or byproducts in the subsurface environment. Larger spills pose a potential for residual surface and subsurface contamination. However, if monitoring data exist indicating that no surface contamination is present in a given area, then it has been assumed that the surficial soils are uncontaminated. Consequently, areas where agent use was limited to small quantities and areas demonstrated by monitoring results to have been decontaminated can be cleared for surface usage. However, clearance of a chemical training area for surface activity does not mean the area is confirmed as agent-free, but indicates that use of the area, restricted to surface activities, can be accomplished. Subsurface use (e.g., excavation) of these areas should not be permitted, due to the possible persistence of small, isolated pockets of live agent.

With regard to large spills, SOPs required decontamination followed by excavation and disposal of the contaminated soil. Since the decontamination/excavation procedure may not have been effective in removing all subsurface agent, it has been assumed that, although surface soils have been decontaminated, the subsurface environment at the spill site is potentially contaminated. Furthermore, the removal of contaminated soils from large spills transfers the problem to another location with a corresponding potential for surface or subsurface contamination, depending on disposal methods. If the disposal method is burial, then the potential for surface contamination as well as subsurface contamination exists depending on the depth of the burial.

2.0 CHARACTERISTICS OF AGENTS AND DECONTAMINATION PROCEDURES

2.1 GENERAL ENVIRONMENTAL CHARACTERISTICS OF AGENTS

2.1.1 Mustard (HD)

Mustard is an oily liquid of low volatility. It is only slightly soluble in water. Due to its low solubility and high density, globules of mustard tend to settle out of aqueous media and may persist for extended periods of time. Polymerization at the surface of the globule may form a protective, insoluble coat, further inhibiting hydrolysis. When completely dispersed or dissolved in water, mustard hydrolyzes rapidly to form hydrogen chloride and non-toxic thiodiglycol, which are also soluble in water (U.S. Army, 1975).

2.1.2 VX

The nerve agent VX is a relatively nonvolatile liquid that hydrolyzes, with the rate of hydrolysis increasing as alkalinity increases. Even in acidic soil environments such as those expected at FTMC, VX is predicted to have a hydrolysis half-life of only 72 to 81 days when it is in aqueous solution. However, if it is adsorbed onto soil particle surfaces or otherwise isolated from water-saturated conditions in the subsurface matrix, VX may persist for longer periods of time (U.S. Army, 1975).

2.1.3 Sarin (GB)

GB is a somewhat volatile liquid at room temperature. Hydrolysis is a function of pH with the most rapid rates occurring under alkaline conditions. Its maximum reported hydrolysis half-life is relatively brief and it is, therefore, not of environmental concern (U.S. Army, 1975).

2.2 TOXIC COMPOUNDS POTENTIALLY PRESENT AT FTMC

The U.S. Army Medical Bioengineering Research and Development Laboratory (USAMBRDL) (Small, 1982) and ESE (1983) evaluated the potential for contamination at FTMC due to the use, storage, and disposal of agents and decontaminants. The studies evaluated the potential for the persistence of subsurface contamination in soils (Small, 1982) and in ground water (ESE, 1983) for agents (HD, VX, and GB), agent degradation byproducts, decontaminant [DS-2 and supertropical bleach (STB)] constituents, and byproducts from the reactions of agents with decontaminants.

Based on the solubility, volatility, stability, toxicity, and formation potential of the compounds evaluated, it was concluded that the only toxic compounds likely to persist in the subsurface soils at FTMC are HD and bis(2-diisopropylaminoethyl) disulfide, also known as $(DES)_2$ (Small, 1982). The latter compound is the principal byproduct formed from the decontamination of VX with DS-2.

Based on similar considerations, it was concluded that the only toxic compounds likely to persist in the ground water are divinyl sulfide (DVS), mustard sulfoxide (HO), $(DES)_2$, and S-(diisopropylaminoethyl) methylphosphonothioate (DESMP) (ESE, 1983). 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. Table 1 summarizes the toxic agent-related compounds with a potential for persistence in the soil and ground water at FTMC.

2.3 DECONTAMINATION PROCEDURES AND CONTAMINATION POTENTIAL

2.3.1 Surface Contamination Potential

For surficial spills of chemical agents, Standing Operating Procedures (SOPs) at FTMC called for the use of excess quantities of STB or DS-2 to ensure complete decontamination of chemical agents. Decontamination was achieved with STB [Ca(OCl)Cl] by virtue of its oxidizing strength and with DS-2 by virtue of alkaline hydrolysis with sodium hydroxide.

As mentioned in the previous section, Small (1982) concluded that HD and $(DES)_2$ have the potential for persistence in the soils at FTMC. However, no residuals of these contaminants are expected in the near surface soils as a result of training exercises. Considering that SOPs required the use of excess decontaminant, little or no residual agent

Consequently, any HD that was spilled onto the ground in training quantities may have penetrated surficial soils and could persist in the subsurface environment. Thus, agent training areas that used HD cannot be declared agent-free with regard to subsurface soil contamination potential. Likewise, training areas that used VX have the potential for subsurface contamination by VX byproducts.

The potential for subsurface soil contamination with HD is enhanced as the size of an agent spill increases (i.e., exceeds training quantities), since the effectiveness of decontaminating procedures decreases as the size of the chemical agent spill increases (U.S. Army Chemical Center, 1946), and the quantities of agent that could penetrate surficial soils prior to reaction with decontaminant increases. Consequently, areas that have been implicated as having been locations of large spills of mustard must be regarded as potentially contaminated due to possible subsurface persistence of agent. Likewise, areas where HD or decontaminated HD were buried or disposed of must be considered as potentially contaminated in the subsurface environment. Furthermore, areas where significant quantities of agent (HD, VX) were used or spilled have the potential for groundwater contamination with agent byproducts.

3.0 APPROACH

The assessment of agent contamination at FTMC was conducted on a site-by-site basis and involved the evaluation and synthesis of the following information:

1. Known and suspected information concerning agent use:
   a. Type of agent used,
   b. Quantity of agent used, and
   c. Frequency and period of use;
2. Decontamination procedures:
   a. Type of decontaminant used,
   b. Quantity of decontaminant used, and
   c. Frequency and period of use;
3. Availabile monitoring data;
4. Environmental degradation characteristics of agents and decontaminants; and
5. SOPs for use of agents during training exercises.

The re-evaluation of existing data available to the 1977 report, coupled with new data generated since that time, have identified the following limitations concerning the agent contaminant assessment of FTMC.

1. There has been no firm determination of the precise locations of stations within identified Chemical School training areas.
2. There is no standardized method of certifying decontaminated or demilitarized chemical warfare areas or materials as being agent-free.
3. The long-term exposure effect of chemical warfare agents has not been sufficiently defined by the Surgeon General.
4. Decontaminant pollution potential (either by decontaminants or byproducts) is unquantified and needs further investigation.

Table 1. Toxic Agent-Related Compounds Potentially Present at FTMC

	Soil	Ground Water
HD-Related Compounds	HD	DVS, HC
VX-Related Compounds	$(DES)_2$	$(DES)_2$, DESMP

Sources: Small, 1983; ESE, 1983.

(HD) is expected at the surface. Furthermore, surficial soil contamination from training exercises would be expected to be minimal due to the small quantities used and the opportunity for residuals to leach and/or evaporate. High annual rainfall [135 centimeters (cm)] (USATHAMA, 1977) coupled with the length of time that has elapsed since training exercises were last conducted (10 years) suggest that residual surface soil contamination as a result of training exercises would be minor or non-existent.

For agent spills, the potential for residual near surface soil contamination is dependent on the quantity of material spilled (see Sec. 2.3.2). For small spills (i.e., spills of agents in quantities similar to training quantities), no residual surface soil contamination is expected, for the same reasons as stated above for training exercise quantities. As the size of a spill increases, the potential for contamination in the surficial soils increases. For areas where spills occurred in excess of training quantities, surface activity can be conducted if monitoring results indicate no residual surficial contamination. However, if such an area is not in use, it may be advisable as an added precaution to restrict surface usage until an evaluation of subsurface contamination is conducted.

2.3.2 Subsurface Contamination Potential

Although spills of agents in small (training) quantities are not likely to result in residual surficial soil contamination, small spills could produce residual subsurface soil contamination with HD. Infiltration of the agent into the soil matrix prior to complete reaction with decontaminants may result in residual concentrations of live agent below the soil surface. Further, since water levels at FTMC are typically 6 to 7 m below land surface, subsurface soils may be unsaturated with water, resulting in retarded contact between the agent and water. The persistence of mustard in soils over a period of 30 years has been observed in Carroll Island, located near Edgewood Arsenal, Md.

1.0 GENERAL

1.1 INTRODUCTION

In 1977, a records search was conducted by the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) at Fort McClellan (FTMC), Ala., to determine the degree of contamination at the installation by chemical, biological, and radiological material (CBR), and to assess the possibility of contaminant migration beyond the installation's boundaries (USATHAMA, 1977). The onsite phase of the search was initiated on Jan. 24, 1977; data were collected through March 1977. The 1977 assessment concluded that FTMC was contaminated with chemical and radiological materials, although contamination migration beyond installation boundaries was not indicated. Lack of sufficient information precluded accurate, firm conclusions and, therefore, collection of more information and data was deemed necessary. Recommendations included expanding the surface water quality monitoring program and implementing a subsurface water quality monitoring program.

1.2 PURPOSE

The objective of this study was to reevaluate the findings and conclusions of the original assessment conducted by USATHAMA. An installation's environmental posture is subject to change with the passage of time. Such changes, coupled with the advent of new regulations, may possibly alter the potential contamination or contaminant migration situation. Therefore, a reevaluation of data was conducted to address these changes, and encompassed the review of the original 1977 records search report assessment, the supporting documentation, and new data produced since that report. The reevaluation did not include an onsite visit.

The reevaluation, which focused on the information leading to the original findings, was restricted to a determination of contamination resulting from the use, storage, and disposal of CBR material in past training activities. As such, it included:

1. A review of the recommended water quality monitoring requirements and an assessment as to the current need for monitoring;
2. Specific recommendations as to general sampling locations and analytical requirements; and
3. A reappraisal of the significance of any problems associated with potentially contaminated areas, to include an assessment of clearance and certification requirements for former CBR training areas.

This report does not address areas outside of the CBR issues and therefore is not a complete reexamination of the original report. This report only includes information where significant differences exist relative to the original report. Moreover, the reevaluation was limited to those tenants using agents.

1.3 HISTORY

The two major tenants of concern at FTMC involved in the use of agents were: (1) the Chemical Corps School and Replacement Center for the Chemical Corps (USACMLCS), which was active at FTMC from 1951 through 1973, and (2) the U.S. Army Combat Developments Command Chemical, Biological, Radiological Agency, which was active from 1962 through 1973 (USATHAMA, 1977). Past activities at FTMC included advanced training in all phases of CBR warfare for students from all branches of the military service. Training exercises were specifically designed to simulate warfare conditions and situations. The USACMLCS has since returned to FTMC and is presently conducting limited training, excluding live agent exercises.

1.4 ENVIRONMENTAL SETTING

FTMC consists of three main bodies of government-owned and leased land in the foothills of the Appalachian Mountains in northeastern Alabama.

