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US Army Corps of Engineers

Toxic and Hazardous
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Preliminary Assessment Screening
First Army Recreation Area
Lewes, Delaware

FINAL

September 1991

Prepared For:
U.S. Army Corps of Engineers
Toxic and Hazardous Materials Agency
Aberdeen Proving Ground, MD

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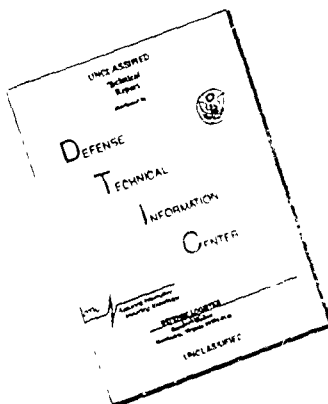
Contract No. DAAA15-90-D-0001, Task 8

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FINAL
PRELIMINARY ASSESSMENT SCREENING
FIRST ARMY RECREATION AREA
LEWES, DELAWARE

Prepared For:
U.S. Army Corps of Engineers
Toxic and Hazardous Materials Agency
Aberdeen Proving Ground, MD 21010-5401

Contract No. DAAA15-90-D-0001, Task 8

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1.0 INTRODUCTION

1.1 Authorization

Advanced Sciences, Inc. performed this work under U.S. Army Armament, Munitions and chemical Command Contract No. DAAA15-90-D-0001, Task Order No. 8, Preliminary Assessment Screening (PAS) of the First Army Recreation Area (FARA), Fort Miles, Delaware.

1.2 Scope of Work

Advanced Sciences, Inc. was tasked to perform a PAS in accordance with Revised Army Regulations 200-1 to determine if hazardous substances were stored, released into the environment or structures, or disposed of on a proposed real property transaction site. Completion of this task required a site visit to FARA, a document review and a physical survey. A report including a statement of findings and recommendations was to be submitted that would support a record of environmental consideration.

1.3 Summary

The subject site (FARA) is located in Lewes, Sussex County, Delaware. Currently, FARA, part of a one-time larger military reservation, consists of approximately 96 acres lying adjacent to the Atlantic Ocean just south of Cape Henlopen, Delaware. During World War II (WWII), FARA was part of a larger Fort Miles Military Reservation (FMMR) which was used by the Army and Navy to conduct military operations on land and sea at the entrance to the Delaware Bay (see Figure 1).

FMMR consisted of approximately 1,381 acres. Its military mission during WWII was to protect the Delaware Bay from German Submarines (U-boats). Since that time, sections have been turned over to the State of Delaware for use as a state park, and an additional 240 acres were conveyed to the Department of the Navy. Approximately 96 acres remain under control of the Army (see Attachment A), and are being used as a recreation area for military personnel.

In 1990, Senate Bill S.2884 was introduced by Senator Biden of Delaware. This bill asked the Army to turn over the remaining 96 acres to the State of Delaware. The Army is presently removing furniture, recreation equipment and other movable items from the recreation area. This PAS is part of that process (see Attachment B).

2.0 SITE BACKGROUND

2.1 Location

FARA is located along the Atlantic coast east of Lewes, and north of Rehoboth Beach, Delaware (see Figure 1). The coordinates of the site are 38 degrees 46 minutes 30 seconds north latitude and 75 degrees 05 minutes 08 seconds west longitude.

2.2 Site Layout

The FARA encompasses approximately 96 acres. Of these 96 acres, approximately 20 acres are used as a housing area for Army personnel and their families. The remaining 76 acres are covered by sand dunes and beach grass and are presently unused except as access to the beach east of the housing area (see

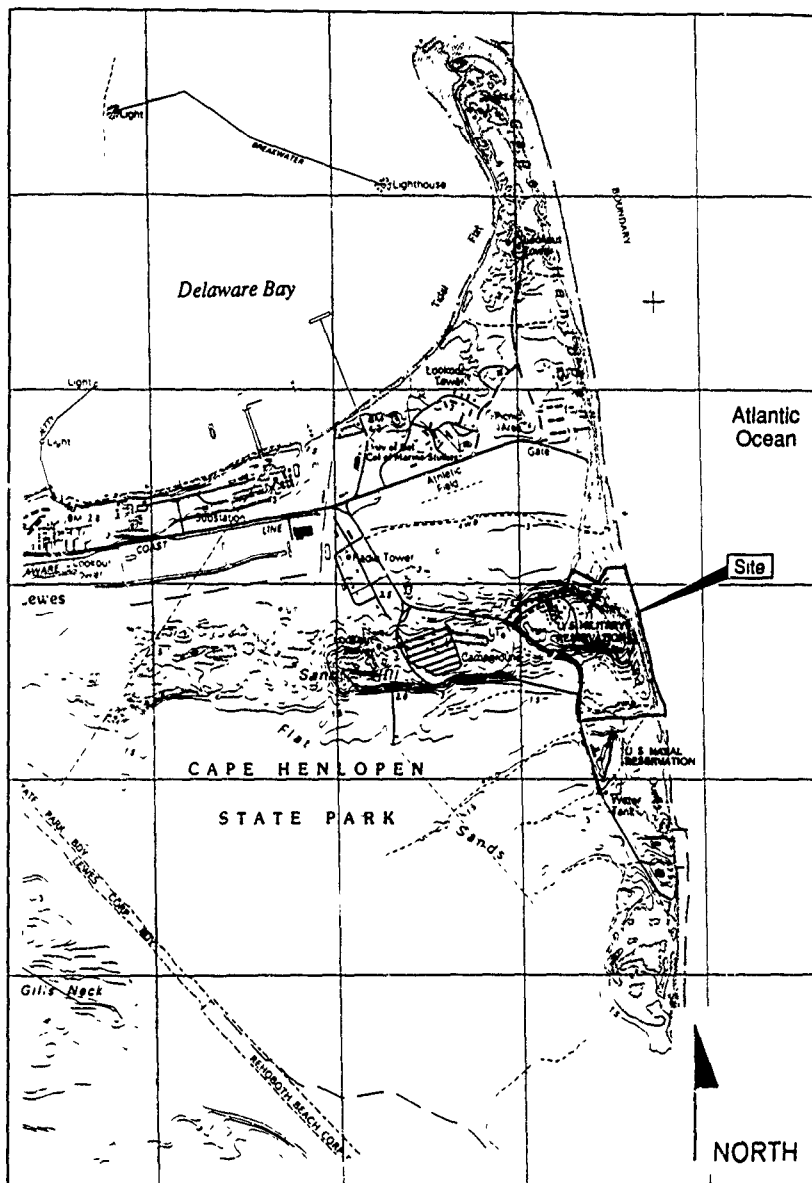


FIGURE 1. FIRST ARMY RECREATION AREA SITE LOCATION MAP

Figure 2). FARA can be entered from Dune Road by turning left on to Sandy Road. The housing area consists of concrete block buildings, mobile homes and octagonal structures used to house visitors. In addition there is a mobile home used as the Post Exchange, and a large concrete building used as a Recreation Hall. A children's playground lies just south of buildings 606 and 607 (see Figure 2).

A bunker lies east of the housing area on the highest point of the installation. This bunker once housed large guns and support supplies for these guns. It is now completely covered by sand except for two doors facing east. Historical records indicate the large guns protruded, and were fired, from these doors. The doors have been blocked off by using concrete blocks and the area is completely surrounded by a six-foot high, chain-link fence topped with barbed wire.

Maps of FARA indicate the areas south and downslope of the bunker were used as 3.5 inch inert rocket ranges (see Attachment D) although no evidence of these activities could be located during the site visit. Records also indicate the area just east of the bunker was used as a pistol range (see Figure 2).

Historical records also indicate a sanitary sewer line underlies the entire site, extending from building 640 (the bunker) to the west and exiting the site near building 600 (see Figure 2). This six-inch sanitary sewer line empties into a septic tank and filter bed just off the site boundaries.

2.3 Ownership History

Fort Miles Military Reservation (FMMR) originally consisted of approximately 1,381 acres and was acquired by DoD by various land transactions between 1873 and 1957 (see Figure 3).

In the spring in 1941 the 261st Coast Artillery, Delaware National Guard, was Federalized and stationed at FMMR. During WWII the installation was used by the Army and Navy in a joint effort to keep U-Boats from mining the entrance to the Delaware Bay and River. Eight-, twelve- and sixteen- inch guns were emplaced at Fort Miles which extended from what is now Cape Henlopen south to Fenwick Island during the war's climax (see Attachment A).

During the Korean Conflict, FMMR was used for training of troops and weapon firing practice. (DERP Report 86)

FMMR was closed in 1958 and most of the installation was conveyed to the State of Delaware by 1983 (see Attachment C). However, the Army retained approximately 96 acres, renamed FARA, and was used by the First Army as a recreation area.

Senator Biden of Delaware introduced Bill S.2884 during the 2nd session of the 101st Congress on July 10, 1990, requesting that the Secretary of the Army convey the remaining 96-acre parcel to the State of Delaware (see Attachment B).

2.4 Site Use History

FMMR originally consisted of approximately 1,381 acres and was acquired by DoD by various land transactions between 1873 and 1957.

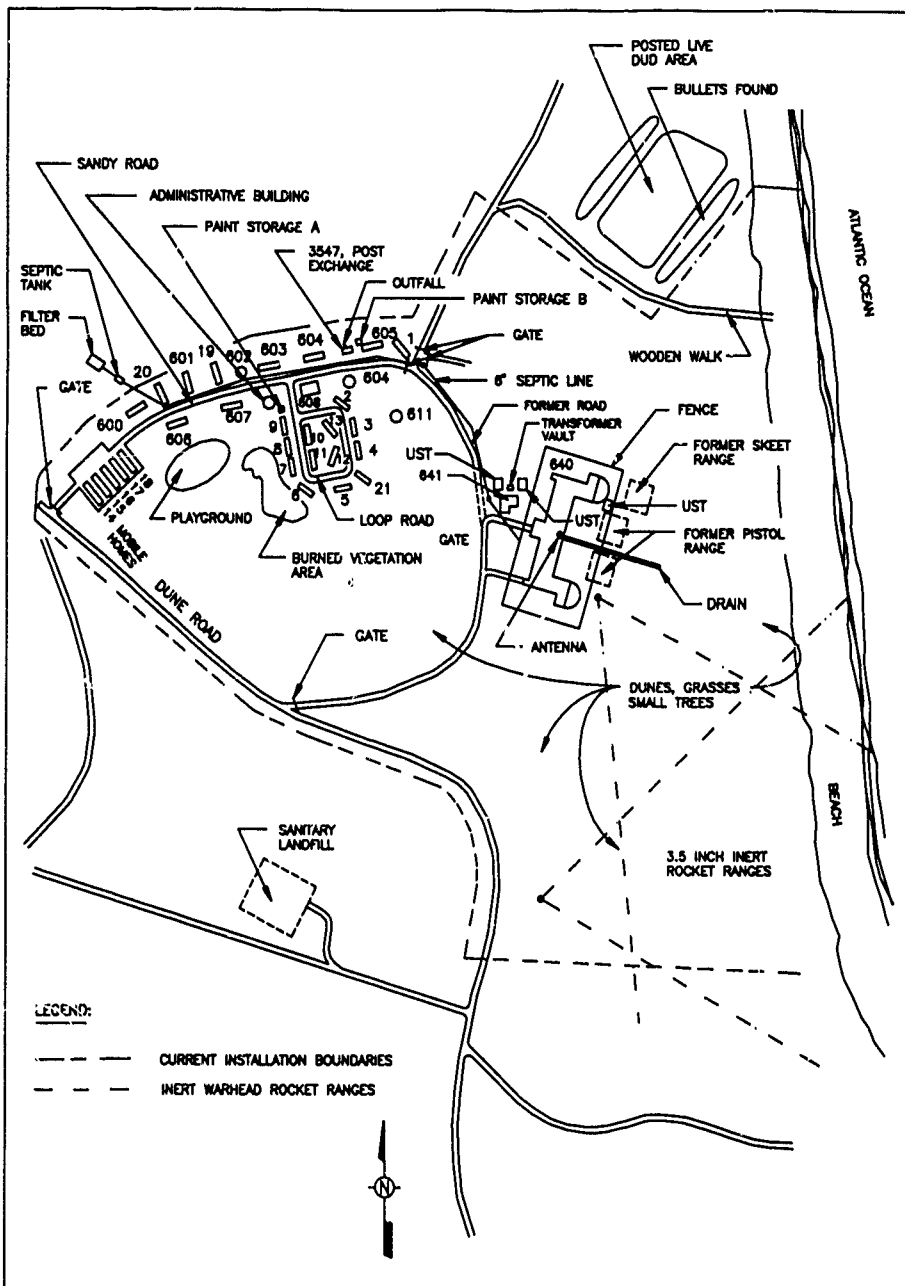


FIGURE 2. FIRST ARMY RECREATION AREA SITE SKETCH

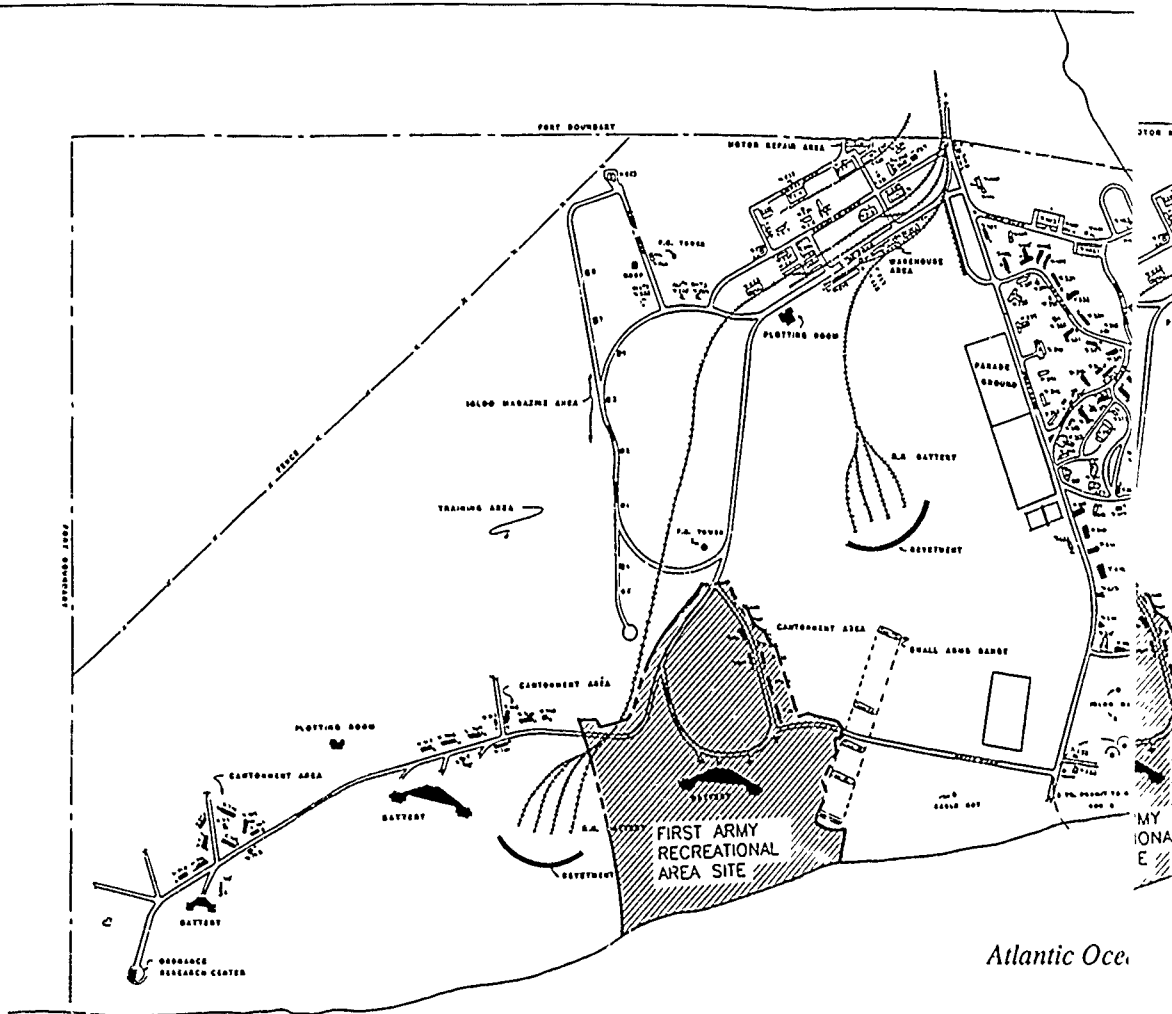
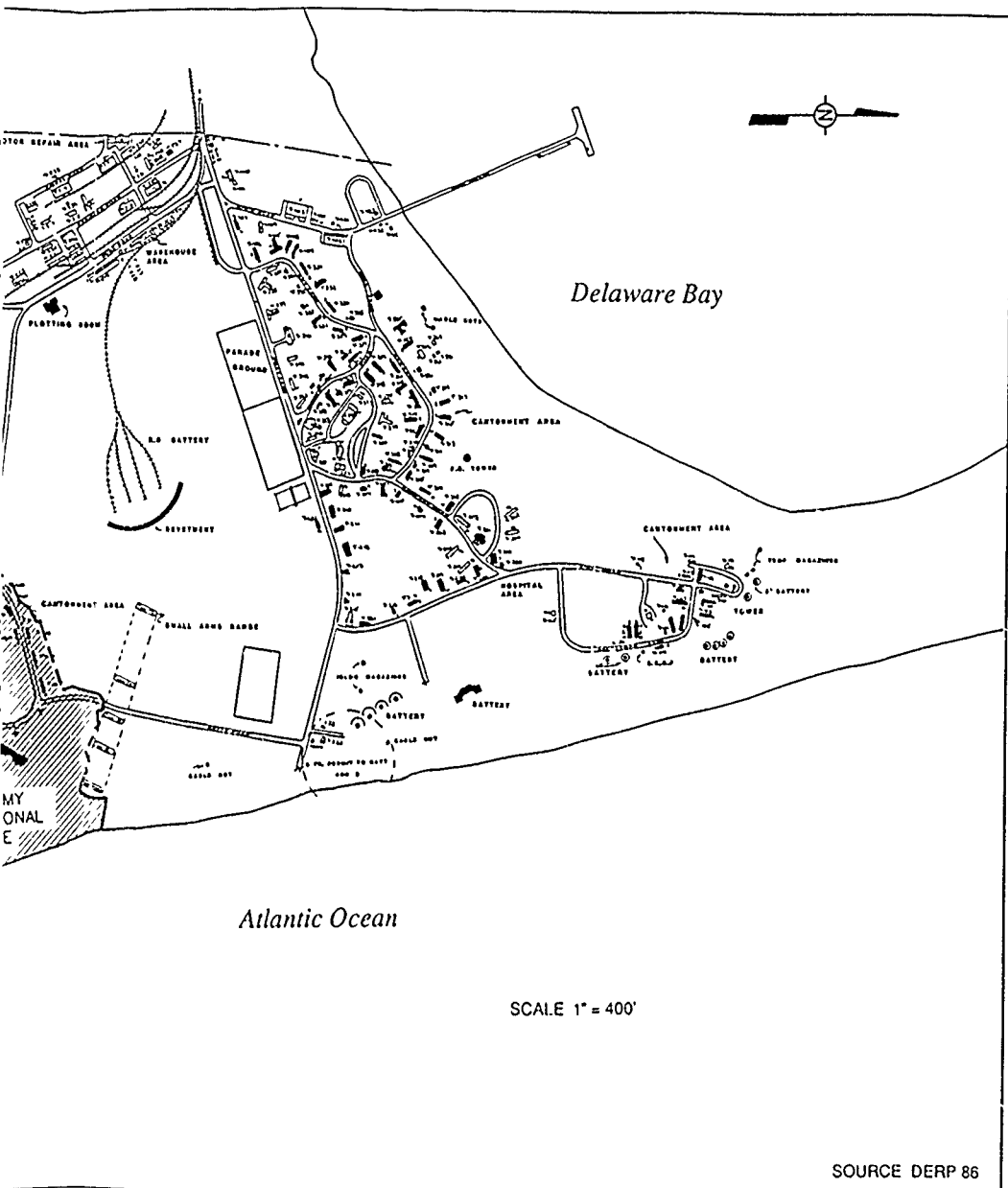


FIGURE 3. FORT MILES MILITARY RESERVATION



No records could be located to document FMMR's history between the initial land transactions in 1873 the beginning of WWII in 1941. In the spring of 1941, the 261st Coast artillery, Delaware National Guard, was Federalized and began to occupy and expand FMMR. During the summer of 1941 much construction of armament and support structures went on at FMMR. The U.S. Navy also occupied parts of the post, and jointly, Navy and Army personnel, laid mines in the channel of the Delaware Bay. (DERP Report 86)

After WWII, FMMR continued its mission as an active Army post. Activity increased in 1950 when the Korean conflict arose. During this time, FMMR was used for troop training and weapon firing practice (DERP Report 86)

In 1961, DoD declared FMMR as and began land transfers from the Army to the State of Delaware. (DERP Report 86) Of the original 1,381 acres acquired, approximately 96 acres remain under the control of the Army.

The State of Delaware has turned the original FMMR post into Cape Henlopen State Park. Fifteen acres are currently used by the Department of the Navy as a Naval Oceanographic Research Station, located south of FARA.

The 96-acre parcel which was reassigned to FARA in 1962 is currently being disassembled with movable Army items being transferred to Ft. Meade, MD

In 1990, Bill S.2884 was introduced in the U.S. Senate by Senator Biden of Delaware which sought to have the remaining 96-acre parcel turned over to the State of Delaware. This bill passed and the Army's return of this land over to the State of Delaware is proceeding

2.5 Permit and Regulatory History

Records could be located that document FARA as having any Federal, State or local environmental permits or regulatory actions

The Army permits the Coast Guard to use land above the bunker, building 640, and a room in building 641 (No. DACA-31-4-84-073). The land above the Bunker is used to position an antenna and the room in building 641 is used for generator and transmitter space

2.6 Remedial Action to Date

Records have not been located to document that remedial actions have neither occurred nor been required at FARA.

3.0 ENVIRONMENTAL SETTING

3.1 Water Supply

Potable water within the study area is derived by both public water systems and private groundwater wells

The Lewes Public Water System (LPWS) owns and operates five groundwater wells just within the study area near Quakertown, DE. These five wells vary in depth from 85 to 100 below ground surface (bgs).

They are completed into the Columbia/Pocomoke Aquifers and supply approximately 2,600 people within the town of Lewes.

The Cape Henlopen State Park Water System (CHSPWS) owns and operates two ground water wells just west of the Lewes and Rehoboth Canal adjacent to Gills Neck. These wells are completed to an approximate depth of 90 feet and supply potable water to users of the park and FARA.

There are no permanent residents of the park area. However, examples of where water would be supplied are, picnic areas, campgrounds, bathhouses, FARA and an area used by the University of Delaware, College of Marine Studies.

The remaining residents of the study area derive their potable water from private groundwater sources. They primarily reside between a three- and four-mile study area of FARA.

All of the residents in this discussion are permanent, full-time residents. As the entire study area is a resort area, during the summer months, these numbers may increase threefold.

3.2 Surface Water

On-site water precipitation is expected to runoff radically because FARA sits atop a high sand dune (15-17 feet). The steepest slope is found east of the bunker and is estimated to be at 30%. In that area, any precipitation not percolating into the sands will flow primarily into the Atlantic Ocean.

The closest stream to FARA is an unnamed tributary to the Lewes and Rehoboth Canal. This tributary lies approximately 0.3 miles southwest of the installation and this tributary continues approximately 1.6 miles until it enters the Lewes and Rehoboth Canal. The Canal runs northwest to southeast through the study area and bisects the entire area.

The largest fresh-water body is Gordons Pond located 1.5 miles south of FARA.

There are approximately 75 acres of wetlands within the study area. The largest portion is between the one and two mile study areas. The closest portion is approximately 0.7 miles southeast of FARA.

3.3 Hydrogeology

The geologic and hydrogeologic conditions in the study area were researched as part of the site investigation. A preliminary literature review was conducted to determine surface and subsurface geologic conditions, soil character, and the status of groundwater transport and storage.

3.3.1 Geology

FARA is located in the Atlantic Coastal Plain Physiographic Province, an area characterized by thick sequences of gently-dipping, unconsolidated deposits. These materials overlie very old metamorphic and igneous rocks probably similar to those exposed in northern Delaware. (Sundstrom and Pickett 1969)

The total thickness of coastal plain sediments may exceed 6000 feet at FARA. These Cretaceous, Tertiary and Quaternary Age deposits are comprised of clay, silt, sand and occasional gravel beds that dip to the southeast at approximately 10 to 15 feet per mile. Sand layers dominate the stratigraphy of the area and

are capable of producing large quantities of groundwater. These zones are often separated by clays and silts that serve as confining beds, separating the deposits into several aquifers (Sundstrom and Pickett 1969). The Columbian Group (aquifer) is of particular interest in the vicinity of FARA in that it is the principal source of groundwater for the region. This formation is further discussed in section 3.3.3.

Table 1 shows the general distribution of geologic units in eastern Sussex County and indicates the general composition of these strata. Figure 4 (Jordan 1990) is a cross-section constructed from Cape May, New Jersey through Sussex County, Delaware, and into northern Maryland. It shows the general configuration of the geologic units and indicates that the beds thicken and the dip steepens southward and eastward.

3.3.2 Soils

Soils on FARA have been classified by the United States Department of Agriculture, Soil Conservation Service, as coastal beach and dune land. This soil consists of non-coherent, loose sand that has been worked and re-worked by waves, tides and winds. FARA soils are derived of marine beach sediments of Pleistocene age and have low runoff and high infiltration rates. Infiltration rates greater than 6 inches/hour are normal (Adams, Durward and Christian 1964).

3.3.3 Groundwater

All residents within the study area derive potable water either from groundwater supplied by public water companies or from private water wells.

Within the Coastal Plain of Delaware, the Columbia aquifer is the shallow subsurface hydrologic unit that supplies most domestic, irrigation, agricultural wells, and many public supply wells. The aquifer is a heterogeneous hydrologic unit occurring in unconsolidated rocks ranging in age from Miocene to Holocene. (Sundstrom and Pickett 69)

Recharge to the Columbia Aquifer is derived entirely from precipitation with most recharge occurring from mid-October to early April. (Sundstrom and Pickett 69)

Water from the Columbia aquifer is of good quality for most purposes, being low in dissolved solids. However, the water is slightly acidic, with a pH of 6.08, making it corrosive to metal. Iron concentrations (1.6 mg/L) may be high enough to cause staining of laundry and plumbing fixtures. (Sundstrom and Pickett 69)

The Columbia aquifer is highly vulnerable to contamination from sources above the aquifer. The soils above are generally sandy transmitting liquid-phase materials at high rates. Additionally, some public supply wells have had to be located further inland to prevent saline water intrusion from affecting their supply. (Sundstrom and Pickett 69)

3.4 Climate and Meteorology

The annual temperature for Lewes, Delaware, which is approximately 3 miles west of the site is 66.3 degrees Fahrenheit. The average monthly temperatures range from a low of 31.6 degrees Fahrenheit in January to a high of 84.2 degrees Fahrenheit in July. The average annual precipitation for Lewes is 45 inches. The mean annual lake evaporation for the area of the site is 34 inches. The net annual precipitation for the site area is approximately 11 inches.

TABLE 1
DISTRIBUTION OF GEOLOGIC UNITS IN EASTERN SUSSEX COUNTY

AGE	NAME	ROCK TYPE
Holocene	Shoreline deposits	Sand and silt-clay
Pleistocene	Columbia Formation Omar Formation Beaverdam Formation	Sand, gravel Sand, silt interbedded Sand
Miocene	Chesapeake Group Pocomoke Aquifer Fredenca Aquifer Cheswold Aquifer	Silt, clay & sand Med. to coarse sand Med. to coarse sand Med. to coarse sand
Eocene	Piney Point Formation	Glauconitic silt and clay
Cretaceous Paleocene-Eocene	Unit A	Glauconitic silt and clay
Late Cretaceous	Monmouth Formation ¹ Matawan Formation ¹ Magothy Formation ¹	Glaucon. silty sand Glaucon. silty clay Sand and clay, carbonaceous
Early Cretaceous	Potomac Formation	Variegated clay and sand interbedded
Triassic	Newark Series	Red shales and arkose sandstones
Lower Paleozoic- Precambrian	Basement Complex	Gneiss, schist, amphibolites

Source: Sundstrom and Pickett 1969

¹ It is not known if these formations exist beneath the area

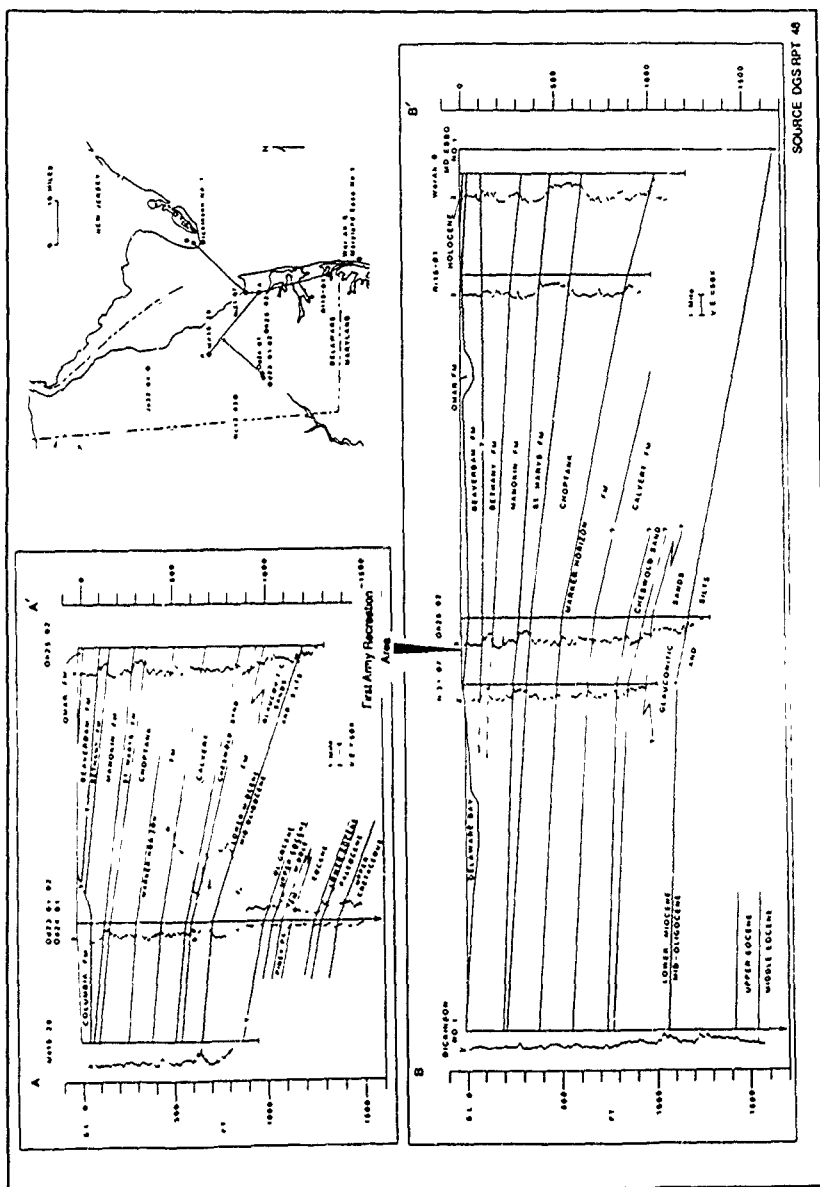


FIGURE 4. FIRST ARMY RECREATION AREA UNDERLYING GEOLOGICAL SEQUENCES

3.5 Land Use

FARA is no longer being used for its recreational purposes. The on-site representative is in the process of inventorying and removing movable Army items to Ft. Meade, MD.

Land within one mile of the installation is used as park and recreation land except for the University of Delaware's College of Marine Studies and the Bancroft Corporation. This plant physically separates sulfates from seawater. The college and manufacturing plant lie northwest of the installation along the Break Water Harbor coast line. (USGS)

The southern edge city of Lewes is bisected by the one-mile study line with the northern edge extending beyond the one-mile study area. There are approximately 2,600 permanent residents in Lewes.

A large wetland (approximately 75 acres) is located between Lewes and Rehoboth Beach and it is bisected by the Lewes and Rehoboth Canal. Much of the area, not part of the wetland, is farmland. (USGS)

Between the three and four-mile study areas lies a rapidly growing residential area along Route 1, the main north/south highway.

3.6 Population Distribution

The population distribution within the study area is as follows:

0	to	.25 miles	0 persons
25	to	.5 miles	0 persons
.5	to	1 miles	0 persons
1	to	2 miles	89 persons
2	to	3 miles	247 persons
3	to	4 miles	3,791 persons

A total of 4,127 persons live within the four-mile study area, including a portion of the residents of Lewes and Rehoboth Beach (USGS). This count includes only permanent residents.

3.6.1 Air Emission Concerns

FARA is currently unused and only three Army personnel are temporarily stationed there. The closest permanent resident lives approximately 1.6 miles northwest of the installation. The FARA is surrounded on all sides, except the east, by the Cape Henlopen State Park. The closest school, Cape Henlopen Jr. High School, is approximately 3.2 miles to the west.

3.7 Critical Environments

The State of Delaware Department of Natural Resources and Environmental Control, Division of Parks and Recreation, reviewed the Natural Heritage Inventory data base for localities of rare plants, animals, and natural communities within the 4-mile study area.

Although no studies have been done on the remaining 96 acre FARA site, the surrounding area has been studied and the following rare or endangered species have been documented as residing within the 4-mile study area.

Table 2 shows animals and plants of concern within the study area.

4.0 WASTE TYPES AND QUANTITIES

Currently, FARA is not being used as a recreation area. A three-man detail is stationed there for the sole purpose of preparing an inventory and shipping all movable Army equipment to Ft. Meade, MD. There are no hazardous wastes generated during this process.

4.1 Areas of Concern

Nine Areas of Concern (AOC's) have been identified which may require further investigation.

Paint Storage A

Paint Storage A is a metal storage building located adjacent to and east of the Administration building. It is used to store paints, paint thinner, pesticides, oils and mixed gas (see Figure 2). The walls of the building are extremely corroded at the bottom (see photograph 3 located in Appendix A).

Visible soil staining was observed around the building. The depth of staining appeared to be approximately three inches. The materials inside the building were stored in one gallon and five gallon metal or plastic containers. Together there were approximately 20 gallons of materials stored inside the building.

Paint Storage B

Paint Storage B, a metal storage building located between building 3547 (the Post Exchange) and building 605, also contained paints and paint thinner stored in metal or plastic containers (see Figure 5). The building had a sound, wooden floor and no corrosion was evident. There were approximately five gallons of paints and paint thinner stored in this building.

Pistol and Skeet Range

Historical maps indicate there was a pistol firing range east of the bunker (Building 640) and a skeet range adjacent and north of the bunker (see Figure 2). During the site visit, small amounts of construction debris were observed in this area. Records indicate these ranges were used as late as 1958. (DERP Report 86)

3.5-Inch Inert Warhead Rocket Ranges

Historical maps also indicate there were two 3.5-inch Inert Warhead Rocket Ranges (see Attachment D) located on this site (see Figure 2). Records were not located that documented information other than location. No indications of other rocket ranges were detected during the site visit.

