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Preliminary Assessment Report for Fort Jacob F. Wolters, Installation 48555, Mineral Wells, Texas

Prepared for

National Guard Bureau, Army Directorate
Aberdeen, Maryland

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Prepared by

Applied Geosciences and Environmental Management Section
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MASTER

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Acronyms

ACM	asbestos-containing material
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DHUD	U.S. Department of Housing and Urban Development
EPA	U.S. Environmental Protection Agency
ESE	Environmental Science and Engineering, Inc.
ESO	environmentally significant operation
FISP	Facility Inventory and Stationing Plan
HIPAR	High-Power Acquisition Radar
IFC	Integrated Fire Control
IRFNA	inhibited red fuming nitric acid
IRP	Installation Restoration Program
MLA	Missile Launch Area
NGB	National Guard Bureau
PA	preliminary assessment
PCB	polychlorinated biphenyl
POL	petroleum, oils, and lubricants
RCRA	Resource Conservation and Recovery Act
TDH	Texas Department of Health
TWC	Texas Water Commission
TXARNG	Texas Army National Guard
UDMH	unsymmetrical dimethylhydrazine
USACE	U.S. Army Corps of Engineers
USAEC	U.S. Army Environmental Center (formerly USATHAMA)
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency (now USAEC)
USGS	U.S. Geological Survey
UST	underground storage tank
UTES	Unit Training Equipment Site

**Preliminary Assessment Report for
Fort Jacob F. Wolters,
Installation 48555,
Mineral Wells, Texas**

Summary

This report presents the results of the preliminary assessment (PA) conducted by Argonne National Laboratory at the Texas Army National Guard (TXARNG) property near Mineral Wells, Texas. Preliminary assessments of federal facilities are being conducted to compile the information necessary for completing preremedial activities and to provide a basis for establishing corrective actions in response to releases of hazardous substances. The principal objective of the PA is to characterize the site accurately and determine the need for further action by examining site activities, quantities of hazardous substances present, and potential pathways by which contamination could affect public health and the environment. This PA satisfies, for the Fort Wolters property, the requirement of the Department of Defense Installation Restoration Program.

Fort Wolters, presently comprising 3,985 acres, is located near Mineral Wells, Texas, which is in Palo Pinto County. The majority of the TXARNG property extends eastward into Parker County. Fort Wolters has a long history of military operations dating from 1925. During World War II, it was the location of a large Infantry Replacement Center for the War Department, occupying 7,500 acres. After World War II, Fort Wolters became a U.S. Army helicopter training center. In the 1960s, Fort Wolters was the site of a Nike-Hercules Missile Program missile launch area and integrated fire control area. Throughout the Vietnam Conflict, it was the location of the nation's largest helicopter training base. In 1975, ownership of much of the reservation was transferred to state and local agencies.

The facility is the primary training area for two tank battalions, an armored cavalry squadron, and a forward support battalion. Fort Wolters is used for training in basic infantry skills, maneuver exercises, engineer skills, maintenance, helicopter operations, and use of firearms. It is also used extensively for aerial drop training by the Texas Air National Guard and the active U.S. Air Force. Organizational maintenance support is available through the Unit Training Equipment Site 2 (UTES 2). Facilities are available to house approximately 500 personnel.

Maintenance activities performed at the Fort Wolters property as part of TXARNG operations require the use of hazardous materials and could result in the release of hazardous waste. In addition, hazardous waste could be present on the property as a result of the former Nike missile base operations, or in the form of original construction materials, or as a result of unauthorized disposal of waste on the property. Environmentally significant operations associated with the property are the following: (1) fuel storage and dispensing, (2) storage of hazardous materials/hazardous waste, (3) vehicle/equipment washing, (4) former Nike missile base operations, (5) the use of hazardous construction materials, and (6) unauthorized disposal of waste on the property. The review of both historical and current practices at the property indicated that the Fort Wolters TXARNG property poses low potential risk to human health and the environment.

Groundwater is not a significant source of drinking water in the area, although a few domestic wells are located within the 4-mi radius of concern. Fuel represents the highest volume of hazardous materials present on site. The central fueling area is near a 14,000-gal aboveground storage tank located within a concrete containing basin that prevents contaminant migration via the groundwater or surface water pathways. Older underground storage tanks, including those dating from the former Nike missile base operations, have been removed. Maintenance and fueling operations at the former missile launch area could have resulted in subsurface contamination, especially at the location of the former waste acid pit, into which waste acid or solvent cleaning solutions were discarded. Limited subsurface soil sampling at the location of the former waste acid pit is recommended to confirm that residual subsurface contamination is not present. Water sampling already performed within the abandoned missile silos indicates that no contamination is present at those locations.

Surface water from Lake Mineral Wells, located south of Fort Wolters, is the primary source of drinking water in the vicinity of Fort Wolters. Drainage from maintenance work areas is directed through oil-water separators before it enters the sanitary sewer system. Storage facilities for hazardous materials/hazardous wastes are largely adequate, preventing migration of contaminants via the surface water pathway. Installation of a small curb (or lip) at the door of the UTES 2 battery storage room is recommended to ensure containment in the event of a release there. The tank/vehicle wash facility at the UTES 2 is designed to prevent release of waste washwater and potential contaminants. If the tank wash area at the former UTES facility (the exercise area maintenance facility) is to be used frequently, upgrading of the washrack by the addition of an oil-water separator and drainage control is recommended.

Two unauthorized waste disposal areas on the TXARNG property are located within surface drainage pathways feeding Lake Mineral Wells. The disposal area in the northern portion of the TXARNG property contains household-type waste and probably results from trespassing civilians. Cleanup of that small disposal area is recommended primarily to discourage continued trespassing on the property. No health hazard or risk to Lake Mineral Wells is suspected. The second, much larger disposal area contains metal debris and other waste strewn over an area approximately 300 ft long and 10 ft wide (as estimated from the air, where the view of the disposal area is partially obscured by vegetation). Close inspection of the disposal area is recommended to characterize the waste content. If the waste is determined to be hazardous in nature (for example, with containers or drums for chemicals or petroleum products), sampling within the disposal area and along the downgradient drainage pathway is recommended. The objective of this limited soil and water sampling effort would be to determine whether contamination is present at a level that would place the downgradient surface water resources at risk.

Surveys have confirmed the presence of polychlorinated biphenyls (PCBs) in transformers on the site and asbestos-containing construction materials in some buildings. The transformers have been catalogued with respect to PCB concentration and are monitored by the responsible electric company. To ensure the health of site workers, the only building in which asbestos was characterized as being friable is no longer used; abatement measures were recommended in an asbestos survey conducted in 1993.

1 Introduction

This document is a report of the preliminary assessment (PA) conducted by Argonne National Laboratory at the Texas Army National Guard (TXARNG) property known as Fort Jacob F. Wolters, located near Mineral Wells, Texas.

1.1 Authority for the Preliminary Assessment

The National Guard Bureau, Army Directorate, has engaged Argonne to perform PAs of selected National Guard properties. These assessments are being done in a manner consistent with both the Department of Defense Installation Restoration Program (IRP) and the U.S. Environmental Protection Agency's (EPA's) Potential Hazardous Waste Site Preliminary Assessment Guidance. Preliminary assessments of National Guard properties are conducted under the authority and direction of the IRP; the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or, more commonly, Superfund); and the Superfund Amendments and Reauthorization Act of 1986 (Public Law 99-499).

1.2 Objectives

This PA report is based on existing information from the National Guard records that were made available to Argonne investigators and from other sources. Although this PA effort did not extend to the generation of new data, it nonetheless identifies areas where existing data are incomplete, unreliable, or ambiguous and recommends ways to address such shortcomings.

The objectives of the PA are to satisfy Phase I of the IRP and to

- Identify and characterize the environmentally significant operations (ESOs),
- Identify property areas or ESOs that may require a site investigation,
- Identify ESOs or areas of environmental contamination that may require immediate removal,
- Identify properties for which no further action is needed, and

Provide information sufficient to prescore the site with the EPA's PA Scoresheets (September 1991).

1.3 Procedures

The PA began with a review of files located at TXARNG Headquarters at Camp Mabry in Austin, Texas, on May 24, 1993. Other relevant information was obtained on May 25 from the Texas Water Commission, the U.S. Department of Agriculture Soil Conservation Service, and other state and federal agencies. A site visit was conducted on May 27 to obtain additional information through direct observation and interviews with personnel familiar with the property and its operations (Dennis 1993).

1.4 Report Format

This PA report presents a summary and evaluation of the data relevant to the PA for this property. Section 2 describes the property and its surrounding environment and land uses. Section 3 identifies and characterizes the ESOs at the site. Section 4 discusses known and suspected releases to the environment, and Section 5 discusses potential human and environmental receptors for such releases. Section 6 summarizes the findings and conclusions, discusses the quality and reliability of the supporting information, identifies areas requiring further action, and (as appropriate) suggests how such actions can be accomplished. Section 7 lists pertinent materials reviewed. The Appendix provides interview information.

2 Property Characterization

2.1 General Property Information

Fort Wolters is 3 mi east of Mineral Wells, Texas, which is in Palo Pinto County. Fort Wolters is a large TXARNG training facility presently comprising 3,985 acres, the majority of which extends northeast into Parker County. Weatherford, Texas, located in Parker County, is approximately 15 mi east of the property, and Fort Worth, Texas, is approximately 15 mi farther east. Major access routes are State Highway 180 and State Highway 281. Figure 1 shows the general location of the Fort Wolters property, and Table 1 lists pertinent information about it.

The federally owned Fort Wolters property has a long history of military activity dating from 1925 (Hall 1988). During World War II and for some years after, land used by the federal government for military training was approximately twice that now available and included a substantial cantonment area. A significant portion of the former, more extensive Fort Wolters property, essentially all of the former cantonment area, has since been redeveloped by Mineral Wells as commercial, industrial, and residential areas. Much of the central portion of the former Fort Wolters property was transferred to state and local agencies for use as parks and forest preserves. Most of the property now licensed to the TXARNG remains undeveloped and is used for firing range and training activities. Included in the facility are the former Nike-Hercules Missile Defense Program missile launch area (MLA) and integrated fire control (IFC) area designated DF-70.

2.2 Description of Facilities

The Fort Wolters property is licensed to the TXARNG as a range and training site. Since acquisition, Fort Wolters has been used extensively for all types of training. It is the primary training area for two tank battalions, an armored cavalry squadron, a forward support battalion, and many smaller units of the TXARNG (Whisenhunt 1987). The property is used extensively for aerial drop training by the Texas Air National Guard and the active U.S. Air Force. Fort Wolters is also used by the Army Reserve, the Marine Corps Reserve, the Reserve Officer Training Corps, and the Texas State Rifle Association when these activities do not interfere with military training. Figure 2 shows the general locations of training areas and activities.

FIGURE 1 General Location of Fort Wolters (Sources: Adapted from USGS 1959a, 1959b)

TABLE 1 Identifying Information for Fort Wolters

Installation address	Fort Wolters Training Facility Rt. 4, Building 1202 Mineral Wells, TX 76067
Geographic location	
Latitude	32° 50' N
Longitude	98° 03' W
FISP ^a installation number	48555
Commander	Maj. Gary L. Huffman
Type of facilities	Unit Training Equipment Site Firing range Aerial drop zone Training site Former Nike missile launch area and fire control facility
License information	Federally owned, licensed to the state of Texas
Principal contact	James F. Resner (512) 465-5629

^a Facility Inventory and Stationing Plan.

