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U.S. Army Toxic and Hazardous Materials Agency

**Enhanced Preliminary
Assessment Report:**

**Woodbridge Army Housing Units
Woodbridge, Virginia**

October 1989

prepared for

Commander
U.S. Army Toxic and Hazardous Materials Agency
Aberdeen Proving Ground, Maryland 21010-5401

prepared by

Environmental Research Division
Argonne National Laboratory
Argonne, Illinois 60439

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Argonne National Laboratory, Argonne, Illinois 60439-4815

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SUMMARY

The Woodbridge housing area located near the city of Woodbridge, Va., does not present an imminent or substantial threat to human health or the environment. There is no evidence to suggest that hazardous or toxic constituents have ever been released from this property. There are no known environmental impacts from this property and during site investigation none were identified.

This property was originally developed in conjunction with a Nike missile battery located in Woodbridge, Va. However, no wastes associated with the operation and maintenance of the missile and tracking systems have ever been delivered to or managed at this housing property. Furthermore, this housing property existed independently of the missile launcher area and integrated fire-control portions of the battery with respect to water, sewer, and electrical utilities. It is therefore believed that there are no connections of these types between the housing area and the former operational areas at the Woodbridge Nike missile battery.

The environmentally significant operations associated with the property are underground fuel-oil storage tanks, two of which were replaced about three years ago because of water-intrusion problems; and the presence of electromagnetic pulse testing at a government-related laboratory adjacent to the housing area.

Although the Woodbridge housing area poses minimal threat to human health or the environment, the following actions are recommended:

- Replacement of the five 550-gallon underground storage tanks; remediation of any contamination encountered.
- Inspection of the 1,000-gallon underground storage tank for integrity.
- Provision of a copy of the Environmental Impact Statement for the electronic pulse testing at the nearby Harry Diamond Laboratory to the area's buyer.

These recommendations are based on the presumption that this property will most likely continue to be used as residential housing.

1 INTRODUCTION

In October 1988, Congress passed the Defense Authorization Amendments and Base Closure and Realignment Act, Public Law 100-526. This legislation provided the framework for making decisions about military base closures and realignments. The overall objective of the legislation is to close and realign bases so as to maximize savings without impairing the Army's overall military mission. In December 1988, the Defense Secretary's ad hoc Commission on Base Realignment and Closure issued its final report nominating candidate installations. The Commission's recommendations, subsequently approved by Congress, affect 111 Army installations, of which 81 are to be closed. Among the affected installations are 53 military housing areas, including the Woodbridge housing area addressed in this preliminary assessment.¹

Legislative directives require that all base closures and realignments be performed in accordance with applicable provisions of the National Environmental Policy Act (NEPA). As a result, NEPA documentation is being prepared for all properties scheduled to be closed or realigned. The newly formed Base Closure Division of the U.S. Army Toxic and Hazardous Materials Agency is responsible for supervising the preliminary assessment effort for all affected properties. These USATHAMA assessments will subsequently be incorporated into the NEPA documentation being prepared for the properties.

This document is a report of the enhanced preliminary assessment (PA) conducted by Argonne National Laboratory (ANL) at the Army stand-alone housing area in Woodbridge, Va.

1.1 AUTHORITY FOR THE PA

The USATHAMA has engaged ANL to support the Base Closure Program and assess the environmental quality of the installations proposed for closure or realignment. Preliminary assessments are being conducted under the authority of the Defense Department's Installation Restoration Program (IRP); the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 91-510, also known as Superfund; the Superfund Amendments and Reauthorization Act of 1986, Public Law 99-499; and the Defense Authorization Amendments and Base Closure and Realignment Act of 1988, Public Law 100-526.

In conducting preliminary assessments, ANL has followed the methodologies and procedures outlined in Phase I of the IRP. Consequently, this PA addresses all documented or suspected incidents of actual or potential release of hazardous or toxic constituents to the environment.

