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**USATHAMA**

U.S. Army Toxic and Hazardous Materials Agency

**Enhanced Preliminary  
Assessment Report:**

**Bedford Army Housing Units  
Bedford, Massachusetts**

September 1989

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OCT 17 1989  
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prepared for

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

prepared by

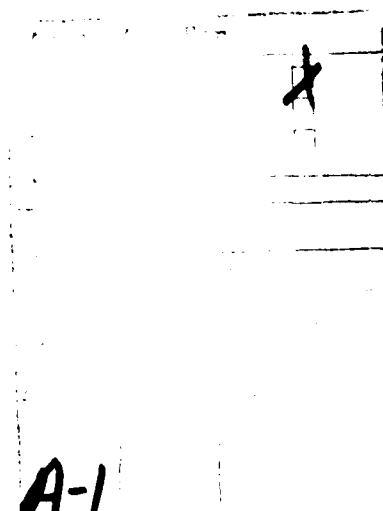
Environmental Research Division  
Argonne National Laboratory  
Argonne, Illinois 60439

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for release by the  
U.S. Army Toxic and Hazardous Materials Agency



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



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## SUMMARY

The Bedford housing facility located in Bedford, Mass., presents no imminent or substantial threat to human health or the environment. No immediate remedial actions are warranted at the site. Although originally developed as a housing area associated with a Nike missile battery, this area has always been exclusively used for housing military personnel, and no missile-related wastes have been delivered to or managed at this property.

Although no adverse impacts from housing operations have been identified for Bedford, one action is recommended prior to release of this property: Visually inspect the interiors of the remainder of the units to determine the possible presence and condition of asbestos-containing water pipe insulation and remediate any problems found.

The recommendation assumes 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 military housing areas, including the Bedford 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 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 Bedford, 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; 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 Devens, Mass., approximately 35 miles northwest of Boston 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 and from conversations with personnel from the office of the Area Engineer, Fort Devens on May 18. A site visit was conducted at Bedford, Mass., on May 17, 1989, at which time additional information was obtained through personal observations of ANL investigators. The interior of one unit (unoccupied) was inspected for the possible presence and condition of asbestos-containing materials. 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.

## 2 PROPERTY CHARACTERIZATION

### 2.1 GENERAL PROPERTY INFORMATION

The Bedford Center Historic District, listed on the National Register of Historic Places, is located 0.5 kilometer south of the housing facility.<sup>2</sup> The nearest water source is a wetland 0.2 kilometer to the northeast.<sup>2</sup> Routine maintenance of the facility is the responsibility of the Directorate Engineering and Housing, Fort Devens, Mass. 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.

Figures 1 and 2 show the general location of the facility.

### 2.2 DESCRIPTION OF FACILITY

The Bedford housing area was originally developed in the 1950s and consists of 5.20 acres of land.<sup>3</sup> A playground area was filled with dumped rock to an elevation of 154 feet, from 148 feet. (A large drain opening was noticed below the playground area, in the surrounding woodland. A creek that was thought to be here is dried up. It is unclear what kind of city drainage takes place at the Bedford area.) A small part of the property, on the eastern side and adjacent to an old railroad spur, was filled for an access road.<sup>2</sup>

Figure 3 presents the site plan of the housing property.