Source: NGB (1988).

2.2.1 Unit Training Equipment Site 2

The Unit Training Equipment Site 2 (UTES 2) is in the southern portion of the TXARNG property, at the intersection of Wagner Road and Heintzelman Road (FH HH 1988). The UTES 2 provides facilities for maintenance of the approximately 35 wheeled and 65 tracked vehicles assigned to the unit. Operations performed include general vehicle maintenance, vehicle fueling, and vehicle and equipment washing. Vehicle maintenance activities include fluid changes (i.e., oil, transmission fluid, and antifreeze/coolant), filter changes (i.e., gas, oil, air, transmission filters), brake repair, lubrication of axles and drive trains, battery changes, tire repair and replacement, engine repair, transmission repair, electronic repair, minor welding and body repair, and minor spot painting. A diagram of the UTES 2 and supporting facilities is provided as Figure 3.

FIGURE 2 Location of Fort Wolters Training Areas and Activities (Source: Adapted from Hall 1988)

FIGURE 3 Fort Wolters Unit Training Equipment Site 2 (Source: Adapted from FHHS 1988)

Building 620 (the main shop) is a single-story structure set on a concrete slab foundation with concrete slab walls and a vulcanized rubber roof covered with gravel (USACE 1993). The 8,180-ft² building was constructed in 1989. Its eastern portion consists of offices, supply and storage rooms, latrines, a communications room, and a break room. The inner walls are primarily drywall. Most floors and ceilings are tile covered. The western portion of the building consists of a large open bay with three maintenance work areas. The walls and ceiling are metal, and the floor is exposed concrete. Drains within the shop area lead to an oil-water separator. Attached to the work bay is a storage shed for petroleum, oils, and lubricants (POL). The 100-ft² POL storage area is an all-metal room on a concrete slab foundation. Access to the POL storage shed is from outside Building 620.

Building 620A, to the north of Building 620, is the hazardous waste storage building. It was constructed in 1989. The 436-ft² building is of metal construction on a concrete slab foundation. Building 615, built in 1985, serves as a battery storage building. The 144-ft² building is a single-story, all-cement structure. Neither building has floor drains. Curbing is present within the hazardous waste storage building to prevent movement of hazardous fluids outside the building in the event of a spill. The battery storage building is partially curbed; curbing is not present at the doorway.

A vehicle wash area is located west of the Building 620 POL storage shed. Drainage from the wash area is directed through the oil-water separator before it is discharged into the sanitary sewer system. Waste oil from the oil-water separator is stored in a 1,000-gal underground storage tank (UST) (TXARNG 1992b). A lubrication rack is available for vehicle inspections. A fuel-dispensing area with a 6,000-gal UST for gasoline and an 8,000-gal UST for diesel fuel is no longer used, and the USTs have been removed.

Outside the fenced area of the UTES 2 are vehicle washing and refueling areas for use by TXARNG personnel during weekend or annual training exercises. The vehicle wash area is approximately 180 ft west of Building 620 (FHHS 1988). Three vehicle wash bays drain through sedimentation tanks to an oil-water separator. Wash water is recycled. Diesel fuel is stored in a 14,000-gal aboveground storage tank located north of Building 620A (BWR 1990). The tank is located within a concrete retaining basin sloped to a sump drain. A leak detection jacket encloses the joint of the connecting piping from the storage tank. Dispensing equipment is located on a concrete fueling pad. The diesel fuel storage and dispensing system was installed in 1991.

2.2.2 Exercise Area Maintenance Facility (Former Nike Missile Base)

The exercise area maintenance facility is located in the northern portion of the TXARNG property. This facility serves as a motor park, a maintenance facility, and a command post for Fort Wolters' exercise areas (Whisenhunt 1987). Operations performed include general vehicle maintenance, vehicle fueling, and vehicle and equipment washing. This facility was constructed in 1959-1960 as a Nike missile launch area (MLA) (USACE 1958). The Nike integrated fire control (IFC) area was approximately 3,000 ft east of the MLA. When the TXARNG received license to the Fort Wolters property in 1974, the former MLA was redeveloped as a UTES, and some structural modification and additions were made (Adams 1976). A diagram of the exercise area maintenance facility is provided as Figure 4.

Building 1201 serves as a guardhouse. The one-room building is a single-story structure, 39 ft² in area, set on a concrete slab foundation with cinder block walls and an asphalt-gravel roof. The inner ceiling is drywall, and the floor is exposed concrete (USACE 1993).

Building 1202 serves as the facility manager's office. The 1,785-ft² building, consisting of office space, an operations break room, a latrine, and utility rooms, is a single-story structure set on a concrete slab foundation with cinder block walls and a flat tar-gravel roof. The walls are cinder block, the ceilings are drywall, and the floor is primarily carpet glued over floor tile.

Building 1205 serves as a warehouse for nonhazardous materials. The building is a single-story structure, 1,925 ft² in area, set on a concrete slab foundation with cinder block walls and a flat tar-gravel roof. Inner walls of the warehouse are cinder block, and the floor and ceiling are concrete.

Building 1206, the state maintenance shop, consists of an office, a work bay, a latrine, and a mechanical room. The 1,573-ft² building is a one-story structure set on a concrete slab foundation with cinder block walls and a gently sloping tar-gravel roof. The floor in the office is tile covered; the ceiling is drywall. The floor in the large work bay is exposed concrete; the ceiling is metal. When it was constructed in 1960 for the Nike missile facility, the building served as the missile assembly and test building. In 1976, the TXARNG modified Building 1206 to facilitate vehicle maintenance operations (Adams 1976). The work bay area was expanded. The battery room was improved by the addition of a new door, a door frame, and a concrete slab floor that sloped to a floor drain. An acid-resistant sink and splash plates were added, as was an emergency

FIGURE 4 Fort Wolters Exercise Area Maintenance Facility (Sources: Adapted from USACE 1970; Adams 1976)

shower decontamination unit. Two 5,000-gal USTs and associated fuel-dispensing equipment were installed for diesel fuel and gasoline. A portion of an existing dirt berm, built to provide a measure of protection for former Nike workers, was removed to facilitate traffic flow. In 1988, two USTs (a 6,000-gal UST for diesel fuel and a 4,000-gal UST for gasoline), which dated from the former Nike operations and which were no longer used, were removed.

Building 1207 serves as a warehouse. The 829-ft² building is a single-story, one-room structure set on a concrete slab foundation with cinder block walls and a flat tar-gravel roof. The floor is exposed concrete; the ceiling is drywall. When it was constructed in 1960, Building 1207 housed a diesel-fueled emergency power generator.

Building 1208 is a welding shop. The 787-ft² building is a single-story structure set on a concrete slab foundation with cinder block walls and a flat tar-gravel roof. The floor is exposed concrete; the ceiling is metal. Adjacent to Building 1208 is a tank washrack that is not currently used. No oil-water separator is available to filter drainage from the tank wash slab.

Buildings 1209, 1210, and 1211 were constructed in 1960 as missile silos and are currently abandoned. Each 5,788-ft² building is an underground structure with a concrete slab foundation and concrete walls. Roofs are cement slab mounds on the ground surface.

Building 1212 is not used. The 96-ft² structure is set on a concrete slab foundation and has an all-wood frame and walls and an asphalt shingle roof. Building 1212 was a sentry control station when it was part of the former Nike operations.

Building 1213 is a storage shed for nonhazardous equipment and materials. The 42-ft² building is all metal on a cement slab foundation, with no interior finish. During the former Nike operations the building served for acid storage.

Building 1215 is used for POL storage. The 51-ft² single-story structure is set on a concrete slab foundation with cinder block walls and an asphalt-gravel roof. During the former Nike operations, Building 1215 was used for storage of paint and oil.

Building 1219 was built in 1965 and serves as a storage shed for flammable materials. The 144-ft² building is all metal on a cement slab foundation, with no interior finish.

Portions of the former Nike IFC area have been used by TXARNG units, primarily for storage of nonhazardous equipment, during training periods. Building 1178 was built in 1959 and serves as a guardhouse. The 64-ft² building is a single-story structure set on a concrete slab foundation, with cinder block walls and an asphalt-gravel roof. The 1,131-ft² Building 1179 is no longer used, but it did serve as a recreation hall. It is a single-story structure set on a concrete slab foundation with cinder block walls and a flat tar-gravel roof. The floor is tile covered; the ceiling and walls are drywall. Building 1180 serves as a generator building. It is a single-story structure, 964 ft² in area, set on a concrete slab foundation with cinder block walls and an asphalt roof. Floors are primarily exposed cement. Walls are cinder block; the ceiling is drywall. Building 1188 was constructed in 1964 and serves as a warehouse. The 1,018-ft² building is a single-story metal structure set on a concrete slab foundation. Floors are either exposed cement or tile covered. Walls are primarily Transite board; ceilings are tile. Two USTs (a 6,000-gal UST for diesel fuel and a 4,000-gal UST for gasoline) dating from the former Nike operations were removed in 1988, when they were no longer used.

2.2.3 Training Areas

Over 3,900 acres of land are available for field training by armor, armored cavalry, infantry, artillery, engineers, medical, aviation, and other troop units (Hall 1988). Light-duty and unimproved roads provide access throughout the training site for tank and troop maneuver operations. Helicopter stage fields in the northern portion of the training area, built in 1957, are used as field billeting and rendezvous areas. Wells at the two locations supply water resources.

Buildings 1101 and 1102 are located at Stage Area 1 (Grid 928380, as identified by Hall [1988]). The 990-ft² Building 1101 range house is not currently used. It is a three-room, single-story structure set on a concrete slab foundation with an asphalt shingle roof and Transite siding walls. The floor is either exposed cement or tile covered; interior walls and ceiling are drywall. Building 1102 serves as a water pump house. The 48-ft² single-story building is set on a concrete slab foundation with wood frame construction, Transite siding on the exterior walls, and an asphalt shingle roof. Interior walls are drywall; the floor is cement (USACE 1993). The well at this location was drilled to a depth of 400 ft (TDH 1986).

Buildings 1121 and 1122 are located at Stage Area 2 (Grid 889377). The 1,269-ft² Building 1121 range house is not currently used. It is a three-room, single-story structure set on a concrete slab foundation with an asphalt shingle roof and Transite siding walls. The floor is either

exposed cement or tile covered. Interior walls are drywall; ceilings are bare. Building 1122 serves as a water pump house. The 36-ft² single-story building is set on a concrete slab foundation with wood frame construction, wood siding on the exterior walls, and an asphalt shingle roof. Interior walls are wood; the floor is cement. The well at this location was drilled to a depth of 360 ft (TDH 1986).

Building 630, at the southern end of the training area, serves as a field kitchen and administration headquarters. The 1,883-ft² building is a single-story structure set on a concrete slab foundation with metal siding and an asphalt shingle roof. The building, constructed in 1941, consists of two dining areas, a kitchen, a bunk room, and a supply room.