In addition, this PA is "enhanced" to cover topics not normally addressed in a Phase I preliminary assessment. Specifically, this assessment considers and evaluates the following topical areas and issues:

- Status with respect to regulatory compliance,
- Asbestos,
- Polychlorinated biphenyls (PCBs),
- Radon hazards (to be assessed and reported on independently),
- Underground storage tanks,
- Current or potential restraints on facility utilization,
- Environmental issues requiring resolution,
- Health-risk perspectives associated with continued residential land use, and
- Other environmental concerns that might present impediments to the expeditious "excessing," or transfer and/or release, of federally owned property.

1.2 OBJECTIVES

This enhanced PA is based on existing information from Army housing records of initial property acquisition, initial construction, and major renovations and remodeling performed by local contractors or by the Army Corps of Engineers. The PA effort does not include the generation of new data. The objectives of the PA include:

- Identifying and characterizing all environmentally significant operations (ESOs),
- Identifying property areas or ESOs that may require a site investigation,
- Identifying ESOs or areas of environmental contamination that may require immediate remedial action,
- Identifying other actions that may be necessary to address and resolve all identified environmental problems, and
- Identifying other environmental concerns that may present impediments to the expeditious transfer of this property.

1.3 PROCEDURES

The PA began with a review of Army Housing records located at Fort Belvoir, Va., on May 23, 1989. A site visit was conducted at Woodbridge, Va., on the same day to obtain additional information through personal observations of ANL investigators. Photographs were taken of the housing units and surrounding properties as a means of documenting the condition of the housing units and immediate land uses. Site photographs are appended.

All available information was evaluated with respect to actual or potential releases to air, soil, and surface and ground waters.

Access to individual housing units was obtained through the senior occupant at the facility.

2 PROPERTY CHARACTERIZATION

2.1 GENERAL PROPERTY INFORMATION²

The Woodbridge housing area is a 7-acre site located in the far northeastern tip of Virginia, about 0.2 mile southeast of the city of Woodbridge in Prince William County. The population of Woodbridge is 35,000; the population of Virginia, 5,346,279; and that of Prince William County, 144,703 (1980 census). Terrain in the general area is grassy rolling plain, with a scattering of trees.

The area consists of nine housing units, a storage building, a playground, and a bus stop waiting shelter. The brick veneer and frame housing units are currently used by noncommissioned military officers and their dependents. Each unit is equipped with air conditioning and heated with forced-air furnaces fired with oil. A single paved street (Dawson Beach Road) runs through the center of the area, with the housing units on either side facing the street.

A turnaround at the end of the street allows residents to have easy access to the area's storage building and also to a bus stop on the east side of the housing units. A chain link fence completely surrounds the Woodbridge housing area. On the property directly to the west of the housing site is the Harry Diamond Laboratory, a secured area maintained as such by a professional guard service. To the southeast, within 2,000 feet of the housing area, is a commercial development area.

Figure 1 shows the general location of the facility.

2.2 DESCRIPTION OF FACILITY

Figure 2 presents the site plan of the housing property.

Housing Units

The 7-acre area has nine housing units in two apartment buildings. One building is a duplex with two units, one with two bedrooms and one with three bedrooms. The other apartment building has seven units; four of these have two bedrooms each, and three have three bedrooms each.

The housing area is generally accessible, but security measures are enforced on the adjacent Harry Diamond Laboratory property. It is necessary to pass through the first guard gate of the Laboratory to reach the housing area. The area is also within 2,000 feet of an industrial/commercial facility in which flammable and explosive materials are handled, and of many other commercial activities in the vicinity.