TABLE 2
ANIMALS AND PLANTS OF CONCERN

ANIMALS

COMMON NAME	SCIENTIFIC NAME	CLASSIFICATION
Tiger beetle	<i>Cincindela lepida</i>	DE Rare
Northern tiger beetle	<i>Cincindela dorsalis</i>	US Endangered
Puritanis tiger beetle	<i>Cincindela puritana</i>	US Endangered
Piping plover	<i>Charadrius melodus</i>	US Threatened

PLANT

COMMON NAME	SCIENTIFIC NAME	CLASSIFICATION
Beach pig-weed	<i>Amaranthus pumilus</i>	US Endangered

Source: DNREC

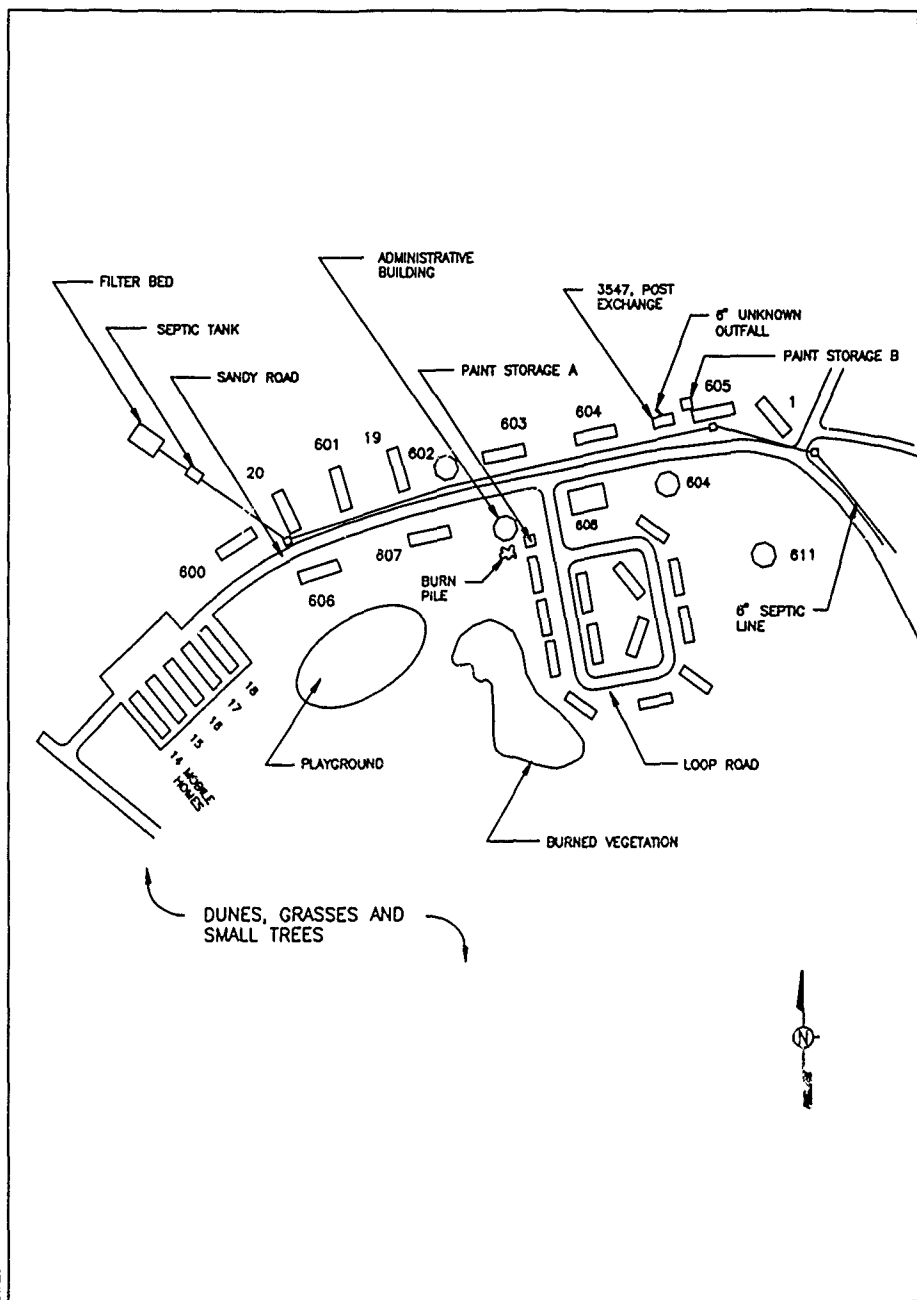


FIGURE 5. FIRST ARMY RECREATION AREA
POPULATED AREA

Post Exchange Outfall

A six-inch diameter, polyvinyl chloride (PVC) outfall pipeline exiting from the Post Exchange (Building 3547) and leading approximately 10 feet north was observed during the site visit. Records were not available to document what was released from this outfall, and the site representative had no knowledge of its previous use. No soil staining or stressed vegetation was observed in this area. Access to the Post Exchange to ascertain the origin of the outfall was not possible (see Figure 5).

Burned Vegetation Area

A wide area of burned vegetation (see Figure 5) was observed west of Loop Road and south of Sandy Road. Records were not available to document the event(s) pertaining to the fire damage, nor did the site representative know the cause.

Burn Pile

A burn pile was observed south of Building 610 and west of Paint Storage A. Rusted metal bolts along with rusted nails were observed among the ashes. The site representative was unsure what had been burned and no records were located to document past practices (see Figure 5).

Bunker

The bunker (Building 640) lies in the central portion of the installation and is surrounded by a six-foot high, chain-link fence topped with barbed wire. A gate is located in the western fence boundary which leads to the main entrance. The gate is locked at all times unless the site representative grants access. The bunker has large gun rooms on both its northern and southern end. Between these gun rooms are various-sized rooms used for storage and support (see Figure 6). In past practice, the guns were emplaced and supplied by personnel who lived within the bunker.

Also, historical maps indicate an UST lies east of the north end of the bunker (see Figure 6). This 1000 gallon UST was used to store fuel oil utilized in the bunker.

Within the bunker there are three potential environmental problems:

- Historical records indicate asbestos containing wall board was used in the construction of the interior of the bunker and floor and ceiling tile may contain asbestos also. In many areas, ceiling tiles have fallen and debris was scattered throughout the rooms. Floor tile was observed in rooms used to support the gun emplacements.
- The bunker has a floor drainage system (see Figure 6). Records could not be found to determine past use, however historical maps indicate it drains to the low land east of the bunker (see Figure 6). Records also indicate this drainage was filled with concrete prior to 1959.
- One room within the bunker was used to store paint, lacquer, polyurethane wood finish, rock salt and hypochloride. Visible staining was observed on the concrete floor (see photograph 8 located in Appendix A). All materials were stored in metal or plastic containers and there were approximately 30 gallons of stored materials.

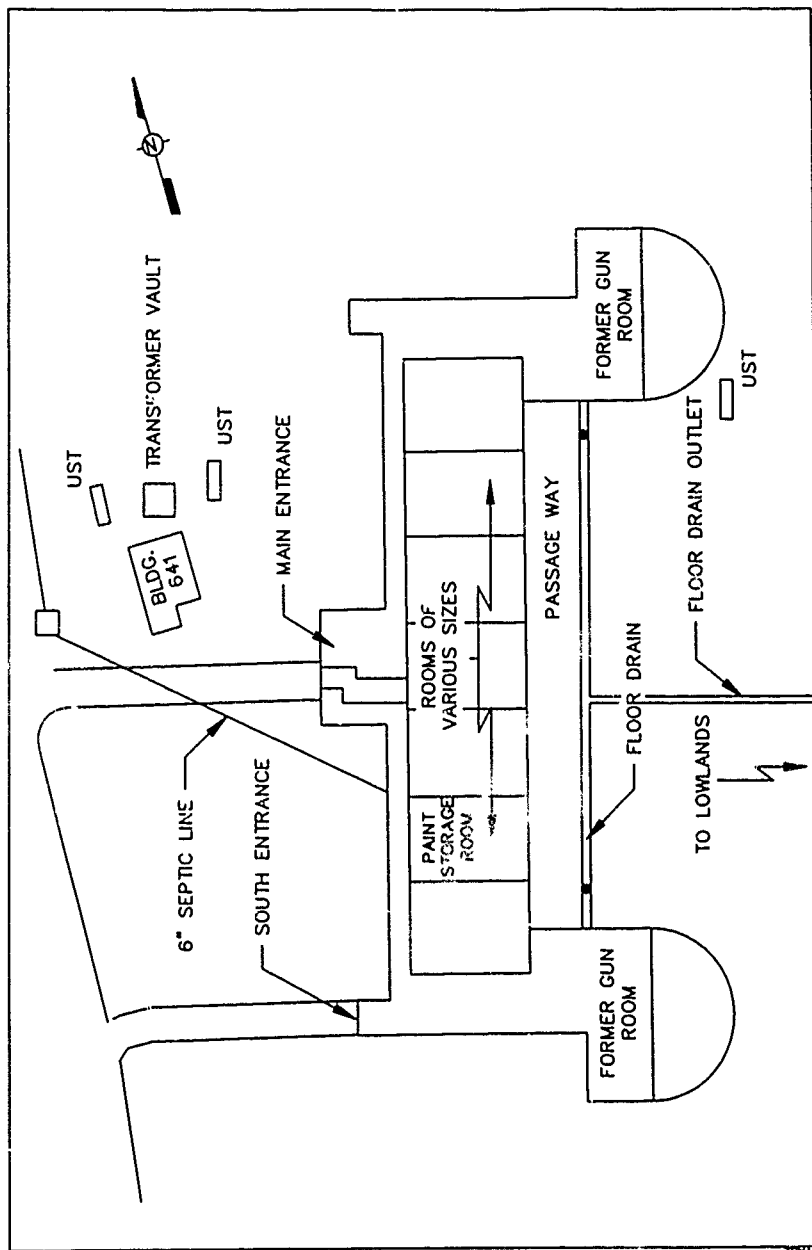


FIGURE 6. FIRST ARMY RECREATION AREA
INTERIOR SITE SKETCH BLDG. 640 (BUNKER)

Building 641

Just west of Building 640 (the bunker) lies Building 641 the emergency generator building. Historical maps show two underground storage tank (UST's) adjacent to the north end of the building and an underground transformer vault north of the building (see Figure 6). No historical records could be located to indicate the capacity of the UST's. However, records do indicate fuel oil was stored in them. Also no records could be located to indicate whether any transformers still remain in the underground vault.

All heat used by on-base structures is supplied via natural gas. No other UST's could be located.

5.0 FIELD REPORT

5.1 Site Observations

The following site observations were made:

- There was a gate at the main entrance to the installation, however, the fence only extended 40 feet on either side of the gate.
- All formerly used housing structures are currently unoccupied.
- Bullets (projectile portion of cartridge) were found just north of the installation's boundary near the area mark "Live Dud Area".
- Construction debris was observed in the former skeet and pistol ranges east of the bunker (Building 640).
- A large vegetation burn area was observed west of Loop Road near the playground area.
- A posted "Live Dud" area was observed just north of the installation's boundary.
- A floor drainage system was observed in the bunker (building 640).
- Flooring and ceiling tiles in the bunker may be of asbestos composition.
- Paint and other materials were stored in one room of the bunker and in Paint Storage Buildings A and B.
- Two Rocket (inert warheads) Ranges that may contain live duds are indicated on historical maps.

6.0 RECOMMENDATIONS

6.1 Paint Storage A

At the writing of this report, the Army is currently closing this installation and all materials in this storage area should be treated as hazardous during their disposal.

The stained soils should be surface sampled and, if found to be hazardous, properly disposed. The depth of contamination was observed to be approximately three inches. It is also recommended that one soil boring (approximately 3 feet) be advanced and one soil sample be collected and analyzed. This would help determine whether contamination has migrated into soils (see Figure 7).

6.2 Paint Storage B

The Army is presently closing this installation and all materials in this storage area should be treated as hazardous during their disposal. No evidence of contamination beyond the building was indicated, therefore, no sampling is recommended.

6.3 Pistol and Skeet Range

The pistol and skeet range located east of the bunker was used until 1958. Although no surficial evidence of materials other than construction debris was observed, a geophysical survey should be undertaken to determine if bullets or ammunition casings exist (see Figure 8).

6.4 3.5-Inch Inert Warhead Rocket Ranges

Historical records indicate there were two 3.5-inch Inert Warhead Rocket Ranges located south of the bunker. Since training and weapon firing practice went on at FARA, it should be assumed the rocket ranges were used until 1958. A geophysical survey of the entire area south of the bunker should be conducted (see Figure 8).

6.5 Post Exchange Outfall

A six-inch diameter PVC outfall pipeline was observed exiting from the north side of the Post Exchange (Building 3547). No information regarding possible release from this outfall is available. A surface soil sample should be collected at the end of the outfall pipe and a soil boring should be advanced with subsurface soil samples collected at one- and three- foot depths (see Figure 9).

6.6 Burned Vegetation Area

A wide area of burned vegetation was observed west of Loop Road and south of Sandy Road. Three surface soil samples should be collected and analyzed. Additionally, three soil borings should be advanced and the soil sampled at one- and three- foot depths (see Figure 10).

6.7 Burn Pile

A burn pile was observed south of Building 610 and west of Paint Storage A. Rusted metal bolts along with rusted nails were observed among the ashes. One sample of the ashes should be collected along with a surface soil sample of the soil beneath the pile, and one soil boring should be advanced beneath the burn pile with samples collected at one- and three- foot depths (see Figure 10).

6.8 The Bunker

There are three potential environmental problems in the bunker.

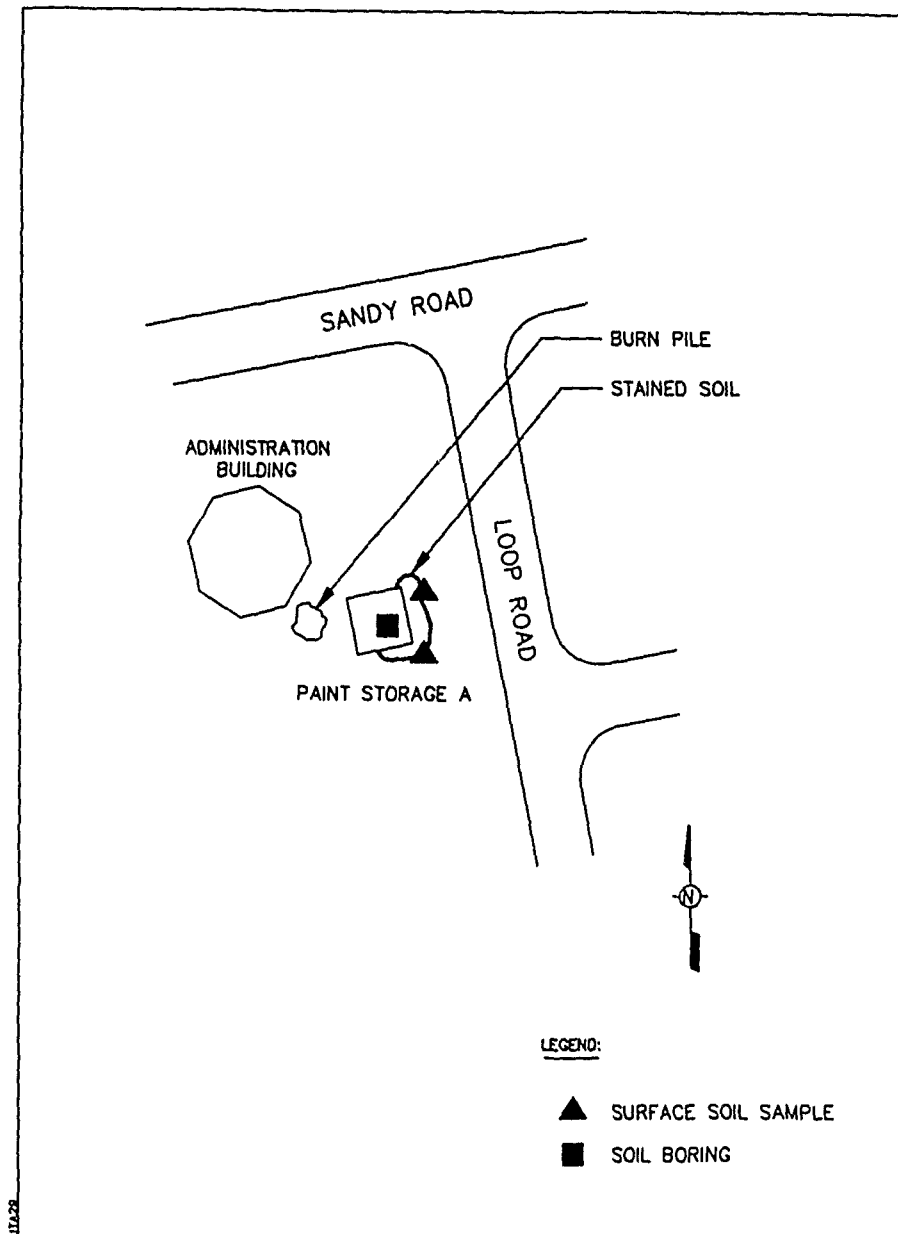


FIGURE 7. FIRST ARMY RECREATION AREA
PROPOSED SAMPLE LOCATIONS (PAINT STORAGE A)

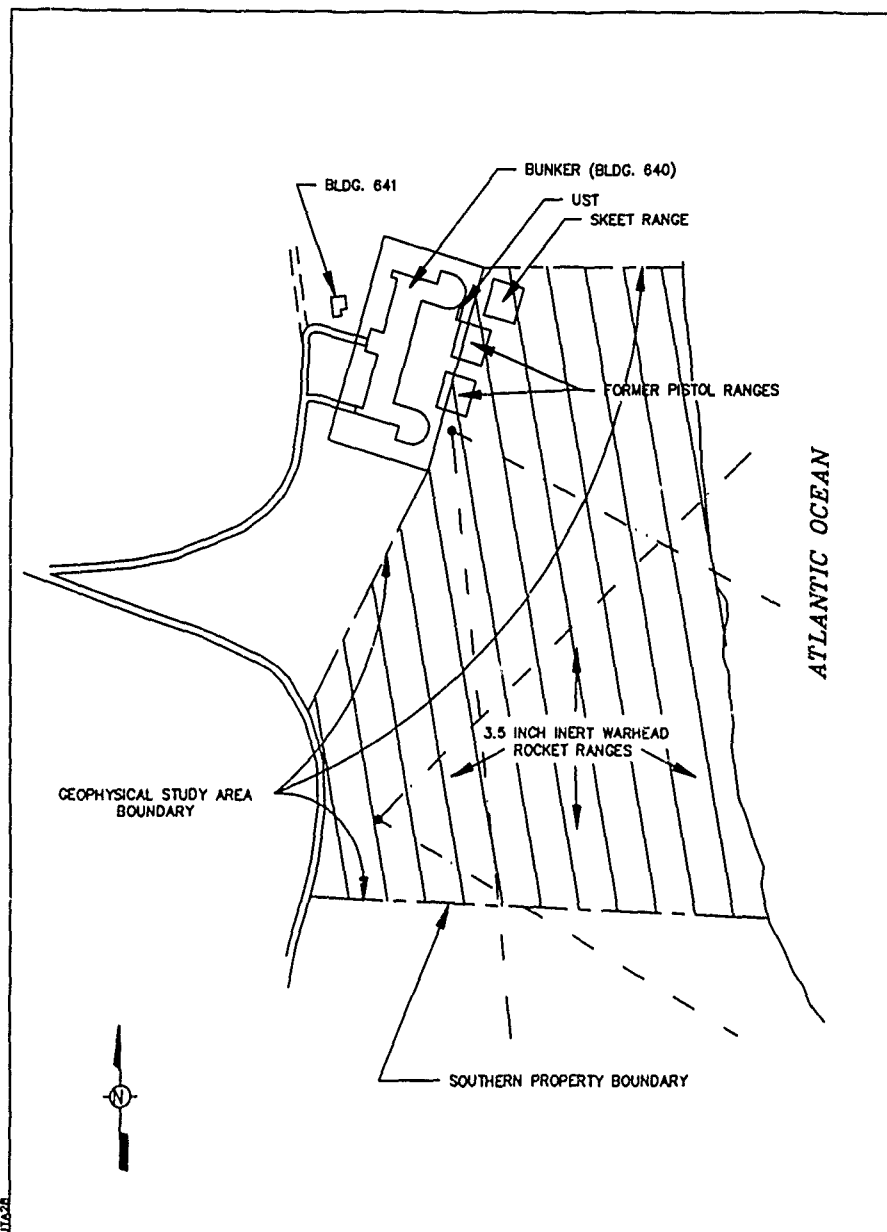


FIGURE 8. FIRST ARMY RECREATION AREA
PROPOSED GEOPHYSICAL STUDY AREA

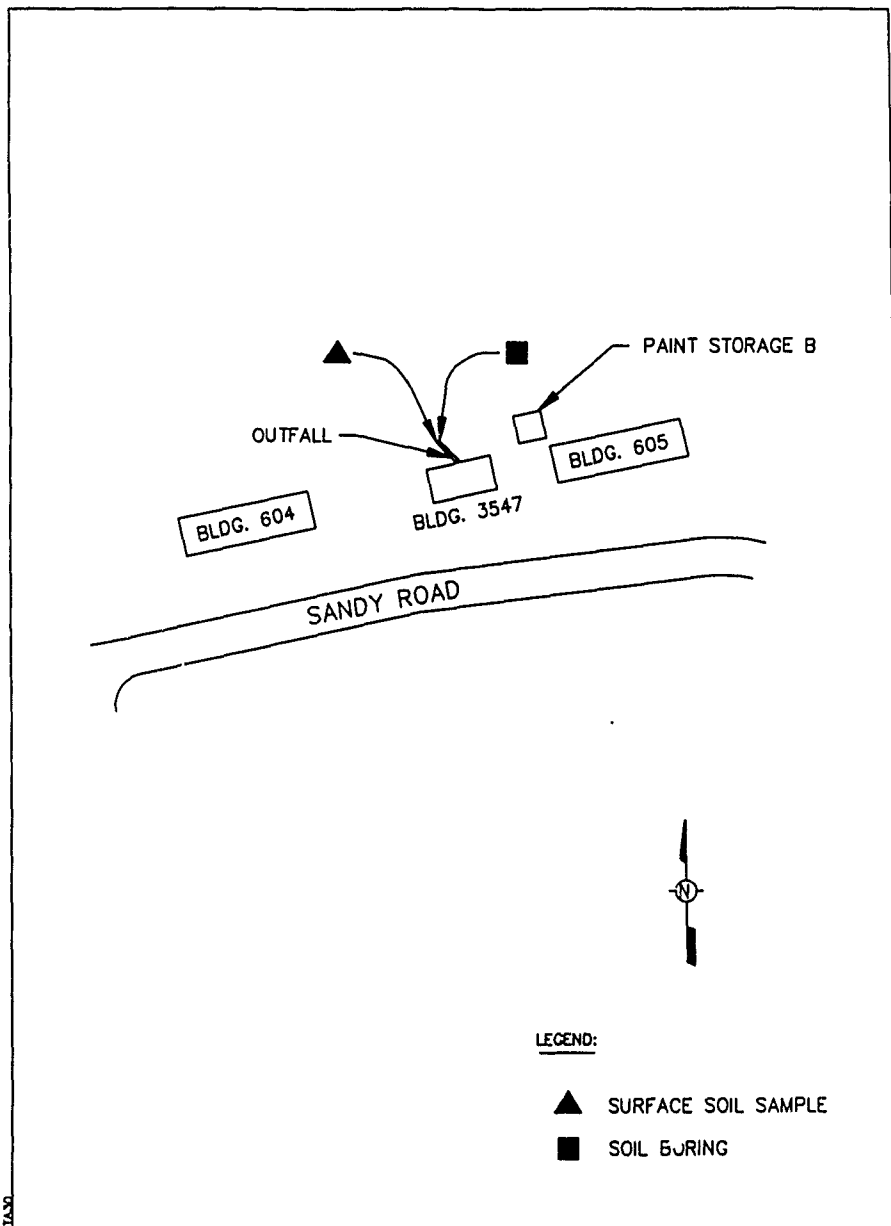


FIGURE 9. FIRST ARMY RECREATION AREA
PROPOSED SAMPLE LOCATIONS (POST EXCHANGE OUTFALL)

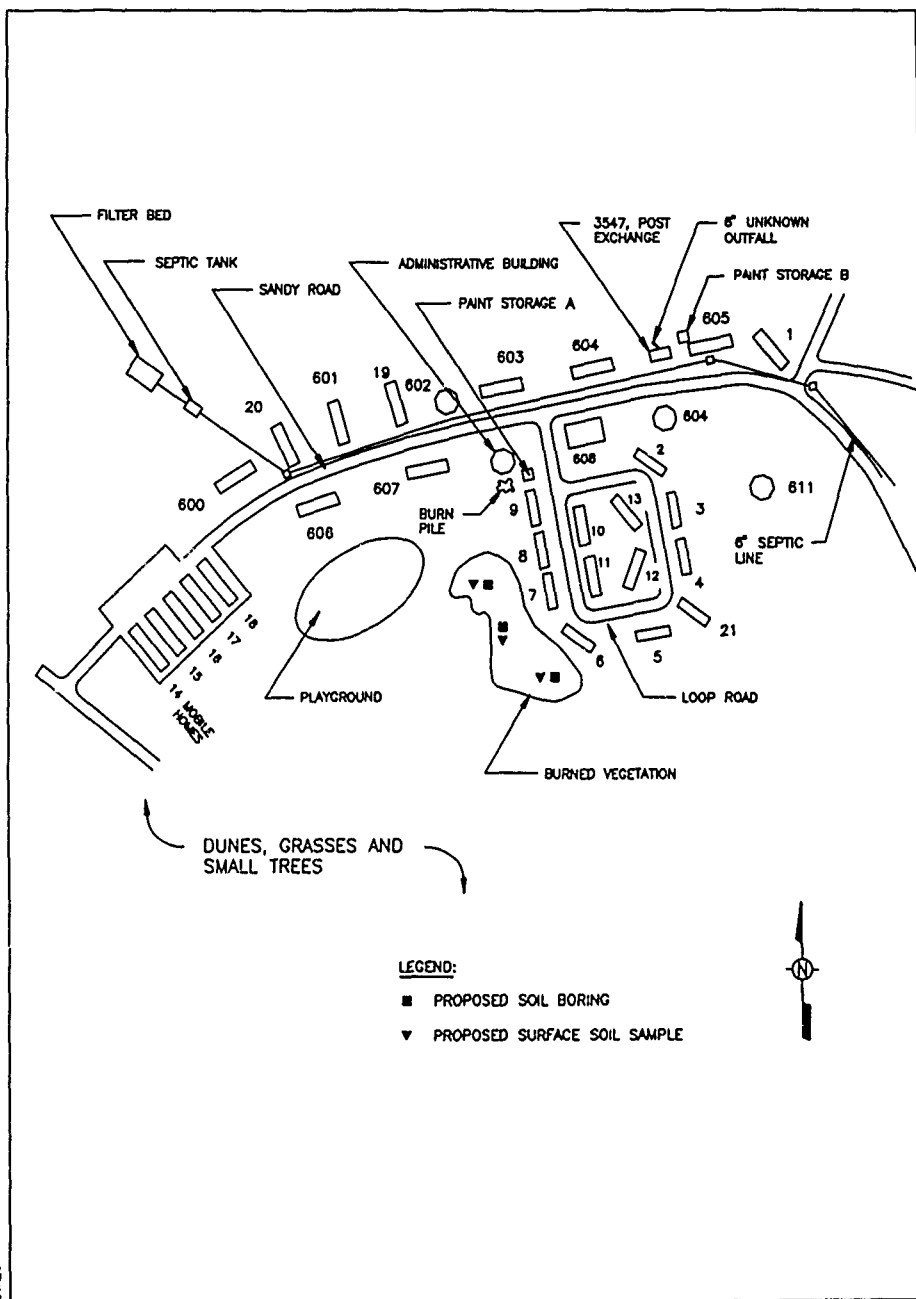


FIGURE 10. FIRST ARMY RECREATION AREA PROPOSED SAMPLE LOCATIONS
(BURNED VEGETATION AREA)

Wall, Floor and Ceiling Tiles

Historical records indicate asbestos containing wall board was used during construction of the bunker and the floor and ceiling tile may contain asbestos. Due to the age of this structure and the types of construction materials used at that time, the potential for the floor and ceiling tile to contain asbestos is high. Samples of wall, floor and ceiling tile should be collected and analyzed for asbestos content (see Figure 11).

Floor Drain

A floor drain runs the length of the interior passage way. Historical maps indicate the floor drain exited the bunker to the low lands east of the bunker. This drainage pipe should be located and soil boring samples collected where it empties. Surface soil and subsurface soil samples of this area should be collected (see Figure 11).

Paint Storage Room

A room inside the bunker is used to store paints and miscellaneous wood finishes. These containers should be removed and treated as hazardous waste. Also, the walls and floor should be cleaned and the waste from the cleaning process should be treated as hazardous waste (see Figure 11).

Bunker UST

Historical records indicate a 1000 gallon UST is buried east of the northern end of the bunker (see Figure 11). The potential area where this UST is located should be included in the geophysical survey to locate it. A sample of any fluid in the UST should be collected and soil borings should be advanced and soil samples collected adjacent the UST to determine if it has leaked.

6.9 Building 641

Historical records indicate two UT's of unknown capacity and an underground transformer vault are buried adjacent to this building (see Figure 11). If these cannot be located by physical inspection a geographical survey of the area surrounding Building 641 should be performed.

When the transformer vault is located, confined space entry will be necessary to determine if transformers are still present and to sample dielectric fluid in the transformers for PCB content.

After the UST's are located a sample of any liquid inside should be collected and soil boring samples should be collected from sides of the UST's to determine if leaking has occurred.

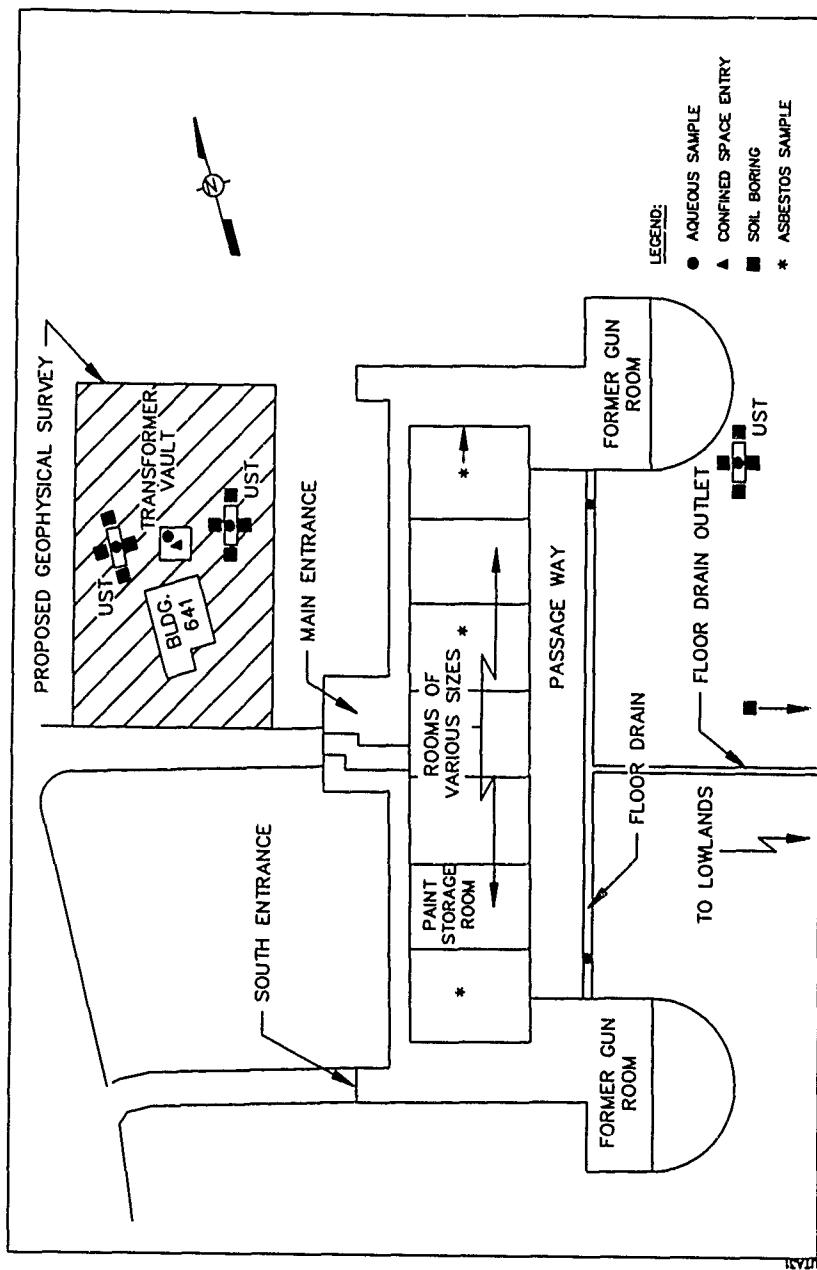


FIGURE 11. FIRST ARMY RECREATION AREA
PROPOSED SAMPLE LOCATIONS FOR THE BUNKER AND BUILDING 641

7.0 REFERENCES

- Adams, J K., Durward, B H , Chnstian, D.F. 1964 Water-Table, Surface-Drainage, and Engineering Soils Map of the Lewes Area, Delaware Geological Survey.
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- Jordon, Robert 1990 Geological and Hydrologic Studies of the Oligocene-Pleistocene Section Near Lewes, Delaware, Report Investigation No. 48, Delaware Geological Survey, October.
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- USGS (U S Geological Survey) 1982. 7.5 Minute Series Quadrangle Maps for Rehoboth Beach, Fairmont, Lewes, Cape Henlopen

APPENDIX A

PHOTOGRAPH LOG

- Photo 1: View of Entrance to First Army Recreation Area
Facing Northeast
- Photo 2: View of Playground
Facing Southeast
- Photo 3: Paint Storage A
Facing South
- Photo 4: View of Burn Pile
Facing West
- Photo 5: View of Entrance to Fenced Bunker Area
Facing East
- Photo 6: View of Former Gun Room (exterior)
Facing Southwest
- Photo 7: View of Main Entrance to Bunker
Facing East
- Photo 8: View of Paints and Solvents Room in Bunker
Facing West



Photo 1: View of Entrance to First Army Recreation Area
Facing Northeast



Photo 2: View of Playground
Facing Southeast



Photo 3: Paint Storage A
Facing South



Photo 4: View of Burn Pile
Facing West



Photo 5: View of entrance to fenced Bunker area
Facing East



Photo 6: View of Former Gun Room (exterior)
Facing Southwest



Photo 7: View of main entrance to Bunker
Facing East



Photo 8: View of paints and solvents room in Bunker
Facing West

ATTACHMENT A

FORT MILES

**1942 - 1943
THE U-BOAT WAR**

War - Fort Miles - World War II

Military restrictions were tightened along the Coast in 1942. Unknown persons in the Eastern military area along 16 seaboard states, called a "dangerous to the national defense zone", were moved.

This order came from headquarters of the Eastern Defense Command and First Army at Governors Island, New York.

In this zone were 905 prohibited zones and 69 restricted zones. They included forts, arsenals, airports, dams, factories, and other defense installations.