The former ammunition storage facility for the old Fort Wolters operations, located east of the UTES 2, is used as a helicopter staging area and as a storage facility for bulky items that TXARNG units can preposition before training exercises (Whisenhunt 1987). Support buildings in the area include Building 622, constructed in 1957; Building 615, constructed in 1985; Buildings 601, 602, and 602A, constructed in 1987; and Building 604, constructed in 1988. Building 622 is a 65-ft² guardhouse, set on concrete slab foundation with cinder block walls and a cement slab roof. Building 601 is a maintenance shed. It is a single-story structure, 2,340 ft² in area, set on a concrete slab foundation with wood frame construction and a metal roof and siding. Building 602 also serves as a maintenance shed. It is a single-story structure, 3,200 ft² in area, built on a foundation partially of concrete slab and partially of dirt, with wood frame construction and a metal roof and siding. Building 602A is 3,075-ft² shelter for vehicles and personnel. It is a pole structure built on a foundation partially of concrete slab and partially of dirt, with a steel roof and no walls. Building 604 serves as a maintenance office for visiting TXARNG personnel. The 224-ft² building is a single-story structure set on a concrete slab foundation with metal siding and roof. It has a cement floor; the inner walls and ceiling are drywall (USACE 1993).

Specialized field training areas include tank courses and a chemical confidence chamber. Building 658, constructed in 1969, is the gas mask training facility. The 600-ft² building is a single-story structure set on a dirt floor with two concrete slabs. The sides and roof of the building are all metal.

Aviation facilities at Fort Wolters include an approximately 370-acre aerial drop zone for use by the 136th Tactical Airlift Wing and the 181st Tactical Airlift Squadron stationed at Hensley Field, Dallas, Texas (NGB 1978). Operations include aerial drops of paratroops and palletized

equipment and supplies. Aircraft landing facilities are available at the Forward Tactical Landing Strip and the two helicopter stage fields located in the northern training area.

2.2.4 Firing Ranges

Firing ranges at Fort Wolters provide for both individual and crew weapons training (Hall 1988). The types of firing ranges and firing positions available at the site are listed in Table 2. Ammunition stored at the site is listed in Table 3. A co-use agreement is in effect with the Texas State Rifle Association for use of the known-distance rifle range, which was constructed and is maintained by the Texas State Rifle Association (Cain 1986). Support facilities at the firing ranges include an observation tower, an ammunition issue building, target storage sheds, and a latrine. Because of the horseshoe shape of Fort Wolters, access to maneuver areas is through the safety fans of the firing ranges.

2.2.5 Housing and Utilities

On the basis of troop usage data, the NGB determined that the size of Fort Wolters for training purposes is 500 (one battalion size unit [NGB 1986]). Approximately 20 full-time employees are at Fort Wolters. Housing and dining facilities for approximately 500 persons, constructed in 1965, are available in the cantonment area south of the UTES 2. Building 738

TABLE 2 Firing Ranges at Fort Wolters

Type	Total Firing Points
Pistol	10
Rifle	25
Shotgun	5
M203 grenade launcher	12
Submachine gun	10
M60 machine gun	5
Tank Table I and II	10
Tank Table III	5
Tank Table IV	5
Tank Table V	1

Source: Hall (1988).

TABLE 3 Ammunition Stored at Fort Wolters

Type	Rounds Stored	Number Consumed Monthly
5.56 millimeter	24,754	6,780
0.22 caliber	23,750	25
7.62 millimeter	6,300	800
Chemical agent capsules	3	10

Source: TXARNG (1991).

serves as women's barracks and administration building. The 4,900-ft² building is a single-story structure set on a concrete slab foundation with cinder block walls and an asphalt shingle roof. Floors are primarily tile covered, and walls and ceiling are primarily drywall. Building 741N and Building 741S serve as men's barracks. Each building is a two-story structure set on a concrete slab foundation with cinder block walls and an asphalt shingle roof. The buildings, designated as 741 north and 741 south, are connected by a two-story shower-latrline facility. The combined area of Building 741N and Building 741S is 10,950 ft². Dining facilities are provided in Building 742. This 9,850-ft² building is a single-story structure set on a concrete slab foundation with cinder block walls and a metal roof. The floor is exposed cement; ceiling materials include drywall, fiberglass tile, and Transite (USACE 1993).

Fort Wolters has no medical facility. A civilian hospital (Palo Pinto General Hospital) is located 8.1 mi west of the facility in Mineral Wells. A military hospital at Carswell Air Force Base is located approximately 38 mi east of the facility, in Fort Worth (Hall 1988).

Water and sanitary sewer service for the facility are supplied by the Mineral Wells municipal utilities. Natural gas lines are installed to the exercise area maintenance facility (the former Nike MLA and IFC area). Butane gas tanks are located on the south side of Building 1207 and the north side of Building 1181. Electrical service to areas of the property is provided via overhead and underground distribution lines (Hall 1988).

2.3 Property History

The Fort Wolters property was originally developed in 1925 when Brigadier General Jacob F. Wolters, commander of the 56th Cavalry Brigade, received a grant to construct a training camp for his TXARNG soldiers. Fifty acres were donated by the city of Mineral Wells, and an additional 2,300 acres were leased for maneuvers three weeks of each year.

In October 1940, Mineral Wells was selected as the location for an Infantry Replacement Center of sufficient capacity to house 17,000 soldiers. By securing individual leases from owners of private lands adjacent to Fort Wolters, the city assembled a tract of 7,500 acres that was then leased to the War Department. On March 22, 1941, construction of Camp Wolters was completed, and the camp was officially turned over to the U.S. Army. After World War II, the camp became the site of a helicopter training center and was also used as a Nike-Hercules MLA and IFC area.

The helicopter training grew with the Vietnam Conflict. In 1963, the facility was designated a permanent installation and renamed Fort Wolters. The training facilities for helicopter pilots were upgraded and expanded. Local farmers and ranchers donated land off-post for the construction of numerous heliports or staging fields, and in 1969 the facility was considered the world's largest primary helicopter training base. The reservation eventually comprised over 7,800 acres (USACE 1970). As the Vietnam Conflict was resolved, training was reduced.

In 1975, approximately 3,000 acres of land and 67 buildings, including essentially all of the former cantonment area, were conveyed to cities and schools in Palo Pinto and Parker counties and to the state of Texas (Starr 1975). The southern portion of the reservation has been developed by Mineral Wells as commercial-industrial and residential areas. The central portion of the property is a recreational state park that includes Lake Mineral Wells. The remaining 3,985 acres continue under federal ownership and since August 8, 1974, have been licensed (License DACA63-3-75-0023) to the TXARNG for military training (Cottrell 1979).

2.4 Permitting Status

The Fort Wolters installation has no ESOs requiring permits under the Resource Conservation and Recovery Act (RCRA) and none designated for CERCLA activities. Because of its solid waste management activities, the UTES 2 is registered with the Texas Department of Health as a small-quantity waste generator, identification number 55132 (Bennett 1985).

According to the requirements of the Underground Storage Tank Program, site USTs have been registered with the Texas Water Commission (TWC 1986).

2.5 Surrounding Environment and Land Use

2.5.1 Demographics and Land Use

Fort Wolters is located in a predominantly rural area, with forest and agricultural lands covering the majority of both Parker and Palo Pinto counties. Ranching and farming are the major land uses. Livestock production includes beef cattle, dairy cattle, and poultry. Commercial farm crops include oats, grain sorghum, watermelons, peaches, pears, pecans, cotton, and alfalfa. Minerals mined in the region include crude oil, natural gas, stone, and clays. The Poolville West Oil Field is approximately 12 mi northeast of the TXARNG property (Figure 1); the Lazy Bend Oil Field is approximately 15 mi southeast (DOT 1982).

The TXARNG property is located between two population centers (Figure 1). Mineral Wells, approximately 3 mi southwest of the site in Palo Pinto County, has a population of 14,870. Weatherford, approximately 15 mi southeast of the site in Parker County, has a population of 14,804 (Rand McNally 1992). The small communities of Cool (about 4 mi south of the site), Millsap (about 6 mi south of the site), Garner (about 4 mi southeast of the site), and Whitt (about 5 mi north of the site's northern boundary) have an estimated combined population of 2,000. Many residents commute east to work in the Fort Worth metropolitan area, about 40 mi east of the TXARNG property.

The cantonment area of the former, more extensive Camp Wolters, located south of the existing TXARNG cantonment area, was substantial (USACE 1970). Since the transfer of this property to local and state agencies in 1975, it has undergone redevelopment. The former main heliport and camp maintenance areas have been developed as private commercial and light industrial properties. Weatherford College opened a west campus on a portion of the property. Much of the central portion of the former cantonment area has been designated by Mineral Wells as a city park. The troop housing facilities have been redeveloped as private and public residences. The central portion of the former camp, including Lake Mineral Wells, was designated as a state park. Figure 5 identifies the existing Fort Wolters boundary and adjacent properties.

FIGURE 5 Vicinity of Fort Wolters (Source: Adapted from USACE 1978)

2.5.2 Climat

The area around Fort Wolters is characterized by hot summers and dry winters. In the winter, surges of cold polar air are frequent, and cold fronts are often accompanied by strong northerly winds and sudden drops in temperature. Very cold weather rarely occurs before the end of December. Snow falls once or twice a month in January and February, but the average accumulation is less than 1 in. The average annual precipitation is about 30 in., with the wettest months being April-May and September-October (3.5, 4, 3.5, and 3 in. average monthly precipitation, respectively). The average monthly high temperature for both July and August is about 97°F, and the average monthly low temperatures for January and February are 31°F and 33°F, respectively (Larkin and Bomar 1983). The average annual gross lake evaporation rate of 70 in. is more that twice the average annual rainfall.

During December-February, the wind blows from the north 14% of the time and from the south 18% of the time (Larkin and Bomar 1983). The wind blows from any 1 of the other 14 compass points less than 10% of the time. During March-May, the wind blows from the south fully 25% of the time and from the south-southeast 11% of the time. In June-August, the wind blows from the south 27% of the time, from the south-southwest 13% of the time, and from the south-southeast 13% of the time. In September-November, the wind blows from the south 19% of the time, from the south-southeast 10% of the time, and from the north 11% of the time. Hence, the prevailing wind direction for the entire year is from the south, although this tendency is most pronounced in March-August.

2.5.3 Surface Water and Physiography

The following sections describe the local and regional surface hydrology and physiography (Buckner and Shelby 1991; DHUD 1977; Duffin and Beynon 1992; Greenwade et al. 1977; Hall 1988; Heath 1989; Nordstrom 1982; USGS 1959a, 1959b).

2.5.3.1 Physiography

Fort Wolters is located in the southeastern corner of the West Texas Rolling Prairies section of the North Central Plains physiographic province (Duffin and Beynon 1992). The Rolling Prairies section covers about 11% of the total area of the state of Texas and includes all or parts of

44 counties in north central Texas. The topography of the Rolling Prairies generally consists of a gently sloping plain dissected by well established systems of drainage, consisting of wide valleys bounded by abrupt embankments.

