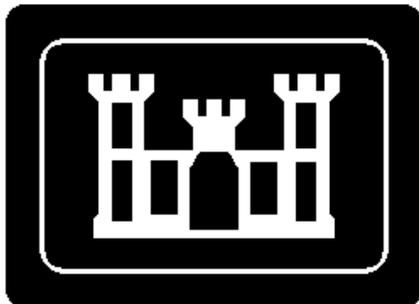


RCRA FACILITY INVESTIGATION REPORT

FOR

**FH-039 (DOL BATTERY SHOP
HOLDING TANK)
FORT HOOD, TEXAS**

PREPARED FOR



**U.S. ARMY CORPS OF ENGINEERS
FORT WORTH DISTRICT**

CONTRACT NO. DACA63-96-D-0021

MAY 4, 1998

SAIC Science Applications
International Corporation
An Employee-Owned Company

**RCRA Facility Investigation
For
Site FH-039 (DOL Battery Shop Holding Tank)**

**Prepared for
U.S. Army Corps of Engineers
Fort Worth District
Fort Worth, Texas**

**Under Contract Number
DACA63-96-D-0021**

**Prepared by
Science Applications International Corp.
655 Metro Place South, Suite 745
Columbus, OH 43017**

May 4, 1998

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ACRONYMS

BEGM	Bureau of Economic Geology
BG	background
EM	Electromagnetic
FH	Fort Hood
ft	feet or foot
mcs	medium specific concentrations
msl	mean sea level
ppb	parts per billion
ppm	parts per million
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RRS	Risk Reduction Standards
SWMU	Solid Waste Management Unit
TNRCC	Texas Natural Resource Conservation Commission
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
UTL	upper tolerance limit

1.0 INTRODUCTION

Fort Hood is an active U.S. Army installation occupying 217,551 acres (339 square miles) in southern Coryell and Bell Counties in central Texas. It is situated 60 miles north of Austin, and about 50 miles south of Waco. The installation is located north of and adjacent to the city of Killeen, east of and adjacent to the city of Copperas Cove, and four miles south of the city of Gatesville. A vicinity map is shown in Figure 1.1.

Fort Hood began operations in 1942. Robert Gray Air Field, originally operated by the Air Force as Robert Gray Air Force Base, was established in 1947 (U. S. Army 1996a). Fort Hood's mission is training, testing, and deployment of military personnel and equipment. The post is commanded by the III Corps Commander. Currently, the post supports two full armored divisions (the 1st Cavalry and 4th Infantry Divisions). Forty-three thousand military personnel are stationed there; and an additional 30,000 family members, civilians, volunteers, and private-sector employees also live or work at Fort Hood (U.S. Army 1996b). Among the military assets of Fort Hood are approximately 2,500 tracked vehicles, over 11,000 wheeled vehicles, six fixed wing aircraft, and 230 rotary-wing aircraft. The post has 67 active firing and demolition ranges.

The Fort Hood military reservation is regulated under the Resource Conservation and Recovery Act (RCRA) as a hazardous waste management facility. Fort Hood has a RCRA permit to operate three hazardous waste storage units. The RCRA permit requires that Fort Hood perform a RCRA Facility Investigation (RFI) for 40 solid waste management units (SWMUs) listed in the permit. These SWMUs are distributed across the military reservation, in the main cantonment, West Fort Hood, and North Fort Hood. They include former solid waste landfills and burial sites, former and inactive underground storage tank locations, active wash rack/sewer systems, effluent ponds, and a sanitary sewer network. An installation map is shown in Figure 1.2.

This report describes the investigation of SWMU FH-039, DOL Battery Shop Holding Tank, one of 35 SWMUs investigated during the RFI conducted November 1996 through March 1997. FH-039 is located in the main cantonment of Fort Hood at the intersection of Tank Destroyer Boulevard and 77th Street.