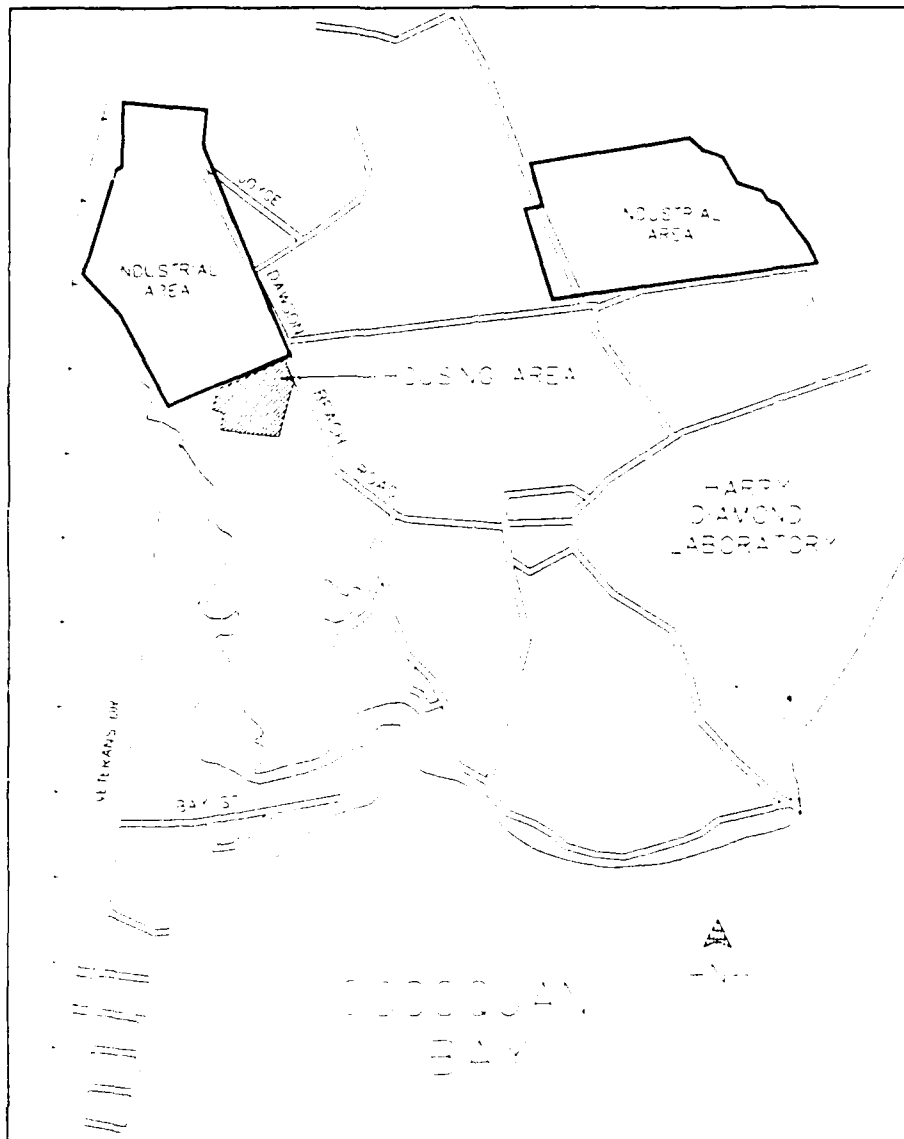


FIGURE 1 Vicinity Map of Woodbridge Army Housing Units

Utilities

The two buildings in the area have separate heating facilities that are adequate for the climatic conditions for the area; the nine units are separately air-conditioned. Water and sanitary sewage services are provided by the city of Woodbridge and have been since original construction. Electricity for the Woodbridge area is furnished by Dominion Resources Corporation. Refuse and garbage are picked up and disposed of off-site by the DYM Corp., a private contractor; information is not available about when this service was first contracted.