Surface elevations throughout the Rolling Prairies section vary from nearly 2,600 ft at the base of the High Plains escarpment near Palo Duro Canyon in the northwest to about 700 ft along the main river valleys near Mineral Wells in the east. Drainage is primarily toward the east and southeast, along the general slope of the land surface.

Within Fort Wolters the terrain consists of gently rolling hills, with steep grades generated by erosion in areas of streams. The site elevation ranges from 860 to 1,039 ft above mean sea level (Hall 1988).

2.5.3.2 Soils

Fort Wolters is situated on soils of the Truce-Bonti association, a neutral to slightly acid sandy loam found on the upland areas of Parker County (Greenwade et al. 1977). This association occurs in timbered and open areas on hills and ridges. Boulders and stones are common throughout much of the area. The Truce-Bonti association makes up about 6% of the county.

The gently sloping to steep Truce soils are on hills and the lower portions of side slopes. Some areas have stones and large boulders on the surface. The surface layer consists of a brown, fine, sandy loam about 8 in. thick. The next layer is reddish brown clay about 16 in. thick, and below this is about 24 in. of brown clay. The underlying material is pale olive shaley clay.

The gently sloping to sloping Bonti soils are on ridges. The surface layer consists of a light brown, fine, sandy loam about 10 in. thick. In many areas, the surface layer is stony. The next layer is a yellowish red clay about 22 in. thick. The underlying layer is a reddish yellow, strongly cemented sandstone.

Minor members of the association are the Bosque, Bunyan, Chaney, Hassee, Owens, Selden, Thurber, and Yahola soils. The Bosque, Bunyan, and Yahola soils are found on flood plains along major streams. Chaney and Selden soils are on foot slopes and plains. Hassee and Thurber soils are found on foot slopes, on broad plains, and in slightly depressed areas. Owens soils are on hillsides.

The former Nike site is situated on Bonti and Truce soils with a slope of 1-8%. These gently sloping stony soils are on uplands and generally follow the contours of hills and ridges. Slopes are complex, but they are mostly convex and are dominantly 2-8%. Sandstone fragments ranging from cobbles to boulders cover about 10-30% of the surface. Bonti soils make up about 50-70% of the mapped area, while Truce soils make up the remaining 30-50%. The soil is not suitable for cultivation. The hazard of water erosion is moderate. The soil is classified as moderately deep to deep and moderately slowly permeable to slowly permeable. The available water capacity is medium (Greenwade et al. 1977).

2.5.3.3 Surface Hydrology

The northern portion of the Rolling Prairies section, well to the north of Fort Wolters, is drained by the Red River and its tributaries. Portions of Parker County to the east of Fort Wolters are drained by the West Fork of the Trinity River. The area to the west of Fort Wolters is drained by the Brazos River through its two main tributaries, Salt Fork and Clear Fork. The area immediately surrounding Fort Wolters drains into Lake Mineral Wells, which discharges into the Brazos River via Rock Creek. Figure 6 identifies surface waters in the vicinity of Fort Wolters.

Areas of Fort Wolters near Rock Creek and Rippy Branch are within designated 100-year flood hazard areas (DHUD 1977). These waterways are in the training area of the property. No flood hazard is present in areas of hazardous materials storage or use.

Currently, 25 major surface reservoirs with capacities of 5,000 acre-feet or more, including Lake Mineral Wells, contribute all or part of their respective yields to supply water needs within the Rolling Prairies section (Duffin and Beynon 1992). These reservoirs have combined capacities of more than 2.2 million acre-feet and can supply approximately 0.62 million acre-feet annually. Within the entire Rolling Prairies section, surface water sources in 1988 supplied a total of 59,447 acre-feet of water for public supply, 41,908 acre-feet for irrigation, 19,950 acre-feet for livestock, 14,799 acre-feet for power generation, 11,397 acre-feet for rural domestic use, 8,556 acre-feet for mining, and 8,341 acre-feet for manufacturing. Surface water supplies are considered adequate to meet current and projected needs through the year 2010 (Duffin and Beynon 1992).

FIGURE 6 Location of Regional Surface Waters (Source: Adapted from USGS 1959a, 1959b)

The surface water resources in the western portions of the Rolling Prairies suffer from various degrees of natural salt contamination, resulting from salt water springs and outcrops of gypsum beds. The upper reaches of the Red River and Brazos River basins are too saline for many uses. In the 1990 water year (October 1989 through September 1990), Brazos River monitoring station number 08079575 near the town of Post in Garza County, about 200 mi to the west of Fort Wolters, measured an average concentration of total dissolved solids of 2,120 mg/L (Buckner and Shelby 1991). For comparison, 500 mg/L is preferred for domestic use, and water with concentrations of total dissolved solids of 1,000-3,000 mg/L is classified as "slightly saline" by the U.S. Geological Survey (USGS) (Heath 1989). To facilitate full use of these water resources, several federally funded chloride control programs have been constructed within the Red River basin northwest of Fort Wolters (Duffin and Beynon 1992).

The surface water in the vicinity of Fort Wolters has not been as compromised by natural salt contamination. Brazos River monitoring station 08090800 near Dennis, Texas, about 15 mi southeast of Fort Wolters, recorded an average concentration of total dissolved solids of 689 mg/L for water year 1990 (Buckner and Shelby 1991).

All major cities (defined either as incorporated cities with 1980 population of 1,000 or greater or as county seats) in the vicinity of Fort Wolters depend on surface water for municipal water supplies (Duffin and Beynon 1992). In 1988, Mineral Wells obtained all of its 2,814 acre-feet of public water from surface water; none came from groundwater. The towns of Palo Pinto, Brackenridge, Bridgeport, Graham, Eastland, Ranger, Olney, and Jacksboro are all within about 50 mi of Fort Wolters. They obtained all of the total of 6,624 acre-feet of water needed to satisfy their municipal requirements in 1988 from surface water; none came from groundwater. Only the village of Whitt in Parker County, about 5 mi north of Fort Wolters, uses groundwater for its public water supply (Nordstrom 1982).

2.5.4 Groundwater and Hydrogeology

The following sections describe the local and regional geology and groundwater (Duffin and Beynon 1992; Nordstrom 1982; TWC 1993).

2.5.4.1 Regional Geology

During most of the Paleozoic era, a sedimentary basin existed throughout much of central and north-central Texas. Sediments consisting of sandstone, limestone, carbonaceous shales, and other marine sediments were deposited in this basin until late Pennsylvanian time, when the Llano Uplift and the Ouachita Fold Belt caused a regional tilting to the west and faulting in the immediate uplift area. The Pennsylvanian-Cretaceous unconformity indicates a period of tremendous emergence and erosion. During Permian time, the basin shifted to the west, and only the Rolling Prairies region continued to receive sediments. The region to the east of Fort Wolters-Mineral Wells underwent significant erosion.

During the Triassic and Jurassic periods of the early Mesozoic era, withdrawal of the seas from north-central Texas, along with subsidence in the Gulf Coast embayment, led to a reversal of drainage direction and an extensive truncation of Pennsylvanian strata in the Fort Worth basin to the east of the Fort Wolters area. By the close of the Jurassic, Paleozoic rocks had been reduced to an almost flat, featureless plain, upon which marine sediments were deposited along an oscillating shoreline during the Cretaceous. Two major invasions of the seas during the Cretaceous are represented by the Comanche and Gulf series. During the late Cretaceous (Gulf series), a general uplift occurred to the west, and the seas withdrew gulfward.

At the close of the Cretaceous, marked by uplift in the west and subsidence along the coast, sediments of Tertiary and Quaternary age were deposited. The repeated transgression and regression of the sea resulted in an alternating sequence of marine and continental deposits. Throughout the Tertiary period, the land surface was eroded and modified by streams and rivers, except for minor periods of subsidence. During Quaternary time, the streams deposited alluvial sediments. The older sediments are represented by terrace deposits above the alluviated valleys of present streams.

2.5.4.2 Local Geology

Pennsylvanian and Permian rocks start to outcrop about 4 mi to the east of Fort Wolters and extend to the west. Figure 7 shows the Paleozoic cross section through the Rolling Hills physiographic section (Duffin and Beynon 1992). Fort Wolters itself is situated on an outcrop of the Strawn group, of middle Pennsylvanian age. Table 4 shows the driller's log from a well

FIGURE 7 Cross Section of the Paleozoic Stratigraphic Units (Source: Adapted from Duffin and Beynon 1992)

**TABLE 4 Driller's Log of
Well UP-32-01-709^a**

Depth (ft)	Driller's Description
0-12	Sandy loam
12-26	Red sand
26-75	Yellow clay
75-92	Rock
92-125	Black shale
125-208	Sandstone
208-258	Rock
258-305	Gray shale
305-328	Limestone
328-345	Black shale
345-396	Sandstone
396-400	Limestone
400-430	Black shale

^a Well owned by Bryant's Horse Ranch and drilled by Can Drilling, July 1988.

Source: TWC (1993).

drilled within 4 mi of Fort Wolters. (The well identification system is discussed in Section 2.5.4.4.) The Paleozoic stratigraphic units dip westward and northwestward with a slope of about 40 ft/mi (Nordstrom 1982).

Cretaceous rocks start to outcrop about 4 mi to the east of Fort Wolters and extend farther to the east. Figure 8 shows the Cretaceous cross section extending to the east of Fort Wolters (Nordstrom 1982). The Cretaceous system forms a southwestward-thickening wedge extending into the East Texas basin. Regional dip is to the east and southeast at rates of 15-40 ft/min.

2.5.4.3 Regional Groundwater

The most important water-bearing formations in north-central Texas are of Cretaceous age. The Cretaceous system is composed of two series, the Gulf and Comanche. The Gulf series is

FIGURE 8 Cross Section of the Cretaceous Sediments (Source: Adapted from Nordstrom 1982)

composed of the Navarro, Taylor, Austin, Eagle Ford, and Woodbine groups. The Comanche series is divided into the Washita, Fredricksburg, and Trinity groups.

The Trinity group, the principal water-bearing group of rocks in the area, is divided into the Paluxy, Glen Rose, Twin Mountains, and Antlers formations. The Twin Mountains formation outcrops about 4 mi to the east of Fort Wolters and is composed of conglomerate, sand, and shale. The Twin Mountains is the principal water-bearing formation of Cretaceous age in the region and yields moderate to large amounts of water. (For the purposes of this PA, a small well yield is less than 100 gal/min, a moderate well yield is 100-1,000 gal/min, and a large yield is over 1,000 gal/min.) Yields of wells completed in the Twin Mountains range from 10 to 1,940 gal/min, with an average yield of 286 gal/min (Nordstrom 1982). Yields are considerably lower on or near the outcrop than farther downdip. The primary source of groundwater in the Twin Mountains is precipitation falling on the outcrop.

Fort Wolters itself is located on the southwestern boundary of the Southern Great Plains hydrogeologic region (Jorgensen et al. 1988). The Paleozoic outcrops in Parker and Palo Pinto counties represent the surface discharge area for the "deep-basin brine" aquifer system, as shown in Figure 9 (Jorgensen et al. 1988). The deep-basin brine aquifer system includes aquifers in Pennsylvanian and Lower Permian shelf and shelf-margin carbonates, aquifers in lower Paleozoic shallow-marine carbonates, and aquifers in upper Paleozoic arkosic or granite-wash sandstones.