#### Housing Units

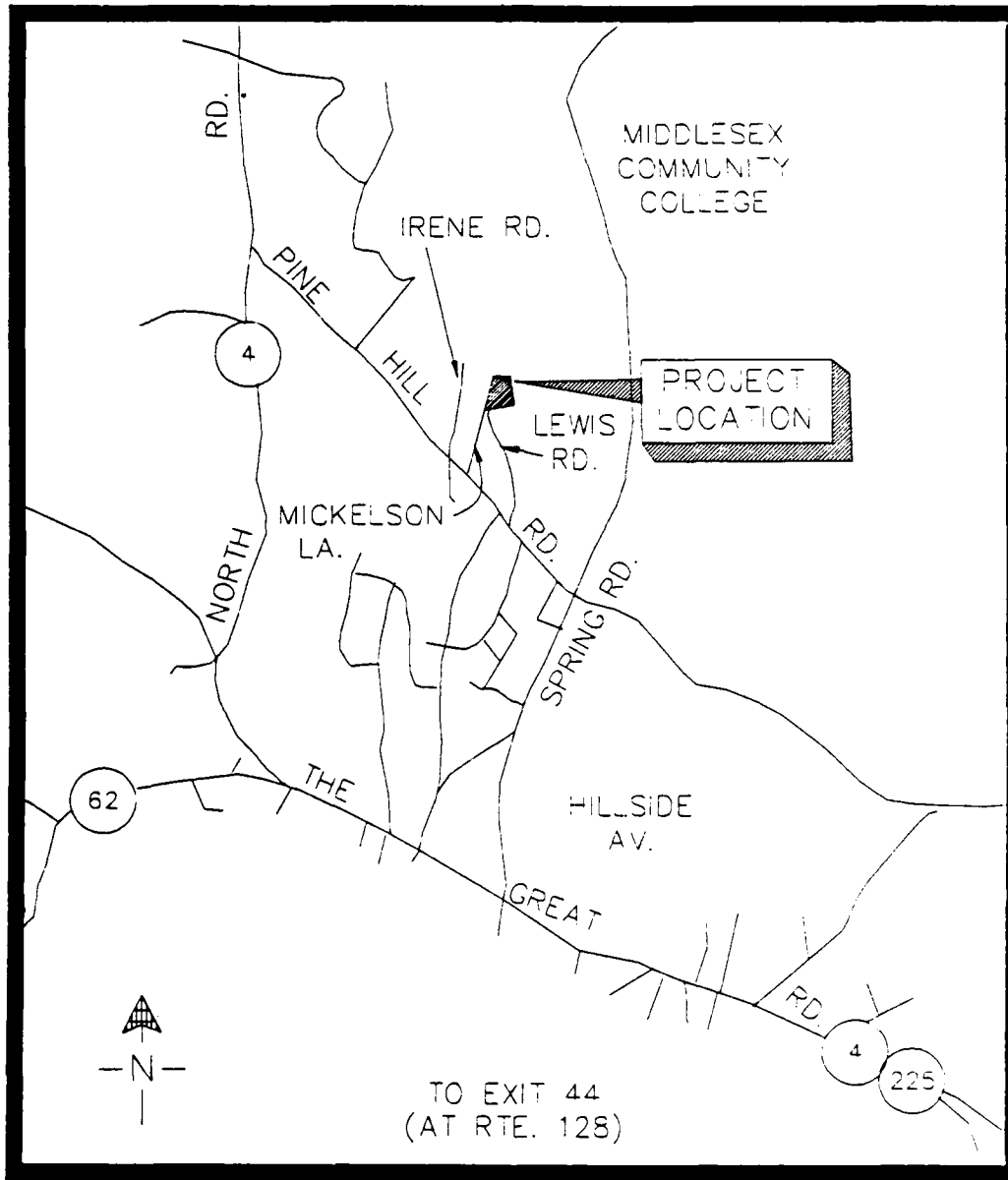
Sixteen "capehart" style houses sit on individual graded terraces. "Capehart" is the model name assigned to these houses by the builder, National Homes. The capehart style includes three bedrooms and a family unit, with carport and storage room. The house is built on a concrete slab foundation; floors are concrete slab with tile, walls are wood frame with asbestos shingle, and the roof is asphalt shingle.<sup>4</sup>

The site investigation revealed that vinyl siding was installed over the original asbestos siding of each house. The date of this action is not documented, but the action was confirmed by the Army Corps Engineers office in Waltham. It is assumed that the siding was added for cosmetic reasons and that the original siding was still in good condition and left in place.