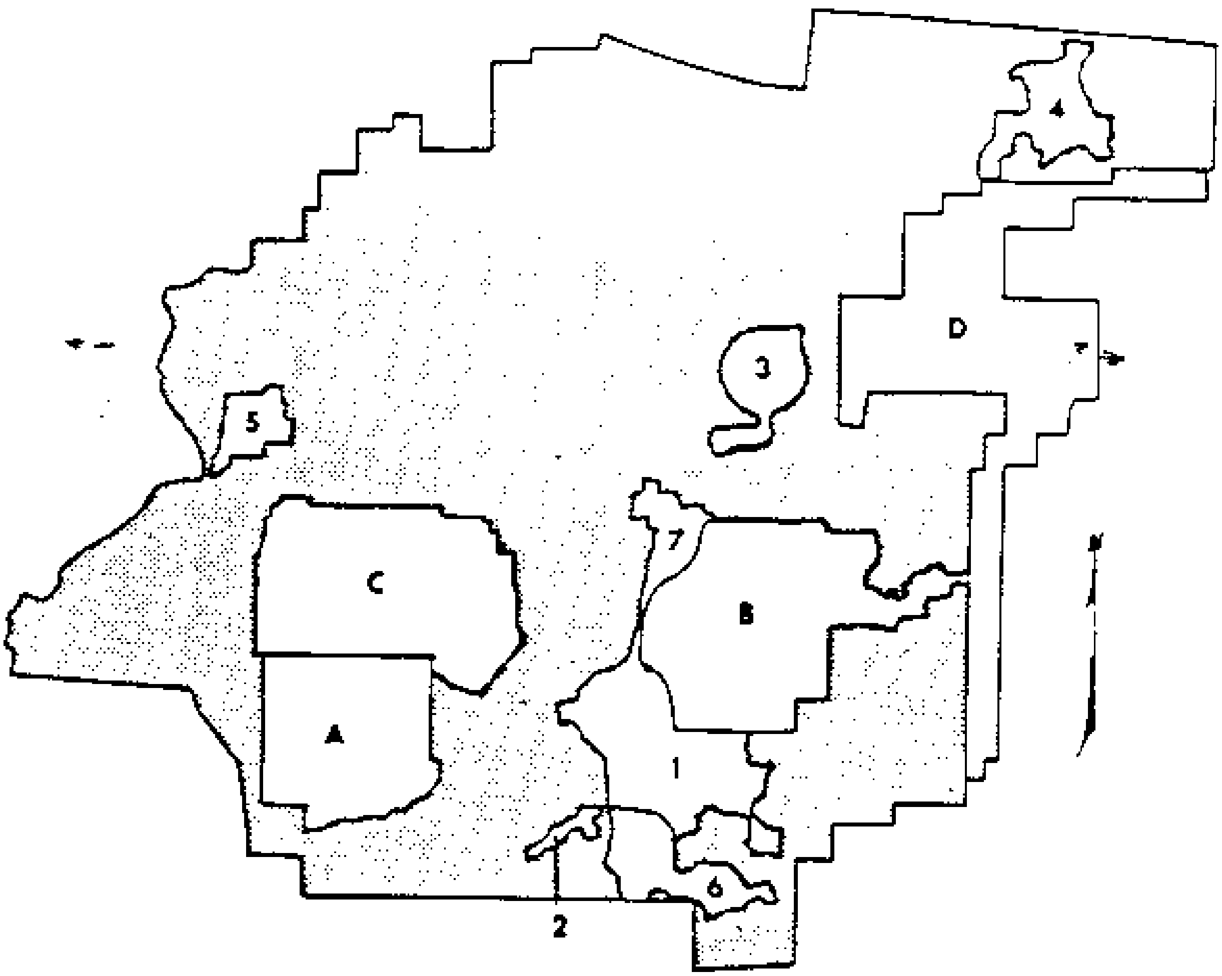
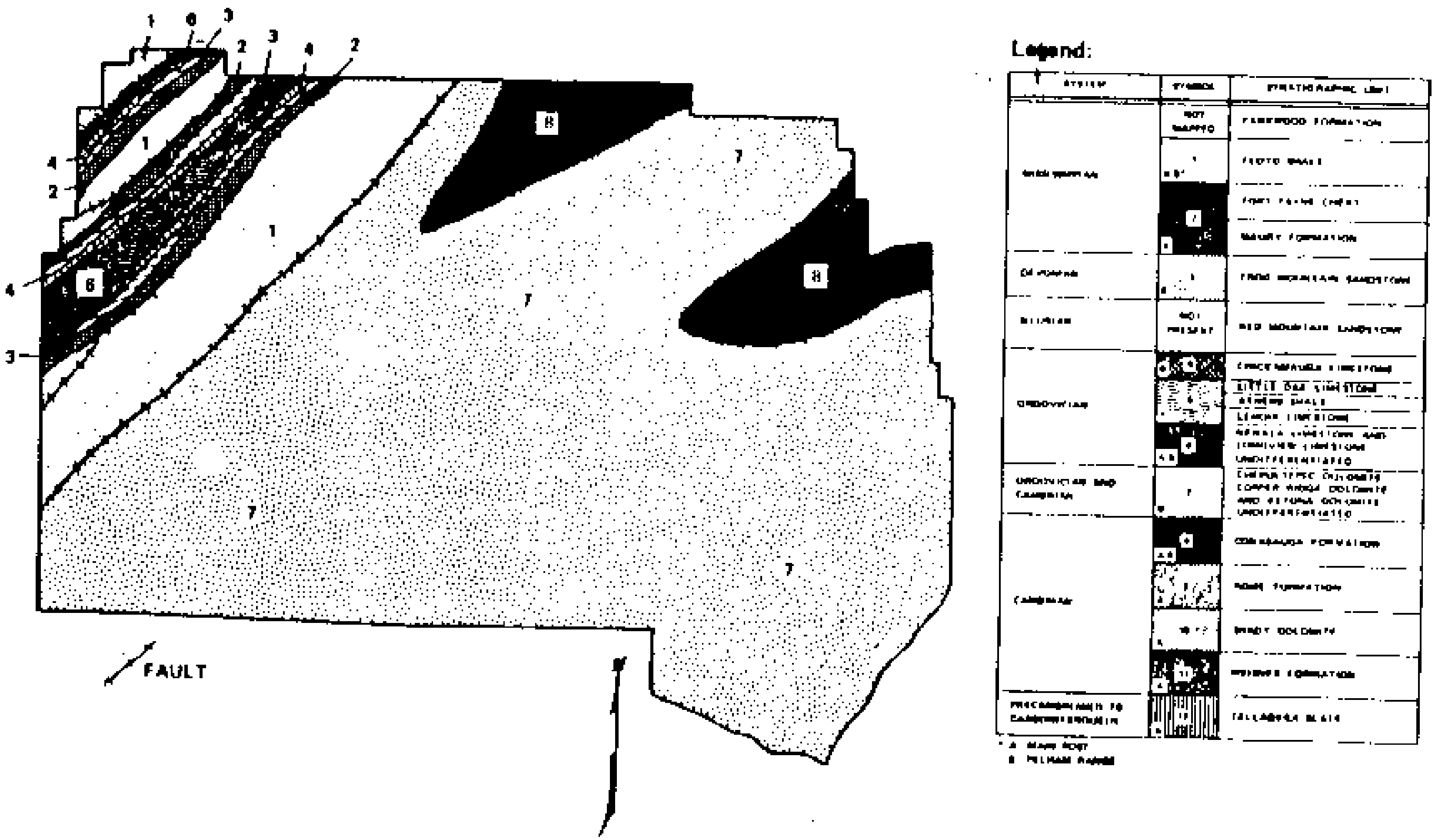


Figure 1
LOCATION MAP -- FORT McCLELLAN

Prepared for:
U.S. Army Toxic and Hazardous Materials Agency
Aberdeen Proving Ground, Maryland

They are the Main Post, Pelham Range, and the Choccolocco Corridor. The combined total land area is 18,508 hectares (ha) located 135 kilometers (km) west of Atlanta, Ga., and 160 km north of Montgomery, Ala. Anniston, Ala., a major municipality, adjoins the main installation on the south and west (Fig. 1).

The geohydrology of the FTMC area is very complex due to the presence of many faults, springs, high relief, and numerous rock types (Warman et al., 1960) (Fig. 2 and 3). The intense nature of the rock deformation in the area contributes to the numerous faults, fractures, and joints present in the rocks. These features can provide conduits for groundwater movement and for the interconnection of ground and surface water systems, implying that pathways for contaminant migration via ground water as well as surface water exist. In carbonate rocks, which are present over all of Pelham Range, the existing faults, fractures, and joints are often further enlarged by solution movement along these planes of weakness. This action increases both infiltration and permeability. Faulting increases infiltration and permeability due to the crushed rock and gravel produced. There are also unmapped faults located on FTMC at the Main Post as well as Pelham Range. This complexity makes prediction of groundwater flow rates and direction or delineation of recharge areas impossible without further study of the geology. Coldwater Spring, a major source of potable water in the area, flows from the Jacksonville Fault, a major thrust fault crossing the FTMC main post (Warman and Causey, 1962). Numerous streams, which are fed from springs and surface runoff, transect FTMC (Fig. 4 and 5), and surface drainage exits from all sides. Water levels at FTMC are typically 6 to 7 meters (m) below land surface (Warman and Causey, 1962). The soils are acidic, with pH generally in the range of 4.5 to 5.5 (Harein et al., 1961).



SOURCE: USATHAMA, 1977.

Figure 3
GEOLOGICAL MAP - PELHAM RANGE

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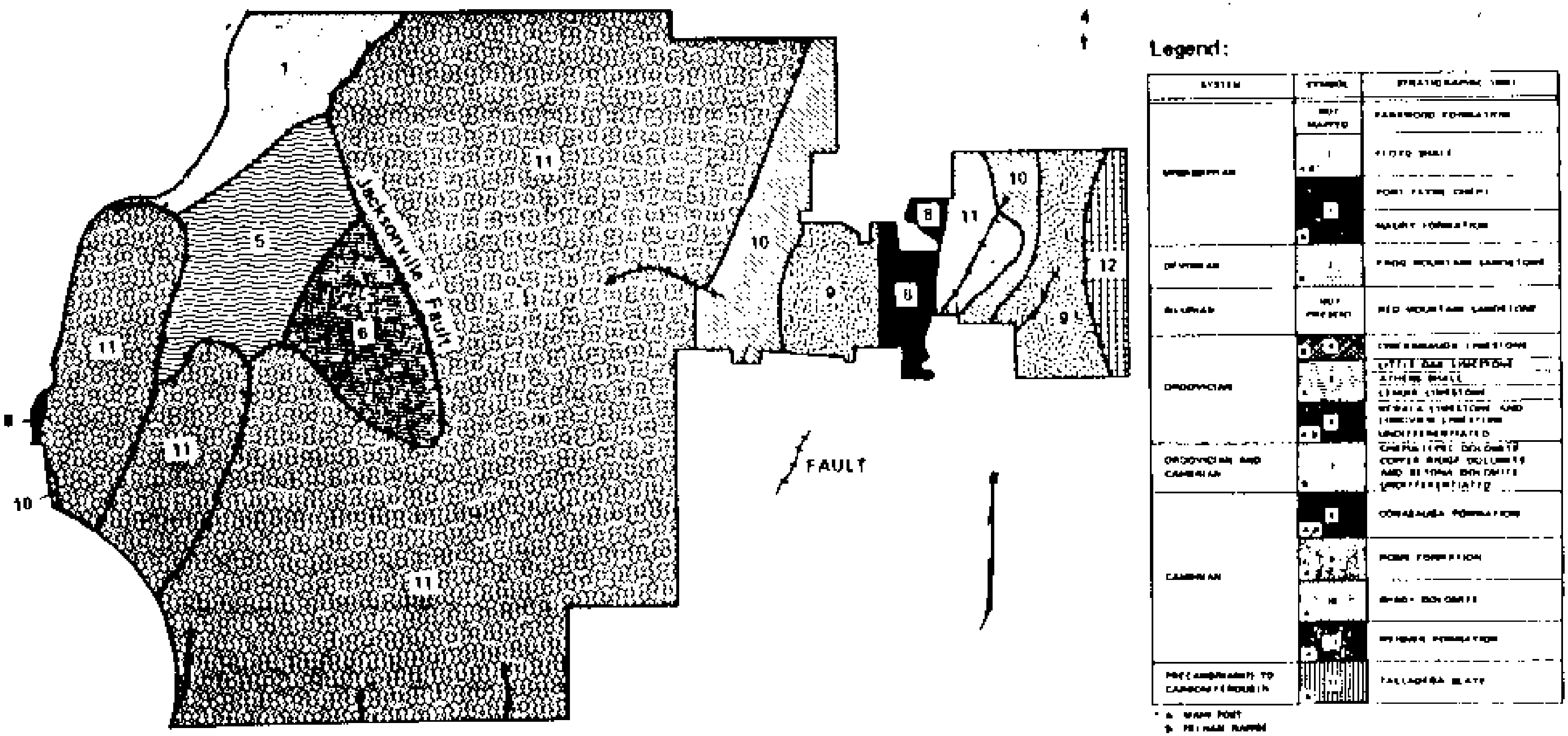
U.S. Army Toxic and Hazardous Materials Agency
Aberdeen Proving Ground, Maryland



SOURCE: USATHAMA, 1977.

Figure 2
GEOLOGICAL MAP - MAIN POST

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Aberdeen Proving Ground, Maryland

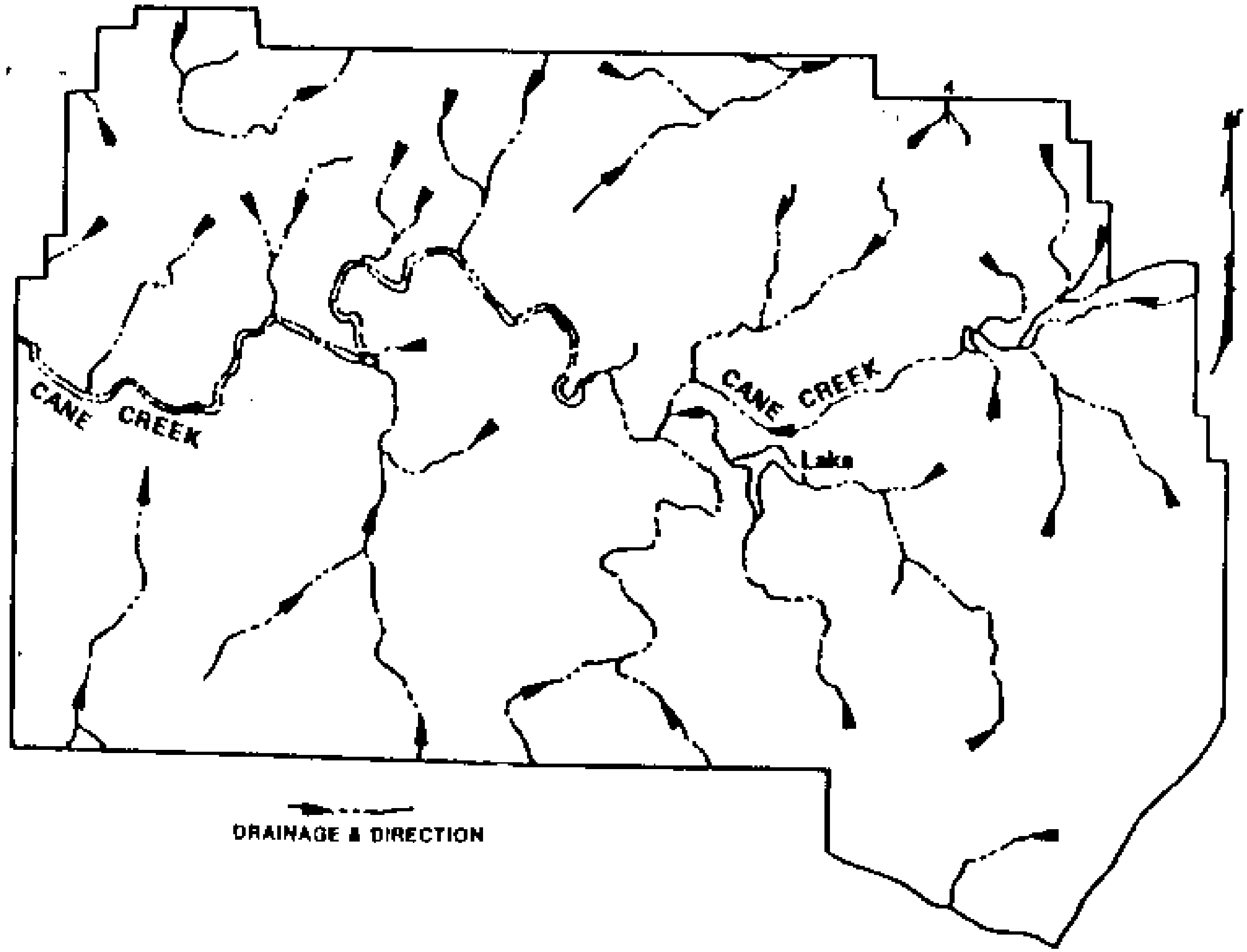

Figure 5
SURFACE DRAINAGE -- PELHAM RANGE

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Aberdeen Proving Ground, Maryland

