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Delivery Order 9
Enhanced Preliminary Assessment

FORT DEVENS, MASSACHUSETTS

Contract Number DAAA15-90-D-0009

April 1992

Prepared for:

U.S. ARMY TOXIC AND
HAZARDOUS MATERIALS AGENCY
Aberdeen Proving Ground
Maryland 21010-5401

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ENHANCED PRELIMINARY ASSESSMENT

FORT DEVENS
MASSACHUSETTS

Contract Number DAAA15-90-D-0009

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13. ABSTRACT *(Maximum 200 words)*

An Enhanced Preliminary Assessment was conducted at Fort Devens, Massachusetts, which is located approximately 40 miles west of Boston in Worcester and Middlesex Counties. Fort Devens contains 9,280 acres, consisting of Main, North, and South Post Areas. Activities at Fort Devens include administration, training, ammunition storage, maintenance, housing, and support. Sensitive environments at Fort Devens include wetlands, habitat areas for endangered species, endangered plants, and historically and archeologically significant areas. Fort Devens is under the jurisdiction of the U.S. Army Forces Command (FORSCOM), and its functions are to command, train, and provide logistical support for nondivisional troop units. Based on information obtained during and subsequent to a site visit (16 through 19 September 1991), 68 types of Areas Requiring Environmental Evaluation (AREEs) were identified and grouped by the following categories: Incinerators; Landfill Disposal Areas; Wastewater Treatment Plant; Storage Areas; Waste Handling Areas; Spills and Leaking Underground Storage Tank Areas; and Facility-wide AREEs. This report presents a summary of findings for each AREE and recommendations for further action.

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DISCLAIMER

This Enhanced Preliminary Assessment report is based primarily on the environmental conditions observed at Fort Devens, Massachusetts, between 16 and 19 September 1991. Past site conditions and management practices were evaluated, based on readily available records and the recollections of people interviewed. Every effort was made, within the scope of the task, to interview all identified site personnel, especially those personnel with a historical perspective of site operations.

No environmental sampling was conducted as part of the assessment. The findings and recommendations for further action are based on Roy F. Weston, Inc.'s experience and technical judgment, as well as current regulatory agency requirements. Future regulations as well as any modifications to current statutes may affect the compliance status of this site.

Roy F. Weston, Inc. does not warrant or guarantee that the property is suitable for any particular purpose or certify any areas of the property as "clean." A more thorough investigation, including intrusive sampling and analyses for specific hazardous materials, is recommended prior to reporting this property as excess.

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LIST OF ACRONYMS AND ABBREVIATIONS

ACM	Asbestos-containing material
AAFES	Army and Air Force Exchange Service
AEHA	U.S. Army Environmental Hygiene Agency
AMRCOM	U.S. Army Armament Material Readiness Command
ANL	Argonne National Laboratories
AOC	Areas of Contamination
AREE	Area requiring environmental evaluation
AST	Aboveground storage tank
bgs	Below ground surface
BNA	TCL base-neutral and acid extractable compounds
BRAC	Base Realignment and Closure Program
BTXE	Benzene, toluene, xylene, ethylbenzene
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
DA	Department of the Army
DCE	1,2-dichloroethylene
DEH	Directorate of Engineering and Housing
DOD	Department of Defense
DOE	Department of Energy
DOL	Directorate of Logistics
DRMO	Defense Reutilization and Marketing Office
EMO	Environmental Management Office
EMSL	Environmental Monitoring Systems Laboratory

LIST OF ACRONYMS AND ABBREVIATIONS
(continued)

EOD	Explosive Ordnance Disposal
EP	Extraction Procedure
EPA	U.S. Environmental Protection Agency
EPIC	Environmental Photographic Interpretation Center
ESE	Environmental Science and Engineering, Inc.
FICWD	Federal Interagency Committee on Wetlands Delineation
FORSCOM	U.S. Army Forces Command
FS	Feasibility Study
FY	Fiscal Year
HC	Hydrocarbons
HWAA	Hazardous Waste Accumulation Areas
IAG	Federal Facilities Interagency Agreement
IRP	U.S. Army Installation Restoration Program
LUST	Leaking underground storage tank
MAAF	Moore Army Airfield
MCL	Maximum contaminant level
MDEP	Massachusetts Department of Environmental Protection
MEK	Methyl ethyl ketone
MEP	Master Environmental Plan
mgd	Million gallons per day
MHC	Massachusetts Historical Commission
MSL	Mean sea level

LIST OF ACRONYMS AND ABBREVIATIONS
(continued)

NA	Not applicable
NED	New England Division, U.S. Army Corps of Engineers
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRC	Nuclear Regulatory Commission
NRO	Natural Resources Office
NWI	National Wetlands Inventory
OMS	Organizational Maintenance Shop
PA	Preliminary Assessment
PAL	Public Archeology Laboratory
PA/SI	Preliminary Assessment/Site Investigation
PCBs	Polychlorinated biphenyls
PCE	Perchloroethylene or tetrachloroethylene
POL	Petroleum, oils, and lubricants
ppm	Parts per million
PVNTMED	Preventive Medical Service
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
RMTS	Regional Maintenance Training Site
SA	Study Area
SARA	Superfund Amendments and Reauthorization Act
SMCL	Secondary Maximum Contaminant Level

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

STP	Sewage treatment plant
SWMU	Solid waste management unit
TA	Training Area
TAL	Target Analyte List
TASC	Training and Audiovisual Services Center
TCA	1,1,-trichloroethane
TCE	Trichloroethylene
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TDA	Table of Distribution and Allowances
TMP	Transportation Motor Pool
TOC	Total organic carbon
TOV	Total organic vapors
TPH	Total petroleum hydrocarbons
TRADOC	U.S. Army Training and Doctrine Command
TSCA	Toxic Substances Control Act
TSS	Total suspended solids
USACE	U.S. Army Corps of Engineers
USAIS	U.S. Army Intelligence School
USAR	United States Army Reserve
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency
USGS	U.S. Geological Survey

LIST OF ACRONYMS AND ABBREVIATIONS
(continued)

UST	Underground storage tank
UXO	Unexploded ordnance
VOC	TCL volatile organic compounds
WESTON	Roy F. Weston, Inc.
WWTP	Wastewater Treatment Plant
WWII	World War II

EXECUTIVE SUMMARY

BACKGROUND AND OBJECTIVES

This enhanced preliminary assessment (PA) report has been prepared by Roy F. Weston, Inc. (WESTON) at the request of the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) pursuant to Contract DAAA15-90-D-0009, Delivery Order 009. The purpose of this enhanced PA report is to document the existing conditions at Fort Devens, Massachusetts, and to provide recommendations for further action.

The objectives of the enhanced PA were to:

- Identify and characterize areas requiring environmental evaluation (AREEs) associated with historical and current uses of the Fort Devens property.
- Identify and characterize possible impacts of the AREEs on the surrounding environment.
- Identify additional environmental actions, if any, that should be implemented for the AREEs identified.

Information contained in this enhanced PA report was obtained through:

- Visual inspection of the facility.
- Review of available Army documentation.
- Interviews with current employees at Fort Devens.
- Aerial photographs.

The AREEs have been grouped by the following categories:

- Incinerators
- Landfill Disposal Areas
- Wastewater Treatment Plant
- Storage Areas
- Waste Handling Areas
- Spills and Leaking Underground Storage Tank Areas
- Facility-Wide AREEs

HUMAN AND ENVIRONMENTAL RECEPTORS

The following summarizes the routes of human and environmental exposure from the types of releases identified at the AREEs:

- Groundwater supplies throughout most of Fort Devens are found primarily in the unconsolidated glacial outwash deposits. Areas of contamination (AOCs) are landfills (AREEs 4, 5, 18, and 40), which are currently being investigated for groundwater contaminants.

- Fort Devens is located in the Nashua River basin, and the Nashua River traverses the facility from south to north. Numerous smaller streams traverse the site as well. Natural and artificial impoundments and ponds exist on Fort Devens, along with extensive wetland areas.

- Contaminated surface/subsurface soils are potential sources of inhalation, ingestion or direct contact exposure risk to personnel working in or around them. Subsurface soils could contain contaminants of concern from several sources. These contaminants may be mobilized through erosion and sedimentation or carried to the aquifer.

- Releases to the air generally come from permitted operations at Fort Devens. Radon and asbestos management programs are ongoing. Remedial actions could lead to dust or vapor release to the air.

CONCLUSIONS AND RECOMMENDATIONS

Table ES-1 presents a summary of findings for each AREE and the recommended activity, if any. Figure ES-1 presents sampling locations and recommendation information for the AREEs. No conditions that present an imminent threat to human health were observed by WESTON on the extensive property. However, imminent threat to human health and the environment could exist. Possible exposure pathways are represented by human consumption of contaminated water or fish, game, and grazing stocks on the reservation. Although known and potential releases from various types of areas exist, resulting exposure to contamination is generally low due to restricted access and the distance to the nearest residences.

Table ES-1

AREEs Identified at Fort Devens and Recommendations for Further Action

AREE No.	Study Area/ Area of Contamination	Description	Figure	Summary of Findings	Concern	MEP Recommended Activity	Additional WESTON Recommended Activity
		Incinerators					
1	SA 1	Cutler Army Hospital Incinerator	ES-1b	From 1977 to present, incinerates medical/ biological waste.	Characteristics of ash and runoff.	Site scheduled for investigation FY 94.	--
2	SA 2	Veterinary Clinic Incinerator	ES-1b	From 1970 to present, incinerates animal carcasses.	Characteristics of ash.	Site scheduled for investigation FY 94.	--
3	SA 3	Intelligence School Incinerator	ES-1b	From 1971 to 1976, incinerated classified documents.	Characteristics of ash and surrounding soil.	Site scheduled for investigation FY 94.	--
4	AOC 4	Sanitary Landfill Incinerator (Bldg. 38)	ES-1a	From 1941 to late 1940s, incinerated household debris.	Leachate.	Remedial investigation conducted in 1991.	--
42	SA 42	Popping Furnace	ES-1c	Used until early 1960s; incinerated small arms ammunition; possible dumping adjacent to site.	Ash and other waste disposal.	Site scheduled for investigation FY 92.	Two additional surface soil samples are recommended by WESTON TCL Organics, TAL Metals, Explosives, TCLP Metals
		Landfill Disposal Areas					
5	AOC 5	Shepley's Hill Landfill (No. 1) Near Shepley's Hill	ES-1a	From 1917 to present, disposal of household refuse, construction/ demolition debris and military refuse.	Leachate.	Remedial investigation conducted in 1991.	--
18	AOC 18	Landfill No. 1 - Asbestos Cell	ES-1a	Asbestos disposal.	Asbestos.	Remedial investigation conducted in 1991.	--
6	SA 6	Landfill No. 2 -- South Post Area 7b	ES-1c	From 1850 to 1920, disposal of household refuse.	Waste disposal.	Site scheduled for investigation FY 95.	--

Table ES-1

AREEs Identified at Fort Devens and Recommendations for Further Action (continued)

AREE No.	Study Area/ Area of Contamination	Description	Figure	Summary of Findings	Concern	MEP Recommended Activity	Additional WESTON Recommended Activity
7	SA 7	Landfill No. 3 -- South Post Impact Area	ES-1c	From 1850 to 1920, disposal of household refuse.	Waste disposal.	Site scheduled for investigation FY 95.	--
8	SA 8	Landfill No. 4 -- South Post Area 8a	ES-1c	From 1900 to 1930 and possibly later, disposal of household refuse and military items.	Waste disposal.	Site scheduled for investigation FY 95.	--
9	SA 9	North Post Landfill (No. 5)	ES-1a	From 1955 to 1978, construction/demolition debris.	Waste disposal.	Site scheduled for investigation FY 92.	--
10	SA 10	Landfill No. 6 -- Near Shirley Gate	ES-1b	From 1975 to 1980, construction/demolition debris.	Waste disposal.	Site scheduled for investigation FY 95.	--
11	SA 11	Landfill No. 7 -- Near Lovell Street	ES-1b	From 1975 to 1980, construction/demolition debris.	Waste disposal.	Site scheduled for investigation FY 95.	--
12	SA 12	Landfill No. 8 -- South Post Combat Pistol Range	ES-1c	From 1960 to present, construction/demolition debris.	Waste disposal.	Site scheduled for investigation FY 92.	--
13	SA 13	Landfill No. 9 -- Near Lake George Street	ES-1b	From 1965 to 1970, construction/demolition debris and possibly oil.	Waste disposal.	Site scheduled for investigation FY 92.	--
14	SA 14	Landfill No. 10 -- South Post Near Dixie Road	ES-1c	Abandoned cars in quarry.	Waste disposal.	Site scheduled for investigation FY 92.	UXO Sweep and Survey for Vehicles
15	SA 15	Landfill No. 11 -- South Post Near Helipad	ES-1c	From 1963 to 1966, fuel oil burned.	Oil.	Site investigation conducted in 1991.	--
16	SA 16	Landfill No. 12 -- Main Post Near Shoppette	ES-1b	Used in 1985, household refuse. Photographic evidence beginning in 1952.	Waste disposal.	Site scheduled for investigation FY 94.	--

Table ES-1

AREEs Identified at Fort Devens and Recommendations for Further Action (continued)

AREE No.	Study Area/ Area of Contamination	Description	Figure	Summary of Findings	Concern	MEP Recommended Activity	Additional WESTON Recommended Activity
17	SA 17	Landfill No. 13 -- Little Mirror Lake	ES-1b	WWII grenades placed in lake.	Explosives.	Site scheduled for investigation FY 94.	--
40	AOC 40	Cold Spring Brook Landfill	ES-1b	Construction/demolition debris and drums.	Waste disposal.	Remedial investigation conducted in 1991.	--
41	SA 41	Unauthorized Dumping Area (Site A)	ES-1c	Disposal of unknown material.	Waste disposal.	Site scheduled for investigation FY 92.	--
46	SA 46	Training Area 6d -- South Post	ES-1c	Disposal of unknown material.	Waste disposal.	Site scheduled for investigation FY 95.	--
		Wastewater Treatment Plant					
19	SA 19	Wastewater Treatment Plant	ES-1a	From 1942 to present, treatment of sanitary sewage, floor drainage, wash rack discharge, boiler blowdown, swimming pool water, and filter backwash.	Inflow to sewer system.	Maintain monitoring programs and permits; note that sludge disposal is permitted at MAAF. Monitoring groundwater monitoring wells. Site scheduled for investigation FY 92.	Monitoring wells no longer in use should be grouted and removed.
20	SA 20	Rapid Infiltration Basins	ES-1a	Treatment of WWTP effluent.	Nitrates and other possible contaminants.	Site scheduled for investigation FY 92.	Monitoring wells no longer in use should be grouted and removed.
21	SA 21	Sludge Drying Beds	ES-1a	Application of sludge from WWTP Imhoff tanks.	Nitrates and other possible contaminants.	Site scheduled for investigation FY 92.	Monitoring wells no longer in use should be grouted and removed.
		Storage Areas					
22	SA 22	Hazardous Waste Storage Facility (Bldg. 1650)	ES-1a	RCRA-permitted storage for >90 days.	No known spill or release.	No further action.	Unit will require RCRA closure in accordance with permit when no longer in use.

Table ES-1

AREEs Identified at Fort Devens and Recommendations for Further Action (continued)

AREE No.	Study Area/ Area of Contamination	Description	Figure	Summary of Findings	Concern	MEP Recommended Activity	Additional WESTON Recommended Activity
23	SA 23	Paper Recycling Center (Bldg. 1650)	ES-1a	Former storage and transfer facility for paper.	No known spill or release.	No further action.	--
24	SA 24	Waste Explosive Storage Bunker (Bldg. 3644)	ES-1b	Storage of waste explosives from military and civilian sources.	Explosives and metals.	Site investigated in 1991;	RCRA closure when no longer in use.
29	SA 29	Transformer Storage Area (Bldg. 1438)	ES-1a	Storage of out-of-service transformers prior to disposal.	PCBs.	Site scheduled for investigation FY 94.	--
30	SA 30	Drum Storage Area - MAAF	ES-1a	Formerly used as satellite accumulation point for hazardous waste in drums.	Waste oil, fuels, and solvents.	Site scheduled for investigation FY 92.	--
32	SA 32	DRMO Yard	ES-1a	Scrap and equipment storage area.	Metals, solvents, and other materials.	Site investigated in 1991.	Twenty surface soil samples; analysis for PCBs.
33	SA 33	DEH Entomology Shop (Bldg. 262)	ES-1a	Pesticide/herbicide storage and mixing.	Pesticides/ herbicides.	Site scheduled for investigation FY 94.	In addition, wipes of building for pesticides.
34	SA 34	Former DEH Entomology Shop (Bldg. 245)	ES-1a	Former pesticide/ herbicide storage.	Pesticides/ herbicides.	Site scheduled for investigation FY 94.	In addition, wipes of building for pesticides.
35	SA 35	Former DEH Entomology Shop (Bldg. 254)	ES-1a	Former pesticide/ herbicide storage.	Pesticides/ herbicides.	Site scheduled for investigation FY 94.	In addition, wipes of building for pesticides.
36	SA 36	Former DEH Entomology Shop (Bldg. 2728)	ES-1b	Former pesticide/ herbicide storage.	Pesticides/ herbicides.	Site scheduled for investigation FY 94.	In addition, wipes of building for pesticides.
37	SA 37	Golf Course Entomology Shop (Bldg. 3622)	ES-1b	Former pesticides storage and mixing. Possible LUST site.	Pesticides/ herbicides.	Site scheduled for investigation FY 94.	In addition, wipes of building for pesticides.

Table ES-1

AREEs Identified at Fort Devens and Recommendations for Further Action (continued)

AREE No.	Study Area/ Area of Contamination	Description	Figure	Summary of Findings	Concern	MEP Recommended Activity	Additional WESTON Recommended Activity
		Waste Handling Areas					
25	SA 25	EOD Range - South Post	ES-1c	Waste explosives destruction.	Metals, explosives, UXO.	Site investigated in 1991;	RCRA closure when no longer in use and UXO Sweep.
26	SA 26	Zulu I and II Ranges - South Post	ES-1c	Training area/hand grenade range; open burning of explosives.	Metals, explosives, UXO.	Site investigated in 1991.	UXO Sweep
27	SA 27	Hotel Range - South Post	ES-1c	Training area/20-mm cannon fire.	Metals, explosives, UXO.	Site scheduled for investigation FY 92.	UXO Sweep
28	SA 28	Training Area 14 - South Post	ES-1c	Training area/waste explosives detonation.	Metals, explosives, UXO.	Site scheduled for investigation FY 92.	UXO Sweep
31	SA 31	Fire-fighting Training Area - MAAF	ES-1a	Burning of jet fuel and solvents for training.	Fuels/solvents.	Site scheduled for investigation FY 92.	--
38	SA 38	Battery Repair Area (Bldg. 3713)	ES-1a	Battery acid formerly neutralized in pit.	Metals.	Site scheduled for investigation in FY 92.	--
45	SA 45	Wash Rack at Lake George Street	ES-1b	Wash rack for private vehicles.	Waste oil, POL.	Site scheduled for investigation in FY 92.	--
		Spills and Leaking Underground Storage Tank Areas					
39	SA 39	Transformer Near Bldg. 4250	ES-1b	Leak from PCB-contaminated transformer; soil removal and sampling in 1984; UST removal also poorly documented.	PCBs, POL.	Present results to MDEP for approval; maximum PCB concentration of 20 ppm following removal.	Review records on UST removal. Recommendation for sampling based on findings.

Table ES-1

AREEs Identified at Fort Devens and Recommendations for Further Action (continued)

AREE No.	Study Area/ Area of Contamination	Description	Figure	Summary of Findings	Concern	MEP Recommended Activity	Additional WESTON Recommended Activity
44	SA 44	Cannibalization Yard	ES-1a	Vehicle storage with possible leaks; HWAA; UST site.	Waste oil, POL.	Site scheduled for investigation in FY 92.	--
43	SA 43 and SA 54	Historic Gas Station Sites	ES-1b	WWII-era gasoline storage and distribution with possible LUST sites.	POL.	Site scheduled for investigation in FY 92.	--
47	SA 47	Bldg. 3816 LUST Site - MAAF	ES-1a	Diesel fuel storage; LUST site.	POL.	Site scheduled for investigation in FY 92.	--
48	SA 48	Bldg. 202 LUST Site	ES-1a	Fuel handling and storage.	POL.	Site investigated in 1991.	--
49	SA 49	Bldg. 3602 LUST Site	ES-1b	Fuel handling and storage.	POL.	Site scheduled for investigation in FY 92.	--
50	SA 50	WWII Fuel Points - MAAF	ES-1a	Fuel handling and storage.	POL.	Site scheduled for investigation in FY 92.	--
51	SA 51	Bldg. 3412, O'Neil Bldg. Spill Site	ES-1b	Fuel handling and storage.	POL.	Site scheduled for investigation in FY 92.	--
52	SA 52	TDA Maintenance Yard	ES-1a	Vehicle storage with possible leaks.	Waste oil, POL.	Site scheduled for investigation in FY 92.	--
53	SA 53	POL Spill Areas - South Post	ES-1b and ES-1c	Fuel handling and temporary storage.	POL.	Sites scheduled for investigation in FY 95.	--
55	SA 55	Shirley Housing Area - Trailer Park Fuel Tanks	ES-1b	Possible fuel oil LUST sites.	POL.	Site scheduled for investigation FY95.	--
56	SA 56	Bldg. 2417 LUST Site	ES-1b	Fuel oil LUST site.	POL.	Site scheduled for investigation FY 92.	--
57	SA 57	Bldg. 3713 Fuel Oil Spill Site	ES-1a	Fuel oil spill.	POL.	Site scheduled for investigation FY 92.	--

Table ES-1

AREEs Identified at Fort Devens and Recommendations for Further Action (continued)

AREE No.	Study Area/ Area of Contamination	Description	Figure	Summary of Findings	Concern	MEP Recommended Activity	Additional WESTON Recommended Activity
58	SA 58	Bldgs. 2648 and 2650 LUST Sites	ES-1b	Fuel oil LUST sites.	POL.	Site scheduled for investigation FY 92.	--
59	NA	Bridge 526	ES-1b	Contaminated grit may have washed from the site.	Metals.	NA	Collect six soil samples adjacent to the site for TAL metals and collect six sediment and six surface water samples downstream.
		Facility-Wide AREEs					
60	NA	Training Areas and Ranges	NA	Training areas and ranges have been used for various activities.	UXO, metals, POL.	NA	Sites should be inspected and records reviewed; sampling based on findings.
61	NA	Waste Accumulation Areas	NA	Some release may have occurred.	Waste oil, POL, solvents.	NA	Sites should be inspected; sampling based on findings.
62	NA	USTs - Existing	NA	Management program in place for USTs.	POL.	NA	Maintain UST Management Program.
63	NA	USTs - Previously Removed	NA	Sketchy records for some LUST removals.	POL.	NA	Investigate former UST sites and review records to determine the adequacy of previous UST removals.
64	NA	ASTs	NA	Adequate listing and records of ASTs not available.	POL.	NA	Maintain AST Management Program.
65	NA	Asbestos	NA	Asbestos is managed at Fort Devens.	Asbestos.	NA	Maintain Asbestos Management Program.

Table ES-1

AREEs Identified at Fort Devens and Recommendations for Further Action (continued)

AREE No.	Study Area/ Area of Contamination	Description	Figure	Summary of Findings	Concern	MEP Recommended Activity	Additional WESTON Recommended Activity
66	NA	Transformers	NA	PCB-containing transformers are managed at Fort Devens.	PCBs.	NA	Maintain PCB Transformer Management Program.
67	NA	Radon	NA	Radon levels are currently being evaluated at Fort Devens.	Radon.	NA	Maintain Radon Management Program.
68	NA	Lead Paint	NA	Buildings exhibit possible lead above TCLP levels.	Lead.	NA	Review available data and inventory buildings.
69	NA	Past Spill Sites	NA	Spills identified by records.	Various.	NA	Consolidate and review available data. Site inspection. Sampling recommended based on findings.

TCLP Metals = RCRA Toxicity Characteristic Leaching Procedure metals.
TAL metals = Target Analyte List metals.
TCL organics = Target Compound List organics.
PCB = Polychlorinated biphenyls.
NA = Not applicable.
Explosives = HMX; RDX; nitrobenzene; 1,3-dinitrobenzene; 1,3,5-trinitrobenzene; 2,4-dinitrotoluene; 2,6-dinitrotoluene; 2,4,6-trinitrotoluene; tetryl; 2-nitrotoluene; and others as appropriate.
UXO = Unexploded ordnance.
POL = Petroleum, oils, and lubricants.
MEP = Master Environmental Plan for Fort Devens, Massachusetts.
LUST = Leaking Underground Storage Tank.
UST = Underground Storage Tank.
AST = Aboveground Storage Tank.
FY = Fiscal year.
SA = Study area.
AOC = Area of contamination.

SECTION 1

INTRODUCTION

1.1 BACKGROUND

Roy F. Weston, Inc. (WESTON) has been retained by the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) to prepare Enhanced Preliminary Assessment (PA) Reports under the authority of Contract DAAA15-90-D-0009, Delivery Order 009. This work is being performed within the scope of the U.S. Army Installation Restoration Program (IRP) Base Closure Division.

The purpose of enhanced PA reports is to document the existing conditions at the properties and to provide recommendations for further action. The recommendations will serve as a guide to the U.S. Army in prioritizing the activities required to report these properties as excess.

This report discusses the enhanced PA of Fort Devens, Massachusetts. WESTON conducted a site visit on 16 through 19 September 1991.

1.2 OBJECTIVES

This enhanced PA report was prepared using existing information obtained from property records and interviews with current employees familiar with this property. No sampling activities were completed as part of this assessment.

The objectives of the enhanced PA are as follows:

- Identify and characterize areas requiring environmental evaluation (AREEs) associated with historical and current uses of the property.
- Identify and characterize possible impacts of the AREEs on the surrounding environment.
- Identify additional environmental actions, if any, that should be initiated for the AREEs identified.

1.3 HISTORY OF ENVIRONMENTAL WORK AT FORT DEVENS

In August 1982, an Installation Assessment (Preliminary Assessment) of Fort Devens was conducted. No additional Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) related studies were recommended. In 1985, a Solid Management Unit Report was prepared for Fort Devens to identify possible Solid Waste Management Units (SWMUs) as part of the Resource Conservation and Recovery Act (RCRA) Part B permit for Fort Devens' hazardous waste storage facility. Forty

SWMUs were identified. Action was recommended at 10 of the SWMUs, which included the Shepley's Hill Landfill (No. 1) and Cold Spring Brook Landfill.

In order to define areas requiring investigations, to outline types of studies required, and to assist the Army with continuity of the Fort Devens project, a Master Environmental Plan (MEP) was initiated in 1988. Fort Devens was subsequently placed on the National Priorities List (NPL) on 21 December 1989. The listing of Fort Devens as an NPL site was a result of volatile organic contamination in the groundwater at the Shepley's Hill Landfill (No. 1) and metal contamination in the groundwater at the Cold Spring Brook Landfill, and the close proximity of both locations to public water supplies. After listing of the site, work on the MEP was halted until the Federal Facilities Interagency Agreement (IAG) could be developed. A two-party IAG was signed by the Army and the U.S. Environmental Protection Agency (EPA), Region I, on 13 May 1991 and finalized on 15 November 1991. The IAG is the framework for the implementation of the CERCLA/Superfund Amendments and Reauthorization Act (SARA) process at Fort Devens. Work on the MEP was resumed after development of the IAG, and the regulatory draft final was submitted for review on 29 November 1991.

The interrelationship between the Army's IRP and the CERCLA/SARA process is delineated in the MEP.

With the inclusion of Fort Devens on the Defense Secretary's BRAC 91 list, an enhanced Preliminary Assessment was required to address areas not normally included in the CERCLA process, but that required review prior to closure. While the enhanced PA addresses MEP activities, its focus is to determine whether additional areas require detailed records review and site investigation, and to provide information and procedures to investigate installation wide areas requiring environmental evaluation.

The IAG requires full integration of CERCLA remedial programs and RCRA corrective actions at Fort Devens. The areas regulated under RCRA will require closure when no longer in use. Closure of units in accordance with RCRA does not constitute RCRA corrective actions and no RCRA corrective actions have been initiated at Fort Devens. The enhanced PA addresses the RCRA closure of regulated units. RCRA units will be closed in accordance with the applicable requirements of 40 CFR 262, 264, and 265. Should closure lead to RCRA corrective actions at any of the units, this will be addressed under the IAG process.

1.4 PROCEDURES

The information contained in this enhanced PA report is based on the following data-gathering activities:

- Visual inspection of the facilities.
- Review of available Army information.
- Interviews with current employees familiar with Fort Devens operations.
- Evaluation of aerial photographs.

No survey was conducted by WESTON of buildings at Fort Devens regarding the presence of lead solder, lead pipes, and/or brass fixtures associated with drinking water systems. There was no survey by WESTON for the presence of lead-based paints on building or equipment surfaces. Additionally, there was no survey by WESTON for the presence of asbestos.

1.5 REPORT FORMAT

This enhanced PA report presents an evaluation of the relevant data for Fort Devens. Section 2 describes the property and provides general environmental information about the site. Section 3 identifies and characterizes all AREEs at Fort Devens related to known and suspected releases to the environment. The potential impacts of these operations on the local environment and human receptors are discussed in Section 4. Section 5 summarizes the findings and conclusions, discusses the quality and reliability of the supporting information, identifies areas requiring further action, and presents recommendations as to how such actions may be accomplished. Section 6 lists the pertinent materials reviewed and the agencies contacted. Photographs taken during the site visit are provided in Section 7. Supporting documentation is provided in Appendices A, B, C, D, E, and F.

SECTION 2

PROPERTY CHARACTERIZATION

2.1 PROPERTY DESCRIPTION AND HISTORY

Camp Devens was established in 1917 as a temporary training camp for soldiers from the New England area. It was named in honor of Civil War hero General Charles Devens. Peak military strength during the World War I era was 38,000. In 1922, Camp Devens was designated a summer training camp for several military groups. By 1931, Camp Devens became a permanent post and was renamed Fort Devens. Between 1931 and 1940, Fort Devens functioned as a training installation. From November 1940 until May 1946, Fort Devens provided an induction center for an estimated 650,000 people in response to World War II. At the close of World War II, Fort Devens served as a demobilization center and was subsequently placed on caretaker status. It was again used as an induction and training center during the Korean and Vietnam conflicts.

Fort Devens is currently on the list for base closures, but continues to function primarily as a training center. Currently, the mission of Fort Devens is to command and train its assigned units and to support the U.S. Army Intelligence School, Fort Devens, the U.S. Army Reserve, the Massachusetts National Guard, and the Reserve Office Training Programs.

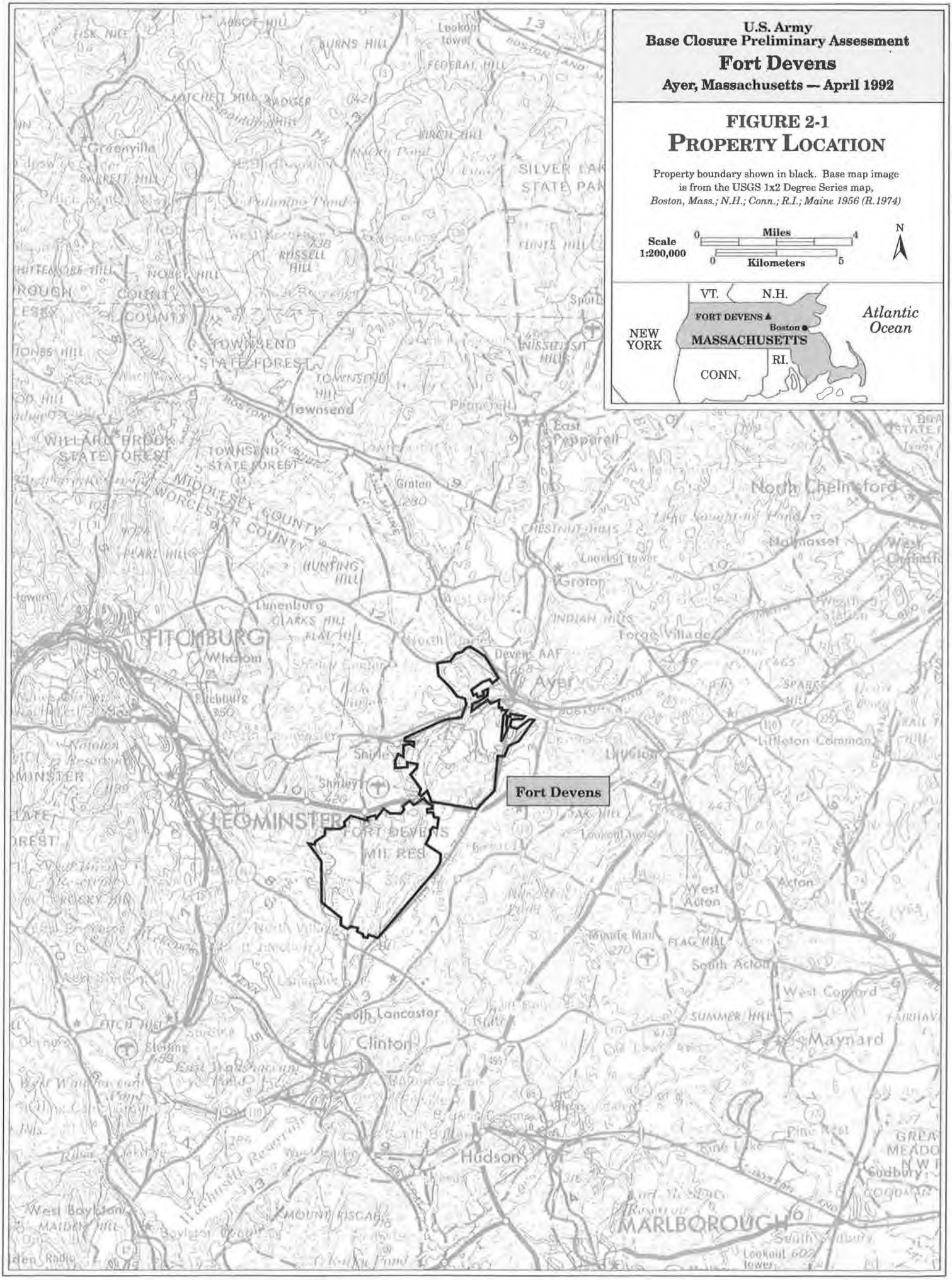
Fort Devens is located in Worcester and Middlesex Counties, approximately 40 miles west of Boston, Massachusetts, in the vicinity of the town of Ayer (see Figure 2-1). In 1917, approximately 11,000 acres was leased to establish Camp Devens. Between 1919 and 1923, approximately 4,900 acres was purchased. In June 1940, Fort Devens received permission to acquire more land, and by 1941, the total land area had increased to 10,163 acres.