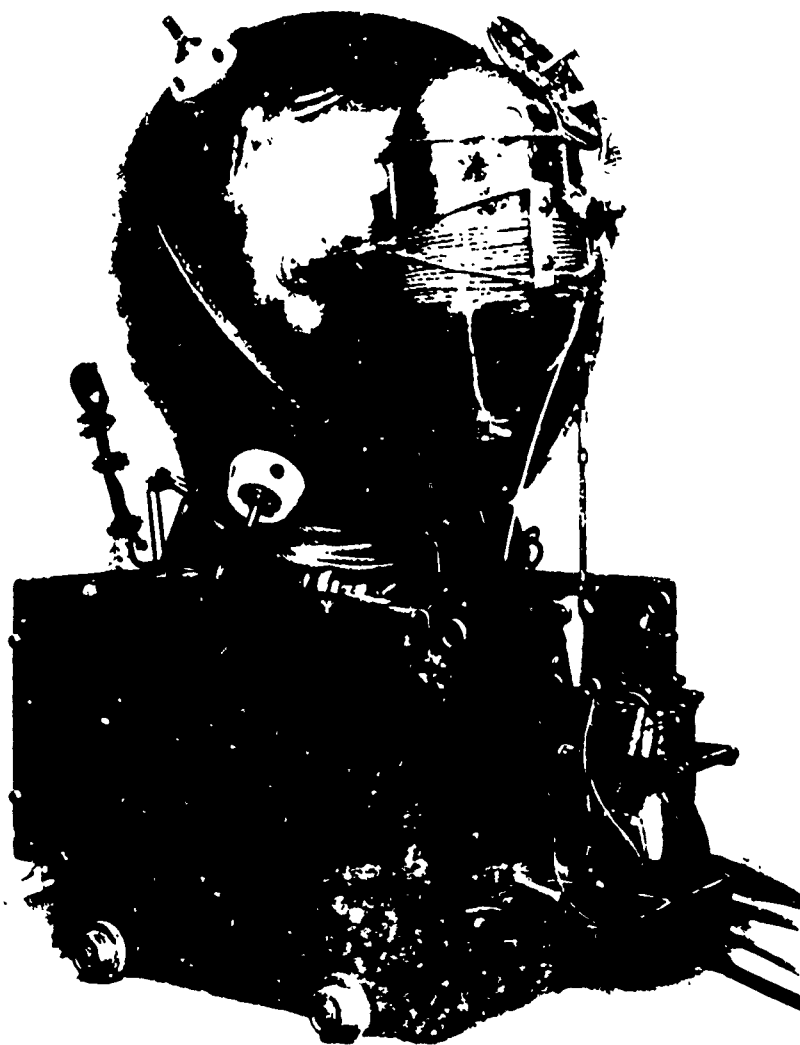
Soon signs were planted at entrances and exits along boundaries at Fort Saulsbury, Fort Miles, Fort DuPont, and the Bellanca Aircraft Corporation plant near New Castle, and marked "prohibited".

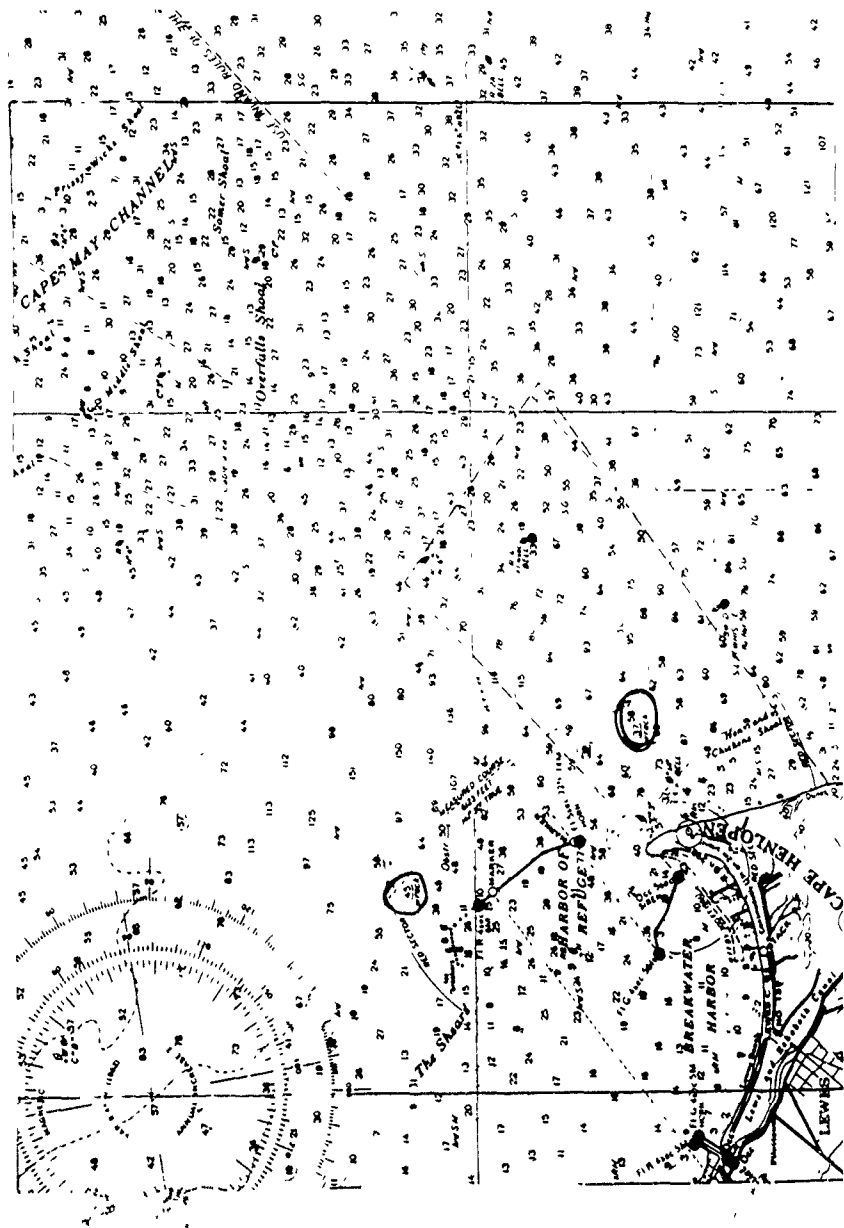
In Sussex County, Delaware there were three "restricted" zones. One ran along the Delaware Bay and the Atlantic Ocean east of the Lewes-Rehoboth Canal and northward from a mark one mile north of State Highway 26, at Bethany Beach. The third started one-half mile south of the highway and extended to the Maryland line.

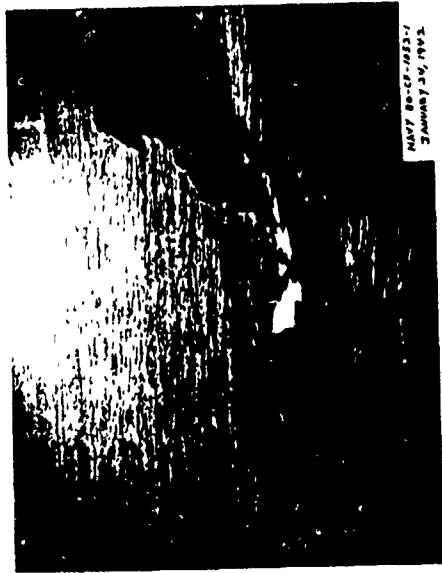
More restrictions limited the right of any person to enter, remain in or leave the eastern military area. In the prohibited zones Service of Supply had to have a permit to enter signed by the commanding general.

All persons who entered either prohibited or restricted zones, except members of the armed forces of the United States, were banned from possessing certain articles, including firearms, explosives, radio sending or receiving sets, signal devices, cameras or binoculars.

The dark days of World War II were coming to Delaware and to Fort Miles. German submarines had closed the Bay with mines.







NMVT 80-10-1023-1
JANUARY 24, 1942

AT THE NEW ARMY AIRFIELD AT DOVER,
B-24 BOMBERS WERE SENT TO BE USED
FOR PATROL — FOR THE SUBMARINE
WAS NOW MORE IMPORTANT THAN ANY
OTHER TARGET.

LATER THE B-24s WERE SENT TO
FLORIDA AND REPLACED BY B-25
TYPES.

AT THE AIRPORT NEAR REHOBOTH (THIS
GRASS FIELD STARTED IN 1938) MEN BUILT
A BUNKHOUSE, HUNG A HUGE WALL MAP,
MOVED IN LARGE WOODEN DESK, AND AN
OLD COMMUNICATIONS RADIO.

IN ALL OF WORLD WAR II, NO PERIOD OF THAT WAR
IS PICTURED WITH SUCH MASSACRE AS THE BATTLES
OF THE ATLANTIC IN 1942.

JUST OFF REHOBOTH BEACH, DELAWARE THE GREATEST
SEA DRAMA OF ALL TIMES WAS UNFOLDING.
A MASSIVE U-BOAT CAMPAIGN OF NAZI GERMANY
WAS TO LAST FOR A YEAR AND A HALF.

THE DARKEST DAYS LAY BETWEEN JANUARY
AND JUNE OF 1942. THE NATION WAS ALMOST
TOTALLY UNPREPARED. GUNS FROM FORT
SAULSBURY NEAR MILFORD WERE RUSHED
TO THE FRESH CONCRETE OF THE GROWING
FORT MILES AT LEWES. SUB-HUNTER BOATS
WERE STARTED AT THE BOATYARD IN MILFORD.

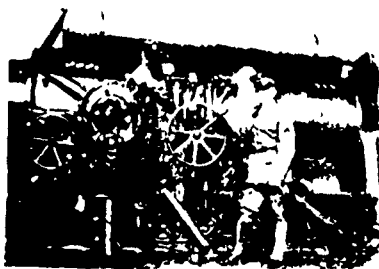


NMVT 80-10-1023-1
JANUARY 24, 1942

BELOW IS BATTERY
519 FORT HILES, DEL.
FORT SAULSBURY GUNS WERE
TAKEN HERE IN
1942 AND 1943



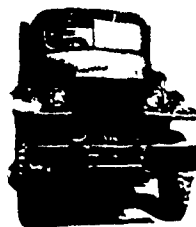
12-INCH GUN - FT. SAULSBURY



IN THIS HISTORICAL PHOTOGRAPH A FEW OF THE LOCAL
MEN ARE SEEN AROUND ONE OF THE SAULSBURY GUNS



PICTURED IS ONE OF THE FOUR BARBETTE CARRIAGE
12-INCH BC M1917 COASTAL DEFENSE GUNS OF THE EAST-
ERN DEFENSE COMMAND, UNITED STATES ARMY. IT WAS
BOUGHT TO FORT SAULSBURY, NEAR MILFORD, DELAWARE,
IN 1917 AND 1918. AT THE START OF WORLD WAR II,
THESE GUNS WERE MOVED TO FORT HILES, DELAWARE.



From this point in history, when children play on the hills and sands of Fort Miles, and Sunday visitors ply the waters without fear of enemy submarines or mines, it all passes like a dream.

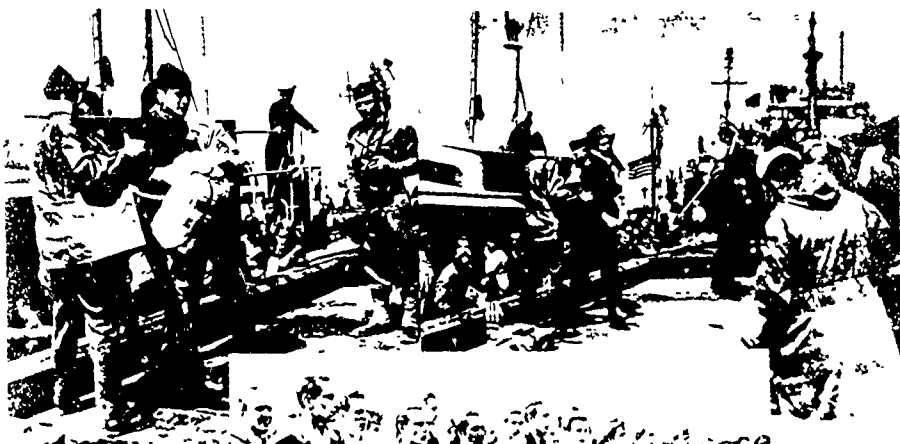
Back in 1941, 1942 and 1943, the Coast Artillery of the 261st looked at the beautiful beaches and saw only the cold and the hot. Back in April of forty-one, fifteen pyramidal tents stood between the Fort and no fort at all.

Here in the 1,500 acre reservation, the four 155 mm guns were talked of as the "huge fortress" over at Cape Henlopen. By April 4, 1941, brackets for mines were sunk in the Bay and a 1,800 foot long pier had been started. The other Delaware Coast Artillery Regiment (the 198th Anti-Aircraft) was soon to move out, leaving the 261st Coast Artillery Regiment (Harbor Defense) to hold the Fort. Huge searchlights, miles of underwater cable from observation towers, and tons of shells for the new 16-inch guns were to be looked after.

Time moved on and the war moved away. In July 1944, a 118-bed hospital was built next to the Lewes High School.

May 14, 1945 found a German submarine at the Fort Miles pier. It was the first enemy submarine to surrender unconditionally to the United States Navy after the cession of the 1935-45 war. A second enemy submarine was placed on display to the public at the pier on November 22, 1945. By 1945, Fort Miles had become headquarters for Prisoners-of-War. Some 6,500 men were held in Delaware, the last leaving in April 1946.

The Second World War was over. Fort Miles and the battle of the Atlantic was quiet.



ATTACHMENT B

Calendar No. 707

101st CONGRESS
2d Session

S. 2884

[Report No. 101-324]

To authorize appropriations for fiscal year 1991 for military activities of the Department of Defense, for military construction, and for defense activities of the Department of Energy, to prescribe personnel strengths for such fiscal years for the Armed Forces, and for other purposes.

IN THE SENATE OF THE UNITED STATES

JULY 20 (legislative day, JULY 10), 1990

Mr. NUN, from the Committee on Armed Services, reported the following original bill; which was read twice and placed on the calendar

A BILL

To authorize appropriations for fiscal year 1991 for military activities of the Department of Defense, for military construction, and for defense activities of the Department of Energy, to prescribe personnel strengths for such fiscal years for the Armed Forces, and for other purposes.

1 *Be it enacted by the Senate and House of Representa-*
2 *tives of the United States of America in Congress assembled,*

3 **SECTION 1. SHORT TITLE**

4 This Act may be cited as the "National Defense Authori-
5 zation Act for Fiscal Year 1991".

1 (7) construction of a public access to the
2 Remnants.

3 SEC. 2324. LAND CONVEYANCE, CAPE HENLOPEN, DELAWARE

4 (a) IN GENERAL.—Notwithstanding any other provision
5 of law, and subject to subsections (b) through (f), the Secre-
6 tary of the Army (hereafter in this section referred to as the
7 "Secretary") shall convey to the State of Delaware all right,
8 title, and interest of the United States in and to a parcel of
9 real property located at Cape Henlopen, in Sussex County,
10 Delaware, consisting of approximately 98 acres and known
11 as the Fort Meade Recreation Area. The conveyance made
12 pursuant to this section shall be without consideration except
13 that required by subsection (f).

14 (b) CONDITIONS OF CONVEYANCE.—The conveyance
15 authorized by this section shall be subject to the following
16 conditions:

17 (1) The State of Delaware shall indemnify the
18 United States against all liability in connection with
19 any hazardous materials, substances, or conditions
20 which may be found on the property to be conveyed
21 pursuant to this section.

22 (2) The State of Delaware shall permit members
23 of the Armed Forces of the United States serving on
24 active duty, their spouses, and their dependents to pur-
25 chase each year, for a price not greater than the price

1 charged residents of the State of Delaware, an annual
2 pass to all Delaware State parks.

3 (3) The State of Delaware shall pay to the Secre-
4 tary for credit to the Army Morale, Welfare, and
5 Recreation Fund, the sum of \$14,869, to reimburse the
6 fund for sums expended to improve the property.

7 (c) USE OF PROPERTY; REVERSION.—(1) The real
8 property conveyed pursuant to this section may be used by
9 the State of Delaware only for public park or recreational
10 purposes.

11 (2) If the Secretary of the Interior determines at any
12 time that the real property conveyed pursuant to this section
13 is not being used for a purpose specified in paragraph (1), all
14 right, title and interest in and to such real property shall
15 revert to the United States and the United States shall have
16 the right of immediate entry thereon.

17 (d) DESCRIPTION OF PROPERTY.—The exact acreage
18 and legal description of the real property to be conveyed pur-
19 suant to this section shall be determined by a survey satisfac-
20 tory to the Secretary. The cost of such survey shall be borne
21 by the State of Delaware.

22 (e) ADDITIONAL TERMS AND CONDITIONS.—The Sec-
23 retary may require such additional terms and conditions in
24 connection with the conveyance pursuant to this section as

1 the Secretary determines appropriate to protect the interests
2 of the United States.

3 (f) TRANSFER DATE.—The transfer referred to in sub-
4 section (a) shall be made not later than one year after the
5 date of the enactment of this section.

6 SEC. 333. RELOCATION OF THE FLORIDA SOLAR ENERGY
7 CENTER

8 (a) IN GENERAL.—The Secretary of the Air Force may
9 pay \$2,563,000 to the State of Florida for the sole purpose of
10 assisting that State to relocate the Florida Solar Energy
11 Center from Cape Canaveral Air Force Station, Florida, to a
12 new site provided by the State of Florida on other than feder-
13 ally owned land. The payment of such sum shall include all
14 Federal Government contributions to the relocation project,
15 including relocation costs.

16 (b) CONSIDERATION.—In consideration for payment of
17 the amount provided for in (a), the State of Florida shall—

18 (1) surrender all leases, easements, and other land
19 interests connected with the Florida Solar Energy
20 Center on Cape Canaveral Air Force Station;

21 (2) convey to the United States title to all build-
22 ings, fixtures, and other real property located on such
23 lands;

24 (3) waive any claims against the United States
25 arising out of the operation of the Florida Solar

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ATTACHMENT C

DEFENSE ENVIRONMENTAL RESTORATION PROGRAM
FORT MILES MILITARY RESERVATION
LEWES, DELAWARE
PROJECT NO. C03DE006300

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APPENDIX D - Photographs
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DEFENSE ENVIRONMENTAL RESTORATION PROGRAM
FINDINGS OF FACT AND DETERMINATION OF
DEPARTMENT OF DEFENSE RESPONSIBILITY
FORT MILES MILITARY RESERVATION, LEWES, DELAWARE
PROJECT NO. C03DE006300

FINDINGS OF FACT

1. This project involves the demolition and removal of unwanted improvements located on land formerly used by the Department of Defense (DOD) for the establishment of the Fort Miles Military Reservation. A building demolition and debris removal project is recommended based on DAEN-ECE-B letter to NADCO-EP dated 4 December 1985 (SUBJECT: Defense Environmental Restoration Account (DERA) - Inventory Phase Policy Guidance). Since the property on which restoration is desired is owned by a government agency, demolition and debris removal is recommended. The project will encompass the following:

A. BUILDING DEMOLITION: Completely demolish and remove 7 buildings including foundations (16,046 square feet total). Include capping of utilities, backfill and compaction, and removal of asbestos from 6 buildings. Prior to demolition and selection of disposal method, sampling of insulation used in buildings is necessary to determine the presence of asbestos.

B. CONCRETE FOUNDATION REMOVAL: Completely remove 4 concrete foundations (13,461 square feet total). Include backfill and compaction.

C. CONCRETE PLATFORM REMOVAL: Remove one concrete platform (120 cubic yards) located adjacent to Bunker #84.

D. BRICK SMOKESTACK REMOVAL: Remove one brick smokestack (50 square feet total) located adjacent to Building #16.

E. TRAILER REMOVAL: Remove 4 trailers (600 square feet each) and foundations located adjacent to Bunker #84.

F. STEEL FRAME RIFLE RANGE TOWER: Remove one steel frame rifle range tower and foundation.

G. TRANSFORMER REMOVAL: Remove 6 transformers (ground-mounted). Prior to removal and selection of disposal method, soil and transformer contents will be analyzed for PCB content and disposed of in an appropriate manner.

H. TRANSFORMER CAGE REMOVAL: Remove 4 transformer cages and foundations. Prior to removal and selection of disposal method, vicinity will be analyzed for PCB contamination and disposed of in an appropriate manner. Backfill and compact.

I. CHAIN-LINK FENCE REMOVAL: Remove 850 linear feet of chain-link fence located around Bunker #84, including all posts and concrete footings.

J. STORAGE TANK REMOVAL: Remove one above grade storage tank (estimated 40,000 gallons) located adjacent to Bunker #84.

K. SECURE BUNKERS: Secure 3 bunkers (Bunkers #7, #38, and #84) to prevent trespasser accessibility.

L. MISCELLANEOUS DEBRIS REMOVAL: Remove 150 cubic yards of miscellaneous debris located throughout site.

M. SITE GRADING AND SEEDING: Site grade and seed 3600 square yards of area disturbed by demolition.

The structures proposed for demolition and removal are considered to be unsightly and a hazard to the safety of the general public within the context of the property's designated use as a state park.

2. The former Fort Miles Military Reservation is located on Cape Henlopen, a sandy point of land where the Atlantic Ocean and the Delaware Bay meet three miles southeast of Lewes and due north from Rehoboth Beach in Sussex County, Delaware.

Audited records of the Baltimore District indicate that the Fort Miles Military Reservation originally consisted of 1381.1 acres in fee. The site was acquired by the Department of Defense by various deeds and condemnation proceedings between 1873 and 1957, and was purchased in nine parts. The original U. S. Fort Reservation Tract (140 acres in fee) was acquired by an act of the State Legislature approved 5 February 1873, according to the Attorney General's Final Opinion dated 27 October 1873. Tract A (212.0 acres fee) was transferred by the Department of Interior through General Services Administration (GSA) to the Department of the Army by letter dated 5 February 1954. Tract B (1.0 acre) was transferred by the United States Treasury Department to the Department of the Army by letter dated 10 May 1957. Tract Nos. 1 and 2 (973.1 and 22.7 acres in fee, respectively) were acquired from the State of Delaware by a Declaration of Taking, as stated in the Attorney General's Final Opinion dated 13 December 1941. Tract No. 3 (15.85 acres fee) was acquired from the Delaware, Maryland & Virginia Railroad Company as stated in the Attorney General's Final Opinion dated 4 August 1945. Tract No. 4 (15.0 acres in fee) was acquired by transfer of jurisdiction conditioned on usage by the United States for national defense. The original owner of Tract No. 4 was the State of Delaware. Tract No. 6 (0.76 acres in fee) was acquired from Harry Rapkin, et ux by a Declaration of Taking filed 5 August 1947 as stated in the Attorney General's Final Opinion dated 28 July 1948. Finally, Tract Nos. 22, 25 and 27 (.69 acres fee total) were also purchased from Harry Rapkin, et ux by Deed dated 10 November 1944 according to the Attorney General's Final Opinion dated 9 January 1947. In addition, parcels of land located along the Atlantic Coast of Delaware totaling 492.8 acres, were leased from the State of Delaware by DOD. A tract register of this land acquired by DOD after 1 July 1940 is as follows:

TRACT REGISTER OF ACQUISITION AFTER 1 JULY 1940 (MILITARY)

<u>TRACT No.</u>	<u>LAND OWNER</u>	<u>LEASE</u>	<u>TERMS OF LEASE</u>
30	STATE OF DELAWARE	3.66	1 June 1942 to 30 June 1963
31	STATE OF DELAWARE	0.68	7 April 1943 to 30 June 1963
32	STATE OF DELAWARE	4.67	1 June 1943 to 30 June 1963
33	STATE OF DELAWARE	15.42	14 July 1943 to 30 June 1963
35-1	STATE OF DELAWARE	84.4	1 June 1950 to 1 January 1951
35-2	STATE OF DELAWARE	275.0	1 June 1950 to 1 January 1951
35-3	STATE OF DELAWARE	108.4	1 June 1950 to 1 January 1951
36	GRANVILLE H. SMITH, et ux	0.57	1 January 1951 to 30 June 1975

USE

<u>TRACT No.</u>	
30	Fire Control Tower Site
31	Fire Control Tower Site
32	Fire Control Tower Site
33	Right of Way
35-1	Encampment
35-2	Firing Range
35-3	Firing Range
36	Unknown

3. In the spring of 1941, the 261st Coast Artillery, Delaware National Guard was Federalized and moved into a tented encampment at Cape Henlopen, Delaware, presumably for harbor and coast defense maneuvers and firing practices. They named their encampment "Camp Henlopen". Soon derricks and dredges and large road equipment began to appear on the site, and it became apparent that the Army was building a fort on the Henlopen sand dunes. In the summer of 1941, the Navy, taking over the old Lewes Coast Guard Station as a headquarters, moved in and set up the Harbor Entrance Control Post. Mines were laid in the 800 feet wide and 40 feet deep channel leading into the Delaware Bay and were controlled by a high frequency radio signal that could set them off in an extreme emergency.

The White Construction Company from New York built the multimillion dollar defense project. George and Lynch, a Delaware firm, worked in conjunction with White. The fort was built with a thick layer of sand on top as well as in front of the guns located on the site for protection against air or sea attack.

Eight, twelve, and sixteen inch guns were brought to the fort and placed in the fortress pits. Concealed along a four-mile sea front, the fortress had gun emplacements, ammunition dumps, and living quarters.

A hospital, theatre, gymnasium, chapel, fire hall, and post exchange, as well as clubhouses, barracks, mess facilities, and recreational facilities were also built at the site. Approximately 60 percent of the site was used as a training area, on which a small arms firing range was established. Other buildings constructed at the site included an automotive repair shop, storage bunkers and warehouses. In 1945, Fort Miles was known as the Prisoners-of-War Headquarters for German and Italian prisoners. Following World War II, Fort Miles continued as an army post and then

became quite active as a training post during the Korean War outbreak in 1950. In 1958, the Army decided to close Fort Miles because of the increasing obsolescence of artillery due to tactical missile development.

4. In 1961, the majority of Fort Miles was declared excess to the needs of the Department of the Army. However, portions of the military reservation were retained by DOD for defense purposes. On 13 February 1961, 614 acres fee were transferred to the Department of the Navy through GSA for the Naval Oceanographic Research Station. Of these 614 acres fee, 526 acres lie in Tract 1, 87 acres lie in Tract A, and 1 acre lies in Tract B (entire tract). 240 acres were conveyed by the Department of the Navy through the Bureau of Outdoor Recreation to the State of Delaware for public park purposes by Quitclaim Deed dated 31 October 1972. Corrected Quitclaim Deed of 19 July 1983 for Quitclaim Deeds of 13 September 1982 and 10 January 1983 states that 353.47 fee acres, less and except 16.80 acres fee and 1.0 acre fee was transferred by the United States Navy through the National Park Service to the State of Delaware. The 16.80 acres fee and 1.0 acre were transferred to the State of Delaware at a later date. (The Department of the Army transferred 614 acres fee more or less as stated above; the Department of the Navy, however, conducted a perimeter survey arriving at a total of 593.47 acres fee. Reverter and recapture clauses are included in the deed of 31 October 1972 and corrected deed of 19 September 1983. No restrictions as to DOD liabilities are included).

By Quitclaim Deed dated 15 October 1964, 523.72 acres fee were conveyed to the State of Delaware. Of these 523.72 acres fee, 329.41 acres lie in Tract 1, 140 acres is the Original U. S. Fort Reservation, 22.70 acres lie in Tract 2, 15.85 acres lie in Tract 3, 15.00 acres lie in Tract 4 and .76 of an acre lies in Tract 6.

Effective 26 January 1962, 190.16 acres fee were reassigned to First Army Recreation Area. Of these 190.16 acres fee, 102.16 acres lie in Tract 1 and 88 acres lie in Tract A. 94.24 acres fee were reported excess to General Services Administration on 18 August 1978, assigned to the Department of Interior who conveyed same to the Department of Natural Resources and Environmental Control, State of Delaware by Quitclaim Deed dated 31 October 1972. A reverter clause is contained in deed of 14 May 1980. No recapture or restrictions as to DOD liabilities are included in the deed. 11.99 acres fee located within the excessed acreage has been restricted to surface use only due to use as a firing range.

On 21 September 1964, 16.22 acres fee were transferred to the Department of the Navy. Of these 16.22 acres, 15.44 acres lie in Tract 1 and .78 of an acre lies in Tract 2. The United States acting through the Heritage Conservation and Recreation Service conveyed .78 acres fee of Tract 2 to the State of the Delaware for Public Park use. The remaining 15.44 acres are currently under DOD control.

In addition, 37 acres fee of Tract A eroded in April of 1926 and is not mentioned in property disposals.

5. The site is currently owned by the State of Delaware (Division of Parks and Recreation) with the exception of 15.44 acres owned by the Department of the Navy and 95.92 acres owned by the Department of the Army. The State of Delaware (Division of Parks and Recreation) owns 1232.74 acres of the site and is restricted to use the subject property for park purposes. The Department of the Navy has established a Naval Oceanographic Research Station on their portion of the site and the Department of the Army has developed their land into the First Army Recreation Area. None of the buildings recommended for demolition on the State of Delaware's

property have been beneficially utilized since DOD ownership. The buildings recommended for demolition by the State of Delaware are as follows: Bldg. #39 (Warehouse), Bldg. #48 (Garage), Bldg. #51 (Storage), Bldg. #52 (Storage), Bldg. #70 (Public Works Shop), Bldg. #85 (Storage) and a Guard House. It is likely that the insulation used in these buildings, with the exception of the Guard House, contains asbestos. In addition, removal of four concrete foundations, a concrete platform, and a brick smokestack is recommended, as well as four trailers and their foundations. Removal of six transformers (ground-mounted) and four transformer cages is also recommended. It is likely that the transformers contain PCB contamination. A 40,000 gallon (volume estimated) above grade storage tank is also to be removed. The contents of the tank, if any, is unknown. It is possible that the tank contents, as well as the surrounding vicinity, may contain PCB contamination. It is likely that there is an underground fuel storage tank in the vicinity of Bldg. #39 which may contain PCB contamination, however, the State of Delaware desires that the underground fuel tank remain intact. Removal of a chain-link fence surrounding Bunker #84, as well as the miscellaneous debris on top of the bunker and located throughout the site, is also recommended. The State of Delaware also desires that three bunkers (Bunkers #7, #38, and #84) be secured to prevent trespasser accessibility. Bldg. #61 (Transmitter Building), currently owned by the State of Delaware (Division of Parks and Recreation), is leased to the University of Delaware for the establishment of a weather station. Also, the State of Delaware (Division of Parks and Recreation) leases property on the northwestern portion of the site to the University of Delaware for the establishment of a marine biology laboratory. The buildings and items recommended for demolition and removal are considered unsightly and a hazard to the condition of the site. The park is open to the general public and the buildings and bunkers are easily accessible to trespassers, especially small children. In addition, portions of the site owned by the Department of the Army were marked off with fences and designated as live dud areas. Since ordnance was stored and fired on the site, it is likely that ordnance conditions exist on the site.

In addition, there are seven tracts of land (totaling 492.8 acres) located along the Atlantic Coast of Delaware which the State of Delaware leased to DOD. There was no mention of DOD liabilities or obligations for restoration in these leases. Concrete Watch Towers were constructed along these lands by DOD. The State of Delaware desires that these towers remain intact. However, there is one steel frame tower located along the Atlantic Coast of Delaware in the vicinity of York Beach near Tract No. 35-3 which the State of Delaware desires to have removed. Also, since two of the tracts (Tract Nos. 35-2 and 35-3) were formerly used as firing ranges, it is possible that ordnance conditions exist on these properties. Comfort stations and shower buildings were constructed on some of these land tracts along the coast by the State of Delaware (Division of Parks and Recreation) for the development of a state park. The Delaware National Guard is currently established on Tract No. 35-1 near Bethany Beach. There is no restoration work needed or desired by the Delaware National Guard on Tract No. 35-1.

The property may be eligible for listing on the National Register of Historic Places. The Department of Defense is now investigating criteria for evaluation of World War II era military sites, such as Fort Miles. The Cape Henlopen State Park also contains several prehistoric sites listed or eligible for listing on the National Register. Further studies will be necessary to complete a determination of eligibility for this former military post and to insure avoidance of any prehistoric archaeological sites.

6. The potential exists for a two-phased project at this site. A resolution of that question will depend upon subsequent investigations to determine if ordnance and toxic and hazardous waste conditions exist.

DETERMINATION

Based on the foregoing findings of fact, the present condition of the site, as described above, has been determined to be the result of a prior DOD utilization in connection therewith. Moreover, it is determined that an environmental restoration project, to the extent set out herein, is an appropriate undertaking within the purview of Public Law 98-473, Continuing Appropriation, 1985 (Conference Report (HR 98-1159)), for the reasons stated above.

DATE

LLOYD A. DUSCHA, P.E.
Deputy Director
Directorate of Engineering
and Construction

SITE SURVEY SUMMARY SHEET
FOR
FORT MILES MILITARY RESERVATION, LEWES, DELAWARE
PROJECT NO. C03DE006300

SITE NAME: Fort Miles Military Reservation, Project No. C03DE006300

LOCATION: Sussex County, Lewes, Delaware

SITE HISTORY: In the spring of 1941, the 261st Coast Artillery, Delaware National Guard was Federalized and moved into a tented encampment at Cape Henlopen, Delaware, presumably for harbor and coast defense maneuvers and firing practices. The named their encampment "Camp Henlopen." Soon derricks and dredges and large road equipment began to appear on the site, and it became apparent that the Army was building a mighty fort on the Henlopen sand dunes. In the summer of 1941, the Navy, taking over the old Lewes Coast Guard Station as a headquarters, moved in and set up the Harbor Entrance Control Post. Mines were laid in the 800 feet wide and 40 feet deep channel leading into the Delaware Bay and were controlled by a high frequency radio signal that could set them off in an extreme emergency. Coast Artillery laid the mines, sinking heavy brackets and attaching explosive charges that could be fired from control stations ashore. Three types of mines were used: timed, electronic and magnetic. The magnetic detector loop installed in April 1942 consisted of six groups of mines with thirteen mines in each group. They were naval mines, Type 51, Model 0.

The mines did not stretch clear across to Cape May, NJ because of the sand bars and shallow water on the north side of the mouth to Delaware Bay. In the early days of World War II, the Army held command of coastal defenses including the mine field at the Bay's entrance. After the installation of the magnetic detector loop in April 1942, the Navy cooperated with the Army in maintaining the underwater defenses. Vessels had to be escorted through the mined harbor by the Coast Guard. When World War II began, the Coast Guard conducted "Search and Rescue" missions for downed aircraft and ships in distress and picked up survivors from torpedoed vessels. Searchlights were set up in a straight line across the point. These searchlights were mobile units on trailer beds.

The White Construction Company from New York built the multimillion dollar defense project. George and Lynch, a Delaware firm, worked in conjunction with White. The fort was built with a thick layer of sand on top as well as in front of the guns for protection against air or sea attack. Eight, twelve, and sixteen inch guns were brought to the fort and placed in the fortress pits. Concealed along a four-mile sea front, the fortress had gun emplacements, ammunition dumps, and living quarters. The two 12 inch guns brought to the fort were of the type barbette carriage B C M-1917.

"A" Battery of the 261st, in August of 1941 set up four G.P.F. French 155-millimeter guns on the sand dunes at Henlopen. In late 1942 and early 1943 the 155-millimeter French guns were replaced by two 16 inch guns. The 16 inch guns were originally taken from old U. S. battleships that had been scrapped. 90-millimeter anti-aircraft guns were also placed on the sand dunes, manned by A, B and C Batteries of the 261st. In 1942 the Army brought six eight-inch guns mounted on railroad cars to the site. Deep in the sand bunkers, where the guns were placed, ward rooms, ammo and equipment store rooms, food storage rooms, kitchen facilities and sleeping

quarters were constructed. In addition, six inch guns were brought in and placed at beach level and test-fired only. The 12- and 16- and 6- and 8-inch guns, as well as the 90-millimeter anti-aircraft artillery guns, had armor-piercing and high explosive shells. Ammunition for small arms was also stored on the site.

