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# USATHAMA

U.S. Army Toxic and Hazardous Materials Agency

## Enhanced Preliminary Assessment Report:

Wakefield Army Housing Units  
Wakefield, Massachusetts



September 1989

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prepared for

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## SUMMARY

The Wakefield housing area located in Wakefield, Mass., about 10 miles north of Boston, presents no imminent or substantial threat to human health or the environment. There is no evidence to suggest that hazardous or toxic constituents have been released from this property. There are no known environmental impacts from this property, and during site investigation none was identified.

This property was originally developed in conjunction with a Nike missile antiaircraft battery located in Wakefield, Mass. However, no wastes associated with the operation and maintenance of the missile-launch and tracking systems have ever been delivered to or managed at this housing property. Furthermore, during its use as a housing site for Nike personnel this property was completely independent of the operational areas of the battery with respect to water, sewer, and electrical utilities. It is therefore presumed there were never any utility connections between the housing area and the other Nike areas.

Based on a review of both historical and current practices at the property, the Wakefield housing area is therefore considered to pose minimal threat to human health or the environment. No immediate remedial actions are warranted for this site.

This conclusion is based on the assumption that this property will most likely continue to be used for 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 stand-alone military housing areas, including the Wakefield housing area addressed in this preliminary assessment.<sup>1</sup>

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 (USATHAMA) 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 Wakefield, Mass.

### 1.1 AUTHORITY FOR THE PA

The USATHAMA has engaged ANL to support the Base Closure Program by assessing 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 Amendments and Reauthorization Act of 1986, Public Law 99-499; and Defense Authorization Amendments and Base Closure and Realignment Act of 1988, Public Law 100-526.

In conducting this assessment 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 or hazardous or toxic constituents to the environment.

In addition, this PA is "enhanced" as a result of additional considerations and evaluations made in topic areas not normally addressed in a Phase I PA. Specifically, this assessment has extended to the following topical areas and issues:

- Status with respect to regulatory compliance,
- Asbestos,
- Polychlorinated biphenyls (PCBs),
- Radon hazards (to be addressed 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 Devens, Mass., approximately 35 miles northwest of Boston during the week of May 15-19, 1989. Additional information was obtained from the Army Corps of Engineers District Office in Waltham, Mass., on May 17, 1989. A site visit at the Wakefield housing area was conducted on the same day to obtain additional information through direct observation and interviews with personnel familiar with the property and its operations and history. ANL investigators revisited the site on August 4, 1989, at which time visual inspections were conducted on two of the units (#7 and #12) to determine the possible presence and condition of asbestos-containing materials. Photographs were taken 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.

## 2 PROPERTY CHARACTERIZATION

### 2.1 GENERAL PROPERTY INFORMATION

The Wakefield housing area is located in Middlesex County at the southwestern edge of the city of Wakefield, Mass., on Tarrant Lane, near State Route 128. Figures 1 and 2 show the general location of the facility.

The Army Corps of Engineers Office for the southeast Boston area, located in Waltham, Mass., is responsible for major renovations and upgrading within the facility.

### 2.2 DESCRIPTION OF FACILITY

Figure 3 presents the site plan of the housing property.

#### Housing Units

The housing area occupies four acres and consists of 12 housing units. The units were constructed by the U.S. Air Force in the late 1950s. All units are built on concrete slabs, with asphalt flooring overlaying the concrete slabs. Original outside construction was of wood frame covered with inorganic-asbestos shake siding. The total area of each of the buildings is 1,245 square feet.

Each unit was originally equipped with forced-air oil-fired furnaces, with air conditioning added at a later date. Underground storage tanks (USTs) were originally used for the heating fuel but were removed and replaced with above-ground tanks in 1986. Regional military authorities confirm that the original asbestos shingles on the exterior walls of the units were covered with aluminum siding, but the date of this action is unknown. It is assumed that the aluminum siding was added for cosmetic reasons and that the original siding was in good condition and left in place.

Inspections of the interiors of units #7 and #12 on August 4, 1989, revealed that there was no insulation material on the water pipes in either of these units. Housing area residents have indicated that this is also the case in the remaining units.

#### Utilities

All units are separately heated and are furnished with window air conditioners. Water and sanitary services are provided by the city. A private utility provides electrical service; there are no electrical transformers on the property. Area contractors collect and dispose of the garbage.