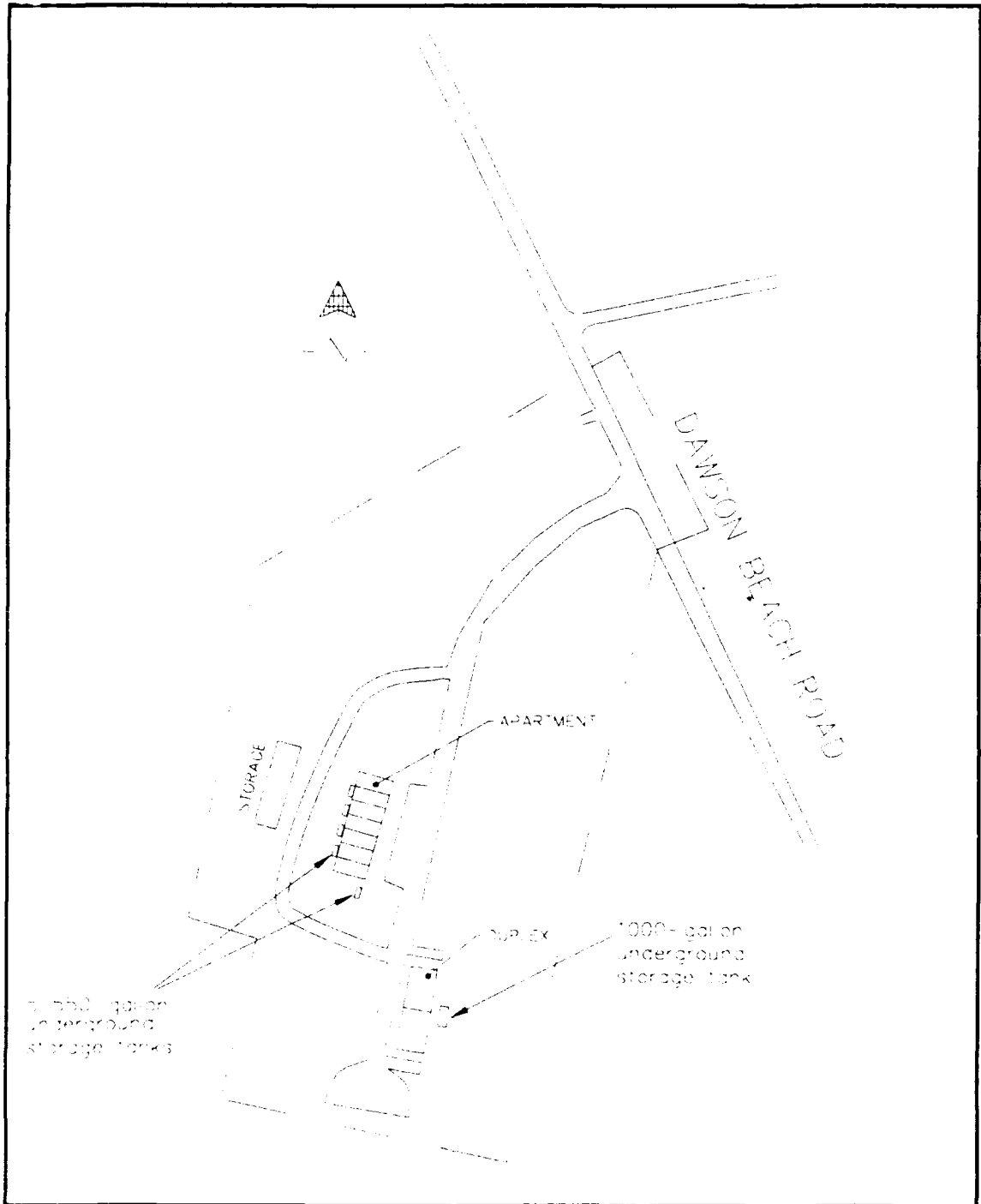


FIGURE 2 Site Plan Map of Woodbridge Army Housing Units

Fuel Storage

The housing area has six underground tanks for storing fuel oil for the forced-air furnaces in each apartment building. Five tanks have 550-gallon capacities, and one has a 1,000-gallon capacity. The duplex is serviced by the 1,000-gallon tank, while the seven units within the apartment building are serviced by the five 550-gallon tanks.