Since 1955, various land parcels, ranging in size from 1 to 662 acres, have been excessed by Fort Devens. The more recent transactions included the 662 acres for the Oxbow National Wildlife Refuge, excessed in 1972 to the Department of the Interior; 76.5 acres deeded to the Town of Ayer in 1978; and an additional 57.26 acres, excessed in 1988.

Fort Devens currently covers approximately 9,280 acres, consisting of three areas:

- Main Post area
- North Post area
- South Post area

Massachusetts Highway 2 crosses Fort Devens and separates the Main Post from the South Post.


U.S. Army
Base Closure Preliminary Assessment
Fort Devens
Ayer, Massachusetts — April 1992
FIGURE 2-1
PROPERTY LOCATION
Property boundary shown in black. Base map image is from the USGS 1x2 Degree Series map, Boston, Mass.; N.H.; Conn.; R.I.; Maine 1956 (R.1974)
Scale 1:200,000
0 Miles 4
0 Kilometers 5
N
VT.
N.H.
FORT DEVENS
Boston
NEW YORK
MASSACHUSETTS
RI.
CONN.
Atlantic Ocean
Fort Devens
Greenville
Townsend
East Pepperell
Groton
North Chelmsford
Ayer
Devens AAF
FITCHBURG
LEOMINSTER
Shirley
Lunenburg
Littleton Common
West Acton
Acton
South Acton
West Concord
Maynard
South Lancaster
Clinton
Hudson
MARLBOROUGH
Sudbury
West Boylston
Mount Pisgah

The terrain surrounding Fort Devens is generally rolling to hilly. Fort Devens is located in the Nashua River Basin, and approximately 8 miles of the river lie within the reservation boundaries.

2.2 DESCRIPTION OF FACILITIES

A large majority of the facilities at Fort Devens lie within the Main Post, located north of Massachusetts Highway 2. The Main Post provides all of the on-post housing, including over 1,700 family units and 9,800 bachelor units (barracks and unaccompanied officers' quarters). Other facilities on the Main Post include community services (such as the shoppette, cafeteria, post exchange, bowling alley, golf course, and hospital), administrative buildings, classroom and training facilities, maintenance facilities, and ammunition storage.

An important element of the land use on the Main Post is the Nashua River Greenway. An area 300 ft on either side of the centerline of the river has been identified as part of the Nashua River Greenway Management Plan. This greenway plan sets aside a vegetative buffer to help protect the river from pollution, prevent soil erosion, and preserve the natural floodplain. Additional benefits from the plan include reduced flood damage, a habitat for wildlife, and conservation of forests along the full length of the river.

The South Post is located south of Massachusetts Highway 2 and contains individual training areas designated for troop training, range activities, and a drop zone. Only about 3,500 acres is usable because of the physiographic considerations. The Nashua River and the associated greenway bound the South Post on the northeast side.

The North Post is located directly north of the Main Post. The principle activity on the North Post is the Douglas E. Moore Army Airfield (MAAF). The airfield is used for military purposes and consists of two fixed wing runways and two rotary wing runways. A parking area for 15 rotary wing aircraft is available adjacent to the permanent hangers and the two rotary wing runways. The North Post also contains the Wastewater Treatment Plant (WWTP) for Fort Devens, including the associated Rapid Infiltration Basins and Sludge Drying Beds. The remainder of the North Post is designed as troop training areas. The Nashua River traverses the North Post and the associated river greenway bisects the area.

2.3 GENERAL ENVIRONMENTAL INFORMATION

2.3.1 DEMOGRAPHICS AND ADJACENT LAND USE

Fort Devens is located in Middlesex and Worcester Counties, Massachusetts. Fort Devens is located in portions of four townships—Ayer, Harvard, Lancaster, and Shirley—and the Main Post adjoins the Towns of Ayer and Shirley to the east and west, respectively, and Harvard boundaries contain a significant portion of the Main Post. Table 2-1 provides a property information summary.

Table 2-1

Property Information Summary

Name: Fort Devens, Massachusetts

FFIS Number: MA-214020270

Installation Number: 25145

Command: U.S. Army Forces Command (FORSCOM)

Counties: Middlesex
Worcester

Property Description: In portions of the townships of Ayer, Harvard, Lancaster, and Shirley. Three areas make up Fort Devens (North Post, Main Post, and the South Post). The Nashua River traverses or forms the boundary of the three areas. The 711.3-acre Oxbow National Wildlife Refuge is located along the east central portion of Fort Devens. A total of 662 acres of the refuge was transferred to the Department of Interior in 1974 and the remaining 49.3 acres were transferred in 1987.

Installation Coordinates: 42°32' N; 71°34' W

Size: 9,280.45 acres

Mission: Command, train, and provide logistical support for nondivisional troop units. Provide support for that portion of the U.S. Army Intelligence School located at Fort Devens, for the Army Readiness Region, and for Reserve components. Provide support for the Army Reserve and Army National Guard for the New England area. Currently on the list for base closure.

The surrounding towns (Ayer, Harvard, Shirley, and Lancaster) are zoned for residential, commercial, and limited industrial development. All have fewer than 10,000 population, except Harvard, which has an estimated population of 13,000, including Fort Devens personnel.

The Town of Ayer and the fort to the north are contiguous and appear to make up a single community; the main street of Ayer passes the main gate of Fort Devens. The town of Shirley borders the northwestern part of Fort Devens. The Shirley Gate provides direct access from the fort to Shirley. North of the Shirley Gate, the Nashua River forms a natural boundary between the fort and the town. South of the gate, the Nashua River and Route 2 form buffers between the fort and the largely undeveloped abutting lands. Most of the 6 miles of boundary between the fort and Harvard lie along the railroad line, and a strip of marshland and wooded hills separates the fort from this semi-rural suburban community. Like Harvard, Lancaster shares a long boundary with the fort. The town has a generally rural characteristic (FORSCOM, 1980).

The number of farms and the amount of agricultural land in the region have seriously declined since World War II. Agriculture remains an integral part of the area, with approximately 21,000 acres classified as agricultural land. The area is expected to remain predominantly open and rural (STV/Lyon, 1987a).

2.3.2 CLIMATE

The climate of Fort Devens is influenced by the following features:

- Latitude (42° N)
- Proximity to frequently followed storm tracks
- Proximity to the ocean

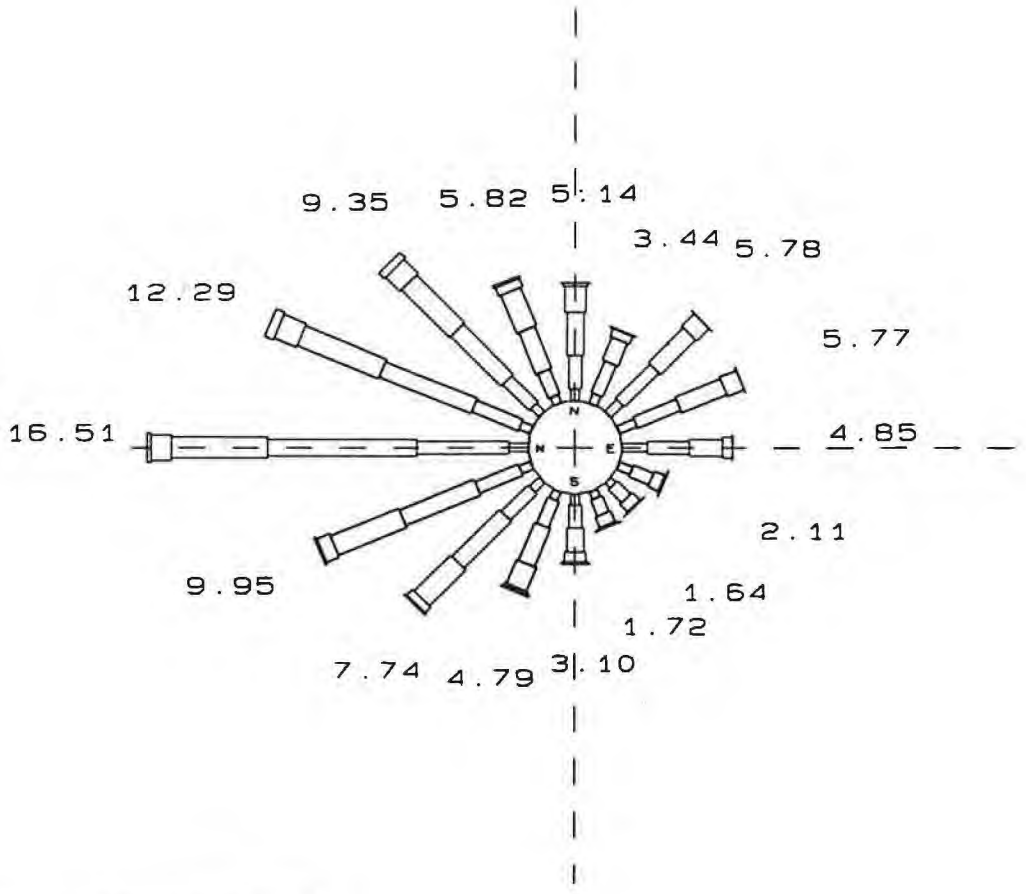
Massachusetts lies in the "Prevailing Westerly" at 42° north latitude. Relative to other sections of the continental United States, a large number of storm systems pass over or near Massachusetts. The majority of these systems come from the interior of the continent.

Figure 2-2 is a wind rose showing wind conditions for Worcester, Massachusetts, which is approximately 20 miles south-southwest of Fort Devens, for the years 1985 through 1990. The prevailing winds are from a westerly direction and show a seasonal variation. In the winter, the winds have a strong northwesterly component, while during the summer the winds are primarily from the west-southwest.

Climatological data used are from Worcester, Massachusetts, which is representative of the Fort Devens area.

Rainfall is evenly distributed over the entire year. Normal yearly precipitation is 45.24 inches. The majority of summer rainfall results from showers and thundershowers. During the rest of the year, storm systems from the interior of the continent and coastal storms produce precipitation on an average of one day in three.

WORCESTER MUNICIPAL AIRPORT, MA
1985 THROUGH 1990
CALMS INCLUDED



	WIND SPEED (KNOTS) PERCENT OCCURRENCE					
	0-3	3-6	6-10	10-16	16-21	>21
N	0.53	1.46	1.87	1.13	0.13	0.02
NNE	0.47	1.50	1.07	0.38	0.02	0.01
NE	0.72	2.14	2.14	0.74	0.04	0.01
ENE	0.79	2.04	2.14	0.78	0.01	0.00
E	1.10	1.84	1.46	0.43	0.02	0.00
ESE	0.60	0.95	0.49	0.06	0.01	0.00
SE	0.31	0.81	0.47	0.05	0.00	0.00
SSE	0.35	0.76	0.52	0.08	0.01	0.00

	WIND SPEED (KNOTS) PERCENT OCCURRENCE					
	0-3	3-6	6-10	10-16	16-21	>21
S	0.48	1.01	1.09	0.40	0.07	0.05
SSW	0.41	1.26	1.82	1.13	0.14	0.04
SW	0.57	1.63	2.92	2.22	0.35	0.05
WSW	0.52	2.04	3.48	3.23	0.60	0.10
W	0.84	3.95	6.54	4.14	0.87	0.18
WNW	0.50	2.19	4.29	3.83	1.07	0.41
NW	0.49	1.62	3.08	2.95	0.86	0.34
NNW	0.38	1.20	1.96	1.80	0.39	0.09

FIGURE 2-2 WIND ROSE

The normal snow season is December through March. Average yearly snowfall is 70.4 inches.

Temperatures vary moderately from season to season. The coldest month is January, with an average temperature of 23.6°F, and the warmest month is July, with an average temperature of 68.6°F. The average date of the last freeze is early April and the first freeze is early October.

Coastal storms or "northeasters" are Worcester's most serious weather hazard. Northeasters can produce high winds, heavy rain, or snow. Occasionally, storms of tropical nature will affect the area, causing widespread damage. Inland, heavy rain and high winds can also cause serious damage. Tornadoes are not a common occurrence, and the chance of a tornado striking the area is extremely small. Thunderstorms occur about 20 to 30 days a year, and the most severe are accompanied by high winds, hail, and heavy rain. Ice storms can occur during the winter but are usually brief in duration.

2.3.3 PHYSIOGRAPHY AND SURFACE WATER

Fort Devens is situated within the riverine lowlands of the Nashua River Basin and borders the hilly uplands east of the Worcester County Plateau or Central Uplands Province. Local relief at Fort Devens ranges from 250 ft above mean sea level (MSL) within the floodplain area along the Nashua River to 350 ft MSL at Shepley's Hill and reaches a maximum of 455 ft MSL at Whittemore Hill. The topography typifies the results of glacial activities that helped form the Nashua River Valley outwash plain.

Predominant landforms on the South Post include a series of kame terraces dissected by secondary tributary streams and wetlands, with esker-like ridges around Cranberry and Oak Hill Ponds. Several low ridges of sand and gravel also surround the pond and lake areas at the Main Post. The remaining property is characterized by broad kame terraces, of which the majority have been smoothed to accommodate most of the fort's 1,200 buildings and other facilities. MAAF at the North Post is situated on a broad kame terrace that was smoothed to accommodate a 4,985-ft main runway and associated facilities. The western half of the North Post, which includes the sewage filtration beds, is characterized by a series of north-south oriented eskers bordering the west bank of the Nashua River and a smaller, flat-topped kame terrace to the west bordered by Walker Road (PAL, Inc., 1989).

The north branch of the Nashua River is formed by the confluence of Flag Brook and the Whitman River in West Fitchburg. The south or main branch originates at the Wachusett Reservoir Dam south of Clinton. The north and south branches of the Nashua River converge at South Lancaster, less than a mile south of the South Post boundary. The Nashua River flows northward through the northeastern portion of the South Post area and along the western boundary of the Main Post. The Nashua River continues northward and discharges to the Merrimack River at Nashua, New Hampshire. Several tributaries feed the Nashua River, including the Squannacook and

Nissitissit Rivers. As shown in Figure 2-3, several secondary feeder streams and brooks throughout the reservation control drainage discharging to the Nashua River.

Several fresh water impoundments occur within Fort Devens, including Robbins Pond, Mirror Lake, Little Mirror Lake, Slate Rock Pond, Oak Hill Pond, and Cranberry Pond. Along the northeast boundary of the Main Post are Plow Shop Pond and Grove Pond.

A comprehensive discussion of the physiography and drainage patterns throughout Fort Devens is presented in the Historic and Prehistoric Reconnaissance Survey, Fort Devens, Massachusetts (PAL, Inc., 1989).

Groundwater provides the main source of potable water for Fort Devens. Groundwater is pumped from three large-diameter and 74 small-diameter production wells. The production wells are described in further detail in Subsection 2.3.5.

As shown in Figure 2-3, the 100-year floodplain is most developed within the Nashua River system: "During the site visit [conducted by Environmental Science and Engineering, Inc. (ESE) in 1982] sufficient rainfall occurred at Fort Devens to approximate a 100-year flood. The extent of the flooding was observed during an aerial tour of the installation on June 9, 1982. The areas most affected by floodwaters were located along the Nashua River" (ESE, 1982).

2.3.4 SOILS

The four major soils associations found at the Fort Devens military reservation are shown in Figure 2-4. In general, these associations divide the reservation into four soil units that run north to south, with the exception of the northern tip of Fort Devens, which has a small cluster of three soil types within an area covering approximately 2 square miles. These four major soils associations include the following:

- Winooski-Limerick-Saco: Very deep, nearly level soils that are moderately well drained, poorly drained, and very poorly drained; on floodplains.
- Hinkley-Merrimac-Windsor: Very deep, nearly level to steep soils that are excessively drained and somewhat excessively drained; on outwash plains.
- Paxton-Woodbridge-Canton: Very deep, nearly level to steep soils that are well drained and moderately well drained; on uplands.
- Chatfield-Hollis: Moderately deep and shallow, gently sloping to moderately steep soils that are well drained or somewhat excessively drained; on uplands.

2.3.5 REGIONAL GEOLOGY AND HYDROGEOLOGY

2.3.5.1 Surficial Geology

The surficial geology throughout most of Fort Devens is characterized by three primary types of glacially derived unconsolidated sediments. A mantle of Pleistocene-age glacial till, outwash, and lacustrine (lake) deposits, ranging in thickness from a few inches to approximately 100 feet, blanket the irregular bedrock surface underlying Fort Devens.

Glacial till is composed of a poorly sorted matrix of clay, silt, sand, gravel, and boulders; outwash is composed of coarser grained sediments including sand, pebble, cobble gravel, and boulders; lacustrine or lake deposits consist of clays and sands. The geologic history of the area, the mechanisms of sediment transport and deposition, and the geomorphology have been described in detail by Emerson (1917), Jahns (1953), Peck (1975), and Russell and Allmendinger (1975).

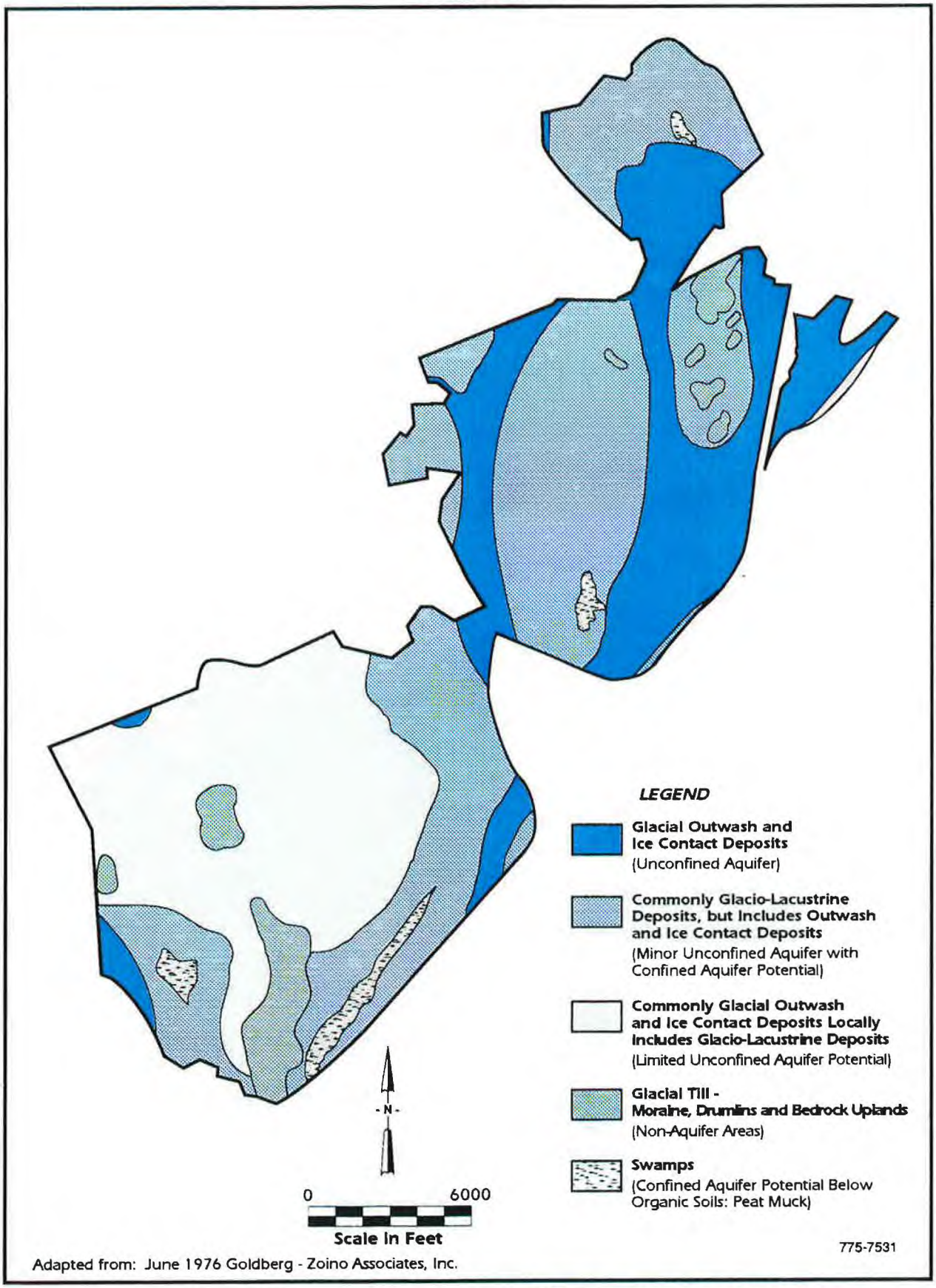
Figure 2-5 depicts the surficial geology for Fort Devens, showing the major aquifers. As shown, the surficial materials within the MAAF and Main Post are comprised of lacustrine deposits (within the central area) contacted on the boundaries by low undulating ridges of outwash deposits. Exposures of glacial till are evident at Shepley's Hill and several areas south of Shepley's Hill. Sediments in the southern training area are comprised mainly of stratified glacial outwash that was deposited over a broad area, referred to as an outwash plain. Outwash plains are typically flat, well drained, relatively free from boulders, and are usually clustered in a riverine setting, such as the Nashua and Nashoba Valleys (MHC, 1985). A band of glacio-lacustrine deposits extends from the southern boundary along the eastern property line into the Oxbow National Wildlife Refuge. Thin deposits of till are exposed on Whittemore Hill and on an unnamed hill to the north.

2.3.5.2 Bedrock Geology

Fort Devens is underlain by a complex assemblage of intensely folded and faulted metasedimentary rocks with occasional igneous intrusions. Bedrock occurs at depths of approximately 100 feet to ground surface where it outcrops at Shepley's Hill. The erosional surface of the bedrock is moderate.

According to Robinson (1978), two rock subunits of the Merrimack and Worcester Formations exist. The Merrimack (classified as Lower Devonian to Silurian age) is described as follows:

> Micaceous ankeritic siltstone-metamorphosed calcareous siltstone. Beds are thinly laminated. Bedding sets range from 1 to 8 cm in thickness. At metamorphic grade lower than biotite zone, the lithology consists of light-tan quartz-muscovite-ankerite-(albitized detrital plagioclase)-(chlorite) siltstone interbedded with thin, dark-greenish-gray, chlorite-muscovite-quartz-ankerite phyllite beds. Thin laminae and brown spots of ankerite



Adapted from: June 1976 Goldberg - Zoino Associates, Inc.

FIGURE 2-5 SURFICIAL GEOLOGY AQUIFER POTENTIAL MAP OF THE FORT DEVENS AREA

are evident on weathered siltstone surfaces. At biotite and actinolitegrade, the rock is a fine-grained reddish and greenish siltstone-granofels. Quartz-plagioclase-chlorite-muscovite-(calcite)-(epidote), quartz-plagioclase-biotite-(calcite)-(chlorite)-epidote, quartz-biotite-plagioclase-(actinolite)-epidote, quartz-plagioclase-biotite-(muscovite)-epidote, and quartz-muscovite-biotite-plagioclase-(garnet) mineral assemblages are present. Above actinolite grade of metamorphism, less than 50 percent of the unit contains actinolite-bearing assemblages. The more pelitic bulk chemistry distinguishes this unit from the Merrimack Formation quartzo-feldspathic granofels (mqfg). Gradational contacts with adjacent subunits. Correlative with unit 2 of Peck (1975) (Robinson, 1978).

A second subunit of the Worcester Formation (classified as Devonian to Ordivician) is described as follows:

Dark-gray carbonaceous slate, phyllite, and metagraywacke consisting of medium-dark-gray carbonaceous slate, phyllite, and silt- to fine-sand-size metagraywacke. These materials weather light gray with some rusty spots from oxidation of pyrite. Thin (less than 4 mm) to massive (11 cm) beds averaging 2 to 7 cm in thickness occur. Graded beds and crosslaminations are present in some metagraywacke and pelite beds. Thin graphite-rich seams and beds common. Minor sand-size quartzwacke, sandstone, and arkose beds and lenses exist. Both aluminous and subaluminous pelite beds are present. This unit constitutes unit 3 of Peck (1975) and was mapped as the Worcester phyllite by Emerson (1917). Muscovite-chlorite-quartz-(plagioclase)-(biotite)-(garnet)-graphite mineral assemblages are present (Robinson, 1978).

A third unit, previously mapped as the Mississippian age Oakdale quartzite was mapped by Emerson (1917). The composition of this rock unit is described as being slightly biotitic with calcareous lenses. This unit is underlain and intruded by the Ayer granite. Emerson shows that the strike of most of the formational contacts generally exhibit a northeast trend.

2.3.5.3 Hydrogeology

As shown in Figure 2-5, the principle aquifers under Fort Devens follow the Nashua River Valley. Most unconsolidated aquifers considered favorable for high-yield wells are in the proximity of, and hydraulically interconnected to, surface water bodies. Groundwater at Fort Devens occurs primarily within the permeable glacial outwash deposits of sand, gravel, cobble, and boulders.

Saturated thickness of the primary aquifer ranges upwards to 60 feet. Depth to the water table ranges from 0 to 30 feet. It has been reported that the regional groundwater flow is to the west (Fox, 1988a). However, it is more likely that the primary aquifer is influent to the Nashua River, and, for the most part, flow directions at other

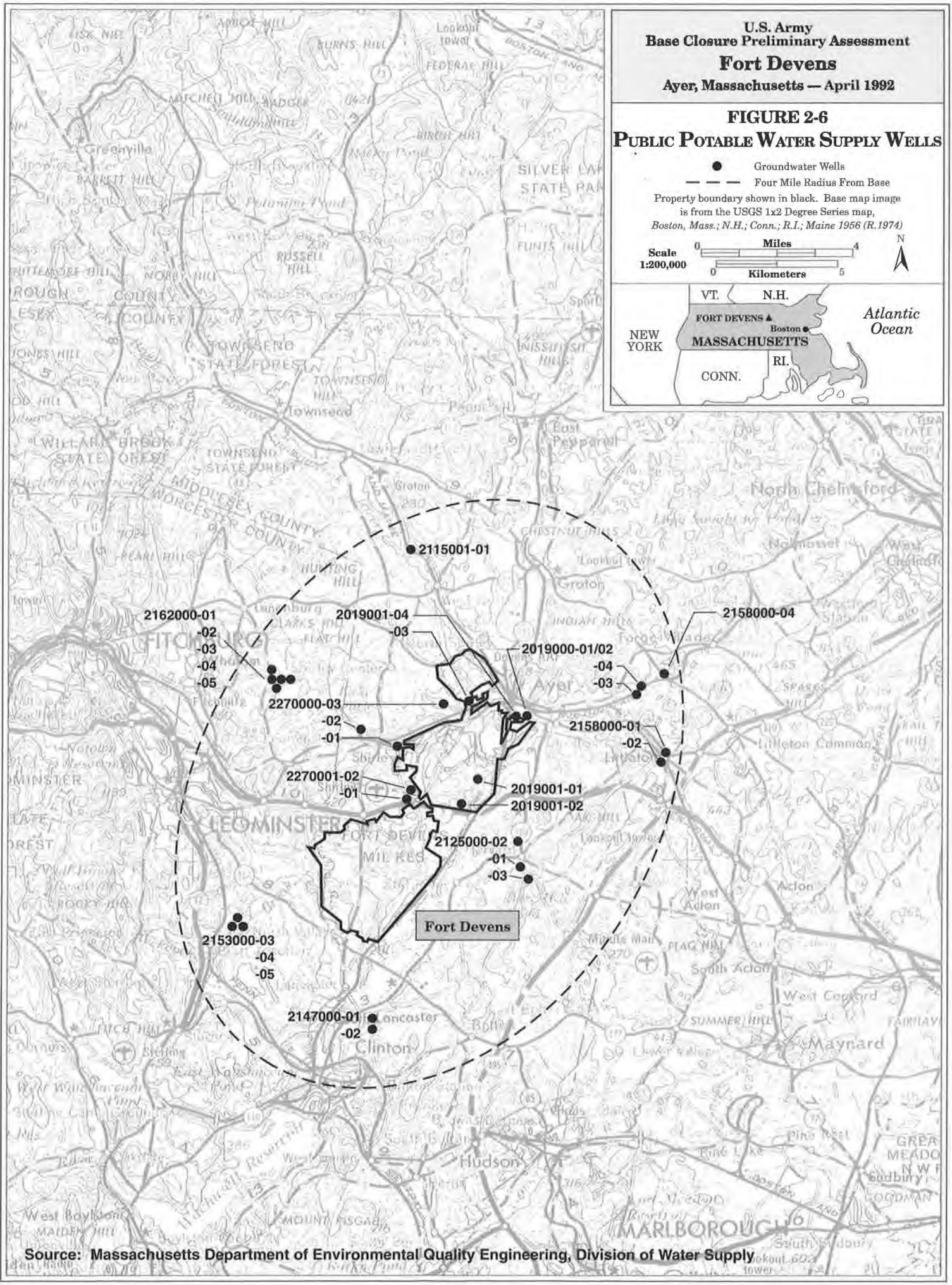
locations on Fort Devens are largely site-specific (Fox, 1988b). However, based on the hydrogeologic investigation conducted by AEHA (Fox, 1988b), it is apparent that Cold Spring Brook, which is restricted by a culvert at Patton Road to the east of Cold Spring Brook Landfill, is a recharge area for the shallow aquifer in the vicinity of the landfill.

Based on the hydraulic conductivities and estimated saturated thicknesses of this aquifer, Brackley and Hansen (1977) have calculated that typical well yields range from 100 to 300+ gallons per minute (gal/min).

Elsewhere on the installation, minor amounts of groundwater occur perched in thin glacial lenses, stratified at various depths. Typical well yields range from 0 to 100 gal/min. Small amounts of groundwater are stored in primary openings (within the pore space) and secondary openings (within the interconnected fractures) of the bedrock. Typical well yields within the bedrock units range from 0 to 10 gal/min.

The following information is taken from the Draft Master Environmental Plan for Fort Devens, Massachusetts (Biang et al., 1991):

> Fort Devens has three large wells (Shabokin, Patton, and MacPherson) and a well field (Grove Pond) consisting of 74 small wells; all wells are screened (McMaster et al., 1982). Well depths range from 34 to 93 ft, and well yields are about 960 gallons per minutes (gpm) for large-diameter wells. Locations of the wells are shown in Figure 2-6, and their physical characteristics are described below.
>
> The Grove Pond well field consists of two fields containing a total of 74 small-diameter wells, or "sand points," which are connected to a central header and pump with a rated capacity of 1,000 gpm. Field 1 was constructed in 1918 and consists of 39 wells, ranging in depth from 34 to 39 ft (McMaster et al., 1982). Field 2 was constructed in 1941 and consists of 35 small-diameter wells, ranging in depth from 35 to 75 ft.
>
> The Shabokin well, constructed in 1941, is 75 ft deep, has a nominal 20-inch casing, and has a rated capacity of 1,000 gpm. This well is located at Bldg. 3628 in the Main Post area, along Sheridan Road north of Route 2.
>
> The Patton well is located at Bldg. 3630 in the Main Post area, north of Mirror Lake along Patton Road. This well, which was constructed in 1953, is 67 ft deep, has a nominal 20-inch casing, and has a rated capacity of 1,000 gpm.
>
> The MacPherson well, constructed in 1966, is 93 ft deep, has a nominal 10-inch casing, and has a rated capacity of 1,000 gpm. This well is located in the North Post area, east of MacPherson Road and the Nashua River and north of Verbeck Gate.


U.S. Army
Base Closure Preliminary Assessment
Fort Devens
Ayer, Massachusetts — April 1992
FIGURE 2-6
PUBLIC POTABLE WATER SUPPLY WELLS
Groundwater Wells
Four Mile Radius From Base
Property boundary shown in black. Base map image is from the USGS 1x2 Degree Series map, Boston, Mass.; N.H.; Conn.; R.I.; Maine 1956 (R.1974)
Scale 1:200,000
Miles
Kilometers
N
VT.
N.H.
FORT DEVENS
Boston
NEW YORK
MASSACHUSETTS
RI.
CONN.
Atlantic Ocean
2115001-01
2162000-01
-02
-03
-04
-05
2019001-04
-03
2019000-01/02
2158000-04
-04
-03
2270000-03
-02
-01
2158000-01
-02
2270001-02
-01
2019001-01
2019001-02
2125000-02
-01
-03
Fort Devens
2153000-03
-04
-05
2147000-01
-02
Source: Massachusetts Department of Environmental Quality Engineering, Division of Water Supply

In addition to the potable water supply wells on Fort Devens, there are numerous public potable water supply wells within 4 miles of Fort Devens. The locations of these wells are also shown in Figure 2-6.

In general, groundwater is soft or moderately hard (hardness 0-120 mg/L) and mildly acid to slightly alkaline (pH 6.0-7.5). Iron or manganese (or both) in excess of the U.S. Environmental Protection Agency's (EPA) Secondary Maximum Contaminant Level (SMCL) limits for drinking water (0.3 mg/L and 0.05 mg/L, respectively) were present in water from 40 percent of the more than 250 municipal and private wells for which chemical analyses were available from the Massachusetts Department of Public Health.

Chloride content in water from all municipal wells is less than the SMCL recommended limit of 250 mg/L for drinking water. However, excess chloride concentrations may be a problem in the future. Data from this basin and others in Massachusetts indicate this increasing trend, which began during the late 1950s and which is continuing, presumably in response to increased highway salting and the increase in the discharge of wastewater from the rising population. Sodium content, also from highway de-icing salt, is increasing as well (Brackley and Hansen, 1977).

2.3.6 SENSITIVE ENVIRONMENTS

The purpose of this subsection is to provide information on the sensitive species and habitats of Fort Devens. Information presented was obtained through a review of existing literature and conversations with personnel of appropriate state and federal agencies and the Environmental Management Office at Fort Devens.