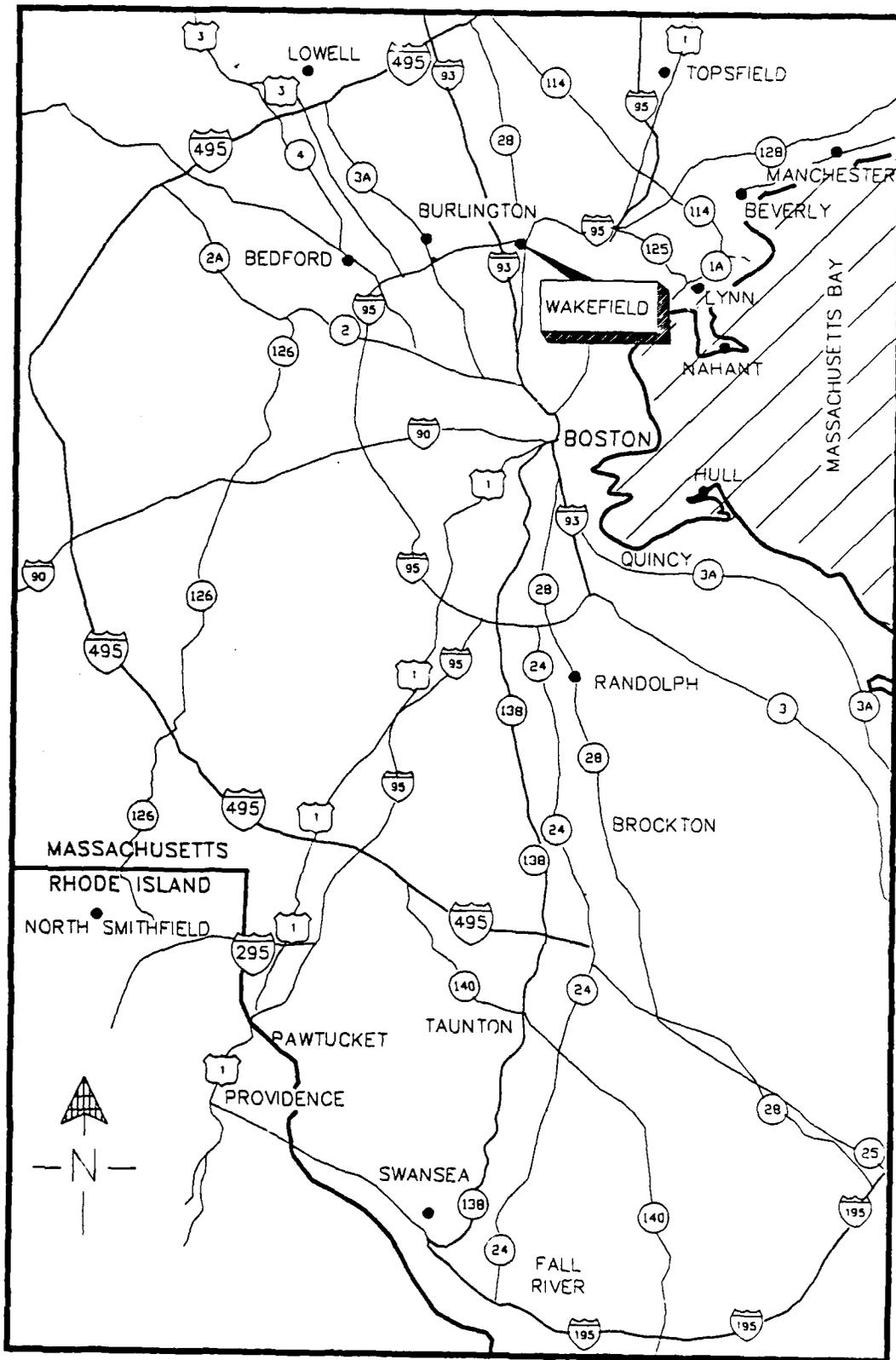
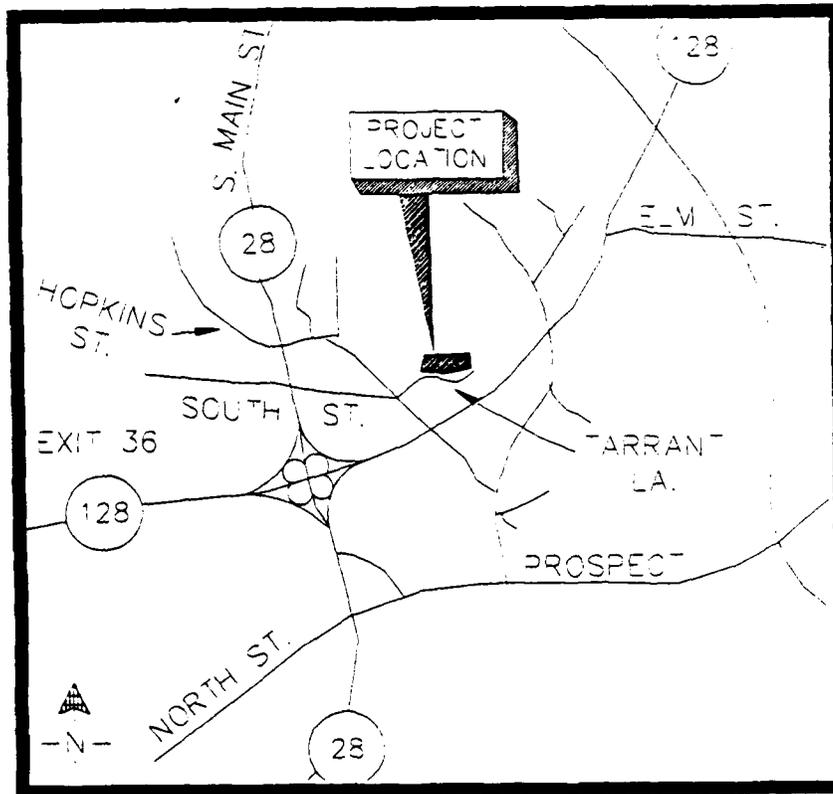