#### Utilities

The property is supplied with city water. Water lines follow the edge of the access road, and feeder lines extend from the main city line to each individual house.<sup>7</sup> Locations of municipal or private drinking water wells are not known. The property is also on city power, and all telephone poles, lines and transformers are owned by the city.





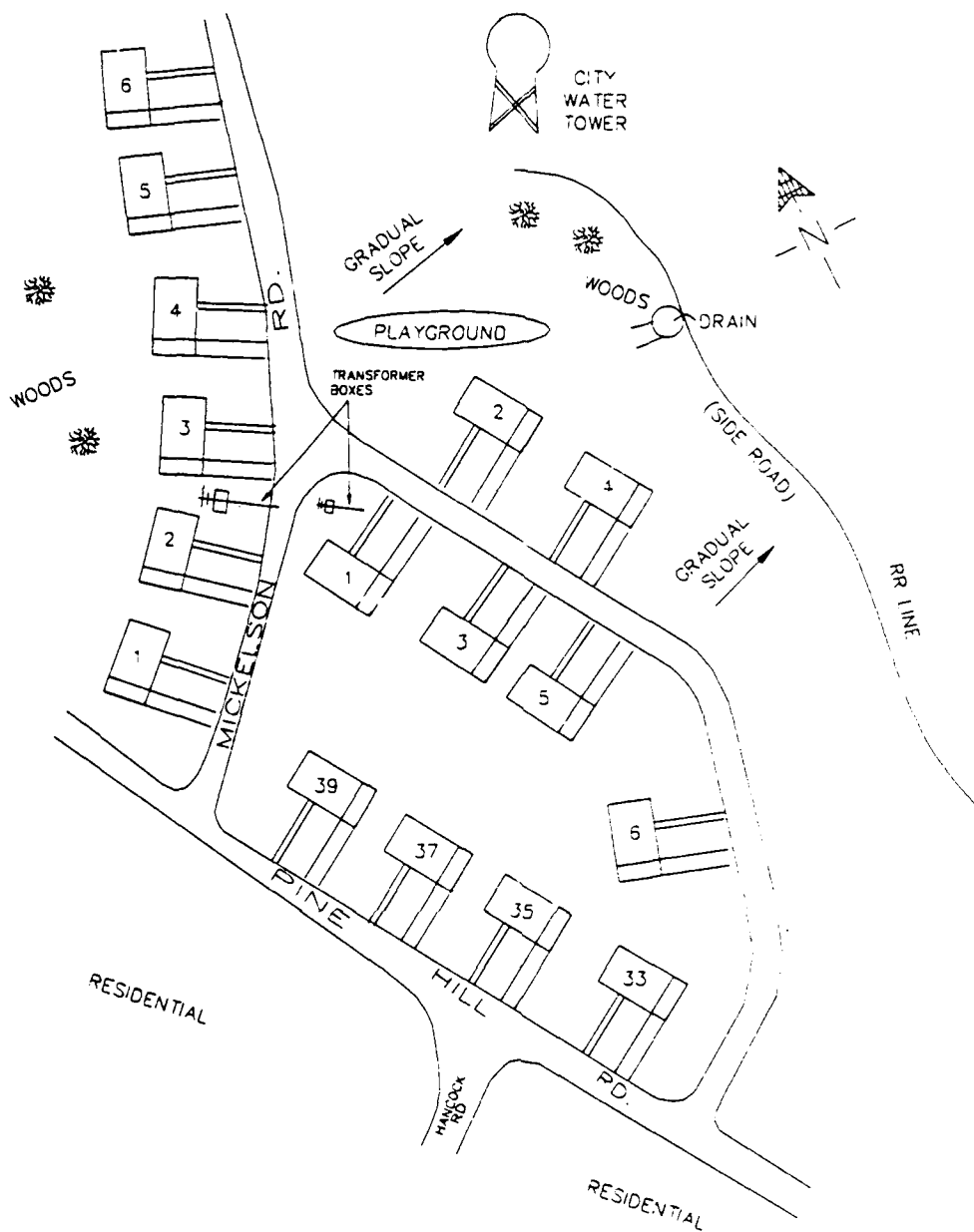
**FIGURE 2 Vicinity Map of Bedford Army Housing Units**