2.3.6.1 Wetlands

Wetlands are protected by the federal government primarily through Section 404 of the Clean Water Act. This act empowered the U.S. Army Corps of Engineers (USACE) and the EPA to regulate most forms of wetlands use.

The following definition of wetlands is the regulatory definition used by EPA and USACE for administering the Section 404 permit program:

> Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (EPA, 40 CFR 230.3 and USACE, 33 CFR 328.3.)

Fort Devens has an abundance of wetlands that meet this definition. These wetlands provide important habitats for a wide variety of plants and animals, as well as providing a wealth of other values for the public, including:

- Flood control.

- Water quality maintenance.
- Erosion buffers.
- Groundwater recharge and stream flow maintenance.
- Timber production.

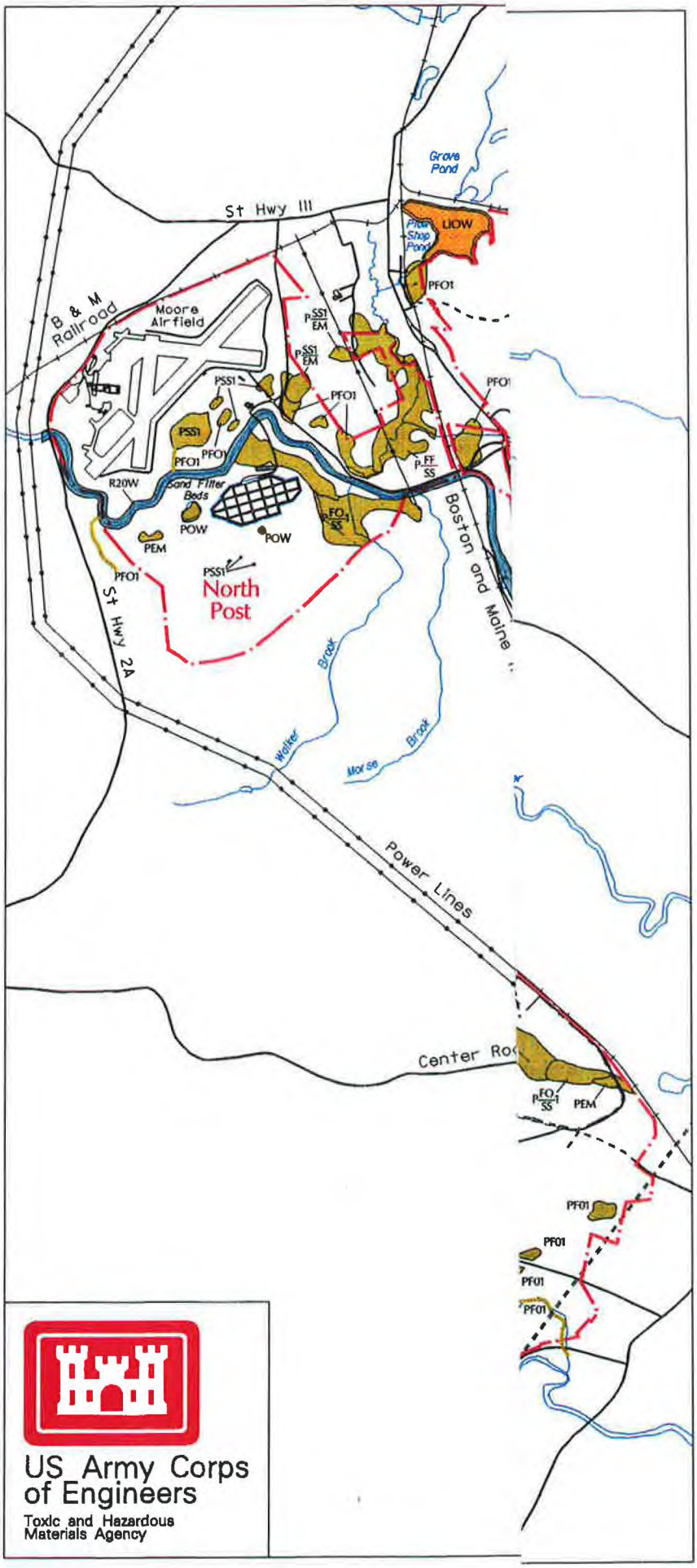
As shown in Figure 2-7, at least 11 types of wetlands plant communities have been mapped and described on the reservation. These communities and their National Wetlands Inventory (NWI) designations include the following (Cowardin et al., 1979):

- PFO1 - Palustrine, Forested (Broad-leaved Deciduous)
- PFO4 - Palustrine, Forested (Needle-leaved Evergreens)
- PSS1 - Palustrine, Scrub/Shrub (Broad-leaved Deciduous)
- $\frac{\text{PFO1}}{\text{SS}}$ - Palustrine, Forested, Scrub/Shrub (Broad-leaved Deciduous)
- POW - Palustrine, Open Water
- $\frac{\text{PFO1}}{\text{OW}}$ - Palustrine, Forested (Broad-leaved Deciduous), Open Water
- PEM - Palustrine, Emergent
- $\frac{\text{PEM}}{\text{OW}}$ - Palustrine, Emergent, Open Water
- $\frac{\text{PSS1}}{\text{EM}}$ - Palustrine, Scrub/Shrub (Broad-leaved Deciduous), Emergent
- L1OW - Lacustrine, Linnetic (Open Water)
- R2OW - Riverine, Lower Perennial (Open Water)

The structure of this classification is hierarchical, progressing from systems and subsystems at the most general levels to classes, subclasses, and dominance types. The community name generally reflects the dominant plants or plant types in the community and, in some cases, the general habitat in which the community occurs (e.g., stream terrace hardwoods). It should be understood that although the various wetlands plant communities of the reservation have been described, any remediation or base closure activities that would involve impacts to a wetlands area would require a delineation of that wetlands, in accordance with the Federal Manual for Identifying and Delineating Jurisdictional Wetlands (FICWD, 1989).

U. S. Army
Base Closure Preliminary Assessment
Fort Devens
Ayer, MA – December 1991

Figure 2–7
Wetlands



Compiled in 1991 from various sources provided by the U.S. Army Toxic and Hazardous Materials Agency

N

0 meters 500

0 feet 3000

Palustrine
Riverine
Lacustrine

Installation Boundary
Hydrography
Road/Pavement Edge
Gravel Edge
Railroad
Powerline
Pipeline
Fence
Structure

US Army Corps of Engineers
Toxic and Hazardous Materials Agency

2.3.6.2 Flora and Fauna

Fort Devens contains a wide variety of aquatic, riparian, and terrestrial habitats for numerous species of wildlife. Old fields that were farmed until about 1940 comprise a large portion of the wildlife habitat at Fort Devens. Other habitats of special interest include several glacial kettle holes or natural ponds (including Robbins Pond, Mirror Lake, Little Mirror Lake, and Grove Pond); artificial ponds (including Slate Rock Pond, Cranberry Pond, and Clear Pond); and many feeder streams and associated wetlands contiguous to the Nashua River Basin.

To best protect, develop, and manage these fish and wildlife resources at Fort Devens, a cooperative plan (agreement) was established in accordance with PL 86-797 between the Installation Commander, the Regional Director of the U.S. Fish and Wildlife Service, and the Massachusetts Division of Fisheries and Wildlife.

Fort Devens instituted its wildlife management program in 1956. The current Fish and Wildlife Management Plan (1980 revision), drafted by the installation's Natural Resources Office (NRO), lists the species shown in Tables 2-2 (game species), 2-3 (non-game species), and 2-4 (non-game birds). Game fish species common to waters on the installation include brook trout, rainbow trout, brown trout, brown bullhead, bluegill, yellow perch, chain pickerel, smallmouth bass, and largemouth bass. According to the NRO, only limited surveys of the installation's amphibians and reptiles have been conducted (listed in Table 2-3).

Current field studies underway at Fort Devens include trapping of small mammals by a local college mammology class and a raptor banding station. The banding station typically bands about 200 individuals of 9 or 10 species of hawks annually and contributes observations to the Hawk Watch Organization. Surveys of Blanding's and spotted turtles, tiger beetles, rare lepidoptera, and vernal pool communities are scheduled for 1992.

A detailed study of the flora of Fort Devens has recently been conducted. The results of this study indicate that 771 plant taxa belonging to 362 genera and 103 families were identified on 6,700 acres of the post. This represents approximately 82% of the 1,000+ species believed to occur on the installation. One federal candidate species, Liatris borealis, one state endangered species, Eleocharis ovata, one state threatened species, Carex typhina, and 13 state watch list species were documented.

2.3.6.3 Archeological Investigations at Fort Devens

The most comprehensive archeological investigation conducted at Fort Devens to date was completed in July 1989 by the Public Archeology Laboratory (PAL), Inc. Under contract to Daylor Consulting Group and the New England Division of the Army Corps of Engineers, PAL conducted a historic and prehistoric reconnaissance survey at Fort Devens Main Post, North Post, and South Post areas (PAL, Inc., 1989).

Table 2-2

Partial List of Game Species Found in the Fort Devens Area

Game Species	
Ring-necked Pheasant Phasianus colchicus	Mallard Anas platyrhynchos
Ruffed Grouse Bonasa umbellus	Green-winged Teal Anas crecca
Woodcock Philohela minor	Canada Goose Branta canadensis
Eastern Cottontail Sylvilagus floridanus	Muskrat Ondatra zibethica
Gray Squirrel Sciurus caroliniensis	Raccoon Procyon lotor
Snowshoe Hare Lepus americanus	Striped Skunk Mephitis mephitis
Mourning Dove Zanaidura macroura	Mink Mustela vison
Woodchuck Marmota monax	Eastern Coyote Canis latrans
Gray Fox Urocyon cinereoargenteus	River Otter Lutra canadensis
Red Fox Vulpes fulva	Beaver Castor canadensis
Whitetail Deer Odocoileus virginianus	Common Snipe Capella gallinago
Wood Duck Aix sponsa	Opossum Didelphis virginiana
Black Duck Anas rubripes	Shorttail Weasel Mustela erminea

Source: Fort Devens Wildlife Management Group, Fish and Wildlife Management Plan (revision, 1980) and interviews with installation wildlife biologist during WESTON site visit (September 1991).

Table 2-3

Partial List of Non-Game Species Found in the Fort Devens Area

Mammals	Reptiles and Amphibians
Moose Alces alces*	Wood Turtle Clemmys insculpta[c]
Bobcat Lynx rufus*	Eastern Box Turtle Terrapene carolina
Black Bear Ursus americanus*	Blanding's Turtle Emydoidea blandingii[b]
Long-tailed Weasel Mustela frenata†	Spotted Turtle Clemmys guttata[c]
Eastern Chipmunk Tamias striatus	Spotted Salamander Ambystoma maculatum
Northern Water Shrew Sorex palustris[c]	Two-lined Salamander Eurycea bislineata
Masked Shrew Sorex cinereus	Redback Salamander Plethodon cinereus
Southern Bog Lemming Synaptomys cooperi†[c]	Blue-spotted Salamander Ambystoma laterale[c]
White-footed Mouse Peromyscus leucopus	Eastern Garter Snake Thamnophis sirtalis
Meadow Jumping Mouse Zapus hudsonius	Northern Water Snake Nerodia sipedon
Smoky Shrew Sorex fumeus	Milk Snake Lampropeltis triangulum
Short-tailed Shrew Blarina brevicauda	Northern Spring Peeper Hyla crucifer
Woodland Jumping Mouse Napaeozapus insignis	Gray Treefrog Hyla versicolor
Redbacked Vole Clethrionomys gapperi	Bullfrog Rana catesbeiana
Pine Vole Pitymys pinetorum	
Meadow Vole Microtus pennsylvanicus	
Red Squirrel Tamiasciurus hudsonicus	
Southern Flying Squirrel Glaucomys volans	
Star-nosed Mole Condylura cristata	
Hairytail Mole Parascalops breweri	

*One sighting on installation during past 10 years (transient species)
†Presence on installation not confirmed
[a]Threatened (in Massachusetts)
[b]Endangered (in Massachusetts)
[c]Special Concern (in Massachusetts)

Source: Fort Devens Wildlife Management Group, Fish and Wildlife Management Plan (revision, 1980) and interviews with installation wildlife biologist during WESTON site visit (September 1991).

Table 2-4

Partial List of Non-Game Birds Found in the Fort Devens Area

Great Blue Heron Ardea herodias	Downy Woodpecker Picoides pubescens	Robin Turdus migratorius
Bald Eagle Haliaeetus leucocephalus[a,c]	Eastern Kingbird Tyrannus tyrannus	House Wren Troglodytes aedon
Red-tailed Hawk Buteo jamaicensis	Eastern Wood Peewee Contopus virens	Catbird Dumetella carolinensis
Cooper's Hawk Accipiter cooperii[b]	Tree Swallow Iridoprocne bicolor	Eastern Bluebird Sialia sialis
Sparrow Hawk Falco sparverius	Bank Swallow Riparia riparia	Cedar Waxwing Bombycilla cedrorum
Peregrine Falcon Falco peregrinus[a,c]	Scarlet Tanager Piranga ludoviciana	Starling Sturnus vulgaris
Killdeer Charadrius vociferus	Evening Grosbeak Hesperiphona vespertina	Eastern Meadowlark Sturnella magna
Great Horned Owl Bubo virginianus	Slate-colored Junco Junco hyemalis	Red-winged Blackbird Agelaius phoenicius
Pied-billed Grebe Podilymbus podiceps[d]	Eastern Phoebe Sayornis phoebe	Common Grackle Quiscalus quiscalus
Whippoorwill Caprimulgus vociferus	Black-poll Warbler Dendroica striata[b]	English Sparrow Passer domesticus
Common Nighthawk Chordeiles minor	Barn Swallow Hirundo rustica	Grasshopper Sparrow Ammodramus savannarum[b]
Chimney Swift Chaetura pelagica	Purple Martin Progne subis	Rufous-sided Towhee Pipilo erythrophthalmus
Ruby-throated Hummingbird Archilocus colubris	Blue Jay Cyanocitta cristata	American Goldfinch Corduelis tristis
Belted Kingfisher Megaceryle alcyon	Common Crow Corvus brachyrhynchos	Song Sparrow Melospiza melodia
American Bittern Botaurus lentiginus[b]	Northern Chickadee Parus hudsonicus	Sedge Wren Cistothorus platensis[c,*]
Flicker Colaptes auratus	Tufted Titmouse Parus bicolor	Upland Sandpiper Bartramia longicauda[c]
Red-headed Woodpecker Melanerpes erythrocephalus*	Brown Creeper Certhia familiaris	
Yellow-bellied Sapsucker Sphyrapicus varius	Wood Thrush Hylocichla mustelina	

[a]Federally Endangered
[b]Special Concern (in Massachusetts)
[c]Endangered (in Massachusetts)
[d]Threatened (in Massachusetts)
*Not confirmed on installation

Source: Fort Devens Wildlife Management Group, Fish and Wildlife Management Plan (revision, 1980) and interviews with installation wildlife biologist during WESTON site visit (September 1991).

Background research was conducted and regional prehistoric and historic period contexts were developed for the Fort Devens area, along with a national military context, in order to place archeological and historic resources within an appropriate cultural and chronological framework. A driveover/visual inspection was used in conjunction with background research to access information and identify gaps on the known and potential cultural resource database. Four prehistoric and six historic sites have been documented within Fort Devens. Background research, environmental attributes, and ground disturbance data were used to stratify Fort Devens into areas of high, moderate, and low archeological sensitivity. A total of 127 potential historic period sites have been identified.

No previous comprehensive historic architectural identification and evaluation studies exist for Fort Devens. One historic district has been proposed for listing in the National and State Registers of Historic Places. Information and discussion is presented in the Historic and Prehistoric Reconnaissance Survey Report on surviving buildings from all periods of the post's history, including one nineteenth-century house (PAL, Inc., 1989).

2.4 ENVIRONMENTAL STUDIES AT FORT DEVENS

Numerous small-scale environmental studies at various locations have been conducted at Fort Devens. Further details of these studies are provided by AREE in Section 3. Major studies and findings are summarized below and provide the basis for the ongoing investigation at Fort Devens.

In August 1982, an Installation Assessment of Fort Devens was conducted (McMaster et al., 1982). No additional CERCLA related studies were recommended.

In 1985, a Solid Waste Management Unit Report was prepared for Fort Devens to identify possible Solid Waste Management Units (SWMUs) (DEH, 1985b). Based on this report and findings at two landfills (Cold Spring Brook and Shepley's Hill), Fort Devens was placed on the National Priorities List (NPL) on 21 November 1989 under CERCLA.

Fort Devens submitted a regulatory draft Master Environmental Plan (MEP), dated July 1991 (Biang et al., 1991), to address the investigation of the study areas (SA) and areas of contamination (AOC) as required under CERCLA. This draft, along with comments provided for the document form the basis of the MEP discussions in this report. Fort Devens submitted the regulatory draft final revision of the MEP on 29 November 1991.

The Environmental Photographic Interpretation Center (EPIC) has provided imagery analysis support for the Fort Devens USATHAMA environmental survey. The original study of portions of the facility was conducted in 1982. The entire facility was reevaluated in 1991 (EMSL, 1991). The Installation Assessment (September, 1991) report was designed to obtain, analyze, and provide USATHAMA aerial photographic coverage taken between 1943 and 1991. This analysis concentrated on the man-made

features that may have caused some deleterious alteration of groundwater or surface water quality (EMSL, 1991).

Studies of the areas of most concern have begun at Fort Devens under the MEP. Results and conclusions from these investigations are currently not available. The remainder of the study areas are scheduled to be investigated between Fiscal Year (FY) 1992 and FY 1995.

2.5 PERMITTING STATUS

2.5.1 RCRA FACILITIES

Fort Devens is a large-quantity generator regulated by the MDEP. Only small-scale, industrial-type activity occurs or has occurred in the past at Fort Devens. Small quantities and various types of hazardous waste are generated at Fort Devens. Waste oil and contaminated soil (regulated as hazardous waste in Massachusetts) were identified as the items generated in the largest quantities at Fort Devens.

To allow the storage of hazardous waste and to ensure sufficient time for proper off-site disposal, an application for a RCRA container-storage area was submitted to allow longer than 90-day storage of hazardous waste. The Hazardous Waste Storage Facility (Building 1650) is a RCRA-permitted container storage unit (EPA ID No. MA7210025154) with an operating permit issued in 1986. The RCRA permit for Building 1650 is being updated and will include a closure plan.

In 1980, a RCRA Part A application was filed placing the Explosive Ordnance Disposal (EOD) Range under interim status as a hazardous waste thermal treatment facility. A RCRA Part B permit application for the EOD Range was submitted in 1988. The EOD Range remains active under RCRA interim status.

The Waste Explosives Storage Bunker (Building 3644) was identified as a RCRA storage area for explosives designated for destruction at the EOD Range in the Solid Waste Management Unit Report (DEH, 1985b).

As part of the RCRA permitting application process, RCRA-regulated units require a written closure plan. At the time the unit is no longer in use, the closure plan will be implemented. RCRA closure and the required certification will be necessary for the permitted and interim status RCRA units.

Satellite accumulation points at the point of generation (55 gallons) and hazardous waste accumulation areas (HWAAs) are located near the maintenance and industrial areas that generate the waste.

The Federal Facilities Interagency Agreement (IAG) under which the work in the MEP has been developed requires full integration of CERCLA remedial programs and RCRA corrective actions at Fort Devens. The RCRA units at Fort Devens are listed as AREEs in Section 3 as follows:

- AREE 22 — Hazardous Waste Storage Facility (Building 1650)
- AREE 24 — Waste Explosive Storage Bunker (Building 3644)
- AREE 25 — Explosive Ordnance Disposal (EOD) Range - South Post

To date, no RCRA corrective actions have been required at Fort Devens. The sampling recommended in the MEP is based on concerns of release from AREEs 24 and 25. Should results show no contamination, these results may assist in developing closure requirements for the units. If results show contamination, rather than establishing a RCRA corrective action program, the actions will be performed in accordance with the guidelines outlined in the IAG. RCRA closure in accordance with the approved RCRA closure plan for each unit will still be required when the units are no longer used.

Satellite and HWAAs have been identified as AREE 61 in Section 3. If these areas are shown to have releases of RCRA waste, again, the actions will be performed in accordance with the guidelines outlined in the IAG.

2.5.2 NPDES PERMITS

The Wastewater Treatment Plant (WWTP) at Fort Devens is designed to discharge to rapid infiltration sand beds, which allow the treated water to recharge to the groundwater. Since the WWTP does not discharge to navigable water, no National Pollutant Discharge Elimination System (NPDES) permit is required. No other discharge has been identified as requiring an NPDES permit at Fort Devens.

In 1986, Fort Devens applied for a Massachusetts Groundwater Discharge Permit for the WWTP. Groundwater within Fort Devens was designated Class I groundwater by Massachusetts and considered to be a source of potable water. When the permit is implemented, MDEP regulations will require the conditions of the permit to include groundwater monitoring, recordkeeping, and reporting of monitoring results to assure compliance with the permit limitations. Currently, Fort Devens is in violation of the nitrate standard for Class I groundwater and has applied for a variance from the MDEP (Biang et al., 1991).

2.5.3 AIR PERMITS

In lieu of a permitting program, the MDEP requires registration of significant air pollution sources. Registered sources include boilers, incinerators, storage tanks (MOGAS, AVGAS, and JP-4 fuels), vehicle paint booths, and woodworking areas (Gates et al., 1986).

2.5.4 SOLID WASTE PERMITS

The Shepley's Hill Landfill (No. 1) is the only landfill currently operating at Fort Devens. The majority of the landfill has been capped in stages. It was scheduled for closure in 1989 but was extended until 1991, with a request for further extension until 1993. Fort Devens has an operating permit under terms of a closure agreement with the MDEP, and according to available information, the landfill is operating within these requirements (Biang et al., 1991).

Fort Devens has a permit to apply dried sludge from the WWTP (treated by anaerobic digestion in the Imhoff tanks and dewatered in the Sludge Drying Beds). Approximately 104 cubic yards of sludge is drawn from the Imhoff tanks every 6 months, dewatered in the Sludge Drying Beds, and spread over a 10-acre site near the Moore Army Airfield (MAAF) in the North Post area of Fort Devens (DEH, 1985b).

2.5.5 NRC LICENSES

No Nuclear Regulatory Commission (NRC) licenses are maintained by Fort Devens. Activities at the Cutler Army Hospital do not require an NRC materials license. Storage and use of such radioactive materials as compasses, rifle sights, watches, and sources for test and calibration equipment are under NRC licenses held by the U.S. Army Armament Material Readiness Command (AMRCOM) at Rock Island Arsenal, Rock Island, Illinois, and the U.S. Army Communications and Electronics Command (CECOM), Fort Monmouth, New Jersey. An inventory of equipment using radiological sources is kept by the Radiological Protection Officer (ESE, 1982).

SECTION 3

AREAS REQUIRING ENVIRONMENTAL EVALUATION

In this section, AREEs at Fort Devens are documented. Most of the AREEs are being addressed as Study Areas (SA) and Areas of Contamination (AOC) under the Master Environmental Plan (MEP), which has been prepared in regulatory draft final form. The AREE numbers were developed to correspond to the SA or AOC number and therefore are not presented in order in the text. Additional AREEs were developed based upon evaluation of existing documentation and the WESTON site visit as part of this enhanced PA. Table 3-1 provides a listing of all AREEs by number, and the locations of the AREEs are shown in Figures 3-1a to 3-1c. Facility-wide AREEs, as outlined in Subsection 3.7, are not shown due to their extensive nature at Fort Devens.

3.1 INCINERATORS

3.1.1 AREE 1 - CUTLER ARMY HOSPITAL INCINERATOR

The Cutler Army Hospital Incinerator (AREE 1) has been identified as SA 1 in the MEP. It is located on the Main Post near Queenstown Street south of the golf course (see Figure 3-1b, AREE 1) at the southeast corner of the hospital (Building 3654). The incinerator is used to incinerate pharmaceutical wastes and nonhazardous medical wastes, including used syringes, hypodermic needles, human body parts, and clothing and bedding used by diseased patients. The incinerator is located outside of and immediately adjacent to Building 3654. The incinerator pad dimensions are approximately 13 by 20 ft. The area adjacent to the pad is paved with asphalt for use by vehicles (Biang et al., 1991).

The incinerator has a volume of 10 ft^3 and the stack is 36 ft high with an inside top diameter of 2 ft. Built and installed in 1977, this incinerator is gas-fed and operates year round. It can be operated 8 hours a day, 5 days a week, and can incinerate about 100 lb/hr (104 ton/yr). Normally, the unit is used about three times a day, each incineration lasting 1 to 2 hours (Alston, 1988). The incinerator ash is normally scraped out of the chamber once every other day, placed into garbage cans, and then thrown into a covered dumpster. When the dumpster is full, it is taken to the sanitary landfill (see AREE 5). The facility is in compliance with applicable Massachusetts pathologic waste regulations (Lewis, 1989).

During the 1988 Argonne National Laboratories (ANL) site assessment, the physical condition of the incinerator was noted. The gaskets of the incinerator door were severely deteriorated and missing in several places. The firebrick inside the first hearth chamber was in poor shape; many of the firebricks were cracked (Biang et al., 1991).

The ash from this incinerator has been periodically sampled and analyzed to determine the EP toxicity. In early 1980, one such analysis showed that one out of five samples

Table 3-1

List of AREEs
Fort Devens, Massachusetts

AREE No.	Study Area/ Area of Contamination	Description	Figure No.
1	SA 1	Cutler Army Hospital Incinerator	3-1b
2	SA 2	Veterinary Clinic Incinerator	3-1b
3	SA 3	Intelligence School Incinerator	3-1b
4	AOC 4	Sanitary Landfill Incinerator (Building 38)	3-1a
5	AOC 5	Shepley's Hill Landfill (No. 1) Main Post - Near Shepley's Hill	3-1a
6	SA 6	Landfill No. 2 - South Post Area 7b	3-1c
7	SA 7	Landfill No. 3 - South Post Impact Area	3-1c
8	SA 8	Landfill No. 4 - South Post Area 8a	3-1c
9	SA 9	North Post Landfill (No. 5) -	3-1a
10	SA 10	Landfill No. 6 - Near Shirley Gate	3-1b
11	SA 11	Landfill No. 7 - Near Lovell Street	3-1b
12	SA 12	Landfill No. 8 - South Post Combat Pistol Range	3-1c
13	SA 13	Landfill No. 9 - Near Lake George Street	3-1b
14	SA 14	Landfill No. 10 - South Post Near Dixie Road	3-1c
15	SA 15	Landfill No. 11 - South Post Near Helipad	3-1c
16	SA 16	Landfill No. 12 - Main Post Near Shoppette	3-1b
17	SA 17	Landfill No. 13 - Little Mirror Lake	3-1b
18	AOC 18	Landfill No. 1 - Asbestos Cell	3-1a
19	SA 19	Wastewater Treatment Plant	3-1a
20	SA 20	Rapid Infiltration Basins	3-1a
21	SA 21	Sludge Drying Beds	3-1a
22	SA 22	Hazardous Waste Storage Facility (Building 1650)	3-1a
23	SA 23	Paper Recycling Center (Building 1650)	3-1a
24	SA 24	Waste Explosive Storage Bunker (Building 3644)	3-1b

Table 3-1

List of AREEs
Fort Devens, Massachusetts
(continued)

AREE No.	Study Area/ Area of Contamination	Description	Figure No.
25	SA 25	Explosive Ordnance Disposal (EOD) Range - South Post	3-1c
26	SA 26	Zulu I and II Ranges - South Post	3-1c
27	SA 27	Hotel Range - South Post	3-1c
28	SA 28	Training Area 14 - South Post	3-1c
29	SA 29	Transformer Storage Area (Building 1438)	3-1a
30	SA 30	Drum Storage Areas - Moore Army Airfield	3-1a
31	SA 31	Fire-Fighting Training Area - Moore Army Airfield	3-1a
32	SA 32	Defense Reutilization and Marketing Office (DRMO) Yard	3-1a
33	SA 33	Directorate of Engineering and Housing (DEH) Entomology Shop (Building 262)	3-1a
34	SA 34	Former DEH Entomology Shop (Building 245)	3-1a
35	SA 35	Former DEH Entomology Shop (Building 254)	3-1a
36	SA 36	Former DEH Entomology Shop (Building 2728)	3-1b
37	SA 37	Golf Course Entomology Shop (Building 3622)	3-1b
38	SA 38	Battery Repair Area (Building 3713)	3-1a
39	SA 39	Transformer Near Former Building 4250	3-1b
40	AOC 40	Cold Spring Brook Landfill	3-1b
41	SA 41	Unauthorized Dumping Area (Site A)	3-1c
42	SA 42	Popping Furnace	3-1c
43	SA 43 and SA 54	Historic Gas Station Sites	3-1b
44	SA 44	Cannibalization Yard	3-1a
45	SA 45	Wash Rack at Lake George Street	3-1b
46	SA 46	Training Area 6d - South Post	3-1c

Table 3-1

List of AREEs
Fort Devens, Massachusetts
(continued)

AREE No.	Study Area/ Area of Contamination	Description	Figure No.
47	SA 47	Building 3816 Leaking Underground Storage Tank Site - Moore Army Airfield	3-1a
48	SA 48	Building 202 Leaking Underground Storage Tank Site	3-1a
49	SA 49	Building 3602 Leaking Underground Storage Tank Site	3-1b
50	SA 50	WWII Fuel Points - Moore Army Airfield	3-1a
51	SA 51	Building 3412, O'Neil Building Spill Site	3-1b
52	SA 52	TDA Maintenance Yard	3-1a
53	SA 53	Petroleum, Oils, and Lubricants (POL) Spill Areas - South Post	3-1b and 3-1c
55	SA 55	Shirley Housing Area Trailer Park Fuel Tanks	3-1b
56	SA 56	Building 2417 Leaking Underground Storage Tank Site	3-1b
57	SA 57	Building 3713 Fuel Oil Spill Site	3-1a
58	SA 58	Buildings 2648 and 2650 Leaking Underground Storage Tank Sites	3-1b
59	NA	Bridge 526	3-1b
60	NA	Training Areas and Ranges	NA
61	NA	Maintenance and Waste Accumulation Areas	NA
62	NA	Underground Storage Tanks (USTs) - Existing	NA
63	NA	Underground Storage Tanks - Previously Removed	NA
64	NA	Aboveground Storage Tanks (ASTs)	NA
65	NA	Asbestos	NA
66	NA	Transformers	NA
67	NA	Radon	NA
68	NA	Lead Paint	NA

Table 3-1

List of AREEs
Fort Devens, Massachusetts
(continued)

AREE No.	Study Area/ Area of Contamination	Description	Figure No.
69	NA	Past Spill Sites	NA

SA = Study Area
AOC = Area of Contamination
NA = Not Applicable
TDA = Table of Distribution and Allowances

violated the hazardous waste criterion for lead (5.0 mg/L) (McMaster et al., 1982). No source of lead was found, and the result was considered an anomaly. The result of a subsequent test completed in September 1980 showed that lead did not exceed the toxicity standard. All other trace metals and pesticides were well below the concentrations that would classify the ash as toxic waste (Brown, 1981). Based on these results, continued disposal of the ash in the installation's sanitary landfill was considered acceptable. Because of the asphalt base in the immediate vicinity, transfer and transport of the incinerator ash is not likely to contribute to any appreciable soil or groundwater contamination. No other data are available on the type or extent of contamination at the site.

3.1.2 AREE 2 - VETERINARY CLINIC INCINERATOR

The Veterinary Clinic Incinerator (AREE 2) has been identified as SA 2 in the MEP. The incinerator is located inside Building 1450 on the Main Post (see Figure 3-1b). The veterinary incinerator is used primarily to incinerate animal carcasses, although it is also used to burn classified materials, needles, medical or veterinary wastes, and expired drugs (Burrs, 1988). Occasionally, the incinerator is used to incinerate photographs and paper, as well as medical and pharmaceutical wastes from the Cutler Army Hospital when its incinerator (AREE 1) is shut down.

The gas-fired veterinary incinerator has a volume of 12 ft^3 and the stack is 23.6 ft tall with an inside top diameter of 1.0 ft. The incinerator can handle a maximum loading of 100 lb/hr; typically, an incineration run lasts about 4 hours. The incinerator, which is normally used about two or three times per week, processes about 21 ton/yr (Burrs, 1988). The ash is normally placed in plastic bags and sent to the Shepley's Hill Landfill (No. 1) (AREE 5).

During the 1988 ANL site assessment, several operational problems were noted, including problems concerning the gasket seals around the incinerator door and cracks in the asbestos casing at the top of the incinerator base. Concerns were raised about the operational incineration temperature and the temperature gauges used to monitor this temperature. The incinerator was constructed within the veterinary clinic; during incinerations, soot enters heating vents, leaving dust on the office desks and equipment. The staff has occasionally complained of sinus problems due to this dust (Burrs, 1988). To minimize such effects, most incinerations occur during evening hours.

The ash from this incinerator has been periodically tested for EP toxicity for metals with negative results (McMaster et al., 1982; Brown, 1981). No other data are available on the type and extent of contamination at the site.

3.1.3 AREE 3 - INTELLIGENCE SCHOOL INCINERATOR

The Intelligence School Incinerator (AREE 3) has been identified as SA 3 in the MEP. The Intelligence School Incinerator was located outside Building 1484 on the Main Post (see Figure 3-1b) on a cement pad about 20 by 20 ft. It was used from 1971 until 1976 to burn paper (classified documents) about twice weekly. The incinerator had a

capacity of 318 lb/h with afterburns of 600 Btu/lb of waste input. In 1976, Fort Devens received notice from Massachusetts that the incinerator was exceeding capacity standards, and the incinerator has not been used since (DEH, 1985b).

During the 1988 ANL site assessment, the physical condition of the incinerator was noted. The incinerator was very rusty and all of the gaskets had deteriorated. The incinerator door had rusted shut, and a crowbar was needed to open it for inspection. The firebrick had severely deteriorated and the incinerator still contained ash (Biang et al., 1991). During the 1991 WESTON site visit, evidence of the incinerator itself was not present, but a concrete pad did remain.

Although it is not known whether ash from the incinerator had been tested for EP toxicity, it is not expected that the ash would fail the test, due to the nature of the materials that were reportedly incinerated.