FIGURE 1 Location Map of Massachusetts Army Housing Facilities



**FIGURE 2 Vicinity Map of Wakefield Housing Units**

#### **Fuel Storage**

All housing units are now equipped with above-ground 275-gallon fuel-oil storage tanks. The USTs originally at each of unit were removed in 1986 under the supervision of the Army Corps of Engineers, Waltham, Mass.

#### **Storm Drainage System**

The storm drainage for the housing units is of the common type of open ground ditches and surface runoff.

#### **Other Permanent Structures or Property Improvements**

Except for the above-ground storage tanks for heating oil and new aluminum siding, no such structures or improvements exist.

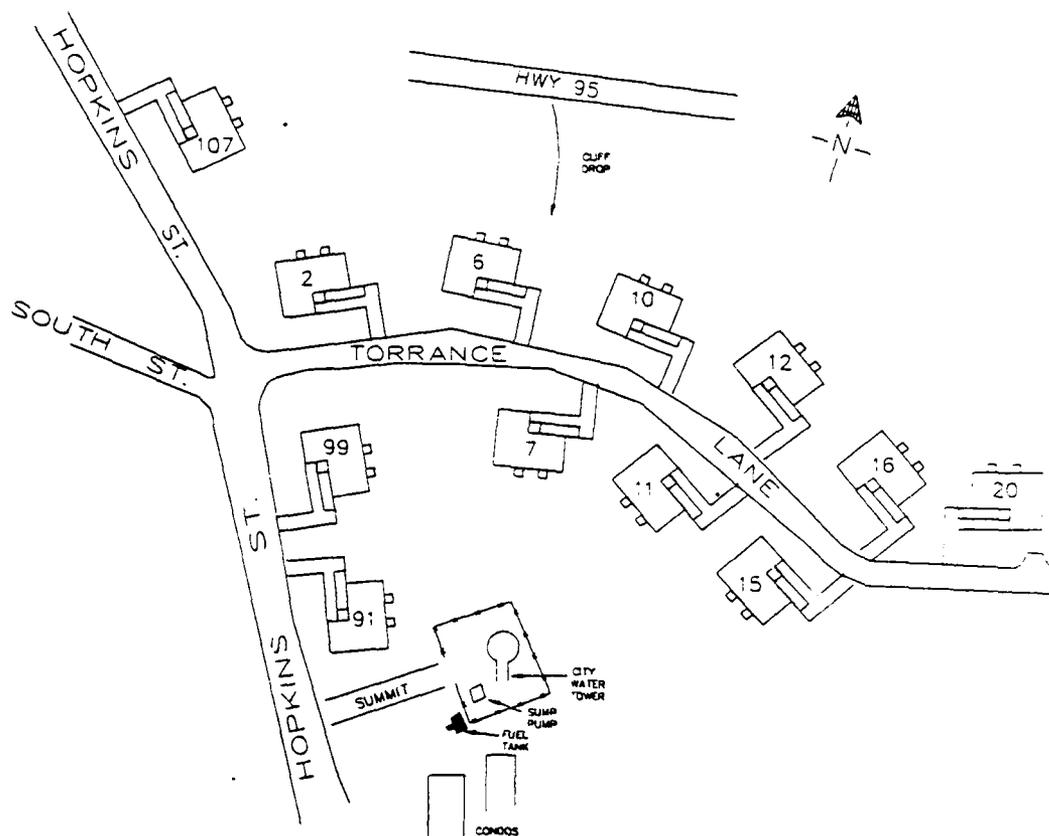


FIGURE 3 Site Plan Map of Wakefield Housing Units

## 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 Engineers<sup>2</sup> and the other by the U.S. Army Toxic and Hazardous Materials Agency.<sup>3</sup> 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 Wakefield Housing Units**

The Wakefield housing units were constructed by the Air Force in the late 1950s to provide family housing for military personnel assigned to the Nike missile battery located in Wakefield, Mass. However, no documentation exists indicating that any missile-related wastes were ever delivered to or managed at this property. Furthermore, records indicate that the housing area operated independently of the rest of the Nike battery with respect to water, sewer, and electrical utilities.

The original outside construction of wood frame was covered with inorganic asbestos shake siding, but the siding was covered with aluminum at a later date.<sup>4</sup> Each unit was also originally equipped with underground tanks for the storage of heating fuel.

## **2.4 ENVIRONMENTAL SETTING AND SURROUNDING LAND USE**

Wakefield is a suburban industrial community whose residential properties surround the housing area addressed in this PA. The population of the city of Wakefield is 25,402, that of Massachusetts is 5,737,081, and that of Middlesex County is 1,367,034 (1980 census).

The city is located on a plain between Lake Quannopowitt and Crystal Lake. Southwest of Wakefield are rugged uplands and marshes.<sup>5</sup>