Plans for Casemate and central transverse magazines and plotting rooms, electrical system details, power rooms, radiator rooms, fuel storage rooms, and many other plans and maps were all considered top secret in 1941. The bunkers also had dehumidification systems and gasproofing systems as well as air conditioning and heating systems.

Each bunker had two entrances and had the name of each gun battery cut into the concrete framing. The letters were 9" high, about 6" across and 3/4" deep. On each bunker entrance was the name of the battery, the letters U.S.E.D., for United States Engineer Department and the date - 1942. The big 12" and 16" gun batteries were named Battery Doe, Battery Hunter, Battery Herring and Battery Smith.

Supplies for the fort came by way of a newly constructed highway and railroad spur. In addition, an 1800 ft. long pier was built so supplies could be brought to the fort by ship. Although a \$3,000,000 air base was constructed at Cape May, NJ, no air facility was built at Cape Henlopen.

A hospital, theatre, gymnasium, chapel, fire hall, and post exchange, as well as clubhouses, barracks, mess facilities, and recreational facilities were built at the site. Approximately 60 percent of the site was used as a training area, on which a small arms firing range was established. Other buildings constructed at the site included an automotive repair shop, storage bunkers and warehouses. In 1945, Fort Miles was known as the Prisoners-of-War Headquarters for German and Italian prisoners. Following World War II, Fort Miles continued as an army post and then became quite active as a training post during the Korean War outbreak in 1950. In 1958, the Army decided to close Fort Miles because of the increasing obsolescence of artillery due to tactical missile development.

DESCRIPTION OF THE PROBLEM: As a result of prior DOD activity, the condition of the site exists such that it creates a hazard. The structures that exist on the site are unsightly and are in a deteriorated condition. The bunkers and buildings on the site are easily accessible to trespassers. There is a possibility that asbestos is present in the insulation of the buildings recommended for demolition. In addition, there are transformers (ground-mounted) located on the site which are possibly contaminated with PCB's. An underground fuel tank, which may contain PCB contamination, exists in the vicinity of Bldg. #39. However, the owner desires that the fuel tank remain intact. An above grade storage tank, contents unknown (if any), also exists on the site. In addition, portions of the site still owned by the Department of the Army were marked off with fences and designated as live dud areas. Since ordnance was stored and fired on the site, it is likely that ordnance conditions exist on the site.

BASIS FOR DETERMINATION OF DOD RESPONSIBILITY: Facilities were constructed by the Department of the Army and vacated thereafter. Currently, the Department of the Navy owns 15.44 acres of the site and the Department of the Army owns 95.92 acres. Items recommended for removal were used by the Department of Defense and have not been of beneficial use to subsequent owners.

POC/DISTRICT: John E. Tunnell, P.E., NAPEN-P, FTS 597-4714/Philadelphia.

STATUS: On 6 March 1986, the following Philadelphia District personnel performed an on-site investigation of the subject property: Jane Jablonski, NAPEN-P, Chris Mazurek, NAPEN-P, and Bill Koch, NAPEN-P.

The site is currently owned by the State of Delaware with the exception of 15.44 acres owned by the Department of the Navy and 95.92 acres owned by the Department of the Army. The State of Delaware (Division of Parks and Recreation) owns 1232.74 acres of the site and is restricted to use the subject property for park purposes. The Department of the Navy has established a Naval Oceanographic Research Station on their portion of the site and the Department of the Army has developed their land into the First Army Recreation Area. The majority of the former DOD buildings on the site have been removed by the State of Delaware. None of the buildings recommended for demolition on the State of Delaware's property have been beneficially utilized since DOD ownership. The buildings recommended for demolition by the State of Delaware are as follows: Bldg. #39 (Warehouse), Bldg. #48 (Garage), Bldg. #51 (Storage), Bldg. #52 (Storage) Bldg. #70 (Public Works Shop), Bldg. #85 (Storage) and a Guard House. It is likely that the insulation used in these buildings, with the exception of the Guard House, contains asbestos. In addition, removal of four concrete foundations (two are located to the southwest of Bunker #7 and the other two are located adjacent to Bldg. #51), a concrete platform (located in the vicinity of Bunker #84), and a brick smokestack (adjacent to Bldg. #16) is recommended, as well as four trailers and their foundations (located in the vicinity of Bunker #84). Removal of six transformers (ground-mounted) and four transformer cages is also recommended. Three transformers are located near Bldg. #70, one is located near Bldg. #78, another near Bldg. #62, and one near Bldg. #61. It is likely that the transformers may contain PCB contamination. Since Bldg. #61 has been leased to the University of Delaware it is possible that the transformer adjacent to it has been beneficially used. A 40,000 gallon (volume estimated) above grade storage tank in the vicinity of Bunker #84 is also to be removed. The contents of the tank, if any, is unknown. It is possible that the tank contents, as well as the surrounding vicinity, may contain PCB contamination. It is likely that there is an underground fuel storage tank in the vicinity of Bldg. #39 which may contain PCB contamination, however, the State of Delaware desires that the underground fuel tank remain intact. Removal of a chain-link fence surrounding Bunker #84, as well as the miscellaneous debris on top of the bunker and located throughout the site, is also recommended. The State of Delaware also desires that three bunkers (Bunkers #7, #38, and #84) be secured to prevent trespasser accessibility. Bldg. #61 (Transmitter Building) currently owned by the State of Delaware (Division of Parks and Recreation), is leased to the University of Delaware for the development of a weather station. Also, the State of Delaware (Division of Parks and Recreation) leases property on the northwestern portion of the site to the University of Delaware for the establishment of a marine biology lab. The buildings and items recommended for demolition and removal are considered unsightly and a hazard to the condition of the site. The park is open to the general public and the buildings and bunkers are easily accessible to trespassers, especially small children. In addition, portions of the site still owned by the Department of the Army were marked off with fences and designated as live dud areas. Since ordnance was stored and fired on the site, it is likely that ordnance conditions exist on the site. The State of Delaware has also constructed five new buildings for the development of a public park on the site. They are Bldgs. #4 and #34 (Comfort Stations), Bldg. #35 (Bathhouse), and Bldgs. #51 and #69 (Shower Bldgs). In addition, several of the former DOD buildings have been renovated for park purposes

by the State of Delaware.

The following buildings are to be utilized for development of a state park and are to be retained: Bldg. #1 (Tower), Bldg. #2 (Contact Station), Bldg. #3 (Pump House), Bldg. #4 (Comfort Station), Bldg. #5 (Cable Hut), Bldg. #6 (Cable Hut), Bldg. #7 (Bunker), Bldg. #8 (Nature Center), Bldg. #9 (Camp Office), Bldg. #10 (Dormitory #24), Bldg. #11 (Mess Hall), Bldg. #12 (Dormitory #21), Bldg. #13 (Dormitory #22), Bldg. #14 (Shower Bldg.), Bldg. #15 (Dormitory #23), Bldg. #16 (Gymnasium), Bldg. #17 (Chapel), Bldg. #18 (Camp Laundry), Bldg. #19 (Dormitory #11), Bldg. #20 (Sewage Lift Station), Bldg. #21 (Camp Office), Bldg. #22 (Dormitory #13), Bldg. #23 (Dormitory #14), Bldg. #24 (Sewage Treatment Plant), Bldg. #25 (Mess Hall), Bldg. #26 (Shower Bldg.), Bldg. #27 (Dormitory #12), Bldg. #28 (Storage Bldg.), Bldg. #29 (Tower), Bldg. #30 (Youth Camp 3), Bldg. #31 (Sewage Lift Station), Bldg. #32 (Maritime Tower), Bldg. #33 (Storage Bldg.), Bldg. #34 (Comfort Station), Bldg. #35 (Bathhouse), Bldg. #36 (Cable Hut), Bldg. #37 (Tower), Bldg. #38 (Bunker), Bldg. #40 (Vehicle Repair Shop), Bldg. #41 (Storage Bldg.), Bldg. #42 (Gas Storage Bldg.), Bldg. #43 (Oil Storage Bldg.), Bldg. #44 (Heavy Equipment Storage Bldg.), Bldg. #45 (Storage Bldg.), Bldg. #46 (Park Office), Bldg. #47 (Supt.'s Residence), Bldg. #49 (Carpenter Shop), Bldg. #53 (Pump House), Bldg. #54 (Tower), Bldg. #55 (Chlorine Bldg.), Bldg. #56 (Contact Station), Bldg. #57 (Shower Bldg.), Bldg. #58 (Incinerator), Bldg. #59 (Bunker), Bldg. #60 (Igloo), Bldg. #61 (Transmitter Bldg.), Bldgs. #62, #63, #64, #65, #66, #67 and #68 (Igloos), Bldg. #69 (Shower Bldg.), Bldg. #72 (Well House), Bldg. #73 (Valve House), Bldg. #74 (Gas Station), Bldgs. #75 and #76 (Shelter Pavilions), Bldg. #77 (Base Exchange), Bldg. #78 (Service Club), Bldg. #79 (Generator & Terminal Equipment Bldg), Bldgs. #80 and #81 (Towers), Bldgs. #82 and #83 (Well House), and Bldg. #84 (Bunker).

In addition, there are seven tracts of land located along the Atlantic Coast of Delaware which the State of Delaware leased to DOD. There was no mention of DOD liabilities or obligations for restoration in these leases. Concrete Watch Towers were constructed along these lands by DOD. The State of Delaware desires that these towers remain intact. However, there is one steel frame tower located along the Atlantic Coast of Delaware in the vicinity of York Beach near Tract No. 35-3 which the State of Delaware desires to have removed. Also, since two of the tracts (Tract Nos. 35-2 and 35-3) were formerly used as firing ranges, it is possible that ordnance conditions exist on these properties. Comfort stations and shower buildings were constructed on some of these land tracts along the coast by the State of Delaware (Division of Parks and Recreation) for the development of a state park. The Delaware National Guard is currently established on Tract No. 35-1 near Bethany Beach. There is no restoration work needed or desired by the Delaware National Guard on Tract No. 35-1.

RIGHT-OF-ENTRY: For the purpose of this site survey, verbal approval to enter the site was arranged by Mr. Charles Salikin, manager of the Technical Services Section, State of Delaware, Department of Natural Resources and Environmental Control, Division of Parks and Recreation. Formal right-of-entry agreements are being prepared for this project and will be executed prior to initiating any further field investigation.

AVAILABLE STUDIES AND REPORTS: As built site plans are on file at the Philadelphia District.

CATEGORY OF HAZARDS: There is a possibility of Polychlorinated Biphenyl (PCB) contaminated oil existing in the transformers (ground-mounted) on the site, as well as in one above grade and one below grade storage tank. A "PCB Analytical Report" prepared for the Department of the Navy is included in Appendix C. Testing for PCB contamination was performed on the transformers existing on formerly owned Navy property currently owned by the State of Delaware. The results of these testings are included in this report. There is also a possibility that the material used as an insulation throughout the buildings recommended for demolition may contain asbestos. However, the presence of such contaminants cannot be confirmed without appropriate testing measures. Contaminated materials, depending on the nature and magnitude of the problem, will require consideration of appropriate procedures for handling and disposal. Other hazards at the site are deteriorated buildings and unsecured bunkers which are easily accessible to trespassers, especially children since the site is currently developed into a state park and is open to the general public. Hazardous remains of a few foundations and miscellaneous debris remain on the site. In addition, portions of the site still owned by the Department of the Army were marked off with fences and designated as live dud areas. Since ordnance was stored and fired on the site, it is likely that ordnance conditions exist on the site.

DESCRIPTION OF REMEDIAL ACTION: The remedial actions to be taken, based on available information, are described in the paragraphs below:

- A. **BUILDING DEMOLITION:** Completely demolish and remove 7 buildings including foundations (16,046 square feet total). Include capping of utilities, backfill and compaction, and removal of asbestos from 6 buildings. Prior to demolition and selection of disposal method, sampling of insulation used in buildings is necessary to determine the presence of asbestos.
- B. **CONCRETE FOUNDATION REMOVAL:** Completely remove 4 foundations (13,461 square feet total). Include backfill and compaction.
- C. **CONCRETE PLATFORM REMOVAL:** Remove one concrete platform (120 cubic yards) located adjacent to Bunker #84.
- D. **BRICK SMOKESTACK REMOVAL:** Remove one brick smokestack (50 square feet total) located adjacent to Building #16.
- E. **TRAILER REMOVAL:** Remove 4 trailers (600 square feet each) and foundations located adjacent to Bunker #84.
- F. **STEEL FRAME RIFLE RANGE TOWER:** Remove one steel frame rifle range tower and foundation.
- G. **TRANSFORMER REMOVAL:** Remove 6 transformers (ground-mounted). Prior to removal and selection of disposal method, soil and transformer contents will be analyzed for PCB content and disposed of in an appropriate manner.
- H. **TRANSFORMER CAGE REMOVAL:** Remove 4 transformer cages and foundations. Prior to removal and selection of disposal method, vicinity will be analyzed for PCB contamination and disposed of in appropriate manner. Backfill and compact.
- I. **CHAIN-LINK FENCE REMOVAL:** Remove 850 linear feet of chain-link fence located around Bunker #84, including all posts and concrete footings.

J. STORAGE TANK REMOVAL: Remove one above grade storage tank (estimated 40,000 gallons) located adjacent to Bunker #84.

K. SECURE BUNKERS: Secure 3 bunkers (Bunkers #7, #38, and #84) to prevent trespasser accessibility.

L. MISCELLANEOUS DEBRIS REMOVAL: Remove 150 cubic yards of miscellaneous debris located throughout site.

M. SITE GRADING AND SEEDING: Site grade and seed 3600 square yards of area disturbed by demolition.

ESTIMATED COST: Total estimated cost of the proposed remedial action, Fort Miles Military Reservation = \$551,000.

APPENDIX A

DD 1391

1. COMPONENT ARMY		FY 19 MILITARY CONSTRUCTION PROJECT DATA		2. DATE 19 March 86	
3. INSTALLATION AND LOCATION Fort Miles Military Reservation, Lewes, Delaware			4. PROJECT TITLE Fort Miles Military Reservation		
5. PROGRAM ELEMENT		6. CATEGORY CODE		7. PROJECT NUMBER C03DE006300	
				8. PROJECT COST (\$000) \$551	
9. COST ESTIMATES					
ITEM		U/M	QUANTITY	UNIT COST	COST (\$000)
Construction Cost					\$441
Contingencies (10%)					41
Supervision & Administration (5.5%)					23
Total Construction CWE					\$475
Design (6%)					\$ 29
FEASIBILITY STUDY COST (R)					\$ 47
Site Investigation/Data Gathering				\$10,200	
Support Activities					
Real Estate				2,000	
Public Participation/Local Cooperation				1,000	
Laboratory Support					
Asbestos Tests (bldgs)				1,800	
PCB Tests (Transf., Tanks)				2,000	
Chemical Testing for Storage Tank				360	
Labor & Report for Chemical Testing				1,000	
Cultural Resources Investigations				20,000	
Environmental/Regulatory Compliance				3,500	
Health, Safety & AQ/AC Plan				1,000	
Project Management				4,000	
Total Implementation Cost					\$551
10. Description of Proposed Construction					
1. Completely demolish buildings, foundations, and above ground appurtenances. All utilities will be terminated and capped					
2. Completely remove one tower and foundation					
3. Backfill, site grade, and seed any area disturbed by demolition.					
4. Cost estimates do not include costs for removal of any toxic waste, hazardous materials or other pollutants that may be found on site other than asbestos removal from buildings, PCB removal from transformers and removal of the contaminated content of the storage tank.					
5. All costs are March 1986 price level.					

APPENDIX B

SITE REPORT

SHEET 1 OF 2

INVITATION NO

GPO 1967 O - 384-400

SHEET 1 OF 2

PROJECT

Fort Miles Military Reservation, Lewes, Delaware

INVITATION NO**INVITATION NO**

ITEM NO	DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
1.	Demolition				
	Bldg. #39 (9099 SF)	-	JOB	L.S.	57,000
	Bldg. #48 (774 SF)	-	JOB	L.S.	3,900
	Bldg. #51 (2010 SF)	-	JOB	L.S.	19,900
	Bldg. #52 (808 SF)	-	JOB	L.S.	8,400
	Bldg. #70 (2080 SF)	-	JOB	L.S.	21,200
	Bldg. #85 (1250 SF)	-	JOB	L.S.	12,100
	Guard House (25 SF)	-	JOB	L.S.	150
	Concrete Foundation Removal (4)	13,461	SF	2.80	37,690
	Concrete Platform Removal	120	CY	460.00	55,200
	Brick Smokestack Removal	50	SF	12.00	600
	Steel Tower	-	JOB	L.S.	4,800
	Trailer w/Foundation (600 SF)	4	EA	2,675.00	10,700
	Transformers - ground mounted (assume PCB contamination)	5	EA	885.00	5,310
	Transformer Cages (assume PCB contamination)	4	EA	175.00	700
	Chain-Link Fence	950	LF	3.00	2,550
	Storage Tank - above ground (estimated 40,000 gallons) (assume PCB contamination)	1	EA	26,000.00	26,000
	Liquid Material Disposal-PCB Contamination (between 50 and 500 ppm PCB)	40,000	GAL	3.50	140,000
	Secure Bunkers #7, #38, and #34	3	EA	230.00	690
	Miscellaneous Debris Removal	50	CY	5.40	810
2	New Work				
	Site Grading and Seeding	3,600	SY	1.00	3,600
	Summary			Sub-Total	\$411,300
	Construction Cost (R)				\$411,000
	Contingencies (10%) (R)				41,000
	S&A (\$52) (R)				23,000
	Total Construction CWE				\$475,000
	Design (6%) (R)				\$ 29,000

FORT MILES MILITARY RESERVATION
(EXISTING SITE PLAN)

**CAPE
HENLOPEN**

EASEMENT GRANTED TO NAVY
FARM BOUNDARY
CONCRETE MONUMENT
IRON PIPE

1. TOWER
2. CONTACT STATION
3. PUMP HOUSE
4. COMFORT STATION
5. CABLE HUT
6. CABLE HUT
7. BUNKER
8. NATURE CENTER
9. CAMP OFFICE
10. DORMITORY #20
11. MESS HALL
12. DORMITORY #21
13. DORMITORY #22
14. SHOWER BLDG.
15. DORMITORY #23
16. STURGEON
17. CHAPEL
18. CAMP LAUNDRY
19. DORMITORY #11
20. SERVICE LIFT STATION
21. CAMP OFFICE
22. DORMITORY #12
23. DORMITORY #13
24. SERVICE TREATMENT PLANT
25. MESS HALL
26. SHOWER BLDG.
27. DORMITORY #12
28. STORAGE BLDG.
29. TOWER
30. YOUTH CAMP 3
31. SERVICE LIFT STATION
32. WARTIME TOWER
33. STORAGE BLDG.
34. COMFORT STATION
35. B-T-HOUSE
36. CABLE HUT
37. TOWER
38. BUNKER
39. WAREHOUSE
40. VEHICLE REPAIR SHOP

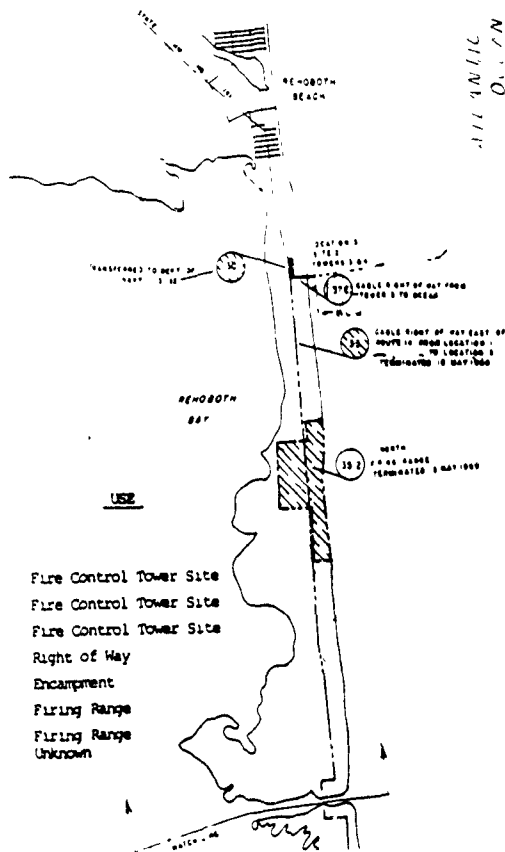
41. STORAGE BLDG.
42. GAS STORAGE BLDG.
43. OIL STORAGE BLDG.
44. HEAVY EQUIPMENT STORAGE BLDG.
45. STORAGE BLDG.
46. FARM OFFICE
47. BAPT. & RESIDENCE
48. GARAGE
49. CARPENTER SHOP
50. STORAGE BLDG.
51. STORAGE BLDG.
52. STORAGE BLDG.
53. TOWER
54. CHLORINE BLDG.
55. CONTACT STATION
56. SHOWER BLDG.
57. INCUBATOR
58. BUNKER
59. H.O.D.
60. TRANSMITTER BLDG.
61. H.O.D.
62. H.O.D.
63. H.O.D.
64. H.O.D.
65. H.O.D.

66. H.O.D.
67. H.O.D.
68. H.O.D.
69. SHOWER BLDG.
70. PUBLIC WORKS SHOP

71. WELL HOUSE
72. WAVE HOUSE
73. GAS STATION
74. SHELTER PARLOR
75. SHELTER PARLOR
76. BASE EXCHANGE
77. SERVICE CLUB
78. GENERATOR & TERNAL EQUIPMENT BLDG.
79. TOWER
80. TOWER
81. WELL HOUSE
82. WELL HOUSE
83. BUNKER
84. STORAGE BUILDING

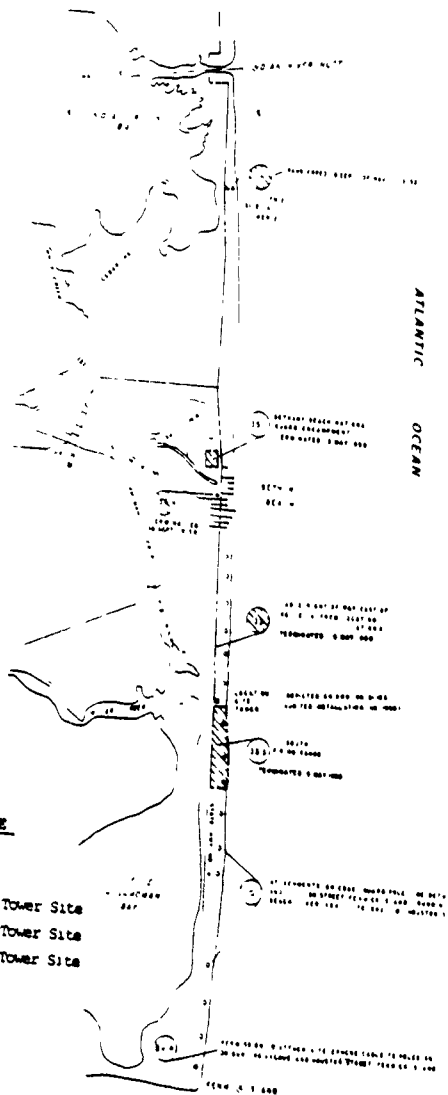
REVISIONS	DIVISION OF FARMS & RECREATION
1	CAPE HENLOPEN STATE PARK
2	BOUNDARY & BLDG. LOCATION
3	BLANKET - REVIS - PLANNING
4	101

NOTE ARROWS INDICATE AREAS WHERE WORK IS TO BE DONE.

[illegible]

30	Fire Control Tower Site
31	Fire Control Tower Site
32	Fire Control Tower Site
33	Right of Way
35-1	Encampment
35-2	Firing Range
35-3	Firing Range
36	Unknown

FORT MILES MILITARY RESERVATION
Coastal Vicinity Map

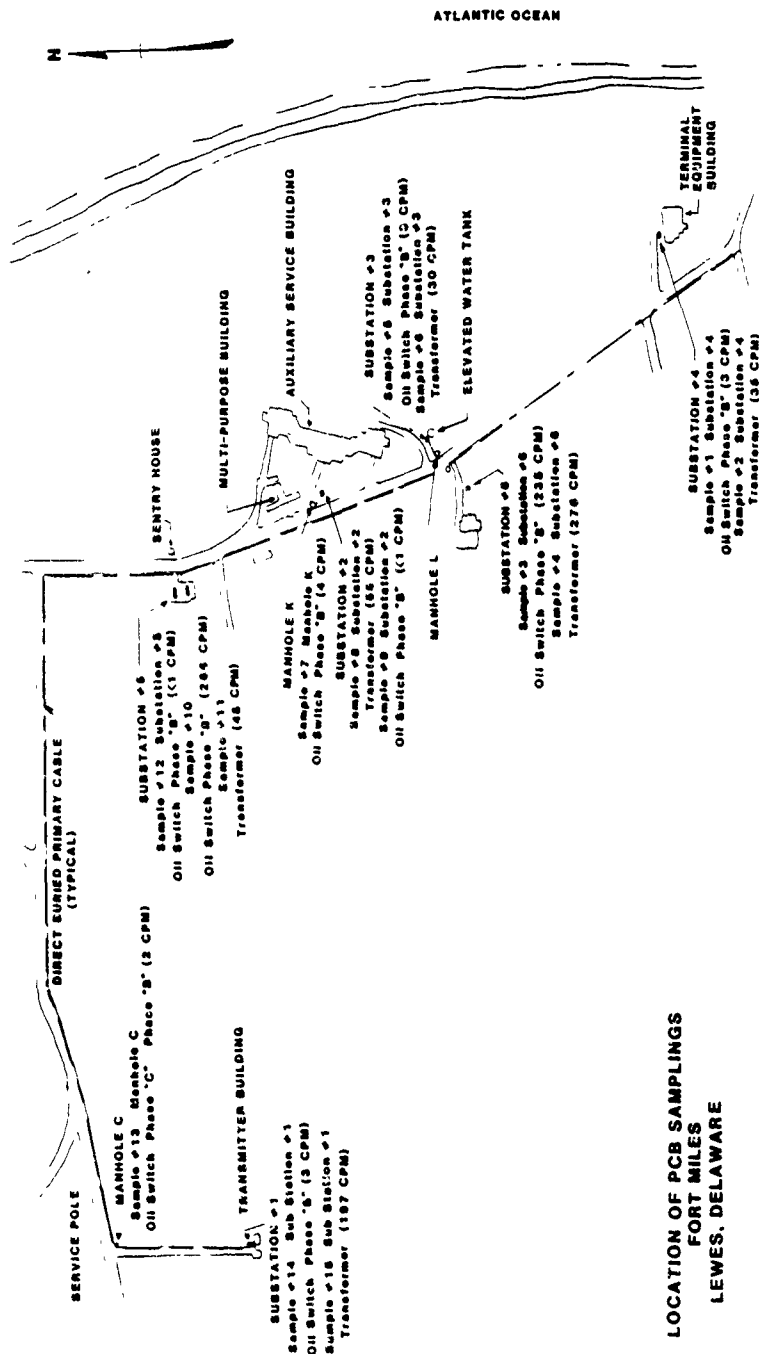


TRACT No.

- | | |
|------|-------------------------|
| 30 | |
| 31 | Fire Control Tower Site |
| 32 | Fire Control Tower Site |
| 33 | Fire Control Tower Site |
| 35-1 | Right of Way |
| 35-2 | Encampment |
| 35-3 | Firing Range |
| 36 | Firing Range
Unknown |

APPENDIX C

PCB ANALYTICAL REPORT



LOCATION OF PCB SAMPLINGS
FORT MILES
LEWES, DELAWARE

WOLFE ENGINEERING

PCB ANALYTICAL REPORT

PREPARED FOR:

Commander
Oceanographic Systems Atlantic
Building NH-95, CINCLANTFLT
Norfolk, Virginia 23511

ATTN: Mr. William Stavenger

REF. # 543.52

Handwritten: JAV, FAC, Lewis

SAMPLE No.	LAB No.	CONCENTRATION PARTS/MILLION	AROCLOL	COMMENTS
1	5155	3.	1260	
2	5156	35.	1260	
3	5157	235.	1260	
4	5158	276.	1260	
5	5159	3.	1260	
6	5160	30.	1260	
7	5161	4.	1260	
8	5162	55.	1260	
9	5163	<1.	-	
10	5164	266.	1260	
11	5165	45.	1260	
12	5166	<1.	-	
13	5167	2.	1260	
14	5168	3.	1260	
15	5169	197.	1260	

Aug 22, 1980

Handwritten: Mark T. Carls
MARK T. CARLS, CHEMIST
APPLIED CHEMISTRY DIVISION

8821 ELECTRONIC DRIVE, SPRINGFIELD, VIRGINIA 22151

TELEPHONE: (703) 750-3000

Handwritten: 10/1/80

APPENDIX D

PHOTOGRAPHS

Fort Miles Military Reservation
Lewes, Delaware
Property Owned by the State of Delaware
Division of Parks and Recreation



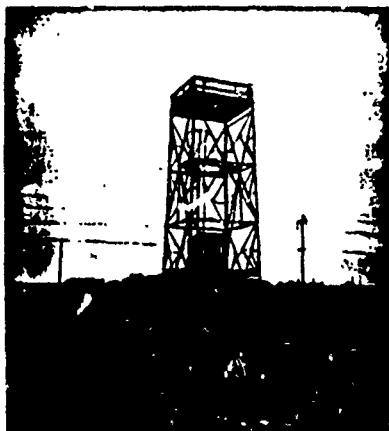
Building #85 (Storage Building), left, and Bunker #84, right.



Fort Miles Military Reservation
Lewes, Delaware
Property Owned by the State of Delaware
Division of Parks and Recreation



Left to right: Trailers within fence surrounding Bunker #84, Storage Tank with concrete foundation (center), and Entrance to Bunker #84 (right).

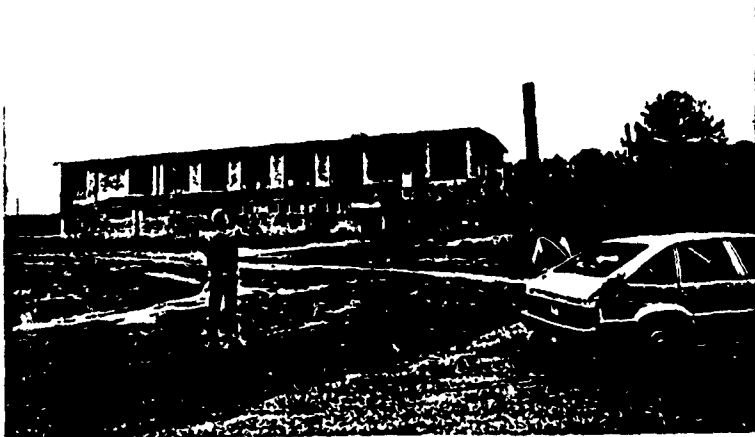


View of Rifle Range Tower (Steel) located in vicinity of York Beach near

Fort Miles Military Reservation:
Lewes, Delaware
Property Owned by the State of Delaware
Division of Parks and Recreation



View of Building #30 (Youth Camp 3), renovated and utilized by the State of Delaware.



View of Building #16 (Commissary) Smokestack to the right is to be removed

Fort Miles Military Reservation
Lewes, Delaware
Property Owned by the State of Delaware



Left:
Entrance to Bunker #7.

Below:
View of Bunker #7.



Fort Miles Military Reservation
Lewes, Delaware
Property Owned by the State of Delaware
Division of Parks and Recreation

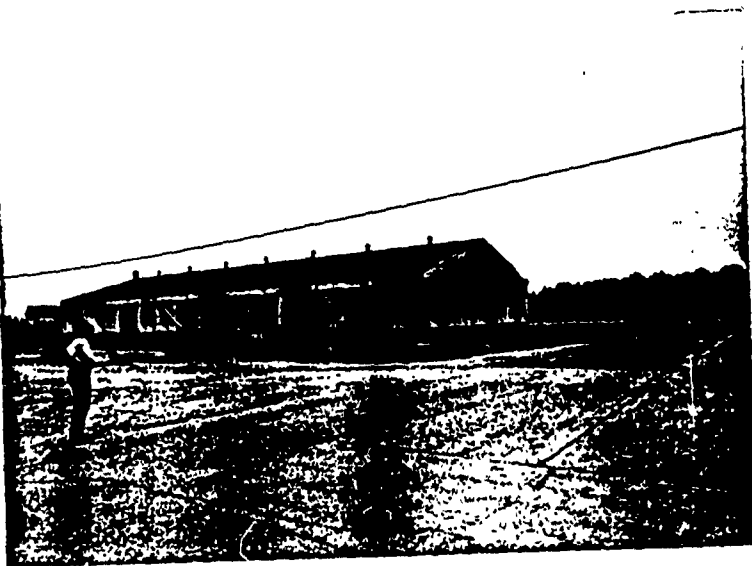


Circular concrete foundation located southwest of Bunker #7.



Concrete foundation located southwest of Bunker #7.

Fort Miles Military Reservation
Lewes, Delaware
Property Owned by the State of Delaware
Division of Parks and Recreation



Front and side view of Building #39 (Warehouse).



Front and side view of Building #48 (Garage).

Fort Miles Military Reservation
Lewes, Delaware
Property Owned by the State of Delaware
Division of Parks and Recreation



Front and side view of Building #51 (Storage). Watch Tower shown in background (right).



Fort Miles Military Reservation
Lewes, Delaware
Property Owned by the State of Delaware
Division of Parks and Recreation



Concrete foundation and debris located adjacent to Building #51 (Storage).



Fort Miles Military Reservation
Lewes, Delaware
Property Owned by the State of Delaware

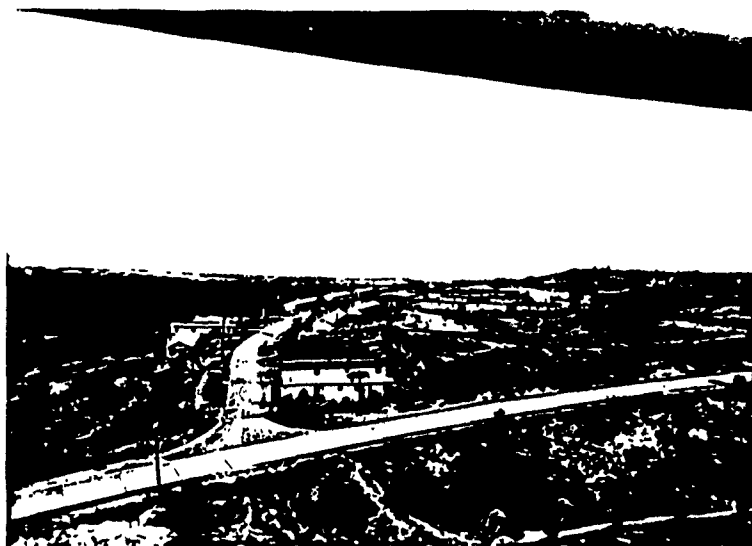


Left:
Building #32 (Maritime
Tower), currently being
restored.

Below:
Entrance to Bunker #38.



Fort Miles Military Reservation
Lewes, Delaware
Property Owned by the State of Delaware
Division of Parks and Recreation



Overview of land owned by the Department of the Army, located in eastern portion of site. Land is currently developed as a recreation area for military personnel.



View of property owned by the Department of the Navy. A Naval Reserve Center is currently established on the property.