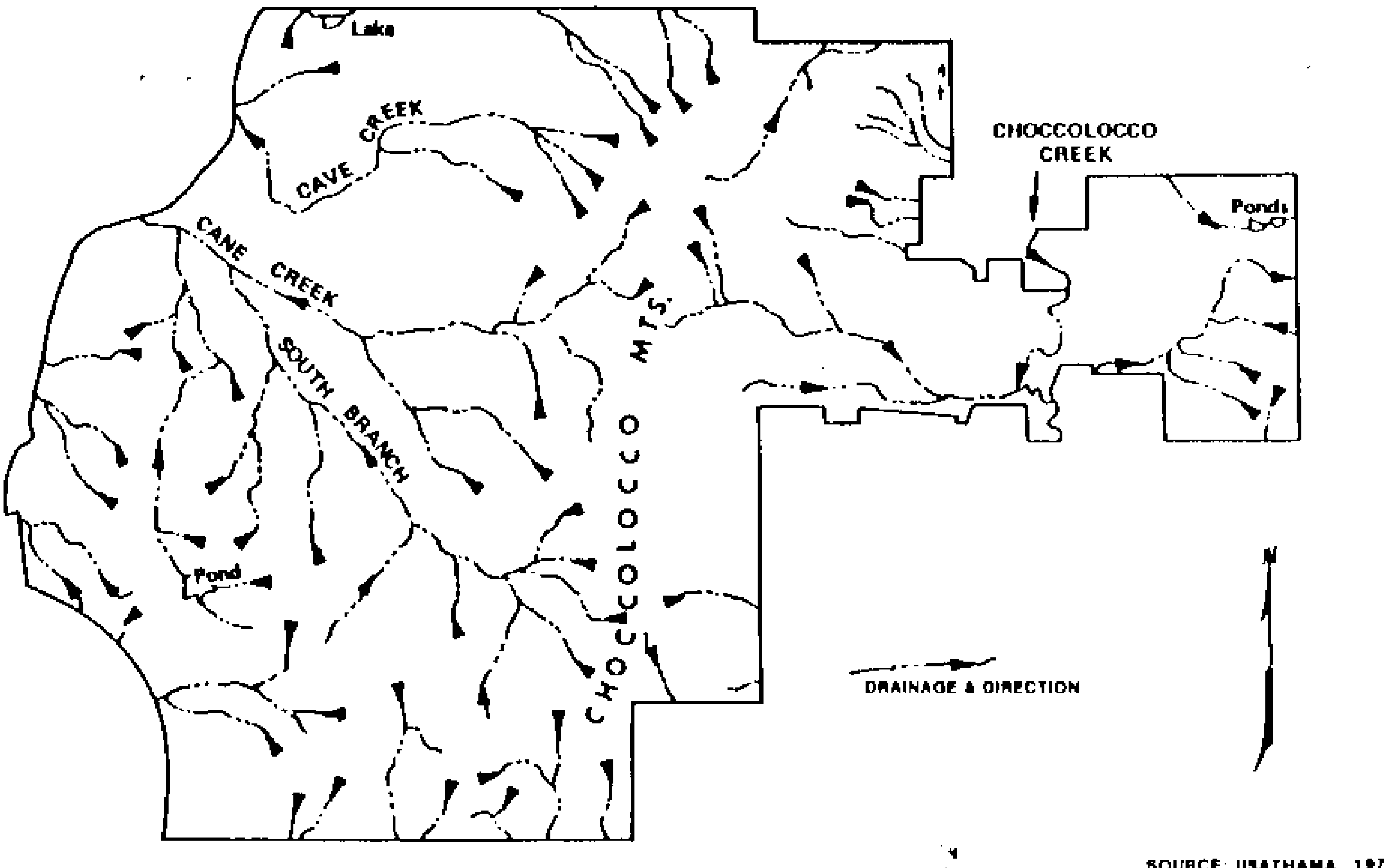


Figure 4
SURFACE DRAINAGE -- MAIN POST

Prepared for:
U.S. Army Toxic and Hazardous Materials Agency
Aberdeen Proving Ground, Maryland

LIST OF FIGURES

4.0 CONTAMINATION ASSESSMENT

The following sections present significant findings, conclusions, and recommendations for each area evaluated. This information is summarized in Tables 2 and 3. Figures 6 and 7 identify the approximate locations of the areas assessed for the Main Installation and Pelham Range, respectively. Detailed site characteristics of several training areas are illustrated in the Appendix.

4.1 T-4 BIOLOGICAL TEST AREA AND T-5 EXPLOSIVE ORDNANCE DISCHARGE AREA (TABLE 2)

Training Areas T-4 and T-5 encompass approximately 0.1 and 4.6 ha, respectively. Training Area T-4 was last used in 1971 for biological simulants (BG, SM); Area T-5 was used for training students in methods of detecting and decontaminating toxic hazards until 1973. Agents used at T-5 included HD, GB, and VX in training quantities [40 milliliters (ml), 20 ml, and 20 ml per exercise, respectively]. Both of these areas have been cited as the possible location of a large [110-gallon (gal)] spill of HD that reportedly occurred in 1955 (USAEHA, 1973a; USAEHA, n.d.). Available evidence indicates that the contaminated soil was chemically decontaminated, removed, and ultimately disposed of at Range J on Pelham Range, thus eliminating residual contamination problems from this spill at either T-4 or T-5 (USAEHA, n.d.; Tedeschi, 1973b).

Area T-4 is located near the base of the northern face of Iron Mountain. Flow of surface runoff is consequently in the direction of the slope (i.e., north) and is intercepted by an intermittent stream bed approximately 100 yards (yd) from the range. No water samples from the stream have been collected. Records indicate that T-4 was used only for biological simulant training. Consequently, it is more likely that the reported spill occurred at T-5 where HD was used in training exercises. It appears the area can be used for surface activity since, even-if the HD spill did occur here, it was nevertheless decontaminated and excavated (Saunders, 1973). Subsurface usage is not recommended because some isolated pockets of live agent from the reported spill may still persist.

Table 2. Synopsis of Contamination Data—Non-Problem Areas

Area	Size	Date Opened	Date Closed	Agents Used	Site Use	Comments	Sampling (Past)	Monitoring (Present)	Conclusion	Recommendation
T-4	0.1 ha	1965	1971	HD, BM	Biological test area	Potentially large HD spill site; biological use only	N/A	N/A	Decontaminated on surface	Allow use for surface activity
T-5	4.6 ha	1961	1973	HD, VX, GB	Agent detection and decontamination area	Training quantities; potentially large HD spill	Dec. 72—ND April 73—ND July 73—ND	N/A	Decontaminated on surface	Allow use for surface activity
T-6	3.0 ha	UNK	1973	HD	Agent decontamination area	Training quantities	Mar. 73—ND Chem. School	N/A	Decontaminated on surface	Allow use for surface activity
T-31	1.4 ha	1957	1969	HD, GB	Escort reaction area	Training quantities used prior to T-30	N/A	N/A	Decontaminated on surface	Allow use for surface activity
Old Toxic Training	45 m^2	early 1950's	UNK	HD	Toxic training	Used prior to D and I	N/A	N/A	Decontaminated on surface	Allow use for surface activity
D and I	0.4 ha		1972	HD, GB, CK, CC, CX, AC	Detection and identification	Training quantities	1973—ND	N/A	Decontaminated on surface	Allow use for surface activity
Range I	0.7 ha	1963	1964	UNK, HD assumed	Agent shell tapping	Assumed HD use; top 60 cm of soil removed	1980—ND	N/A	Decontaminated on surface	Allow use for surface activity
Range K	0.8 ha	UNK	UNK	UNK	UNK	Site has been bulldozed; rusted toxic agent signs	1980—ND	N/A	Decontaminated on surface	Allow use for surface activity
HD spills	UNK	UNK	UNK	HD	N/A	Reported spills, unknown quantity	N/A	N/A	Decontaminated on surface	Allow use for surface activity
AAD Decon	UNK	UNK	UNK	UNK	UNK	Posted with toxic agent signs, assumed buffer zone	N/A	N/A	Decontaminated on surface	Allow use for surface activity

Table 2. Synopsis of Contamination Data—Non-Problem Areas (Continued, Page 2 of 2)

Area	Size	Date Opened	Date Closed	Agents Used	Site Use	Comments	Sampling (Past)	Monitoring (Present)	Conclusion	Recommendation
Old Warehouse	UNK	UNK	UNK	UNK	UNK	Reported munitions disposal	N/A	N/A	Location and existence unconfirmed	If found, further investigation
Unidentified Range	UNK	UNK	1963	UNK	UNK	Area has been policed	1967-Free of contamination (Chem. School)	N/A	Location and existence unconfirmed	If found, further investigation
Radiological Facilities (Bldgs. 3192, 3182, 3180)		1954 1965	1971 1972	Co-60	Radiological training	Majority of isotopes used had short half lives and would have decayed away—longer lived isotopes are contained and secure (hot cell)	1973-No levels above maximum permissible concentrations (MPC) ARC	N/A	Decontaminated or controlled	Allow use for continued, controlled activity
Radiological Areas (Iron Mt., Alpha Field, Bromine Field, Eldorad Field)	*	*	*	Co-60, Tl-204, Ra-226, Cs-137, Sr-90, U-233, U-238, Br-82	Radiological training	Radiological sources and wastes reportedly removed	Since 1972, radiological surveys have declared all areas decontaminated	N/A	Surface and subsurface decontaminated	Allow use for surface and subsurface activity

* See Section 6 for specific information for each individual area.

UNK = Unknown.
ND = None detected.

Source: ESE, 1983.

Table 3. Synopsis of Toxic Agent Data—Potential Problem Areas

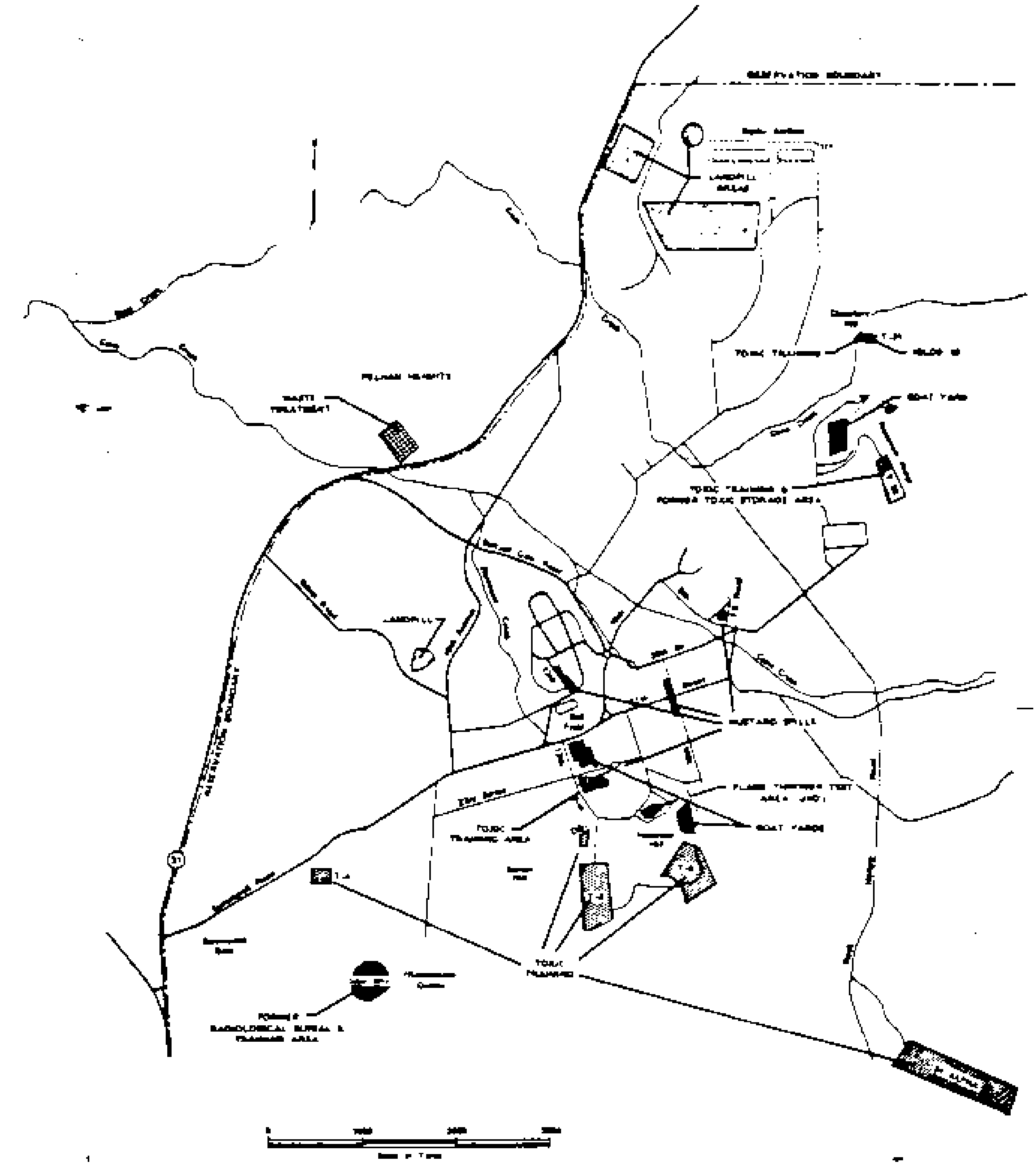
Area	Size (ha)	Date Opened	Date Closed	Agents Used	Site Use	Comments	Sampling (Past)	Monitoring (Present)	Conclusion	Recommendation
T-38	3.4	1961	1972	HD, VX, GB	Technical escort reaction area, storage area, agents and decontaminants	Many reported spills, extensive decontaminant use; evidence of surface HD contamination potentially located over recharge/fault zone; currently in use for surface activity	Dec. 72—HD Jan. 73- Surf. HD March 73—HD (Chem. Sch.)	N/A	Potential groundwater and subsurface soil contamination	Overland Surface Use. Limited sampling and analysis by USATHAMA
T 764	0.6	UNK	1973	CG, BZ, CN, HD	Chemical munitions disposal training area	Burning pits for decontamination, 4.66 kg HD used per exercise. Pits covered with soil prior to sampling, insulating HD from evaporation or hydrolytic degradation	April 73—HD July 73—HD	N/A	Potential groundwater and subsurface soil contamination	Fence and Post. Limited sampling and analysis by USATHAMA
Range F	0.4	UNK	1963	UNK, HD Assumed	UNK	Reported burial site for large (110 gal) HD spill	1980 HD (CSL)	N/A	Potential groundwater and subsurface soil contamination	Fence and Post. Limited sampling and analysis by USATHAMA
Range L	0.2	UNK	UNK	UNK	UNK	Lime Pond reported dump site for WW II captured munitions	1980 HD (CSL)	N/A	Potential groundwater, sediment, and subsurface soil contamination if leaking chemical munitions	Fence and Post. Determine presence of munitions by geophysical means; limited sampling and analysis by USATHAMA if leaking munitions found

Table 3. Synopsis of Toxic Agent Data—Potential Problem Areas (Continued, Page 2 of 2)

Area	Size (ha)	Date Opened	Date Closed	Agents Used	Site Use	Comments	Sampling (Past)	Monitoring (Present)	Conclusion	Recommendation
Landfill	25	1967	N/A	[illegible] sludge, waste POL, decontaminated materials	Sanitary landfill	Landfill has elevated metals above drinking water standards (Mn, Pb, Fe, Cr, As). Landfill was formerly in violation of state and federal requirements. Landfill is currently and has been in compliance with Alabama and Federal requirements since 1979.	1976–1978 (AEHA)	ADEM groundwater monitor program; five wells, water quality and levels State of Alabama water quality	Potential surface and groundwater contamination and migration by POL, solvents, and heavy metals	Expand existing monitoring program for existing and two past landfills to include additional water quality parameters and piezometer clusters for groundwater flow direction determination

UNK = Unknown.
ND = None detected.