The present direction of groundwater flow is generally eastward in each hydrogeologic element of the deep-basin brine aquifer system (Jorgensen et al. 1988). Discharge areas for the deep-basin brine aquifer system lie in the broad outcrop of Pennsylvanian and Lower Permian formations throughout north-central Texas and southwestern Oklahoma. Permeable fluvial-deltaic sandstone and shelf-margin carbonate banks provide narrow paths across the discharge area for fluid movement out of the Midland basin. Vertical hydrologic continuity is restricted by thin, widespread beds of carbonate mudstone and interfluvial shale deposits. The fresh groundwater system of meteoric origin circulates to only a shallow depth in the regional discharge zone.

2.5.4.4 Local Groundwater

The most important Paleozoic freshwater-bearing formations in the vicinity of Fort Wolters are the Wichita group of the Permian system and the Cisco group of the Pennsylvanian system

FIGURE 9 Conceptual Diagram of Surface Discharge from the Regional Deep-Basin Brine Aquifer System (Source: Adapted from Jorgensen et al. 1988)

(Figure 7). The Wichita, which outcrops in Throckmorton County, about 60 mi northwest of Fort Wolters, consists mainly of gray and red shale, with minor amounts of limestone, sandstone, siltstone, conglomerate, and coal. It yields small quantities of fresh to slightly saline water in the outcrop area.

The Cisco group outcrops in Young County, about 25 mi from Fort Wolters, and underlies the Wichita group to the northwest. The Cisco group is composed of alternating beds of shale, sandstone, limestone, and conglomerate, and it yields small to moderate quantities of fresh to moderately saline water.

The Strawn group, which outcrops in Parker and Palo Pinto counties, is composed of alternating beds of shale, conglomerate, and sandstone, with minor amounts of limestone and coal. The Strawn yields small quantities of slightly to moderately saline water from sandstone and conglomerate units in and near the outcrop area.

Within the entire Rolling Prairies physiographic section, groundwater sources in 1988 supplied a total of 110,077 acre-feet of water for irrigation, 8,515 acre-feet of water for mining, 7,534 acre-feet of water for rural domestic consumption, 7,028 acre-feet for public supply, 2,752 acre-feet for livestock, and 726 acre-feet for manufacturing (Duffin and Beynon 1992).

By a wide margin, irrigation represents the largest category of groundwater use within the Rolling Prairies section. In Palo Pinto County, however, only 5 acre-feet of groundwater were supplied for irrigation in 1989, whereas 575 acre-feet of surface water were used to irrigate crops in the same year (Duffin and Beynon 1992). Approximately 86% (95,613 acre-feet) of the groundwater used for irrigation in 1988 was produced from the Seymour formation, a Quaternary age aquifer that is not found in Parker County or Palo Pinto County. The Seymour aquifer supplied about 80% of the total groundwater pumped in the Rolling Prairies section for all use categories in 1988.

Figure 10 shows the locations of wells within a 4-mi radius of Fort Wolters in Parker County (Nordstrom 1982). The areal extent of Fort Wolters causes some ambiguity about the center point chosen for the 4-mi-radius inclusion zone. The zone drawn on Figure 10 was centered on the northern portion of Fort Wolters to demonstrate that the only public water supply well in the vicinity, that belonging to the town of Whitt, is considerably more than 4 mi from the locations of TXARNG maintenance activities or former Nike operations. As mentioned before, the town of

FIGURE 10 Locations of Water Wells in the Vicinity of Fort Wolters (Source: Adapted from Nordstrom 1982)

Whitt taps the Strawn formation for public water. The Whitt public well is reported to produce 122 gal/min, and in 1975 it was found to have 1,974 mg/L of total dissolved solids (Nordstrom 1982).

Table 5 summarizes pertinent information on the wells shown in Figure 10. The wells are numbered according to a system originally developed by the Texas Water Commission, which is now in use statewide. The system is based on the division of the state into 1-deg quadrangles of latitude and longitude, with repeated division of these quadrangles into smaller and smaller units. Each 1-deg quadrangle is subdivided into 64 quadrangles (7.5 min each), and these quadrangles are further subdivided into 9 quadrangles (2.5 min each). The 1-deg quadrangles are identified with large open-block numbers on Figure 10. The 7.5-min quadrangles are numbered in their respective upper left-hand corners. The 2.5-min quadrangles are not shown on Figure 10.

Wells are identified by a two-letter county prefix, which in this case is UP for Parker County, and a seven-digit number. The first two digits identify the 1-deg quadrangle in which the well is located (either 31 or 32 for this report). The third and fourth digits identify the appropriate 7.5-min quadrangle, and the fifth digit identifies the appropriate 2.5-min quadrangle. The last two digits identify the particular well within the 2.5-min quadrangle. As an example, the Whitt public well is designated UP-31-08-602, meaning (reading right to left) that it is the second well in the sixth 2.5-min quadrangle in the eighth 7.5-min quadrangle in the 31st 1-deg quadrangle in Parker County.

Oil production operations may have adversely affected groundwater quality (Duffin and Beynon 1992). Oil fields in the area (Figure 1) produce significant amounts of brine in addition to the desired hydrocarbons. Probably the greatest single cause of groundwater contamination was the disposal of oil field brines into unlined surface pits before the statewide "no pit" order was issued by the Texas Railroad Commission, effective January 1, 1969. Emergency pit waivers are still granted in certain cases, although the permitting procedure became much more restrictive in 1985. Even so, most pits that are permitted for emergency use (as when a tank farm is struck by lightning) are still not required to have liners.

TABLE 5 Water Wells in the Vicinity of Fort Wolters

Well Number	Owner	Depth of Well (ft)	Use ^a	Production Rate (gal/min)	Total Dissolved Solids (mg/L)
UP-31-08-601	Whitt Public School	60	D	-	989
-602	City of Whitt	410	P	122	1,974
UP-32-09-201	H.B. Jennings	35	N	-	577
-202	E.A. Ponds	90	N	-	863
-401	Garner Consolidated School	30	N	-	1,019
-402	W.L. Jenkins	125	N	15	-
-403	-	106	D	15	-
UP-31-08-826	J. Cotton	400	D	20	-
UP-31-16-311	B.J. Mayhar	64	D	14	-
-329	T. Herndon	140	-	15	-
UP-32-01-703	R. Long	400	D	12	-
-709	Bryant's Horse Ranch	430	D	-	-
-720	Chester	130	D	-	-
UP-32-09-101	H. Easton	80	D	4	-
-102	J. Lee	140	D	6	-
-112	T. Fina	140	D	-	-
-124	Hammond	170	D	8	-
UP-32-09-432	J. Cates	200	D	-	-
-433	M. Blaird	160	D	-	-

^a Abbreviations: D, domestic; P, public supply; N, not in use.

Sources: Nordstrom (1982) and TWC (1993).

2.5.5 Sensitive Environments

The Fort Wolters property surrounds the Lake Mineral Wells State Park on three sides. Drainage is southerly through Rock Creek and Rippy Branch to Lake Mineral Wells. This surface water impoundment is the source of drinking water for the city of Mineral Wells and nearby towns.

Fort Wolters lies within the West Cross Timbers vegetation zone (NGB 1978; Gore and Reagan 1989). The predominant growth is post oak and blackjack oak with an undergrowth of brush and grass. The trees are scrubby, of small size, and unsuited for most uses other than firewood. Common shrubs in the area are obelia, grandiflora, holly, ligustrum, nandina, honeysuckle, and yucca. Aquatic plants in the area include algae, busy pondweed, coontail, fanworth, water weed elodea, water star grass, duckweed, yellow water lily, white water lily,

American lotus, cattails, bulrush, rush, water primrose, water smartweed, arrowhead, black willow, and button brush. The climax plant community is a post oak, blackjack oak savanna that has an understory of medium and tall grasses. Little bluestem, indian grass, big bluestem, and side oats grama are dominant. Approximate species composition, by weight, is 30% little bluestem; 10% big bluestem; 10% indian grass; 10% side oats grama; 5% silver bluestem; 5% Scribner panicum; 5% Texas wintergrass; 5% Arizona cottontop; 10% post oak, blackjack oak, elm, hackberry, skunkbush sumac, and prickly ash; and 10% Engelmann daisy, bundleflower, prairie clover, western ragweed, and dotted gayfeather.

Principal land animals found in the area are armadillos, squirrels, rabbits, opossums, raccoons, foxes, and bobcats. Ducks and other migratory waterfowl pass through the area in late fall and early spring but seldom stop for more than short periods. A large variety of song birds either resides in or migrates through the area. The birds include bluejays, cardinals, sparrows, mockingbirds, mourning doves, blackbirds, meadowlarks, bobwhite quail, and redwing blackbirds. Principal fish species found in the area are catfish, carp, sunfish, and bass. Most of the impoundments in the area offer good fish habitat. Shellfish found in the area are mussels and freshwater clams. Amphibians are frogs and salamanders.

Whether habitats of endangered or threatened species are located on or near the site is unknown (TXARNG 1992b). An earlier survey by the Texas Parks and Wildlife Department reported no evidence of rare or endangered species inhabiting the area (NGB 1978).

3 Environmentally Significant Operations

Maintenance activities performed at the Fort Wolters property as part of TXARNG training operations require the use of hazardous materials and could result in the release of hazardous waste. Also of concern is the potential for hazardous waste to be present on the site as a result of former Nike missile program operations, or in the form of original construction materials, or as a result of unauthorized disposal of waste on the property.

The PA team from Argonne identified six ESOs at the Fort Wolters TXARNG property. These ESOs are (1) fuel storage and dispensing, (2) storage of hazardous materials/hazardous waste, (3) vehicle/equipment washing, (4) former Nike missile program operations, (5) use of hazardous construction materials, and (6) unauthorized disposal of waste. Each ESO is described below.

3.1 Fuel Storage and Dispensing

Fuel storage and dispensing are currently performed at Fort Wolters at the UTES 2 and at the exercise area maintenance facility (the former Nike MLA). Fuel storage and dispensing also occurred at the former Nike IFC area when that facility was still in operation. Release of fuel could result from tank leakage or rupture, a fuel line break, or an inadvertent spill during tank filling. Table 6 is a summary of current and former fuel storage tanks at the TXARNG property. Not included in the table are two 600-gal fuel storage pods for gasoline (MOGAS) located at the exercise area maintenance facility, which are available for use during field training exercises.

3.2 Storage of Hazardous Materials/Hazardous Waste

Maintenance activities performed at the Fort Wolters UTES 2 and at the exercise area maintenance facility as part of normal operations require the use and storage of limited quantities of hazardous materials and the generation and storage of hazardous waste. Materials are segregated by type and are stored in designated storage areas. The UTES 2 is the primary maintenance facility at Fort Wolters, and the majority of hazardous materials are at that location. Used oil (crankcase oil, gear lubricants, metal-working lubricants, hydraulic oils, cutting oils, etc.) and cleaning solvents (Safety Kleen) are recycled. Waste oil is stored at the UTES 2 in a 1,000-gal

TABLE 6 Summary of Fuel Storage Tanks at Fort Wolters

Fuel Tank Volume (gal)	Type of Storage	Type of Fuel	Tank Status
<i>Unit Training Equipment Site 2</i>			
14,000	Aboveground	Diesel fuel	In use
8,000	Underground	Diesel fuel	Removed in 1992
6,000	Underground	Gasoline	Removed in 1992
<i>Former Nike Missile Launch Area</i>			
5,000	Underground	Diesel fuel	In use
5,000	Underground	Gasoline	In use
6,000	Underground	Diesel fuel	Removed in 1988
4,000	Underground	Gasoline	Removed in 1988
<i>Former Nike Integrated Fire Control Area</i>			
6,000	Underground	Diesel fuel	Removed in 1988
4,000	Underground	Gasoline	Removed in 1988

Source: Hall (1988).