Storm Drainage System

Storm drainage for the housing units is accomplished by the common methods of open ground ditches and surface runoff.

Other Permanent Structures or Property Improvements

Also included in the property are a storage building with 417 square feet, and a bus-waiting shelter of 50 square feet (date of construction unknown). The present age of the buildings is 33 years. There is also a small playground of 800 square feet with a swing, seesaw, jungle gym, slide, a gym set, and a small merry-go-round.

2.3 PROPERTY HISTORY

2.3.1 Nike Defense Program and Typical Battery-Level Practices

Generic information on the national Nike antiaircraft defense program has been compiled in two studies, one commissioned by the Army Corps of Engineers³ and the other by the U.S. Army Toxic and Hazardous Materials Agency.⁴ In both studies, independent contractors relied on information contained in unclassified documents related to the Nike surface-to-air missile program, including engineering drawings and specifications (for the facilities and the missiles themselves), interviews with Army personnel participating in the Nike program, and operations manuals and directives relating to the operations and maintenance of Nike facilities. Taken together, these two reports represent the most complete assemblage of generic information on the Nike missile program from an environmental perspective. Salient points from both reports are condensed below.

At its zenith in the early 1960s, the Nike program included 291 batteries located throughout the continental United States. The program was completely phased out by 1976, with many of the properties sold to private concerns or excessed to state or local governments for nominal fees.

Nike Ajax missiles were first deployed in 1954 at installations throughout the continental United States, replacing, or in some cases augmenting, conventional artillery batteries and providing protection from aerial attack for strategic resources and population centers. Typically, Nike batteries were located in rural areas encircling the

protected area. The Ajax was a two-stage missile using a solid-fuel booster rocket and a liquid-fuel sustainer motor to deliver a warhead to airborne targets.

The Ajax missile was gradually replaced by the Nike Hercules missile, introduced in 1958. Like the Ajax, the Hercules was a two-stage missile, but it differed from the Ajax in that its second stage was a solid-fuel rather than liquid-fuel power source and its payload often was a nuclear rather than conventional warhead. Ajax-to-Hercules conversions occurred between 1958 and 1961 and required little change in existing Nike battery facilities. A third-generation missile, the Zeus, was phased out during development and consequently was never deployed.

A typical Nike missile battery consisted of two distinct and separate operating units, the launch operations and the integrated fire control (IFC) operations. The two operating areas were separated by distances of less than two miles, with lines of sight between them for communications purposes. A third separate area was also sometimes part of the battery. This area was typically equidistant from the two battery operating sites and contained housing for married personnel assigned to the battery. Occasionally, these housing areas also contained battalion headquarters, which were responsible for a number of Nike batteries.

Depending on area characteristics and convenience, the housing areas were often reliant on the launch or IFC sites for utilities such as potable water, electrical power, and sewage treatment. In those instances, buried utility lines connected the housing area to one or both of the other battery properties. It is also possible, however, that housing areas were completely independent of the missile launcher and tracking operations. In those instances, the necessary utilities were either maintained on the housing site or purchased from the local community. In many localities, as the character of the land area around the housing units changed from rural to suburban or urban, communities extended utility services to the housing unit locations, in which case conversions from independent systems to community systems were made.

A large variety of wastes was associated with the operation and maintenance of Nike missile batteries. Normally encountered wastes included benzene, carbon tetrachloride, chromium and lead (contained in paints and protective coatings), petroleum hydrocarbons, perchloroethylene, toluene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, and trichloroethylene. Because of the rural locations of these batteries, and also because very few regulatory controls existed at that time, most of these wastes were managed "on-site." (Unused rocket propellants and explosives, however, would always have been returned to central supply depots and not disposed of on-site.) It is further conceivable that wastes generated at one of the Nike properties may have been transferred to its companion property for management or disposal.