Source: ESE, 1983.



SOURCE: USATHAMA, 1977.

Figure 6 **APPROXIMATE LOCATION OF AREAS ASSESSED: MAIN INSTALLATION**	**Prepared for:** **U.S. Army Toxic and Hazardous Materials Agency** **Aberdeen Proving Ground, Maryland**

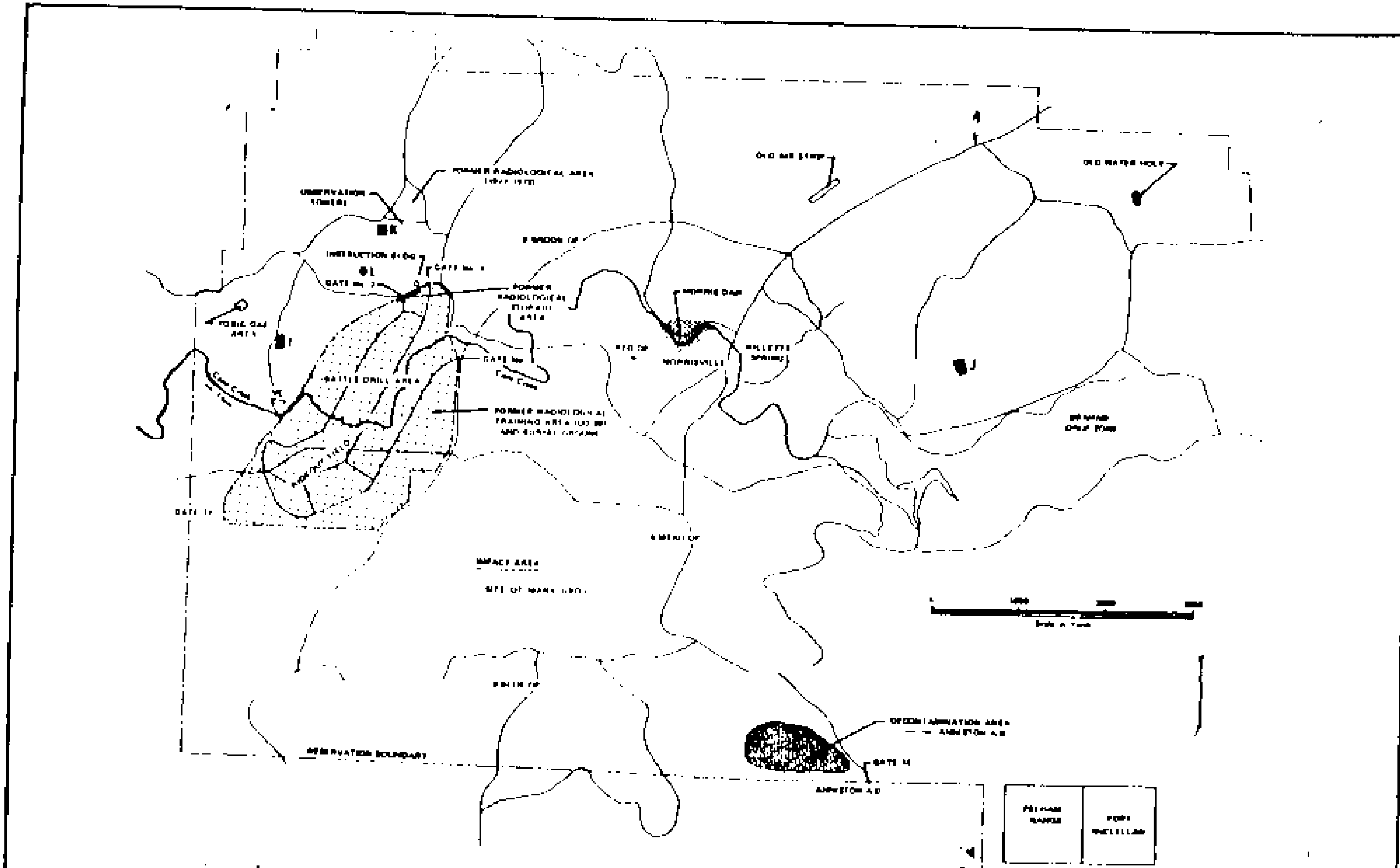


Figure 7
APPROXIMATE LOCATION OF AREAS ASSESSED: PELHAM RANGE

Prepared for:
U.S. Army Toxic and Hazardous Materials Agency
Aberdeen Proving Ground, Maryland

Area T-5 is situated between Sunset Hill and Howitzer Hill on the southern perimeter of the main post. An intermittent stream bed bisects the area, flowing to the north and intersecting South Branch near the aqueduct on the main post. Training exercises were limited to small sites within a fenced, controlled area. Training sites were decontaminated and checked at the end of each exercise. Surficial soil samples taken and analyzed from T-5 during December 1972, April 1973, and July 1973 indicated no residual contamination with agents HD, GB, or VX (Vanderbleek, 1973a; Tedeschi, 1973a). Soil samples were analyzed for agents using both the M-18 test kit and the field expedient method, with the results being negative (Tedeschi, 1973a).

The field expedient method, which is a more rigorous analytical technique than simple application of the M-18 test kit, involved heating the soil samples in a water bath at an elevated temperature (72°C) to volatilize any residual agent present; the vapors generated were subsequently analyzed by the M-18 test kit (Simonson and Vanderbleek, 1973).

All excavations were filled in accordance with SOP. Training aids were decontaminated and burned twice according to SOP. Items of no salvage or training value after decontamination were buried in the sanitary landfill. Most items were subsequently renovated and shipped to Redstone Arsenal.

Based on the available information, the area can be used for surface activity. However, as for Area T-4, subsurface use should not be permitted due to possible persistence of isolated pockets of live agent from the reported spill.

4.2 T-6 AGENT DECONTAMINATION AREA (TABLE 2)

Training Area T-6 encompasses 3.0 ha and was last used in 1973 for training in techniques of decontaminating chemical agents including HD. Training quantities for HD were 40 ml at each exercise.

The site (also called Naylor Field) is located near the base of the east slope of Howitzer Hill. Drainage is north-northeast towards South Branch. Toxic agents were last used on T-6 in April 1973. From that period to the end of the following month, unprotected personnel worked continuously in the area reportedly without any ill effects. All training aids were decontaminated and moved by the end of May 1973 (Vanderbleek, 1973b). The area contained eight training sites, each with a concrete pad on which equipment was parked. The equipment was contaminated with not more than 40 ml of HD during each exercise. After the equipment was decontaminated, it was checked, presumably by the range safety officer (Pojmann, 1973) for residual contamination. No information is available regarding the procedures employed to check the equipment or the results of the procedures. Although specific locations of training stations within T-6 were undocumented, random soil surveys and surface analysis (March 1973) revealed no agent contamination, and the area was recommended for clearance by USACMLCS in 1973. Based on the quantities used and the monitoring results, the area can be used for surface activity. However, as mentioned in Sec. 3.0, subsurface use should not be permitted due to possible persistence of isolated pockets of live agent.

4.3 T-31 TECHNICAL ESCORT REACTION AREA (TABLE 2)

Training Area T-31 encompasses 1.4 ha and was last used in 1969 prior to use of T-38. Agents used included GB and HD in training quantities (20 ml and 40 ml, respectively) (Tedeschi, 1973b). Range T-31 lies in a valley surrounded by Cemetery Hill to the west, Reservoir Ridge to the south, and Caffey Hill to the southwest. This area comprises the upper drainage basin of Cave Creek; the creek itself flows through the western portion of T-31. Six different sites within T-31 were used for training exercises. A visit by the U.S. Army Environmental Hygiene Agency (USAEHA) in December 1973 revealed the presence of several small piles of white powder (presumably STB), implying that STB had been used in the past to decontaminate HD. This site was not used on a regular basis prior to deactivation. Training aids were removed to Range T-38 in

1973. This site was also used for storage of unknown chemical agents, and spills were reported. However, no information was available regarding the quantities spilled or the agent(s) involved in the reported spills. Since only small quantities of agent were known to have been used in this area and since SOPs required the decontamination of spills, the area can be used for surface activity. However, subsurface use should not be permitted due to possible persistence of isolated pockets of live agent.

4.4 T-38 TECHNICAL ESCORT REACTION AREA (TABLE 3)

Area T-38 was used for training escort personnel in techniques of eliminating toxic hazards caused by mishap to chemical munitions during transport. The area was also used as a storage area for toxic agents and munitions including GB, VX, and HD. The site, which encompasses 2.4 ha, was last used for agent training in 1972 (Drake, 1973). Storage facilities included four 1-ton HD containers. In addition, unspecified decontaminants were stored on at least two sites and were used for demonstration purposes (see Appendix). Extensive decontamination was conducted on this site for reported spills and for contaminated training aids, including a railroad flat car.

Topographical analysis of T-38 indicates that surface drainage patterns will tend to be primarily in a southwesterly direction from the crest of Reservoir Ridge towards the main post. The site is an elevated ridge with no surface bodies of water coursing through the site. Cave Creek lies approximately 500 m north-northwest of the site. Surficial soils are moderately well drained, indicating that the principal mechanisms of pollutant transport are expected to be infiltration through the soil column and into ground water.

Residual surface contamination with HD on T-38 was reported in January 1973 (Pojmann, 1973). An implication is that subsurface contamination of soils may exist due to potential vertical leaching. Subsequent sampling in March 1973 indicated that T-38 was free from surficial contamination (Drake, 1973). No description of clean-up or decontamination was cited. The types and quantities of decontaminant used, as well as the frequency of the demonstrations, are unknown. Considering the quantities of agents stored and the fact that HD was present on the surface for a period of time which could permit vertical leaching (as indicated by the January 1973 analytical results), an implication is that subsurface contamination of soils with HD may exist. In addition, since VX may also have been spilled in this area, subsurface soils may have also been contaminated with VX byproducts.

The site cannot be declared free of significant subsurface contamination at this time. The potential for vertical migration indicates that significant levels of agent or byproducts may reside in the subsurface environment. Subsurface soil sampling and downgradient well sampling for the toxic HD- and VX-related compounds in Table 1 are recommended. Since the area has been used for surface activity since 1973 with no reported adverse impacts, and since the March 1973 sampling did not detect surficial contamination, there appears to be no problem for surface use. Therefore, fencing and posting of the area for personnel safety is not required as long as land use is restricted to surface activities.

4.5 T-24A, EOD AREA (TABLE 3)

Training Area 24-Alpha encompasses 0.6 ha and was last used in 1973. Agents used included CG, BZ, GB, and HD. There are no reports of VX usage. This range was used as a chemical munitions disposal training range. Consequently, the amount of live agents (in particular HD) used during each exercise exceeded the quantities typically used for training exercises at other ranges. The quantity of HD used during each exercise was 4.46 kilograms (kg), which is approximately 1,000 times that used in other training exercises. Quantities used per exercise for CG, BZ, and GB were 40 ml, one M-6 cannister, and 740 grams (g), respectively (Pojmann, 1973).

Drainage from the site is toward the center of the range and exiting in a northerly direction. Two intermittent streams are receptors of surface flow, with ultimate discharge to South Branch.

Two burning pits enclosed by a fenced area measuring 40 m x 80 m were used for decontamination procedures. The approximate area of each pit was 5 m x 5 m (Tedeschi, 1973b). The depth of each burning pit is not known. However, SOP recommended a depth of 6 feet for pit construction (Vanderbleek, 1973c). On the day following each exercise, the fenced area was checked for contamination and sprayed with STB (Pojmann, 1973).

Upon closure, the fenced area and remaining training aids were subjected to decontamination procedures with DS-2. An inventory of training aids requiring decontamination in April 1973 included 183 105-mm and 155-mm projectiles (Vanderbleek, 1973c). The burning pits were covered with soil at closure.

A series of samples collected in April and July 1973 in proximity to the burn pits failed to detect surface contamination with HD (Vanderbleek, 1973a; Tedeschi, 1973a). However, samples were collected randomly from within a 2-m radius of sites believed to be agent use locations. Furthermore, sample depths ranged from 3 to 10 cm, whereas the burning pits are believed to have been to a depth of approximately 2 m. The pits were covered with soil prior to any sampling for range clearance.

Considering the quantities of mustard used per exercise, the potential for mustard to persist underground, and the fact that the burning pits were covered with soil at closure, there is potential for subsurface soil contamination by HD at the site of the burn pits. The soil cover could effectively insulate any residual HD from evaporation and hydrolytic degradation. Additionally, the ground water in the area is potentially contaminated with HD decontamination byproducts.

Subsurface sampling of soils for HD and the ground water for the toxic HD decontamination byproducts listed in Table 1 are recommended.

There is no expected problem for surface use since monitoring results did not detect any surface contamination and because the pits have been covered. However, since the area is not currently being used, it is recommended that, as an added safety measure, it be fenced and posted and restricted from surface use until the extent of subsurface contamination has been identified.

4.6 OLD TOXIC TRAINING AREA (TABLE 2)

The old toxic training area encompasses approximately 45 square meters (m^2) of ditch located behind Bldg. 3183 (Reproduction Bldg.) and was used during the early 1950's prior to the Detection and Identification (D and I) area development. The site is a trench or shallow depression with heavy growth of vegetation. During periods of heavy rainfall, surface runoff may become part of the flow of Remount Creek. Agents used included HD in training quantities, although verification of quantities is nonexistent. Based on SOPs for decontamination along with no reported evidence of spills or the use of large quantities of agent, it appears the area can be used for surface activity. However, as mentioned in Sec. 3.0, subsurface use should not be permitted due to possible persistence of isolated pockets of live agent.

4.7 D AND I AREA (TABLE 2)

The D and I area encompasses 0.4 ha and was last used in 1972. Records indicate that this area was only used for GB testing. However, Navy activity in the late 1950's may have used HD, and it was reported that simulants CK, GC, CX, and AC were also used in training exercise quantities. A pit was dug in which all training aids from this site, along with the building from T-4, were burned twice and buried. Burning was accomplished according to USACMLCS SOPs. The remains are still located in the pit. This site was declared clear in 1973 and, based on relatively small quantities used and SOPs for decontamination along with no reported spills, it appears the area can be used for surface activity. However, subsurface use should not be permitted due to possible persistence of isolated pockets of live agent.

4.8 RANGE I, TOXIC AGENT SHELL TAPPING (TABLE 2)

There is very limited information available for Range I, including lack of specific size and location. CSL (USATHAMA, 1977) cites the size of this range as 0.2 ha. Agent use was assumed to have included HD in 1963 to 1964. The area has been physically rearranged with the top 60 cm of soil removed. Field tests conducted in 1979 showed no evidence of surface contamination. Site rearrangement and decontamination procedures and monitoring results indicate no apparent problems for surface activity. However, subsurface use should not be permitted due to possible persistence of isolated pockets of live agent.