Fort Miles Military Reservation
Lewes, Delaware
Property Owned by the State of Delaware
Division of Parks and Recreation



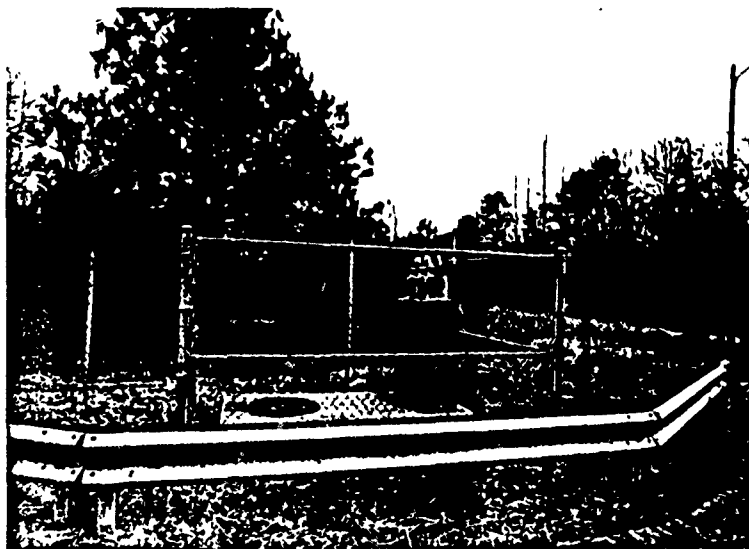
View of transformer cage (contains 3 transformers) on the State of Delaware's property across from the Naval Reserve Center.



View of Building #70 (Public Works Shop) located across from the Naval

[illegible]

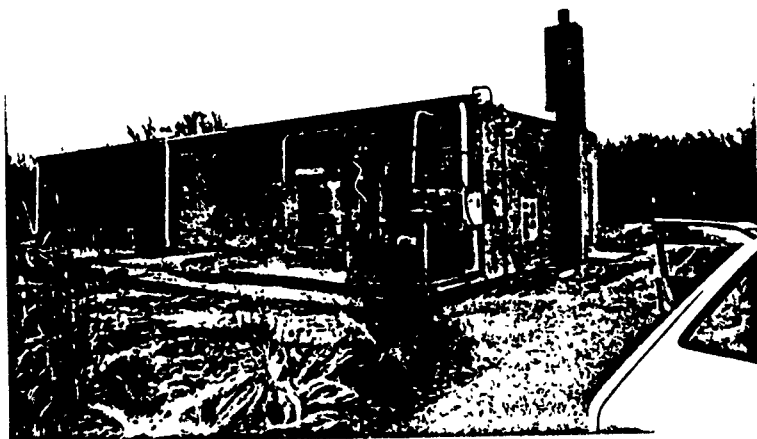
5



Lewes, Delaware
Property Owned by the State of Delaware
Division of Parks and Recreation



Front view of a typical igloo located throughout the site.



View of Building #61 (Transmitter Building) and transformer adjacent to it.
Building #61 is currently leased to the University of Delaware for the estab-

Fort Miles Military Reservation
Lewes, Delaware
Property Owned by the State of Delaware
Division of Parks and Recreation



View of Live Dud Area marked off by a fence. This Property is still owned by the Department of the Army.



Overview of site looking south from Building #37 (Tower) Sewage Treatment Plant is in foreground (right) Property owned by the

APPENDIX E

INVENTORY REPORT AND HAZARDOUS RANKING SYSTEM EVALUATION

DERP

INVENTORY REPORT AND HAZARDOUS RANKING SYSTEM EVALUATION

Preliminary General Information

1. DERP Code Number. (11) C.O.J.D.E.O.D.4300.
2. Site Name (current). (35) C.A.P.E. HENLOPEH. STATE. .
PARK.
3. Site Name when used by DOD. (35) F.O.R.T. M.I.L.E.S. M.I.L.I.T.A.R
Y. R.E.S.E.R.V.A.T.I.O.N.
4. Street/Route Number. (25) ROUTE. 9.
5. City. (16) LEWES.
6. County. (15) SUSSEX.
7. State. (2) DE.
8. Zip Code. (9) 19958. . . .
9. Congressional District Code Number. (2) 01.
10. Latitude: degrees, minutes, seconds. (6) 38°47'30" N
11. Longitude: degrees, minutes, seconds. (7) 75°05'00" W
12. Is a large scale, greater than 1 inch equals 200 feet, topographic map
of the site area available to attach to this inventory report? (1) Y.
Y = YES N = NO
13. Are site maps or sketches on file with the inventory? (1) Y.
Y = YES N = NO
14. Are there photographs on file with the inventory? (1) Y.
Y = YES N = NO
15. Current Owners Name(s). (45) (1) DELAWARE STATE - DEPT NATURAL RESOURCES &
ENVIRONMENTAL CONTROL - DIV OF PARKS & RECREATION
(2) M.I.Y. (3) NAVY.
16. Owner's Street Address. (25) (1) DEPT. NATURAL RESOURCES &
ENVIRONMENTAL CONTROL - DIV OF PARKS & RECREATION - TECHNICAL SERVICES
PO. BOX 1401 89 KINGS HIGHWAY SECTION
Owner's City. (16) D.O.V.E.R.

18. Owner's State. (2) D.E.
19. Owner's Zip Code. (9) 1.9.9.0.3. . . .
20. Number of Years Owned. (2) 13.
21. What is the current owner's use of the site? (50) PUBLIC . . .
PARK

REAL ESTATE SEARCH INFORMATION

22. Give chronological list of owners or lessees since termination of DOD ownership or lease; include dates of ownership and brief description of use. (240)
- DEPT NATURAL RESOURCES & ENVIRONMENTAL CONTROL
- STATE OF DELAWARE - DIVISION OF PARKS AND RECREATION - 1972 TO PRESENT PUBLIC PARK PROPERTIES
PARKS HAS LEASED PROPERTY TO THE UNIV. OF DELAWARE FOR THE ESTABLISHMENT OF A MARINE BIOLOGY LAB . . .
AND A WEATHER STATION
23. Was property leased out to others by DOD? (Y or N), describe and match owner/lessee with use(s). (51)
- N.
24. Was property leased-out to others by subsequent owners? (Y or N) Describe. (51)
- Y. DELAWARE STATE PARKS LEASES TO UNIV. OF DELAWARE
25. Type of problem(s) listed in claim documents, check as many as applicable: (3) H.O.N.
- Hazardous and Toxic = H (if listed complete questions 100 to 399).
- Ordinance and Explosive = O (if listed complete questions 400-499).
- Debris/Structures = D (if listed complete questions 500 to 599).
26. Has Right of Entry Permit been obtained? (Y or N). (1) N.

27. Are copies of lease agreements or deeds or other instruments conveying title on file? (Y or N). (1) .Y.

28. Does deed(s) or lease agreement(s) contain any disclaimers or restoration requirements? (Y or N). If yes, describe. (161)

.N.

.....

.....

.....

.....

29. Date field inspection completed. (6) .6. MAR. .86

30. Agency performing inspection. (25)

.U.S.A.F.D.P. PHILADELPHIA P.A. . . .

31. Inspection team leader's name. (20) .J.A.N.E. J.A.S. O.D.S.K.I. . . .

.....

32. Title. (25) .C.I.V.I.L. ENGINEER.

33. Organization (office symbol). (10) .U.A.P.E.N. P. . . .

34. Telephone number(s): Commercial. (10) .515.59.7595.8

35. Telephone number(s): FTS. (7) .59.7.59.5.8

36. Telephone number(s). AUTOVON. (7)

37. Site Status: A = Active I = Inactive (1) .A

38. Years of operation in current status. (2) .13.

39. Type(s) of problems found by inspection team. (3) .HOD.

USE:
H = H&T
O = OEW
D = Debris

40. Enter the number of buildings on the site. (3) .83. .

41. Describe. (80)

.7 CONC. TOWERS; 14 WOOD FRAME 44 CONC. BLOCK 4 CONC. BUNKERS;
.5 CONC. BLDGS; 1 BRICK CONC. BLOCK; 8 CONC. THEROS.

42. What is the major land use for a one mile radius around the site? (20)
(e.g., agriculture, industry, residential).

RESIDENTIAL

43. What is the estimated population within a one mile radius around the site? (use 3.8 persons/house). (6) 200 . . .

44. Describe the security of the site. (120)

CHARTERED LINKS PARK. BAREFIELD WILCO. AIRFIELD . . .
DEVELOPMENT. OFFSHORE. AIR. TRANSFER. . .
OTHERWISE. SITE (PARK) IS OPEN TO GENERAL PUBLIC
.

45. Describe the best access to the site from the nearest public road. (120)

ENTER SITE FROM ROUTE 9, WHICH RUNS
EASTBOUND INTO SITE
.
.

LIST CURRENT AND/OR PAST POLLUTION ABATEMENT PERMITS

PERMIT INFORMATION				
NONE AVAILABLE				
TYPE OF PERMIT ISSUED	PAST AND/OR PRESENT	PRESENT NO.	DATE ISSUED	EXPIRATION DATE
COMMENTS				
46.	NPDES. (72) (PERMIT #, DATE ISSUED, EXPIRATION DATE, COMMENTS)			
47.	UIC. (72) (SAME AS 46)			
48.	AIR. (72) (SAME AS 46)			

49. RCRA. (72) (SAME AS 46)

.....
.....
.....

50. Describe any pertinent environmental protection response actions previously taken at the site. (240)

THE D.F.P.T. OF NAVY HAD PCB TESTING PERFORMED
ON THE TRANSFORMERS THAT WERE FORMALLY OWNED
BY THE NAVY AND ARE CURRENTLY OWNED BY DELAWARE
STATE PARKS.

51. Describe any environmental protection remediation actions previously taken at the site. (240)

NONE KNOWN

52. List any court orders, lawsuits, fines or other legal actions that have been taken against any owners/operators of the site since DOD ownership/lease. (160)

NONE KNOWN

53. Determination of Responsible Party for restoration: (1)

D

DOD

Other

Not yet determined

54. Contract 1. (13)

.....

55. Contract 2. (13)

.....

56. Contract 3. (13)

.....

57. Contract 4. (13)

.....

58. Contract 5. (13)

.....

59-98. (Reserved)

99. Preliminary Information remarks. (80)

.....
.....
.....

DESCRIPTION OF WASTE AREAS WITH HRS OF WASTE STORAGE AT THE SITE

CONTAINMENT

100. Types of containment found in the individual waste areas:
(4) ... C.
- Surface impoundment ☐ (I) Waste piles, including
contaminated surface soils ☐ (P)
- Containers ☒ (C) Landfill, including
contaminated subsoils ☐ (L)
101. Present integrity of containment (25) (Use TABLES 1, 2 or 3 phrases)
.....
102. Evaluation of the integrity of containment versus potential groundwater release, before any remedial actions (see TABLE 1 for evaluation considerations). HRS Value - (Groundwater Containment). (1) ..
103. Evaluation of the integrity of containment versus potential surface water release, before any remedial actions (see TABLE 2 for evaluation considerations). HRS Value - (Surface Water Containment). (1) ..

QUANTITY

104. Total quantity of hazardous waste, as deposited and capable of migrating. (Having a non-zero containment value (TABLE 3)). The air pathway quantity is to include only those quantities that can be transported by the air: (10) 1. TRANSFORMERS, 1 STORAGE TANK, 1 UNDERGROUND FUEL TANK
105. Total quantity of waste now present: CY, drums and gallons (use only one common unit). (10) 1. TRANSFORMERS, 1 STORAGE TANK, 1 UNDERGROUND FUEL TANK
106. Quantity with the potential to migrate by groundwater. (10) 1. TRANSFORMERS, 1 STORAGE TANK, 1 UNDERGROUND FUEL TANK
107. HRS Value (groundwater quantity). (1) (TABLE 3) .4.
108. Quantity with the potential to migrate by surface water. (10) 1. TRANSFORMERS, 1 STORAGE TANK, 1 UNDERGROUND FUEL TANK
109. HRS Value (Surface Water Quantity). (1) (TABLE 3) .4.

- U.N.K.N.O.W.N . . .

- •

112. Hazardous substances in this area. (360)

- INSURE. RAIL. TRAIL. S. F. OR T. C. R. S. AND ONE ABOVE AND
ONE BELOW GRADE STORAGE TANK MAY CONTAIN PCB
CONTAMINATION. INSULATIONS USED IN BUDGS. MAY
CONTAIN ASBESTOS.

-

- •

- •

- • •

-

- 1

-

- •

* * Use TABLE 7

121. Highest scoring substance for Air Migration Route. (25)

122.* Toxicity (ranking number). (1)

123.** HRS Value. (2)

PHYSICAL STATE

124. Physical state of waste as deposited: (1)

	HRS Value		HRS Value
Solid consolidated or stabilized:	0	Powder or fine material:	2
Solid, unconsolidated or unstabilized:	1	Liquid, sludge or gas:	3
HRS value from item 124.			

125. Description of current physical state of waste. (15)

GROUNDWATER MIGRATION ROUTE

HYDROGEOLOGY TO BE DETERMINED BY CONFIRMATION STUDY (TOD)

126. Description of strata from surface to the deepest aquifer or confining (names, thickness, type of material). (Refer to TABLE 8) (200)

127. Direction of regional groundwater flow. (3)

128. Are there barriers to horizontal migration of groundwater within 3 miles downgradient of the site (e.g., rivers). These barriers should be identified on a map of the site. (1) Y/N

* Use TABLES 4, 5, or 6

**Use TABLE 7

129. Are there discharge and/or recharge areas within 3 miles of the site?
(These areas should be identified on a map of the site). (1) Y/N . . .

COMPARATIVE DOCUMENTATION OF AQUIFERS TGD

(All questions on this page refer to surficial aquifer).

130. Name of aquifer. (25)
.....
131. Designation of aquifer use. (10)
132. Depth to highest seasonal level. (3)
- Circle the HRS value corresponding to the use of groundwater drawn from within 3 miles from the source of contamination:
- | | <u>VALUE</u> |
|--|--------------|
| Unusable | 0 |
| Commercial, irrigation, or not used but usable | 1 |
| Drinking water with alternate source available | 2 |
| Sole source, drinking water supply | 3 |
133. The HRS Value circled. (1) ..
134. Location of nearest drinking or irrigation well within 3 miles downgradient of the source of contamination, give direction. (20)
.....
135. Depth of the nearest well (ft). (3)
136. Distance to the well from nearest point of contamination (critical distances that require careful measurement for HRS purposes of 2000', 1 mile, 2 miles and 3 miles). (5)
137. Population served by groundwater drawn from aquifer within 3 miles of contamination. (6)

138. Basis of population figure (e.g., census, house count). (10)
139. HRS value from Distance/Population Matrix (TABLE 9). (2)
140. Acres of cropland/pastureland irrigated by water drawn from the aquifer within 3 miles of contamination. (4)

COMPARATIVE DOCUMENTATION OF AQUIFERS TAB D

(All questions on this page refer to Deeper Aquifer)

141. Name of aquifer. (25)
142. Designation of aquifer use. (10)
143. Distance from ground surface (elevation) to highest seasonal water level. (3)
- Circle the HRS value corresponding to the use of groundwater drawn from within 3 miles from the source of contamination:

	<u>VALUE</u>
Unusable	0
Commercial, irrigation, or not used but usable	1
Drinking water with alternate source available	2
Sole source, drinking water supply	3

144. HRS value circled. (1) ..
145. Location of nearest drinking or irrigation well within 3 miles downgradient of the source of contamination, give direction. (20)
146. Depth of the nearest well (ft). (3)
147. Distance to the well from nearest point of contamination (critical distance that require careful measurement for HRS purposes are 2000', 1 mile, 2 miles and 3 miles). (5)

148. Population served by groundwater drawn from aquifer within 3 miles of contamination. (6)
149. Basis of population figure (e.g., census, house count). (10)
150. HRS value from Distance/Population Matrix (TABLE 9). (2) ..
151. Acres of cropland/pastureland irrigated by water drawn from the aquifer within 3 miles of contamination. (4)

RELEASE TO AQUIFER OF CONCERN T/D

Select from the comparative documentation of aquifers, the aquifer that yields the highest HRS groundwater score. Document and evaluate this aquifer.

152. Name of aquifer. (25)
153. Is it the surficial (S) or deeper (D) of the aquifers? (1) ..
154. Is there an observed release of contaminants to this aquifer? (1) ..
Y (YES), Value = 45
N (NO), Value = 0
155. HRS Value. (2)
156. Are there any analytical findings that document observed release to groundwater above background? (1) Y = YES N = NO ..
157. Date of Analysis. (6)
158. Reference. (60)
.....
159. Identification of background well(s). (25)
160. Identification of contaminated well(s). (25)

161. Contaminants detected. (150)

.....
.....
.....
.....
.....

162. Depth of contamination. (3)

.....

163. Distance from ground surface to highest seasonal water level in this aquifer. (3)

.....

164. Depth below ground surface of deepest documented waste or of intake of of a contaminated well. (3)

.....

165. Depth from deepest point of documented contamination to the aquifer of concern. (3) (Question 164 minus 165)

.....

166. HRS Value. (1) DEPTH

VALUE

..

0 - 20

3

21 - 75

2

76 - 150

1

150

0

167. Inches of normal annual total precipitation (Figure 1). (2)

+ ..

168. Inches of mean annual lake evaporation (Figure 2). (2)

- ..

169. Net precipitation, in inches (if seasonal data is used, show month(s) represented). (2)

.....

-10 inches = 0

15 inches = 3

-10 to + 5 = 1

+ 5 to +15 = 2

170. HRS Value (Precipitation). (1)

..

171. Permeability of the least permeable layer between documented contamination and the highest seasonal water level of this aquifer of concern (TABLE 10). (6)

.....

172. HRS Value (Permeability) (1)

..

GROUNDWATER USE TBD

173. Write the number for the highest-valued actual use of this aquifer within a 3-mile radius as shown on the comparative evaluation. (1)

<u>USE</u>	<u>VALUE</u>	<u>USE</u>	<u>VALUE</u>
Unusable	0	Drinking water with with alternate source	2
Commercial or irrigation	1	Without alternate source	3

DISTANCE TO NEAREST WELL TOD

174. Distance to the nearest drinking water or irrigation well in this aquifer (comparative evaluation between surficial and deeper). (3)

POPULATION SERVED TOD

175. Total population served by groundwater drawn from the aquifer within 3 miles of contamination (comparative evaluation between surficial and deeper).

Population (3.8 persons/house) (5) +

176. Acres irrigated times 1.5 (4) +
persons/acre

177. Total Population (5)

178. Determine the worst case from distance/population Matrix (TABLE 9) and enter HRS value. (2)

SURFACE WATER MIGRATION

A topographical map is to be attached showing the migration path that run-off would follow from the areas of waste storage to surface waters and thence to targets within 5 miles downstream. All distances are to be measured along the migration path rather than by a straight line.

Indicate sampling points, the most downstream point (or point along migration path) of documented contamination, all water intakes by use, and sensitive environments and critical habitats that lie contiguous to the migration path. Show names of water bodies.

OBSERVED RELEASE TGD

179. Is there analytical evidence of contamination of surface waters above background? (1) N, Go to Item 185
Y, Go to Item 180
180. Date of Evidence: (6)
181. Reference: (60)
182. Background sampling points (list well identification): (80)
183. Downstream sampling points (list well identification): (80)
184. Contaminants detected (5 maximum): (100)
185. HRS Value. Direct evidence of release of surface water (evidence must be quantitative) - HRS value = 45; no evidence - HRS value = 0 (2)

186. Check if drinking water intakes have been contaminated. (1) 0 = NO
1 = YES, Public
2 = YES, Private
3 = BOTH

Questions 187 to 193 MUST BE COMPLETED ONLY IF EVIDENCE OF AN OBSERVED RELEASE TO SURFACE WATER IS LACKING:

ROUTE CHARACTERISTICS TDD

187. Does this facility lie in a topographical depression with no surface water migration route? If YES, assign a surface water migration score of zero. If NO, continue with Item 188. (1)

SLOPE TDD

188. Slope of the facility. (2)
189. Slope of intervening terrain from nearest point of documented contamination to surface water (Use TABLE 11): (2)
190. HRS Value (Slope Matrix). (1)
191. 1 year 24 hour rainfall as indicated for the site on Figure 3 (inches). (2)
192. HRS Value (Rainfall). (1)
193. Distance along migration path from most downstream point of documented contamination to surface waters. (7)
Distances of 2 miles and less are classifiable.

*DISTANCE - Assign a value as follows:

<u>Distance</u>	<u>Assigned Value</u>
2 miles	0
1 to 2 miles	1
1000 feet to 1 mile	2
1000 feet	3

194. HRS Value (Distance of Surface Water). (1)

SURFACE WATER USE TGD

195. Surface water use within 3 miles (1 mile maximum in static waters) along the migration path from the most downstream point of documented contamination: (1)

HRS Value

Not currently used for reasons unrelated to contamination from site: ----- 0 Irrigation recreation, etc: ---- 2

Commercial or industrial use: ----- 1 Drinking water: ---- 3

HRS Value (Surface Water Use) (Values may be added if water has more than one use).

DISTANCE TO A SENSITIVE ENVIRONMENT TGD

196. Name of nearest sensitive environment that is within 2 miles. (20)

.....

197. Type of Sensitive Environment. (3) 1 = Coastal Wetland
2 = Freshwater Wetland
3 = Critical Habitat (S - State or F - Federal)

198. Distance to a wetland (5 acre minimum) or a critical habitat of a Federal list endangered species that lies contiguous to the migration path. Measure distance from the nearest point of documented surface contamination along the migration path. (6)

199. HRS Value (Distance to Sensitive Environment). (1) Use TABLE 12 ..

DISTANCE TO WATER INTAKE TGD

200. Distance to drinking water or irrigation intake, measured from probable point of entry of migration path to surface water. (6)

POPULATION SERVED

TBD

Total Population served by water drawn from surface water within the 3 mile limit:

201. Population (assume 3.8 persons/house). (5)
202. Acres irrigated times 1.5 persons/acre. (4)
203. Total HRS population: (5)
204. HRS, Value (Dist/Pop Matrix). (2)
 (The distance (question 200) and population
 (question 203) are used in TABLE 9 to
 determine HRS value.

AIR MIGRATION ROUTE

OBSERVED RELEASE - AIR

TBD

205. Is there any reason to suggest that air sampling should be done? (80)

NO ____ YES ____

Narrative Summary:

.....

206. Is there analytical evidence confirming an observed released air above
background? (1) . .

NO ____ Go to Item 212 YES ____ Continue with Item 207

207. Date: (6)

208. Reference: (60)

.....

209. Location of upwind and downwind sampling points: (80)

.....

210. Method and equipment: (80)

.....
.....
.....

211. Contaminants detected above background: (150)

.....
.....
.....
.....
.....

212. Analytical evidence of contaminants. (2)

...

HRS value - 45 if yes NO evidence - HRS value = 0

REACTIVITY & INCOMPATIBILITY

TBD

See TABLE 13 and TABLE 14

Most reactive materials onsite are: (List)

213. (25)

214. (25)

215. (25)

216. (25)

217. (25)

218. (25)

Most incompatible pairs of material onsite are: (List)

219. (25)

220. (25)

221. (25)

222. (25)

223. (25)

224. (25)

INCOMPATIBILITY VALUE and TABLE 13

No incompatible materials
are present 0

Present but do not pose
a hazard 1

Present & may pose a
future hazard 2

Present & posing an immediate
hazard 3

225. HRS Value (R/I). (1) . . .

POPULATION EXPOSED TBD

Population exposed to risk of air release, (fill in population information for all distances from the volatilizing source):

Indicate in each box (a, b, c and d) the total population for the given radius.

Total Population

226. 0 - 1/4 mile (7)

227. 0 - 1/2 mile (7)

228. 0 - 1 mile (7)

229. 0 - 4 miles (8)

230. Use insert *** to determine HRS value. (2) . . .

***Select the highest value for this rating factor as follows: Distance to Population from Hazardous Substance

Population	0-4 Mile	0-1 Mile	0-1/2 Mile	0-1/4 Mile
0	0	2	0	0
1-100	9	12	15	18
101-1000	12	15	18	21
1001-3000	15	18	21	24

DISTANCE TO A SENSITIVE ENVIRONMENT T B D

Coastal wetland Freshwater wetland Critical habitat

231. Location and description of wetlands (5 acre minimum). (200)

.....

Location of critical habitat of endangered species, including notation of whether the species is on the Federal list.

232. Distance from volatile substance to the sensitive environment. (6)

.....

233. HRS Value - See TABLE 12. (1)

..

LAND USE within 2 miles - See TABLE 14

DISTANCE/VALUE

234. Commercial/Industrial area. (5)

..... / .

235. Residential area. (5)

..... / .

236. National/State park, forest, wildlife reserves. (5)

..... / .

237. Prime agricultural land. (5)

..... / .

238. Agricultural land in production within the past 5 years. (5)

..... / .

239. Is a historic landmark site within view of the facility or like to be subject to significant impacts from air release? YES/NO (30)
 If so, identify, locate and describe expected impacts:

.....

240. HRS Value (use TABLE 14, Land Use). (1)

..

FIRE AND EXPLOSION FROM HAZARDOUS OR TOXIC MATERIALS

FIRE AND EXPLOSION POTENTIAL: TGD

241. Based on field observation and measurement, is there a demonstrated fire and explosion threat at this site? (41) NO/YES Describe:

Narrative summary:

.....
.....

242. Has state or local fire marshal certified that site presents a significant hazard of fire or explosion: (41)

Narrative summary.

.....
.....

IF ANY QUESTIONS IN ITEMS 241 and 242 HAVE BEEN CHECKED "YES" FOR FIRE AND EXPLOSION POTENTIAL, COMPLETE ITEMS (243 TO 284)

CONTAINMENT

Substances found onsite that are individually ignitable.

243. (25)

244. (25)

245. (25)

246. (25)

247. (25)

Substances found onsite that are incompatible.

248. (25)

249. (25)

250. (25)

251. (25)

252. (25)

253. Are any of the substances that are onsite hazardous in combination and are not segregated or isolated so as to prevent the formation of incompatible mixtures: Y OR N (1) . .

ISOLATED/SEGREGATED	VALUE
YES	1
NO	3

254. HRS Value (Containment). (1) . .

WASTE CHARACTERISTICS:

255. Direct evidence of ignitability or explosion potential, as measured:
Y = YES N = NO (1) . .

256. HRS Value (Direct Evidence). VALUE. YES 3 NO 0 (1) . .

257. Ignitability: List the most ignitable substance onsite and indicate the National Fire Protection Agency (NFPA) level assigned this substance (TABLE 15): (25)

258. HRS Value (Ignitable). (1) . .

259. Most reactive materials onsite are See TABLE 16 (25)

260. HRS Value (Reactive): (1) . .

261. Most incompatible pairs of material onsite are: See TABLE 13 (40)

262. HRS Value (Incompatible). (1) . .

263. Quantity of materials onsite that are flammable or explosive, including hazardous materials that are flammable or explosive alone or in combination: (9) . .

264. HRS (Quantity) - See TABLE 3. (1) . .

DISTANCE TO TARGETS:

265. Distance to nearest persons like to be at risk to fire or explosion (critical distances that require careful measurement for HRS purposes are 0 feet, 200 feet, 1/2 mile, 1 mile and 2 miles): (6)
266. HRS Value (Population) - See TABLE 15A. (1)
267. Distance to the nearest building from the hazardous substance (critical distances that require careful measurement for HRS purposes are 50 feet, 200 feet and 1/2 mile): (6)
- | <u>DISTANCE</u> | <u>VALUE</u> |
|-----------------|--------------|
| 1/2 mile | 0 |
| 201'-1/2 mile | 1 |
| 51'-200' | 2 |
| 0-50' | 3 |
268. HRS Value (Buildings). (1)
269. Distance to nearest wetland from the hazardous substance? (6)
- | <u>DISTANCE</u> | <u>VALUE</u> |
|-----------------|--------------|
| 100' | 0 |
| 100' | 3 |
270. HRS Value (Wetlands). (1)
271. Distance to a critical habitat from the hazardous substance (critical distances that require careful management of HRS purposes are 100 feet, 1000 feet and 1/2 mile): (6)
- | <u>DISTANCE</u> | <u>VALUE</u> |
|-----------------|--------------|
| 1/2 mile | 0 |
| 1001 -1/2 mile | 1 |
| 101-1000' | 2 |
| 0-100' | 3 |
272. HRS Value (Habitat). (1)
273. Is a fire like to spread to this critical habitat, regardless of distance? YES or NO (1)

TARGETS FOR FIRE AND EXPLOSION:

Land use within 2 miles (note that this item is identical to the air migration pathway, providing the location of the volatilizing substances and the flammable or explosive substance is the same):

(Critical distances requiring measurement for HRS purposes are 1/4 mile, 1/2 mile, 1 mile and 2 miles): See TABLE 14

		<u>DISTANCE / VALUE</u>
274.	Commercial/Industrial area. (5)	 / ..
275.	Residential area. (5)	 / ..
276.	National/State park, forest, wildlife reserves. (5)	 / ..
277.	Prime agricultural land. (5)	 / ..
278.	Agricultural land in production within the past 5 years. (5)	 / ..
279.	Is a historic landmark site within view of the facility or like to be subject to significant impacts from fire or explosion? YES OR NO. Describe (81)	

TABLE 14 is used to determine the HRS value. The highest value is to be chosen.

280.	HRS Value (Land Use). (1)	
281.	Population with 2 mile radius. (If areal photography is used in making the count, assume 3.8 individuals per dwelling). (6)	
	<u>POPULATION</u>	<u>VALUE</u>
	0	0
	1-100	1
	101-1000	2
	1001-10000	3
	10001-10,000	4
	10,000	5
282.	HRS Value (Population). (1)	

283. Buildings within a 2-mile radius (measures from the hazardous substance). (4)

<u>NO OF BUILDINGS</u>	<u>VALUE</u>
0	0
1-26	1
27-60	2
261-790	3
791-2600	4
2600	5

284. HRS Value (Buildings). (1) . .

DIRECT CONTACT

285. Is there a confirmed instance in which contact caused injury, illness or death to humans or to domestic or wild animals? (100)

Narrative summary:

.....

286. HRS Values: YES - 45, NO - 0 (2) . . .

IF ITEM 285 FOR DIRECT CONTACT IS CHECKED "YES" SKIP TO LINE 292 - IF NO, COMPLETE ITEMS 287 TO 291

Accessibility to where the hazardous material is deposited - evaluate the following aspects: (1)

- | | | | |
|------|--------------------------|--------------|-----|
| | | <u>VALUE</u> | |
| 287. | Surveillance system: YES | 0 | |
| | NO | 1 | . . |

288. Artificial or natural barriers to entry: (1)

	<u>VALUE</u>	
YES	0	
NO	1	. .

289.	Control of entry points: (1)	<u>VALUE</u>	
	YES	0	
	NO	1	<u>..</u>

Add values from lines 287, 288 and 289 to mark in 291.

290. Have any changes in accessibility been made since the confirmed instance of direct contact? (1) Y/N ..

291. HRS Value (Access). (1) ..

292. Indicate if there is Containment of the hazardous materials against direct contact: (6)

<u>CONTAINMENT</u>	<u>VALUE</u>	<u>Y OR N</u>
Surface impound.	15	<u>..</u>
Sealed or unsealed containers	15	<u>..</u>
Tanks	15	<u>..</u>
Landfill with less than 2' cover	15	<u>..</u>
Spills	15	<u>..</u>
Otherwise	0	<u>..</u>

293. HRS Value (Containment) from item 292. (2) ..

294. Toxicity of the most hazardous materials that are not adequately contained against direct contact: Refer to TABLES 4 & 5 (60)

Storage Area #

..... (20)

Material

..... (20)

Toxicity

..... (20)

295. HRS Value (Toxicity). (1) ..

296. Population within one mile of hazardous materials: (7)

POPULATION WITHIN	
<u>1 MILE</u>	<u>VALUE</u>
0	0
1-100	1
101-1000	2
1001-3000	3
3001-10,000	4
>10,000	5

Basis for this estimate:

297. HRS Value (Population): (1) . .

Location of critical habitat of endangered species, including notation of whether species is on the federal list:

298. Circle the appropriate Distance to the critical habitat (critical distance that require measurement for HRS purposes are 1/4 mile, 1/2 mile and 1 mile): (6)

<u>DISTANCE</u>	<u>VALUE</u>
1 mile	0
1/2 mile - 1 mile	1
1/4 mile - 1/2 mile	2
<1/4 mile	3

299. Indicate if the critical habitat is on the State S, Federal F, or both B list(s). (1) . .

300. HRS Value (Distance to critical habitat) from Item 298. (1) . .

301-398. Reserved

399. Remarks. (80)

.

ORDNANCE AND EXPLOSIVE WASTE (OEW)

OEW RISK ASSESSMENT:

The OEW risk assessment is based on records searches, reports of Explosive Ordnance Detachment actions, and field observations and measurements. These data are used to assess the risk involved based upon the hazards identified at the site. The risk assessment is composed of two factors, hazard severity and hazard probability.

Hazard Severity. Hazard severity categories are defined to provide a qualitative measure of the worst credible mishap resulting from personnel error, environmental conditions, or other pertinent factors.

Description	Category	Mishap Definition
CATASTROPHIC	1	Explosion, Death, Life-threatening or other injury causing total permanent disability, or Property damage in excess of \$500,000.
CRITICAL	2	Major fire, Severe injury which requires doctor or hospital care for 1 or more persons, or Property damage between \$100K and \$500K.
MARGINAL	3	Minor fire, Minor injury which would require any medical or Property damage between \$700 and \$100,000.
NEGLIGIBLE	4	No injuries or Property damage less than \$700.

400. The Hazard Category assigned for this site is. (1) 1.

401. This is based primarily upon the following: (160)

A. U.V.E. D.D. AREA ON THE SITE IS MARKED OFF WITH A FENCE. THIS PROPERTY IS STILL OWNED BY THE ARMY. HOWEVER, IT IS LIKELY THAT ORDNANCE CONDITIONS ALSO EXIST ON DELAWARE PARKS PROPERTY. AREA IS EASILY ACCESSIBLE TO TRESPASSERS, ESPECIALLY SMALL CHILDREN.

Hazard probability. The probability that a hazard has been or will be created due to the presence of unexploded ordnance or explosive materials on a formerly used DOD site.

Description	Level	Probability Definition
FREQUENT	A	Has already occurred more than once or has the potential to occur at least every 1 or 2 years.
PROBABLE	B	Has already occurred once or has the potential to occur more than once in the next 10 to 20 years.
OCCASIONAL	C	Is likely to occur sometime in the next 10 to 20 years.
REMOTE	D	Unlikely but possible due to the nature of past DOD use of the site.
IMPROBABLE	E	So unlikely that it can be assumed that it will not occur.

402. The hazard probability level assigned for this site is. (1) A.

403. This is based upon the following: (160)

STATE OF CALIFORNIA - A LIVE DOD AREA STILL OWNED BY A.R.M.Y.

Risk Assessment. The risk assessment is completed by using the following table. Enter with the results of Items 400 & 402.

Probability Level	A	B	C	D	E
Severity Category:					
I	20	20	18	14	10
II	20	18	14	10	6
III	18	14	10	6	2
IV	14	10	6	2	0

404. The risk assessment value for this site is. (3) .20

405. Ordnance and Explosive Waste Characteristics. Is there any direct or other evidence that OEW is present or could be present based upon former DOD uses of the site? This evidence can be based upon direct observation of the site survey team, reports received from individuals, government agencies, or news media, review of drawings or archive documents relating to DOD operations at the site, or any other pertinent source.

YES (Complete the rest of this question).

NO (Enter 0 in Question 2 on the OEW Work Sheet and continue starting with Question 422).

If the answer to this question is YES describe briefly the type of evidence and where that evidence is available for detailed review. (161)

LIVE DUD AREA IS MARKED WITH FENCE ON SITE . .
THIS PROPERTY IS STILL OWNED BY THE ARMY. SINGLE
ARMED WARE STORED AND FIRED ON THE SITE. IT IS
LIKELY THAT ORDNANCE CONDITIONS ALSO EXIST ON DELAWARE
STATES PROPERTY

(For Questions 406 through 442 underline, check, circle or otherwise indicate each appropriate answer.)