UST constructed of fiberglass with steel piping. Throughput of the waste oil is approximately 1,200 gal per month (Dennis 1993). Table 7 is an inventory of hazardous materials typically stored at the UTES 2. Table 8 is an inventory of hazardous materials typically stored at the exercise area maintenance facility.

3.3 Former Nike Missile Program Operations

Hazardous waste could be present on the property as a result of the operation of the former Nike missile base. Generic information on the Nike missile program has been compiled by both the Army Corps of Engineers (LETC 1986) and the former U.S. Army Toxic and Hazardous Materials Agency (ESE 1984). Some information about the Nike defense program is available, but much remains classified for reasons of national security. Nevertheless, taken together, these two reports represent the most complete assemblage of information on the Nike missile program from an environmental perspective.

TABLE 7 Hazardous Materials Inventory at the UTES 2

Material	Type of Container	Maximum Amount Stored
Used oil	UST	1,000 gal
Used solvents	55-gal drum	2 drums
Lubricating oil (new)	1-gal or 1-qt can	250 gal
Brake fluid (new)	1-gal or 1-qt can	4 gal
Brake fluid (used)	5-gal can	5 gal
Paints/thinners (new)	1-gal or 1-qt can	30 gal
Paints/thinners (old)	55-gal drum	1 drum
Solvents (new)	55-gal drum	3 drums
Batteries (new)	-	18 batteries
Batteries (used)	-	8 batteries
Battery acid	1-gal plastic bottle	24 gal
Coolant/antifreeze (new)	55-gal drum or 1-gal can	3 drums
Coolant/antifreeze (used)	55-gal drum	1 drum
Other oil (new)	55-gal drum	250 gal

Source: TXARNG (1987).

The Fort Wolters Nike battery consisted of two distinct operating units, the MLA and the IFC area. The MLA was approximately 8 acres in size, while the IFC was approximately 14 acres (Hall 1988). The two areas were separated by a distance of about 3,000 ft, with a line of sight between them for communication and tracking purposes. Barracks facilities were incorporated into the IFC area.

Of the two operating areas composing the missile battery, the MLA clearly represented the greater potential for environmental contamination. At Fort Wolters, missile assembly was conducted in Building 1206. Missile components were shipped to the site in metal canisters and wooden crates. Solvents used for missile preparation and cleaning included petroleum distillates, chlorinated solvents, and small amounts of alcohols. Large quantities of certain solvents would evaporate during use; this particularly applies to chlorinated solvents such as carbon tetrachloride. Spills to the ground surface would evaporate rapidly in the dry Texas soils.

Missile fueling and warheading were conducted apart from the assembly building. Fueling with unsymmetrical dimethylhydrazine (UDMH), inhibited red fuming nitric acid (IRFNA), aniline, furfuryl alcohol, and ethylene oxide presented fire and personnel safety hazards, so their

TABLE 8 Hazardous Materials Inventory at the Exercise Area Maintenance Facility

Material	Amount Stored	Consumption Rate
Super-Sol grease trap emulsifier	3-6 gal	6 gal/yr
Ice machine coil cleaner	4 gal	2 gal/yr
Roundup herbicide	2.5 gal	5 gal/yr
Flounce hand soap	13 gal	1 gal/mon
Wescodyne detergent	3 gal	1 gal/mon
Seal All floor cleaner	34 gal	4 gal/yr
So-Sure paint	76 cans	4 cans/mon
Pine Oil disinfectant	1,632 oz	32 oz/wk
Clenzol degreaser	768 oz	64 oz/mon
Big-D cleaner	405 oz	15 oz/mon
WHC hand cleaner	55 lb	5 lb/week
TOBO toilet cleaner	1,312 oz	128 oz/mon
Bippy metal cleaner	1,696 oz	160 oz/mon
Glass cleaner	288 oz	128 oz/mon
Floor stripper	22 gal	2 gal/mon
Clenzol degreaser	14 gal	2 gal/mon
Limesol lime remover	16 gal	4 gal/yr
Mel-Tex floor finish	33 gal	2 gal/mon
Bright-Klear detergent	80 lb	5 lb/mon

Source: TXARNG (1991).

use was strictly controlled. Turn-in to the depot for official disposal, as a means of recycling to maintain fresh fuel on site, was likely to have been strictly practiced. Environmental contamination, if it occurred, would probably have been limited to incidental releases.

Missile maintenance was performed within the bermed area south of Building 1207. A portion of the berm was removed in 1976 when the site was redeveloped by the TXARNG. Maintenance most typically involved removal of corrosion, painting, and replacing of hydraulic fluid. Removal of corrosion from metal parts was conducted with at least three types of cleaners. Phosphoric acid in alcohol was used for metal parts, and alodine powder was used in water for minor cleaning. Most significant was the use of chromates in the form of chromium trioxide and sodium dichromate. Chromium trioxide, a solid material available in 5-lb containers, was dissolved in water and used to wash magnesium and steel. Sodium dichromate, also a solid, was dissolved in acids to form a pickling solution, into which the metal parts were dipped. Solutions used for decorrosion were washed into sumps and allowed to leach into the soil. The acid

neutralization leaching pit identified in the 1958 site plan of the facility, in the vicinity of the current vehicle/tank washrack, is no longer exposed.

Painting of missile components involved the use of chromium and lead. Zinc chromate was used to prime magnesium parts after cleaning; lead-based paint was used for steel. The majority of paint would have been consumed. The remainder was probably discarded via POL collection or as solid waste. Missile hydraulic fluid was replaced regularly. Unused hydraulic fluids would have been discarded via POL collection or dumped on the site.

The primary mission of the Nike IFC facility was radar tracking and missile guidance. Radar did not require extensive use of chemicals. Maintenance of radar was mostly electrical, using relatively small amounts of solvent for cleaning. The High-Power Acquisition Radar (HIPAR) used a coolant pumping system consisting of an ethylene glycol circulating system and a pump. The ethylene glycol was replaced annually. The pump was oil lubricated. Paint was the most significant chemical used on the radar systems. Except for fuel, paint represented the greatest volume of hazardous material present at the IFC facility. Common paints of the Nike period used lead (20-30%) as a pigment. Most paint was consumed, leaving little waste for disposal. Unused paint was discarded either via POL collection or as solid waste.

Pesticides and herbicides had variable use at former Nike facilities. Pesticides were used as needed. Herbicides were used to maintain vegetation-free areas around site perimeters, primarily for fire control.

The former Nike MLA and IFC area both had underground fuel storage facilities as indicated in Table 6. Each facility had a 6,000-gal UST for storage of diesel fuel used to power electric generators, as well as a 4,000-gal UST for storage of gasoline for vehicles. All four tanks were removed in 1988.

Documentation regarding deactivation of the Fort Wolters Nike base was unavailable for this PA, although a site plan of the former MLA was available (USACE 1958). No evidence of an on-site landfill or other waste disposal area was seen during the site survey. Table 9 contains a general inventory of hazardous materials present at former Nike facilities that were required for maintenance and servicing of missile launching and control operations (LETC 1986).

TABLE 9 Inventory of Hazardous Materials at Former Nike Facilities

Material	Quantity Used Annually	Purpose	Likely Disposal Method
Acetone	20 gal	Special cleaning	Evaporation, drainage, and leaching
Alodine powder	10 lb	Decorroding missile parts	Drainage and leaching
Benzene	100 gal	Solvent	Evaporation, drainage, and leaching
n-Butanol	20 gal	Missile cleaning	Drainage and leaching
Carbon tetrachloride	300 gal	Solvent	Evaporation, drainage, and leaching
Chromium trioxide	100 lb	Decorroding missile parts	Drainage and leaching
UDMH	10 gal	Missile fuel/starter	Depot turn-in
Dry cleaning solvent	500 gal	Solvent	Evaporation, drainage, and disposal
Electrical insulating oil	20 gal	Electronics lubricant	POL turn-in
Ethanol	20 gal	Solvent	Drainage and leaching
Ethylene glycol	25 gal	Equipment coolant	Unknown
Furfuryl alcohol	10 gal	Fuel starter	Depot turn-in
Greases (hydrocarbons)	100 lb	Machinery lubricant	Consumed, POL turn-in
Herbicides	20 lb	Vegetation control	Consumed
Hydraulic fluid	2,000 gal	Hydraulic fluid	POL turn-in, drainage and leaching, surface disposal
JP-4 fuel	500 gal	Missile fuel	Depot turn-in
Lead (carbonates and oxides)	200 lb	Paints	Consumed, solid waste disposal, POL turn-in
Low-level radiation sources	< 1 lb	Battery electrolyte	Drainage and leaching
Lubricating oils	200 gal	Electrical tubes	Depot turn-in, solid waste
Mineral spirits	500 gal	Lubrication of machinery	POL turn-in, surface disposal
Molybdenum disulfide	5 lb	Solvent/thinner	Drainage and leaching
Naphtha	50 gal	Lubricant	Consumed, drainage, and leaching
Nitric acid	300 gal	Solvent/thinner	Evaporation, drainage, and leaching
Paints (hydrocarbons and pigments)	300 gal	Missile fuel/starter	Depot turn-in
Perchlorethylene	100 gal	Painting missiles, radar	Consumed, solid waste disposal, POL turn-in
Phosphoric acid	20 gal	Solvent	Evaporation, drainage, and leaching
Propanol	10 gal	Cleaning metal	Drainage and leaching
Selenium	100 lb total	Missile cleaning	Drainage and leaching
Sodium dichromate	50 lb	Rectifier parts	Removed at deactivation
		Metal cleaning	Drainage and leaching

TABLE 9 (Cont.)

Material	Quantity Used Annually	Purpose	Likely Disposal Method
Sodium phosphate	50 lb	Equipment cleaning	Drainage and leaching
Stoddard solvent	500 gal	Solvent	Evaporation, drainage, and leaching
Sulfuric acid	30 gal	Battery acid	Drainage and leaching
Toluene	50 gal	Solvent	Drainage and leaching
1,1,1-Trichloroethane	500 gal	Solvent	Evaporation, drainage, and leaching
1,1,2-Trichloroethane	500 gal	Solvent	Evaporation, drainage, and leaching
Trichloroethene	500 gal	Solvent	Evaporation, drainage, and leaching
Tricresyl phosphate	20 gal	Special lubricant	Drainage and leaching
Zinc chromate	100 lb	Paint	Consumed, POL turn-in, solid waste disposal

Source: LETC (1986).