## **2.5 GEOLOGIC AND HYDROLOGIC SETTINGS**

Wakefield is located in the Coastal Drainage Basin of the New England Physiographic Province. The topography of the area is typified by low, rounded hills rising out of the swampy lowland and by a number of lakes, ponds, and creeks. Lowlands range in elevation from sea-level to approximately 350 feet at the tops of many small rolling hills. The streams in the area have low gradients. Poor drainage and low relief result in numerous wetlands.<sup>6</sup>

Mean annual temperature is about 50°F. Mean annual precipitation in the area is about 44 inches per year, of which 28 inches evaporates and transpires. Part of the remainder travels overland directly to streams and, during or immediately after storm periods, makes up a large part of the increased streamflow. However, most of the water not evaporated or transpired percolates through the ground to the water table and then moves to streams, where it becomes the major component of annual streamflow.

Groundwater discharge may be as much as two-thirds of the average annual runoff and, in unregulated streams, is commonly the sole supply for streamflow during low-flow periods. The 1-year 24-hour rainfall is about 2.5 inches in this area.

Soils of the study area have formed since the retreat of the Wisconsin ice sheet.<sup>7</sup> Soil development reflects the influence of glaciation. Generally, the Paxton-Hollis-Canton and the Canton-Paxton-Merrimac soil associations have formed on the upland hills and ridges that are mantled with glacial till. The Hinckley-Windsor-Much association has formed on glacial outwash deposits and the Dune Land-Tidal Marsh-Beaches association has formed along the coast.

Unconsolidated glaciofluvial deposits of sand and gravel constitute the principal aquifers in the area. A crystalline bedrock aquifer beneath the unconsolidated deposits is of secondary importance. The crystalline-bedrock aquifer consists primarily of igneous and metamorphic rocks, including Dedham grano-diorite of Devonian age, a Pre-Cambrian Marlboro formation, and Carboniferous-age metamorphic rocks. The rocks have been folded, fractured, and faulted. Bedrock exhibits low porosity, specific yield, and hydraulic conductivity. Wells drilled in bedrock for domestic water supplies are commonly 100 to 300 feet deep and generally yield a few gallons per minute.