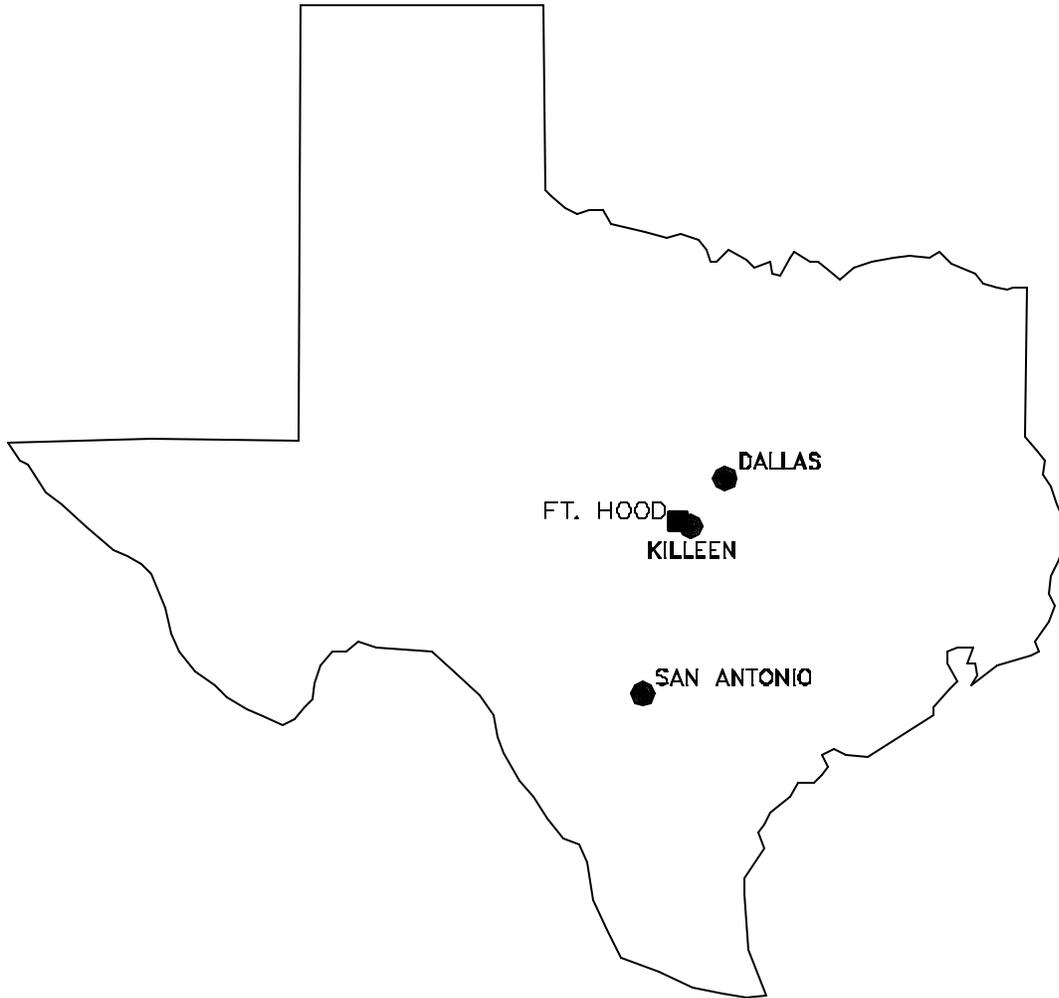
1.1 BACKGROUND

FH-039 is the area that previously held a 600-gallon tank which was used to collect electrolyte from spent, lead-acid batteries. The tank was trailer mounted and placed along the north edge of asphalt pavement with a 4-foot by 4-foot limestone drip pad immediately adjacent to the pavement edge. The discharge valves on the tank were located over the drip pad. Electrolyte was collected in the tank and, once neutralized, taken to the DOL Cannibalization Point where the mixture was emptied in an underground concrete holding tank (FH-040). The DOL Cannibalization Point was closed in 1986. Subsequently, the neutralized electrolyte from FH-039 was disposed of in the existing sanitary sewer. Operations at the site ceased sometime in the early 1990's. Photographs of the site were taken in April, 1997 and are presented in Figure 1.3. The site remained unchanged from the time the holding tank was taken out of service until the site was excavated for the current facilities.

1.2 SCOPE AND OBJECTIVES

The objective of the RFI at FH-039 was to determine if a release to the environment has occurred due to neutralized electrolyte leaking into soils surrounding the tank and drip pad.