3.1.4 AREE 4 - SANITARY LANDFILL INCINERATOR (BUILDING 38)

The Sanitary Landfill Incinerator (AREE 4) has been identified as AOC 4 in the MEP. This incinerator was located near Cook Street within the area included in Phase I of the Shepley's Hill Landfill (No. 1) (AREE 5) closure (see Figure 3-1a). The site was located in former Building 38, which was built in 1941; the incinerator was operated until the late 1940s. Building 38 was a one-story, concrete building with a full basement and a slate roof. Utilities included two overhead electric lines and an underground water line and sewer line (2 inches and 6 inches in diameter, respectively). No gas or steam lines served the building (Ford, 1989).

The incinerator burned household debris generated on-site; glass and incinerator ash were placed in a landfill next to the building. In September 1967, the incinerator (which was not used after the 1940s) was demolished and placed in the sanitary landfill. In 1976, the building foundation was also removed and landfilled on-site (Biang et al., 1991).

3.1.5 AREE 42 - POPPING FURNACE

The Popping Furnace (AREE 42) has been identified as SA 42 in the MEP. This furnace is located in the southern part of Fort Devens off Trainfire Road, across from O Range (Figure 3-1c). Since the activity conducted at the site is not documented, its history is largely unknown. Facility personnel report the furnace may have been used until the early 1960s. The site consists of an old "furnace" in which small-caliber ammunition apparently was burned. Waste material (ash and casings) may have been thrown down a hillside (about 30 ft high) toward the east of the Popping Furnace.

During the 1991 EPIC evaluation, the Popping Furnace first appears on the aerial photographs of 6 April 1965 and is described as follows:

> A small building is visible. This feature could have been obscured by heavy vegetation in previous years. Light-toned material appears to have been dumped over an incline into a small pond east of the building.

In addition, evaluation of the site on the 6 March 1991 aerial photographs reveals:

> The site remains; disposal is seen east of the building, and down the ravine. (EMSL, 1991).

No records are available concerning the nature of the material disposed of at this site. There are no records of any hazardous materials or wastes being dumped at this site. Bullet casings were evident around the furnace and on the hillside. A few small rusty cans were seen on the surface and at the base of the cliff (Biang et al., 1991).

Because of the assumed nature of the material disposed of at this facility, the potential for soil or water contamination is minimal.

3.2 LANDFILL DISPOSAL AREAS

3.2.1 AREE 5 AND AREE 18 - SHEPLEY'S HILL LANDFILL (NO. 1) - MAIN POST NEAR SHEPLEY'S HILL

The Shepley's Hill Landfill (No. 1) (AREE 5) has been identified as AOC 5 in the MEP. In addition, the Asbestos Cell (AREE 18) within the landfill has been identified as AOC 18.

The Shepley's Hill Landfill (No. 1) is in the northeastern portion of the Main Post (Figure 3-1a). Details are provided in Figure 3-2. It is about 84 acres in extent and is adjacent to Plow Shop Pond on the east and Shepley's Hill on the west. Immediately north (within 1 mile) is the town of Ayer, and to the south, along Cook Street, is the Defense Reutilization and Marketing Office (DRMO). Landfill operations date as far back as 1917. Currently, the landfill receives about 6,500 ton/yr of household refuse, military refuse, and construction debris. A small portion of the landfill located south of Plow Shop Pond was the site of a former railroad roundhouse. It was used from approximately 1900 to 1935. Because of the time period it was active, any contaminants would likely be coal and steam-era waste.

The landfill is operated using the modified trench method. There is evidence that more recent trenches in the northwest portion may have cut into previously used areas containing glass and spent shell casings. The glass dated from the mid-nineteenth century to as late as 1920. The total depth of the refuse is about 30 ft (DEH, 1985b).

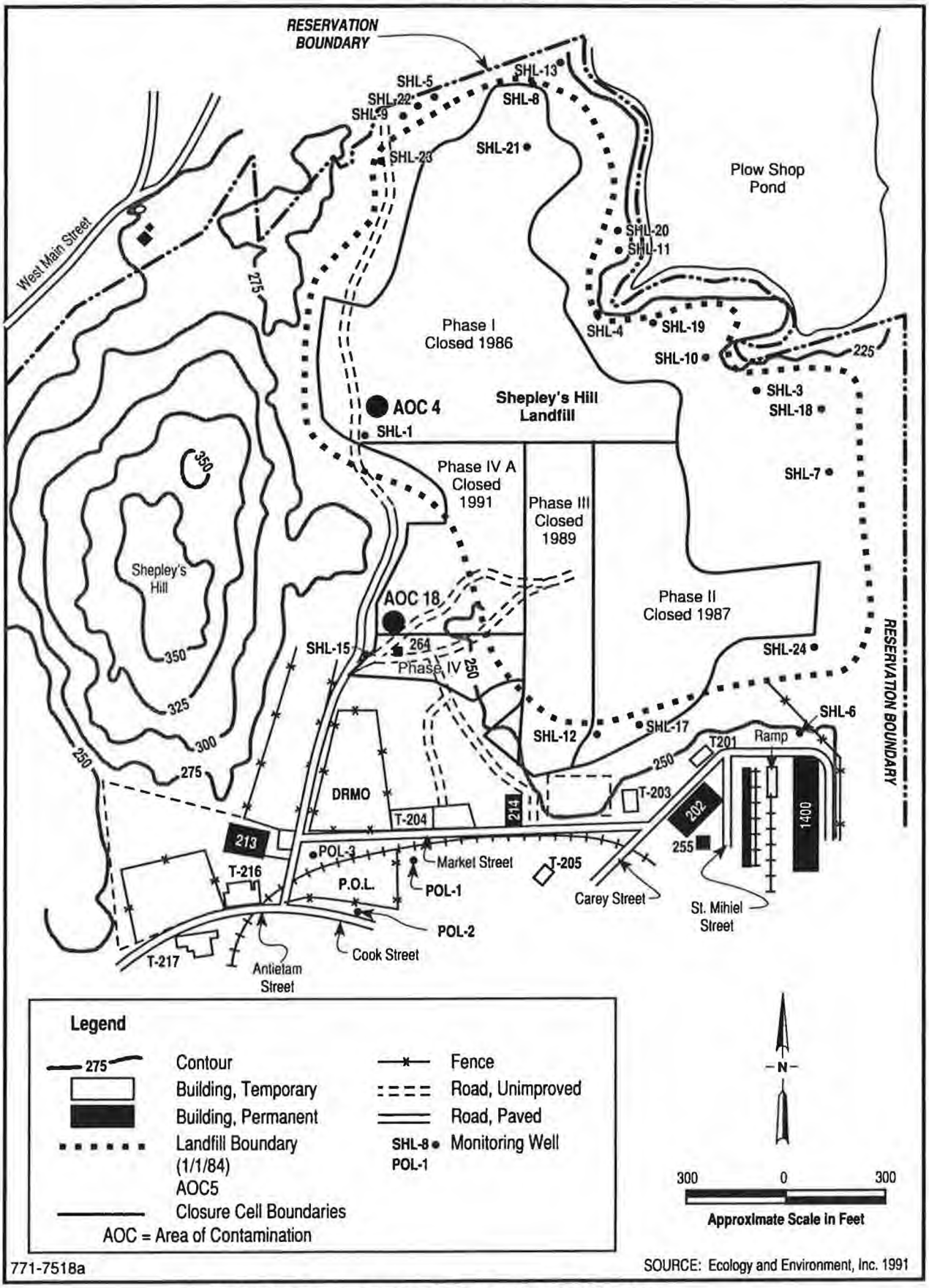


FIGURE 3-2 LOCATION OF SHEPLEY'S HILL LANDFILL (NO.1) INCLUDING FORMER SANITARY LANDFILL INCINERATOR AND THE ASBESTOS CELL

Fort Devens has an operating permit from the MDEP, and according to available information, the landfill is operating within these requirements. In an effort to abate the potential for off-site contaminant migration, Fort Devens initiated the Fort Devens Sanitary Landfill Closure Plan in 1984, in accordance with 310 CMR 19.00. The four-stage plan, written by Gale Engineering, was submitted to MDEP for review and approval. As part of a corrective action, the last section of the landfill was scheduled for closure in 1991 and an extension may allow operation into 1992; most of the landfill has already been closed (Figure 3-2). Fort Devens is coordinating the closure with MDEP authorities and is following an approved closure plan that includes regrading, gas ventilation, membrane capping, and a final vegetative cover. Some of the areas adjacent to Plow Shop Pond lie within the 100-year floodplain (Gale Engineering, 1985).

In 1985, the MDEP reviewed and approved the closure plan, and the landfill is being closed in phases. Phase I (50 acres) was capped in October 1986, Phase II (15 acres) was capped in November 1987, and Phase III (9.2 acres) was capped in March 1989. In May 1989, Fort Devens presented a proposal to MDEP to extend the Phase IV closure date. A "conceptual approval" was given by the Worcester Office. The MDEP requested the installation to reconsider the thickness of the liner that was originally approved in 1985, to change the slope, and to divide Phase IV into two sections. The Phase IV closure plan was modified to create Sections A and B.

The landfill contains a permitted Asbestos Cell (AREE 18) that was used for disposal of asbestos construction debris from on-site activities. An estimated 6.6 tons was placed in the cell between March 1982 and November 1985. It is located in Section A of the Phase IV area. The cell was originally scheduled for capping in later 1989 or early 1990, and a new asbestos disposal location has been identified in the southeastern corner of the landfill. The original Phase IV will be divided into revised Phases V and VI. The site was scheduled for final closure in late 1991 (Biang et al., 1991).

The landfill site was probably selected because it was a wetland area and was an expedient choice for direct disposal of wastes. Information indicates that it was formerly operated as an open burning site. At a later time, waste was incinerated and the residue was buried. Con-Test (1989) reports that during a 1984 investigation, 40 test pits were excavated in various locations. An area of special concern was a location in the southeastern portion of the landfill reportedly used to dispose of flammable fluids. The report cited by Con-Test indicates that contamination was not substantiated by test pits or other research.

The landfill is in a thick section of glacial outwash consisting primarily of laterally discontinuous sand and gravel. The bedrock is Ayer Granite, a light gray, foliated, phaneritic biotite granodiorite. It lies close to the ground surface at the western edge of the landfill and in some locations is within 2 ft of the surface. To the east, the bedrock surface is deeper and covered by a veneer of bluish-gray glacial till. The till is beneath the glacial outwash layer. The bedrock surface forms a northwest-trending trough that apparently controls the northerly groundwater flow.

The water table depth ranges from 5 to 30 ft (MacLean, 1989). Leachate formed in the landfill may seep directly into Plow Shop Pond (Gale Engineering, 1985). Results of the groundwater monitoring are referenced in the MEP (Biang et al., 1991).

3.2.2 AREE 6 - LANDFILL NO. 2 - SOUTH POST AREA 7b

The Landfill No. 2 (AREE 6) has been identified as SA 6 in the MEP. McMaster et al. (1982) reported that Landfill No. 2 was probably an old town dump used by local residents for disposal of household rubbish and glass from about 1850 to 1920, before the site's incorporation into Fort Devens. The site's supposed location is somewhere in the South Post near Training Area 7b (Figure 3-1c). The existence and location of the inactive Landfill No. 2 is in doubt. Despite repeated attempts, Fort Devens personnel have not been able to locate the site, and no surface evidence has been found to indicate its location. Access to the site's general location would be from Shirley Road. The exact size of the landfill is unknown, but it has been reported to have been about 1 acre in extent. Based on historical practices at similar disposal sites, rubbish was probably just dumped over the edge of a bluff or hill (Biang et al., 1991).

The EPIC evaluation of the aerial photographs available beginning in 1943 reports:

> Due to the time span the site was believed to be present (1850-1920), no evidence of this site is visible throughout the period of analysis (EMSL, 1991).

The location of this area has been only tentatively identified on Figure 3-1c.

The nature and extent of any soil or groundwater contamination is unknown, for no records exist detailing the quantities or nature of the material disposed of at this landfill.

3.2.3 AREE 7 - LANDFILL NO. 3 - SOUTH POST IMPACT AREA

Landfill No. 3 (AREE 7) has been identified as SA 7 in the MEP. Landfill No. 3 is reported to have been an undocumented estate or farm dump where household rubbish and glass were disposed of from the mid-1800s to about 1920 (McMaster et al., 1982). The landfill, which cannot be found, is reported to have been located in the middle of the South Post; it existed before Fort Devens acquired the South Post property. The site was reported to be about 1 acre in extent. Based on the landfill's estimated location (Figure 3-1c), the site would be approximately west of the EOD Range (AREE 25) in the impact area.

The EPIC evaluation of the aerial photographs available beginning in 1943 reports:

> Due to the time span (1850-1920), no evidence of this site is visible throughout the period of analysis (EMSL, 1991).

The location of this area has been only tentatively identified on Figure 3-1c.

This site, if it exists, has not received any debris for over 70 years. No records are available concerning the nature of the material disposed of at this site, and no data are available on soil or groundwater contamination in the area.

3.2.4 AREE 8 - LANDFILL NO. 4 - SOUTH POST AREA 8a

The Landfill No. 4 (AREE 8) has been identified as SA 8 in the MEP. The exact location of Landfill No. 4 is unknown. The landfill reportedly was used from about 1900 to 1930 for the disposal of household items and military items before and after the land was incorporated into Fort Devens (McMaster et al., 1982; Nicholls, 1986b). The landfill is reported to have been about 6 acres in size and located in the south-central part of the South Post (McMaster et al., 1982; Nicholls, 1986b). The site's approximate location is shown in Figure 3-1c. Based on the site's general location, the landfill would appear to have been located west of Shirley Road in tactical training area 8a. Even though Fort Devens environmental personnel have searched for the site, and troops have traversed area 8 and adjacent training areas for years, the site has not been found. No surface evidence has been found to indicate its location.

The 1991 EPIC evaluation of aerial photographs taken from 1943 to 1991 revealed the following:

> Only a small ground scar and a light-toned area are visible in this location in 1943. In 1952, the area has expanded, and is possibly being used as a waste disposal area. In 1965, the site appears inactive; no evidence of activity is noted throughout the remainder of the study period.

In addition, activities involving possible waste disposal were noted north of Landfill No. 4 during 1943 to 1952 (EMSL, 1991). The location of this area has been only tentatively identified on Figure 3-1c.

No records are available concerning the nature of the material disposed of at this site; therefore, the nature and extent of any soil or groundwater contamination in this area is unknown.

3.2.5 AREE 9 - NORTH POST LANDFILL (NO. 5)

North Post Landfill (No. 5) (AREE 9) has been identified as SA 9 in the MEP. North Post Landfill (No. 5) is located in the North Post (Figure 3-1a); it occupies 14.8 acres. The landfill, located on a sand and gravel glacial deposit, is an old "stump dump," used primarily for construction demolition debris and tree stumps; it operated from the later 1950s until 1978, when it was closed. Originally, this site was a low wet area, but the ground level has been raised by 34.4 to 39.4 ft (McMaster et al., 1982; DEH, 1985b). It was reported that the debris from nearly 100 demolished buildings was placed into this landfill (McMaster et al., 1982; DEH, 1985b). This landfill was reported to be a trench that received debris from demolition of six warehouses (Buildings T-955 through T-960). The 642nd Engineer Company removed the buildings in 1980 (Ford, 1989). The site was used by the Army, National Guard, contractors, and off-post personnel.

The type of disposal methods were area filling and trench landfilling (McMaster et al., 1982). Access was not controlled during the period when the dump was operated (McMaster et al., 1982; DEH, 1985b). Even today, access is not strictly controlled (Sharma, 1988), and it is not known to what extent unauthorized dumping has occurred (McMaster et al., 1982; DEH, 1985b). A portion of the landfill contains abandoned cars.

The presence or extent of contamination at this site is not known. Since access was not restricted, it is likely that illegal dumping occurred. During the 1988 ANL site assessment, the landfill was noted to contain wood (lumber and stumps), rubble, and scrap metal. Near the middle of the landfill (along the northern boundary, near the WWTP sand filter beds), several old cars had been junked. This car "graveyard" contained old car body parts, brake linings, tires, asphalt, bed springs, and several old, crushed 5-gal cans (Biang et al., 1991). Due to past disposal practices and the highly permeable soils, contamination is possible.

3.2.6 AREE 10 - LANDFILL NO. 6 - NEAR SHIRLEY GATE

Landfill No. 6 (AREE 10) has been identified as SA 10 in the MEP. Building debris from an old hospital is reported to be buried in the 900 area near the Shirley Housing (McMaster et al., 1982). The landfill's reported location is the flat area northwest of the enlisted housing near Shirley Gate along the west side of the Main Post and between Perimeter and Lovell Roads (Figure 3-1b). If the landfill was in this area, no evidence is available attesting to its former existence. At the time of the ANL site visit (November 1988), an attempt was made to locate this site, but it could not be recognized. The site is level and overgrown with grass. Trout Brook, a tributary of the Nashua River, flows along the northeast side of the site's presumed location. The Nashua River flows along the southeast side of the site (Biang et al., 1991).

During the EPIC evaluation of the aerial photographs from 1943 to 1991, the following was reported for the area identified as Landfill No. 6:

> The site was reportedly active from 1975 to 1980; however, no photographic evidence of this site is visible throughout the period of analysis (EMSL, 1991).

However, other possible disposal areas noted in the EPIC study in the vicinity of the Shirley Gate could represent the actual disposal area.

No specific information was found about disposal activities at this site. There have been no previous investigations of the site.

3.2.7 AREE 11 - LANDFILL NO. 7 - NEAR LOVELL STREET

Landfill No. 7 (AREE 11) has been identified as SA 11 in the MEP. This landfill, located just east of Lovell Street on the Main Post (Figure 3-1b), was active from 1975 to 1980. The site, about 2 acres in extent, was part of a small gully leading down to the Nashua River, about 200 ft distant. The landfill was covered and graded after closure.

Between 1980 and 1982, Fort Devens used this area to dispose of tree limbs and other vegetation uprooted or felled during heavy storms. This material was placed on the surface, not buried. According to available information, no illegal dumping occurred at this site (Black, 1989). Construction debris and vegetation are reported to be the only material disposed of in this landfill. Therefore, the probability of contamination in this area is very low.

At the time of the ANL site visit (November 1988), it was observed that construction of the new intelligence school building and parking lots had disturbed the landfill and left some old construction material, including plastic, rebar, wood, and roofing, lying on the surface (Biang et al., 1991).

The EPIC study of aerial photographs from 1943 to 1991 does identify in the 4 May 1980 photograph "light-toned material...suggesting disposal is observed." In addition, "light-toned material is visible north of [Landfill No. 7]. Filling activity is visible south of [Landfill No. 7] where light-toned material was seen in 1972. The fill material is light-toned rubble" (EMSL, 1991).

3.2.8 AREE 12 - LANDFILL NO. 8 - SOUTH POST COMBAT PISTOL RANGE

Landfill No. 8 (AREE 12) has been identified as SA 12 in the MEP. This landfill consists of debris randomly dumped without supervision over the edge of a 30-ft hill. According to McMaster et al. (1982), from 1960 to the present, a wide variety of scrap metal and wooden debris has been disposed of at this site. In November 1988 during the ANL site assessment, metal and wood debris were observed lying on the surface, but it appeared that no debris had been placed in this area for a number of years, and the site should be classified as inactive (Biang et al., 1991). The site is located across from the combat pistol range in the South Post Area between Dixie Road and the Nashua River (Figure 3-1c). The Oxbow National Wildlife Refuge is about 250 ft east of the site.

No records are available concerning the quantities or nature of the material disposed of at this site. Gates (1987) reported that material disposed of here consisted of concrete blocks, barbed wire, old stumps, tree cuttings, brush, wood, and other inert materials. Gates also noted that there is no record of any hazardous materials or putrescible wastes being dumped at the location. Although the nature and extent of any soil or groundwater contamination in this area are unknown, the nature of the material reportedly disposed of at this facility means that the potential for soil or water contamination is minimal (Biang et al, 1991).

3.2.9 AREE 13 - LANDFILL NO. 9 - NEAR LAKE GEORGE STREET

Landfill No. 9 (AREE 13) has been identified as SA 13 in the MEP. According to McMaster et al. (1982), Landfill No. 9 was used from 1965 to 1970 for the disposal of construction debris, tree trunks, stumps, and possibly waste oil. The site, about 1 acre in size, is located on the Main Post at Lake George Street and Hattonsville Road (Figure 3-1b).

During the ANL site assessment in November 1988, the landfill's exact location was not apparent because it was covered when it was closed. The only evidence of a landfill was a miscellaneous mixture of wood, metal objects, cans, and other debris scattered about on the surface of a small gully that leads down to the Nashua River, about 350 ft north-northwest. During the March 1990 site visit, active dumping of stumps and brush was observed (Biang et al., 1991).

The site has not received waste except brush debris for more than 21 years; therefore, it is possible that any contaminants placed in the disposal site have completely disappeared due to evaporation, dissolution, oxidation, and biodegradation. No detailed records are available concerning the nature or quantities of the material disposed of at this facility; therefore, the nature and extent of any soil or groundwater contamination in this area are unknown. Evidence of the site consists of a mixture of wood, metals, cans, etc. scattered about on the surface of a small gully. It is not apparent whether these items are from the landfill (Biang et al., 1991).

During the 1991 EPIC evaluation of aerial photographs, the following was noted for Landfill No. 9:

> A short access road and light-toned material on the edge of the incline suggest disposal in 1965. The site remains with no significant change in 1972. By 1980, the deposition of light-toned rubble...is visible downslope in this location (EMSL, 1991).

3.2.10 AREE 14 - LANDFILL NO. 10 - SOUTH POST NEAR DIXIE ROAD

Landfill No. 10 (AREE 14) has been identified as SA 14 in the MEP. Landfill No. 10 is not a landfill but rather an abandoned quarry, about 1 acre in size, in which unwanted automobiles are illegally dumped. It has been reported that ordnance and other debris were found during a recent dive into the quarry (Poole, 1992). The cars are periodically removed by Fort Devens personnel. The site is located in the South Post, about 3,000 ft west along an unnamed dirt road from the intersection of Dixie Road and Jackson Road (Figure 3-1c).

General geologic conditions in the area consist of a metamorphic slate bedrock knob sticking up out of unconsolidated glacial deposits of undetermined thickness. The surrounding soils have been mapped as the Quonset-Hinckley-Windsor Association (Nicholls et al., 1980). The soil is well drained and has high permeability. No wells have been drilled through the glacial moraine in this vicinity, and its thickness is unknown. The quarry is spring-fed, and no surface water flows in or out. The regional hydrogeological conditions at this location have been mapped as a minor aquifer consisting of thin sections of glacial outwash and glacial lacustrine deposits. Goldberg-Zoino & Associates (1976) showed the saturated thickness to be less than 20 ft in this area.

No records are available concerning the number of automobiles disposed of at this site. No contamination is apparent, and all the automobiles reportedly have been removed (Poole, 1988), but there is a potential for the presence of petroleum hydrocarbons. The

quarry is very deep, making it difficult to determine whether any cars are in the water. During a previous dive to locate abandoned cars, ordnance was noted.

3.2.11 AREE 15 - LANDFILL NO. 11 - SOUTH POST NEAR HELIPAD

Landfill No. 11 (AREE 15) has been identified as SA 15 in the MEP. The landfill consisted of a series of pits in which fuel oil, primarily heavy No. 4 and No. 6, was burned (Gates, 1989). While active (1963-1966), the landfill encompassed about 3 acres and was located adjacent to the helipad on Jackson Road in the South Post (Figure 3-1c). The pits have been closed and no evidence is visible today attesting to their former existence. The site was located and sampled during an environmental audit of Fort Devens in 1985 by the U.S. Army Environmental Hygiene Agency (USAEHA) (Gates et al., 1986; Gates 1987, 1989).

The site was investigated in 1985 to determine what petroleum, oil, and lubricants (POL) were present and if any fuel residues had migrated downward (Gates, 1989). To determine whether contamination was present, a backhoe was used to excavate five trenches 5 ft deep. Samples were obtained from the trench walls at the surface and at depths of 0.5 to 1.5 ft and 4 ft below the surface. Because of the heavy POL product, the fuel had tended to coalesce within the first 6 inches of soil, visibly limiting downward migration.

The soil samples were analyzed for total POL, PCBs, pesticides, and the metals arsenic, chromium, cadmium, mercury, and lead (both total and extractable) (Gates, 1989). The study concluded that the soil was contaminated with a POL product, as reported to EPA Region I in April 1986. All samples contained metal concentrations less than the maximum concentrations allowed by federal and state law. In addition, the samples contained no detectable concentrations of PCBs or pesticides.

Gates (1987) stated that additional burning of the material caused the formation of an asphalt-like cap that inhibited infiltration of water, further inhibiting downward migration. Because of the physicochemical nature of the waste, the volatile fuel by-products tended to migrate toward the heat source, burning fuel. Gates (1987) doubted that much of the fuel or volatile by-products had migrated down toward the groundwater.

3.2.12 AREE 16 - LANDFILL NO. 12 - MAIN POST NEAR SHOPPETTE

Landfill No. 12 (AREE 16) has been identified as SA 16 in the MEP. Landfill No. 12 is about 1 acre in size and was operated for 3 weeks in 1985 to reduce the volume of material entering the sanitary landfill (AREE 5). It received construction debris generated at the installation (Black, 1989).

The landfill's location is reported to be on the Main Post, southeast of the shoppette and the intersection of Patton Road and Marne Street and west of the Boston and Maine Railroad tracks (Figure 3-1b). During the ANL site visit in November 1988, no surface evidence attested to the landfill's prior existence.

It is reported that an unknown amount of 2-inch metal chain and three to four truckloads of debris were disposed of in the Landfill No. 12. Disposal was supervised by DEH. Operations were ceased because of the proximity of a wetland and Cold Spring Brook (Black, 1989).

The 1991 EPIC study of aerial photographs at Landfill No. 12 reveals the following:

> The area is first cleared and a pile of refuse is noted in 1952; an excavation and dark-toned material are seen in 1965. In 1972, the excavation area contains scattered material and liquid. In 1980, the area continues to contain liquid, and additional material is present. No significant changed is noted in 1991 (EMSL, 1991).

During the WESTON and ANL site visits, no visual evidence of the landfill (e.g., surface debris) could be identified. No contamination is apparent, and none has been reported.

3.2.13 AREE 17 - LANDFILL NO. 13 - LITTLE MIRROR LAKE

Landfill No. 13 (AREE 17) has been identified as SA 17 in the MEP. Landfill No. 13, in the southeastern portion of the Main Post near the enlisted housing (Figure 3-1b), is not really a landfill; rather, it is a lake (Little Mirror Lake). Little Mirror Lake is separated from the larger Mirror Lake by a natural berm. The Mirror Lake area is a major wetland, with an associated spruce-peat bog on the northeastern side, and is a recreational area for fishing, boating, and swimming.

The entire installation can be considered an outwash plain dotted with small conical and drumlinoid hills. The plain was formed by glacial deltas prograding into glacial Lake Nashua during various stages. Sand and gravel were deposited by the deltas around blocks of stagnant ice. As the block ice melted, depressions known as kettles developed. One of these kettles formed Little Mirror Lake (Brown, 1981).

At an unknown time, World War II-era grenades were disposed of in Little Mirror Lake. During a low-water period in the early 1970s, about 200 were exposed. They were removed and destroyed by the 14th Explosive Ordnance Disposal at Fort Devens. Little information exists regarding the removal action or the exact location where they were found (Biang et al., 1991).

3.2.14 AREE 40 - COLD SPRING BROOK LANDFILL

Cold Spring Brook Landfill (AREE 40) has been identified as AOC 40 in the MEP. This landfill is located in the southeastern part of the Main Post near the Shoppette on Patton Road (Figure 3-1b). Considered an abandoned landfill, it was discovered in November 1987, when fourteen 55-gal drums were uncovered along Cold Spring Brook. The waste disposal extended about 850 ft along the edge of the brook and involved an area of 10 to 20 acres. Wastes included concrete slabs, wire, tanks, rebar, timber, and debris found at depths of 10 to 25 ft (Hopkins, 1988). It is possible that the area was

filled to raise the surface elevation near Patton Road. It is not known if the drums were placed in the landfill when it was first excavated or at a later date.

The 1991 EPIC study evaluating aerial photographs from 1943 to 1991 noted the following:

> Filling of a wetland area with debris is observed in 1965. The filling activity continues and the filled area has almost doubled in size by 1972. In 1980, the area no longer appears to be receiving waste and is revegetating. By 1991 the area appears inactive (EMSL, 1991).

In March 1988, the drums were examined by a response team from Union Carbide. An identification number on the drums indicated that the original contents had been antifreeze manufactured by Union Carbide and that they were 15 to 20 years old. Apparently, the drums had been painted yellow and reused (Hopkins, 1988).

The AEHA completed a hydrological investigation at the site in 1988. Eight monitoring wells were installed by AEHA. The investigation showed that the landfill is located over glacial sand and gravel deposits in or adjacent to a former wetland. USGS information indicates that the area is underlain by swampy deposits of muck and peat with adjacent units of sand and gravel from kame deposits. With the exception of two borings, coarse or medium to fine-grained sand interspersed by fine to coarse gravel was the primary subsurface material. Two borings (CBW-4 and CBW-5) adjacent to a peat deposit contained organic matter with the silt and sand or clay (Fox, 1988b).

Monitoring wells were installed in each of the boreholes to determine groundwater flow in the upper aquifer and to monitor groundwater quality. Flow in this area is influenced by the brook and by seasonal variations in the water table. Initial water level measurements have indicated that the brook is recharging the aquifer. More information should be provided by continued water level measurements (Fox, 1988b). A production well, the Patton well, is located about 900 ft southwest of the site.

The landfill site was sampled on three different occasions in 1988 (March 25, April 12, and April 19). The results are summarized below (Fox, 1988b).

On 25 March 1988, surface water samples were taken from the brook in the drum area. Three of the contaminants found in the samples were priority pollutants, and concentrations exceeded the maximum contaminant levels (MCLs). These pollutants, bromoform, 1,2-dichloroethane, and 1,1,2,2-tetrachloroethane are carcinogens (Fox, 1988b).

During an inspection of the site on 12 April 1988, a submerged drum was noticed. Four surface water samples and five sediment samples were taken and analyzed for metals. Results for the water samples showed elevated levels of selenium (0.130 to 0.177 mg/L), silver (0.010 to 1.320 mg/L), and arsenic (0.16 to 0.18 mg/L). The MCLs for these metals are 0.01 mg/L, 0.05 mg/L, and 0.05 mg/L, respectively (Fox, 1988b).

On 19 April 1988, three surface water and sediment samples, one groundwater sample from Patton well, and seven soil samples were collected and analyzed for volatile organics by EPA Method 601. None of the water samples showed elevated concentrations of contaminants. Two sediment samples contained detectable levels of 1,1-dichloroethene (Fox, 1988b).

Although there is no enforceable standard for 1,1-dichloroethene (1,1-dichloroethylene), there is a proposed RCRA action level of 10 mg/kg in soil. The reference for this is Proposed Rules, Corrective Action for Solid Waste Management Units (SWMUs) at Hazardous Waste Management Facilities, 55 Federal Register, 30798, 27 July 1990.

In spring 1988, the eight monitoring wells were sampled for priority pollutants, RCRA metals, pesticides, PCBs, and herbicides. Results are reported as follows (Fox, 1988b):

- One volatile organic compound (trichlorofluoromethane) was detected at 8 mg/L. All other volatiles were below detection limits.
- Well CBW-3 contained 40 μg/L of bis(2-ethylhexyl)phthalate. All other priority pollutants were below detection limits.
- Two samples contained arsenic above the Primary Drinking Water Standards (0.05 mg/L). Wells CBW-4 and CBW-5 contained 0.94 mg/L and 0.24 mg/L, respectively. All other metal concentrations were below Primary Drinking Water Standards.

Two possible sources of arsenic are natural accumulation in the organic matter and pesticides that may have been used at the landfill area (Fox, 1988a).

3.2.15 AREE 41 - UNAUTHORIZED DUMPING AREA (SITE A)

The Unauthorized Dumping Area (Site A) is AREE 41 and has been identified as SA 41 in the MEP. The old unauthorized landfill or dump was found in the South Post area by Fort Devens personnel (Figure 3-1c). The 1-acre site is completely overgrown with trees and vegetation, and no records are available detailing when the site was used or what material was placed in it. From the appearance of the rubbish, it appears that the site was used until the 1950s for disposal of nonexplosive military and household debris. The site consists of debris scattered over a hill slope about 10 ft high. It is located between Harvard Road and new Cranberry Pond in the South Post. A small wetland is just south of the site. Although site-specific hydrogeological information is lacking, it is assumed that any groundwater in this area would flow southeast toward and into Cranberry Pond and the Nashua River (Biang et al., 1991).

Because no records are available concerning the nature of the material disposed of at this site, the nature and extent of any soil or groundwater contamination in this area are unknown. No contamination is apparent other than broken glass and rusty metal objects lying on the surface. Some of the cans looked like brake fluid cans or old-style beer cans.

3.2.16 AREE 46 - TRAINING AREA 6d - SOUTH POST

Training Area 6d (AREE 46) has been identified as SA 46 in the MEP. Training Area 6d is on the southwestern boundary of the impact area in the South Post, near the intersection of Shoefelt and Firebreak Roads (Figure 3-1c). It is a small (about 200 ft^2) sandy area. During the ANL site visit in 1988, the area contained two abandoned armored vehicles and an abundance of spent canisters that appeared to have contained tear gas. Personnel report that the site may have been used for 3.5-inch rocket launchers, LAW range, and later an M79 Range (Biang et al., 1991).

During the EPIC study, evaluation of aerial photographs from 1943 to 1991 revealed the following:

> Two rectangular structures (probable tanks) are present in two cleared areas in 1965 and remain with no significant change throughout the period of analysis (EMSL, 1991).

Very little is known about the activities at this site. The sandy, permeable nature of the soils and the observed conditions indicate that there is a possibility for contamination. There were no visibly stained areas.