#### **Sewage**

Each house was originally equipped with a 720-gallon septic tank, with a leach field in the rear of the structure.<sup>4</sup> (In 1976, all individual septic systems were abandoned in place, and the houses were connected to the Bedford sewer system.)

#### **Fuel Storage**

In October 1986, after underground fuel tanks for the housing units were removed, new 275-gallon above-ground tanks were installed.<sup>5</sup> No documentation was



**FIGURE 3 Site Plan Map of Bedford Army Housing Units**

found indicating problems with the underground tanks. No leakage was documented, and no soil tests were taken. The old steel underground tanks were scrapped by a local contractor in July 1986.<sup>6</sup>

The Heating maintenance contractor for the Bedford units is Refrigerated Air Company, which is responsible for oil deliveries as well.<sup>7</sup> The only problem noted by the Area Engineer Office in Brockton, is that the oil tends to freeze up, or gel, in the pipes during cold temperatures. This is because there is no outer covering around the pipes to protect them from harsh weather conditions.

### **Storm Drainage Systems**

The property is drained by open ditches or surface run-off.

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

No such structures or improvements exist.

## **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>8</sup> and the other by the U.S. Army Toxic and Hazardous Materials Agency.<sup>9</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 Bedford Housing Units**

The Bedford facility was built in 1958 solely for housing. Sixteen single-family houses were erected on the property. No documentation indicates that any Nike-related wastes were delivered to or managed at this housing area. Furthermore, the housing area operated independently of the rest of Nike battery with respect to water, sewer, and electric utilities.

In December 1965, the facility had a sewage problem, with sewage overflowing in the storm drains, and then backing up to the ground surface and draining into the catch basin, which eventually leads to the Shawsheen River.<sup>10</sup> This resulted in the proposal that a temporary "french drain" be constructed and that the site be connected to the city sewer system.<sup>11</sup> No documentation could be identified confirming the installation of this drain. However, the individual septic systems were abandoned and the units hooked to the city sewer system in 1976.<sup>12,13</sup>

## 2.4 ENVIRONMENTAL SETTING AND SURROUNDING LAND USE

Bedford, Mass., embeds riverine lowland and adjacent hilly uplands. Soils are sandy to gravelly, and extensive marsh and meadows lie in the western and southern sections of the town. The town is situated along the Concord River valley and the headwaters of the Shawsheen River.<sup>2</sup>

## 2.5 GEOLOGIC AND HYDROLOGIC SETTINGS

Bedford is located in the Shawsheen River Basin of the New England Physiographic Province. In its upstream half, the Shawsheen River flows in a well-defined channel that meanders over a 200 to 600-ft-wide grassy flood plain. In its downstream half, it flows through a gently curving pool and riffle channel interrupted by five dams.<sup>14</sup>

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 10 feet at its mouth to between 250 to 300 feet at the tops of many small rounded hills along the drainage divide.

Average precipitation in the area is about 44 inches per year, of which 28 inches evaporates and transpires.<sup>15</sup> 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.

Continental glaciers, during the Pleistocene Epoch, scoured the bedrock surface of the study area and deposited a discontinuous mantle of till, which is an unconsolidated and unstratified mixture of clay, silt, sand, gravel, cobbles, and boulders. During melting of glacial ice, soil and rock fragments from within the glacier were transported, sorted, and deposited by meltwater as stratified sand and gravel in stream channels and as silt and clay in ponds and lakes. The unconsolidated glaciofluvial deposits of sand and gravel constitute the principal aquifers.