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FORT HOOD, TEXAS



RCRA FACILITY INVESTIGATION

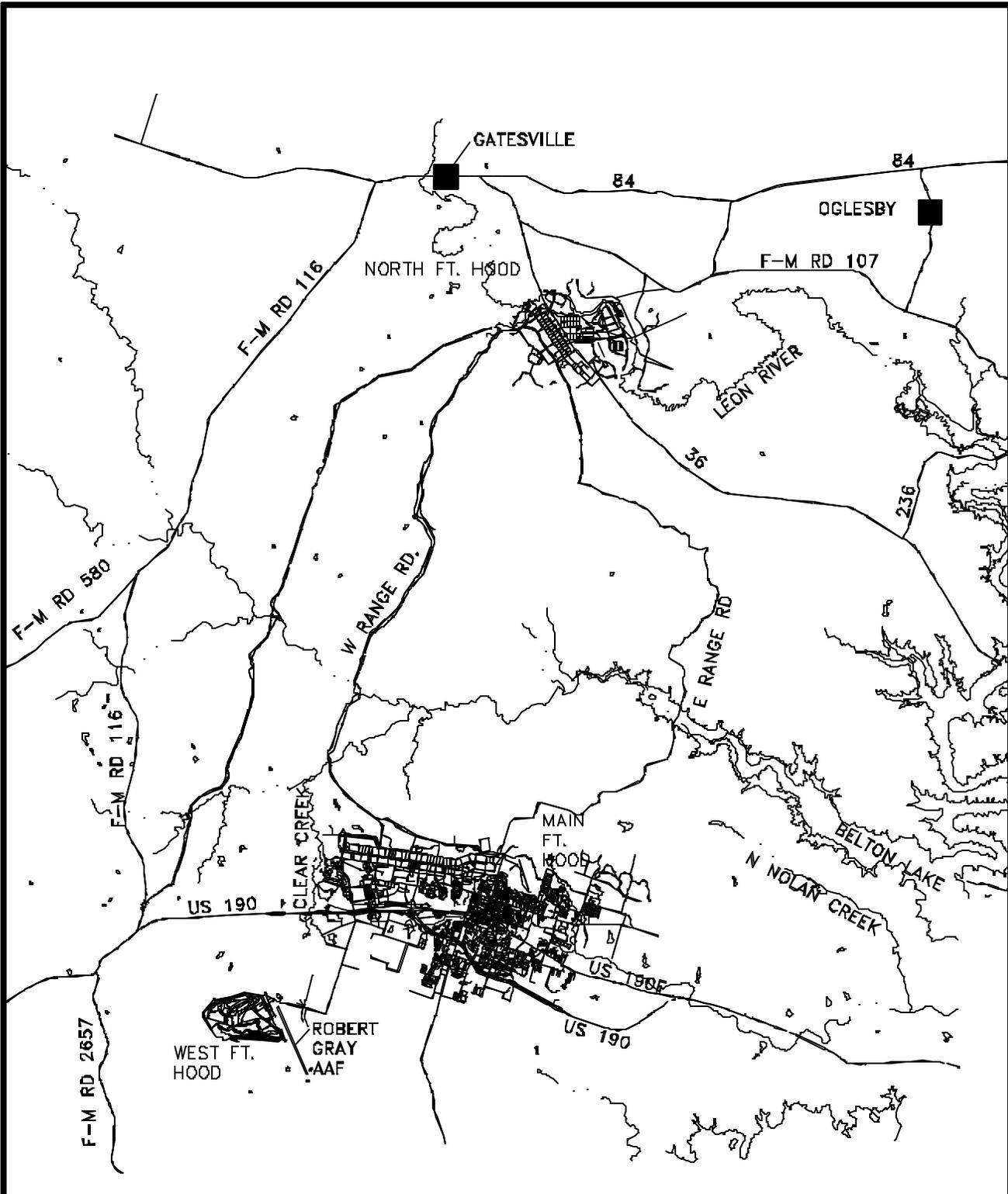
**FORT HOOD
VICINITY MAP**



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LEGEND

-  MAJOR ROADS
-  RIVERS/STREAMS
-  WATER BODIES

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RCRA FACILITY INVESTIGATION

FT. HOOD INSTALLATION MAP



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DRAWN	CHECKED	DATE	SCALE	PROJECT NO.	FIGURE NO.
			1"=7000M		1.2



Figure 1.3. Photograph of FH-039.