3.3 WASTEWATER TREATMENT PLANT

3.3.1 AREE 19 - WWTP

The WWTP (AREE 19) has been identified as SA 19 in the MEP. The WWTP, formerly called the sewage treatment plant, is located in the North Post (Figure 3-1a). Built in 1942, it has a design capacity of 3.0 mgd. The average daily flow is about 1.3 mgd (McMaster et al., 1982; Nicholls et al., 1980; DEH, 1985b; Gates et al., 1986). Although designed to serve a population of 30,000 people, the WWTP served an effective population of only about 11,000 people in 1985. Less than 1% of the flow is from industrial sources, such as vehicle washrack discharge, caustic radiator washwater, floor drains, heating plant boiler blowdown, and swimming pool filter backwash (McMaster et al., 1982; DEH, 1985b). The facility does not require an NPDES permit since it does not discharge to surface waters (McMaster et al., 1982).

Wastewater from the Main Post and North Post is carried to the main pumping station via a gravity-flow sanitary sewer (with the aid of several small pump stations) (Nicholls et al., 1980). Figure 3-3 shows a schematic diagram of the wastewater treatment unit operations at Fort Devens. At the main pumping station, the wastewater is pretreated by passing through a bar screen, grit chamber, and comminutor. The wastewater is

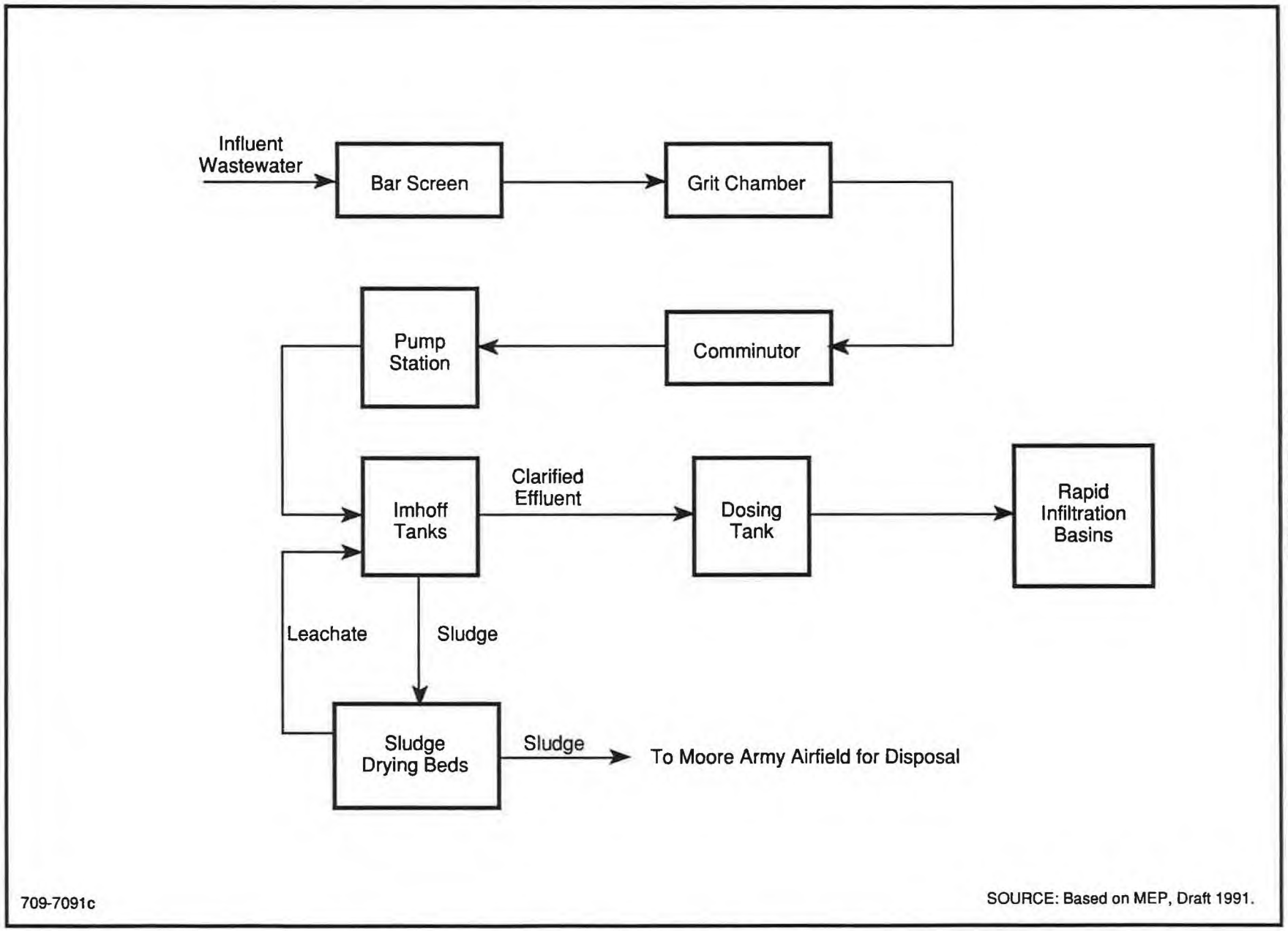


FIGURE 3-3 FLOW DIAGRAM FOR WWTP UNIT OPERATIONS AT FORT DEVENS

then pumped to three parallel Imhoff tanks, a 30,000-gal dosing tank, 22 Rapid Infiltration Basins of 0.8 acre each (AREE 20), and eight Sludge Drying Beds of 0.086 acre each (AREE 21). Settleable solids are anaerobically digested in the lower compartments of the Imhoff tanks; gases from the digestion process are vented to the atmosphere. The clarified (unchlorinated) primary effluent from the Imhoff tanks discharges into a dosing tank, which intermittently applies wastewater to the Rapid Infiltration Basins.

The WWTP is located on the Quonset-Hinckley-Windsor Association, which consists of droughty sand and gravelly soil underlain by stratified sand and gravel. This area drains well, and the soil is highly permeable (Nicholls et al., 1980; McMaster et al., 1982; DEH, 1985b). Hydraulic conductivities range from 3.0×10^{-4} to 2.4×10^{-2} cm/s (Satterwhite et al., 1976a). Groundwater movement at the treatment site is in a north and northeast direction, as determined from groundwater gradients and water quality in the various observation wells (Satterwhite et al., 1976b).

Two sets of wells have been installed at this site. The U.S. Army Corps of Engineers (USACE) installed the first set of 20 observation wells in 1974. These wells are no longer in use. The current monitoring network consists of 16 wells. Wells 1 through 4 were installed in 1984, and wells 1a and 2a were installed in 1988 (Biang et al., 1991). Wells 5 through 14 were installed in 1991.

Based on a review of the plant records and associated files, no contamination problems are apparent at the WWTP itself.

3.3.2 AREE 20 - RAPID INFILTRATION BASINS

The Rapid Infiltration Basins (AREE 20) have been identified as SA 20 in the MEP. The Rapid Infiltration Basins are used in rotation. Reportedly, the current application cycle involves discharge to nine basins for 9 days, to another seven basins for 7 days, and to the remaining six basins for 6 days (McMaster et al., 1982; DEH, 1985b). The application rate for each Rapid Infiltration Basin has been calculated to be about 25 to 28 m/yr (AEHA, 1979). During the application, effluent may accumulate on the bed to a depth of 0.5 to 1.6 ft; it infiltrates within 2 to 3 days of the initial application period (Satterwhite et al., 1976a; Nicholls et al., 1980).

The major operational problem noted at the WWTP has been the maintenance of the distribution troughs in the Rapid Infiltration Basins; there has been evidence of erosion in cells with damaged distribution systems (McMaster et al., 1982). A USAEHA assessment (Nicholls et al., 1980) noted that Fort Devens had experienced some infiltration and inflow problems in the sanitary sewer; this is cause for concern, particularly near the WWTP, where a portion of the sanitary sewer line is located parallel to the Nashua River within the floodplain.

The Rapid Infiltration Basins are located on a large oval-shaped, steep-sided kame, composed of stratified sand that rises about 70 ft above the Nashua River floodplain (Satterwhite et al., 1976a). Background soil samples have previously been collected

from a formation consisting of stratified horizons of sand and gravel. Coarse to medium sand constituted the major portion of the 10-ft profile, with gravel accounting for a large percentage in the 1- to 3-ft horizon. Below 3 ft, the formation consisted of 6 ft of medium sand, underlain by strata of sandy gravel and gravelly sand. Silts and clays constituted about 10 to 15% of the volume in the upper profile, but accounted for less than 1% below 1.6 ft (Satterwhite et al., 1976a).

The Rapid Infiltration Basins are working remarkably well considering the length of their service (Nickelson, 1986). The beds were not specifically designed or operated for removal of nitrogen. The total nitrogen concentration ranges from 15.8 to 30.7 mg/L (with about 90% present as nitrates) (Nickelson, 1986). Of particular significance to the nitrogen problem (and its contribution to groundwater contamination with nitrate) is the location of the Rapid Infiltration Basins with respect to the Nashua River (Nickelson, 1986). The Nashua River is less than 1,200 ft from the infiltration basins and is located downgradient of the system. No users are downgradient of the groundwater recharged from the bottom of the infiltration basins. Nickelson (1986) reported an estimate that 100% of the water infiltrating from the bottom of these basins enters the Nashua River, although it is not known what effect this recharge has on the water quality of the Nashua River.

Samples taken from the current monitoring well network between September 1987 and May 1989 show that nitrate levels continue to exceed the 10-mg/L standard for Massachusetts Class I groundwater quality.

Results from well 1 show the background nitrate mean concentration of 0.51 mg/L. Since groundwater flow is generally north-northwest, well 1a also showed generally low nitrate levels. The highest nitrate concentration (42.5 mg/L) was found in water from well 2, which is near the Sludge Drying Beds (AREE 21). Nitrate concentrations in water from other wells ranged from 0.72 to 21.2 mg/L. It is not known whether the nitrate source is the Rapid Infiltration Basins, Sludge Drying Beds, or both.

3.3.3 AREE 21 - SLUDGE DRYING BEDS

The Sludge Drying Beds (AREE 21) have been identified as SA 21 in the MEP. Sludge from the Imhoff tanks, typically about 4 to 10% solids, gravimetrically drains to four uncovered Sludge Drying Beds two to three times annually. The Sludge Drying Beds are equipped with 4-, 8-, and 10-inch clay pipe underdrains to collect leachate. Before 1982, the leachate was discharged to an adjacent wetland area located on the east bank of the Nashua River. After 1984, leachate was collected and pumped back into a Rapid Infiltration Basin. Because these pipes have collapsed over the years, it is likely that most of the leachate infiltrates into the permeable subsurface. Up until 1984, the leachate from the Sludge Drying Beds was discharged through tile pipe into the floodplain adjacent to the river.

Dried sludge from the Sludge Drying Beds, typically about 70% solids, is removed and land-applied at MAAF per the requirements of a state Class III Sludge application permit.

A 1974 study to evaluate the WWTP and determine its effects on the subsurface soils and groundwater used monitoring well data to confirm the observation that most of the leachate from the Sludge Drying Beds infiltrated into the permeable subsurface (Satterwhite et al., 1976a). Compared with the native groundwater in the surrounding area, the monitoring wells showed elevated specific conductivity, alkalinity, chloride, and total coliform measurements, with slightly elevated concentrations of nitrogen species (total, NO_3, NH_4, and organic). This was confirmed by Satterwhite et al. (1976a). (If the WWTP were to add a chlorination unit to the process, the extremely high total coliform number resulting from the effluent from the Imhoff tanks (typically about 32 x 10^{-6}/100 mL) would be greatly reduced.) Effluent nitrogen consisted primarily of organic nitrogen and ammonia, with a small amount of nitrate and nitrite, while the groundwater nitrogen was primarily nitrate, with small amounts of ammonia and organic nitrogen (Satterwhite et al., 1976a). Calculations by Satterwhite et al. (1976a) showed that the organic carbon present at the surface of the treatment beds was insufficient to facilitate denitrification (provided other environmental conditions are amenable). In 1983, DEH implemented a project to return the seepage from the Sludge Drying Beds to the Imhoff tanks (DEH, 1985b). In 1984, the leachate was redirected into a sump and pumped up the hill into one of the Rapid Infiltration Basins. In 1990, the Sludge Drying Beds were completely rebuilt. An impermeable liner was added. The collection piping was replaced with PVC pipe. The beds were graded with new material. The discharge point for the leachate was rerouted from the Rapid Infiltration Basins to the Imhoff tanks.

As discussed in Subsection 3.3.2, high nitrate levels have been found in groundwater samples from the current monitoring well network. The Sludge Drying Beds are a potential source of the nitrate.

Sludge from the Imhoff tanks must be removed and disposed of periodically. For comparison, the state standards for Type I and II sludges must be considered. A Type I sludge, if approved by MDEP, may be used as fertilizer and may be used, sold, distributed, or offered for use, sale, or distribution on any site without further state approval. A Type II sludge has the same basic definition as a Type I sludge, except that MDEP approval is required for each transaction. Two parameters that exceed Massachusetts standards for a Type I sludge are cadmium and selenium. The state standard is 2 mg/kg, while the Fort Devens sludge contains 3 to 6 mg/kg. The state standard for selenium is 0.01 mg/kg, while the Fort Devens sludge contains 0.03 mg/kg. Nickelson (1986) attributed this elevated cadmium concentration to the frequency of sludge removal from the bottom of the Imhoff tanks (only twice a year until 1985). The results from several other analyses performed on the sludge indicate that the parameters exceeding the state limitations for Type I and Type II sludges are cadmium, copper, and molybdenum (Biang et al., 1991).

3.4 STORAGE AREAS

3.4.1 AREE 22 - HAZARDOUS WASTE STORAGE FACILITY (BUILDING 1650)

The Hazardous Waste Storage Facility at Building 1650 (AREE 22) has been identified as SA 22 in the MEP. The facility is located at Building 1650 in the northeastern area of the Main Post (Figure 3-1a). It has been a storage facility since 1980 and was remodeled in 1984. Previous uses include hazardous materials storage, a maintenance shop, and a stockade. It is classified as a container storage area and is a RCRA-permitted unit (facility identification No. MA7210025154). About 35,750 gal of hazardous waste is currently stored there. Table 3-2 lists the types of wastes typically stored (Fox, 1988a).

The total size of the facility, including the outdoor areas, is 26,000 ft^2 (Fox, 1988a). The outside portion of the facility is fully paved. Waste is not generally stored outside. The indoor area is 6,000 ft^2 and has cement floors. It contains an office and a series of bermed storage areas. Half of the area (3,000 ft^2) is used to store the hazardous waste. There are no floor drains, and wastes were clearly marked and segregated by the type of waste (i.e., acids, flammable). Aisle space was adequate, and none of the wastes were stacked. The storage portion of the building is totally enclosed and has an exit that leads to a working and loading area. There are two loading docks, one in the rear and one on the side (Biang et al., 1991).

No spills or releases from this facility have been reported (Fox, 1988a; Gates et al., 1986). At the time of the ANL site visit in 1988, all of the areas were scrupulously clean and showed no visible staining or other indications of spills or leaks (Biang et al., 1991). During the site visit, WESTON noted drums labeled as containing monitoring well purge water and two tanks in the bermed area at the rear of Building 1650.

3.4.2 AREE 23 - PAPER RECYCLING CENTER (BUILDING 1650)

The Paper Recycling Center (AREE 23) has been identified as SA 23 in the MEP. The center was located in Building 1650, the current Hazardous Waste Storage Facility (Subsection 3.4.1). It was a storage and transfer facility for recycling computer paper, computer tab cards, and high-grade office paper. About 160 tons/yr of paper was recycled. The period of operation was April 1984 until sometime in 1985 (Fox, 1988a). At the time of the ANL site visit in 1988, the recycling operation was inactive (Biang et al., 1991).

Operations were restricted to storage and recycling of several types of paper. There is no record of any associated liquids or releases that would endanger human health or the environment.

Table 3-2

Hazardous Wastes Typically Stored in Building 1650 at Fort Devens

Waste Description	EPA or Massachusetts Waste No.
Flammable liquid	D001
Compound lacquer	D001, D008
Compound paint	D001, D007
Corrosive alkaline liquid	D002
Electrolyte/battery fluid	D002, D006
Flammable solid/lithium batteries	D003
Arsenical compound	D004, D010
Mercury compound	D009
Solvent	F001
Solvent	F002
Oil	M001
Hazardous solid	M001
PCBs	M002
Hexachlorophene	U132
Reserpine	U200
Cyclophosphamide	U058
Ferric dextran	U139
Chlorambucil	U035
Chlordane	U036
Hexachlorocyclohexane	U129
Hexachlorobenzene	U127
Formaldehyde	U122
1,1,1-Trichloroethane	U226
Toluene	U220
Phenol	U188

Table 3-2

Hazardous Wastes Typically Stored in Building 1650 at Fort Devens (continued)

Waste Description	EPA or Massachusetts Waste No.
3-(alpha-acetonylbenzyl)-4-hydroxycoumanin	P001
Epinephrine	P042

Source: Fox, 1988a.

3.4.3 AREE 24 - WASTE EXPLOSIVE STORAGE BUNKER (BUILDING 3644)

The Waste Explosive Storage Bunker (AREE 24) has been identified as SA 24 in the MEP. The bunker was previously known as Bunker 187. The magazine area is in the southeastern portion of the Main Post, about 0.5 mi north of Mirror Lake (Figure 3-1b). The Waste Explosive Storage Bunker (Building 3644) is in the magazine area, which requires a prearranged security pass.

The U.S. Army EOD controls the bunker. Explosives that are designated for detonation at the EOD Range (see Subsection 3.5.1.1) are stored in the bunker. The bunker, an in-ground igloo with cement floors, has been used since 1979. Fort Devens provides disposal for the entire New England area, both civilian and military. The sources of waste explosives range from on-site finds during excavation to explosives found, confiscated, or otherwise removed by the state police. About 2,000 lb of explosive wastes are destroyed annually (DEH, 1985b).

The types of explosives stored in the bunker include a broad range of materials that varies with time. Table 3-3 lists typical items that are stored in the bunker and detonated at the EOD Range (DEH, 1985b; Fox, 1988a).

The bunker is used only for storing explosive items prior to detonation at the EOD Range. Many of the items are encased (e.g., grenades and rockets), and by their description, it is obvious that they are not "opened" until they are detonated on a range. Therefore, many of the stored items can be eliminated as likely sources for contamination. Other items are stored in containers.

3.4.4 AREE 29 - TRANSFORMER STORAGE AREA (BUILDING 1438)

The Transformer Storage Area (AREE 29) has been identified as SA 29 in the MEP. This area is located in the northeastern part of the Main Post, near DEH (Figure 3-1a). The storage facility, known as Building 1438, has been in use since 1980. The storage facility has a total area of 1,600 ft^2. The storage facility has a roof and paved floor, is enclosed on three sides, and is secured by a locked gate that serves as the fourth wall. An area of 33 ft^2 is bermed for temporary storage of transformers containing polychlorinated biphenyls (PCBs) that have been taken out of service. All of the transformers are tested for PCB content. If a unit exceeds 25 ppm PCB content or is determined to be unserviceable, it is designated for disposal (Fox, 1988a).

Because 1 to 2 years was required to dispose of transformers (Gates et al., 1986), the enclosed storage area was full. A second storage yard was in use at the time of the ANL site visit in 1988. This second yard (about 400 ft^2) was unprotected and unpaved, and according to Fort Devens personnel, held about 14 PCB-containing transformers. None was drained or properly marked. During the first quarter of 1989, the transformers were transferred to the Hazardous Waste Storage Facility (AREE 22) until disposal. The regional DRMO is responsible for transportation of hazardous wastes and is ultimately responsible for the disposition of the transformers.

Table 3-3

Waste Explosives Stored and Detonated at Fort Devens

Small arms	PETN (pentaerythritoltetranitrate)
Artillery/mortar	RDX (cyclotrimethylene trinitroamine)
Grenades	C-4 (RDX, polyisobutylene)
Rockets	Compounds B (RDX, TNT, Wax)
Pyrotechnic compound	Octol (cyclotetramethylene, tetranitroamine)
Propellant	White phosphorus (aluminum, magnesium, barium, nitrate, potassium, perchlorate)
Bulk explosives	TNT (trinitrotoluene)
Photoflash powder	
Lead azide	
Black powder	
Hazards explosive material	

Sources: DEH, 1985b; Fox, 1988a.

The Building 1438 Transformer Storage Area showed no signs of spills or leaks. Available information indicates that there have not been any reportable spills or releases (Fox, 1988a). Neither have there been any spills or releases reported in the yard storage area (nonconforming storage) where excess transformers were stored temporarily. The potential exists that leaks could have occurred.

3.4.5 AREE 30 - DRUM STORAGE AREAS - MAAF

The Drum Storage Areas at the Moore Army Airfield (AREE 30) has been identified as SA 30 in the MEP (Figure 3-1a). Three small areas located in the northern part of the airfield were reportedly used for temporary storage of hazardous waste between 1975 and 1990. The Drum Storage Areas were originally thought to be located at two nearby areas at the end of the aircraft defueling area (west drum storage area). More recently, it has been learned that drums were stored in that location only for the later years. Previous to that and for a longer period, drums of waste were stored at a location farther to the east (ABB, 1992).

The west temporary drum storage area was an outdoor satellite accumulation point for storage of containerized hazardous waste for 90 days or less. Pallets with space for ten to fifteen 55-gal drums were positioned at the end of the aircraft defueling area (DEH, 1985b). During 1990, Fort Devens constructed a prefabricated 90-day storage area at another location, and the area is no longer in use.

This area was used to store materials such as alkaline cleaners (EPA waste D002), methyl ethyl ketone (F005), contaminated JP-4 jet fuel (D001), and paint thinners (D001, D008) (DEH, 1985b). During the ANL site assessment in 1988, the following materials were being stored at this site: naphtha, drycleaning solution (such as PD-680), JP-4, aircraft cleaning compounds, lube oil, and waste solvent (F-list wastes). The JP-4 drum was resting on asphalt rather than on the pallet. In addition to these materials, five empty drums were present (out of a total of 21 drums). Several drums were damaged. The drums were all exposed to the natural elements, and ponding was evident on the drum tops. Several bungs appeared to be broken.

At the time of the WESTON site visit, September 1991, all drums had been removed.

The west temporary storage location was not bermed or sheltered. It was set apart from the airfield with railroad ties. The asphalt storage pad had several cracks, and leaks were apparent on the soil and asphalt surface. This site is located north of the runways near the top of a hill. The Nashua River lies in the valley below the site, and contaminants, if any, would probably migrate downhill to the river. No monitoring wells are in this area (Sharma, 1988).

It was reported that waste oils, fuels, and solvents from aircraft maintenance operations were formerly poured into 55-gal drums near the Drum Storage Areas. The drums occasionally overflowed, and soil contamination was evident in the area (McMaster et al., 1982).

In the east drum storage area there is no visible evidence of previous waste storage activities. An area of stressed vegetation about 30 feet to the north resulted from a single incident of discharge of fire retardant onto the ground (ABB, 1992).

3.4.6 AREE 32 - DRMO YARD

The Defense Reutilization and Marketing Office (DRMO) Yard (AREE 32) has been identified as SA 32 in the MEP. The DRMO Yard is located near Building 204 in the northeastern portion of the Main Post near the Shepley's Hill Landfill (No. 1) (AREE 5, as shown on Figure 3-1a). Records of operations are available as far back as 1964. Numerous items are stored at the DRMO, including scrap metal, vehicles, batteries, tires, and used office equipment. All items are stored before reuse or resale. No hazardous wastes were reportedly received or stored there (Fox, 1988a). Several transformers/capacitors containing PCBs were reportedly destroyed on-site in August 1991, and sampling data indicate hazardous wastes have been spilled within the yard.

Cook Street intersects the two main storage areas. The yard on the west side is fenced on four sides and is about 150 by 600 ft in area. In contains various types of used equipment. The northwest corner of the yard is dedicated to storage of used lead-acid batteries. All battery acid is drained by the generator prior to arrival. Batteries are stacked on pallets, with the top of the battery turned sideways to avoid any accumulation of precipitation. During the 1988 ANL site visit, about 750 batteries were being stored in this manner (Biang et al., 1991). About 40,000 lb of batteries pass through the DRMO per month. The batteries are accumulated for 4 to 6 weeks and sold to the Department of Energy (DOE) (Berry, 1988).

The yard on the east side is about 600 by 300 ft in area. A warehouse and offices are also located there. On the west end of the yard, vehicles are cut and disassembled to recover usable parts. This yard contains scrap metal, tires, stored items that are ready for sale, and the accumulation point for used photographic solution. The recovery of scrap precious metals (silver and platinum) from the solution is subcontracted (Berry, 1988).

The west yard is completely paved with asphalt. The perimeter of the yard is lower than the yard and there is a considerable amount of runoff. As much as 2 inches of water may accumulate or run off during a moderate rainfall (Gates et al., 1986). The soil around the yard appeared to be discolored. Personnel from the Environmental Management Office sampled the soil at various locations. The focal point was near the battery storage area. Soil samples were tested for EP toxicity. There were no elevated concentrations of EP toxic metals (Hopkins, 1988).

Most of the east yard is also paved with asphalt. However, several small square areas have no asphalt, and the soil is exposed. The reasons for leaving these areas unpaved is not known.

Massachusetts considers used motor oil a hazardous waste. Because of the nature of the operations, it is possible that motor oil and other possibly hazardous wastes may have leaked onto the ground. Contamination due to runoff is also possible.

3.4.7 ENTOMOLOGY SHOPS

3.4.7.1 AREE 33 - DEH Entomology Shop (Building 262)

The DEH Entomology Shop in Building 262 (AREE 33) has been identified as SA 33 in the MEP. Pesticides and herbicides have been used at Fort Devens for general pest control and elimination of vegetation in a 1-ft strip on each side of the base's boundary fences, in hard-to-mow areas along fences, in athletic areas, and at the bases of antenna guy wires (Nicholls et al., 1980). Weeds are removed to slow the spread of possible ground fires and for general appearance.

Malathion, Warfarin, Diazinon, Carbaryl, Bromacil, 2,4-D, and Pyrythrum were identified in 1977 (Nicholls et al., 1980) as the pesticides used across the site. Four certified pest exterminators use manufacturer-specified concentrations of these pesticides. The certified pest exterminators supervise application of pesticides at the golf course by the groundskeeper. All golf course personnel are required to draw out only quantities needed to meet short-term needs (5 to 7 days).

Pesticides are stored in Building 262 on the Main Post, as shown in Figure 3-1a. It is a metal building with an area of 960 ft^2, designed to meet AEHA and EPA requirements. Completed in 1982, it is the newest pesticide storage area (DEH, 1985b). On 1 October 1982, pesticides from other DEH storage areas (Buildings 245, 254, and 2728) were moved to Building 262, and all pesticide activities were consolidated at this location (McMaster et al., 1982). According to site personnel, all containers are closed when not being used. During the ANL 1988 site visit, labels were affixed and could be easily read (Biang et al., 1991).

Drains in the locker rooms of the building are connected to the sanitary sewer system (Gates et al., 1986). These drains are completely blocked off when chemicals are being mixed. Any spills are contained using clay adsorbent. This pesticide shop/storage building is dry, fire-resistant, and well secured by locked doors and fences (Gates et al., 1986). During a 1985 evaluation, pesticides were stored either on the floor or on wooden pallets and were not segregated by type. Gates et al. (1986) noted that pesticides should be stored off the floor to prevent moisture damage to containers and contents, containers should be stored with their labels plainly visible, and aisles should be accessible to permit inspection. The insecticides, herbicides, and fungicides were not segregated by either distance or physical barriers, such as wire cages. Fertilizers were observed in the facility. To prevent possible contamination of the fertilizers, they should not be stored with pesticides.

During the ANL 1988 site visit, the following pesticides and herbicides were noted: Tersan 1991 DF (turf fungicide), 26019 FLO fungicide, Turf Green, Oftanol, Daconil 2787 (ornamental fungicide) Acti-Dione TGF, Bayleton (turf and ornamental fungicide),

Aqua-Gro S spreadable, Diazinon granular, Dursban Professional Killer, Dursban lawn insecticide, Dursban Termiticide TC, Malathion, Roundup (herbicide), 2 Plus 2, and Weed Rhap LV-4D. In a smaller storage area within this building, roach pots, mothballs, Roach Control Systems, and Max Force Roach Control Systems were stored on steel pallets and shelves, while aerosols were stored in steel cabinets. An area alongside the building was littered with debris (scrap metal, wood, etc.) (Biang et al., 1991).

The Industrial Hygiene Section of the Preventive Medicine Service (PVNTMED) performed a ventilation reading at Building 262 during the course of the operational review (Gates et al., 1986). To provide adequate ventilation in pesticide storage areas, at least six air changes per hour are required; the reading in the pesticide area indicated the ventilation was adequate (6.4 air changes/hour). However, because this value was only slightly above the requirement, AEHA recommended that readings be made on a routine basis. The smaller pesticide storage area had no means of ventilation. The pesticide room hood covered the entire length of the workbench surface and sink and provided a face velocity of 74 ft/min. A hood face velocity in the range of 100 to 150 ft/min is required, depending on the toxicities and flammabilities of the pesticides and solvents being used. AEHA also observed that the pest control heating system did not operate using outdoor air only. This resulted in incomplete furnace combustion, causing smoke and possible recirculation of pesticide contaminants throughout the building. At the time of the operational review, insufficient hazard signs were posted both inside and outside of Building 262. AEHA further noted that the outdoor mixing area at Building 262 was inadequate.

Gates et al. (1986) have previously recommended that Building 262 be provided with adequate cold weather protective gear, an adequate change room, proper segregation and storage pallets for pesticides, adequate ventilation and mixing hood face velocity, sufficient hazard signs, proper labeling for hand sprayers, and an adequate outdoor pesticide mixing area.

Very little documentation exists of contamination associated with pesticides at this site. A distinct chlorine smell was noted inside the building during the ANL site 1988 assessment. The exhaust system did not perform efficiently. USAEHA has previously recommended that ventilation readings of this building be taken periodically (Gates et al., 1986). Scattered debris was observed around the outside of the building.

3.4.7.2 AREE 34 - Former DEH Entomology Shop (Building 245)

The Former DEH Entomology Shop in Building 245 (AREE 34) has been identified as SA 34 in the MEP. Pesticides were formerly stored and mixed in Building 245 on the Main Post (Figure 3-1a). This building, which has an area of 1,825 ft^2, was used for pesticide storage and control from 1978 to 1982 (DEH, 1985b). The facility, which was used to store pesticides such as Diazinon, Baygone, Dursban, boric acid, and Pyrythrum, did not meet EPA guidelines (McMaster et al., 1982; 40 CFR Part 165). Although pesticides are no longer handled within this building, it is still under Entomology control (DEH, 1985b). The building is currently used to store cleaning solution.

Although the dates of releases are unknown, the facility had a history of small rinsewater discharges and small spills into the sanitary sewer system (DEH, 1985b). During the 1988 ANL site assessment, it was noted that the drainpipe from the sink discharges to the ground immediately outside of the building; it is not known when the sink's drain was disconnected from the sanitary sewer. The sink drain discharge area is not bermed. Scattered debris was observed around the outside of the building.

3.4.7.3 AREE 35 - Former DEH Entomology Shop (Building 254)

The Former DEH Entomology Shop in Building 254 (AREE 35) has been identified as SA 35 in the MEP. Building 254 is located on the Main Post (Figure 3-1a). It has an area of 740 ft^2 and was used for pesticide storage and mixing during the period 1978 to 1982 (DEH, 1985b). The inventory included pesticides such as Malathion, Diuron, VG Trol, and Weeder; the building did not meet EPA guidelines (McMaster et al., 1982; 40 CFR Part 165). Although pesticides are no longer handled within this building, it is still under Entomology control (DEH, 1985b). It is now used to store various types of equipment and drycleaning solvents.

Although the dates of releases are unknown, the facility had a history of small rinsewater discharges and small spills into the sanitary sewer system (DEH, 1985b). Numerous pipes, wood pallets, and other miscellaneous debris, which hindered inspection for contaminated soil, were located behind the building. Inside the facility, two large bags of fertilizer (about 50 lb each) were ruptured and their contents were spilling out onto the floor (Biang et al., 1991).

3.4.7.4 AREE 36 - Former DEH Entomology Shop (Building 2728)

The Former DEH Entomology Shop at Building 2728 (AREE 36) has been identified as SA 36 in the MEP. Pesticides were formerly stored and mixed in Building 2728, which is located on the Main Post (Figure 3-1b). This building, which has an area of 3,219 ft^2, was used for pesticide storage during the period 1968 to 1978 (DEH, 1985b). This facility was used to store pesticides and herbicides such as Diazinon, Baygone, Dursban, boric acid, Pyrythrum, Malathion, Diuron, VG Trol, and Weeder and did not meet EPA guidelines (McMaster et al., 1982; 40 CFR Part 169).

Building 2728 is now used by the Fort Devens Directorate of Personnel and Community Activities, Administrative and Marketing Services Division. The activities of this organization include designing and printing plans and storing small quantities of supplies.

Although dates of releases from the former storage and mixing activities are unknown, the facility had a history of small rinsewater discharges and small spills into the sanitary sewer system (DEH, 1985b). Because soil in the area is highly permeable, groundwater contamination with pesticides and herbicides is possible if sufficient quantities were released.

3.4.7.5 AREE 37 - Golf Course Entomology Shop (Building 3622)

The Golf Course Entomology Shop in Building 3622 (AREE 37) has been identified as SA 37 in the MEP. It is on the golf course in the southern portion of the Main Post as shown in Figure 3-1b. Pesticides were stored and mixed in Building 3622 until 1987. This building, which has an area of 1,386 ft^2, was used for pesticide storage and mixing between 1976 and 1988. Pesticides and fungicides such as Dursban, TGF, Daconil, and Antidrone Thinner Plus F were stored at this site. It is of wood-frame construction, and the storage room is secured with a padlock. A 1985 assessment by AEHA (Gates et al., 1986) noted many inadequacies related to the building's current use. Building 3622 was found to lack fire-resistance, warning signs, ventilation, spill containment measures, and other provisions to prevent environmental contamination. During another assessment, DEH (1985b) reported an odor attributed to Dursban. In general, the pesticide storage area in Building 3622 does not meet EPA guidelines for such facilities (McMaster et al., 1982; 40 CFR Part 165).