Wastes related to missile operation and maintenance would not have been purposely transferred from a battery operating area to a housing area with no facilities for waste management or disposal. In some instances, however, the sewage treatment facilities for all Nike battery properties were located at the housing area; that possibility cannot be automatically ignored. Finally, where housing areas received various utilities from either of the operating areas, it is also possible that wastes disposed of on those other properties may have migrated to the housing area via the buried utility lines. And

since decommissioning of the Nike batteries did not normally involve removal of buried utility or communication lines, any such contaminant migration is likely to have gone unnoticed.

2.3.2 Woodbridge Housing Units

There have been no structural changes in the apartment building or the duplex since their construction in 1956.

Despite its affiliation with the Woodbridge Nike battery, this area remained independent of the battery with respect to electrical, water, and sewer utilities. Furthermore, no missile-related wastes have ever been delivered to this housing property for management or disposal.

2.4 ENVIRONMENTAL SETTING AND SURROUNDING LAND USES

The Woodbridge housing area is located in the Piedmont Physiographic Province, which includes parts of 40 counties in Virginia. Bordered on the west by the Blue Ridge Province and on the east by the Coastal Plain Province, the Piedmont Province encompasses about 40% of Virginia's land area. The Piedmont is predominantly a rural setting, with forest and pasture its major land uses. According to the 1980 census, approximately 41% of the Virginia population lives in the Piedmont Province. Excluding water used in cities and by thermoelectric plants, the estimated amount of water used in the Piedmont during 1980 was 272 million gallons per day. Approximately 43% of this water is groundwater.

The province is characterized by gently rolling hills and long ridges whose orientation tends to be northeast-southeast. Elevations range from about 200 feet above mean sea level in the east to 1,000 feet MSL along the western boundary. Local relief between highland areas and valley floors may exceed 100 feet.

An intricate network of rivers and streams dissects the Piedmont Province. While most of the drainage system follows a dendritic drainage pattern, some streams follow nearly straight courses called lineaments. These linear features are controlled by fracture systems in the underlying bedrock. Major rivers crossing the Piedmont include the Potomac, Rappahannock, James, Appomattox, Nottoway, Meherrin, Roanoke, and Dan. Major lakes include Lake Anna and the John Kerr Reservoir.

The climate of the Piedmont is mild and humid, with an average annual temperature of about 56°F. Temperatures are generally lowest in January and highest in July. The Piedmont Province receives an average of 44 inches of precipitation annually. Although rather evenly distributed throughout the year, average monthly precipitation usually increases in the late spring and summer and decreases in the fall.

2.5 GEOLOGIC AND HYDROLOGIC SETTINGS

The Piedmont Province consists primarily of metamorphic rock containing igneous intrusions of varying size. Major rock types include schist, gneiss, marble, slate, and quartzite, all of which may be intruded by granite and diabase. Five sedimentary basins intruded by diabase sills and dikes are located in the Piedmont. Rocks in these basins include sandstone, siltstone, shale, conglomerate, and coal. Bedrock throughout the Piedmont is overlain by a nearly continuous layer of loose, weathered material. Referred to as "regolith," this material is composed of soil, saprolite (well-weathered rock), and alluvium (deposited by streams). The thickness of the regolith exceeds 100 feet in some areas of the Piedmont.

The geologic structural trend is northeast-southwest, generally paralleling the fall line (border between the Piedmont and Coastal Plain provinces). The line extends northeast into Maryland, Pennsylvania, and New Jersey, and southwest into North Carolina, South Carolina, and Georgia. While rock formation names vary from state to state, rock composition and structure are similar throughout the Piedmont.

Precipitation in the Piedmont Province is a significant source of its water; the Piedmont's only other source is surface water in streams passing through it from other geologic provinces. The hydrologic cycle in the province functions as follows. Precipitation reaching the land surface either runs off into streams, which make their way back to the ocean, or infiltrates the ground to pass through a more complicated, circuitous route to the sea. Water following the complex ground route supplies basic human needs for water as well as the needs for much of the Piedmont's flora and fauna.