4.9 RANGE J (TABLE 3)

There is very little information available on Range J beyond the location and reported size (0.4 ha). Agents used in training are unknown, with HD assumed. The last known use of the range was in 1963; however, information indicates that Range J was the disposal site for soil recovered from a large (110 gal) HD spill on Main Post in 1955 that was decontaminated (USAEHA, 1973a; USAEHA, n.d.). Soils are moderately drained, suggesting subsurface transport is important. Limited monitoring data indicate there is no surface contamination; however, these results do not negate the possibility of subsurface soil contamination, since evaporative losses of HD from subsurface soils are not expected to be rapid. Subsurface soil sampling for HD and groundwater sampling for the HD decontamination byproducts list in Table 1 are recommended.

Considering the report that a relatively large quantity of decontaminated HD is buried on Range J (evidenced by a stake in the ground at the disposal site), that the depth of the burial is unknown, and that only limited monitoring was conducted, this range cannot be declared free of residual surface agent contamination and should not be used for surface activity until the extent of the subsurface contamination is identified. Considering: (1) the uncertain nature of surface contamination, (2) the potential for significant subsurface contamination, and (3) that the area is not currently being used, Range J should be fenced and posted, as an added safety measure, and restricted from further surface use to ensure personnel safety until the extent of contamination is determined.

4.10 RANGE K (TABLE 2)

Very little information is known about Range K, including agents used, dates used, and last known activity. The site encompasses 0.8 ha and is marked by rusted toxic agent signs. The site has been physically rearranged (bulldozed), and USACMLCS records indicated the site clear in 1967 (Wahlquist, 1967). Recent monitoring data (1980) failed to detect any residual surface contamination (Crafton, 1980). There is no evidence to indicate any problems for surface activity. However, subsurface use should not be permitted due to possible persistence of isolated pockets of live agent.

4.11 RANGE L (TABLE 3)

Information on Range L is limited. Approximate size of the site is 0.2 ha, and it contains a manmade pond (Lima Pond). It is not known whether this site was used for toxic chemical training exercises; however, World War II captured munitions, including chemical munitions, were reportedly disposed of in drums in the pond (USAEHA, n.d.).

Surface soil monitoring was recently conducted on Range L (Crafton, 1980). It is not known precisely how and where the soil samples were collected. However, the effort was intended to sample "soils characteristic of the range area." The results of the soil monitoring program indicated no detectable surface soil contamination. In 1982, three water samples were collected from Lima Pond and analyzed for HD, VX, and GB, with detection limits of 2 milligrams per liter (mg/l), 1.4 mg/l, and 0.5 mg/l, respectively. None of these agents was detected in the pond water (Headquarters, Anniston Army Depot, 1982). However, these data may not represent a valid evaluation of the contamination potential of the munitions reportedly disposed of in the pond, since samples of the pond sediments were not included.

Due to the distinct possibility of ground and surface water interconnection, draining the pond and investigating bottom sediments using geophysical means and/or metal detectors are recommended. If chemical munitions are discovered and if there is evidence suggesting that leakage has occurred, sampling and analysis of sediments, subsurface soils, and ground water for agents and their byproducts is warranted. Since the area is not currently being used, it is recommended that, as an added safety measure, it be fenced and posted and restricted from surface use until the extent of subsurface contamination has been identifed.

4.12 OLD WATER HOLE (TABLE 2)

This site is possibly a sinkhole and is reported to be between New Mt. Sellers Cemetery and the POW camp in the northeast corner of Pelham Range. The period of use or agent use is unknown; however, reports indicate disposal of a variety of munitions, including chemical, in the water hole (USATHAMA, 1977). Several attempts (including infrared photography) have been made to locate this site to no avail. Concern exists about this site due to possible ground and surface water interconnection. Several sinkholes are present, and Cane Creek disappears underground in the northeast corner of Pelham Range. The precise location of the Old Water Hole is unknown, but the probability is high that it is in an area of sinkhole activity. However, due to the inability to locate the site, no action can be taken. If this site is located in the future, further investigation is warranted.

4.13 UNIDENTIFIED RANGE AREA--PELHAM RANGE (TABLE 2)

This range area, thought to be located near Road Junctions 28, 29, 30, and 32, is of unknown size and use. Last known training was in 1963, and a survey conducted in 1967 by the USACMLCS declared the area free of contamination. All empty rounds, containers, and miscellaneous items were policed and disposed of in accordance with SOP. The area was then bulldozed and decontaminated. Based on existing information, it appears the area can be used for surface activity. However, due to the possible persistence of small, isolated pockets of live agent, subsurface use is not recommended.

4.14 HD SPILLS--MAIN POST (TABLE 2)

No documented information exists on three spills reported on Main Post beyond a reference in the 1977 records search report on the potential contamination map (USATHAMA, 1977). Contact with FTMC personnel indicates that there are no records of spills and that at least one site has been paved over. The absence of documentation suggests that these spills were minor if indeed they did occur. Assuming SOP were followed carefully, it is concluded that these sites can be used for surface activity. Prolonged contact by personnel on post, with no evidence of symptomatic development from agent exposure, further substantiates this conclusion. However, subsurface use should not be permitted.

4.15 ANNISTON ARMY DEPOT (AAD)--DECONTAMINATION AREA (TABLE 2)

Reportedly, an area of unknown size and shape is fenced and posted with "toxic agent training area" signs. The operation, size, and period of use for this site are unknown. However, based on available information, it is believed that the AAD decontamination area was used only as a buffer zone for AAD demilitarization operations. Consequently, no further action is recommended unless future information indicates actual agent usage onsite.

4.16 LANDFILL OPERATION (TABLE 3)

The current landfill operation at FTMC encompasses approximately 28 ha and has been used since 1967 for disposal operations. SOP dictated disposal of decontaminated materials, including dead animals resulting from agent training exercises, in the landfill. In the past, trichloroethylene (TCE) sludge and waste petroleum, oil, and lubricants (POL) products were reportedly disposed of in the landfill. Past violations of State and Federal requirements have included standing water in trenches and lack of adequate compaction, both of which contribute to leachate production (USAEHA, 1976). The landfill is currently and has been in compliance with Alabama and Federal requirements since 1979. Data provided by USAEHA (1976) and analysis of data through 1978 indicate that the present monitoring system may not be intercepting the leachate plume because groundwater flow direction from the landfill is undetermined. Existing data provided by FTMC indicate several parameters [manganese (Mn), lead (Pb), iron (Fe), and chromium (Cr)] are above current drinking water criteria on a regular basis. However, the variance of results by orders of magnitude raises doubt as to the validity of the results. High levels of phenols observed in Reilly Lake suggest potential leachate migration from the landfill to surface waters. Arsenic levels exceeding water quality criteria have also been found in a well at Reilly Lake.

Placement of additional monitor wells around the current landfill and the two closed landfills in the adjacent area is recommended. Additional parameters including oil and grease, phenols, solvents, and arsenic should be monitored. Piezometer clusters should be employed to define groundwater flow direction.

4.17 RADIOLOGICAL FACILITIES (TABLE 2)

The Radiological Facilities at FTMC included Bldgs. 3192, 3182, 3181, and 3180, which contained the Hot Cell Facility (Bldg. 3192) and Storage Vault (Bldg. 3180). The Storage Vault and Hot Cell were the contaminated buildings within the Radiological Facilities.

The Hot Cell was connected to an underground drainage system consisting of a drain pipe leading to two underground liquid waste storage tanks and then to a liquid waste disposal pit. Co-60 was the only isotope used in the Hot Cell and was the waste isotope contained in the liquid waste tanks which were connected to the Hot Cell (USAEHA, 1973b). The Hot Cell and drainage system were not decontaminated at closure, but were sealed off. Soil core samples taken in 1973 in the vicinity of the underground storage tanks exhibited low levels of radioactivity (USAEHA, 1973b). The source of this activity is not known, but was presumably from the underground drainage system.

The Storage Vault has been decontaminated to within acceptable limits for clearance for unrestricted use (USACMLCS, 1973; AEC, 1970). A storage well adjacent to the Storage Vault was excavated and disposed of.

Radioactive waste containers were stored in the vicinity of the loading dock at the Radiological Facilities. It is not known what was stored in the containers, but based on knowledge of the radioactive isotopes used in radiological training, the major potential contaminant was Co-60. Based on information available, the Radiological Facilities, including the Storage Vault, have been well decontaminated with the exception of the Hot Cell and its drainage system which are sealed off. Therefore, although there may still be localized areas of radioactivty, the Radiological Facilities are fenced and posted and can be used for continued, controlled activity.

4.18 IRON MOUNTAIN (RATTLESNAKE GULCH)--RADIOLOGICAL TRAINING (TABLE 2)

The Iron Mountain site was in use for training from 1954 to 1971. The training area size was 43 x 24 m. Radiological materials used in training included Co-60, Th-204, Ra-226, Cs-137, and Sr-90 (Anderson, 1971). No records are available on quantities and dates used. "Hot spots" at the radioactive waste burial site near the top of Iron Mountain were subsequently dug up and removed along with contaminated soil in 1973. Iron Mountain was subsequently declared decontaminated based on a 1973 survey by FTMC, and there is no indication of migration of radionuclides from the burial site. Based on available data, the area can be used for surface and subsurface activity.

4.19 ALPHA FIELD--RADIOLOGICAL TRAINING (TABLE 2)

Alpha Field was a nuclear accident training facility located adjacent and south of the Radiological Facilities. Radiological materials used included U-233 and possibly U-238 (USAEHA, 1969). Sources were sealed and inventoried monthly and leak-tested. If a leaking source was found, it was removed and the surrounding area decontaminated. Alpha Field has been decontaminated, and a 1973 survey of the field indicated radiation levels were within Atomic Energy Commission (AEC) limits (USAEHA, 1973b). There are no records or reports of radiological waste burials at this location. On the basis of existing evidence, the area can be used for surface and subsurface activity.

4.20 BROMINE FIELD--RADIOLOGICAL TRAINING (TABLE 2)

Bromine Field is directly adjacent to Alpha Field behind the Radiological Facilities. Br-82 was the radiological source used at this site, and the area was monitored during tests (USAEHA, 1969). A survey was performed by FTMC after every test to determine high-activity areas to be decontaminated. Since Br-82 has a short half-life of 36 hrs, any activity that was not removed rapidly decayed away. Consequently, the area can be used for surface and subsurface activity.

4.21 RIDEOUT FIELD—PELHAM RANGE (TABLE 2)

Rideout Field was used as a radiological survey training facility and burial site from 1965 to 1972. Co-60 sources were installed in an enclosed area 3.2 km long and 1.6 km wide. Upon closure of the USACMLCS, all the radioactive Co-60 sources were removed. Buried wastes were dug up and removed, and the field was certified clean by AEC. A survey by FTMC completed after decontamination showed radioactive levels within acceptable limits (Radiological Division Training Office, 1977). On this basis, the area can be used for surface and subsurface activity.

5.0 1977 REPORT CONCLUSIONS AND RECOMMENDATIONS

The following are conclusions and recommendations from the original records search assessment. See Sec. 6 and 7 for reevaluation conclusions and recommendations.

5.1 CONCLUSIONS (1977)

1. Although FTMC itself is contaminated with chemical and radiological materials, the available records (and interviews) did not reveal indications of contaminant migration beyond installation boundaries. Therefore, a Preliminary Survey is not recommended at this time.

2. Only on rare occasions, however, will the amount and quality of data uncovered during a records search be considered as totally fulfilling all of the requirements on which to base accurate, firm conclusions. In view of this, the data should be augmented by the expansion of the present surface water quality monitoring program to include radiological and arsenic analysis, and also by the initiation of a subsurface water quality monitoring program. The results of these programs will be reviewed periodically by the Project Manager for Chemical Demilitarization and Installation Restoration (PM CDIR) to make a final determination, at a future date, as to the need for a Preliminary Survey.

5.2 RECOMMENDATIONS (1977)

1. Advise that the surface water quality monitoring program be expanded and a subsurface water quality program be initiated.

2. Because of UXO and potential contamination, the current regulations concerning Pelham Range should be reviewed with respect to area control and access.

3. Initiate an investigation of fenced areas at the Main Post and Pelham Range, which are currently identified as contaminated, to ascertain the current level of CBR contamination and to assess the possibility of using the areas more productively.

6.0 REEVALUATION CONCLUSIONS

A. Training Areas T-4, T-5, T-6, T-31, T-38, D and I Area, and Old Toxic Training Area; and Ranges I and K have been decontaminated on the surface and, based upon available information, they can be used for surface activity.

B. Radiological areas (Iron Mountain, Alpha Field, Bromine Field, and Rideout Field) have been decontaminated and can be used for surface or subsurface activity. The Radiological Facilities (Bldgs. 3192, 3182, 3181, and 3180) have been decontaminated or controlled and can be used for continued, controlled activity.

C. Reported HD spills on Main Post pose no problems for continued use of the areas.

D. The existence and location of the Old Water Hole and the location of the Unidentified Range have never been confirmed.

E. Based on available information, the AAD decontamination area was used only as a buffer zone for AAD demilitarization operations.

F. Without flow data, the existing well locations and water quality data for the landfill are of limited use. Available geological evidence and information on disposal practices, combined with limited surface water and groundwater quality data, indicate the potential for migration of contaminants from landfill areas via surface and subsurface waters.

G. Area T-24A has the potential for subsurface soil contamination with HD and groundwater contamination with HD byproducts.

H. Area T-38 has the potential for subsurface soil contamination with VX byproducts and HD and groundwater contamination with HD byproducts and VX byproducts.

I. Range J has the potential for subsurface soil contamination with HD and groundwater contamination with HD byproducts.

J. Range L may have been used as a dumping ground for various munitions including agents. If so, the potential for agent and by-product contamination and migration exists.

7.0 REEVALUATION RECOMMENDATIONS (Keyed to Conclusions)

Environmental characteristics of agents and available information concerning training activities (small quantities and knowledge of decontaminating procedures) do not indicate residual surface contamination in the following areas: T-4, T-5, T-6, T-31, T-38, D and I, and Old Toxic Training Area; and Ranges I and K. Furthermore, subsequent data on usage of these areas following cessation of chemical agent training activities in 1973 provide additional corroborating evidence.

Accordingly, it is recommended that FTMC do the following:

A. Allow use of Training Areas T-4, T-5, T-6, T-31, T-38, D and I, and Old Toxic Training Area; and Ranges I and K for surface activity.

B. Allow use of Radiological areas (Iron Mountain, Alpha Field, Bromine Field, and Rideout Field) for surface and subsurface activity. Continue to keep the Radiological Facilities containing the Hot Cell and waste storage tanks under controlled use.