Although the dates of releases are unknown, the facility may have a history of small rinsewater discharges and small spills into the sanitary sewer system. The building had no exhaust system and was very poorly lit. There was evidence of soil contamination in the rear of the building, possibly from fuel (Brooks, 1988). Many fertilizer bags were on wooden pallets; it was estimated that about 150 fifty-lb bags of N:P:K type 22:0:16 fertilizer were present. Some of the bags had seriously deteriorated, spilling their contents onto the floor. The floor was wood and tile, but without any berms or containment. Several old, rusty paint cans were in the rear of the building. Old machinery (lawnmowers, spreaders, etc.) was also present. These were scheduled for shipment to DRMO (Brooks, 1988). The soil around these pieces of equipment had visible staining.

One 1,000-gal underground storage tank was removed from this site. The tank was last used to store fuel for the building heating system. The integrity of the tank was questioned because product was visible on the ground surface near the fill pipe. When the tank was removed, it was found to be structurally sound; therefore, the visible product was probably the result of overfilling the tank or loose piping. About 30 yd^3 of contaminated soil was removed. It was clear that there was further contamination, but it was not removed because further excavation might have endangered the structural integrity of the building foundation. Soil samples obtained during the installation of four monitoring wells contained some volatile organic compounds (Biang et al., 1991).

3.5 WASTE HANDLING AREAS

3.5.1 WASTE EXPLOSIVES DETONATION RANGES

3.5.1.1 AREE 25 - EOD Range - South Post

The EOD Range (AREE 25) has been identified as SA 25 in the MEP. The EOD Range, which is located in the impact area in the South Post, extends about 0.5 mi east from Firebreak Road (Figure 3-1c). The disposal pits are located in an area of about 5 acres along the southeastern boundary of the range. Porter (1986) reported that this site was included in the Fort Devens RCRA Part A permit application as a hazardous waste thermal treatment facility. The unit operates under interim status.

About 1,200 lb/yr of explosives and ammunition have been disposed of at an area in the EOD range since 1979. Small-arms ammunition, smoke grenades, and pyrotechnics are covered by scrap packing materials, soaked with diesel fuel, and burned in open pits. Larger items are detonated with C-4 or TNT (Porter, 1986).

Porter (1986), who has made the most extensive study of the geologic conditions of this site, described the disposal pits as being in a kettle opening to the west. Bedrock occurs 10 to 30 ft below the surface and is composed of granitic and metamorphic rocks of Paleozoic age. Surficial materials are composed of glacial-deltaic and outwash deposits of poorly graded sands, well graded sands, silty and clayey sands, and some lenses of clay (Porter, 1986).

The sandy and gravelly soil at this site, which is underlain by stratified sand and gravel, is part of the Quonset-Hinckley-Windsor Association.

Although perched groundwater water lenses occur, the water table generally lies just above the bedrock at a depth of about 30 ft below the surface. A northeasterly trending groundwater divide, parallel to the eastern boundary of the site, causes the groundwater under the range to flow west. The groundwater enters the Slate Rock Pond drainage system, which eventually flows into the Nashua River (Porter, 1986).

Thermally treated materials disposed of at the EOD Range consist primarily of C-4, smokeless powder, PETN, and RDX. Other materials disposed of are composition B, dynamite, white phosphorus, TNT, pyrotechnics, octol, black powder, photoflash powder, lithium batteries, and lead azide (Porter, 1986).

In 1985, AEHA investigated this site to determine the extent of any contamination (Porter, 1986). Seven boreholes were drilled, six pits were excavated, and soil samples were collected and analyzed for physical and chemical constituents. All the samples were analyzed for EP toxic metals, explosives, volatile organics, and acid and base-neutral extractable organics. While highly variable, the number of constituents and their concentrations tended to decrease with depth, and most of the constituents found in the samples were present in low concentrations.

Results from boreholes 1 through 7 and the pit samples were reported by Porter (1986). Results from boreholes 1, 2, and 5 are considered representative of background concentrations in area soils. The total metals analysis revealed concentrations as high as 34.9 ppm (total arsenic), but only one sample (No. 102) showed any evidence of EP toxic metals at a very low concentration (0.524 ppm extractable lead). Porter (1986) believed that the lack of EP toxic metals indicates that the metals are bound to the soil and very unlikely to leach out under normal conditions.

High concentrations of trichloroethylene (18,000 ppm), 1,1,1-trichloroethane (38 ppm), acetone (25 ppm), tributyl phosphate (up to 10 ppm), and bis(2-ethylhexyl) phthalate (up to 60 ppm) were found in the soil. The presence of tributyl phosphate may be explained by the operations at the range, and phthalates are a common laboratory contaminant, which could explain the presence of the bis(2-ethylhexyl)phthalate; however, trichloroethylene, 1,1,1-trichloroethane, and acetone should not be present under normal operating conditions. The elevated values of trichloroethylene, dichloroethylene, and other volatile organic compounds in sample 602 can probably be attributed to laboratory error. When the site was resampled, concentrations of volatile organic compounds in the soil were below the limit of detection of 0.0003 ppm (Proter, 1986).

Constituents found at low concentrations were 2-butanone, di-N-octyl phthalate, 1,2-dichlorobenzene, di-N-butyl phthalate, trichlorofluoromethane, and trimethyl-2-heptene. The concentrations of these constituents were so low that they should not present any substantial threat to human health or the environment (Porter, 1986).

In addition to the seven boreholes drilled, five pits were dug and the soil sampled. The samples were analyzed for EP toxic metals, explosives, volatile organics, and acid and base-neutral extractable organics. According to Porter (1986), the total metals analysis revealed concentrations as high as 97.2 ppm total cadmium, but only that sample showed any evidence of EP toxic metals (3.1 ppm extractable cadmium). This sample exceeded the maximum allowable concentration of 1.0 ppm extractable cadmium (40 CFR 261). The lack of EP toxic metals in the soils indicates that the metals are bound to the soil and very little metal is likely to leach out under normal conditions (Porter, 1986). The high concentrations of total cadmium in this sample may account for the higher EP toxicity level found in that sample. Other constituents that were found at very low levels in the pits are TNT, bis(2-ethylhexyl)phthalate, di-N-butyl phthalate, diethyl phthalate, and N-nitrosodiphenylamine. Porter (1986) believed that these constituents are at such low concentrations that they should not present any substantial threat to human health or the environment.

During the ANL site visit in November 1988, old shell casings were observed in two pits. No contamination was apparent (Biang et al., 1991). Similar conditions were found by WESTON in September 1991.

3.5.1.2 AREE 26 - Zulu I and II Ranges - South Post

The Zulu Range (AREE 26) has been identified as SA 26 in the MEP. The 20-acre Zulu Range consists of the two range areas, Zulu I and Zulu II. It is in the South Post on the western boundary of the impact area (Figure 3-1c). Zulu I and Zulu II are adjacent and similar in size and terrain.

Zulu I is a 10-acre bowl-like area used primarily for hand grenade and demolition activity training. Although current operation does not include disposal, open detonation of high explosives has occurred (Brown, 1981).

Zulu II is used for burning explosives and explosively contaminated items, such as propellants, C-4, TNT, RDX, and HMX (Brown, 1981). Blasting mats are used to cover reactions and to control the spread of fire and debris. Specialized training for cutting metals and similar objects using controlled burning is performed here. According to site personnel, there is no ordnance disposal at Zulu II; hence, no unexploded ordnance (UXO) is expected there.

Both ranges are in the kettle opening to the west. Bedrock of the Worcester Formation is estimated to be about 30 ft below the surface. Soil is composed of glacial-deltaic and outwash silty sands, poorly graded sands, and gravels interspersed with clay lenses (Brown, 1981).

A wetland area of about 6 acres adjoins Zulu I; at the time of the 1988 ANL site visit, activity by heavy equipment had disturbed the soil, revealing an apparent water table about 2 ft below the ground surface (Biang et al., 1991). Surface runoff from the area eventually enters the Nashua River (Brown, 1981).

Prior to 1979, Zulu range was used to dispose of explosive items. Explosives were destroyed by burning or detonation. Small-arms rounds, smoke grenades, and pyrotechnics were covered, soaked with diesel fuel, and burned in open pits. Larger explosive items were covered with tamped earth and detonated with C-4 or TNT (Fox, 1988a).

Past and current activities, as well as the disposal methods (i.e., the use of diesel fuel), may have contributed to some contamination of the range. Explosives contamination could result from incomplete burning and from demolition. Because of the proximity of wetland areas and the local hydrologic characteristics, the possibility of contaminant migration must be addressed. In an effort to control migration, the soil is periodically removed; however, it is very permeable, and contaminants could migrate downward before removal or as the result of incomplete removal. No information was available to indicate the disposition of the soil when it is removed. There was no indication that confirmation sampling is done on a routine basis to determine the effectiveness of soil removal (Biang et al., 1991).

3.5.1.3 AREE 27 - Hotel Range - South Post

The Hotel Range (AREE 27) has been identified as SA 27 in the MEP. Hotel Range covers an area of about 7 acres on the northwestern edge of the impact area in the South Post about 500 yd west of Cranberry Pond (Figure 3-1c). The Hotel Range has been relocated recently, and the former area was reportedly cleaned of UXOs.

Before 1979, this range was used for explosive ordnance disposal of old or defective high-explosive grenades and 3.5 -inch rocket projectiles. Explosives were destroyed by burning or detonation. Small-arms rounds, smoke grenades, and pyrotechnics were covered, soaked with diesel fuel, and burned in open pits. Larger explosive items were covered with tamped earth and detonated with C-4 or TNT (Fox, 1988a).

The range is in a kettle that opens to the north. Although site-specific information is limited, bedrock is estimated to be 30 ft below the surface and is probably part of the Worcester Formation. Surface materials comprise interbedded and cross-bedded glacial-deltaic and outwash sands and silty sands and gravels that are interspersed with small clay lenses.

Based on the available hydrogeological information, the water table is estimated to be at the same depth as the bedrock, flowing easterly to Cranberry Pond and on to the Nashua River (Brown, 1981). Cranberry Pond is a kettle lake recharged by groundwater and surface runoff from the surrounding area (Fox, 1988a).

Past and current activities as well as disposal methods (i.e., the use of diesel fuel) may have contributed to some contamination of the range. Explosives contamination could result from incomplete burning and from demolition. Because of the proximity of Cranberry Pond and the local hydrologic characteristics, the possibility of contaminant migration should be addressed.

3.5.1.4 AREE 28 - Training Area 14 - South Post

A portion of Training Area 14 (AREE 28) has been identified as SA 28 in the MEP. Training Area 14 is a 160-acre tactical training area in the South Post. It is bounded on the south by Slate Rock Pond, on the east by Jackson Road, on the west by Old Turnpike Road, and on the north by the South Post boundary (Figure 3-1c). The site encompasses the medical litter obstacle course and a helipad; a jump tower; a Squad Automatic Weapon/M60 Machine Gun Range at the Hotel Range (AREE 27); and Landfill No. 11 (AREE 15). A portion of Training Area 14 was identified as a former EOD range used in the 1940s (McMaster et al., 1982).

The range currently is a tactical training area in constant use by active and reserve units. According to Gates (1987), the following historical activities occurred at this site. In the 1940s, hand grenade range "J," about 6 acres in size, was established along the northern side of the range. No other weapons were used on this range, nor is there any record of burning or disposal of hazardous materials. However, during a review of maps in the archives at Fort Devens, it was discovered that this range was mapped as

a demolition area in 1941. In the 1970s, the hand grenade range was moved and the range cleared of UXO and EOD debris and converted to Facility 8, a medical litter obstacle course. Since it was converted, several thousand soldiers have used the course and no hazards have been reported.

No soil or groundwater contamination has been reported in this area. Gates (1987) noted that only hand grenades were exploded at the site and that no hazardous wastes were burned or disposed of. This activity ceased more than 20 years ago, and since that time no activities that could cause contamination have taken place on this range.

3.5.2 AREE 31 - FIRE-FIGHTING TRAINING AREA - MAAF

The Fire-Fighting Training Area (AREE 31) has been identified as SA 31 in the MEP. Fire-Fighting Training Area is located on an abandoned portion of the MAAF runway apron in the North Post (Figure 3-1a). It was used between 1975 and 1986 and is located on a 50- by 50-ft asphalt-covered concrete pad that is 8 inches thick and is surrounded by a 12-inch-high by 24-inch-wide earthen containment berm. The center of the pit contained the shell of a U-8 airplane used during exercises. Remnants of fuel samples analyzed by the laboratory were openly burned about once a year (McMaster et al., 1982). Fuels used during the training included contaminated fuel and paint thinner (DEH, 1985b). No discharge of fuel from the training pit has been reported (McMaster et al., 1982).

Gates et al. (1986) reported that the concrete portion of the pad on which the facility rests is an assemblage of concrete slabs, some of which have cracked due to age. Waste oil and JP-4 jet fuel, which were poured onto the pad for the fire-fighting exercises, could have migrated through the cracks and joints of the pad and into the subsurface soil; thus, the potential exists for contamination of the underlying groundwater system. Gates et al. (1986) pointed out, however, that the potential for migration was very low because contact time for the fuel was short since the fuel products were ignited and burned. Reportedly, very little product was noted on the pad after a fire was extinguished (Gates et al., 1986).

During the 1988 ANL site assessment, numerous cracks were noted on the asphalt surface. Portions of both the asphalt and soil were visibly stained. About six extinguished smoke bombs were also found at the site (Biang et al., 1991).

Due to the nature of the training exercises, the potential for contaminant migration in the subsurface does exist, particularly if the fuel products were not reignited (after the training exercises) to burn the remaining fuel as completely as possible.

3.5.3 AREE 38 - BATTERY REPAIR AREA (BUILDING 3713)

The Battery Repair Area (AREE 38) has been identified as SA 38 in the MEP. One of the Directorate of Logistics (DOL) Maintenance Division industrial operations conducted in Building 3713 is battery repair, which generates about 106 gal of waste battery acid each month (Brown, 1981; McMaster et al., 1982). Building 3713 is located

in the northeast corner of the Main Post along Barnum Road (Figure 3-1a). Waste acid currently is stored in federally approved containers and later taken to the DEH hazardous waste storage area (Biang et al., 1991).

Before 1978, waste electrolyte was placed in a pit northwest of Building 3713 and neutralized with sodium bicarbonate. It was reported that the pit was covered and paved over in 1981 (McMaster et al., 1982). From 1978 to August 1980, the waste battery acid was neutralized in a large tank and discharged to the sewer system (Brown, 1981; McMaster et al., 1982). This discharge was discontinued in 1980 when a chemical analysis indicated that the waste contained cadmium in excess of the limits for EP toxicity.

Geologic conditions of the site consist of unconsolidated glacial deposits overlying metamorphic and granitic bedrock of Paleozoic age. The soil association at the site is the Quonset-Hinckley-Windsor, described as droughty sand and gravelly soil underlain by stratified sand and gravel (Nicholls et al., 1980). The soil is well drained and has high permeability.

This location has been mapped as an area of poor groundwater availability because of the predominance of glacial till and bedrock uplands. Building 3713 is about 1,400 ft west of Cold Spring Brook and about 2,200 ft south of Grove Pond. The Grove Pond well field is located along the bank of Grove Pond, north of the site. Although site-specific hydrogeological information is lacking, it is assumed that any groundwater in this area would flow to the east toward Cold Spring Brook.

There have been no previous investigations at this site. Any soil or water contamination from the battery repair operations would be associated with the former waste electrolyte pit east of Building 3713. While the potential for contamination around the old waste pit does exist, there has been no report of contaminated surface soil or water around the site. This pit has not received any waste battery electrolyte in more than 13 years.

3.5.4 AREE 45 - WASH RACK AT LAKE GEORGE STREET

The Wash Rack at Lake George Street (AREE 45) has been identified as SA 45 in the MEP. The vehicle wash rack is on the northwestern portion of the Main Post along Lake George Street (Figure 3-1b). It was an open, asphalt-paved area with eight bays, previously used for washing privately owned autos. The bays contained drains that empty into an adjacent sump or the sewer. A site inspection revealed no additional information about the outfall from this site. According to site personnel, the sump that is just north of the site contained about 6 inches of oil on the water (Biang et al., 1991). A new sewer connection has been installed near the sump (Hopkins, 1988). Facility personnel indicate that liquids entering the wash rack drain will flow through a catch basin, an oil/water separator, and into the sanitary sewer. A berm underneath the grease rack would contain POL spills. The topography of the area suggests that the site is directly upgradient of the Nashua River and that an uncontrolled outfall could have an impact on the wetland adjacent to the River.

Access to the site is open, and activities are not controlled. There are no detailed records of operations. The concern at this site is the possibility that it could be used for other vehicle maintenance activities such as oil changing and lubrication. The oily sump water would indicate that this has happened in the past. Not only is this an unsound environmental practice, but in Massachusetts used motor oil is classified as a hazardous waste.

3.6 SPILLS AND LEAKING UNDERGROUND STORAGE TANK AREAS

3.6.1 AREE 39 - TRANSFORMER NEAR FORMER BUILDING 4250

The spill at the transformer near the former Building 4250 (AREE 39) has been identified as SA 39 in the MEP. The locations of two buildings (Nos. 4249 and 4250), formerly referred to as the old Sylvania buildings, were within the Oxbow National Wildlife Refuge, which was formerly part of the South Post of Fort Devens (Figure 3-1b). The refuge was deeded by Fort Devens to the U.S. Department of Interior in 1973 (McMaster et al., 1982). According to available information, a spill area was discovered near Building 4250 in September 1984. The oil stain, which was adjacent to a transformer (found empty), had an estimated area of 288 ft^2 (DEH, 1985a).

The entire refuge is within the Nashua River drainage basin. In general, this area consists of glacial till comprising poorly sorted clay, silt, sand, gravel, and boulders. The composition ranges from metasediments to granodiorite.

Site-specific information regarding soils is limited; however, since the refuge is classified as a wetland, the moderately to poorly drained soil associations known to exist in this area are the Muck-Peat-Walpole and the Winooski-Limerick-Saco. The Muck-Peat-Walpole is organic and sandy, is poorly drained, and has low permeability. The Winooski-Limerick-Saco consists of silty soil that ranges from moderately well drained to poorly drained with low permeability. The water table is high and may be subject to seasonal flooding (McMaster et al., 1982).

The 1984 oil spill area was divided into four quadrants as follows:

- Quadrant I - visibly stained area
- Quadrant II - transformer and concrete slab
- Quadrants III and IV - areas believed to be contaminated with oil leaked from the transformer (DEH, 1985a).

A spill report documents the cleanup action taken for the transformer and the stained soil. After the spill was discovered in September 1984, samples were taken from each of the quadrants during October and November 1984. The sample results ranged from 5.2 to 60 ppm of PCBs.

During December 1984, eight 85-gal drums of PCB-contaminated soil (50 ppm or above) and the transformer were removed and taken to the Hazardous Waste Storage Facility (AREE 22). In January 1985, confirmation samples were taken (DEH, 1985a). The analytical results reveal concentrations ranging from 15 to 20 ppm of PCBs.

A former UST was also noted in the area as having been removed. Very little documentation currently exists on the removal of the UST at the site. Former USTs that have been removed have been identified as AREE 63.

3.6.2 AREE 44 - CANNIBALIZATION YARD

The Cannibalization Yard (AREE 44) has been identified as SA 44 in the MEP. The Cannibalization Yard is an unpaved area (about 150 by 75 ft) east of Building 3713 (Figure 3-1a) where vehicles are stored before dismantlement for reusable parts.

The storage time for vehicles varies, depending on the demand for parts. At the time of the 1988 ANL site visit, no visibly stained areas were apparent. According to site personnel, the topsoil is periodically removed. The most recent removal was in 1988, when the upper 2 ft of soil was removed and disposed of in an off-site disposal facility (Prior, 1989).

Vehicle storage for an indeterminate time makes it possible that used oil, gasoline, and other vehicle fluids could have been released onto the ground. The yard is not paved or bermed in any way. Although there was no visibly stained soil, this could be the result of routine clearing operations that remove the top layer of soil. The possibility exists for soil and water contamination from the yard (Biang et al., 1991).

The Cannibalization Yard was also used to accumulate RCRA hazardous waste for less than 90 days. Wastes were accumulated in drums and waste oil in an UST.

3.6.3 AREE 43 - HISTORIC GAS STATION SITES

The Historic Gas Station Sites (AREE 43) have been identified as SA 43 (A to S) in the MEP. A number of historic gas station sites are located at Fort Devens. Available documentation for these sites includes a map (circa 1941), which shows the locations of the former gasoline dispensing stations and one central distribution station on the Main Post (Barbour, 1941) (see Figures 3-1b and 3-4), and notes from the Fort Devens environmental staff and the real property offices (summarized in Table 3-4). These sites are referred to here as AREE 43 A to S. Figure 3-4 shows the locations of the sites on a current Fort Devens map; the locations were inferred from present landmarks, such as the Nashua River and some of the roads. The legend of the 1941 map indicated that all of the USTs were 5,000 gal, with two different types of connections to the pumps. The central dispensing station appears to have been located near the Shepley's Hill Landfill (No. 1) (AREE 5) and the DRMO Yard (AREE 32). The length of time that the stations were in operation is not known. Table 3-4 provides real property records data on buildings and tanks.

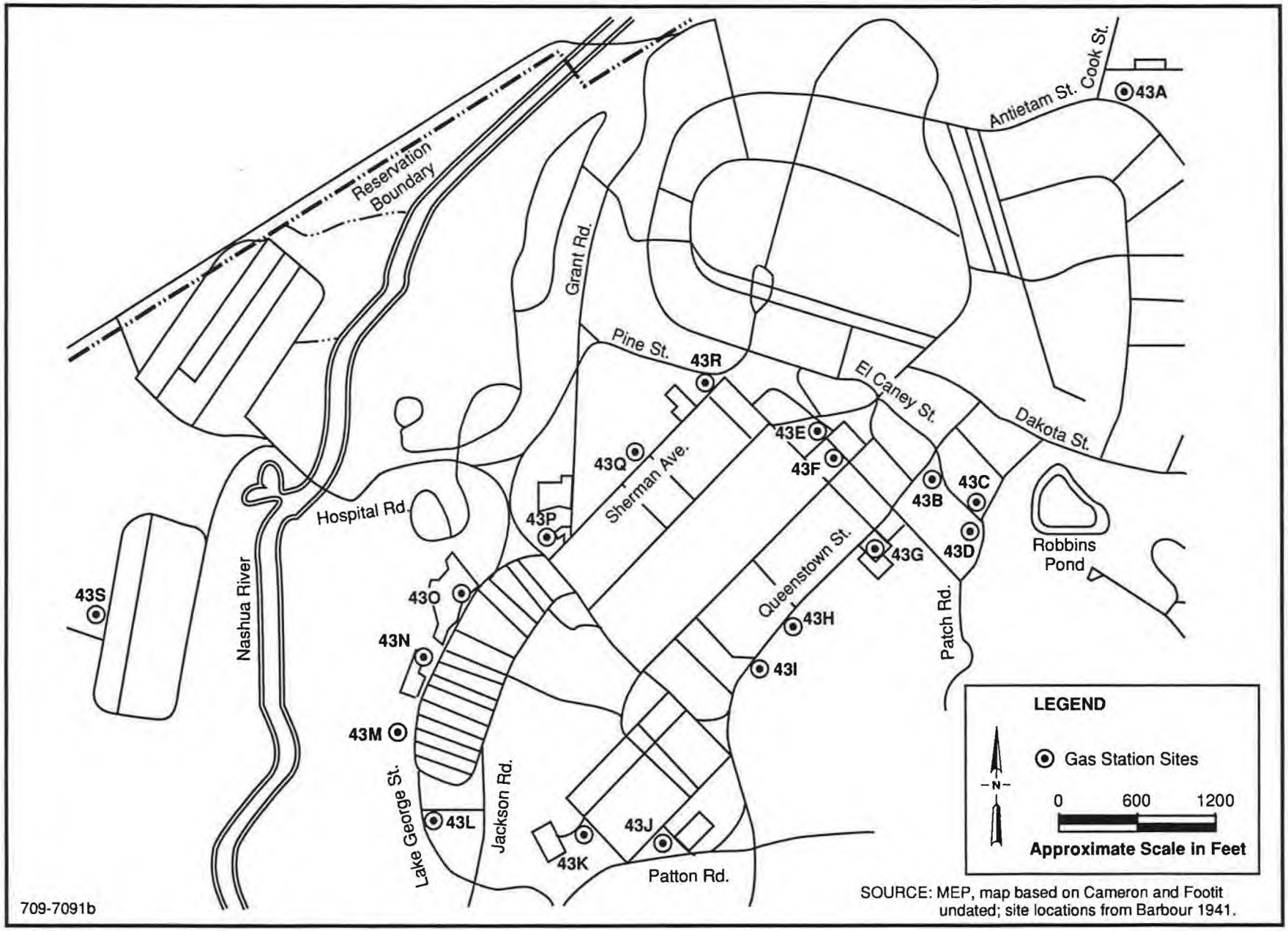


FIGURE 3-4 ESTIMATED LOCATIONS OF HISTORIC GAS STATION SITES

Table 3-4 is a summary of current Fort Devens documentation on these sites. This is the most accurate information available.

A UST Management Program is in progress at Fort Devens. During investigations for that program, tanks were discovered at Building 2680 in December 1989. The building was identified as a former motor pool fueling point that had two 5,000-gal tanks used to store fuel oil between 1942 and 1975. The site was added to the MEP list as SA 54. Upon further evaluation of the tanks and the WWII-era plans, it was discovered that this study area is the same as SA 43-O. Therefore, there is no AREE 54.

Because of the limited information regarding actual locations of these USTs, they can only be addressed categorically. According to available information, it is unlikely that many of the tanks have been removed. To date, activities of the UST Management Program have located the tanks for sites SA 43A, L, M, and O. The age of the tanks and the method of tank placement and construction in the 1940s are factors that indicate a high probability of leaks. No information is available to determine whether any tanks were emptied before their inactivation. USTs at sites SA 43 A, L, and O were removed by a contractor under the UST Management Program. All of these tanks were used by the vehicle servicing facilities for storing fuel. These sites, as well as SA 43H, I, and K, are discussed below.

3.6.3.1 SA 43A, POL Storage LUST Site

Four 12,600-gal tanks and one 10,000-gal tank were removed from SA 43-A. Reportedly, the tanks were last used for storing No. 2 fuel oil. When they were removed, all of the tanks were structurally sound, so it is believed that soil contamination was the result of overfilling or loose piping. About 800 yd^3 of contaminated soil was removed. The site was over-excavated to reach a depth at which a photoionizing detector showed no further contamination. During the installation of three groundwater monitoring wells, low concentrations of volatile organic compounds were found in a soil boring near the water table. The groundwater contained no detectable concentration of total petroleum hydrocarbons (TPH). Based on these analyses, contaminants did not exceed state limiting criteria as required under MGL Chap. 21E; therefore, these excavations were considered clean by site personnel (GZA, 1990).

3.6.3.2 SA 43H, Building 602 LUST Site

A 1,000-gal UST used to store waste oil was removed from SA 43-H at Building 602. This tank was one of many tanks that were installed 6 to 10 years ago at motor pools along Queenstown Street and elsewhere. There were no visible leaks or damage to the tank and its associated piping. Soil was removed to a depth that contained less than 10 ppm total organic volatiles. A composite soil sample was obtained from the bottom of the excavation and analyzed for TPH. It contained less than 100 ppm TPH, and did not exceed the state limiting criteria (GZA, 1990). Since there was no violation of state requirements, this waste oil tank was not included for further investigation in the MEP.

Table 3-4

Current List of Historic Gas Station Sites

Study Area	Original Building No.	No. of Tanks	Tank Capacity (gal.)	Remarks
43A	186	3 2 2	12,000 12,000 (pits) 8,000 (pits)	5 tanks have been removed. It is possible that 2 still remain.
43B	169	1	5,170	
43C	170	2	5,170	
43D	171	2	5,170	
43E	172	1	5,170	
43F	173	1	5,170	WWII era map shows 2 tanks.
43G	174	1	5,170	
43H	175	1	5,170	
43I	176	2	5,170	One tank transferred to SA43P 10/45. Transferred back 12/45.
43J	177	1	5,170	
43K	178	1	5,170	
43L	179	2	5,170	Tanks removed.
43M	180	2	5,170	Tanks removed.
43N	181	2	5,170	
43O	182	2	5,170	Tanks removed, contaminated residue remains.
43P	183	1	5,170	The presence of this tank has not been confirmed.
43Q	184	1	5,170	
43R	185	1	5,170	
43S	203	2	5,170	

3.6.3.3 SA 43I, Building 604 LUST Site

A 1,000-gal UST used to store waste oil was removed from SA 43-I in February 1989. This tank was one of many tanks that were installed 6 to 10 years ago at motor pools along Queenstown Street and elsewhere. Contaminated soil was found around the fill pipes and extended along the eastern side of the tank. There were no visible leaks or damage to the tank and its associated piping. The only signs of leakage were attributed to the area around the fill pipe. The tank contained 900 gal of waste oil and 28 gal (by volume) of sediment. It was 3 1/2 ft below ground surface, and no groundwater was encountered during the removal. About 80 yd^3 of contaminated soil were removed and screened for total organic volatiles using a soil gas detector. The soil contained less than 10 ppm total organic volatiles. The state limiting criteria is 10 ppm total organic volatiles. A composite soil sample was obtained from the bottom of the excavation and analyzed for TPH. It contained 1,517 ppm TPH and exceeded the state limiting criteria of 100 ppm TPH. A confirmation sample was obtained; it contained 74 ppm TPH. All of the soil was disposed of in an off-site facility (Environmental Engineering & Geotechnics, 1989; Prior, 1991).

3.6.3.4 SA 43K, Building 2517 LUST Site

A 1,000-gal UST used to store waste oil was removed from SA 43-K in February 1989. This tank was one of many tanks that were installed 6 to 10 years ago at motor pools along Queenstown Street and elsewhere. Minor quantities of contaminated soil were encountered during removal of the tank. There were no visible leaks or damage to the tank and its associated piping. It was 4 1/2 ft below ground surface, and groundwater was encountered at 3 1/2 ft. A pump was used for dewatering the excavation during the removal. The tank contained 300 gal of waste oil and about 28 gal (by volume) of sediment. About 10 yd^3 of contaminated soil was removed and screened for total organic volatiles using a soil gas detector. The soil contained 1.4 ppm to 9.0 ppm total organic volatiles. The state limiting criteria is 10 ppm total organic volatiles. A composite soil sample was obtained from the bottom of the excavation and analyzed for TPH. It contained 3,539 ppm TPH, and exceeded the state limiting criteria of 100 ppm TPH. A confirmation sample was obtained; it contained 663 ppm TPH. Water that had accumulated in the excavated area was analyzed and found to contain only 4.8 ppm TPH. All of the soil was disposed of in an off-site facility (Environmental Engineering & Geotechnics, 1989; Prior, 1991).

In May 1989, two soil borings were drilled near the excavation. Samples were obtained from depths of 0 to 2 ft, 5 to 7 ft, and 10 to 12 ft. The samples were analyzed and found to contain 663 ppm TPH and 0.6 ppm total organic volatiles. There is no information that indicates that there has been any further testing of the soil in this area (Prior, 1991).

3.6.3.5 SA 43L, Building 2601 LUST Site

Three 5,000-gal USTs (Tanks 5, 6, and 13) were removed from SA 43-L by Franklin Environmental Service. These tanks were among many that had been installed 6 to 10

years ago along Queenstown Street and elsewhere. Two USTs (Tanks 5 and 6) were removed on 29 and 30 November 1989. They were located about 10 ft west of Building 2681 in a paved area. Both tanks contained about 100 gal of fuel mixed with water. Before the tanks were removed, their contents were emptied into a vacuum truck. The tanks were then cleaned with a pressure washer and purged of vapor with dry ice. The wash water was also placed in the vacuum truck. Both tanks were inspected and found to be in good condition. About 150 yd^3 of soil was removed (Kurtz, 1991). Nine soil samples were collected from each tank excavation area and screened using a photoionizing detector. The samples from the Tank 5 excavation contained concentrations of volatile organics ranging from 0.4 ppm to 3.4 ppm. Two composite soil samples contained TPH of 98 ppm to 108 ppm. Based on this information, the excavations were backfilled and closed (Kurtz, 1991).

Tank 13 was removed on 5 December 1989. It contained about 48 inches of fuel mixed with water and waste oil. Before the tank was removed, the contents were pumped into a vacuum truck. The tank was then cleaned with a pressure washer and purged of vapor with dry ice. The wash water was also placed in the vacuum truck. The tank was inspected and found to be in good condition. About 3 yd^3 of soil was removed. Groundwater was not encountered during the removal (Kurtz, 1991). Nine soil samples were collected from the excavation and screened using a photoionizing detector. The sample concentrations ranged from not detected to 1.0 ppm volatile organics. Two composite soil samples contained TPH of 280 ppm and 300 ppm. Because of these elevated TPH concentrations, more soil was excavated on 11 January 1990, and the site was resampled. Of the two composite samples analyzed, one showed no detectable TPH, and the other showed 80 ppm volatile organics. Based on this information, the excavations were backfilled and closed (Kurtz, 1991).

3.6.3.6 SA 43O, Building 2680 LUST Site

Two USTs were discovered at Building 2680 in December 1989 under the UST Management Program. The building was identified as a former motor pool fueling point that had two 5,000-gal tanks used between 1942 and 1975 to store fuel oil. Contamination was encountered during removal of these tanks, and about 100 yd^3 of contaminated soil was excavated. Soil samples contained TPH concentrations that warrant further investigation and remediation (Prior, 1991).

3.6.4 AREE 47 - BUILDING 3816 LUST SITE - MAAF

The LUST site at Building 3816 on the MAAF (AREE 47) has been identified as SA 47 in the MEP. This LUST site is on the North Post on the south side of Building 3816, the flight control tower (Figure 3-1a). The tank was used to store fuel for an electric generator between 1970 and 1989. On 10 January 1989, the Environmental Management Office was informed that the 500-gal underground fuel tank was scheduled for removal by an outside contractor on 11 January. The Fort Devens Fire Chief inspected the tank after it was removed and stated that it was in "fair" condition. It was disposed of by the contractor (Biang et al., 1991).

Soils were visibly contaminated at the excavation site, and about 15 yd^3 of material was removed by Fort Devens personnel. It is reported that visible contamination appeared to be confined to directly under the tank, and that there was little migration. The excavation had reached 8 1/2 ft below the ground surface when the sides of the excavation began to show signs of collapse. It was determined that any further excavation or removal would endanger the foundation of the flight tower, so all of the contaminated soil could not be removed (Biang et al., 1991).