406. High Explosives. (4)

	YES VALUE	NO VALUE	Y OR N
Primary or Initiating Explosives (Lead Styphnate, Lead Azide, Nitroglycerin, Mercury Azide, Mercury Fulminate, etc.)	10	0	..
Booster or Bursting Explosives (PETN, Compositions A, B, C, Tetryl, TNT, RDX, HMX, HBX, Black Powder, etc.)	5	0	..
Military Dynamite	5	0	..
Less Sensitive Explosives (Ammonium Nitrate, Favier Explosives, etc.)	3	0	..

407. High Explosives Ordnance Ranking System (ORS) Value
(Maximum value of 10). (2)

..

408. Propellants. (5)

	YES VALUE	NO VALUE	Y OR N
Single Base Propellant (M10, M12, etc.)	3	0	..
Double Base Propellant (M2, M5, M9, M13, etc.)	4	0	..
Triple Base Propellant (M15, M17, etc.)	4	0	..
Liquid Propellant	4	0	..
Large Rocket Motors	5	0	..

409. Other (describe). (15)

.....

410. Propellants HRS Value from item 408. (1)

..

411. Conventional Ordnance and Ammunition. (11)

	YES VALUE	Y OR N
Small Arms (.22 cal - 20mm)	1	<u>.√.</u>
Medium/Large Caliber (over 20mm)	5	<u>.√.</u>
Ammunition, Inert	0	<u>..</u>
Ammunition, Blank or Practice	2	<u>.√.</u>
Bombs, Explosive	5	<u>..</u>
Bombs, Practice, Fuzed	2	<u>..</u>
Grenades, Mines	5	<u>..</u>
Grenades, Mines, Practice, Fuzed	2	<u>..</u>
Detonators, Blasting Caps	5	<u>..</u>
Rockets, Missiles	5	<u>..</u>
Demolition Charges	4	<u>..</u>

412. Other. (15)

.....

413. Conventional Ordnance and Ammunition ORS Value from Item 411 (Maximum of 5). (1)

.5.

414. Pyrotechnics. (4)

	YES VALUE	Y OR N
White Phosphorus	5	<u>..</u>
Pyrolusite	4	<u>..</u>
Flares	3	<u>..</u>
Smoke Rounds and Bombs	3	<u>..</u>

415. Other Pyrotechnic Devices. (15)

.....

416. Pyrotechnics ORS Value (Maximum of 5). (1)

..

417. Chemical Weapons/Agents. (3)

YES
VALUE

Y OR N

Toxic Chemical Warfare Agents
(GB, VX, H, HD, BZ, , etc.)

40

• •

Vomiting Agents
(DA, DM, DC, etc.)

20

• •

Tear Agents
(CNS, CNB, BDC, CS, etc.)

10

1 2

418. Other Chemical Warfare Agents. (15)

[illegible]

419. Chemical Weapons ORS Value. (2)

• • •

420. Total Ordnance and Explosive Waste Characteristics ORS Value (Total = 407 + 410 + 413 + 416 + 419 with a Maximum value of 55). (2) . .

• • •

421. Provide a detailed description on any and all chemical weapons or chemical agents present at the site. (400)

422. Locations of Contamination. (6)

VALUE

Y OR N

Within Tanks, Pipes, Vessels
or Other confined locations.

3

•N•

On the surface or within 3 feet.

5

.y.

Inside walls, ceilings, or other parts
of Buildings or Structures.

4

N.

423. Other (describe). (22)
424. Locations of Contamination ORS Value (Maximum of 5). (1) .5.
425. Area Contaminated. (6)

VALUE

None	0
Less than 1 acre	1
1 to 5 acres	2
5 to 50 acres	3
50 to 250 acres	4
Over 250 acres	5

426. Area Contaminated ORS Value (Maximum of 5). (1) 4.
427. Extent of Contamination ORS Value Sum of Items (424 + 426) -
(Maximum of 10). (2) .9.
428. Weight of OEW materials on site. (7)
429. Number of rounds (from 428). (7)

Weight of Bulk Explosives in Rounds	No. of Rounds, Containers, etc.	Value
0	0	0
Less than 10	1 to 9	2
10 to 100	10 to 100	4
101 to 500	101 to 500	6
501 to 1000	501 to 1000	8
Over 1000	Over 1000	10

430. Quantity of OEW ORS Value (Maximum of 10). (2) . . .
Two valves may be figured (e.g., 8 lbs TNT gives value of 2 & 200 rounds
a value of 6. Then the ORS value would be 8).

- [illegible]

- | Distance to Nearest Target | VALUE |
|----------------------------|-------|
| Less than 1250 feet | 5 |
| 1250 feet to 0.5 miles | 4 |
| 0.6 miles to 1.0 mile | 3 |
| 1.1 mile to 2.0 miles | 2 |
| 2.1 miles to 5.0 miles | 1 |
| Over 5.0 miles | 0 |

- 5.

434. Distance to nearest utility system (power, water, or gas) or public highway likely to be at risk from ORW site. (6)

Distance to Nearest Target	VALUE
Less than 1250 feet	5
1251 feet to 1 mile	3
11 mile to 2 miles	1
Over 2 miles	0

435. Distances to Public Utilities/Highways ORS Value (Maximum of 5). (1) 3.

436. Distances ORS Value (433 + 435) - (Maximum of 10). (2) .08.

437. Numbers and Types of Buildings within a 2 mile radius measured from the hazardous area, not the installation boundary. (6)

Numbers of Buildings	VALUE
0	0
1 to 10	1
11 to 50	2
51 to 100	3
101 to 250	4
251 or Over	5

438. Numbers of Buildings ORS Value (Maximum of 5). (1) 3

439. Types of Buildings. (30)

P.A.R.K. T.Y.P.E. BUILDING: NATURE CENTER, YOUTH CAMPS,
BATHHOUSES, DORMITORY, MESS HALL, IGLOOS, MILITARY
VALUE

Educational, Child Care, etc.	5
Residential, Hospitals, Hotels, etc.	5
Commercial, Shopping Centers, etc.	5

Industrial, Warehouse, etc.	4
Agricultural, Forestry, etc.	3
Detention, Correctional	2
Military	C
No Buildings	0
440. Types of Buildings ORS Value (Maximum of 5). (1)	<u>.5</u>
441. Numbers and Types of Buildings ORS Value (438 + 440) - Maximum of 10). (2)	<u>0.8</u>
442. Accessibility to site refers to the measures taken to limit access by humans or animals to ordnance and explosive wastes. Assign a value using the following guidance: Describe. (40)	

SITE IS OPEN TO GENERAL TRAFFIC; ONLY A WOODEN FENCE
A DANGER SIGNS IS A BARRIER TO THE LIVE DUG AREA

Barrier	Assigned Value
A 24-hour surveillance system (e.g., television monitoring or surveillance by guards or facility personnel) which continuously monitors and controls entry onto the facility;	0
or	
An artificial or natural barrier (e.g., a fence combined with a cliff), which completely surrounds the facility; and a means to control entry, at all times, through the gates or other entrances to the facility (e.g., an attendant, television monitors, locked entrances, or controlled roadway access to the facility).	0
Security guard, but no barrier	1
A barrier, but no separate means to control entry	2
Barriers do not completely surround the facility	3
No barrier or security system	5

443. ORS Value (Maximum of 5). (1)

5

444-498. Reserved

499. Remarks. (80)

WOODEN FENCE SURROUNDING LIVE OIL AREA (ARMY
PROPERTY). PROVIDES VIRTUALLY NO BARRIER OR SECURITY
TO TRESPASSERS, ESP SMALL CHILDREN

DCBRIS

Debris description:

500. Type of Debris. (150)

3 WOOD FRAME BLDGS. 4 CONX. BLOCK BLDG. CONX. FOUND. & PLATFOR
1 BRICK SMOKESTACK. 1 TRAILERS W/ FOUND. 4 TRANSFORMERS
AND CAGES. CHAIN-LINK FENCE. 1 ABOVE GRADE STORAGE TAN
TRAC. DEBRIS. 3 UNSECURED BUNKERS. 1 STEEL
TOWER.

501. Type of construction for structures. (100)

SEE ABOVE.

502. Quantity. (80)

SEE ABOVE.

503. Condition, etc. (15)

HAZARDOUS.

504. List underground structures or items. (90)

ONE UNDERGROUND FUEL TANK WHICH OWNER DESIRES
TO HAVE REMAIN INTACT.

505. DOD use of debris items. (90)

WAREHOUSES. GARAGE. STORAGE. PUBLIC WORKS SHOP. AMMO
STORAGE IN THE UNSECURED BUNKERS. BUNKERS ARE
TO REMAIN INTACT, JUST SECURED FROM TRESPASSERS

506. List buildings or other items that owner(s), after DOD disposal, have used for their benefit. Give use. (150)

BLDG. #9 THRU #15 AND #19 THRU #29 ARE USED AS YOUTH
CAMPS. BLDG. #39 THRU #52 ARE USED AS MAINTENANCE
AREAS. DOD PARK MAINTENANCE. BLDG. #3 (NATURE CENTER)
BLDG. #30 (YOUTH CAMP).

DEBRIS (CONTINUED)

507. List items onsite that were not constructed or used by DOD or DOD contractor. (80)

2. S-I-H-O-W-E-R · B-U-I-L-D-I-N-G-S; · · · · · B-A-T-H-H-O-U-S-E; · 2 · ·
C-O-M-F-O-R-T · S-T-A-T-I-O-N-S · · · · ·

508. List items owner wants to retain. (80)

List items owner wants to retain: (5)
#49,
•B-L-D-G-S; •T-H-R-U #38, #40 thru #47, #53 thru #69, #72 thru #74
.....
.....
.....

509. List items that may have salvage value. (100)

N.O.N.E.

510. Give location of nearest or most economical disposal location. (80)

J.E.G.R.I.S. M.A.T.E.R.I.A.L.S. S.H.O.U.L.D. B.E. C.O.M.P.A.C.T.E.D
I.V.D. G.U.R. I.D. A.T. C.O.U.N.T.Y. L.A.N.D.F.I.L.L.

311. Give special labor, equipment or methods that will be required for project. (100)

ANALYSIS OF THE DATA OF THE 1990-1991 PERIOD
FOR THE 1990-1991 PERIOD
THE 1990-1991 PERIOD

512. List any restrictions on methods of demolition or disposal. (80)

NAME: A.S. A.B.O.V.E.

513. Describe site grading that will be required for restoration: (include any special requirements or adverse foundation conditions). (40)

M.A.T.C.H. S.U.R.R.O.U.N.D.I.N.G. G.R.A.D.E.

514. Give location for borrow material if required. (40)

FROM MATERIAL OVER BUNKERS

DEBRIS (CONTINUED)

515. List and give location of underground items that need to be preserved.
(60)

UNDERGROUND FUEL TANK IN VICINITY OF BLDG. #3?
.....

516. Give requirements for seeding and mulching or other erosion measures.
(80)

S.E. T.C. GRADE AND TAKE APPROPRIATE MEASURES
TO PREVENT EROSION DURING CONSTRUCTION
.....

517. Describe unsightly debris (UD). If no unsightly debris exists, enter NONE for this item and 0 for item 538, and do not complete items 518 thru 529. (160)

3 WOOD FRAME BLDGS, 1 CONK BLOCK BLDG, COAL FOUND & PLATFORM,
1 BRK SMOKESTACK, 4 TRAILERS, 1 FOUND, 1 TRANSFORMER,
AND CABLE CHAIN LINK FENCE, 1 ABOVE GROUND STORAGE TANK,
MISC. DEBRIS, 3 UNIDENTIFIED PUNKERS, 1 STEEL
TOWER.....

518. Size of Debris Area (UD): (2) Value 0.5

Debris covers area 5 acres or less in size. 2

Debris covers area 6-25 acres in size. 5

Debris covers area over 25 acres in size. 10

519. Debris Above Ground Level (UD): (2) 0.6

(Include structures, miscellaneous debris items or piles 3' or more in height. Structures larger than 12,000 SF in area or more than two-story height to count as two structures. Groups of individual items will be considered one structure).

Number of Structures or Piles: Value

0	0
1-2	2
3-6	4
7-15	6
16-30	8
31 or more	10

DEBRIS (CONTINUED)

520. Describe unusual items that require transformation to structure comparison in Item 519. (100)

CONC. FOUND. & PLATFORM, BRICK SMOKESTACK, TRAILERS, TRANSFORMERS, STORAGE TANK, FENCE, STORAGE TANK, MISC. DEBRIS, 1 STEEL TOWER.

521. Ground level debris (less than 3' high) (UD). Foundations, slabs, small piles, etc: (1)

<u>Area Covered by Debris Items</u>	<u>Value</u>	<u>.1.</u>
No Ground Level Debris	0	
0-20,000 SF	1	
20,000 - 100,000 SF	3	
Over 100,000 SF	5	

522. Briefly describe Item 521 (concrete foundation, rubble etc). (80)

MISC. DEBRIS
.
.

523. Condition of Debris (UD): (2) Value .05

Building or structures very unsightly, such as partially demolished or collapsed or deteriorated beyond any reasonable renovation. 10

Structures that are in need of considerable maintenance, very large foundations, piles of building rubble, etc. 5

Small foundations, small debris piles or buildings in good condition that are not compatible with surrounding area. 2

524. Give basis for value selected in Item 523. (100)

BUILDINGS ARE DETEIORATED, UNSIGHTLY, AND A HAZARD TO THE CONDITION OF THE SITE WITHIN THE CONTEXT OF THE PROPERTY'S DESIGNATED USE AS A STATE PARK

DERRIS (CONTINUED)

525.	<u>Location (UD):</u> (2)	<u>Value</u>	<u>00.</u>
	Rural	2	
	Small Town or Community	5	
	Urban or densely populated residential area	10	
526.	<u>Effect on Surrounding Area (UD):</u> (1)	<u>Value</u>	<u>2.</u>
	Contributes highly to general area being slum or very desirable for use.	5	
	Serves as a deterrent to development of general area or has slight bearing on above choice.	2	
	No effect.	0	
527.	Briefly describe effect in Item 526. (80)		
	<u>DEVELOPMENT IN THE PUBLIC USE OF THE LAND IS A POSITIVE</u> <u>CONTRIBUTION TO THE COMMUNITY AND TO THE ECONOMY OF THE AREA.</u> <u>IT IS A FACT THAT THE LAND IS A POSITIVE CONTRIBUTION TO THE</u> <u>COMMUNITY AND TO THE ECONOMY OF THE AREA.</u>		
528.	<u>Public Use or Exposure (UD):</u> (2)	<u>Value</u>	<u>0.6.</u>
	Isolated from public exposure.	0	
	Located in area with little public exposure.	1	
	Located in area that receives heavy public use or exposure of seasonal or other varying nature.	6	
	Located in area that receives heavy year round use.	10	
529.	Give basis for value selected in Item 528. (80)		
	<u>LOCATED IN STATE PARK AND RECREATION</u> <u>AREA</u> <u>.....</u>		

DEBRIS (CONTINUED)

530. Describe Hazardous Debris (HD): (160)

If there is no debris that represents a potential physical or health hazard to persons or is a potential source of damage to surrounding property, enter NONE for this item and 0 for item 539 and do not complete items 531 thru 537.

3. WOOD FRAME BLDGS; 4. CONC. BLOCK BLDGS; CONC. FOUND. + PLATFORM
1. BRICK SMOKESTACK; 4. TRAILERS W/ FENDS; 10. TRAILER-FARMERS
AND CAGES; CHAIN-LINK FENCE; 2. ABOVE GRADE STORAGE TANK;
MISC. DEBRIS; 3. UNSECURED BUNKERS; 1. STEEL
TOWER.

531. Probability of Injury or Health Hazard Value 100
 (HD). (2)

Has occurred frequently or has potential to occur at least annually. 10

Has occurred once and has potential to occur at least once every two years. 8

Has potential to occur every 2-10 years. 6

Has potential to occur every 10-25 years. 4

Unlikely to occur once every 25 years. 2

532. List past occurrences or give basis for value selected in Item 531.
 (100)

CONTINUING DESTRUCTION OF PRESENT
OF STRUCTURES INCREASES DANGER TO
HAZARD TO PUBLIC LIFE. ISP TO CHILDREN CAMPING
AT THE SITE

533. Severity of Potential Hazard (HD): (2) Value 0.6
 (Most probable results from incident involving debris)

Totally disabling or death. 10

Loss of limb, partial sight, hearing, etc. 8

Would require hospitalization or repeated medical treatment. 6

Would require minor medical care. 3

Minor cuts and bruises. 1

No injury. 0

DEBRIS (CONTINUED)

534. Give information on past incidents or describe conditions that would contribute to value selected in Item 533. (100)

DETERIORATED . . . BUILDINGS
. . . FORTUNITATELY, TREASURES, P.O.D. MISC. DEBRIS
W.O.C. ACCIDENTAL E.T.O. TRASH DISPOSERS, ESPECIALLY YOUNG
CHILDREN WHO RESIDE AT THE YOUTH CAMPS WHEN IN SEASON

535. Hazard to Property Other Than Owner (HD): (2) Value 0.1.
 (Damage resulting from fire, collapse, etc.)

Potential for damage in excess of \$250,000.	10
Potential for damage of \$75,000 to \$250,000.	5
Potential for damage of less than \$75,000.	1
No damage potential.	0

536. List hazard and property that would be exposed to hazard in Item 535. (80)

ALL BUILDINGS ON PROPERTY WOULD BE EXPOSED
. . . TO POTENTIAL FLOODING. NEARBY COMM.
INDUSTRIAL AND BUILDINGS IN USE ARE EXTREMELY VULNERABLE TO
HAZARDOUS EVENTS

537. Probability of Damage Occurring Value 4.
 (HD). (1)

In next two years.	5
In 2-10 years.	4
In 10-25 years.	2
Beyond 25 years.	1

538. Has site been coordinated for demolition and/or removal under Section 106 of the National Preservation Act? Yes No (1) N.

542-598. Reserved.

599. Remarks (80)

BUNKERS ALSO POSS. AS A HAZARDOUS THREAT
UNTIL THEY CAN BE SECURED TO KEEP TRESPASSERS OUT
.

DEBRIS WORKSHEET

539. Unsightly Debris Score:

<u>A. Item No.</u>	<u>Value</u>
518	05
519	06
521	01
523	05
525	02
526	02
TOTAL	<u>21</u>

B. If value for item 528 is 0, multiply total in A. by 0.5 _____.

If value for items 528 is 1, multiply total in A. by 0.9 _____.

If value for item 528 is 6 to 10, add value selected to
Total in A. 27.

C. Divide B. by 2.10 for Unsightly Debris Score 13 (Round
to nearest whole number).

540. Hazard Debris Score:

<u>Item No.</u>	<u>Value</u>
531	10
533	06
535	01
537	04

A. Multiply Item 531 value by Item 533 = 60

B. Multiply Item 535 value by Item 537 = 4

TOTAL A + B = 64

Hazardous Debris Score = Total A+B = 64
(Round to nearest whole
number)

DEBRIS WORKSHEET (CONTINUED)

541. Total Score for Ranking.

Total Score = Unsightly Debris Score (Item 538) + Hazardous Debris
Score (Item 539) = 77.

TABLE 1
CONTAINMENT VALUE FOR GROUNDWATER ROUTE
(Use technical judgement of best fit)

Assign containment a value of 0 if: (1) all the hazardous substances at the facility are underlain by an essentially nonpermeable surface (natural or artificial) and adequate leachate collection systems and diversion systems are present; or (2) there is no groundwater in the vicinity. The value '0' does not indicate no risk. Rather, it indicates a significantly lower relative risk when compared with more serious sites on a national level. Otherwise, evaluate the containment for each of the different means of storage or disposal at the facility using the following guidance.

A. Surface Impoundment		Assigned Value	Assigned Value
Sound run-on diversion structure, essentially nonpermeable liner (natural or artificial) compatible with the waste, and adequate leachate collection system.	Essentially nonpermeable compatible liner with no leachate collection system; or inadequate freeboard.	1	1
	Potentially unsound run-on diversion structure; or moderately permeable compatible liner.	2	2
	Unsound run-on diversion structure; no liner; or incompatible liner.	3	3
B. Piles			
Piles uncovered, waste unstabilized; or piles covered, waste unstabilized, and essentially nonpermeable liner.		0	0
Piles uncovered, waste unstabilized, moderately permeable liner, and leachate collection system.		1	1
Piles uncovered, waste unstabilized, moderately permeable liner, and no leachate collection system.		2	2
Piles uncovered, waste unstabilized, and no liner.		3	3

TABLE 1 (CONTINUED)
CONTAINMENT VALUE FOR GROUNDWATER ROUTE
(Use technical judgement of best fit)

C. Containers	<u>Assigned Value</u>	D. Landfill	<u>Assigned Value</u>
Containers sealed and in sound condition, adequate liner, and adequate leachate collection system.	0	Essentially nonpermeable liner, compatible with waste, and adequate leachate collection system.	0
Containers sealed and in sound condition, no liner or moderately permeable liner.	1	Essentially nonpermeable compatible liner, no leachate collection system, and landfill surface precludes ponding.	1
Containers leaking, moderately permeable liner.	2	Moderately permeable, compatible liner, and landfill surface precludes ponding.	2
Containers leaking and no liner or incompatible liner.	3	No liner or incompatible liner; moderately permeable compatible liner; landfill surface encourages ponding; no run-on control.	3

TABLE 2

CONTAINMENT VALUES FOR SURFACE WATER ROUTE

Assign containment a value of 0 if: (1) all the waste at the site is surrounded by diversion structures that are in sound condition and adequate to contain all runoff, spills, or leaks from the waste; or (2) intervening terrain precludes runoff from entering surface water. Otherwise, evaluate the containment for each of the different means of storage or disposal at the site and assign a value as follows:

<u>A. Surface Impoundment</u>	<u>Assigned Value</u>	<u>B. Waste Piles</u>	<u>Assigned Value</u>
Sound diking or diversion structure, adequate freeboard, and no erosion evident.	0	Piles are covered and surrounded by sound diversion or containment system.	0
Sound diking or diversion structure, but inadequate freeboard.	1	Piles covered, wastes unconsolidated, diversion or containment system not adequate.	1
Diking not leaking, out potentially unsound.	2	Piles not covered, waste unconsolidated, and diversion or containment system potentially unsound.	2
Diking unsound, leaking, or in danger of collapse.	3	Piles not covered, wastes unconsolidated, and no diversion or containment or diversion system leaking or in danger or collapse.	3

TABLE 2 (CONTINUED)
CONTAINMENT VALUES FOR SURFACE WATER ROUTE

<u>C. Containers</u>	<u>Assigned Value</u>	<u>D. Landfill</u>	<u>Assigned Value</u>
Containers sealed, in sound condition, and surrounded by sound diversion or containment system.	0	Landfill slope precludes runoff, landfill surrounded by sound diversion system, or landfill has adequate cover material.	0
Containers sealed and in sound condition, but not surrounded by sound diversion or containment system.	1	Landfill not adequately covered and diversion system sound.	1
Containers leaking and diversion or containment structures potentially unsound.	2	Landfill not covered and diversion system potentially unsound.	2
Containers leaking, and no diversion or containment structures or diversion structures leaking or in danger of collapse.	3	Landfill not covered and no diversion system present, or diversion system unsound.	3

TABLE 3

QUANTITY RANKING VALUES

Hazardous waste quantity includes all hazardous substances at a facility (as deposited) except that with a containment value of 0 (See items 102 or 103). Do not include amounts of contaminated soil or water; in such cases, the amount of contaminating hazardous substance may be estimated.

On occasion, it may be necessary to convert data to a common unit to combine them. In such cases, 1 ton - 1 cubic yard - 4 drums and for the purposes of converting bulk storage, 1 drum - 50 gallons. Assign a value as follows:

<u>Gallons</u>	<u>Tons/Cubic Yards</u>	<u>No. of Drums</u>	<u>Assigned Value</u>
0	0	0	0
1-2000	1-10	1-40	1
2,050-12,500	11-62	41-250	2
12,550-25,000	63-126	251-500	3
25,050-50,000	126-250	501-1000	4
50,050-125,000	251-625	1001-2500	5
125,050-250,000	626-1250	2501-5000	6
250,050-500,000	1251-2500	5001-10,000	7
500,000	2500	10,000	8

TABLE 4
WASTE CHARACTERISTICS VALUES
FOR SOME COMMON CHEMICALS

CHEMICAL/COMPOUND

Acetaldehyde	3	0	3	2
Acetic Acid	3	0	2	1
Acetone	2	0	3	0
Aldrin	3	3	1	0
Ammonia, Anhydrous	3	0	1	0
Aniline	3	1	2	0
Benzene	3	1	3	0
Carbon Tetrachloride	3	3	0	0
Chlordane	3	3	0*	0*
Chlorobenzene	2	2	3	0
Chloroform	3	3	0	0
Cresol-O	3	1	2	0
Cresol-M&P	3	1	1	0
Cyclohexane	2	2	3	0
Endrin	3	3	1	0
Ethyl Benzene	2	1	3	0
Formaldehyde	3	0	2	0
Formic Acid	3	0	2	0
Hydrochloric Acid	3	0	0	0
Isopropyl Ether	3	1	3	1
Lindane	3	3	1	0
Methane	1	1	3	0
Methyl Ethyl Ketone	2	0	3	0
Methy Parathion in xylene Solution	3	0**	3	2
Naphthalene	2	1	2	0
Nitric Acid	3	0	0	0
Parthion	3	0**	1	2
PCB	3	3	0**	0**
Petroleum, Kerosene (Fuel Oil No. 1)	3	1	2	0
Phenol	3	1	2	0
Sulfuric Acid	3	0	0	2
Toluene	2	1	3	0
Trichlorobenzene	2	3	1	0
- Trichloroethane	2	2	1	0
xylene	2	1	3	0

¹Sax, N. I., Dangerous Properties of Industrial Materials, Van Nostrand Reinhold Co., New York, 4th ed, 1975. The highest rating listed under each chemical is used.

²JRB Associates, Inc., Methodology for Rating the Hazard Potential of Waste Disposal Sites, May 5, 1980.

³National Fire Protection Association, National Fire Codes, Vol 13, No. 49, 1977.

*Professional judgment based on information contained in the U.S. Coast Guard CHRIS Hazardous Chemical Data, 1978.

**Professional judgment based on existing literature.

TABLE 5

SAX TOXICITY RATINGS

0 - No Toxicity* (No.e)**

This designation is given to materials which fall into one of the following categories:

- (a) Materials which cause no harm under any conditions of normal use.
- (b) Materials which produce toxic effects on humans only under the most unusual conditions or by overwhelming dosage.

1 - Slight Toxicity*(Low)**

- (a) Acute Local. Materials which on single exposure lasting seconds, minutes, or hours cause only slight effects on the skin or mucuous membranes regardless of the extent of the exposure.

- (b) Acute Systemic. Materials which can be absorbed into the body by inhalation, ingestion, or through the skin and which produce only slight effects following a single exposure lasting seconds, minutes, or hours, or following ingestion of a single dose, regardless of the quantity absorbed or the extent of exposure.

- (c) Chronic Local. Materials which on continuous or repeated exposure extending over periods of days, months, or years cause only slight and usually reversible harm to the skin or mucuous membranes. The extent of exposure may be great or small.

- (d) Chronic Systemic. Materials which can be absorbed into the body by inhalation, ingestion, or through the skin and which produce only slight and usually reversible effects extending over days, months, or years. The extent of the exposure may be great or small.

In general, those classified as having "slight toxicity" produce changes in the human body which are readily reversible and which will disappear following termination of exposure, either with or without medical treatment.

TABLE 5 (CONTINUED)

SAX TOXICITY RATINGS

2 - Moderate Toxicity*(Mod)**	3 - Severe Toxicity((High)**
(a) Acute Local. Materials which on single exposure lasting seconds, minutes, or hours cause moderate effects on the skin or mucous membrane. These effects may be the result of intense exposure for a matter of hours. (b) Acute Systemic. Materials which can be absorbed into the body by inhalation, ingestion, or through the skin and produce moderate effects following single exposure lasting seconds, minutes, or hours, or following ingestion of a single dose. (c) Chronic Local. Materials which on continuous or repeated exposure extending over periods of days, months, or years cause moderate harm to the skin or mucous membrane. (d) Chronic Systemic. Materials which can be absorbed into the body by inhalation, ingestion, or through the skin and which produce moderate effects following continuous or repeated exposure extending over periods of days, months, or years. Those substances classified as having "moderate toxicity" may produce irreversible as well as reversible changes in the human body. These changes are not of such severity as to threaten life or to produce serious physical impairment.	(a) Acute Local. Materials which on single exposure lasting seconds or minutes cause injury to skin or mucous membranes of sufficient severity to threaten life or to cause permanent physical impairment or disfigurement. (b) Acute Systemic. Materials which can be absorbed into the body by inhalation, ingestion, or through the skin and which can cause injury of sufficient severity to threaten life following a single exposure lasting seconds, minutes, or hours, or following ingestion of a single dose. (c) Chronic Local. Materials which on continuous or repeated exposure extending over periods of days, months, or years can cause injury to skin or mucous membrane of sufficient severity to threaten life or cause permanent impairment, disfigurement, or irreversible change. (d) Chronic Systemic. Materials which can be absorbed into the body by inhalation, ingestion or through the skin and which can cause death or serious physical impairment following continuous or repeated exposures to small amounts extending over periods of days, months, or years.

*Sax, N.I., Dangerous Properties of Industrial Materials, Van Nostrand Reinhold Company, New York, 4th Edition, 1975.

**Sax, N.I., Dangerous Properties of Industrial Materials, Van Nostrand Reinhold Company, New York, 5th Edition, 1979.

TABLE 6

PERSISTENCE (BIODEGRADABILITY) OF
SOME ORGANIC COMPOUNDS*

VALUE = 3 HIGHLY PERSISTENT COMPOUNDS		VALUE = 1 SOMEWHAT PERSISTENT COMPOUNDS	
ALDRIN	HEPTACHLOR	ACETYLENE DICHLORIDE	LIMONENE
BENZOPYRENE	HEPTACHLOR EPOXIDE	BEHENIC ACID, METHYL ESTER	METHYL ESTER OF LIGNOCERIC ACID
BENZOTHAZOLE	1, 2, 3, 4, 5, 7-HEPTACHLOROPOR- BORNE	BENZENE	METHANE
BENZOTHIOPHENE	HEXACHLOROBENZENE	BENSLNE SULFONIC ACID	2-METHYL-5-ETHYL- PYRIDINE
BENZYL BUTYL PHTHALATE	HEXACHLORO-1, 3-BUTADIENE	BUTYL BENZENE	METHYL NAPHTHALENE
BROMOCHLOROBENZENE	HEXACHLOROCYCLOHEXANE	BUTYL BROMIDE	METHYL PALMITATE
BROMOFORM BUTANOL	HEXACHLOROETHANE	E-CAPROLACTAM	METHYL PHENYL CARBINOL
BROMOPHENYL PHINTL ETHER	METHYL BENZOTHAZOLE	CARBON-DISULFIDE	METHYL STEARATE
CHLORDANE	PENTACHLOROBIPHENYL	O-CRESOL	NAPHTHALENE
CHLOROHYDROXY BENZOPHENONE	PENTACHLOROPHENOL	DECANE	NONANE
BIS-CHLOROISOPROPYL ETHER	1, 1, 3, 3-TETRACHLOROACETONE	1, 2-DICHLOROETHANE	OCTYL CHLORIDE
M-CHLORONITROBENZENE	TETRACHLOROPHENYL	1, 2-DIMETHOXY BENZENE	PENTANE
DDE	TRIMETHYLBENZOTHAZOLE	1, 3-DIMETHYL NAPHTHALENE	PHENYL BENSOATE
DDT	TRICHLOROBENZENE	DIOCTYL ADIPATE	PHTHALIC ANHYDRIDE
DIBROMOBENZENE	TRICHLOROBIPHENYL	N-DODECANE	PROPYLBENZENE
DIBUTYL PHTHALATE	TRICHLOROFUOROMETHANE	ETHYL BENZENE	1-TERPINEOL
1, 4-DICHLOROBENZENE	2, 4, 6-TRICHLOROPHENOL	2-ETHYL-N-HEXANE	TOLUENE
DIELDRIN	BROMODICHLOROMETHANE	0-ETHYLTOLUENE	VINYL BENZENE
DIETHYL PHTHALATE	BROMOFORM	ISODECANE	XYLENE
DI(2-ETHYLHEXYL) PHTHALATE	CARBON TETRACHLORIDE	ISOPROPYL BENZENE	
DIETHYL PHTHALATE	DIBROMODICHLOROETHANE		
4, 6-DINITRO-2 AMINOPHENOL	TRACHLOROETHANE		
DIPROPYL PHTHALATE	1, 1, 2-TRICHLOROETHANE		
EIDRIN			

TABLE 6 (CONTINUED)

PERSISTENCE (BIODEGRADABILITY) OF
SOME ORGANIC COMPOUNDS*

VALUE = 2	PERSISTENT COMPOUNDS	VALUE = 0	NONPERSISTENT COMPOUNDS
ACENAPHTHYLENE	CIS-2-ETHYL-4-METHYL-1,3-DIOXOLANE	ACETALDEHYDE	METHYL BENZOATE
ATRAZINE	TRANS-2-ETHYL-4-METHYL-1,3-DIOXOLANE	ACETIC ACID	3-ETHYL BUTANOL
(DIETHYL) ATRASINE	QUAIACOL	ACETONE	METHYL ETHYL KETONE
BARBITAL	2-HYDROXYADIPONITRILE	ACETOPHENONE	2-METHYLPROPANOL
BORNEOL	ISOPHORONE	BENZOIC ACID	OCTADECANE
BROMOBENZENE	INDENE	DI-ISOBUTYL CARBINOL	PENTADECANE
CAMPOR	ISOBORHEOL	DODECANE	PENTANOL
CHLOROBENZENE	ISOPROPENYL-R-ISOPROPYL BENZENE	EICOSANE	PROPANOL
1,2-BIS-CHLOROETHOXY ETHANE	2-METHOXY BIPHENYL	ETHANOL	PROPYLAMINE
8-CHLOROETHYL METHYL ETHER	METHYL BIPHENYL	ETHYLAMINE	TETRADECANE
CHLOROMETHYL ETHER	METHYL CHLORIDE	HEXADECANE	n-TRIDECAE
CHLOROMETHYL ETHYL ETHER	METHYLINDENE	METHANOL	N-UNDECANE
3-CHLOROPYRIDINE	METHYLENE CHLORIDE		
DI-T-BUTYL-P-BENZOQUINONE	NITROANISOLE		
DICHLOROETHYL ETHER	NITROBENZENE		
DIBHYDROCARVONE	1,1,2-TRICHLOROETHYLENE		
DIMETHYL SULFOXIDE	TRIMETHYL-TRIOXO-HEXAHYDRO-		
2,6-DINITROTOLUENE	TRIAZINE IOSMER		

TABLE 7

Toxicity and Persistence have been combined in the matrix below because of their important relationship. To determine the overall value for this combined factor, evaluate each factor individually as discussed below. Match the individual values assigned with the values in the matrix for the combined rating factor. Evaluate several of the most hazardous substances at the facility independently and enter only the highest score in the matrix on the work sheet.

MATRIX

<u>VALUE FOR TOXICITY</u>	<u>VALUE FOR PERSISTENCE</u>			
	0	1	2	3
0	0	0	0	0
1	3	6	9	12
2	6	9	12	15
3	9	12	15	18

TABLE 9

DISTANCE TO DRINKING WATER OR IRRIGATION INTAKE

Population*	>3 Miles	2-3 Miles	1-2 Miles	2001 FEET to 1 Mile	0-2000 Feet
0	0	0	0	0	0
1-100	0	4	6	8	10
101-1000	0	8	12	16	20
1001-3000	0	12	18	24	30
3001-10,000	0	16	24	32	35
> 10,000	0	20	30	35	40

Determine population by.