Transmissivity of unconsolidated deposits ranges from less than 10 square feet per day ( $\text{ft}^2/\text{d}$ ) for till and deposits of lacustrine silt and clay in the headwater area of the Shawsheen River valley to more than 10,000  $\text{ft}^2/\text{d}$  for deposits of sand and gravel in the towns of Burlington and Tewksbury. Aquifers that sustain well yields that exceed 300 gallons per minute (gal/min) lie primarily along the Shawsheen River and its major tributaries. Most of the best aquifers have been located during test drilling by towns searching for groundwater supplies and have been developed for municipal and light industrial use. Glaciofluvial deposits along the Shawsheen River in the town of Billerica have not been explored. Aquifers that sustain well yields of less than 200 gal/min occur in many stream valleys and swampy areas. These aquifers are generally less than 50 ft thick and are of small areal extent.

Water from bedrock is generally available in quantity and quality suitable for single-family domestic supplies. Bedrock is composed of a variety of igneous and metamorphic rock types. Water in bedrock occurs in secondary pore spaces, such as joints and fractures, which are commonly narrow and represent only a small percentage of total aquifer volume. Consequently, bedrock-aquifer transmissivity varies greatly with location, and overall storage capacity is generally low. Nearly all wells constructed in bedrock intercept some water-bearing fractures; however, bedrock well yields range from a fraction of a gallon per minute, in places where the fractures are small and poorly interconnected, to more than 100 gal/min, where fractures are numerous and well interconnected, as in some fault zones. The median yield of 26 bedrock wells is 10 gal/min.

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.

Approximately 85% of the municipalities within the Shawsheen River Basin obtain part or all of their water from sources outside the basin. Public-supply wells in sand and gravel aquifers are located adjacent to streams, and well yields can be partly sustained by infiltration from the streams. Bedford has wells near Spring and Vine Brooks and the Shawsheen River. Groundwater quality is generally good throughout the Shawsheen Basin, and the water is suitable for most uses. Per-capita usage ranges from 65 to 153 gal/d and depends, in part, on the amount of industrial use and leakage from water mains.

### 3 ENVIRONMENTALLY SIGNIFICANT OPERATIONS

Because of the nature of this facility, no environmentally significant operations exist. The area has always been used only for housing, and no industrial operations took place here. No hazardous waste or hazardous materials are stored on the property, which also contains no landfills. Two areas of concern were noted.

Exposed insulation wrap was discovered around the water heater pipes inside one of the houses. This insulation may contain asbestos, and it was slightly deteriorated. The floor tiles are also likely to contain asbestos, but they were in good condition. It is assumed that the pipe insulations and floor tiles in the remaining units were in similar conditions.

In addition, minor spillage on concrete pads under the fuel-storage tanks was observed, probably the result of sloppy filling or overfilling. Environmental impacts of such minor amounts of fuel are considered insignificant.

Water pipe insulation in the one housing unit which was inspected showed signs of slight deterioration.

#### 4 KNOWN AND SUSPECTED RELEASES

Because of the residential nature of the facility, no major releases or impacts on the environment exist at Bedford. No hazardous wastes or hazardous materials are stored on-site, and no evidence of contamination from housing activities has been documented.

Slightly deteriorated water pipe insulation, which may contain asbestos, could have been the source of asbestos release to the indoor air space of the housing units.

## 5 PRELIMINARY ASSESSMENT CONCLUSIONS

Although these 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 Nike battery's operational activities and received no missile-related wastes.

Real property records indicate that the original heating oil tanks were installed underground. The underground tanks were replaced in 1986. Although no soil tests were made, visual observations at the time of the tank removals gave no indication of leaks or contamination. The above-ground tanks give no evidence of leakages since their installation. It was noted that the oil frequently gels up in the winter, resulting in problems with fuel delivery to the furnaces.