Two soil samples were obtained; one was a composite from each of the pit sides, and the other was from the bottom of the pit. All of the excavated soil was stored until the results for these samples were available; information about these results was not available.

The tank has been replaced at the location. During the 1991 WESTON site visit, the excavation had been backfilled, but the area remained unpaved (see Photograph 19 in Section 7).

3.6.5 AREE 48 - BUILDING 202 LUST SITE

The Building 202 LUST Site (AREE 48) has been identified as SA 48 in the MEP. Building 202 is near the intersection of Carey and St. Mihiel Streets (Figure 3-1a). The LUST was a 1,000-gal tank used between 1942 and 1989 to store waste oil from the vehicle servicing facilities. As part of the Fort Devens UST Management Program for Fiscal Year (FY) 1988, waste oil storage tanks were being replaced with aboveground storage tanks. This and several other tanks were removed on 13 and 14 February 1989 (Environmental Engineering & Geotechnics, 1989).

When the tank was removed, minor discolorations of the soil were noted, and elevated readings on a photoionizing detector were recorded. After the tank was removed, a separation was found in one of the seams. The tank contained 300 gal of waste oil and about 80 gal (by volume) of sediment. It was 4 ft below the ground surface, and no groundwater was encountered during the removal. About 100 yd^3 of contaminated soil was removed and screened for total organic vapors (TOV). Soil was removed to a depth which contained less than 10 ppm total organic volatiles. A composite soil sample was obtained from the bottom of the excavation. The soil contained 916 ppm TPH. A confirmation sample was obtained; it contained 3,213 ppm TPH. All of the soil was disposed of in an off-site facility (Environmental Engineer & Geotechnics, 1989; Prior, 1991).

In May 1989, two soil borings (32 ft deep) were drilled near the excavation. Samples were obtained and analyzed for total organic volatiles. All but one of the samples contained less than 0.6 ppm total organic volatiles. A sample from the 18 to 20 ft depth contained 150 ppm total organic volatiles. There is no information that indicates that there has been any further testing of the soil in this area (Prior, 1991).

3.6.6 AREE 49 - BUILDING 3602 LUST SITE

The Building 3602 LUST Site (AREE 49) has been identified as SA 49 in the MEP. Building 3602 is north of the golf course along Sheridan Road (Figure 3-1b). Two 5,000-gal tanks were removed from the site. The tanks were originally used to store gasoline and diesel fuel for a motor pool that was located in nearby Building 3601. They were also used for in-ground bulk storage of No. 2 fuel oil. They were used by the motor pool from 1942 to 1975. An apparent leak was first discovered in December 1989. The tanks then were removed under an FY 1989 Abandoned UST Removal Contract (No. EQ-19175-8P) (Biang et al., 1991).

When the two tanks were excavated, they were structurally sound, but there was a strong gasoline odor. The contamination was probably the result of over-filling or loose piping. About 250 yd^3 of contaminated soil was removed. The soil was excavated beyond the area of contamination until the water table was encountered. Four monitoring wells were installed and elevated concentrations of volatile organics were detected in samples of the soil borings (Biang et al., 1991).

3.6.7 AREE 50 - WWII FUEL POINTS - MAAF

The WWII Fuel Points (AREE 50) have been identified as SA 50 in the MEP. The WWII Fuel Points were located at the MAAF on the North Post near Building 3618, the flight control tower (Figure 3-1a). This site is adjacent to the east-west runway and consists of piping that connects USTs at another location. Two sets of USTs are associated with this system. They are located east of Building 3840 and south of Building 3813. There are estimated to be four locations for aviation fueling activities that were used between 1941 and 1945 (Prior, 1991).

The site consists of two sets of aircraft fuel tanks, a network of piping, fuel points, and truck fill stands. One set of three 25,000-gal gas fuel USTs is located east of Building 3803. Three tanks are shown on Fort Devens Drawing No. X100-109/43A, date August 1942, along with a water separator pit and piping to two truck fill stands. Another set of two 25,000-gal gas storage USTs is located east of Building 3818. The two tanks are shown on Fort Devens Drawing No. 6101-243 dated February 1941, along with piping leading to two separate locations, one of which is the four aircraft fuel points. Figure 3-5 shows the approximate locations of features associated with AREE 50. Abandoned tanks will be removed under the installation UST removal program with close coordination with MDEP and EPA.

No investigations have been made in this area, and thus the nature and extent of any contamination is not known. No fueling activities have taken place at this site since the late 1940s (Prior, 1991).

3.6.8 AREE 51 - BUILDING 3412, O'NEIL BUILDING SPILL SITE

The O'Neil Building Spill Site (AREE 51) has been identified as SA 51 in the MEP. The site is located just west of Lovell Street in the Main Post (Figure 3-1b). This site

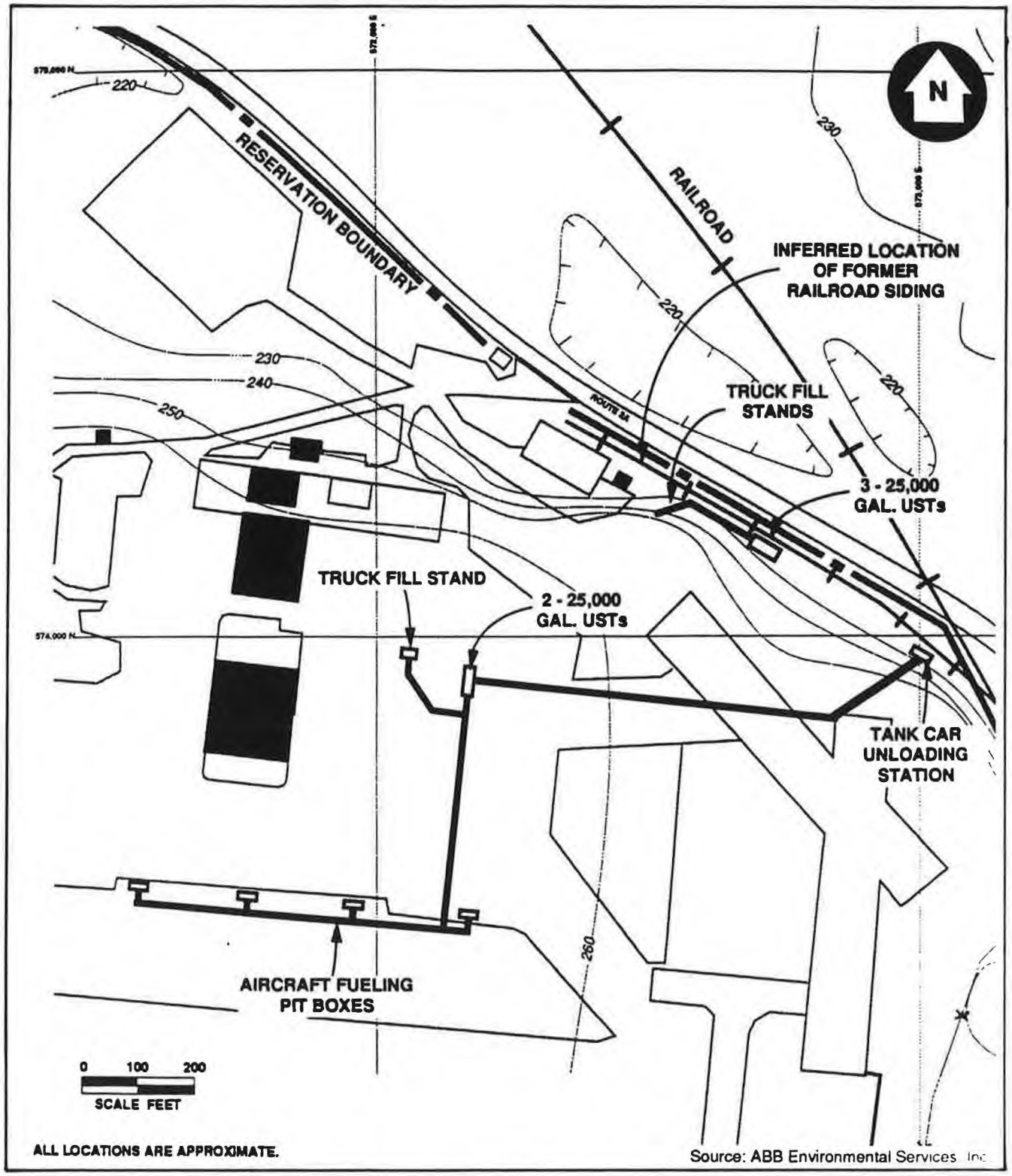


FIGURE 3-5 APPROXIMATE LOCATION OF FEATURES ASSOCIATED WITH WWII FUEL POINTS (AREE 50)

is the location of the former Lovell Army Hospital. It is an active training site for radio operators and uses high frequency, diesel-powered generators to provide electricity. The generators are filled daily, and any water is drained from the fuel tank (Biang et al., 1991).

About 15 gal of fuel was spilled onto the ground when a drain valve was left open. When the spill area was inspected, it was evident that this was not an isolated incident. Even after 200 yd^3 of soil was removed, significant contamination was still evident. Several soil samples were obtained and analyzed. They contained 90 to 200 ppm TPH (Biang et al., 1991).

3.6.9 AREE 52 - TDA MAINTENANCE YARD

The TDA Maintenance Yard (AREE 52) has been identified as SA 52 in the MEP. The yard is located in the northeast corner of the Main Post along Barnum Road (Figure 3-1a). It is an active storage area for vehicles with oil leaks that are awaiting repair (Biang et al., 1991).

According to Fort Devens personnel, there are many small patches of soil visibly contaminated with motor oil or hydraulic fluid. The average size is 2 to 3 ft diameter. The extent of the contamination has not yet been investigated (Biang et al., 1991).

3.6.10 AREE 53 - POL SPILL AREAS - SOUTH POST

The POL Spill Areas in the South Post (AREE 53) have been identified as SA 53 (A through M) in the MEP. The South Post contains primarily ranges and training areas. The POL spill areas are located where fueling and POL storage occur as part of troop training exercises (AREE 53A to M on Figures 3-1b and 3-1c) and, therefore, are potentially contaminated. According to site personnel, many of these areas are limited in size and primarily store fuel and oil for vehicles (Biang et al., 1991).

The South Post generally comprises outwash sands and gravels that are fairly permeable. Because of the permeable nature of the soils in this area and (for some locations) the proximity of surface water, there is a potential for contaminant migration.

3.6.11 AREE 55 - SHIRLEY HOUSING AREA TRAILER PARK FUEL TANKS

The fuel oil tanks in the Shirley Housing Area Trailer Park (AREE 55) have been identified as SA 55 in the comments to the MEP. The Shirley Housing Area Trailer Park is located in the northwest portion of the Main Post along Hoff Street and Lovell Street (Figure 3-1b). The trailer park includes 30 privately-owned trailers on government land. Each trailer has its own 225-gal heating fuel tank located underground. The heating fuel tanks are no longer being utilized. To date, 24 tanks have been pumped out. The six remaining tanks (at lots 6, 7, 11, 12, 13, and 14) have not been pumped yet because of porches or other permanent structures which prevent access. These tanks will be pumped in the spring, 1992. A 5-year plan for removal of

the 30 tanks was proposed to the MDEP on 8 May 1991, with the removals proposed to occur as trailer occupants are reassigned.

Contamination from some of the 30 heating fuel tanks has been observed. The extent of contamination of soil or groundwater has not been determined.

3.6.12 AREE 56 - BUILDING 2417 LUST SITE

Building 2417 LUST Site (AREE 56) has been identified as SA 56 in comments to the MEP. Building 2417 is located off Givry Street in the southwest portion of the Main Post (Figure 3-1b). A 1,000-gal underground fuel oil tank was removed on 24 October 1990 from an area of the narrow strip of grass between the building and an unnamed asphalt road on the building's southeast side. No associated piping from the tank was noted during the tank's removal.

When the tank was removed, a strong petroleum odor was noted, and visibly stained soils were present. The tank was found to be filled with rainwater and a residual accumulation of No. 2 fuel oil. Groundwater was 4 ft below grade; however, no free product was observed, and only several small faint petroleum sheens were noted. An examination of the Fort Devens utility plans indicated the presence of a 6-inch water main parallel to the unnamed road, immediately adjacent to the tank site. The exact location of the water main could not be ascertained from the plans. It is most likely located approximately 5 ft deep (to prevent freezing).

Contamination was excavated to the building and to the road, and two soil samples were then collected from the excavated soil. The soil samples results were at 226 ppm and 234 ppm of TPH. Full remediation of the site was prevented by the building and the water main. It was feared that if the water main was broken, a further spread of the fuel oil could occur. The excavation has subsequently been backfilled.

3.6.13 AREE 57 - BUILDING 3713 FUEL OIL SPILL SITE

The Building 3713 Fuel Oil Spill Site (AREE 57) has been identified as SA 57 in the comments to the MEP. Building 3713 is located in the eastern section of the Main Post (Figure 3-1a). The building is the location of several industrial activities, including a heavy duty repair shop for large Army vehicles. In 1978, a major spill of several thousand gallons of No. 4 fuel oil occurred. The spill was caused by the accidental overfilling of a 30,000-gal UST. The fuel oil was intercepted by storm drains which discharge to Cold Spring Brook. An earthen dam was constructed on Cold Spring Brook just downstream from where the fuel oil entered the brook. The dam was constructed in order to prevent the further migration of the spill.

Cleanup of the site occurred to some extent. It is believed that some earth-type absorbents were used to soak up the oil. The spill, however, was apparently not fully removed, since asphalt-like material interbedded with waste and soil on the banks of Cold Spring Brook is still visible. No report on the cleanup is believed to exist.

3.6.14 AREE 58 - BUILDINGS 2648 AND 2650 LUST SITES

The Buildings 2648 and 2650 LUST Sites (AREE 58) have been identified as SA 58 in the comments to the MEP and are identified on Figure 3-1b. Buildings 2648 and 2650 were apparently last utilized for storage purposes. In conjunction with the demolition of these buildings, which has been partially completed to date, two heating oil USTs were removed. Residual contamination was evident.

Building 2648 remediation efforts extended only to the fractured shale and bedrock. A decision has not yet been made on what to do with the site. No soil samples or report is believed to exist.

The cleanup effort at Building 2650 also extended to the fractured shale and bedrock. On 12 April 1991, two samples were taken for TPH analysis: the sample results were 54 ppm and 268 ppm of TPH.

3.6.15 AREE 59 - BRIDGE 526

Bridge 526 (AREE 59) is a structure carrying a two-lane roadway across Tail Race Brook, a small tributary of the Nashua River in the northwest corner of the Main Post of Fort Devens, as shown on Figure 3-1b.

In the late summer of 1990, a contractor began sandblasting and repainting Bridge 526. The contractor analyzed the old paint as diluted in the corundum sandblast grit and found it to have a total lead content (based on one sample) of 1,275 ppm. The contractor used a spent sandblast grit containment system during the surface preparation and drummed the resulting waste. On 1 October 1990, rains and a possible release from Lake Shirley Dam caused the water under the bridge to rise to the point that it washed away the scaffolding and the grit containment system, thus depositing contaminated grit into the stream. The Environmental Management Office (EMO) inspected the site and found contaminated sandblast grit on the stream banks as well as the bridge beams and abutments. EMO obtained 10 soil samples from the bank sediments in the immediate vicinity of the bridge, had them analyzed, and found that total lead concentrations ranged from 3.6 to 90 ppm, with an average of about 32 ppm.

Contaminated grit may have been deposited farther downstream as channel sediments (as opposed to stream bank sediments). These sediments may be remobilized and transported farther downstream during seasonal and storm event high water flows.

The incident at Bridge 526 was not identified in the MEP and does not therefore have an associated study area number. An investigation was to be conducted by the installation under the Clean Water Act. Due to base closure requirements at Fort Devens, the site was added as an AREE.

3.7 FACILITY-WIDE AREEs

3.7.1 AREE 60 - TRAINING AREAS AND RANGES

The training areas and ranges at Fort Devens have been identified as AREE 60. Thirteen Training Areas (TAs) were identified at Fort Devens (see Figure 3-6). TA 1 is located on the Main Post near Massachusetts Route 2. TAs 2 and 3 are located on the North Post. The area of TA 4 has been excessed to form the Oxbow National Wildlife Refuge.

Appendix A.1 provides a recent TA overlay for the South Post. Historical use of range and training areas is provided in Appendix A.2.

In the 1991 EPIC evaluation of aerial photographs taken from 1943 to 1991, possible areas of concern within the training areas are noted as "Additional Features." The use of these areas and nature of the disturbances noted from the aerial photographs should be reviewed. The features possibly related to the training areas or ranges are noted as follows:

- Photo Area A - North Post
- Photo Areas E, F, and G - South Post
- Photo Area D - Part of Training Area 4 (South Post) and Training Area 1 (Main Post)

Further details are presented in the EPIC report (EMSL, 1991).

The conditions and the nature of contamination in the training areas and ranges are not known. UXOs are thought to be possible within the impact area but perhaps not exclusively within this area. Debris, such as spent casings or shells at firing ranges, is likely to remain in the training areas.

3.7.2 AREE 61 - MAINTENANCE AND WASTE ACCUMULATION AREAS

The Waste Accumulation Areas (HWAAs) at Fort Devens have been identified as AREE 61. These areas are associated with motor pools and maintenance areas on the Main Post and at the MAAF. Some of the environmental concerns at the areas are addressed by other AREEs, such as USTs (AREES 62 and 63) and the Wash Rack at Lake George Street (AREE 45).

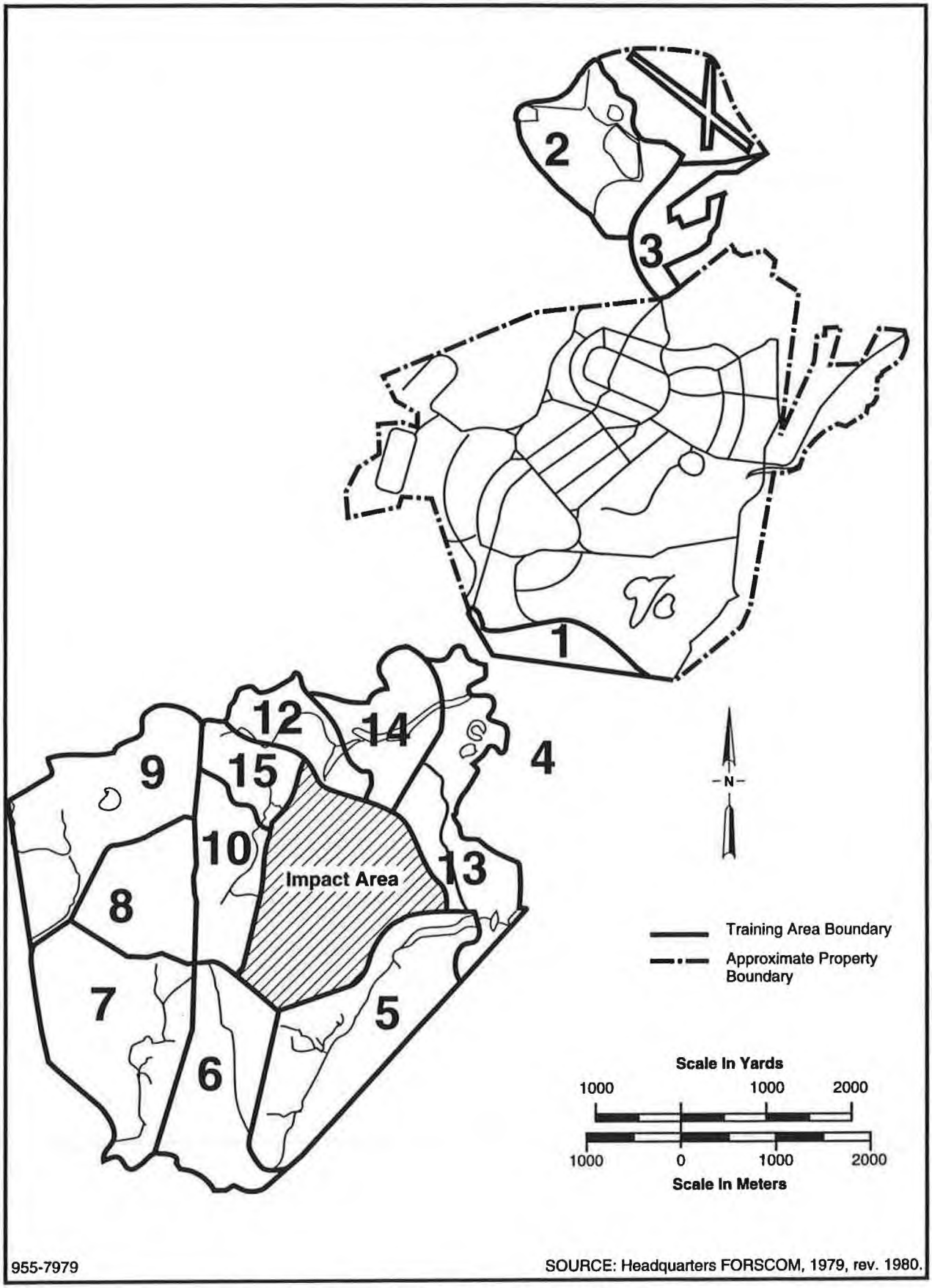


FIGURE 3-6 FORT DEVENS TRAINING AREAS

Environmental concerns include:

- Proper operation of oil/water separators and discharge locations prior to December 1981, when oil/water separators discharged to the storm drainage system.

- Hazardous waste accumulation points (less than 90 days or satellite accumulation) are and have been properly operated in accordance with the requirements of 40 CFR 262.34. When the facilities are no longer used for hazardous waste accumulation, the closure requirements of 40 CFR 265.111 (Closure Performance Standard) and 40 CFR 265.114 (Disposal or Decontamination of Equipment, Structures, and Soils) will apply.

- Activities at motor pools and maintenance areas in the past may present environmental concerns, such as POL and solvents.

Table 3-5 summarizes what is known about the waste accumulation areas and identifies each with its own AREE designation. Note that some are closely associated with previously identified AREEs, particularly AREE 43, the Historic Gas Station Sites. Figures 3-7a and 3-7b show the locations of each area.

3.7.2.1 61A Former Motor Pool

AREE 61A is a former motor pool located near Building T-242.

3.7.2.2 61B Motor Pool Area

A motor pool area is located at Building 3774, the USAR Organizational Maintenance Shop (OMS). The motor pool has been rebuilt. Two oil/water separators have been identified. A trench drain at a vehicle door drains through an oil interceptor and into the sanitary sewer. The wash rack immediately south of Building 3775 drains through an oil/water separator and into the sanitary sewer system.

In addition, Building 3774 and Building 3773 operate satellite accumulation points for hazardous waste.

3.7.2.3 61C Former Motor Pool

The former motor pool near Building 2021 has been identified as AREE 61C. The motor pool is no longer in use.

3.7.2.4 61D Motor Pool

The motor pool area at Building 1677, USAR Regional Maintenance Training Site, is currently in use and has been identified as AREE 61D.

Table 3-5

Summary of Maintenance and Waste Accumulation Areas

AREE No.	Associated AREE	Building/Location	Summary of Findings
61A	NA	Near T-242	Motor pool; no longer in use.
61B	NA	3773/3774	Building 3774 motor pool; in use - rebuilt. Two oil/water separators connected to sanitary sewer. Building 3773 and 3774 have satellite accumulation points for HW.
61C	NA	2021	Motor pool; no longer in use.
61D	NA	1677	Motor pool; in use.
61E	NA	P-1401	Motor pool; in use - rebuilt. One oil/water separator with discharge to storm drain; HWAA and satellite HW accumulation points.
61F	NA	T-3549	Motor pool; in use.
61G	NA	2008	Motor pool; no longer in use. Present location of gas station.
61H	NA	616 to 618	Building 616 motor pool; in use - rebuilt. Two oil/water separators connected to sanitary sewer; HWAA and satellite accumulation points for HW.
61I	43H and I	601 to 605	Motor pool; in use - rebuilt. One oil/water separator connected to sanitary sewer; HWAA and satellite accumulation points for HW.
61J	NA	612 to 614	Motor pool; in use - rebuilt. One oil/water separator connected to sanitary sewer; HWAA and satellite accumulation points for HW.
61K	37	3622	Motor pool; no longer in use.
61L	43J	Across from cemetery	Motor pool; no longer in use.
61M	NA	3606	Motor pool; no longer in use.
61N	NA	T-3605	Motor pool; no longer in use.

Table 3-5

Summary of Maintenance and Waste Accumulation Areas (continued)

AREE No.	Associated AREE	Building/Location	Summary of Findings
61O	43I	2517	Motor pool; in use - rebuilt. One oil/water separator with undetermined outlet. One oil/water separator at carwash facility connected to sanitary sewer.
61P	NA	T-2601	Motor pool; no longer in use.
61Q	NA	2613	Motor pool; no longer in use.
61R	43M, 45	Between 2613 and 2680	Motor pool; no longer in use. One oil/water separator connected to sanitary sewer.
61S	43O	2680	Motor pool; no longer in use.
61T	43P	622	Motor pool; no longer in use.
61U	43Q	Across Street 694	Motor pool; no longer in use.
61V	43S	3412	Motor pool; no longer in use.
61W	NA	3601	Motor pool; no longer in use.
61X	38 and 52	3713	Three oil/water separators connected to sanitary sewer; HWAA and satellite accumulation points for HW.
61Y	NA	3813/3816/3818	Two oil/water separators connected to sanitary sewer. Satellite accumulation points for HW.
61Z	NA	202	One oil/water separator connected to sanitary sewer.
61AA	NA	Commissary	Two oil/water separators in commissary parking lot connected to sanitary sewer.
61AB	NA	219	Satellite accumulation point for HW. One oil/water separator connected to sanitary sewer.

Table 3-5

Summary of Maintenance and Waste Accumulation Areas (continued)

AREE No.	Associated AREE	Building/Location	Summary of Findings
61AC	NA	207	HWAA accumulation point for HW.
61AD	NA	247	Satellite accumulation point for HW.
61AE	NA	1672	HWAA and satellite accumulation points for HW.
61AF	NA	2479/2446	HWAA accumulation points for HW.
61AG	NA	3809	Satellite accumulation point for HW.
61AH	NA	1451	Satellite accumulation point for HW.
61AI	NA	3587	HWAA and satellite accumulation points for HW.
61AJ	NA	3625	Satellite accumulation point for HW.
61AK	NA	P-12	Satellite accumulation point for HW.
61AL	NA	3	Satellite accumulation point for HW.
61AM	NA	3654	Satellite accumulation point for HW.
61AN	NA	2729	Satellite accumulation point for HW.
61AO	2	1450	Satellite accumulation point for HW.
61AP	NA	1677	Satellite accumulation point for HW.

Notes: NA - Not applicable
HW - Hazardous waste
HWAA - Hazardous waste accumulation area for less than 90-day accumulation.

3.7.2.5 61E Motor Pool

The motor pool area (AREE 61E) at Building P-1401 is operated by the 104th Transportation Company. The motor pool has been rebuilt. The wash rack drains into a grit chamber and then into an oil/water separator and into the storm drain. The storm drain discharges into the field directly north of the motor pool. HWAAs and satellite accumulation points are maintained at the motor pool.

3.7.2.6 61F Motor Pool

The motor pool at Building T-3549 has been identified as AREE 61F. The motor pool is still in use.

3.7.2.7 61G Former Motor Pool

The former motor pool at Building 2008 has been identified as AREE 61G. The site is presently used as a gas station.

3.7.2.8 61H Motor Pool

The 36th Medical Battalion and the 46th Combat Support Hospital share the use of facilities at Buildings 616, 617, and 618. A motor pool is identified at Building 616 that is currently in use and has been rebuilt.

Two oil/water separators have been identified (at Buildings 616 and 618). The liquids that flow into the trench drains at the front of each motor repair bay will drain through a sand and gas trap and into the sanitary sewer. Liquids that enter the drains at the center of the wash racks will pass through an oil/water separator and flow into the sanitary sewer.

HWAAs and satellite accumulation points have been identified in this area.

3.7.2.9 61I Motor Pool

The 39th Engineer Battalion (Combat) operates the motor pool at Buildings 601 through 605. The motor pool is in use and has been rebuilt.

One oil/water separator has been identified in the area. Liquids enter the drains at the center of the wash racks, pass through the oil/water separator, and flow into the sanitary sewer.

3.7.2.10 61J Motor Pool

The motor pool at Buildings 612 and 613 (AREE 61J) has been rebuilt and is currently in use by the 10th Special Forces. The facility has one oil/water separator. Liquids that flow into the trench drain at the front of each motor repair bay will drain through a sand and gas trap and then into the sanitary sewer. Liquids that enter the drains at

the center of the wash racks will pass through an oil/water separator and then flow to the sanitary sewer. HWAAs and satellite accumulation points for hazardous waste are located at the motor pool.

3.7.2.11 61K Former Motor Pool

The motor pool at Building 3622 is no longer in use. The Golf Course Entomology Shop (AREE 37) was also located in this area.

3.7.2.12 61L Former Motor Pool

The motor pool located across from the cemetery is at the approximate location of AREE 43J. The motor pool is no longer in use.

3.7.2.13 61M Former Motor Pool

The motor pool at Building 3606 (AREE 61M) is no longer in use. AEHA reported that the building was being used as the Golf Course Equipment Maintenance Shop in 1979 (AEHA, 1979).

3.7.2.14 61N Former Motor Pool

The motor pool at Building T-3605 (AREE 61N) is no longer in use. Building T-3605 was originally a fire station that was built in 1941.

3.7.2.15 61O Motor Pool

The temporary motor pool at Building 2517 (AREE 61O) has been rebuilt. One oil/water separator has been located at the motor pool along the east end at the wash rack. The outlet for the oil/water separator has not been determined. One oil/water separator is located at the Car Wash Facility at Building 2517 as well, and this oil/water separator discharges to the sanitary sewer.

3.7.2.16 61P Former Motor Pool

The motor pool at Building T-2601 (AREE 61P) is no longer in use. Building T-2601, USAR OMS, has been in continuous use since 1982. Waste oil and industrial waste are typically generated here.

3.7.2.17 61Q Former Motor Pool

The motor pool at Building 2613 (AREE 61Q) is no longer in use. The Installation Assessment (McMaster et al., 1982) shows the building in use by the U.S. Army Reserve and indicates waste oil or industrial waste generations.

3.7.2.18 61R Former Motor Pool

The motor pool between Buildings 2613 and 2680 is co-located with AREEs 43M and 45. Liquids entering the wash rack drain will flow through a catch basin (an oil/water separator) and into the sanitary sewer. A berm beneath the grease rack will contain any POL spills.

3.7.2.19 61S Former Motor Pool

The motor pool at Building 2680 is no longer in use. The motor pool is co-located with AREE 43O.

3.7.2.20 61T Former Motor Pool

The motor pool at Building 622 is no longer in use. The motor pool is co-located with AREE 43P.

3.7.2.21 61U Former Motor Pool

The motor pool across the street from Building 694 is no longer in use. The motor pool is co-located with AREE 43Q.

3.7.2.22 61V Former Motor Pool

The motor pool at Building 3412 is no longer in use. The motor pool is co-located with AREE 43S.

3.7.2.23 61W Former Motor Pool

The motor pool at Building 3601 is no longer in use.

3.7.2.24 61X TDA Waste Accumulation Area

The Equipment Concentration Site 65 and the Material Maintenance Division are co-located at Building 3713. The area includes three oil/water separators. All floor drains (including steam cleaning area and battery repair) drain through an oil/water separator and into the sanitary sewer. There is one oil/water separator inside the building and two are located outside the building.

The area of AREE 61W seems to be associated with AREEs 38 and 52.

3.7.2.25 61Y Waste Accumulation Areas

Buildings 3813, 3816, and 3818 are located at the MAAF. Floor drains from the North Hangar drain into an oil/water separator and into the sanitary sewer. The wash rack drains into an oil/water separator and into the sanitary sewer. Satellite accumulation points are located within these buildings.

3.7.2.26 61Z Waste Accumulation Area

The 756th Engineer Company (USAR) is located at Building 202. The wash rack drains through a grit chamber, then an oil/water separator, and then into the sanitary sewer.

3.7.2.27 61AA Commissary Parking Lot

The Commissary Parking Lot has two oil/water separators.

3.7.2.28 61AB DEH Roads and Railroads

The DEH Roads and Railroads operates in Building 219. One oil/water separator is located in the area and discharges to the sanitary sewer. Satellite accumulation points for hazardous waste are operated in this area.

3.7.2.29 61AC Waste Accumulation Area

The HWAA is operated at Building 207 under the control of the DEH operations.

3.7.2.30 61AD Waste Accumulation Area

A satellite accumulation point is operated in Building 247 by the DEH Grounds Maintenance.

3.7.2.31 61AE Waste Accumulation Areas

HWAAs and satellite accumulation points are operated in Building 1672 by the 756th EBC of the 187th Infantry Brigade.

3.7.2.32 61AF Waste Accumulation Areas

HWAAs are operated at Buildings 2479 and 2446 by the 10th Special Forces, 3rd Battalion.

3.7.2.33 61AG Waste Accumulation Area

A satellite accumulation point is operated at Building 3809 by the Directorate of Logistics.

3.7.2.34 61AH Waste Accumulation Areas

A satellite accumulation point is operated at Building 1451 by the DPTMSEC for the TASC Photo Lab.

3.7.2.35 61AI Waste Accumulation Area

HWAAs and satellite accumulation points are operated at Building 3587 by the DPCA at the Auto Craft Shop.

3.7.2.36 61AJ Waste Accumulation Area

A satellite accumulation point is operated at Building 3625 by the DPCA at the Golf Course Maintenance Shop.

3.7.2.37 61AK Waste Accumulation Area

A satellite accumulation point is operated at Building P-12 by the USAISD Print Shop.

3.7.2.38 61AL Waste Accumulation Area

A satellite accumulation point is operated at Building 3 by the ISC Duplicating Shop.

3.7.2.39 61AM Waste Accumulation Area

A satellite accumulation point is operated at Building 3654 by the MEDDAC as the CAH.

3.7.2.40 61AN Waste Accumulation Area

A satellite accumulation point is operated at Building 2729 by the MEDDAC at the Vail Dental Clinic.

3.7.2.41 61AO Waste Accumulation Area

A satellite accumulation point is operated at Building 1450 by the DENTAC at the Veterinary Clinic.