*3.8 persons/house and

*1-1/2 persons/acre of irrigated land or by

*census

TABLE 10
PERMEABILITY OF GEOLOGIC MATERIALS*

TYPE OF MATERIAL	APPROXIMATE RANGE OF HYDRAULIC CONDUCTIVITY	ASSIGNED VALUE
Clay, compact till, shale; unfractured metamorphic and igneous rock	$<10^{-7}$ cm/sec	0
Silt, loess, silty clays, silty loams, clay loams; less permeable limestone, dolomites, and sandstone; moderately permeable till	$<10^{-5} - 10^{-7}$ cm/sec	1
Fine sand and silty sand; sandy loams; loamy sands; moderately permeable limestone, dolomites, and sandstone (no karst); moderately fractured igneous and metamorphic rocks, some coarse till	$<10^{-3} - 10^{-5}$ cm/sec	2
Gravel, sand; highly fractured igneous and metamorphic rocks; permeable basalt and lavas; karst limestone and dolomite	10^{-3} cm/sec	3

*Derived from.

Davis, S. N., Porosity and Permeability of Natural Materials in Flow-Through Porous Media, R.J.M. DeWitt ed., Academic Press, New York, 1969.

Freeze, R.A. and J.A. Cherry, Groundwater, Prentice-Hall, Inc., New York, 1979.

TABLE 11
VALUES FOR FACILITY SLOPE AND INTERVENING TERRAIN

DEPOSITION SITE	Intervening Terrain				
	Terrain Average Slope 3% or Site Separated from Water Body by Areas of Higher Elevation	Terrain Average Slope 3-5%	Terrain Average Slope 5-8%	Terrain Average Slope 8%	Site in Surface Water
Facility Slope	0	0	0	0	3
Facility is closed basin					
Facility has average slope	0	1	1	2	3
Average slope	0	1	1	2	3
Average slope	0	2	2	3	3
Average slope	0	2	3	3	3

TABLE 12

VALUES FOR SENSITIVE ENVIRONMENT (SURFACE W/TER)

ASSIGNED VALUE	0	1	2	3
<u>DISTANCE TO WETLANDS*</u> (5 acre minimum)				
Coastal	2 miles	1 - 2 miles	1/2 - 1 mile	1/2 mile
Fresh Water	1 mile	1/4 - 1 mile	100 feet - 1/4 mile	100 feet
<u>DISTANCE TO</u> <u>CRITICAL HABITAT</u> (of endangered species)**	1 mile	1/2 - 1 mile	1/4 - 1/2 mile	1/4 mile

*Wetland is defined by EPA in the Code of Federal Regulations 40 CFR Part 230, Appendix A, 1980

**Endangered species are designated by the U. S. Fish and Wildlife Service.

TABLE 13

INCOMPATIBLE MATERIALS

In the lists below, the mixing of Group A material with a Group B material may have the potential consequence as noted.

Group 1-A	Group 1-B	Group 4-A	Group 4-B
Acetylene sludge	Acid sludge	Alcohols	Concentrated Group 1-A or 1-B wastes
Alkaline caustic liquids	Acid and water	Aldehydes	Group 2-A wastes
Alkaline cleaner	Battery acid	Halogenated hydrocarbons	
Alkaline corrosive liquids	Chemical cleaners	Nitrated hydrocarbons	
Alkaline corrosive batter fluid	Electrolyte acid	Unsaturated hydrocarbons	
Caustic wastewater	Etching acid liquid	Other reactive organic compounds and solvents	
Lime sludge and other corrosive alkalies	or solvent	Potential consequences:	Fire, explosion, or violent reaction.
1/2 m wastewater	Pickling liquor and other corrosive acids		
Lime and water	Spent acid	Group 5-A	Group 5-B
Spent caustic	Spent mixed acid	Spent cyanide and sulfide solutions	Group 1-B wastes
	Spent sulfuric acid		
Potential consequences:	Heat generation violent reaction.		
		Potential consequences:	Generation of toxic hydrogen cyanide or hydrogen sulfide.
Group 2-A	Group 2-B	Group 6-A	Group 6-B
Aluminum	Any waste in Group 1-A or 1-B	Chlorates	Acetic acid and other organic acids
Beryllium		Chlorine	Concentrated mineral acids
Calcium		Chlorites	Group 2-A wastes
Lithium		Chronic acid	Group 4-A wastes
Potassium		Hyphochlorites	Other flammable and combustible wastes
Sodium		Nitrates	
Zinc powder		Nitric acid, fuming	
Other reactive metals and metal hydrides		Perchlorates	
		Permanganates	
		Peroxides	
		Other strong oxidizers	
Potential consequences:	Fire or explosion; generation of flammable hydrogen gas.	Potential consequences:	Fire, explosion or violent reaction.

TABLE 13
INCOMPATIBLE MATERIALS (CONTINUED)

<u>Group 3-A</u>	<u>Group 3-B</u>
Alcohols	Any concentrated waste in
Water	Groups 1-A or 1-B
	Calcium
	Lithium
	Metal hydrides
	Potassium
	Thionylchloride
	Sulfonylechloride, Phosphorus dichloride
	Methane, Silicon Trichloride
	Other water-reactive waste

Potential consequences: Fire, explosion, or heat generation, generation of flammable or toxic gases.

SOURCE. Hazardous Waste Management Law, Regulation, and Guidelines for the Handling of Hazardous Waste. California Department of Health, Sacramento, California, February 1975.

TABLE 14

VALUES FOR LAND USE (AIR ROUTE)

ASSIGNED VALUE	0	1	2	3
Distance to Commercial-Industrial	1 mile	1/2 - 1 mile	1/4 - 1/2 mile	1/4 mile
Distance to National/State Parks, Forests, Wildlife Reserves, and Residential Areas	2 miles	1 - 2 miles	1/4 - 1 mile	1/4 mile
Distance to Agricultural Lands (in Production within 5 years)				
Ag land	1 mile	1/2 - 1 mile	1/4 - 1/2 mile	1/4 mile
Prime Ag land*	2 miles	1 - 2 miles	1/2 - 1 mile	1/2 mile
Distance to Historic/Landmark Sites			within view of site or if site is subject to significant impacts	
(National Register of Historic Register and National Natural Landmarks)				

*Defined in the Code of Federal Regulations, 7 CFR 657.5, 1981.

TABLE 15

NFPA IGNITABILITY LEVELS AND ASSIGNED VALUES

NFPA LEVEL	ASSIGNED VALUE
4 Very flammable gases, very volatile flammable liquids, and materials that in the form of dusts or mists readily form explosive mixtures when dispersed in air. Flashpoint less than 80 F.	3
3 Liquids which can be ignited under all normal temperature conditions. Any material that ignites spontaneously at normal temperature in air. Flashpoint less than 80 F.	
2 Liquids which must be moderately heated before ignition will occur and solids that readily give off flammable vapors. Flashpoint 80 to 140 F.	2
1 Materials that must be preheated before ignition can occur. Most combustible solids have a flammability rating of 1. Flashpoint 141 to 200 F.	1
0 Materials that will not burn. Flashpoint greater than 201 F.	0

TABLE 15A

DISTANCE TO POPULATION	VALUE
>2 mi.	0
>1 to 2 mi.	1
>1/2 to 1 mi.	2
201' to 1/2 mi.	3
51' to 200'	4
0' to 50'	5

TABLE 16
NFPA REACTIVITY RATINGS

NFPA LEVEL	ASSIGNED VALUE
0 Materials which are normally stable even under fire exposure conditions and which are not reactive with water.	0
1 Materials which in themselves are normally stable but which may become unstable at elevated temperatures and pressures or which may react with water with some release of energy but not violently.	1
2 Materials which in themselves are normally unstable and readily undergo violent chemical change but do not detonate. Includes materials which can undergo chemical change with rapid release of energy at normal temperatures and pressures or which can undergo violent chemical change at elevated temperatures and pressures. Also includes those materials which may react violently with water or which may form potentially explosive mixtures with water.	2
3 Materials which in themselves are capable of detonation or of explosive decomposition or of explosive reaction but which require a strong initiating source or which must be heated under confinement before initiation. Includes materials which are sensitive to thermal or mechanical shock at elevated temperatures and pressures or which react explosively with water without requiring heat or confinement.	3
4 Materials which in themselves are readily capable of detonation or of explosive decomposition or explosive reaction at normal temperature and pressures. Includes materials which are sensitive to mechanical or localized thermal shock.	3

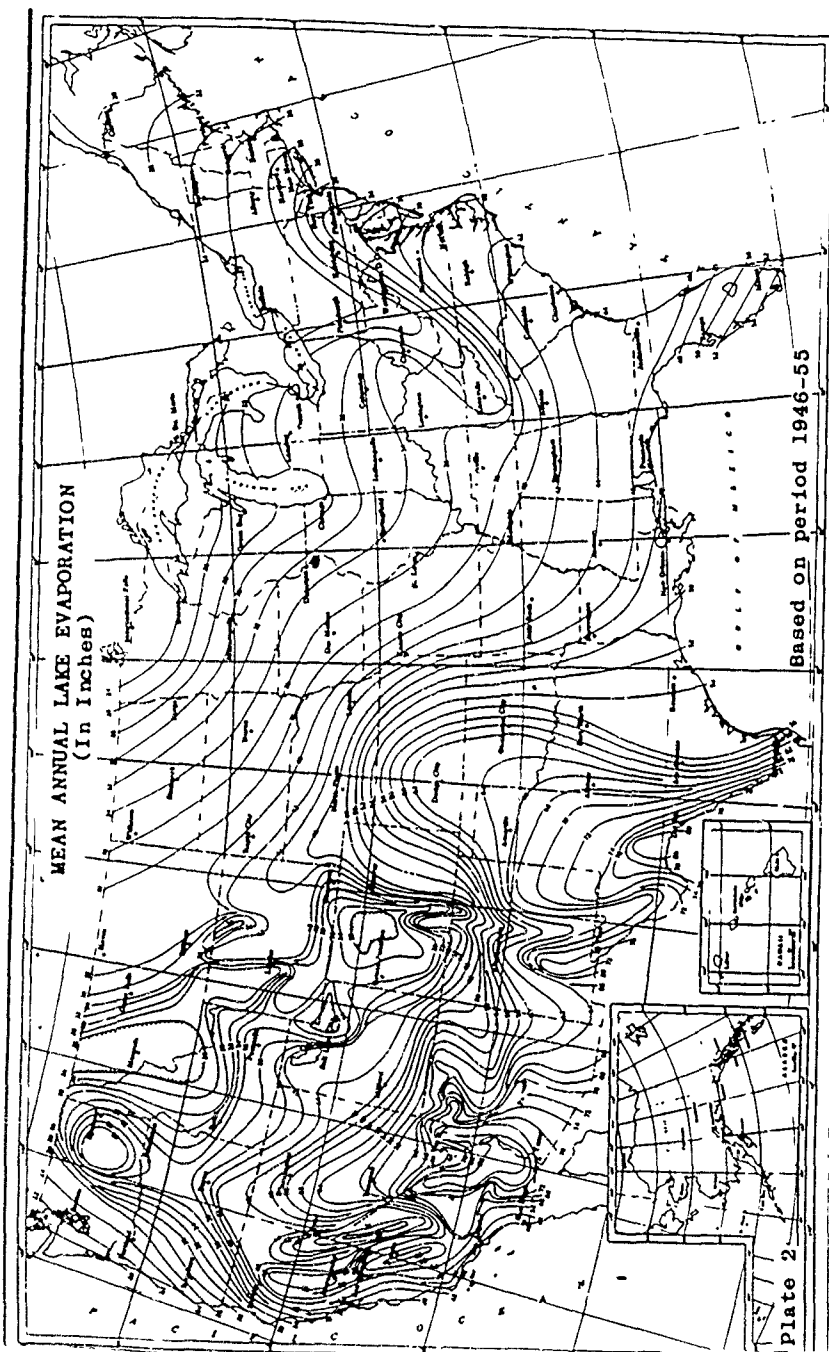


FIGURE 1

NORMAL ANNUAL TOTAL PRECIPITATION (inches)

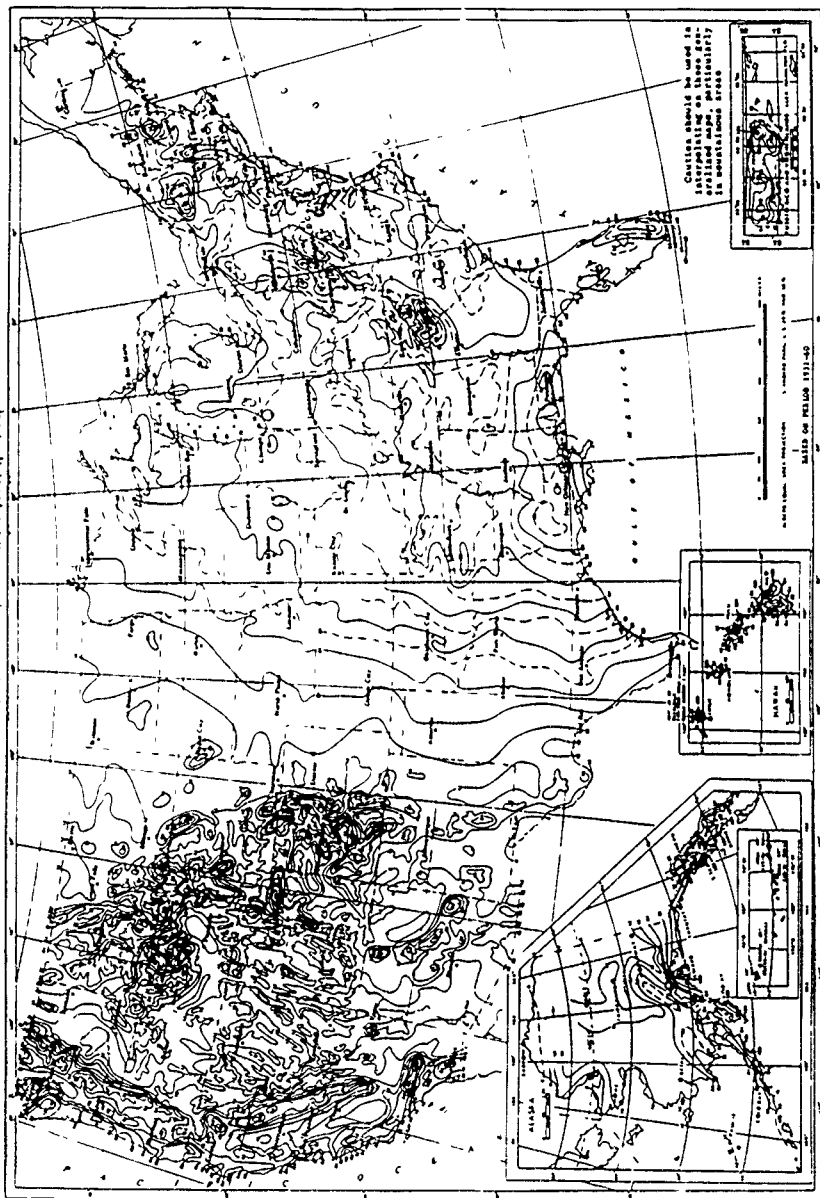


FIGURE 2



Source: Statistical Properties of the United States, Technical Paper No. 40, U.S. Department of Commerce, U.S. Government Printing Office, Washington, D.C., 1941

FIGURE 3
1-YEAR 24-HOUR RAINFALL
(INCHES)

Figure 3 inches	Value
less than 1.0	0
1.0 - 2.0	1
2.1-3.0	2
greater than 3	3

ATTACHMENT D

TM 9-1950
TO 11A11-1-101

C 4

DEPARTMENT OF THE ARMY TECHNICAL MANUAL
DEPARTMENT OF THE AIR FORCE TECHNICAL ORDER

ROCKETS

TM 9-1950
TO 11A11-1-101
CHANGES No 4

DEPARTMENTS OF THE ARMY
AND THE AIR FORCE
WASHINGTON 25, D C, 29 August 1961

TM 9-1950, 7 February 1958, is changed as follows

Page 34

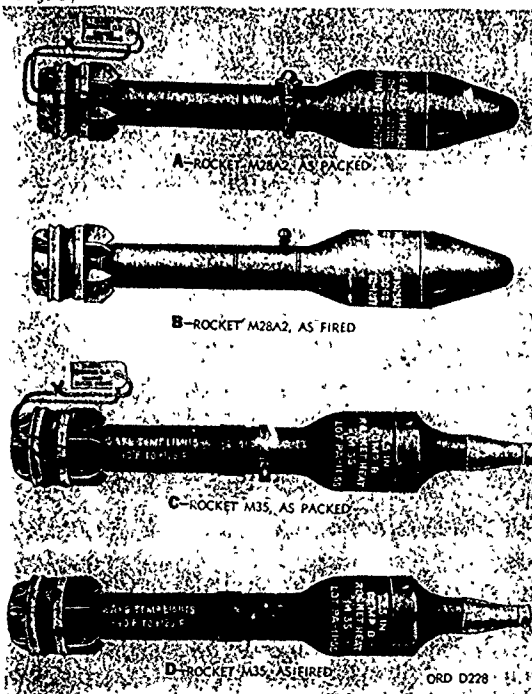


Figure 12 (Superceded) 3.5-inch rockets (as fired and packed)

Figure 41

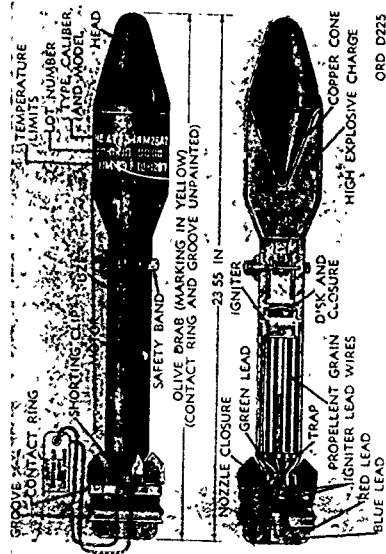


Figure 42 (Superseded) Rocket high explosive 3 1/2 inch W.T. M24 12

Figure 43

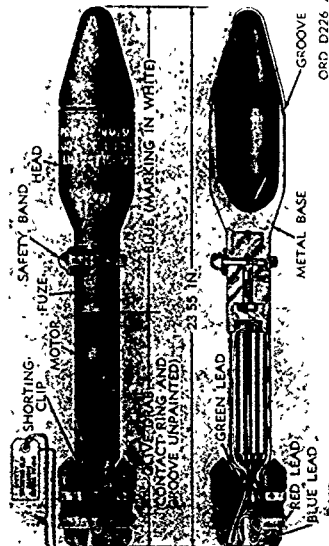


Figure 46 (Superseded) Rocket, practice, 3 1/2 inch M29 12

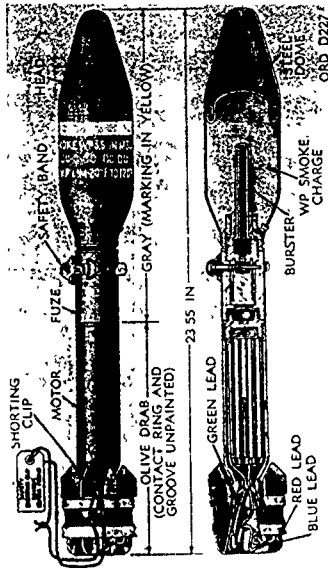


Figure 48 (Superseded) Rocket, smoke, 3 1/2 inch W.T. M30 (T127 ES)

Table 1 3.5-Inch Rocket Data

Rocket nomenclature	Length (in.)	Weight (lb.)	Head filler		Fuse	Velocity (ft/sec)	Range (ft)	Temperature (° F.)	Burning Time (sec)	
			Live	Weight (lb.)					At lower limit	At higher limit
Rocket, high-explosive, 3.5-inch AT, M28A2	23 6	9 02	Comp B	1 90	0 35	M404A1 or M404A2	317	-26 to 120*	0 045	0 015
Rocket, practice, 3.5-inch M29A2	23 6	8 96	Inert	Empty	0 35	M405	317	-26 to 120*	0 045	0 015
Rocket, smoke, 3.5-inch M30 (T127E3)	23 6	8 98	Smoke (WP)	2 23	0 35	M404A1 or M404A2	317	-26 to 120*	0 045	0 015

* (Added) Rockets of older manufacture may have temperature limit markings of -30° F. to 120° F.

TM 9-1950

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OUTDATED:

FOR REFERENCE ONLY

ROCKETS

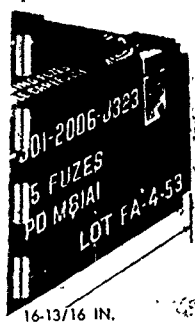


HEADQUARTERS, DEPARTMENT OF THE ARMY
FEBRUARY 1958

AGO 3897B—Jan

assembled complete (fig. 10) which, in turn, the 3.25-inch rocket is present in the box shipped with head rockets M20 and M21 launchers Aircraft assembled. Complete in one box or components are packed in boxes (fig. 10) rocket head Dimensions are published 9-5-1310

TRAPPING
SHOWN



RA PD 212983

AGO 3897B

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CHAPTER 2 GROUND ROCKETS

Section 1. 3.5-INCH ROCKETS

18. General

These rockets (fig. 12) of the fixed-fin stabilized type, are fired from the shoulder or from a bipod and rear support with launchers M20, M20A1, M20A1B1, and M20B1 or from a tripod mount with launchers M31 and M31B1. The rockets comprise two types—rockets M35, M35A1, and M36 with velocity approximately 485 feet per second and rockets M28, M28A2, M29A1, M29A2, T127E2, and M30 with velocity approximately 320 feet per second. The 3.5-inch rockets M35, M35A1, and M36 burn completely within the launcher at all operating temperatures. At normal operating temperatures, the 3.5-inch rockets M28, M28A2, M29A1, M29A2, T127E2, and M30 burn almost completely in the launcher. At freezing temperatures the rockets M28, M28A2, M29A1, M29A2, T127E2, and M30 may continue to burn ("after burning") after the rocket has been fired from the launcher. Rockets with high-explosive head are used against armored targets. Smoke rockets are used for smoke screening. Rockets with inert head and sub-caliber rockets are used for practice. Dependent on the type of head, these rockets are designated high-explosive, antitank (HE, AT), practice or smoke (WP). Practice rockets of smaller caliber are designated subcaliber. A rocket M35, M35A1, or M36 consists of a head assembly and motor assembly. A rocket M28, M28A2, M29A1, M29A2, T127E2, or M30 consists of a head assembly and fuze and motor assembly.

a. Head Assembly.

- (1) *Rockets M35, M35A1, and M36.* In external contour, the head assemblies of these rockets are similar being cylindrical with tapered convex rear portion, tapered concave ogive, and flat nose. The HE, AT rockets M35 and M35A1 differ from the practice rocket M36 in having an unpainted aluminum nose and fuze system. The head is threaded internally at the rear end to receive the motor assembly.

- (2) *Rockets M28, M28A2, M29A1, M29A2, T127E2, and M30.* In external contour, the head assemblies of these rockets

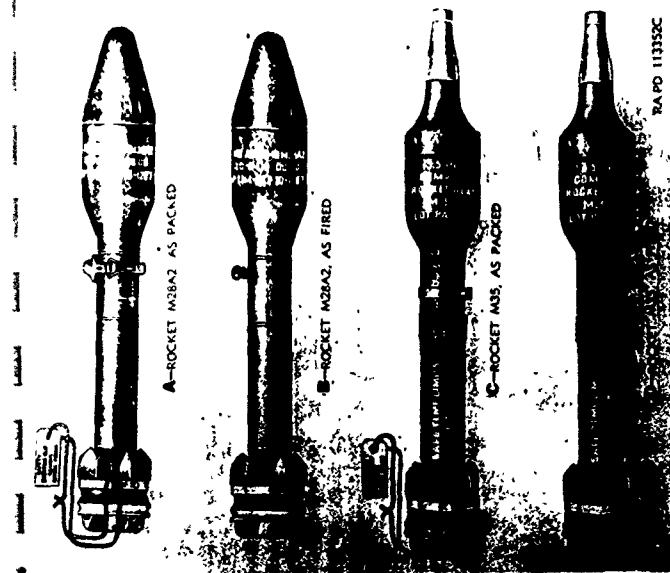


Figure 12 5.5-inch rockets (as fired and packed).

are similar being cylindrical with tapered forward and rear positions. The head is threaded externally at the rear end to receive the fuze.

b. Fuze Fuzes used with the 3.5-inch rockets are base detonating (BD) type M404, M404A1, and M404A2, the point initiating base detonating (PIBD) type M408 and M408E1, and the dummy M405.

(1) **PIBD fuzes M408 (72030E4) and M408E1.** The fuze is contained in the head of the HE, AT rocket and consists of a nose assembly and base assembly connected electrically by an insulated wire passing through a conduit

the rear portion of the head and is in place during shipping and handling, prevents accidental functioning of the fuze. It is removed immediately before loading the rocket in the launcher. See paragraph 41 through 51 for fuze description.

(2) **BD fuzes M404, M404A1, and M404A2 and dummy fuze M405.** The fuze, which serves also as a coupling for the head and motor assembly, is cylindrical. It is threaded externally at the forward end to fit into the head assembly and internally at the rear end to receive the motor assembly. A safety band (fig. 14), which fits around the fuze and is in place during shipping and handling, seals the fuze against the entry of moisture and prevents accidental functioning. It is removed immediately before loading the rocket in the launcher. See paragraphs 41 through 51 for fuze description.

c Motor Assembly.

(1) **Rockets M35, M35A1, and M36.** The motor assembly is threaded externally at the forward end to engage the head. It consists of the motor body, motor closure, tail assembly, propelling charge, shorting clip assembly, and igniter M38. The tail assembly is press fitted over the knurled rear portion of the motor body. The motor body contains the propelling charge which is positioned by the suspension plate and suspension screws at the head end of the motor and by the cushioning ring at the tail end. The motor is sealed at the head end by the closure and disk assembly and at the nozzle end, by the igniter which serves also as nozzle closure. The shorting clip assembly serves as a safety device to prevent electrical ignition of the loaded motor by shorting the circuit. The motor body is a steel tube threaded externally at the forward end to engage the closure and disk assembly, constricted to a nozzle at the rear and tapered to the knurled surface externally at the rear.

(a) **Tail assembly.** The tail assembly consists of a cone-shaped aluminum alloy nozzle extension to which three double-bladed fins are crimped or spot welded. Three concentric rings are mounted over the fins—the grooved support ring, plastic insulator ring, and contact ring assembly (outermost). The rings are held on the fins by rivets which also serve to connect the igniter lead wires to the support ring and contact ring.

(b) *Propelling charge.* The propelling charge consists of 19 monoperforated cylindrical extruded grains of solvent propellant M7. Each grain is 5.7 inches long and 0.33 inches in diameter. The grains are lengthwise in the motor suspended from screws at the head end. Refer to paragraph 93.

(c) *Igniter.* The igniter M38 is a short cylindrical plug hollowed out to contain a charge of black powder and an electric squib. The igniter, which serves as nozzle closure for the motor, is positioned in the nozzle. The lead wires from the squib pass through the nozzle into the extension cone of the tail assembly where one lead wire is connected to the ground lead terminal (red).

(2) *Rockets M28, M28A2, M29A1, M29A2, T127E2, and M30.* The motor assembly (fig. 14) is threaded externally at the forward end to engage the fuse. It consists of the motor body, tail assembly, shorting clip assembly, nozzle closure, propelling charge, igniter M20, trap and spacer assembly, and disk and closure assembly. The tail assembly is pressed fitted over the knurled rear portion of the motor body. The motor body contains the trap and spacer assembly, propelling charge, and igniter. The motor is sealed at the rear by a plastic nozzle closure and at the forward end by the disk and closure assembly. The motor body is a steel tube threaded internally at the forward end to receive the disk and closure assembly (fig. 14), constricted to a nozzle internally at the rear and tapered to the knurled surface externally at the rear. The trap and spacer assembly consists of the disk-like trap to which the spacer blades are staked and is positioned in the motor lengthwise so that the blades divide the motor chamber into four compartments.

(a) *Tail assembly.* The tail assembly is similar to that of the 3.5-inch rockets M35, M35A1, and M36.

(b) *Propelling charge.* The propelling charge consists of 12 monoperforated cylindrical extruded grains of solvent propellant M7. Each grain is 5 inches long and $\frac{3}{8}$ inch in diameter. The propellant grains are lengthwise, three in each of the four compartments formed by the spacer blades. Refer to paragraph 93.

(c) *Igniter.* The igniter M20, which consists of a short cylindrical plastic case containing a black powder charge and an electric squib, is positioned in the forward end of the motor fitting in the recessed portion of the motor closure. The lead wires from the electric squib pass from the igniter, running parallel to the propellant

grains, to the nozzle where one lead wire is connected to the ground lead cable (green) and the other to the live lead cable (red).

d. *Electric Circuit*

(1) *Rockets M35, M35A1, and M36.* The electrical circuit, which comprises the igniter, the ground terminal, the live terminal, the support ring, the contact ring, and the shorting clip, provides for firing the rocket from the launcher and for short circuiting the rocket during shipping and handling. Live contact is made by direct contact between the launcher and the contact ring (launchers M20A1, M20A1B1, M31, and M31B1). The contact ring is connected to one igniter lead wire. The launcher makes ground contact with the groove of the support ring. The other igniter lead wire is connected to the support ring. The shorting clip spring is assembled over the edge of the contact ring and support ring providing a direct connection between the support ring (ground contact) and contact ring (live contact) and thus "short circuiting" the igniter. The rocket cannot be fired while the shorting clip is in place.

(2) *Rockets M28, M28A2, M29A1, M29A2, T127E2, and M30.* The electrical circuit for these rockets comprises the igniter, the terminal lead assembly (ground), the terminal lead assembly (live and auxiliary), the support ring, the contact ring, and the shorting clip. Live contact is made by withdrawing the blue auxiliary lead cable coiled in the nozzle extension and attaching it to the launcher contact spring (launchers M20 and M20B1). Both the contact ring and the blue auxiliary lead cable are connected to the red live lead cable which is connected to one igniter lead wire. The launcher makes ground contact with the groove of the support ring. The green lead cable is connected to the support ring and also to the other igniter lead wire. The shorting clip is assembled the same as for rockets M35 and M36 ((1) above).

e. *Identification*

(1) *Rockets M35, M35A1, and M36.* The rocket may be identified by the concave nose with flat end and the removable safety band near the motor end of the head. Painting and marking for identification are in accordance with the basic scheme prescribed in TM 9-1900.

(2) *Rockets M28, M28A2, M29A1, M29A2, T127E2, and M30.*

The rocket may be identified by the following safety band which is fitted around the base detonating fuze located between the head and motor. Painting and marking for identification are in accordance with the basic scheme in TM 9-1900.

f. Packing and Shipping The rockets are packed and shipped one per fiber or metal container, three containers per wooden box. Packing and shipping data appear in SM 9-5-1310.

g. Differences Between Modifications of 3.5-Inch Rocket M28-Series, M29-Series, T127E2, and M30. The modifications of HE, AT rocket M28 series and practice rocket M29 series differ principally in the trap and spacer assembly and in the tail assembly (fig. 13). The modifications of practice rocket M29 series differ from each other also in the construction of the head. The modifications of WP smoke rocket M30 and T127E2 differ in the internal construction of the head, both modifications using the same motor assembly.

h. Precautions in Firing. General firing precautions are given in paragraphs 29 through 37. In addition, the following are applicable to 3.5-inch rockets.

(1) *Rockets M35, M35A1, and M36.*

(a) At temperatures below freezing, it is important that the safety band not be removed until just before firing and that the rocket be kept dry. When the band is removed, moisture may enter the opening in the head and freeze, preventing reassembly of the head, if the rocket is not used.

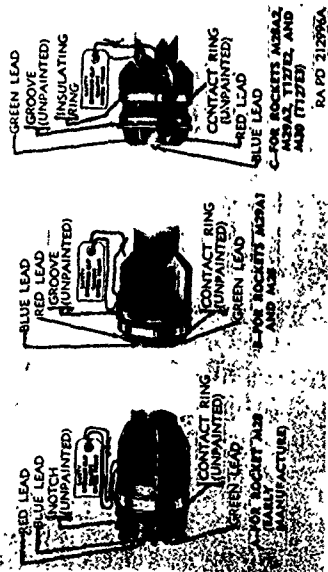


Figure 13 3.5-inch rockets—tail modifications.

(b) When loading a rocket in launcher M20 or M20B1, make sure that the yoke of the contactor latch is properly engaged in the groove of the support ring. If the latch is engaged forward of the fins, the rocket may be prevented from being expelled from the launcher and injury to personnel and damage to materiel may result.

(2) *Rockets M28, M28A2, M29A1, M29A2, T127E2, and M30.*

(a) Since the rocket may burn for a short time beyond the launcher, placing the operating personnel in the "back-blast" areas (fig. 9), care should be taken to protect the eyes at all temperatures.

(b) At temperatures below freezing, face and hand protection are mandatory since burning of the propellant continues after the rocket has been projected from the launcher.

(c) At temperatures below freezing, it is important that the safety band (fig. 14) not be removed until just before firing and that the rocket be kept dry. When the band is removed preparatory to loading the rocket in the launcher, the ejection pin moves outward to the locked position leaving an opening around the pin, permitting moisture to enter the fuze cavity and freeze. Ice or frost within the fuze may prevent functioning of the fuze.

(d) When loading a rocket in the launcher M20 or M20B1, make sure that the yoke of the contactor latch is properly engaged in the groove of the support ring. If the latch is engaged forward of the fins, the rocket may be prevented from being expelled from the launcher and injury to personnel and damage to materiel may result.

i. *Preparation for Firing.*

(1) *Rockets M35, M35A1, and M36.*

(a) Remove from packing and inspect for serviceability. Should it be considered necessary to test for continuity, test with the circuit continuity tester (par. 14).

(b) Before loading the rocket in the launcher, remove the shorting clip from the tail and safety band from the head.

(c) Restore rockets prepared for firing but not fired to their original condition and packing. Mark the packings of serviceable rockets for prior use in order that opened packages will be kept to a minimum.

(2) *Rockets M28, M28A2, M29A1, M29A2, T127E2, and M30.*

(a) Remove from packing and inspect for serviceability. Check for the presence of the base detonating fuze.

(c) Test the ejection pin of the fuze to insure that it is free from binding. This is done in the case of the BD fuze M404A1, which can be identified by its *square* ejection pin, by merely depressing the pin with the fingers and releasing it. It is done in the case of the BD Fuze M404A2, which can be identified by its *round* ejection pin, by depressing the pin with the fingers, and the pin twisting it and releasing it. If the ejection pin binds while being depressed or twisted, reject the rocket and report the condition to the Ordnance Technical Service Personnel.

(d) If the rocket is prepared for firing and not fired, restore the rocket to its original condition and packing. Mark the packings of serviceable rockets for prior use in order that changed packages will be kept to a minimum.

19. Rocket, High-Explosive, 3.5-Inch: AT, M28

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This rocket (fig. 14) is intended for use against armored targets. When fired from launcher M20 or M20B1 live contact is made by withdrawing the blue auxiliary lead wire coiled in the nozzle and attaching it to the contact spring of the 1-inch. When fired from launcher M20A1B1, M31, or M31B1, the blue auxiliary lead wire is not used since the launcher makes live contact directly to the contact ring of the rocket. The rocket M28A2 consists of the HE, AT head M28A2, RD fuze M404A2 or M404A1, and the older motor assembly. The head contains a copper cone, whose apex is to the rear, which acts to shape the high-explosive charge of 1.90 pounds of composition B. The penetration effect is derived from the shaped charge. The tail assembly differs from earlier 3.5-inch rocket models in that the support ring is wider and has a 360° latching groove located to the rear of the contact ring (fig. 13). See table for data.