Although the property had a sewage problem in 1965, this was corrected by connecting the Bedford housing facility to the city sewage system in 1976. No problems have been noted since that time.

The water pipe insulation in one of the units was slightly deteriorated. It is assumed that water pipe insulations in the remainder of the units were in similar conditions. This insulation may contain asbestos.

## 6 RECOMMENDATION

No significant adverse environmental impacts have been associated with current operations of the Bedford housing area. Although no immediate remedial actions are warranted for the area, one action is recommended before excessing the land. Slightly deteriorated water pipe insulations in the utility rooms of the units should be removed. Such action should be preceded by a determination of whether this insulation contains asbestos, and the removal should be conducted in accordance with accepted practice if this is found to be the case.

The recommendation assumes this property will most likely continue to be used for residential housing.

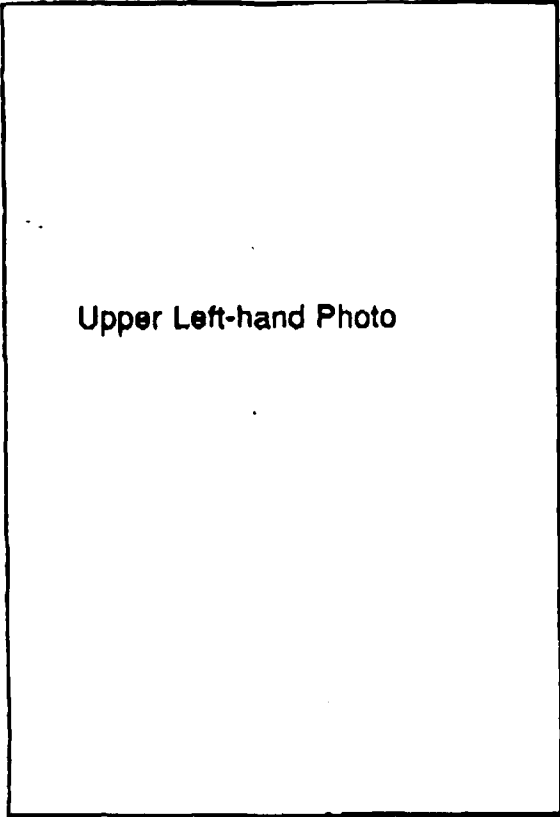
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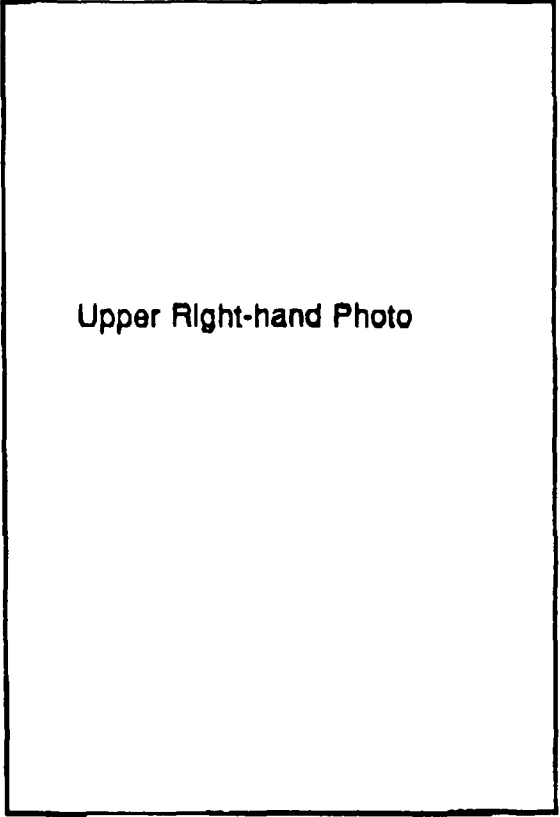
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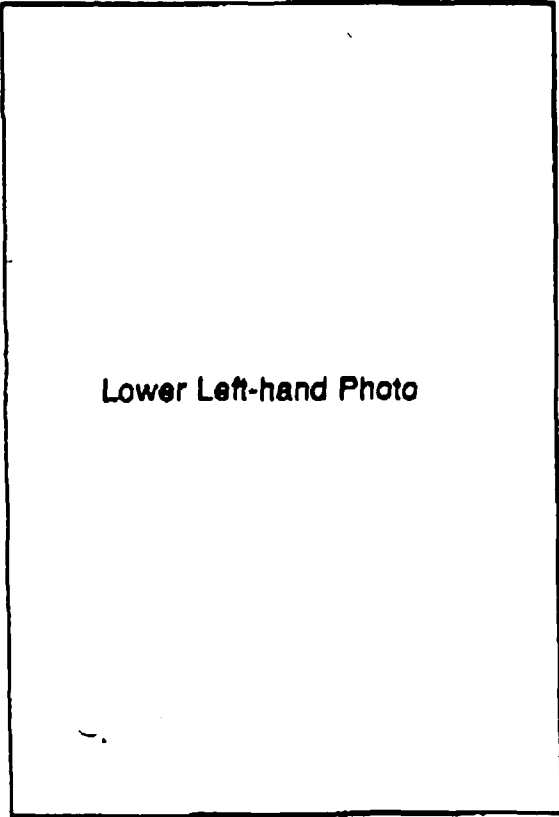
**APPENDIX:**  
**PHOTOGRAPHS OF BEDFORD HOUSING FACILITY  
AND SURROUNDING LAND**