The unconsolidated deposits are composed of till, stratified drift, wind-laid, wetland, alluvial, and beach and dune sediments. The till is of two types, an upper till and a lower one. Generally, lower till has a high content of silt and clay and is dense, compact, fine-grained, and poorly sorted. Upper till usually contains larger amounts of sand, cobbles, and boulders, a wider range of grain sizes, and is less compact. Both tills are unfavorable for development of municipal water supplies. Stratified drift consisting of glaciofluvial deposit of ice-contact, outwash, and marine sediments overlies most of the till. Ice-contact and outwash deposits are major water-bearing units in the basin. Ice-contact deposits are predominantly sand and gravel, with a small percentage of silt and clay. Outwash deposits are composed mostly of sand, with small amounts of silt, clay, and gravel. Wetland deposits are found overlying outwash in the lowlands, till in the upland depressions, and tidal flats along the coast. They consist of peat and muck intercalated with silt and sand. Porosity of wetland deposits is large, but the vertical hydraulic conductivity is very low. Wind deposits, alluvium, and beach and dune deposits comprise only a small portion of the basin.<sup>8</sup>

Precipitation is the principal source of recharge to the groundwater aquifer. Direct infiltration of rain and snow melt into outcrops of outwash, ice-contact, and wetland deposits acts as the primary recharge mechanism; because of low hydraulic conductivity and steeper slopes, recharge through till and bedrock outcrops is minimal. Discharge of groundwater in the basin is mainly from well pumping, evapotranspiration, and seepage to ponds, springs, wetlands, and streams. Water-table levels are generally highest in the late winter and spring and lowest in the late summer and fall.

Water supply in Wakefield comes from the Metropolitan District Commission, dug wells, and surface-water reservoirs. The total water use in Wakefield was about 1,269 million gallons in 1974.<sup>8</sup>

### 3 ENVIRONMENTALLY SIGNIFICANT OPERATIONS

#### 3.1 FORMER UNDERGROUND STORAGE TANKS

Each housing unit was originally equipped with underground storage tanks, which were removed in 1986. Regional military personnel present at the time have reported that these tanks were not removed because of any known or suspected leaks, but rather as a matter of good engineering practice, considering the tanks' advancing ages. Military personnel also report that some fuel may have been lost from the tanks during removal. However, all those who were present at the removal concur that the volumes involved were very small and that remedial actions were not warranted.

#### 3.2 ABOVE-GROUND STORAGE TANKS

The above-ground fuel storage tanks presently in use on the property are all in excellent condition. Furthermore, there was no indication of spills or leaks from any of these tanks.

#### 4 KNOWN AND SUSPECTED RELEASES

Based on information made available to the ANL team of investigators, there is no known release to water or air that would have a negative long-term effect on the environment. There is no known danger or threat to human health from toxic or hazardous waste contamination at this property.

It has been reported that minor amounts of heating fuel may have been lost during the replacement of storage tanks in 1986. However, the volumes involved did not warrant remedial actions at the time.

## 5 PRELIMINARY ASSESSMENT CONCLUSIONS

Although the Wakefield housing units were originally developed in support of a Nike missile battery, all available documentation and circumstantial evidence support the conclusion that this housing property was completely independent of the battery's operational activities.

Although some heating fuel was reported to have been released to the environment during fuel-tank replacements in 1986, ANL investigators concur in the decision made at the time that the very limited quantities involved did not warrant remedial actions. Furthermore, since none of the removed tanks showed evidence of leakage at that time, no additional investigations for subsurface contamination are warranted at this time.

**6 RECOMMENDATIONS**

No imminent or substantial threat to human health was identified at the Wakefield housing area. No actions are recommended prior to the release of this property. This conclusion is based on the assumption that this property will continue to be used as family housing.

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**APPENDIX:**  
**PHOTOGRAPHS OF WAKEFIELD FAMILY HOUSING UNIT  
AND SURROUNDING LAND**

Upper Left-hand Photo

Upper Right-hand Photo

Lower Left-hand Photo

Lower Right-hand Photo

## WAKEFIELD, MASSACHUSETTS

(All the photographs for this housing area were taken 5/17/89.)

### Page 1:

Upper left-hand photo: Cap of the in-ground trash bin located at the rear of each of the housing units.

Lower left-hand photo: Terraced land on which the housing units are built; the city water tower is in the background.

Lower right-hand photo: A typical MCA-style house found at the housing area.

### Page 2:

Upper left-hand photo: A typical 275-gallon tank, located at the rear of each housing unit; note the insulation around the transfer pipe to the inside of the house, used to prevent winter freezing of the oil.

Upper right-hand photo: Northeastern view from housing area, depicting the surrounding residential land.

Lower left-hand photo: Housing units built on step-like terraced land.

Lower right-hand photo: Abandoned tank next to the pumping station on city property.