Water infiltrating the ground surface moves downward through the soil zone, under the force of gravity, until it reaches impermeable rock. On the way through the soil and underlying saprolite, some water remains lodged between the mineral grains and is available to the roots of plants in the unsaturated zone (zone of aeration). Much of this water, known as soil moisture or capillary water, is eventually returned to the air through evapotranspiration.

Water passing down to impermeable rock saturates the materials immediately above the rock and the fractures present within the rock. The upper surface of this saturated zone (zone of saturation) is referred to as the water table. Water below the water table may replace the soil moisture lost through evapotranspiration by moving up through the unsaturated zone by capillary movement. Water in the saturated zone below the water table can also be removed by constructing a well penetrating below the water table and installing a device such as a pump to lift the water to the land's surface.

3 ENVIRONMENTALLY SIGNIFICANT OPERATIONS

Two ESOs at the Woodbridge housing were identified: underground fuel-oil storage tanks, and the presence of electromagnetic pulse testing at a government-related laboratory adjacent to the housing area.

There are presently five 550-gallon and one 1,000-gallon underground storage tanks that contain #2 diesel fuel for the apartment building furnaces. Originally there were seven underground tanks at this site, but two were removed approximately three years ago because of heating problems at one of the housing units. These problems were traced back to leakages of water into the two tanks. The two removed tanks were replaced with one 1,000-gallon tank. No significant amounts of petroleum product were believed to have leaked out of these two tanks prior to their removal. No contaminated soils are reported to have been observed in the tank excavations. Therefore, no samples were taken to confirm the absence of petroleum contamination. No specifications on the replacement tank were available.

Occupants of the housing units are subject to electromagnetic pulse testing that occurs on the adjacent Army property, occupied by the Harry Diamond Laboratory. The laboratory is currently under a court order to prepare an environmental impact statement detailing this testing procedure.

4 KNOWN AND SUSPECTED RELEASES

Based on information that was made available to the ANL team of investigators, there has been no known release to surface water or ground water and no releases to the air that would have had a negative effect on the environment. There is no known danger or threat from toxic or hazardous waste contamination, from Nike-related ordnance, or from explosive waste or debris. There are no known PCBs on the property being excessed; the two pole-mounted transformers owned by Dominion Resources Corporation are scheduled for PCB testing by the utility. There are no known asbestos-containing construction materials that were used in the housing units.

5 PRELIMINARY ASSESSMENT CONCLUSIONS

The six underground fuel-storage tanks in the area and the electromagnetic pulse testing adjacent to the area have potential environmental impacts, although neither situation represents an actual known threat at present. Until the environmental impact statement from the Harry Diamond Laboratory is completed, no conclusion can be reached about environmental hazards that may or may not be caused by the company's electromagnetic pulse testing.

Of the six underground tanks presently in use at the site, five have been in service since 1956, and the sixth was installed three years ago. Although there have been no documented incidents of fuel releases from any of these tanks, two of the original tanks have had to be replaced because of water intrusion. It is therefore possible that the other five original tanks still remaining in service may also be in jeopardy of water-intrusion problems and consequent fuel releases to the environment. In addition inspection of the 1,000-gallon tank is also recommended as a matter of good engineering practice.

6 RECOMMENDATIONS

There is evidence that at least five of the six underground fuel-oil storage tanks in the housing area may be deteriorating. These five tanks, each with a 550-gallon capacity, are more than 30 years old. Two 550-gallon tanks had water-intrusion problems three years ago and were replaced. However, no significant amounts of petroleum product were reported to have escaped from these tanks prior to their removal.

It is recommended that the five tanks that are more than 30 years old be replaced and any contamination encountered in the tank excavations should be remediated. The 1,000-gallon tank should be tested for integrity.