2.0 ENVIRONMENTAL SETTING

The material presented in this section describes the physical characteristics of FH-039 and its surroundings. The geology, physiography, and climate are presented using regional and site-specific data where available.

2.1 PHYSIOGRAPHIC SETTING

Fort Hood is located within the eastern edge of the Lampasas Cut Plains region of the North-Central Plains physiographic province. The topography of Fort Hood consists of small stream valleys separated by ridge-forming mesas. Relief is as great as 340 ft. The Black and Blackwell Mountains are prominent features north of the main cantonment, as are Seven Mile Mountain at West Fort Hood, and the Dalton Mountains southwest of North Fort Hood. A topographic map of the main cantonment of Fort Hood is provided in Figure 2.1.

Local relief on the main cantonment and at West Fort Hood is generally less than 100 ft, with flat to gently rolling topography. Elevations on the main cantonment range from 860 to 950 ft above mean sea level (msl). SWMU FH-039 elevation is approximately 950 ft above msl. The ground surface slopes to the west towards an unnamed tributary of Clear Creek.

The rivers, streams, and creeks that constitute the main surface water pathways at Fort Hood are shown on Figure 1.2. The main cantonment lies along a watershed divide between Belton Lake and the Leon River, downstream from the lake. The western and north-central parts of the main cantonment are drained by Clear Creek, which discharges to House Creek. House Creek is a tributary to the eastward-flowing Cowhouse Creek, which discharges to Belton Lake, a man-made reservoir. South Nolan Creek and North Nolan Creek both originate on Fort Hood and flow eastward to the Leon River, below Belton Lake.

2.2 GEOLOGIC CONDITIONS

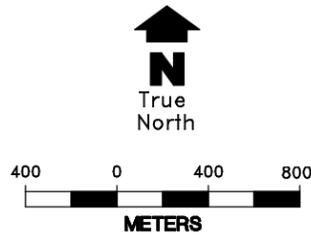
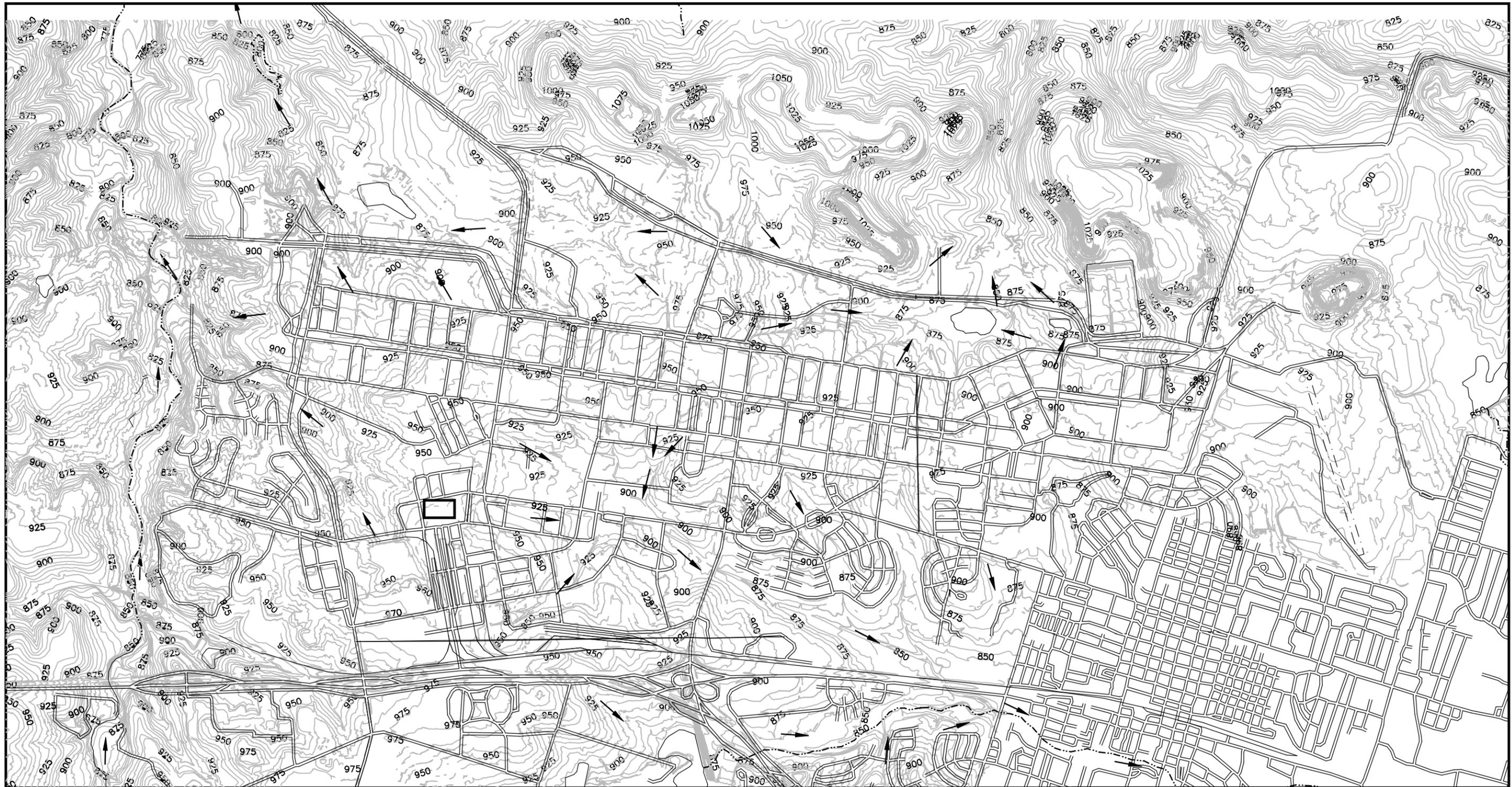
A summary of the geology of the Fort Hood area relevant to this RFI is adapted from the Final RCRA Facility Investigation Work Plan, 35 Solid Waste Management Units, Fort Hood, Texas (USACE 1995). Relevant information on the occurrences of soils and bedrock has been incorporated to further characterize the geology of FH-039 and its surroundings.