3.4 Use of Hazardous Construction Materials

Two materials now recognized as hazardous that were typically used as construction materials during the years when Fort Wolters was constructed as an army training center and Nike facility are PCBs and asbestos. Carcinogenic PCBs were used as a component of dielectric fluid in transformers. Eventual deterioration of sealed units could have resulted in rupture of the unit, with the subsequent release of small quantities of the carcinogen. PCBs are relatively immobile in soils, and contamination, if release occurred, would be limited to the immediate vicinity of the leaking transformer. Transformers containing PCBs are present at the facility, and surface soil contamination has occurred as a result of a leaking transformer. See Section 4.3 for further discussion.

Asbestos was in widespread use in past years as a building/equipment insulation material and as a component of some construction materials, including floor and ceiling tiles and wall siding. Asbestos still present on the site in buildings and on piping and ductwork could constitute a health hazard for site workers. An asbestos survey performed in early 1993 confirmed the presence of asbestos in some building construction materials (USACE 1993). See Section 4.4 for further discussion.

3.5 Unauthorized Disposal of Waste

In two areas, unauthorized disposal of waste materials is known to have occurred on the property. The approximate locations of Waste Disposal Area 1 and Waste Disposal Area 2 are shown in Figure 11 (Dennis 1993). Waste Disposal Area 1, containing metal sheeting, shingles, and other debris, covers an area approximately 300 ft long and 10 ft wide (as estimated from the air, where the view of the disposal area is partially obscured by vegetation). Waste Disposal Area 2 is a small area of trash discarded by an unknown party, probably a trespassing civilian. This waste material appears to be primarily household waste and construction debris.

FIGURE 11 Approximate Locations of Unauthorized Waste Disposal Areas (Source: Dennis 1993)

4 Known and Suspected Releases

4.1 Releases to Groundwater

Because of the age of the four USTs used as part of operations at the former Nike MLA and IFC area, tank deterioration and consequent leakage over time was highly likely. These four USTs were removed in 1988. Inspection at the time of excavation revealed that the tanks had been laid in hollowed-out rocky areas and that the lack of moisture had prevented corrosion. No noticeable leakage to the subsurface had occurred.

In 1992, the USTs at the UTES 2 facility were discovered to be leaking at the piping connection points to the dispenser. The USTs were removed, and 24 drums of soil (55 gal each) were excavated during cleanup. The Texas Water Commission authorized removal of the excavated soil on June 9, 1992 (Dennis 1993).

Waste disposal activities at the former Nike MLA and IFC facilities cannot be verified. Most materials would have been consumed during operations, so that only a fraction would have been disposed as waste. This is especially the case at the former IFC area. The acid leaching pit at the former MLA, the Nike location of greater chemical use, was probably used for disposal of waste solvents and acids. This area has subsequently been covered by the tank washrack. Water sampling performed in the three missile silos in 1991 provided no evidence of contamination at those locations (STS 1991).

4.2 Releases to Surface Water

The TXARNG maintenance activities are located in areas some distance from surface water streams, making releases to surface waters from those areas unlikely. Runoff from maintenance areas that is not directed to the sanitary sewer system will infiltrate surface soils before it migrates to surface water streams.

The two unauthorized waste disposal areas are located near surface water streams. Drainage from the area of Waste Disposal Area 1 flows to Rock Creek. Drainage from Waste Disposal Area 2 flows toward Rippy Branch. Both streams feed Lake Mineral Wells.

4.3 Releases to Soil

Fuel represents the greatest volume of hazardous materials historically used at the property, and the most significant releases of hazardous materials to surface soils are likely to have occurred as a result of surface runoff from fueling operations. Such releases can occur either during refilling of the USTs or during fuel dispensing to vehicles. Drainage from current fuel locations is directed through oil-water separators. With the construction of the tank/vehicle wash facility at the UTES 2, the tank wash area at the exercise area maintenance facility is seldom used. Drainage from the tank wash area at the exercise area maintenance facility is not directed through an oil-water separator, and surface runoff is partially to the surrounding soil surface. Herbicides have been applied to site areas to control vegetation. No staining of surface soils and no areas of stressed vegetation were evident during the site survey.

Deterioration of a sealed transformer located at the former Nike IFC site caused the unit to rupture and led to the subsequent release of a small quantity of PCB-contaminated dielectric fluid to surface soils in approximately 1987, according to site personnel (Dennis 1993). Contaminated soils were excavated and removed by the TU Electric Company. Transformers on the site have been analyzed for PCB contamination (Shields 1992; Tryce 1992). Table 10 is a summary of transformers on the site and their PCB status.

4.4 Releases to Air

Routine operations performed as part of current TXARNG activities or during the former Nike IFC activities did not result in the release of significant quantities of hazardous materials to the air. Fugitive dust and emissions that result from the use of vehicles during current TXARNG training exercises are discounted as an ESO.

A survey performed in early 1993 for the U.S. Army Corps of Engineers confirmed the presence of asbestos in certain building materials, including floor tiles and mastic, asphalt roofing mastic and roofing felt, tar patching, wall mastic, Transite board, window putty, and insulation materials (USACE 1993). A total of 126 bulk samples were collected from 27 of the 42 buildings inspected at the Fort Wolters property. Thirty-eight of the samples were identified as asbestos-containing materials (ACMs). Table 11 summarizes the samples of building construction materials collected that contained asbestos. Friable ACMs can be hazardous to building occupants because

TABLE 10 Summary of Transformers at Fort Wolters

Location	Transformer Identification	Size (kVA)
<i>TU Electric Co. Transformers</i> (PCB concentrations 0 ppm to < 50 ppm)		
Building 1200	3003752	50.0
Building 1200	3008111	167.0
Building 1200	3008110	167.0
Building 742	3007817	15.0
Building 742	3008075	15.0
Building 742	3007813	15.0
Building 741	3007928	37.5
Building 741	3007929	37.5
Building 741	3007930	37.5
Building 738	7442042	25.0
Stage Field 1	3007907	10.0
Stage Field 2	3003539	5.0
Building 630	3007915	37.5
Building 630	3007916	15.0
Firing range	3007913	15.0
<i>TU Electric Co. Transformers</i> (PCB concentrations 50 ppm to < 499 ppm)		
Building 1100	8842015	25.0
Building 1100	8842016	25.0
Building 1100	8842017	25.0
Building 604	8342078	10.0
Building 620	8742031	15.0
Building 620	8742032	15.0
Building 620	8742033	15.0
Building 621	8642138	10.0
Building 594	8842119	10.0
<i>TXARNG Transformers</i> (PCB concentrations < 2 ppm)		
Building 1202	Exercise area maintenance facility manager's office	- ^a
Building 1201	Exercise area maintenance facility guardhouse	-
Building 1188	Former Nike IFC area warehouse	-
Building 1179	Former Nike IFC area recreation hall	-
Building 1178	Former Nike IFC area guardhouse	-

^a Sizes of TXARNG transformers are unavailable.

Sources: Shields (1992) and Tryce (1992).

TABLE 11 Samples of Building Construction Materials Collected Containing Asbestos

Sample Number	Asbestos-Containing Material	Condition	Amount of Material	Type of Asbestos ^a	Percent Asbestos ^b
UTES2-05	Gray floor tile	Not damaged, nonfriable	1,288 ft ²	Chrysotile	0
	Mastic	Not damaged, nonfriable	1,288 ft ²	Chrysotile	2
630-05	Gray caulking	Not damaged, nonfriable	10 ft ²	Chrysotile	5
659-01	Exterior Transite siding	Damaged, nonfriable	450 ft ²	Chrysotile	40
738-01	Asphalt roofing	Not damaged, nonfriable	5,700 ft ²	Chrysotile	< 1
	Black mastic	Not damaged, nonfriable	5,700 ft ²	Chrysotile	5
738-03	Green floor tile	Not damaged, nonfriable	4,200 ft ²	Chrysotile	5
	Mastic	Not damaged, nonfriable	4,200 ft ²	Chrysotile	2
738-06	Silver heating, ventilation, and air conditioning (HVAC) boot	Damaged, nonfriable	4 ft ²	Chrysotile	45
741-02	Hot water tank insulation	Not damaged, nonfriable	100 ft ²	Chrysotile	10
742-02	Transite ceiling tile	Not damaged, nonfriable	1,720 ft ²	Chrysotile	40
742-04	Wall mastic	Not damaged, nonfriable	50 ft ²	Chrysotile	2
742-08	Tar patching	Not damaged, nonfriable	1 ft ²	Chrysotile	2
1101-3	Exterior Transite siding	Damaged, nonfriable	1,260 ft ²	Chrysotile	40
1101-4	Brown floor tile	Damaged, nonfriable	150 ft ²	Chrysotile	5
	Mastic	Damaged, nonfriable	150 ft ²	Chrysotile	0
1101-7	White asphalt shingles	Damaged, nonfriable	1,300 ft ²	Chrysotile	< 1
	Black felt	Damaged, nonfriable	1,300 ft ²	Chrysotile	5
1102-02	Exterior Transite siding	Damaged, nonfriable	224 ft ²	Chrysotile	40
1121-02	Green floor tile	Damaged, nonfriable	150 ft ²	Chrysotile	5
	Mastic	Damaged, nonfriable	150 ft ²	Chrysotile	< 1
1121-03	Exterior Transite siding	Damaged, nonfriable	1,350 ft ²	Chrysotile	40
1121-07	Window putty	Damaged, nonfriable	5 ft ²	Chrysotile	2
1178-02	White floor tile	Damaged, nonfriable	64 ft ²	Chrysotile	5
	Mastic	Damaged, nonfriable	64 ft ²	Chrysotile	0
1179-02	Transite siding	Not damaged, nonfriable	460 ft ²	Chrysotile	35
1179-03	Light brown floor tile	Damaged, nonfriable	405 ft ²	Chrysotile	5
	Mastic	Damaged, nonfriable	405 ft ²	Chrysotile	3

TABLE 11 (Cont.)

Sample Number	Asbestos-Containing Material	Condition	Amount of Material	Type of Asbestos	Percent Asbestos
1179-04	Dark brown floor tile	Damaged, nonfriable	405 ft ²	Chrysotile	5
	Mastic	Damaged, nonfriable	405 ft ²	Chrysotile	3
1179-05	Green floor tile	Damaged, nonfriable	52 ft ²	Chrysotile	5
1179-06	Gray floor tile	Damaged, nonfriable	172 ft ²	Chrysotile	5
	Mastic	Damaged, nonfriable	172 ft ²	Chrysotile	0
1180-05	Green floor tile	Damaged, nonfriable	72 ft ²	Chrysotile	5
1188-01	Transite tile	Damaged, nonfriable	1,242 ft ²	Chrysotile	15
1188-02	Green floor tile	Damaged, nonfriable	360 ft ²	Chrysotile	5
	Mastic	Damaged, nonfriable	360 ft ²	Chrysotile	2
1188-05	HVAC insulation	Damaged, friable	5 ft ²	Chrysotile	30
1188-06	HVAC expansion boot	Not damaged, nonfriable	2 ft ²	Chrysotile	50
1202-03	Brown floor tile	Not damaged, nonfriable	1,170 ft ²	Chrysotile	5
1205-01	1-in. pipe elbows and tees	Not damaged, nonfriable	24E, 6T	Chrysotile	2
1205-02	1-in. pipe elbows and tees	Not damaged, nonfriable	24E, 6T	Chrysotile	2
1206-03	Light brown floor tile	Damaged, nonfriable	81 ft ²	Chrysotile	5
	Mastic	Damaged, nonfriable	81 ft ²	Chrysotile	2
1206-04	Dark brown floor tile	Damaged, nonfriable	81 ft ²	Chrysotile	5
	Mastic	Damaged, nonfriable	81 ft ²	Chrysotile	< 1
1206-07	Ceiling material	Not damaged, nonfriable	90 ft ²	Chrysotile	40
1206-09	Heater expansion boot	Not damaged, nonfriable	2 ft ²	Chrysotile	40
1209-02	Brown floor tile	Damaged, nonfriable	120 ft ^{2c}	Chrysotile	5
1209-04	Transite ceiling tile	Not damaged, nonfriable	60 ft ^{2c}	Chrysotile	40
1209-07	Patching tar	Not damaged, nonfriable	100 ft ^{2c}	Chrysotile	5

^a Abbreviations: ft², square feet; E, number of elbows; T, number of tees.