C. Take no further action with regard to reported HD spills on Main Post.

D. Further investigate the Old Water Hole and/or the Unidentified Range if they are located.

E. Continue existing surface use at AAD decontamination area.

F. Determine flow direction to ensure proper well location, and expand the existing landfill monitoring program to include additional water quality parameters (oil and grease, phenols, solvents, arsenic) and to encompass the two landfills adjacent to the existing landfill.

Based on uncertainties concerning residual contamination, it is recommended that the following areas be fenced and posted to ensure personnel safety:

T-24A,

Range J, and

Range L.

The following areas are recommended for sampling and analysis to determine if residual contamination exists as well as the potential for contaminant migration. However, current analytical capabilities are inadequate to quantify very low-level, contaminant concentrations; furthermore, criteria for chronic exposure levels have not been developed. Sampling and analysis by USATHAMA is recommended once these analytical methods and criteria have been developed:

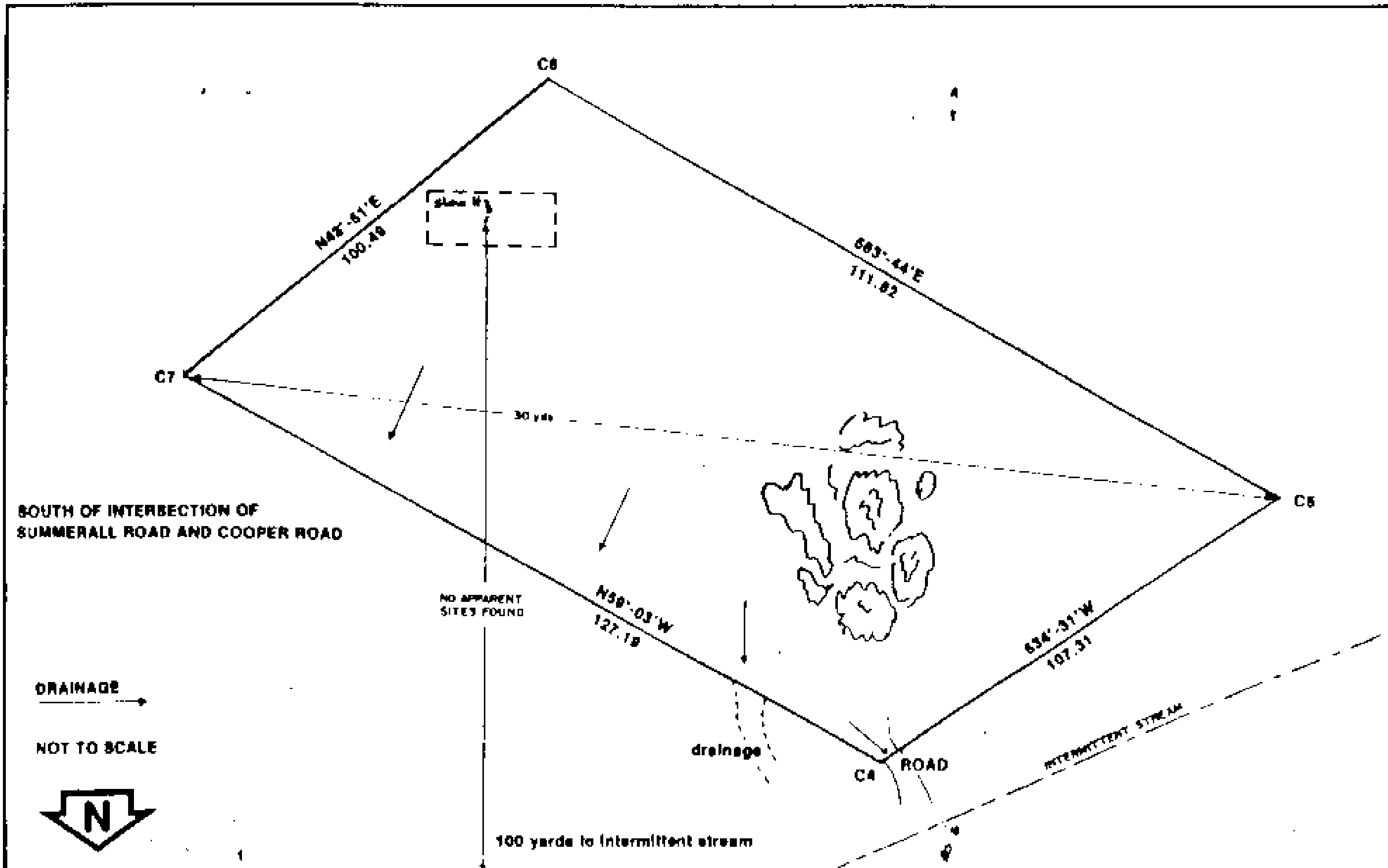
G. T-24A for HD-related subsurface soil and groundwater contaminants (Table 1).

H. T-38 for HD- and VX-related subsurface soil and groundwater contaminants (Table 1).

I. Range J for HD-related subsurface soil and groundwater contaminants (Table 1).

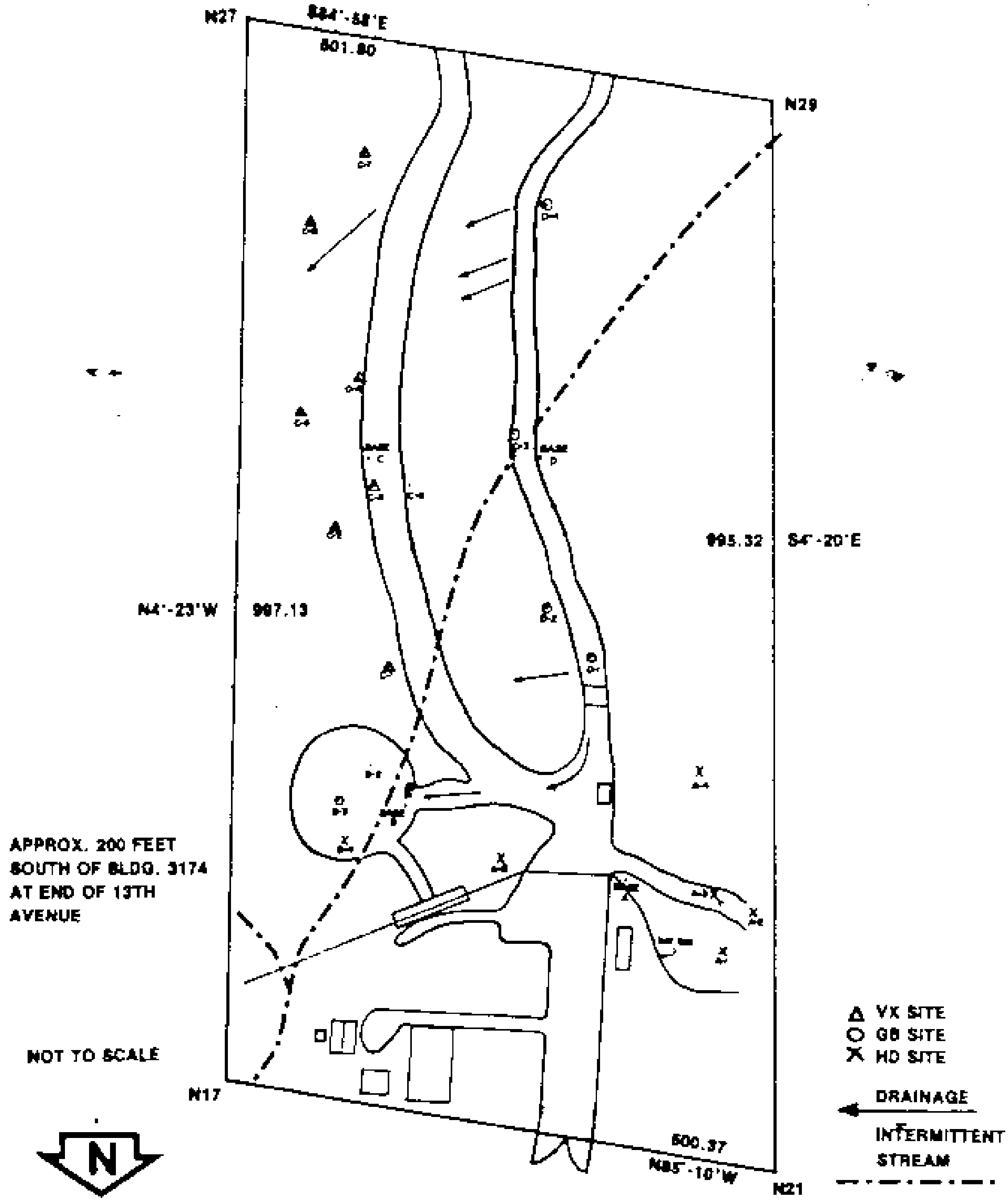
The following action is within the purview of FTMC to accomplish:

J. Investigate Range L by geophysical means to determine the presence of buried munitions. If leaking chemical munitions are detected, then USATHAMA will conduct sampling and analysis of sediments, subsurface soils, and ground water for agents and byproducts.



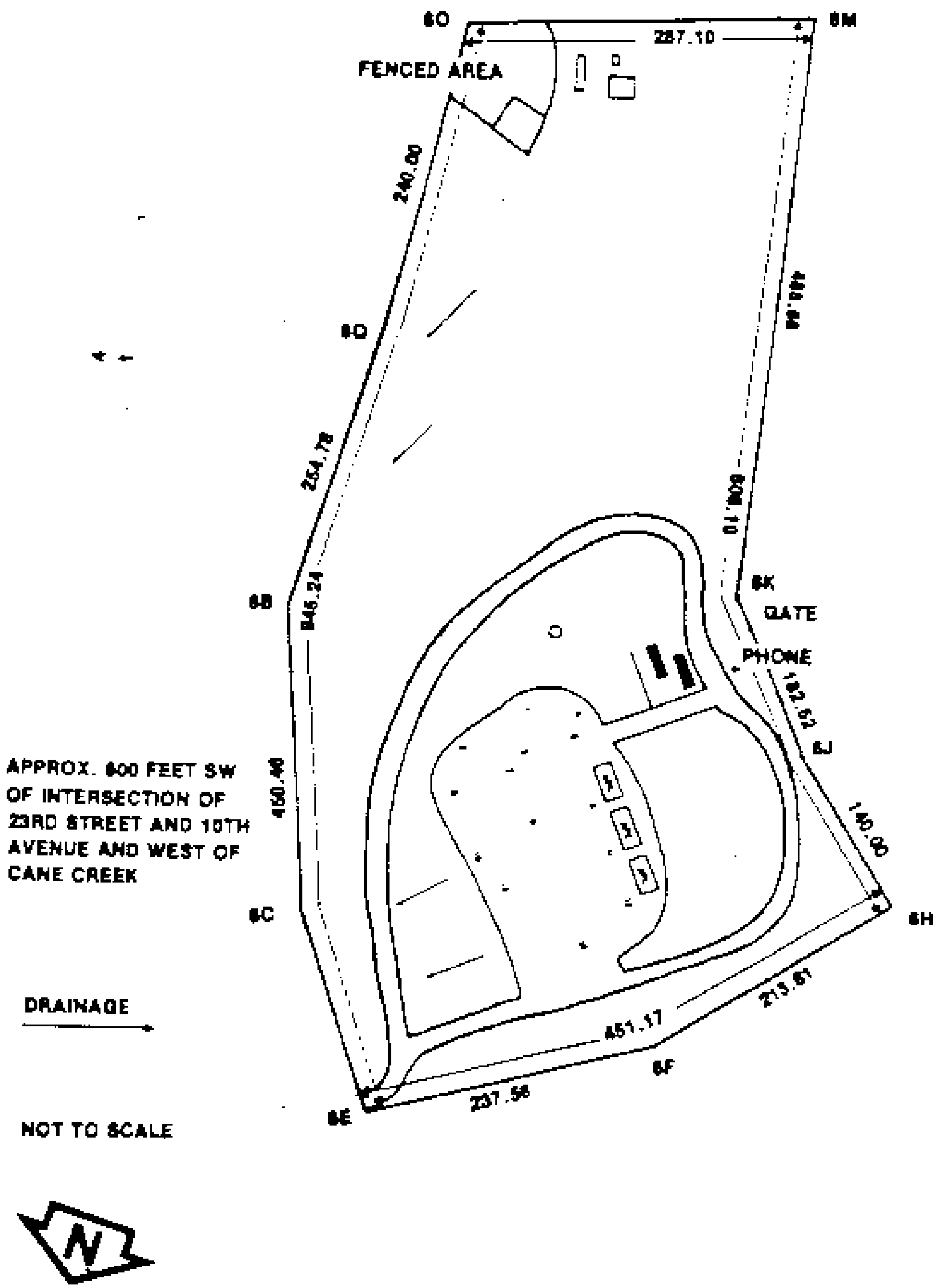
TRAINING AREA T-4 -- FORT McCLELLAN
BIOLOGICAL TEST AREA

Prepared for:
U.S. Army Toxic and Hazardous
Materials Agency
Aberdeen Proving Ground, Maryland