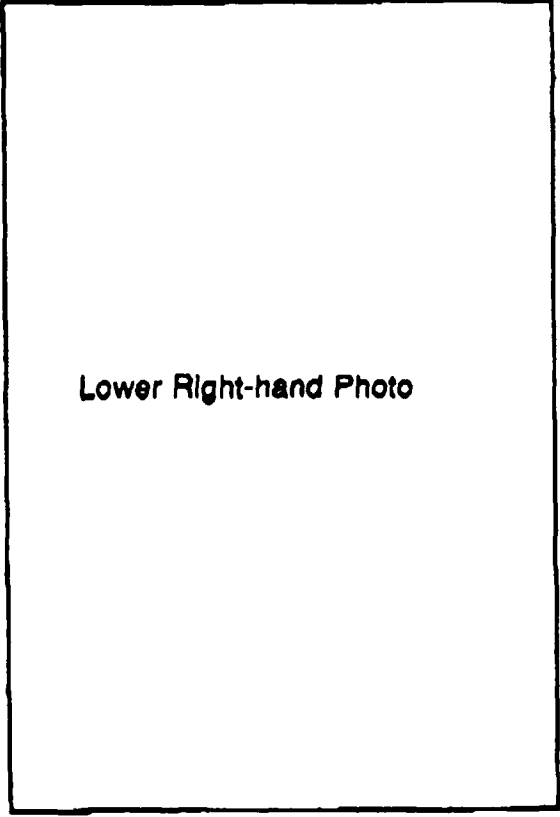
**Upper Left-hand Photo**



**Upper Right-hand Photo**



**Lower Left-hand Photo**



**Lower Right-hand Photo**

BEDFORD, MASSACHUSETTS

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

Page 1:

Upper left-hand photo:

Deteriorating wrap around a hot water pipe, possibly asbestos-containing material.

Upper right-hand photo:

Aboveground heating oil tank with spill marks.

Lower left-hand photo:

Street view of typical housing unit.

Lower right-hand photo:

Playground area, believed to have been filled to present elevation.

Page 2:

Upper left-hand photo:

Capehart house with carport.

Upper right-hand photo:

Rear view of units showing the terracing of houses.

Lower left-hand photo:

Access road along the east border of housing units.

Lower right-hand photo:

Surrounding land to east contains city water tower and industrial smoke stack.