2.2.1 Bedrock

Lower Cretaceous marine sedimentary rocks make up the stratigraphy underlying Fort Hood. The Fredericksburg Group consists of several stratigraphic units. The Walnut Formation is the lowermost unit of the Fredericksburg Group and is the dominant stratigraphic unit in the main cantonment. It consists of shales with interbedded limestone, chalky nodular limestone, and shell aggregates. The fossiliferous Walnut Formation is exposed in many locations at Fort Hood. It varies in thickness from 100 to 150 ft (BEGM 1979). The Comanche Peak Formation and an undifferentiated unit overlie the Walnut Formation, but are present at the surface only north of the main cantonment in the Black and Blackwell Mountains, and on West Fort Hood on Seven Mile Mountain.

Bedrock dips gently to the southeast throughout the area. Inactive faults are present in the subsurface to the east of Fort Hood along the Balcones Fault Zone, which runs through Bell, McLennan, and Hill Counties.

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LEGEND

-  TOPOGRAPHIC CONTOUR (FT.)
-  DRAINAGE
-  SURFACE DRAINAGE FLOW
-  FH-039

U.S. ARMY
FORT HOOD, TEXAS



RCRA FACILITY INVESTIGATION

TOPOGRAPHY OF MAIN CANTONMENT



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2.2.2 Unconsolidated Materials

Alluvial deposits of Quaternary age are present along stream valleys on the main cantonment, specifically along South Nolan Creek on the southern edge of the cantonment (USACE 1995). It is suspected that much alluvium and other natural surface deposits have been reworked throughout the active life of Fort Hood during construction projects.

2.3 CHARACTERIZATION OF SOILS

In many areas of the main cantonment, silty or sandy clay soils overlie bedrock. In upland areas, these soils contain abundant rock fragments. In general, these soils have low permeabilities (USDA 1985a,b). They range in thickness from 15 to 20 ft. Because soils have been extensively reworked for construction and landfilling in the SWMUs that were investigated, it is difficult to apply the USDA classification to the soils encountered on the main cantonment.