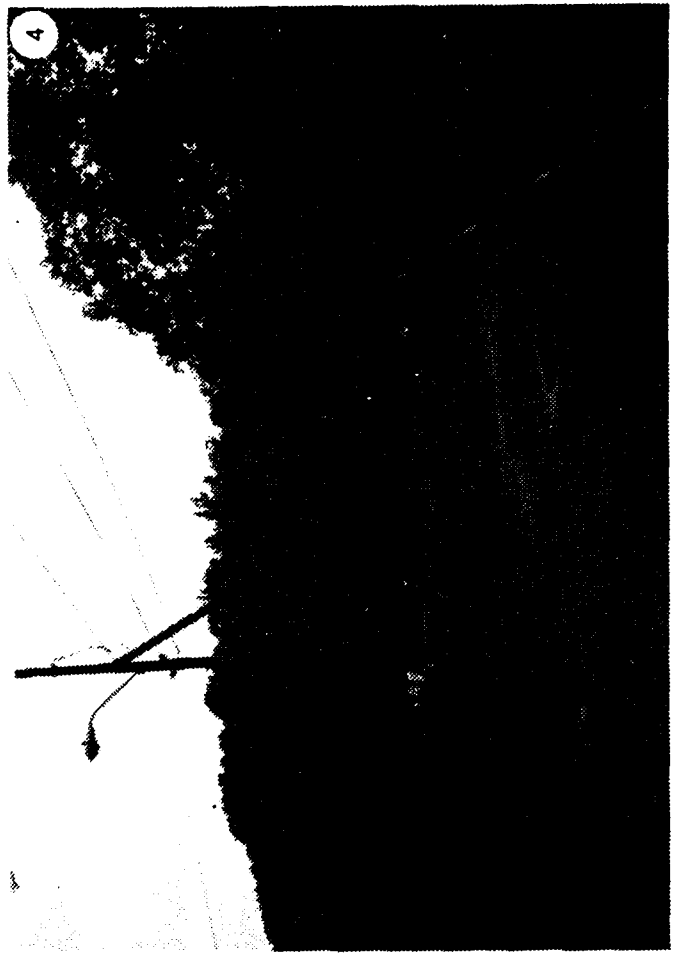
Present and future occupants at the Woodbridge Housing site are subject to electromagnetic pulse testing that occurs at the adjacent Army property, which the Harry Diamond Laboratory now occupies. The Laboratory is currently under a court order to prepare an Environmental Impact Statement (EIS) for this testing procedure. A copy of this EIS should be provided to the buyer of this property for information purposes.

These recommendations are based on the presumption that this property will most likely continue to be used for residential housing.

REFERENCES

1. *Base Realignments and Closures*, Report of the Secretary's Commission (Dec. 1988).
2. Memorandum from the Commander, U.S. Military District of Washington, Subject, *Base Closure, Real Estate Coordinator*, to Linda Baylor, Fort McNair, Washington, D.C. (April 28, 1989).
3. U.S. Army Corps of Engineers, Huntsville Div., *Investigation of Former Nike Missile Sites for Potential Toxic and Hazardous Waste Contamination*, Law Engineering and Testing Co., LEG-Government Services Division, LEG Job #601 (March 1986).
4. U.S. Army Toxic and Hazardous Materials Agency, *Historical Overview of the Nike Missile System*, prepared by B.N. McMaster et al., Environmental Science and Engineering, Inc., for USATHAMA Assessments Div., Aberdeen Proving Ground, Md. (Dec. 1984).

APPENDIX:
**PHOTOGRAPHS OF WOODBRIDGE HOUSING FACILITY
AND SURROUNDING LAND**



IDENTIFICATIONS OF PHOTOGRAPHS

1. West view from housing area, with Harry Diamond Laboratory property beyond chain link fence.
2. Front view of the area's one-story duplex.
3. North view from housing area, with Harry Diamond Laboratory in background and area's apartment building at left.
4. Playground, at southeast of housing area.