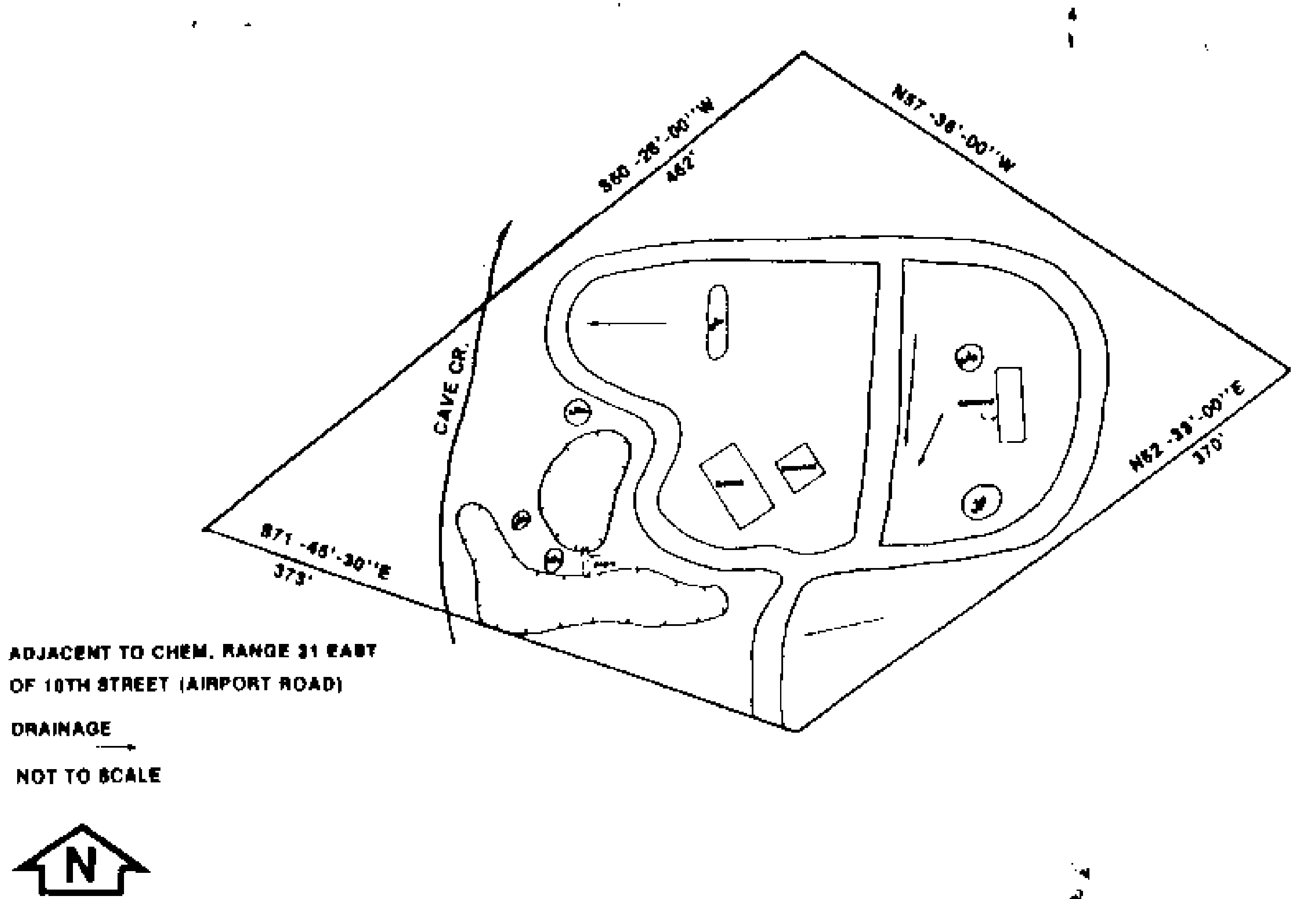


T5 CHEMICAL AREA -- FORT McCLELLAN
EOD REACTION AREA

Prepared for:
U.S. Army Toxic and Hazardous Materials Agency
Aberdeen Proving Ground, Maryland



T6 CHEMICAL AREA (HOWITSER HILL) AGENT DECONTAMINATION AREA -- FORT McCLELLAN	Prepared for: U.S. Army Toxic and Hazardous Materials Agency Aberdeen Proving Ground, Maryland



TRAINING AREA T-31 -- FORT McCLELLAN

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Materials Agency
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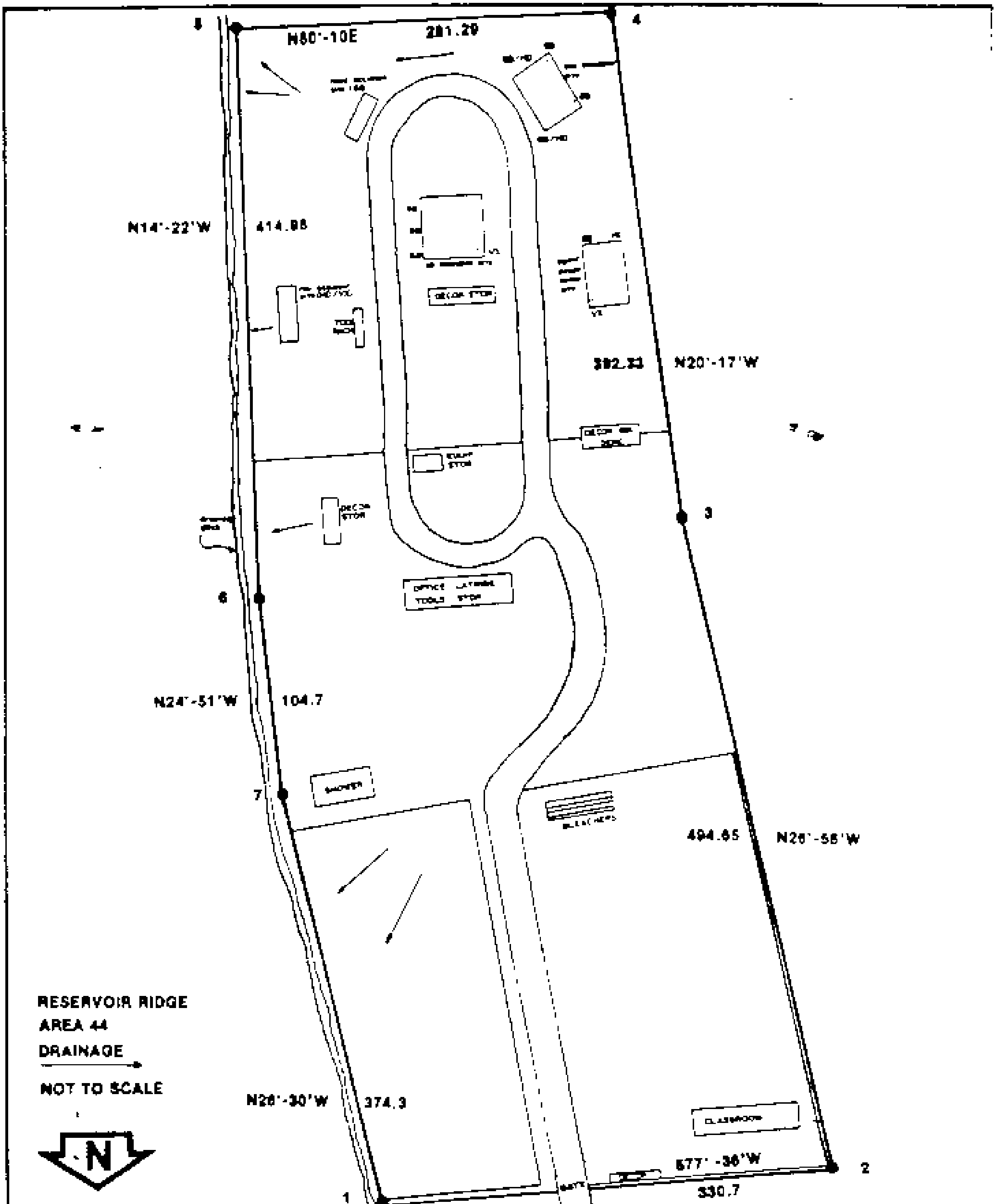
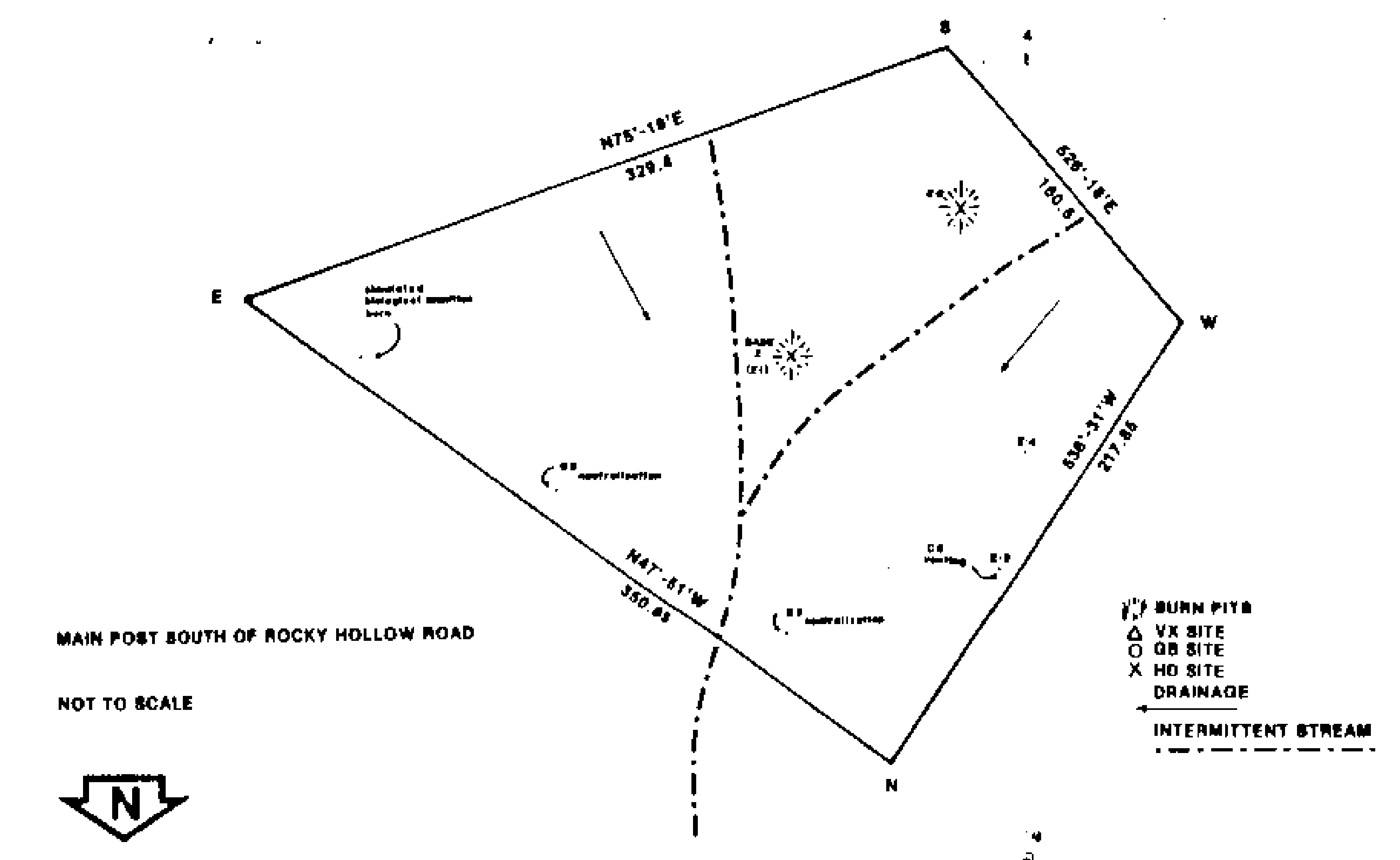


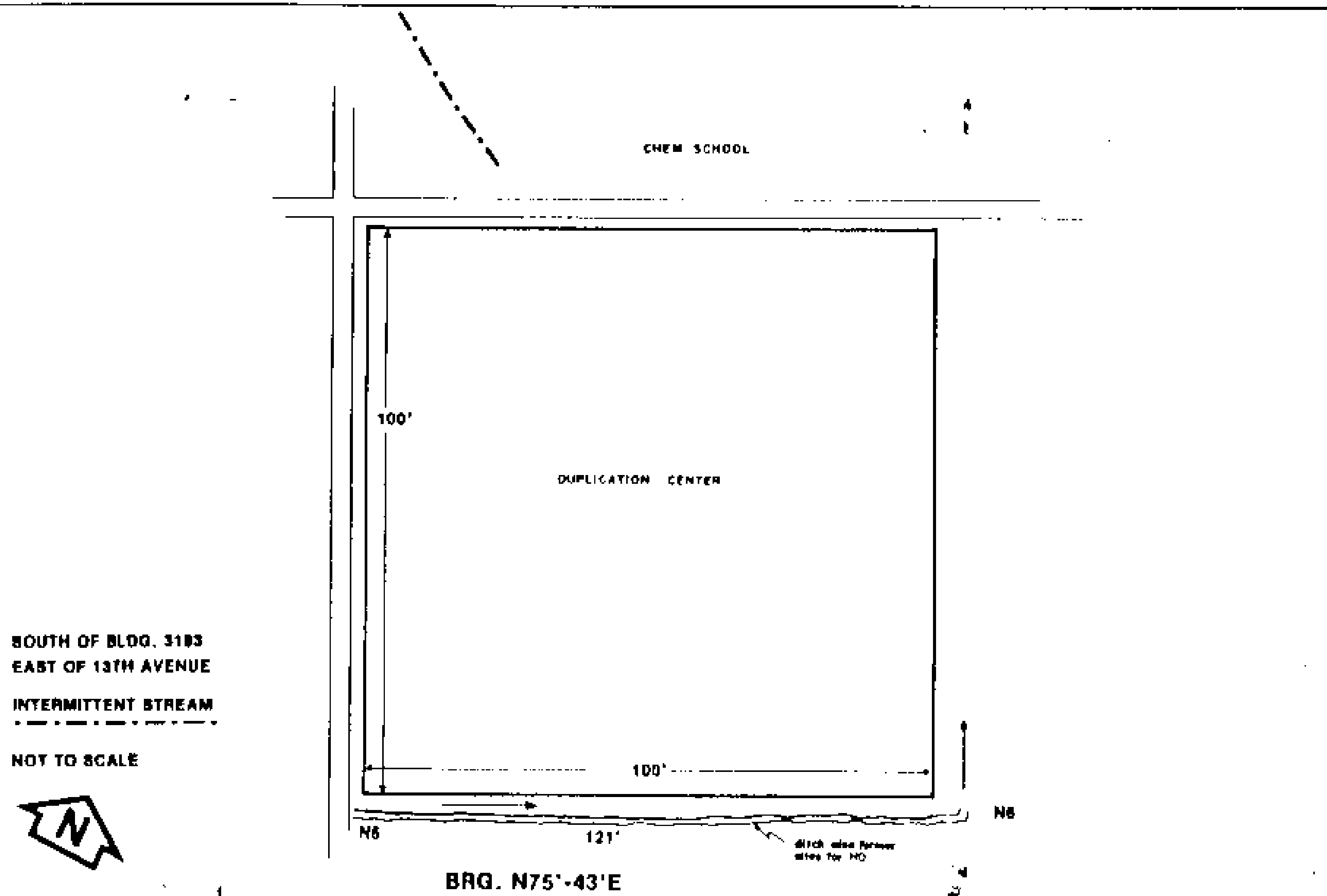
T38 TRAINING AREA -- FORT McCLELLAN
TECHNICAL ESCORT REACTION AREA

Prepared for:
U.S. Army Toxic and Hazardous Materials Agency
Aberdeen Proving Ground, Maryland