2.4 CHARACTERIZATION OF CLIMATE

The climate of the Fort Hood-Killeen area can be characterized as semi-arid continental. Winters (December-March) are mild, with the average daily maximum temperature in January (the coldest month) reaching 60° F. Below-freezing temperatures occur on an average of 23 days per year. The normal daily winter temperature range is 42 to 62° F. At times, strong northerly winds accompanied by sharp drops in temperature occur during the winter months. Summers (June-September) are hot and dry. The average daily maximum temperature in August, the hottest month, reaches 95.9° F. The normal daily temperature range for summer is 75 to 95° F. The average daily temperature in Killeen is 68.1° F.

Average annual rainfall in the Killeen area is 30.4 inches, and is most concentrated from September to May (U.S. Army 1996). Snowfall is rare. The average annual humidity in the region is 55 percent. Total rainfall for 1996 at Fort Hood was 26.7 inches. The ten months prior to the start of the field program for this RFI were anomalously dry. During the five-month period in which the field program of the RFI was conducted, precipitation was higher than the historical monthly averages. Severe weather in the form of heavy rain, hail storms, and ice storms is common in the winter months.

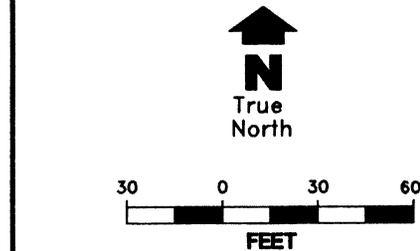
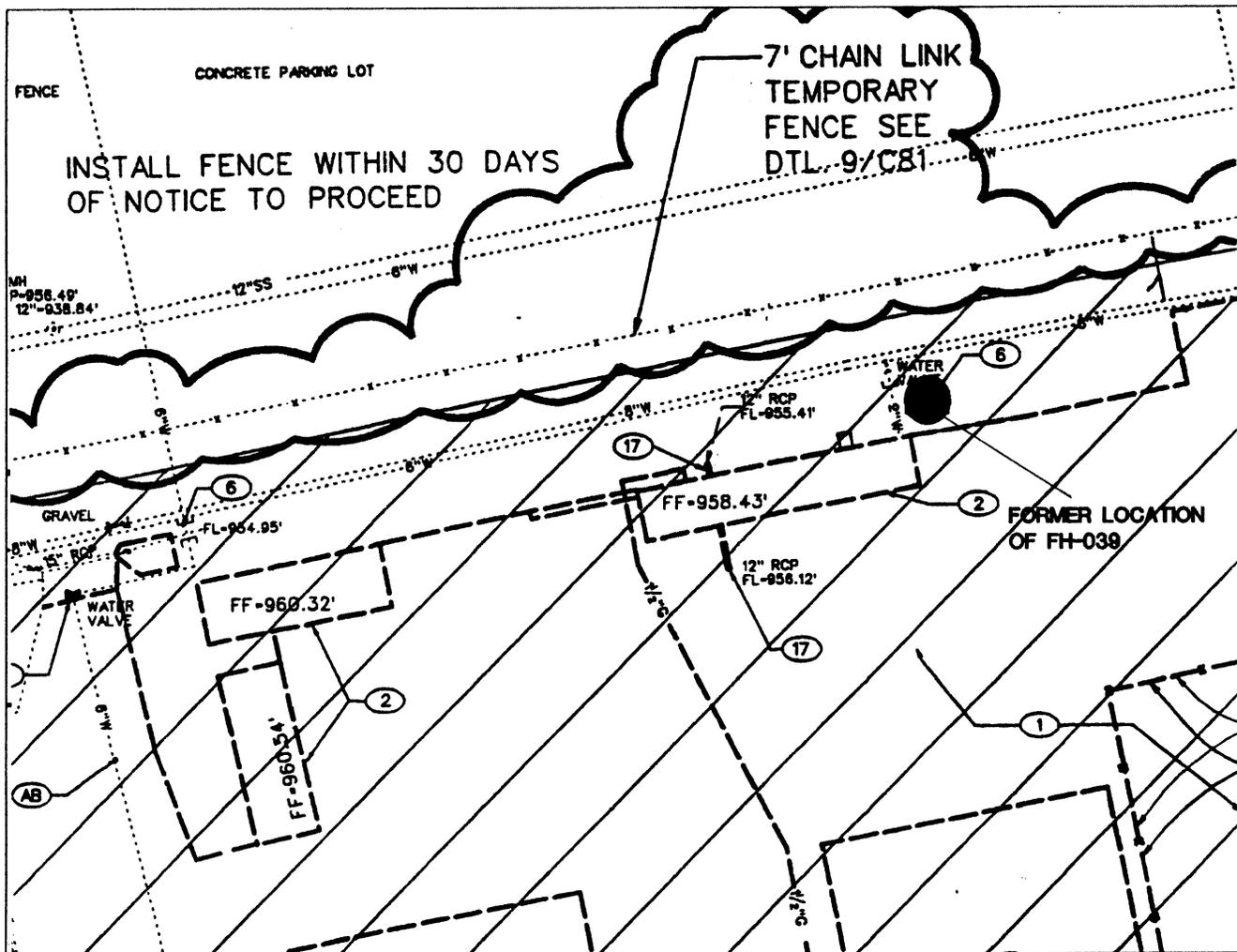
3.0 UNIT CHARACTERIZATION