This rocket (fig. 15) is intended for use against armored targets. Since the modern launchers do not require the blue lead wire, it has been eliminated from this round. When fired from launcher.

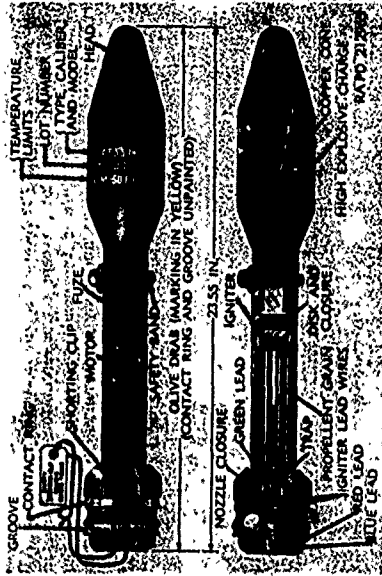


Figure 14. Rocket high-explosive, 3.5-inch: AT, M28A2.

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Should it be considered necessary to test for continuity, test with the circuit continuity tester (par. 14).

(b) Before loading the rocket into the launcher, remove the shorting clip from the tail and remove the safety band from the fuze.

(c) Test the ejection pin of the fuze to insure that it is free from binding. This is done in the case of the BD fuze M404A1, which can be identified by its square ejection pin, by merely depressing the pin with the fingers and releasing it. It is done in the case of the BD Fuze M404A2, which can be identified by its round ejection pin, by depressing the pin with the fingers, and then twisting it and releasing it. If the ejection pin binds while being depressed or twisted, reject the rocket and report the condition to the Ordnance Technical Service Personnel.

Caution: When loading the rocket into the launcher, depress the ejection pin with the fingers until the pin is in the bore of launcher. Failure to hold the ejection pin depressed while loading the rocket may result in the ejection pin coming in contact with the breech end of the launcher tube and thereby becoming bent. This procedure gives greater assurance of proper functioning of the rocket.

(d) If the rocket is prepared for firing and not fired, restore the rocket to its original condition and packing. Mark the packings of serviceable rockets for prior use in order that opened packages will be kept to a minimum.

J. Subcaliber Rocket. The 27-mm subcaliber rocket is fired from 3.5-inch rocket launchers M20, M20A1, M20A1B1, M20B1, M31, and M31B1 as practice ammunition in lieu of the 3.5-inch rocket for reasons of economy. The subcaliber rocket is fired utilizing the 3.5-inch rocket launcher firing mechanism with a subcaliber device inserted in the bore. The 27-mm subcaliber rockets matches 3.5-inch rockets M35, M35A1, and M36 ballistically.

19. Rocket, High-Explosive, 3.5-Inch: AT, M28

The rocket is authorized for firing in launchers M20 and M20B1 only. The rocket is similar to that described in paragraph 20 except for the fuze, tail assembly, and trap and spacer assembly. Base detonating fuze M404 is used with this rocket. The tail assembly has short fin blades and a 360° grooved support ring forward of the contact ring (fig. 13). Rockets of early manufacture may have

20. Rocket, High-Explosive, 3.5-Inch: AT, M28A2

This rocket (fig. 14) is intended for use against armored targets. When fired from launcher M20 or M20B1 live contact is made by withdrawing the blue auxiliary lead wire coiled in the nozzle and attaching it to the contact spring of the launcher. When fired from launcher M20A1, M20A1B1, M31, or M31B1, the blue auxiliary lead wire is not used since the launcher makes live contact directly to the contact ring of the rocket. The rocket M28A2 consists of the HF, AT head M28A2, BD fuze M404A2 or M404A1, and the older motor assembly. The head contains a copper cone, whose apex is to the rear, which acts to shape the high-explosive charge of 1.90 pounds of composition B. The penetration effect is derived from the shaped charge. The tail assembly differs from earlier 3.5-inch rocket models in that the support ring is wider and has a 360° latching groove located to the rear of the contact ring (fig. 13). See table I for data.

21. Rocket, High-Explosive, 3.5-Inch: AT, M35 (T205E1)

This rocket (fig. 15) is intended for use against armored targets. Since the modern launchers do not require the blue lead wire, it has been eliminated from this round. When fired from launcher

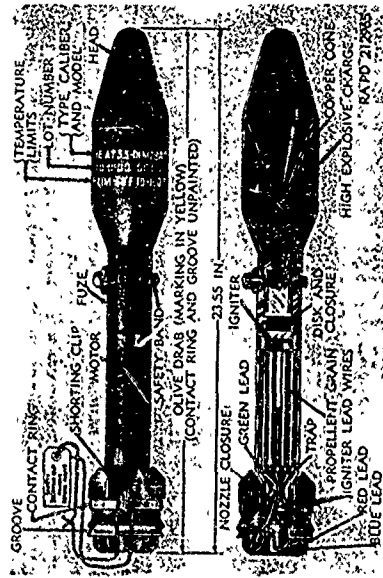


Figure 14. Rocket, High-Explosive, 3.5-inch: AT, M28A2.

not necessary since the launcher firing mechanism makes live contact directly to the contact ring of the rocket. The rocket M35 consists of the HE, AT head M405 and the improved motor assembly. Rocket M29A2 of an early manufacturing alternative is identical in contour with the rocket M28A2, except for the lack of crimping groove in the head, consisting of the head metal parts of the rocket M28A2 inert loaded with plaster of paris. See table I for data.

22. Rocket, High-Explosive, 3.5-Inch: A7, M35A1 (T205E3)

This rocket is the same as Rocket M35 (par. 21) except that the head contains a double angle cone. The Rocket M35A1 uses fuze M408E1. See table I for data.

23. Rocket, Practice, 3.5-Inch: M29A1

This rocket is authorized for use in launchers M20 and M20B1 only. The rocket is similar to the practice rocket described in paragraph 24. It differs in the head and trap and spacer assembly. The ogive is attached to the head body by four screws, staked to the ogive. Some rockets may have the cast trap and square spacer blades. Rockets of manufacturing alternative are assembled with the HE, AT head metal parts inert loaded with plaster of paris. See table I for data.

24. Rocket, Practice, 3.5-Inch: M29A2

In external contour the rocket (fig. 16) is similar to the HE, AT rocket M28A2 (par. 20), except for a circumferential groove in the head at the juncture of the head body and ogive due to the crimp by which the ogive and body are secured. The rocket is

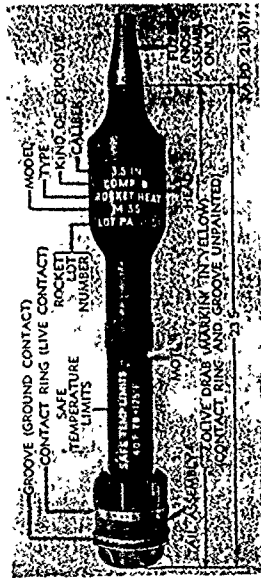


Figure 15. Rocket, high-explosive, 3.5-inch: AT M35 (T205E1) (as fired).

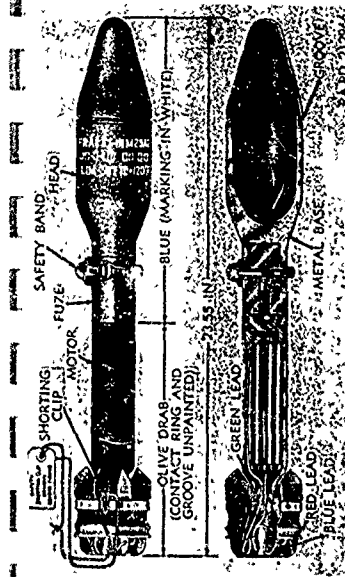


Figure 16. Rocket, practice, 3.5-inch: M29A2.

authorized for firing in all 3.5-inch rocket launchers in a manner similar to the HE, AT rocket. The rocket consists of a hollow head, dummy fuze M405, and the improved motor assembly. Rocket M29A2 of an early manufacturing alternative is identical in contour with the rocket M28A2, except for the lack of crimping groove in the head, consisting of the head metal parts of the rocket M28A2 inert loaded with plaster of paris. See table I for data.

25. Rocket, Practice, 3.5-Inch: M36 (T206E1)

In external contour the rocket (fig. 17) is similar to the HE, AT rocket M35 (par. 21). The rocket is authorized for firing in all 3.5-inch rocket launchers in a manner similar to the HE, AT rocket. The rocket consists of a hollow cast iron head, which matches the weight of the head M36, and the new motor assembly. Ballistically, this rocket matches HE, AT rocket M35. See table I for data.

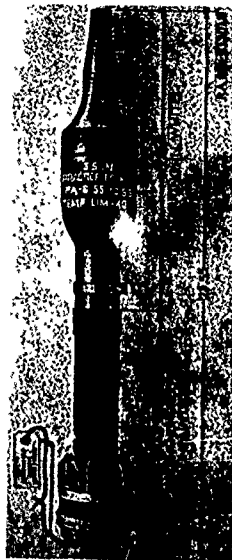


Figure 17. Rocket, practice, 3.5-inch: M36 (T206E1).

26. Rocket, Smoke, 3.5-inch. WP, T127E2

This rocket is authorized for use in all 3.5-inch launchers. The rocket is similar to the smoke rocket described in paragraph 27 except for a slight difference in the internal construction of the head. See table I for data.

27. Rocket, Smoke, 3.5-inch. WP, M30 (T127E3)

This rocket, which is authorized for firing from all 3.5-inch rocket launchers, is fired in the same manner as the rocket M28A2. It is intended for screening smoke purposes. On impact the rocket bursts to produce a spray of phosphorus particles which ignite on contact with air generating dense white smoke. The smoke itself is harmless but the burning particles produce painful burrs. In external contour the rocket (fig. 18) is similar to the HE, AT rocket M28A2, and the service motor assembly. The head is internally threaded at the rear end and contains a 233-pound charge of white phosphorus. At the rear it has a union internally threaded to receive the fuze, the burster casing M8 is press fitted into the union, and the steel body is fitted over it. The steel ogive and the internal steel dome, which closes the forward end of the filler cavity, are attached to the body. See table I for data.

28. Rocket, Subcaliber, 27 Millimeter. Practice, T265

This rocket (fig. 19) is authorized as practice ammunition for 3.5-inch rocket launchers adopted for this application by the in-

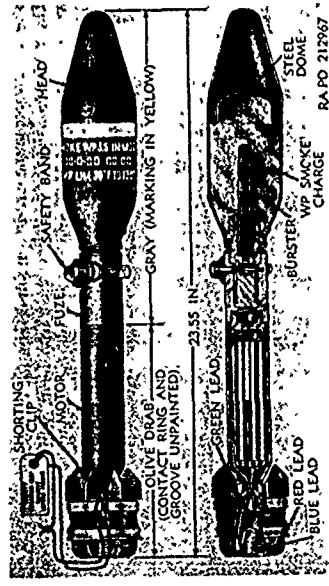


Figure 18. Rocket, smoke, 3.5-inch: WP, M30 (T127E3).

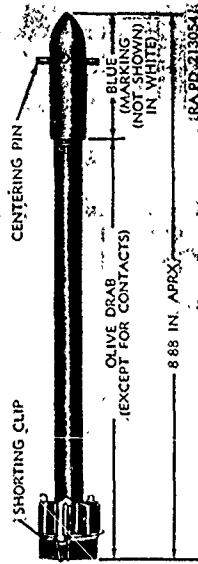


Figure 19. Rocket, subcaliber, 27 millimeter: practice, T265.

section of 27-mm subcaliber rocket launcher T144 in the bore. Firing this rocket simulates firing of the HE, AT rocket M35, since this rocket matches the rocket M35 ballistically and since the firing mechanism of the 3.5-inch launcher is used. This rocket is used for economy reasons to save wear on the 3.5-inch launcher and to expend a cheaper rocket during practice. See table I for data.

Table I. 3.5-Inch Rocket Data

Rocket nomenclature	Length (in.)	Weight (lb)	Head filler		Weight of propellant (lb)	Fuse	Velocity (fps)	Range (yds)	Tempera- ture limits (°F)	Burning time (sec)	
			Type	Weight (lb)						At lower limit	At higher limit
Rocket, high-explosive, 3.5- inch: AT, M28 (T80E2).	23.6	8.9	Comp B	1.93	0.36	M404 or M404A1	334	945	-20 to 120	0.035	0.015
Rocket, high-explosive, 3.5- inch: AT, M28A2.	23.6	9.02	Comp B	1.90	0.35	M404A1 or M404A2	317	945	-30 to 120	0.045	0.015
Rocket, high-explosive, 3.5- inch: AT, M35 (T205E1).	23.5	7.3	Comp B	1.60	0.44	M408	485	1300	-40 to 125	0.024	0.009
Rocket, high-explosive, 3.5- inch: AT, M35A1 (T205E- 3)	23.5	7.6	Comp B	1.70	0.44	M408E1			-40 to 125		
Rocket, practice, 3.5-inch: M29A1	23.6	8.9	Inert	Empty ¹	0.36	M405	334	945	-20 to 120	0.035	0.015
Rocket, practice, 3.5 inch M29A2	23.6	8.96 ²	Inert	Empty ¹	0.35	M405	317	945	-30 to 120	0.045	0.015
Rocket, practice, 3.5-inch: M36 (T206E1)	23.5	7.3	(³)	(³)	0.44 ³	(³)	485	1300	-40 to 125	0.024	0.009
Rocket, smoke, 3.5-inch. T- 127E2.	23.6	8.98	Smoke (WP)	2.23	0.36	M404A1	317	945	-20 to 120	0.035	0.015
Rocket, smoke, 3.5 inch: M30 (T127E3)	23.6	8.98	Smoke (WP)	2.23	0.35	M404A1 or M404A2	317	945	-30 to 120	0.045	0.015
Rocket, subcaliber, 27-milli- meter: Practice, T265 ⁴ .	8.88	0.32					485				

¹ A manufacturing alternative head consists of the HE head metal parts inert loaded with plaster of paris

² Rockets with alternative head weight 9.02 pounds.

³ The head of the practice rocket M36 has no filler or fuse. It is hollow and of cast iron.

⁴ This rocket authorized practice ammunition for 3.5-inch launchers.

SECRET

ADO 3857

TM 9-1950
* C 5

TECHNICAL MANUAL

ROCKETS

TM 9-1950

CHANGE No. 5

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 1 October 1963

TM 9-1950, 7 February 1958, is changed as follows:

6. Identification

e. *Marking.* Ammunition items are * * * the rocket motor. In some cases temperature limits are shown on the launcher and/or shipping containers.

9. Fuze

d. (As changed by C 1, 11 Mar 59) The PIBD fuze * * * with the target. One type of PIBD fuze used on rockets consists of a nose assembly and a base assembly connected by a wire passing through a conduit in the rocket head. The pressure * * * functions the fuze.

11. Launchers

f. (Superseded) *Expendable Launchers.*

- (1) *66-mm Rocket Launcher M72.* The rocket launcher is a tubular, telescoping, smooth bore, single-shot, expendable weapon. The launcher serves as the carrying case, provides the initial flight direction, and fires the rocket. The launcher consists of an aluminum inner (rear) tube, a plastic impregnated glass outer (front) tube, a sling assembly, and controls and sighting equipment. In order to fire the weapon it is necessary to remove the sling assembly, extend the launcher, pull out the safety pin, unlock the trigger, and squeeze the trigger spring boot. For more information pertaining to this launcher refer to TM 9-1340-214-10.
- (2) *4.5-Inch Rocket Launcher M12-series.* The 4.5-inch rocket launcher M-12 series consists of a plastic or metal alloy tube

* This change supersedes C 2, 21 November 1960, and C 3, 2 March 1961.

in which the rocket and fuze are shipped, and a light adjustable tripod mount. Sights and mounting clamps are assembled to the launcher as shipped, and accessories such as spades, batteries, and reels of wire, are packed in the launcher. In using this launcher, the covers are removed and the rocket is fuze. The tripod is then set up and adjusted and the launcher mounted and aimed. The lead wires are unreeled to reach a safe firing position and the rocket fired by means of a battery or magneto-type firing device.

12. Inspection of Rockets Prior to Use

(As superseded by C 2, 21 Nov 60)

With rockets unpacked, perform the following inspections prior to use:

a. Make certain that safety devices, such as safety wires, safety pins, short-circuit devices (shorting strips or clips, and the like) are in place.

b. All 3.5-inch HEAT rockets M28-series, WP smoke rockets T127E2, and WP smoke rockets M30 (T127E3) should be examined for loose heads. Grasp the fuze with one hand and attempt to twist the rocket head with the other. Examine for a discernible 360° gap between the head and the fuze.

Warning: Any round in which the head moves with respect to the fuze or has a discernible 360° gap between the head and the fuze is not to be fired. Any rocket evidencing either of the above conditions will be returned to segregated ammunition storage in a properly marked container indicating the condition.

c. Examine motors for serious dents or deformation and check straightness of fins

d. Check that motor sealing disks and caps are securely in place. Loose disks should be replaced and the rocket used if it can be ascertained that moisture or other foreign matter has not entered the motor.

e. Examine components for corrosion, dirt, grease, or other foreign material, with particular attention to electrical contacts (fig. 5), threads, and fuze seats.

f. Ascertain that the temperature range, marked on the rocket or launcher, is not being exceeded at the time of use.

g. Check for exudation; high explosive heads may be cleaned and used.

Warning: Rockets with leaking chemical heads or exuding motors will not be fired but will be returned to segregated ammunition storage in a properly marked container indicating the condition.

15. Precautions in Storage, Handling and Use

b. *Handling and Use.*

- (7) The danger areas * * * materiel before firing.

Warning: (page 1 of C 3; superseded) Eye protection in the form of goggles with safety glass lenses is mandatory for operating personnel at temperatures of 70°F. and above when firing 3.5-inch rockets. At temperatures below 70°F., 3.5-inch rockets of M28 (HEAT) and M29 (PRAC-TICE) series and rockets T127E2 and M30 (SMOKE) may be expected to produce blowback of propellant particles after projection from the launcher. Therefore, at temperatures below 70°F., face and hand protection is mandatory for all operating personnel. Field protective mask M9A1 will be used for face protection; other types of face protection are not authorized. All field protective masks M9A1 used for these rocket firings must be distinctively identified by attaching DA Form 10-197 or comparable blank tag to the head harness. One side of the tag will be marked in pen with the stock number and nomenclature of the mask while the reverse side will be marked in pen with the following: "Used in rocket launcher firing; prior to CBR use, inspect in accordance with SB 3-30-10 and repair as necessary." The identification tag will be removed at the time of inspection, only if the mask is acceptable for CBR use. Serviceability of masks, when used for rocket firings, should be based solely on considerations of vision and facial protection afforded and sanitation.

- c. (As changed by C 3, 2 Mar 61) *Freezing Weather Use.* Rockets will function * * * limits marked thereon. Observe the **Warning** contained in b. (7) above relative to face and hand protection at temperatures below 70°F. Precautions (2), (3), and (4) below) should * * * within the motor.

16. Misfires, Hangfires, Cook-Offs, and Duds

d *Unloading an Unfired Round.*

- (2) (As superseded by C 2, 21 Nov 60) *Before removal of the round* Definite intervals, for waiting after a failure to fire and after additional attempts to fire, have been established on the basis of experience and characteristics of the launcher and ammunition as follows:

Warning No. 1: After a failure to fire, actuate the firing switch two additional times in attempts to fire. If the rocket launcher still fails to fire, wait 15 seconds from the last attempt to fire, then check the electrical circuit for

breaks, shorts, and poor contacts before another attempt to fire. If it is necessary to rotate 3.5-inch rockets M28-series, T127E2, or M30 (T127E3) within the launcher tube to insure electrical contact, rotate in a clockwise direction only, viewed from the rear of the launcher, to eliminate the possibility of unscrewing the head of the rocket from the fuze. After making any necessary adjustments, again actuate the firing switch three times. If the launcher still fails to fire, wait 15 seconds before removing the round, which is to be considered at fault unless subsequent examination reveals a defect in electrical circuits not previously detected.

Warning No. 2: If a slight noise is heard and a small puff of smoke is emitted from the rear of the launcher during an attempt to fire, this indicates that the igniter has functioned but has failed to initiate the propellant. If this is the case, it is mandatory to keep the launcher trained on the target and to observe all the precautions for firing for a 2 minute interval. At the end of this 2 minute interval, remove the rocket and return it to segregated ammunition storage in a properly marked container indicating the condition.

.

d. 1 (Added) *Disposal of an Unfired 66-mm Light Antitank Weapon.*

Note. The following procedure will be followed under training conditions only. Under combat conditions disposal will be made of the weapon after one failure to fire.

After failure to fire, due to the possibility of a misfire or a hangfire, the following warning will be observed until disposal is made of the weapon.

Warning: After a failure to fire, allow a precautionary waiting period of at least 1 minute before attempting to recock the weapon. During this interval the weapon will be kept trained on the target. After 1 minute, return the trigger safety handle to the safe position. Replace the safety pin in the firing pin housing, squeeze the detent boot, push the inner (rear) tube forward, and close the weapon at least one inch. Pull the recocking latch rod handle forward until it stops and release it. Grasp the bail handle and re-extend the rocket launcher to the extended (locked) position. Withdraw the safety pin. During all this time the weapon must remain as near the on-target position as possible. Next the weapon must be reaimed and the trigger safety handle pulled forward to the released position. Again squeeze the trigger boot. If the weapon still does not fire, it must be kept trained on the target for at least 1

minute. At the end of this one minute interval, return the trigger safety handle to the safe position, replace safety pin in the firing pin housing, and place the weapon system in a segregated location for disposition by Ordnance Ammunition Personnel in accordance with the provisions of TM 9-1903.

17. Packing

Ground rockets are * * * in wooden boxes. Exceptions are the 66-mm rocket M72 and 4.5-inch rockets M20 and M21-series, which are packed in their expendable launcher. Aircraft rockets * * * Department of the Army Supply Manual 9-5-1340.

18. General

These rockets (fig. 12) of * * * and motor assembly.

h. Precautions in Firing. General firing precautions * * * to 3.5-inch rockets:

(2) *Rockets M28, M28A2, M29A1, M29A2, and M30 (T127E3).*

- (a) (Superseded) Since the rocket may burn for a time after projection from the launcher thereby placing the operating personnel in the "backblast" areas (fig. 9), eye protection in the form of goggles with safety glass lenses is mandatory at temperatures of 70°F. and above.
- (b) (As superseded by C 3, 2 Mar 61) At temperatures below 70°F., these rockets may be expected to produce blowback of propellant particles after projection from the launcher. Therefore, at temperatures below 70°F., face and hand protection is mandatory for all operating personnel. Field protective mask M9A1 will be used for face protection; other types of face protection are not authorized. All field protective masks M9A1 used for these rocket firings must be distinctively identified by attaching DA Form 10-197 or comparable blank tag to the head harness. One side of the tag will be marked in pen with the stock number and nomenclature of the mask while the reverse side will be marked in pen with the following: "Used in rocket launcher firing; prior to CBR use, inspect in accordance with SB 3-30-10 and repair as necessary." The identification tag will be removed at the time of inspection, only if the mask is acceptable for CBR use. Serviceability of masks, when used for rocket firings, should be based solely on considerations of vision and facial protection afforded and sanitation.

i Preparation for Firing.

(2) *Rockets M28, M28A2, M29A1, M29A2, T127E2, and M30 (T127E3).*

- (a) (As superseded by C 2, 21 Nov 60) Remove from packing and inspect for serviceability as indicated in paragraph 12 as applicable. Should it be necessary to test for continuity, test with the circuit continuity tester.

Section I.1. 66-MM ROCKETS (FOR SELF-CONTAINED EXPENDABLE LAUNCHER)

28.1 General

a. *General Discussion.* The 66-mm rocket (fig. 19.1) of the fin stabilized type, is fired from either shoulder in a standing, kneeling, sitting, or prone position with the expendable launcher M72 (fig. 19.2). The rocket burns completely within the launcher at all operating temperatures. The high-exposive rocket M72 is used against armored targets. The complete weapon system consists of the launcher, warhead, fuze, and rocket motor which contains the propellant, primer, igniter, and fins.

b. *Warhead.* In external contour, the warhead M18 is cylindrical with tapered forward and rear portions. A closure is soldered to the rear portion of the warhead and the forward portion which tapers to a blunt portion, contains three evenly spaced detents around the circumference. These detents engage the three lugs of the nose cap for securing the cap to the warhead. The closure, which contains the fuze is internally threaded at the rear for assembly of the rocket motor.

c. *Fuze.* The PIBD fuze M412, a point-initiating base-detonating type, is electrically initiated, incorporating a graze functioning element. Electrical energy required to initiate the fuze is developed by a piezo-electric element ("lucky") located in the warhead nose. Upon contacting the target the "lucky" generates an electrical current which is carried by two leads to the electric detonator in the fuze. See paragraphs 41 through 51 for fuze description.

d. *Motor Assembly.* The motor assembly M54 consists of a cylindrical aluminum tube with external threads at the forward end for assembly to the closure and formed into a cone-shaped nozzle at the rear end. Six equally-spaced spring-actuated fins are located at the nozzle end of the motor body. The motor assembly contains the charge assembly (propellant) and rocket motor integral igniter. The primer block with percussion primer is assembled in a cavity at the rear of the rear tube.

- (1) *Charge assembly (propellant).* The charge assembly (propellant) consists of 19 monoperforated cylindrical extruded grains of solvent propellant M7. The propellant grains are assembled lengthwise in a stud plate which is located at the

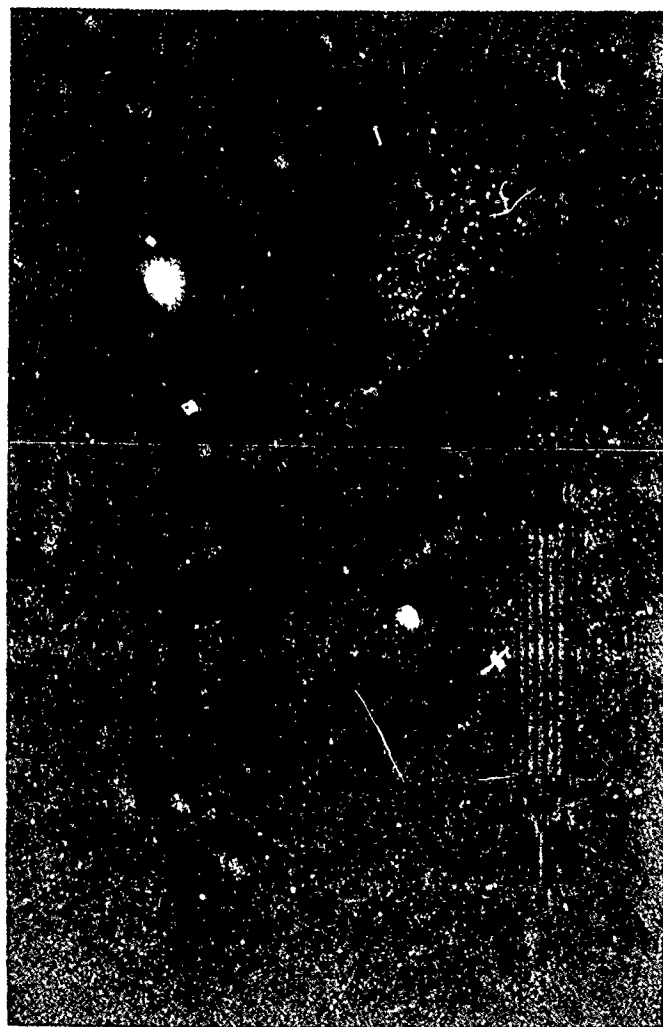


Figure 19.1. (Added) 66-mm High-Explosive Antitank Rocket M72.

forward end. Each grain is 5.78 inches long and 0.23 inch diameter.

- (2) *Rocket motor integral igniter.* The rocket motor integral igniter M56 consists of a one-piece polyethylene plastic molded igniter body containing 1.6 grams Grade A4 black powder, a flash tube 2.23 inches long and 0.175 inch in diameter containing an ignition transmission line of black powder impregnated cotton, and a primer block containing the percussion primer M29A1 which contains 60 milligrams of Grade A5 black powder.

e. Identification. The rockets are identified by their long tapered ogives and spring-actuated fins. The warheads are painted black with markings in yellow and the motors and closures are painted brown.

f. Preparation for Firing. The rockets require no preparation for firing. For firing instructions on the launcher, refer to TM 9-1340-214-10.

g. Packing and Shipping. Five rocket launcher assemblies are packed in a fiberboard container with three (fifteen rocket launcher assemblies) containers per wirebound wooden box.

28.2 Rocket, High-Explosive, 66-mm: AT, M72

a. This rocket (fig. 19.1) is intended for use against armored targets. The rocket M72 consists of the HE, AT warhead M18 containing a PIBD fuze M412-series within the closure and a rocket motor M54. The warhead contains a copper cone, whose apex is to the rear, which acts to shape the high-explosive charge of 0.666 pound of Octol (70% HMX and 30% TNT). The penetration effect is derived from the shaped charge.

b. Data.

Length (complete round) (fins closed)	19.987 inches
Weight (complete round)	2.3 lb (approx.)
Length (warhead w/fuze)	11.5 inches
Weight (warhead w/fuze)	1.2 lb
Range (maximum) ..	325 meters
Muzzle velocity (at 70°F) ..	479 fps

47.1 Fuze, PIBD: M412-series

(Added)

a. General. This fuze (fig. 25.1) consists of a nose cap assembly crimped to the forward end of the warhead, and a base assembly contained in the closure at the rear end of the warhead. The fuze is designed to function by either impact or graze. The impact action of the fuze is derived from the piezoelectric element which is contained in the nose cap assembly. When the piezoelectric element is crushed, a very small amount of electrical energy is developed and transmitted through the lead wire to the fuze. For graze functioning of the fuze, a spring-loaded

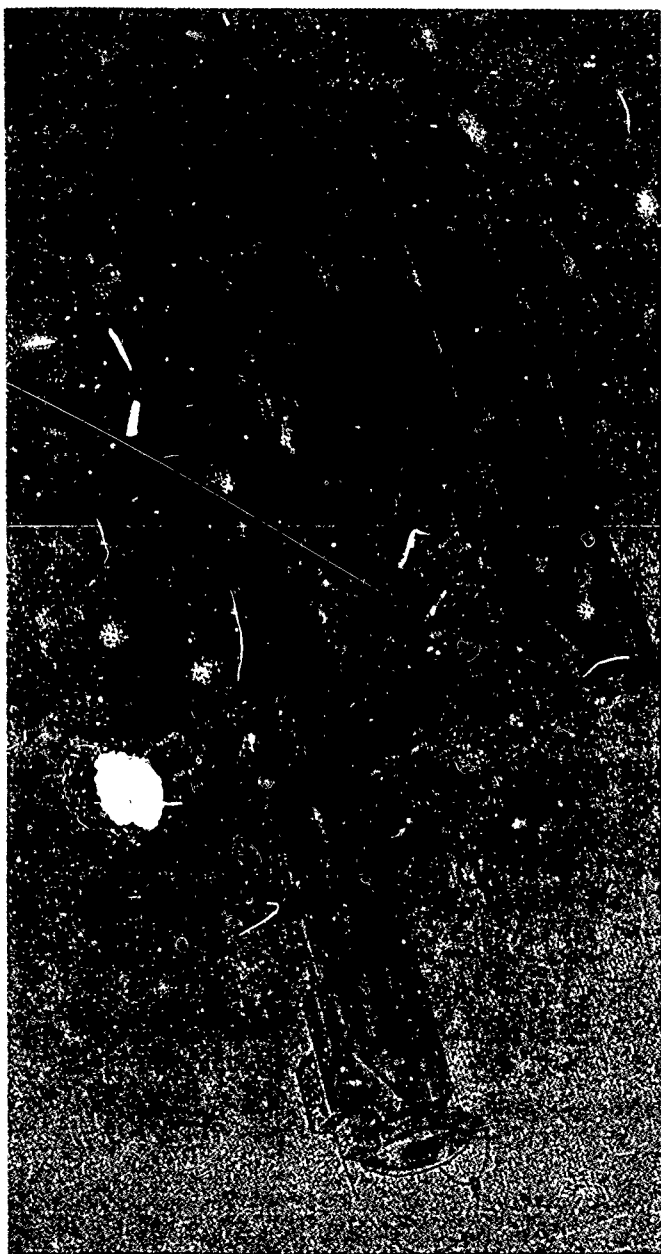


Figure 192. (Added) 66-mm Rocket Launcher M72.

firing pin is released by the decelerating force of graze impact. The fuze is drop-safe and boresafe and arms after approximately 30 feet of rocket travel.

b. *Description.* The nose cap assembly is connected to the base assembly (fuze) by an insulated wire passing through a brass conduit in the warhead. The nose cap assembly consists of an aluminum cone containing the "lucky" (piezoelectric) element. The front face of the element is grounded to the body of the warhead through the aluminum cone and the rear face is connected to a detonator in the base assembly. The base assembly (fuze) consists of a body containing a rotor assembly, an escapement assembly, a spring-loaded firing pin, a stab primer T96, an electric detonator M48, and a tetryl-loaded booster cup.

c. *Functioning.* The fuze is free to arm when acceleration force accompanying the firing of the rocket has acted on the fuze. This force causes release of the escapement leaves and allows the rotor assembly to rotate into the armed position. The minimum arming distance is approximately 30 feet of rocket travel. The spring-loaded firing pin which is released by the decelerating force of impact allows for graze functioning of the fuze. The firing pin fires the stab primer which initiates the electric detonator which in turn, fires the booster charge.

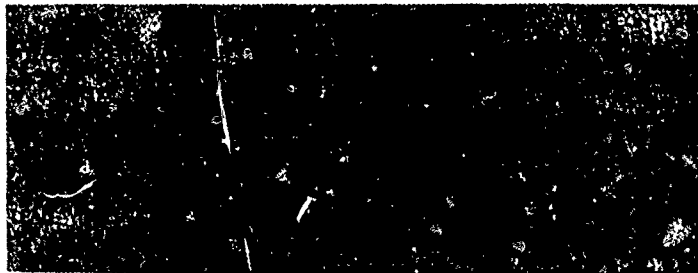


Figure 25.1. (Added) Fuze, point-initiating base-detonating: M412-series.

Page 97. Table II, (As changed by C 1, 11 Mar 59) change the model number in column 2, line 6, from MK1 to M1.

84. Fuze, Rocket: PI, M406

(As superseded by C 1, 11 Mar 59)

The fuze, which is externally threaded at the base to engage the 2.75-inch rocket head M1, is a mechanical PI type. The fuze is a fast acting, point initiated, spit back device with detonator safety and delayed arming features.

93.1 Propellant for 66-mm Rocket

(Added)

Propellant for the 66-mm rocket is of the solvent extruded type M7. It is in the form of 19 single perforated cylindrical grains supported in a stud plate at the head end of the motor. The propellant, of the neutral burning type, burns in relatively short time and is completely consumed at all operating temperatures, while the rocket is in the launcher. See table V for data.

Table V. Rocket Propellant Data

Caliber of rocket	Propellant composition or name of grain	Type of composition	Type of grain	Grains per rocket	Weight of propellant (lb)	Grain length (in.)	Grain outside diameter (in.)	Web (in.)
• (Added)	M7	• Solvent	• Single perfor- ated.	• 19	0 13	• 5.78	0.23	0.035
•	•	•	•	•		•		