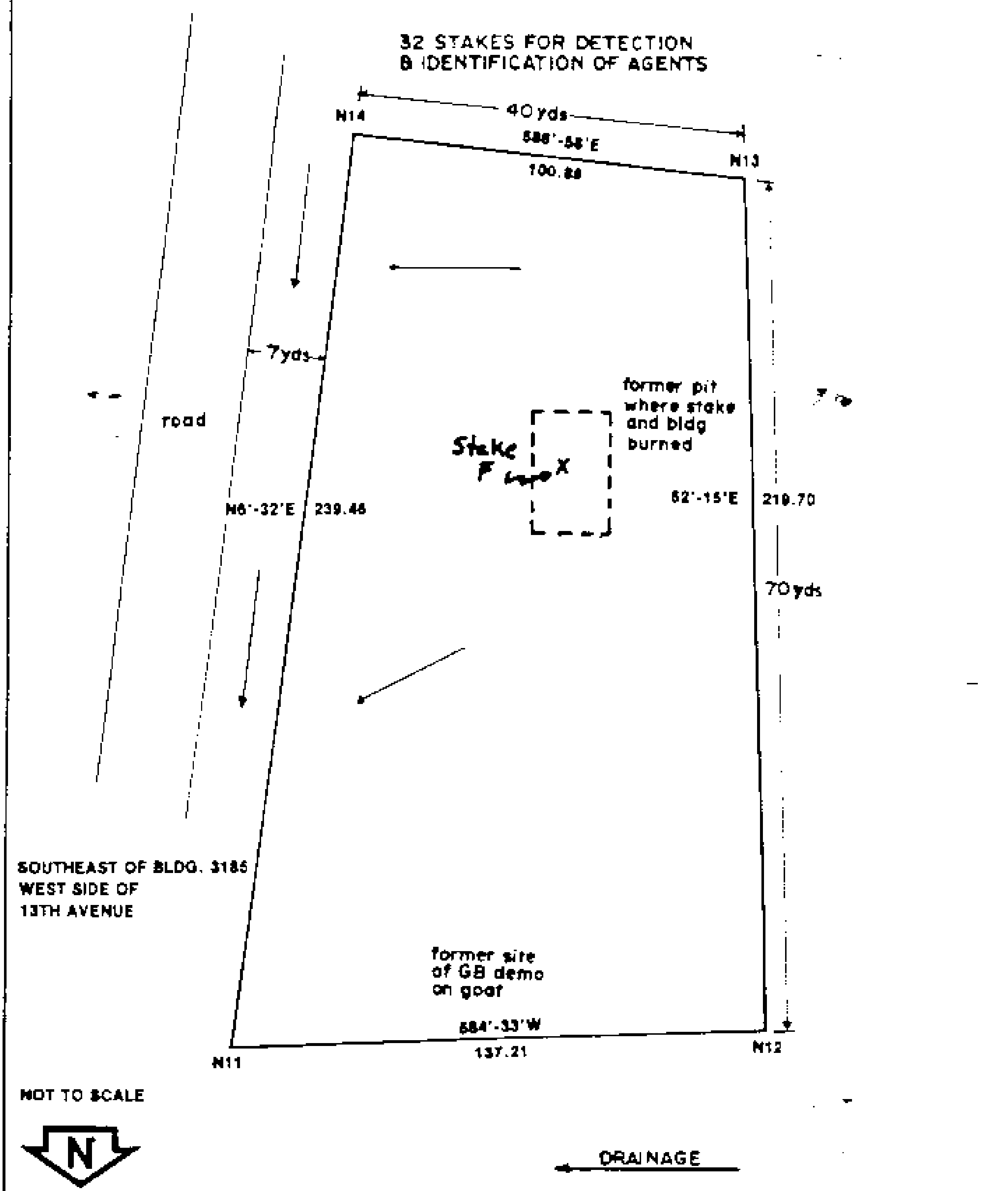
RANGE 24 ALPHA -- FORT McCLELLAN
EOD DISPOSAL AREA

Prepared for:
U.S. Army Toxic and Hazardous
Materials Agency
Aberdeen Proving Ground, Maryland

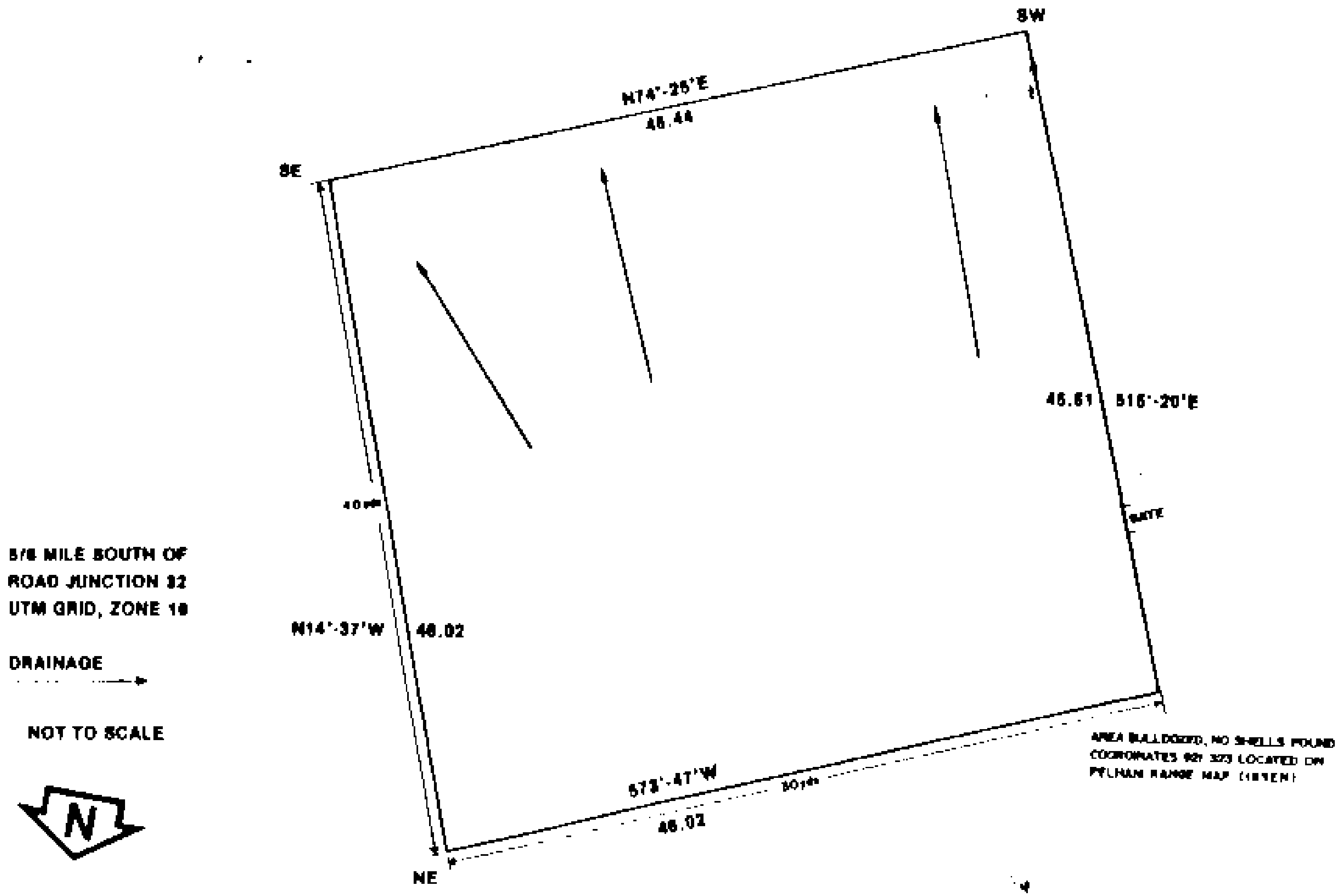


OLD TOXIC TRAINING AREA -- FORT McCLELLAN

Prepared for:
U.S. Army Toxic and Hazardous
Materials Agency
Aberdeen Proving Ground, Maryland



DETENTION AND IDENTIFICATION AREA -- FORT McCLELLAN	Prepared for: U.S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, Maryland



PELHAM RANGE - AREA I -- FORT McCLELLAN
TOXIC SHELL TAPPING

Prepared for:
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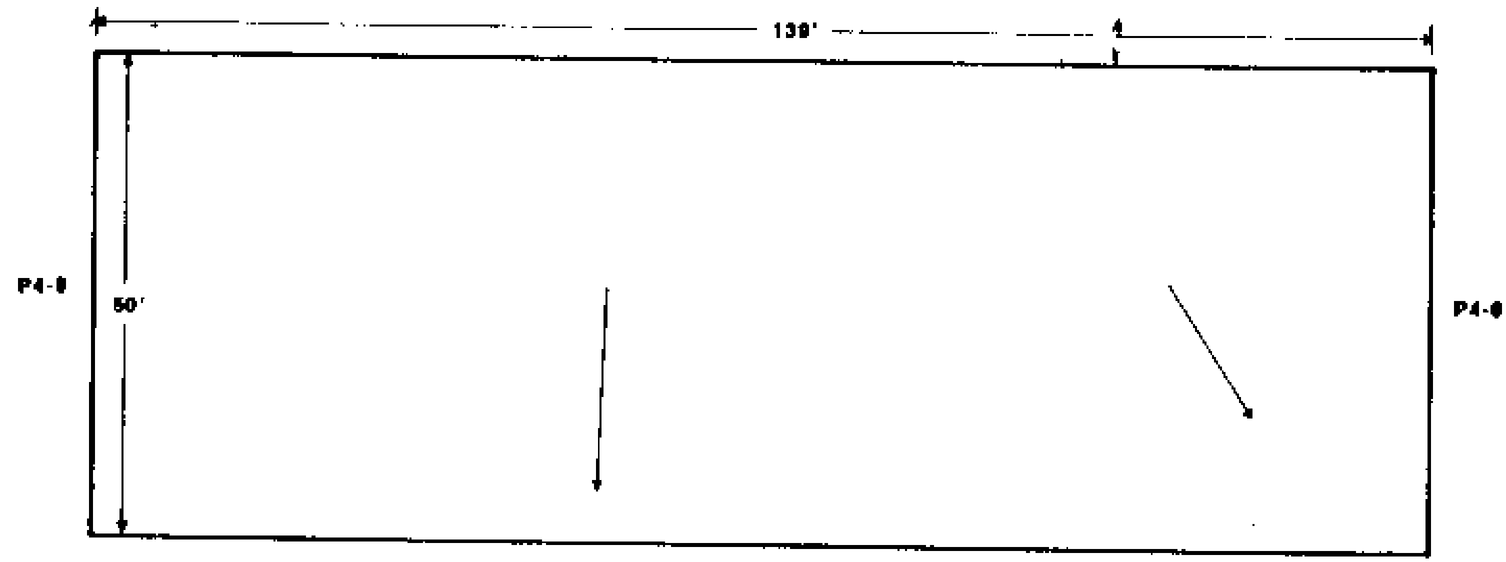
Aberdeen Proving Ground, Maryland



NORTHEAST OF ROAD JUNCTION 26
UTM GRID, ZONE 16

DRAINAGE

NOT TO SCALE

N

PELHAM RANGE - AREA J -- FORT McCLELLAN
REPORT HD BURIAL SITE

Prepared for:
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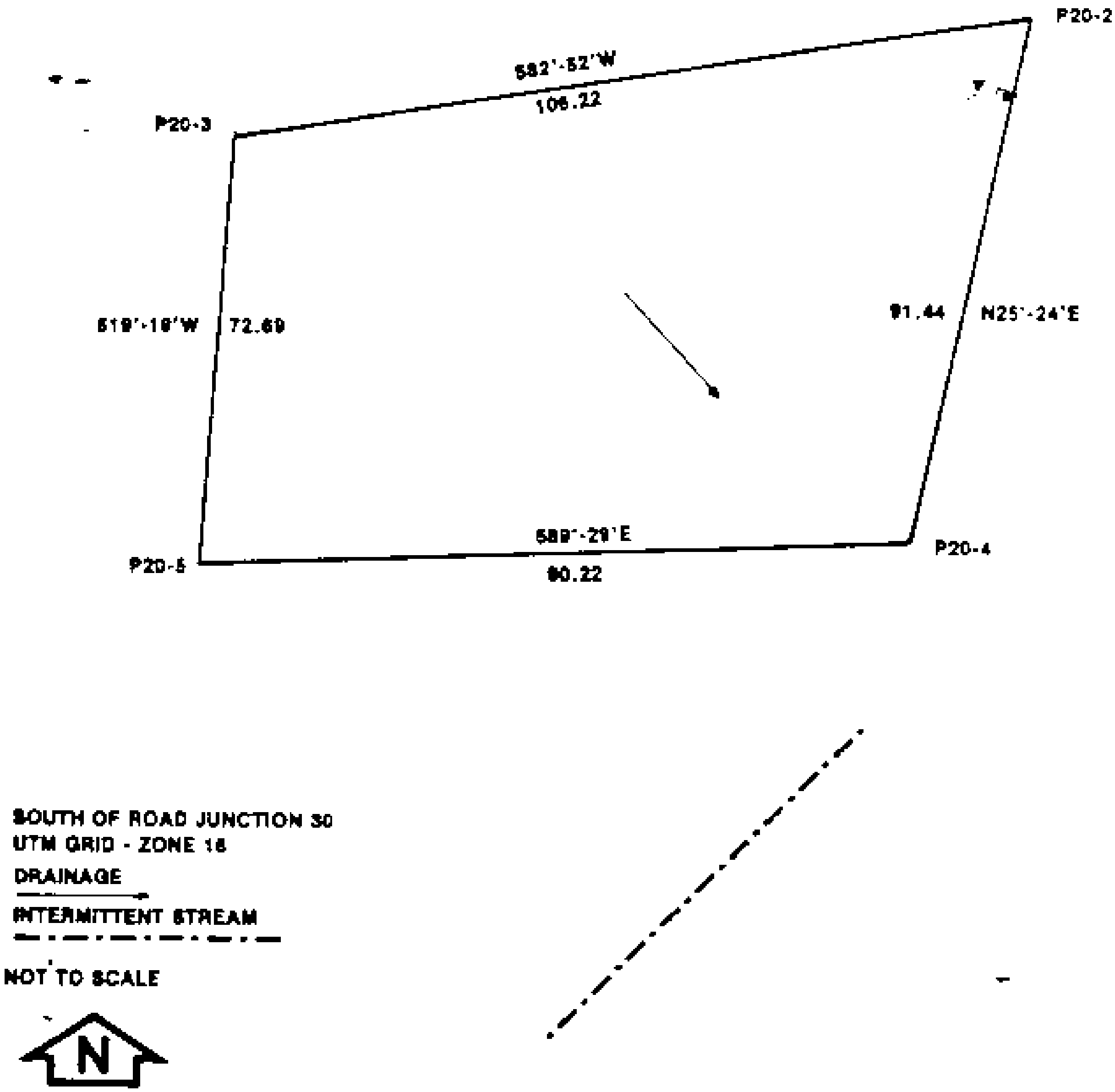
Materials Agency
Aberdeen Proving Ground, Maryland



PELHAM RANGE - AREA K --
FORT McCLELLAN

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APPENDIX

SITE CHARACTERISTICS OF TRAINING AREAS