Site FH-039 is the area around the old trailer-mounted electrolyte tank that was used to collect electrolyte from spent lead-acid batteries. The electrolyte collected in the tank was diluted with water and sodium bicarbonate was added to neutralize the material. When a pH of 7 was achieved, as determined with pH paper, the tank was taken to the DOL Cannibalization Point, where the mixture was emptied into an underground concrete holding tank (FH-040) and discharged into the sanitary sewer system. The only known waste material handled at FH-039 was spent lead-acid battery electrolyte. Therefore, the contaminants of potential concern in the investigation are lead and acidity (pH<2). The sources of this contamination are drips from the limestone gravel lined drip pad and from spills at the site.

Historical information for the site is limited to a site visit performed in April 1995. At the time, the entire site was under construction and complete demolition of the onsite buildings and pavements had occurred. The site had been graded and soils at the site had been disturbed. Construction of Building 40015 and a 9 inch thick concrete hardstand was underway. No samples were taken during the site visit.

Drawings for the construction of Building 40015 at the location of FH-039 provide details on the excavation, grading, and paving at the site. Figures 3.1 through 3.3 address the location of the former drip pad in relation to the construction activities that followed removal of the tank. The original elevation of the FH-039 area was between 957 and 958 ft above msl. It is evident from Figure 3.3 that the post-construction elevation of the site was between 955 and 956 ft above msl. Figure 3.4 shows that the construction of the concrete pavement at the site called for 6 inches of lime-stabilized subgrade on top of 6 inches of raw subgrade, with 9 inches of roller compacted concrete overlying these. If the final site elevation is 955 to 956 ft above msl, the area would have been graded at least 9 inches and as much as 21 inches below the final paved elevation, depending upon how much in-place material could be reworked for the twelve inches of subgrade. Therefore, at least 1 foot and perhaps as much as 2.5 ft of soil was removed from the site during the construction of Building 40015.