^b When more than one analytical result is available, the highest value is reported.

^c Both Building 1210 and Building 1211 have the same amounts of ACMs.

Source: USACE (1993).

of the potential for release of asbestos fibers to the atmosphere. Friable ACMs were identified only in Building 1188, in the former Nike IFC area. Building 1188 was previously used by TXARNG personnel as a recreation hall, but it is now unused. Recommendations for abatement of the friable and nonfriable ACMs were included in the survey report (USACE 1993).

4.5 Other Releases

Training activities at the TXARNG property, including the operation of tanks and low-flying aircraft and weapons fire, result in increased noise levels. Fire or explosion could result from an accident involving a vehicle or aircraft assigned to the unit. Low-level radiation sources in minute amounts were used in electronic tubes in Nike missile IFC equipment; release, if any, would have been negligible.

5 Human and Environmental Receptors

5.1 Groundwater

Groundwater is available in the vicinity of Fort Wolters in the Paleozoic freshwater-bearing formations of the Wichita group of the Permian unit and the Cisco group of the Pennsylvanian unit, as discussed in Section 2.5.4. Nearby populations, including the city of Mineral Wells and nearby towns, obtain their drinking water from surface water resources. Upgradient of the TXARNG property, outside the 4-mi radius of concern, the town of Whitt uses groundwater in its public water supply.

5.2 Surface Water

Drainage in maintenance areas of the property, where hazardous materials are used and stored and where the potential exists for release of hazardous waste, is directed to the sanitary sewer system. Maintenance areas are some distance from surface streams, and release of contaminants from the maintenance areas via the surface water pathway is unlikely.

Surface drainage in the maneuver areas is southward, to Lake Mineral Wells. Tributaries within the TXARNG training areas feed Rock Creek and Rippy Branch, which then flow south to Lake Mineral Wells. The two unauthorized waste disposal areas are located near surface drainage flows. Waste Disposal Area 1 is approximately 1 mi north of Lake Mineral Wells. Waste Disposal Area 2 is approximately 3 mi north of the lake.

5.3 Soil

Releases of hazardous waste to surface soils as a result of current TXARNG activities, primarily as a result of vehicle fueling and washing activities, are not considered to be a significant environmental concern with respect to soil contamination. Refueling is performed on asphalt or concrete surfaces, and runoff to surface soils is prevented. The central wash area at the UTES 2 is designed to prevent runoff of waste water to the surrounding soils.

5.4 Air

Limited fugitive dust and vehicle emissions result from the use of military vehicles during training exercises. However, there are currently no permit requirements. Exposure via air of the off-site population to TXARNG-generated contamination is unlikely.

Asbestos present on the site in the form of original construction materials poses a potential health risk to building occupants. No health risk to the off-site population is suspected. The only building on the site in which friable ACMs were identified is no longer used.

5.5 Other Receptors

Access to areas of the property in which hazardous materials are used and hazardous waste is generated is restricted to TXARNG personnel and escorted visitors. Workers are appropriately trained regarding potential hazards.

The TXARNG training operations can result in increased noise levels. Operating procedures are in place to reduce the impact to off-site areas and persons.

6 Preliminary Assessment Findings and Conclusions

6.1 Summary of Preliminary Assessment Findings

Fort Wolters is located 3 mi east of Mineral Wells, Texas, which is in Palo Pinto County. Fort Wolters is a large TXARNG training facility, presently comprising 3,985 acres. The majority of the Fort Wolters property extends northeast into Parker County.

The federally owned Fort Wolters property has a long history of military activity dating from 1925. During World War II and for some years after, the land area used by the federal government for military training was approximately twice that now available and included a substantial cantonment area. A significant portion of the former, more extensive Fort Wolters property, essentially all of the former cantonment area, has since been redeveloped by Mineral Wells as commercial, industrial, and residential areas. Much of the central portion of the former Fort Wolters property was transferred to state and local agencies for use as parks and forest preserves. Most of the property now licensed to the TXARNG remains undeveloped and is used as firing ranges and for maneuver training. Maintenance support is provided through the UTES 2. Aviation facilities include an approximately 370-acre aerial drop zone. Included in the Fort Wolters property are the former Nike-Hercules Missile Defense Program MLA and IFC area designated DF-70.

Maintenance activities performed at the Fort Wolters property as part of TXARNG training operations require the use of hazardous materials and could potentially result in the release of hazardous waste. Also of concern is the potential for hazardous waste to be present on the site as a result of former Nike missile program operations, or in the form of original construction materials, or as a result of unauthorized disposal of waste on the property. The PA team from Argonne identified six ESOs at the Fort Wolters TXARNG property. These ESOs are (1) fuel storage and dispensing, (2) storage of hazardous materials/hazardous waste, (3) vehicle/equipment washing, (4) former Nike missile program operations, (5) use of hazardous construction materials, and (6) unauthorized disposal of waste. The available information indicates that the Fort Wolters TXARNG property poses low potential risk to human health and the environment.

Groundwater is not a significant source of drinking water in the area. The removal of older USTs, including those dating from the former Nike missile base operations, and installation of drainage barriers to prevent surface runoff of TXARNG-generated contaminants reduced the

potential for subsurface migration of contaminants to groundwater. The extent of residual subsurface contamination, if any, that may be present at the site of the waste acid pit (now covered by the concrete tank wash area) in the former Nike MLA is unknown. Much of the volatile acid-solvent cleaning solutions used to remove corrosion from missile parts evaporated during use, reducing the amount discarded.

Surface water from Lake Mineral Wells is the source of drinking water in the vicinity of Fort Wolters. Maintenance areas where hazardous materials are used and TXARNG-generated hazardous waste is likely to be present are not located near surface water streams feeding the lake. The two unauthorized disposal areas within the training areas are near surface drainage pathways, forming a route for contaminants that may be present to migrate beyond the property boundaries to areas of human or environmental concern.

6.2 Recommendations for Further Action

The primary objective of the PA is to identify and evaluate ESOs that would result in either (1) immediate action, (2) site investigation, or (3) no further PA/IRP action. No current TXARNG training activities at Fort Wolters are considered to have a significant adverse impact to the environment.

6.2.1 Fuel Storage and Dispensing

Fuel represents the highest volume of hazardous materials present on the site. The present central fueling area is at a 14,000-gal aboveground storage tank within a concrete containing basin. Older USTs, including those dating from the former Nike missile base operations, have been removed. Inspection of the former Nike USTs at the time of excavation in 1988 confirmed the integrity of those tanks. Leaking USTs at the UTES 2 were removed in 1992. Cleanup of the subsurface soils was performed under the authorization of the Texas Water Commission. No further PA/IRP action is recommended for this ESO.

6.2.2 Storage and Use of Hazardous Materials

Drainage from maintenance work areas is directed through oil-water separators before it enters the sanitary sewer system. Storage facilities for hazardous materials/wastes are adequate.

Installation of a small curb (or lip) at the door of the UTES 2 battery storage building is recommended to ensure containment in the event of a release there.

6.2.3 Vehicle/Equipment Washing

The tank/vehicle wash facility at the UTES 2 is the central wash area. It is designed to prevent release of waste washwater and potential contaminants. If the tank wash area at the former UTES facility (the exercise area maintenance facility) is to be used frequently, upgrading of the washrack by the addition of an oil-water separator and drainage control is recommended.

6.2.4 Former Nike Missile Base Operations

Little is known about deactivation of the former Nike MLA and IFC area. As stated, USTs dating from those operations have been removed with no evidence of subsurface contamination. The volume of potentially hazardous waste fluids generated at the former IFC facility was low, and subsurface contamination at that site is not suspected. Maintenance and fueling operations performed at the former MLA could have resulted in subsurface contamination, especially at the location of the former waste acid pit. Missile maintenance operations required the use of significant quantities of solvents and acids, which were discarded at the waste acid pit now covered by the tank wash area. In the intervening years, infiltration of precipitation has probably diluted and washed away the discarded fluids. Limited subsurface soil sampling (no deeper than 20 ft) at the location of the former waste acid pit is recommended to confirm that no residual subsurface contamination is present. Water sampling already performed within the abandoned missile silos indicated that no contamination is present at those locations.

6.2.5 Use of Hazardous Construction Materials

Surveys have confirmed the presence of PCBs in transformers on the site and asbestos-containing construction materials in some buildings. The transformers have been catalogued with respect to PCB concentration and are monitored by the responsible electric company. The only building in which asbestos was identified as being in a friable condition is no longer used, ensuring the health of site workers; abatement measures were recommended in the asbestos survey. No further PA/IRP actions are recommended for these sites.

6.2.6 Unauthorized Disposal of Waste

Of concern are two unauthorized waste disposal areas on TXARNG property. Both disposal areas are within drainage pathways feeding Lake Mineral Wells, to the south of Fort Wolters. Lake Mineral Wells is the source of drinking water for the surrounding population. The disposal area in the northern portion of the TXARNG property contains household-type waste probably left on the site by a trespassing civilian. Cleanup of that small disposal area is recommended primarily to discourage continued trespassing and discarding of waste on the property. No health hazard or risk to Lake Mineral Wells is suspected. The second, much larger disposal area contains metal debris and other waste strewn along an area approximately 300 ft long and 10 ft wide (as estimated from the air). Close inspection of the disposal area is recommended to characterize the waste content. If the waste is determined to be hazardous (for example, containing a substantial number of containers or drums for chemicals or petroleum products), sampling within the disposal area and along the drainage pathway downgradient from it is recommended. Such sampling would include collection of near-surface and subsurface soil samples. If drainage into Rock Creek (which feeds Lake Mineral Wells) or a tributary is evident, surface water sampling at that drainage location is recommended. The objective of this limited soil and water sampling effort would be to determine whether contamination is present at a level that would place the downgradient surface water resources at risk.

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Appendix:
Interview Information

Appendix:

Interview Information

Individuals Interviewed

Environmental Officer
Texas Army National Guard
Camp Mabry
Austin, Texas

Construction Inspector (retired)
Texas Army National Guard
Camp Mabry
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