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 FORT HOOD, TEXAS
 RCRA FACILITY INVESTIGATION

PRE-DEMOLITION DETAIL OF
 FH-039 AND VICINITY

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FIGURE NO.
 3.1

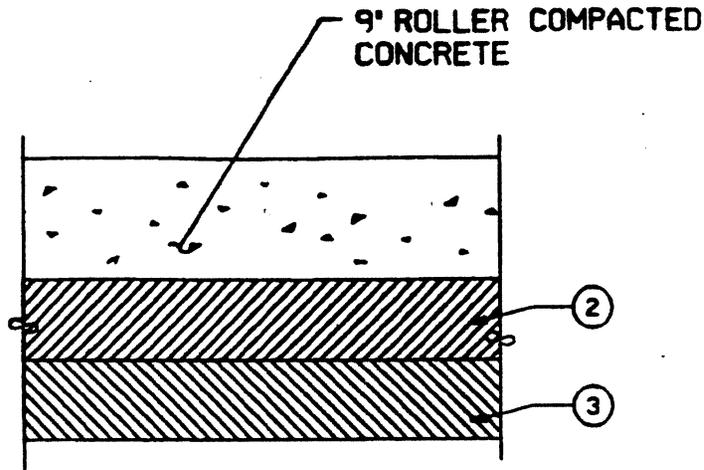
GENERAL NOTES

C. ALL BUILDING FOUNDATIONS WITHIN THE LIMITS OF CONSTRUCTION WORK SHALL BE DEMOLISHED TO 4' BELOW FINISHED GRADE.

KEYED NOTES

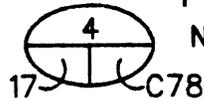
- 2. REMOVE EXISTING CONCRETE SLABS OR BUILDING FOUNDATION (SEE GEN. NOTE C)
- 6. CAP OPEN ENDS OF VALVES, FITTINGS AND PIPE LINES WITH MANUFACTURER'S STANDARD PIPE PLUG OR CAP.
- 17. REMOVE EXISTING CULVERT AND HEADWALLS.

SOURCE: CONTRACT NO. DACA63-94-C-0100, SHEET NO. C32



RIGID RC CONCRETE PAVEMENT SECTION

NOT TO SCALE



KEYED NOTES

1. 6" STABILIZED AGGREGATE BASE COURSE COMPACTED TO AT LEAST 100 PERCENT OF MAXIMUM DENSITY.
2. 6" LIME-STABILIZED SUBGRADE COMPACTED TO AT LEAST 95 PERCENT OF MAXIMUM DENSITY OR 6" STABILIZED BASE COURSE COMPACTED TO AT LEAST 95 PERCENT OF MAXIMUM DENSITY.
3. 6" RAW SUBGRADE COMPACTED TO AT LEAST 90 PERCENT OF MAXIMUM DENSITY.



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CONSTRUCTION DETAIL,
ROLLER-COMPACTED CONCRETE
HARDSTAND IN THE VICINITY
OF FH-039

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FIGURE NO.
3.4

4.0 CHARACTERIZATION OF UNIT CONTAMINATION

The RFI program was designed to do the following at SWMU FH-039:

- C Characterize the migration potential of the contaminants identified in the subsurface soils beneath the location of the tank; and
- C Obtain information about the local geological conditions at the site.

No sampling of FH-039 was conducted during the RFI. Rather, construction information such as as-built drawings was used to meet the stated objectives. The demolition, soil removal, and construction that took place in 1995 resulted in the removal of the drip pad, drainage ditch, and, as presented in Section 3.0, much of the shallow soil that would have contained any potential lead contamination. An RFI performed for site FH-041 and a Corrective Measures Implementation Report for FH-042 (USACE 1995b, 1997), where treated battery acid had been released to soils, showed that lead associated with the discharge of neutralized battery acid to the calcareous soils at Fort Hood migrates to a maximum depth of 2.5 ft. Migration of lead occurs when the acids are directly disposed on the ground surface. Because releases at FH-039 were reportedly limited to drips and spills from the holding tank at the site, and the site is underlain by like calcareous soils, it is unlikely that any lead contamination introduced to soils could migrate vertically to 2.5 ft below the surface. Therefore, site grading and construction activities removed a sufficient amount of soils to reduce lead concentrations in soils to levels consistent with background values. Based on USACE records, material excavated from FH-039 was reused as fill for other motorpools at Ft. Hood and has been covered with asphalt or concrete. Any hardstand material removed during excavation of FH-039 was disposed in a construction debris landfill at Ft. Hood.”

5.0 CONCLUSIONS AND RECOMMENDATIONS

All traces of the former position of the battery acid tank, its drip pad, and drainage ditch have been obliterated by construction activities. As discussed in Sections 3.0 and 4.0, construction of Building 40015 in 1995 included extensive soil excavation and the removal of 1 to 2.5 ft of soil at the site. Excavation of the uppermost layer of soils in conjunction with low migration potential of lead in calcareous soils at the site indicate that any lead that may have been released was most likely removed. Based on a review of historical information at the site and the results of similar studies (USACE 1995b; 1997) no further action is proposed for the site.

6.0 REFERENCES

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