3.7.2.42 61AP Waste Accumulation Area

A satellite accumulation point is operated at Building 1677 as the Regional Maintenance Training Site.

3.7.3 UNDERGROUND STORAGE TANKS (USTs)

3.7.3.1 AREE 62 - USTs -Existing

USTs have been identified as AREE 62 at Fort Devens. Fort Devens has an ongoing UST Management Program. The majority of the USTs at Fort Devens contain heating oil, as this is the primary heating fuel used. The remaining tanks contain or contained POL-type materials, such as waste oil, gasoline, and JP-4 fuel. Appendix B provides the current listing of USTs at Fort Devens. When possible, USTs no longer in use are

removed from service, pumped out, and excavated. The excavation is then inspected for evidence of leaks/spills. Appendix B.1 contains the current list of USTs for Fort Devens. Appendix B.2 provides a listing of USTs under contract for removal in FY 1991/1992. Sampling and site clearance/characterization will be coordinated with MDEP.

3.7.3.2 AREE 63 - USTs - Previously Removed

A number of leaking underground storage tank (LUST) areas have already been identified as separate AREEs (see AREEs 43, 47, 48, 49, 50, 55, 56, and 58). Previously removed tank sites that are not listed as LUST sites were removed and cleaned to state criteria at the time of removal. These are identified as AREE 63. Appendix B.3 provides a listing of previously removed USTs.

3.7.4 AREE 64 - ABOVEGROUND STORAGE TANKS (ASTs)

Fort Devens has a limited number of aboveground storage tanks (ASTs), which have been identified as AREE 64 at Fort Devens. Like the USTs, the ASTs are managed under the ongoing Tank Management Program. Appendix B.4 contains a partial list of ASTs at Fort Devens. Additional ASTs containing propane and heating fuel oil may also be located at Fort Devens.

No known evidence of environmental contamination from ASTs exists.

3.7.5 AREE 65 - ASBESTOS

Asbestos has been identified as AREE 65 at Fort Devens. Because of the era during which many of the buildings at Fort Devens were constructed, asbestos was used in construction. An Asbestos Materials Survey Analysis and Assessment was conducted at Fort Devens by HUB Testing Laboratories in 1987 (HUB, 1987). Appendix C contains an excerpt outline of the 1987 HUB Report. Because the study does not distinguish between friable and non-friable asbestos, Fort Devens uses the report for screening purposes. When construction/ demolition is necessary in a building at Fort Devens, three steps are taken to ensure that asbestos is properly addressed:

- The 1987 HUB Report is reviewed for references to asbestos in the building.
- Drawings and construction specifications for the building are reviewed.
- A trained inspector inspects the building.

Only minor maintenance activities in areas containing asbestos are conducted by Fort Devens personnel. Contractors will normally perform large-scale asbestos removal. Reports on asbestos removal and disposal are maintained at Fort Devens.

An asbestos disposal cell was maintained at the Shepley's Hill Landfill (No. 1) (AREE 5) for disposal of asbestos-containing materials generated on-site. The majority of the asbestos-containing materials are now disposed of off-site.

3.7.6 AREE 66 - TRANSFORMERS

PCB-containing transformers have been identified as AREE 66 at Fort Devens. Because of the age of the facilities at Fort Devens, some transformers are known to contain polychlorinated biphenyls (PCBs). A survey of in-service transformers was conducted by the Facility Engineering Support Activity in April 1982 (McMaster et al., 1982). At this time, the transformers were inspected for leaks and labeled as either PCB-containing or non-PCB-containing transformers. Approximately 900 transformers were in service at this time, and approximately 100 were labeled as PCB-containing. Appendix D provides a listing of current transformer locations at Fort Devens.

When taken out of service, transformers have been stored at Building 1438 (AREE 29), as referenced in the MEP, and at the Hazardous Waste Storage Facility (AREE 22) prior to off-site disposal. Small PCB spills and cleanup actions were documented in the spill records and in the 1982 Installation Assessment (McMaster et al., 1982). A large spill and cleanup action noted at the old Sylvania building (Building 4250) was noted as AREE 39.

3.7.7 AREE 67 - RADON

Radon has been identified as AREE 67 at Fort Devens, and a radon testing program is in progress. All Category I Housing at Fort Devens has been tested. The tests were based on year-long radon measurements to determine yearly averages. Some elevated radon level readings have been noted (to 10 pCi/L), and measures are being taken to address these areas. Appendix E provides the Phase I Radon Testing results. Radon level tests have been conducted in Category II and III buildings, and results are pending.

3.7.8 AREE 68 - LEAD PAINT

Lead paint has been identified as AREE 68 at Fort Devens. Because of the age and construction of many of the buildings at Fort Devens, lead-based paints are a concern. Many buildings have exposed painted surfaces, and some painted surfaces have been covered by vinyl or aluminum siding. Fort Devens has implemented a plan to address the health risk associated with exposure to lead-based paint. Appendix F provides information on the work being conducted by Fort Devens in the housing units.

Fort Devens personnel collected and analyzed representative samples of those painted surfaces for Toxicity Characteristic Leaching Procedure (TCLP) analysis. The analysis revealed that material on the interior and exterior of the building exceeded the TCLP limit for lead and would therefore be classified as a hazardous waste when generated by maintenance, repair, and demolition.

3.7.9 AREE 69 - PAST SPILL SITES

Past spill sites have been identified as AREE 69. During WESTON's site visit, records of spills were made available, although no concise, complete listing was available. In addition, because staff at Fort Devens assist with environmental concerns at many Army facilities in the northeastern United States, spill records from various other locations were combined. Table 3-6 provides an incomplete listing of spill records noted for Fort Devens.

Some spill events have been identified previously as AREEs: AREE 39, Transformer near Building 4250; AREE 51, Building 3412, O'Neil Building Spill Site; AREE 53, POL Spill Areas in the South Post; and AREE 57, Building 3713 Fuel Oil Spill Site.

Table 3-6

Past Spill Sites - Fort Devens*

Location	Previously Identified AREE No.	Date	Chemical	Amount	Report	Status	Remarks
Building 3606-Ramp 3651	NA	3/27/91	Waste Oil	UNK	UNK	Soil has been removed and is awaiting disposal. No known report to MDEP.	
Building 2602	NA	10/30/90	No. 2 Fuel Oil	UNK	Notice	Notice of responsibility sent 11/2/91. No recorded followup or cleanup.	
Building 2417	56	6/20/90	No. 2 Fuel Oil	UNK	UNK	Tank removed, some contamination removed.	
DRMO Yard	32	4/6/90	PCB	UNK	UNK	UNK	UNK Quantity from rectifiers
Bridge 526	59	12/5/90	Lead	UNK	MDEP	Notice of noncompliance issued by MDEP.	No followup on record.
Building 3412	NA	10/6/89	Diesel Fuel	UNK	UNK	UNK	
South Post	NA	11/19/87	Diesel Fuel	275 gal	UNK	All contaminated soil removed in drums.	Fuel spill during fueling.
Intel School	NA	UNK	Water Treatment	90 gal	UNK	UNK	
MAAF-Bldg 3809	NA	4/9/89	JP-4 Fuel	70 gal	UNK	Dennis England, OSC, DEH notified. Cleanup complete 4/11/89.	Area was excavated.
Airfield	NA	1/15/89	Helicopter Fuel	15 gal	UNK	Dennis England notified. Cleanup before any damage occurred.	Fuel spill onto cement floor.
Lake George Street	NA	7/3/90	Diesel	20-30 gal	MDEP	Notice of responsibility given. No record of followup.	Cleanup begun 8/15/90 by Masci Construction.
Woods	NA	8/15/88	UNK	3 drums	UNK	UNK	

*Preliminary and incomplete listing based on partial records review.

Table 3-6

Past Spill Sites - Fort Devens*
(continued)

Location	Previously Identified AREE No.	Date	Chemical	Amount	Report	Status	Remarks
Building 202	48	2/9/89	Oil	UNK	DMEP	Unknown as to whether soil has been treated. No record of followup to MDEP.	LUST - possibly hundreds of gallons.
Hospital	NA	1/4/89	Mercury	UNK	UNK	UNK	Mercury from thermometers.
Building 1401	NA	11/14/88	Asphalt	250 gal	UNK	UNK	
Foxhole near Goddard Memorial	NA	12/7/88	Betz Entec 338	60 gal	UNK	UNK	
Building 1450	NA	10/27/88	Fuel oil	20 gal	UNK	UNK	
Pole at corner near Red Cross	NA	9/26/88	PCB oil	<1 lb	UNK	UNK	
DEH Transformer Storage Area	29	9/14/88	PCB oil	10 gal	UNK	UNK	
Overpass on Barnum Road Near Antietam	NA	1/6/88	Hydraulic oil/gasoline	30 gal	UNK	UNK	
Elm Street	NA	UNK	JP-5 Fuel	UNK	UNK	JP-5 contaminated fuel	
Building 2517	NA	10/20/87	Diesel Fuel	20 gal	UNK	UNK	Motor Asphalt Area.
FD Elementary School	NA	2/26/74	No. 4 Fuel oil	400 gal	UNK	UNK	

UNK - Unknown
NA - Not Applicable
PCB - Polychlorinated Biphenyls
MDEP - Massachusetts Department of Environmental Protection

*Preliminary and incomplete listing based on partial records review.

SECTION 4

HUMAN AND ENVIRONMENTAL RECEPTORS

4.1 RELEASES TO GROUNDWATER

As outlined in Subsection 2.3.5, groundwater supplies throughout most of Fort Devens are found primarily in the unconsolidated glacial outwash deposits. Permeability of these sediments generally is high, especially in gravel beds. Depth to the top of the groundwater table varies from land surface to greater than 32 ft below the land surface (Biang et al., 1991). The groundwater flow direction has not been studied completely, but the groundwater is likely to flow toward the nearest surface stream or the Nashua River.

Two areas of contamination (AOC) have been identified at Fort Devens, the Shepley's Hill Landfill (No. 1) (AREEs 4, 5, and 18) and the Cold Spring Brook Landfill (AREE 40). These landfills present possible sources of groundwater contamination. Other AREEs (such as USTs) present potential sources of groundwater contamination, primarily petroleum, oils, and lubricants (POL). Groundwater at the WWTP has exhibited nitrate levels above the standard for Massachusetts Class I groundwater quality. Further groundwater investigation will be conducted at the AREEs under the MEP.

Fort Devens provides potable water from three large wells and a well field consisting of numerous small wells, all located on the installation. The MacPherson Well is located in the southern portion of the North Post, and the Shaboken and Patton Wells, as well as the Grove Pond Well Field, are located on the Main Post. Several AREEs are located within the wellhead protection areas of these wells; releases from these AREEs thus have the potential to migrate and impact the Fort Devens potable water supply system. The wellhead protection areas and associated AREEs are shown in Figures 4-1a and 4-1b.

In addition to the Fort Devens wells, there are numerous public potable water supply wells within a 4-mile radius of Fort Devens that are also potential receptors. The locations of these wells are shown in Figure 2-6. Table 4-1 presents population data for the public potable water wells in the Fort Devens area that are potential receptors.

4.2 RELEASES TO SURFACE WATER

Fort Devens is located in the Nashua River Basin, as outlined in Subsection 2.3.3. The Nashua River flows northward through Fort Devens to join the Merrimack River at Nashua, New Hampshire. Many natural impoundments exist in the Nashua River Basin. Those completely within the boundaries of Fort Devens include Robbins Pond, Cranberry Pond, Mirror Lake, Little Mirror Lake, and Oak Hill Pond. Slate Rock Pond is an artificial pond in the South Post. Plow Shop Pond and Grove Pond are located

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Table 4-1

Population Data for Public Potable Water Wells that are Potential Receptors in the Fort Devens Area

Well	Population Served	Associated AREE
Fort Devens	16,500	
2019001-02G (Shaboken)		1, 17
2019001-01G (Patton)		16, 17, 24, 40
2019001-03G (MacPherson)		9, 20, 21
2019001-04S (Grove Pond)		5, 38, 44, 52
Ayer Department of Public Works	6,100	NA
2019000-01G		
2019000-02G		
2019000-03G		
2019000-04G		
West Groton Water Supply District	700	NA
2115001-01G		
Harvard Water Department	980	NA
2125000-01G		
2125000-02G		
2125000-03G		
Lancaster Water Department	6,000	NA
2147000-01G		
2147000-02G		
Leominster Water Department	36,000	NA
2153000-03G		
2153000-04G		
2153000-05G		
Littleton Water Department	6,000	NA
2158000-01G		
2158000-02G		
2158000-04G		

Table 4-1

Population Data for Public Potable Water Wells that are Potential Receptors in the Fort Devens Area (continued)

Well	Population Served	Associated AREE
Lunenburg Water District 2162000-01G 2162000-02G 2162000-03G 2162000-04G 2162000-05G	6,500	NA
Shirley Water District 2270000-01G 2270000-02G 2270000-03G	3,800	NA
MCI Prerelease Center 2270001-01G 2270001-02G	650	NA

along the northeastern boundary of the Main Post, and Spectacle Pond is located along the northwestern boundary of the South Post.

In addition to the rivers, streams, and ponds, extensive wetlands exist at and in the vicinity of Fort Devens. As outlined in Subsection 2.3.6, these areas provide excellent habitat for a variety of wildlife.

Because of the proximity of the Shepley's Hill Landfill (No. 1) (AREE 5) to Plow Shop Pond, it is possible that contaminated groundwater and leachate may migrate to the pond (Biang et al., 1991). The Cold Spring Brook Landfill (AREE 40) presents a concern for the Cold Spring Brook, which flows adjacent to the site. Surface water quality data will be collected as part of the investigations of these AREEs under the MEP at Fort Devens as well as other possible sources of surface water contamination.

4.3 RELEASES TO SOIL

A number of potential releases of contaminants to the soils at Fort Devens have been identified at the AREEs in Section 3. Further investigation is required under the MEP to determine whether the potential releases do exist and to what extent, if any, groundwater and surface water are impacted. Some additional sources of releases to soil have been identified based on the evaluation of possible AREEs, and recommendations for additional sampling are provided in Section 5.

4.4 RELEASES TO AIR

The MEP does not identify any releases to air that present a concern or require sampling. The AREEs reviewed in Section 3 do not present major air contamination concerns for human health or the environment, with the exception of AREEs 65 and 67, asbestos and radon, respectively. Fort Devens has ongoing programs that deal with these concerns. Any remedial action or disturbance of contaminated soils could result in a release of air contaminants.

SECTION 5

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER ACTION

The AREEs identified at Fort Devens and recommendations for further action are summarized in Table 5-1 and Figures 5-1a to 5-1c. It is important to note that the majority of the AREEs are in the process of being investigated under the MEP; the recommendations in this enhanced PA are intended to complete the SI/RI work. It should be noted that the recommendations from the draft MEP (Biang et al., 1991) with comments are presented and that this enhanced PA should not be used or referenced in any way other than for informational purposes regarding the SI/RI work. The recommended actions are preliminary in nature because the work will be detailed in the Site Investigation/Remedial Investigation Work Plans. The schedule presented in Table 5-1 is tentative and subject to change. Additional work recommended by WESTON will be highlighted in the following subsections. WESTON did not intend to review and critique the MEP but rather to identify any additional environmental concerns at Fort Devens.

5.1 INCINERATORS

5.1.1 AREE 1 - CUTLER ARMY HOSPITAL INCINERATOR

MEP Recommendations

As recommended in the MEP, a sample of the incinerator ash should be collected by Fort Devens personnel each time the ash is scraped out for disposal. A monthly composite sample should be analyzed for TCLP. Samples should be analyzed for radionuclides and dioxins semiannually. If, after 1 year, the results indicate a trend, then the sampling frequency can be changed accordingly, perhaps to semiannual or annual grab samples. If necessary, emissions testing may be conducted. When the unit will no longer be used, the ash should be removed and properly disposed of.

A phased sampling and monitoring program will be conducted to characterize the site and determine if rainwater and melting snow have contaminated the surrounding soil. The initial program will consist of collecting surface soil samples. A surface reconnaissance of the site should be made to determine runoff patterns and locate any visibly stained soil. Two surface soil samples (6 to 12 inches) will be collected adjacent to the incinerator pad, and two will be collected from a downgradient storm sewer outlet. The soil samples will be analyzed for Target Analyte List (TAL) metals and TCLP metals.

If the soil samples indicate the presence of contamination, then a second phase will be initiated. During this phase, additional soil samples will be collected from all areas

Table 5-1

AREEs Identified at Fort Devens and Recommendations for Further Action

AREE No.	Study Area/ Area of Contamination	Description	Figure	Summary of Findings	Concern	MEP Recommended Activity	Additional WESTON Recommended Activity
		Incinerators					
1	SA 1	Cutler Army Hospital Incinerator	5-1b	From 1977 to present, incinerates medical/ biological waste.	Characteristics of ash and runoff.	Site scheduled for investigation FY 94.	--
2	SA 2	Veterinary Clinic Incinerator	5-1b	From 1970 to present, incinerates animal carcasses.	Characteristics of ash.	Site scheduled for investigation FY 94.	--
3	SA 3	Intelligence School Incinerator	5-1b	From 1971 to 1976, incinerated classified documents.	Characteristics of ash and surrounding soil.	Site scheduled for investigation FY 94.	--
4	AOC 4	Sanitary Landfill Incinerator (Bldg. 38)	5-1a	From 1941 to late 1940s, incinerated household debris.	Leachate.	Remedial investigation conducted in 1991.	--
42	SA 42	Popping Furnace	5-1c	Used until early 1960s; incinerated small arms ammunition; possible dumping adjacent to site.	Ash and other waste disposal.	Site scheduled for investigation FY 92.	Two additional surface soil samples are recommended by WESTON TCL Organics, TAL Metals, Explosives, TCLP Metals
		Landfill Disposal Areas					
5	AOC 5	Shepley's Hill Landfill (No. 1) Near Shepley's Hill	5-1a	From 1917 to present, disposal of household refuse, construction/ demolition debris and military refuse.	Leachate.	Remedial investigation conducted in 1991.	--
18	AOC 18	Landfill No. 1 - Asbestos Cell	5-1a	Asbestos disposal.	Asbestos.	Remedial investigation conducted in 1991.	--
6	SA 6	Landfill No. 2 -- South Post Area 7b	5-1c	From 1850 to 1920, disposal of household refuse.	Waste disposal.	Site scheduled for investigation FY 95.	--

Table 5-1

AREEs Identified at Fort Devens and Recommendations for Further Action (continued)

AREE No.	Study Area/ Area of Contamination	Description	Figure	Summary of Findings	Concern	MEP Recommended Activity	Additional WESTON Recommended Activity
7	SA 7	Landfill No. 3 -- South Post Impact Area	5-1c	From 1850 to 1920, disposal of household refuse.	Waste disposal.	Site scheduled for investigation FY 95.	--
8	SA 8	Landfill No. 4 -- South Post Area 8a	5-1c	From 1900 to 1930 and possibly later, disposal of household refuse and military items.	Waste disposal.	Site scheduled for investigation FY 95.	--
9	SA 9	North Post Landfill (No. 5)	5-1a	From 1955 to 1978, construction/demolition debris.	Waste disposal.	Site scheduled for investigation FY 92.	--
10	SA 10	Landfill No. 6 -- Near Shirley Gate	5-1b	From 1975 to 1980, construction/demolition debris.	Waste disposal.	Site scheduled for investigation FY 95.	--
11	SA 11	Landfill No. 7 -- Near Lovell Street	5-1b	From 1975 to 1980, construction/demolition debris.	Waste disposal.	Site scheduled for investigation FY 95.	--
12	SA 12	Landfill No. 8 -- South Post Combat Pistol Range	5-1c	From 1960 to present, construction/demolition debris.	Waste disposal.	Site scheduled for investigation FY 92.	--
13	SA 13	Landfill No. 9 -- Near Lake George Street	5-1b	From 1965 to 1970, construction/demolition debris and possibly oil.	Waste disposal.	Site scheduled for investigation FY 92.	--
14	SA 14	Landfill No. 10 -- South Post Near Dixie Road	5-1c	Abandoned cars in quarry.	Waste disposal.	Site scheduled for investigation FY 92.	UXO Sweep and Survey for Vehicles
15	SA 15	Landfill No. 11 -- South Post Near Helipad	5-1c	From 1963 to 1966, fuel oil burned.	Oil.	Site investigation conducted in 1991.	--
16	SA 16	Landfill No. 12 -- Main Post Near Shoppette	5-1b	Used in 1985, household refuse. Photographic evidence beginning in 1952.	Waste disposal.	Site scheduled for investigation FY 94.	--

Table 5-1

AREEs Identified at Fort Devens and Recommendations for Further Action (continued)

AREE No.	Study Area/ Area of Contamination	Description	Figure	Summary of Findings	Concern	MEP Recommended Activity	Additional WESTON Recommended Activity
17	SA 17	Landfill No. 13 -- Little Mirror Lake	5-1b	WWII grenades placed in lake.	Explosives.	Site scheduled for investigation FY 94.	--
40	AOC 40	Cold Spring Brook Landfill	5-1b	Construction/demolition debris and drums.	Waste disposal.	Remedial investigation conducted in 1991.	--
41	SA 41	Unauthorized Dumping Area (Site A)	5-1c	Disposal of unknown material.	Waste disposal.	Site scheduled for investigation FY 92.	--
46	SA 46	Training Area 6d -- South Post	5-1c	Disposal of unknown material.	Waste disposal.	Site scheduled for investigation FY 95.	--
		Wastewater Treatment Plant					
19	SA 19	Wastewater Treatment Plant	5-1a	From 1942 to present, treatment of sanitary sewage, floor drainage, wash rack discharge, boiler blowdown, swimming pool water, and filter backwash.	Inflow to sewer system.	Maintain monitoring programs and permits; note that sludge disposal is permitted at MAAF. Monitoring groundwater monitoring wells. Site scheduled for investigation FY 92.	Monitoring wells no longer in use should be grouted and removed.
20	SA 20	Rapid Infiltration Basins	5-1a	Treatment of WWTP effluent.	Nitrates and other possible contaminants.	Site scheduled for investigation FY 92.	Monitoring wells no longer in use should be grouted and removed.
21	SA 21	Sludge Drying Beds	5-1a	Application of sludge from WWTP Imhoff tanks.	Nitrates and other possible contaminants.	Site scheduled for investigation FY 92.	Monitoring wells no longer in use should be grouted and removed.
		Storage Areas					
22	SA 22	Hazardous Waste Storage Facility (Bldg. 1650)	5-1a	RCRA-permitted storage for >90 days.	No known spill or release.	No further action.	Unit will require RCRA closure in accordance with permit when no longer in use.

Table 5-1

AREEs Identified at Fort Devens and Recommendations for Further Action (continued)

AREE No.	Study Area/ Area of Contamination	Description	Figure	Summary of Findings	Concern	MEP Recommended Activity	Additional WESTON Recommended Activity
23	SA 23	Paper Recycling Center (Bldg. 1650)	5-1a	Former storage and transfer facility for paper.	No known spill or release.	No further action.	--
24	SA 24	Waste Explosive Storage Bunker (Bldg. 3644)	5-1b	Storage of waste explosives from military and civilian sources.	Explosives and metals.	Site investigated in 1991;	RCRA closure when no longer in use.
29	SA 29	Transformer Storage Area (Bldg. 1438)	5-1a	Storage of out-of-service transformers prior to disposal.	PCBs.	Site scheduled for investigation FY 94.	--
30	SA 30	Drum Storage Areas - MAAF	5-1a	Formerly used as satellite accumulation point for hazardous waste in drums.	Waste oil, fuels, and solvents.	Site scheduled for investigation FY 92.	--
32	SA 32	DRMO Yard	5-1a	Scrap and equipment storage area.	Metals, solvents, and other materials.	Site investigated in 1991.	Twenty surface soil samples; analysis for PCBs.
33	SA 33	DEH Entomology Shop (Bldg. 262)	5-1a	Pesticide/herbicide storage and mixing.	Pesticides/ herbicides.	Site scheduled for investigation FY 94.	In addition, wipes of building for pesticides.
34	SA 34	Former DEH Entomology Shop (Bldg. 245)	5-1a	Former pesticide/ herbicide storage.	Pesticides/ herbicides.	Site scheduled for investigation FY 94.	In addition, wipes of building for pesticides.
35	SA 35	Former DEH Entomology Shop (Bldg. 254)	5-1a	Former pesticide/ herbicide storage.	Pesticides/ herbicides.	Site scheduled for investigation FY 94.	In addition, wipes of building for pesticides.
36	SA 36	Former DEH Entomology Shop (Bldg. 2728)	5-1b	Former pesticide/ herbicide storage.	Pesticides/ herbicides.	Site scheduled for investigation FY 94.	In addition, wipes of building for pesticides.
37	SA 37	Golf Course Entomology Shop (Bldg. 3622)	5-1b	Former pesticides storage and mixing. Possible LUST site.	Pesticides/ herbicides.	Site scheduled for investigation FY 94.	In addition, wipes of building for pesticides.

Table 5-1

AREEs Identified at Fort Devens and Recommendations for Further Action (continued)

AREE No.	Study Area/ Area of Contamination	Description	Figure	Summary of Findings	Concern	MEP Recommended Activity	Additional WESTON Recommended Activity
		Waste Handling Areas					
25	SA 25	EOD Range - South Post	5-1c	Waste explosives destruction.	Metals, explosives, UXO.	Site investigated in 1991;	RCRA closure when no longer in use and UXO Sweep.
26	SA 26	Zulu I and II Ranges - South Post	5-1c	Training area/hand grenade range; open burning of explosives.	Metals, explosives, UXO.	Site investigated in 1991.	UXO Sweep
27	SA 27	Hotel Range - South Post	5-1c	Training area/20-mm cannon fire.	Metals, explosives, UXO.	Site scheduled for investigation FY 92.	UXO Sweep
28	SA 28	Training Area 14 - South Post	5-1c	Training area/waste explosives detonation.	Metals, explosives, UXO.	Site scheduled for investigation FY 92.	UXO Sweep
31	SA 31	Fire-fighting Training Area - MAAF	5-1a	Burning of jet fuel and solvents for training.	Fuels/solvents.	Site scheduled for investigation FY 92.	–
38	SA 38	Battery Repair Area (Bldg. 3713)	5-1a	Battery acid formerly neutralized in pit.	Metals.	Site scheduled for investigation in FY 92.	–
45	SA 45	Wash Rack at Lake George Street	5-1b	Wash rack for private vehicles.	Waste oil, POL.	Site scheduled for investigation in FY 92.	–
		Spills and Leaking Underground Storage Tank Areas					
39	SA 39	Transformer Near Former Bldg. 4250	5-1b	Leak from PCB-contaminated transformer; soil removal and sampling in 1984; UST removal also poorly documented.	PCBs, POL.	Present results to MDEP for approval; maximum PCB concentration of 20 ppm following removal.	Review records on UST removal. Recommendation for sampling based on findings.

Table 5-1

AREEs Identified at Fort Devens and Recommendations for Further Action (continued)

AREE No.	Study Area/ Area of Contamination	Description	Figure	Summary of Findings	Concern	MEP Recommended Activity	Additional WESTON Recommended Activity
44	SA 44	Cannibalization Yard	5-1a	Vehicle storage with possible leaks; HWAA; UST site.	Waste oil, POL.	Site scheduled for investigation in FY 92.	--
43	SA 43 and SA 54	Historic Gas Station Sites	5-1b	WWII-era gasoline storage and distribution with possible LUST sites.	POL.	Site scheduled for investigation in FY 92.	--
47	SA 47	Bldg. 3816 LUST Site - MAAF	5-1a	Diesel fuel storage; LUST site.	POL.	Site scheduled for investigation in FY 92.	--
48	SA 48	Bldg. 202 LUST Site	5-1a	Fuel handling and storage.	POL.	Site investigated in 1991.	--
49	SA 49	Bldg. 3602 LUST Site	5-1b	Fuel handling and storage.	POL.	Site scheduled for investigation in FY 92.	--
50	SA 50	WWII Fuel Points - MAAF	5-1a	Fuel handling and storage.	POL.	Site scheduled for investigation in FY 92.	--
51	SA 51	Bldg. 3412, O'Neil Bldg. Spill Site	5-1b	Fuel handling and storage.	POL.	Site scheduled for investigation in FY 92.	--
52	SA 52	TDA Maintenance Yard	5-1a	Vehicle storage with possible leaks.	Waste oil, POL.	Site scheduled for investigation in FY 92.	--
53	SA 53	POL Spill Areas - South Post	5-1b and 5-1c	Fuel handling and temporary storage.	POL.	Sites scheduled for investigation in FY 95.	--
55	SA 55	Shirley Housing Area - Trailer Park Fuel Tanks	5-1b	Possible fuel oil LUST sites.	POL.	Site scheduled for investigation FY95.	--
56	SA 56	Bldg. 2417 LUST Site	5-1b	Fuel oil LUST site.	POL.	Site scheduled for investigation FY 92.	--
57	SA 57	Bldg. 3713 Fuel Oil Spill Site	5-1a	Fuel oil spill.	POL.	Site scheduled for investigation FY 92.	--

Table 5-1

AREEs Identified at Fort Devens and Recommendations for Further Action (continued)

AREE No.	Study Area/ Area of Contamination	Description	Figure	Summary of Findings	Concern	MEP Recommended Activity	Additional WESTON Recommended Activity
58	SA 58	Bldgs. 2648 and 2650 LUST Sites	5-1b	Fuel oil LUST sites.	POL.	Site scheduled for investigation FY 92.	--
59	NA	Bridge 526	5-1b	Contaminated grit may have washed from the site.	Metals.	NA	Collect six soil samples adjacent to the site for TAL metals and collect six sediment and six surface water samples downstream.
		Facility-Wide AREEs					
60	NA	Training Areas and Ranges	NA	Training areas and ranges have been used for various activities.	UXO, metals, POL.	NA	Sites should be inspected and records reviewed; sampling based on findings.
61	NA	Waste Accumulation Areas	NA	Some release may have occurred.	Waste oil, POL, solvents.	NA	Sites should be inspected; sampling based on findings.
62	NA	USTs - Existing	NA	Management program in place for USTs.	POL.	NA	Maintain UST Management Program.
63	NA	USTs - Previously Removed	NA	Sketchy records for some LUST removals.	POL.	NA	Investigate former UST sites and review records to determine the adequacy of previous UST removals.
64	NA	ASTs	NA	Adequate listing and records of ASTs not available.	POL.	NA	Maintain AST Management Program.
65	NA	Asbestos	NA	Asbestos is managed at Fort Devens.	Asbestos.	NA	Maintain Asbestos Management Program.
66	NA	Transformers	NA	PCB-containing transformers are managed at Fort Devens.	PCBs.	NA	Maintain PCB Transformer Management Program.

Table 5-1

AREEs Identified at Fort Devens and Recommendations for Further Action (continued)

AREE No.	Study Area/ Area of Contamination	Description	Figure	Summary of Findings	Concern	MEP Recommended Activity	Additional WESTON Recommended Activity
67	NA	Radon	NA	Radon levels are currently being evaluated at Fort Devens.	Radon.	NA	Maintain Radon Management Program.
68	NA	Lead Paint	NA	Buildings exhibit possible lead above TCLP levels.	Lead.	NA	Review available data and inventory buildings.
69	NA	Past Spill Sites	NA	Spills identified by records.	Various.	NA	Consolidate and review available data. Site inspection. Sampling recommended based on findings.

TCLP Metals = RCRA Toxicity Characteristic Leaching Procedure metals.
TAL metals = Target Analyte List metals.
TCL organics = Target Compound List organics.
PCB = Polychlorinated biphenyls.
NA = Not Applicable.
Explosives = HMX; RDX; nitrobenzene; 1,3-dinitrobenzene; 1,3,5-trinitrobenzene; 2,4-dinitrotoluene; 2,6-dinitrotoluene; 2,4,6-trinitrotoluene; tetryl; 2-nitrotoluene; and others as appropriate.
UXO = Unexploded Ordnance.
POL = Petroleum, Oils, and Lubricants.
MEP = Master Environmental Plan for Fort Devens, Massachusetts.
LUST = Leaking Underground Storage Tank.
UST = Underground Storage Tank.
AST = Aboveground Storage Tank.
FY = Fiscal Year.
SA = Study Area.
AOC = Area of Contamination.

identified as contaminated during the first phase (particularly areas of soil discoloration) and analyzed for parameters with elevated concentrations. If necessary, soil borings and groundwater monitoring wells will be included in the second phase.

Remedial action will be initiated to address all significantly contaminated areas. If no evidence of contamination is found in these investigations, it is recommended that no further action be taken for this site.

5.1.2 AREE 2 - VETERINARY CLINIC INCINERATOR

MEP Recommendations

As recommended in the MEP, a sample of the incinerator ash should be collected by Fort Devens personnel each time the ash is scraped out for disposal. A composite sample should be analyzed semiannually for TCLP metals. Samples should be analyzed for radionuclides and dioxins semiannually. If, after 1 year, the results indicate a trend, then the sampling frequency can be changed accordingly, perhaps to quarterly grab samples. If necessary, emissions testing may be conducted. When the unit will no longer be used, the ash should be removed and properly disposed of.

The heating and ventilation system of Building 1450, air intakes in particular, should be modified to eliminate the intake of incinerator ash.

5.1.3 AREE 3 - INTELLIGENCE SCHOOL INCINERATOR

MEP Recommendations

As recommended in the MEP, a sampling program will be conducted to characterize the site and determine if any soil is contaminated. The initial program will consist of collecting and analyzing soil and ash samples.

A sample of any ash remaining at the incinerator site will be collected and analyzed for TCLP metals and dioxin. A surface reconnaissance of the site should be made to locate any visibly stained areas. Surface soil samples (6 to 12 inches) will be collected on each side of the incinerator pad and in possible runoff areas and analyzed for TAL metals and TCLP metals.

If the initial samples indicate the presence of contamination, then a second phase will be initiated. During this phase, significantly contaminated soils will be excavated and disposed of in accordance with state and federal requirements. If no evidence of contamination is found in these investigations, it is recommended that no further action be taken for this site.

5.1.4 AREE 4 - SANITARY LANDFILL INCINERATOR (BUILDING 38)

MEP Recommendations

As recommended in the MEP, because the Sanitary Landfill Incinerator is located in the landfill under the cap, the RI activities planned for the landfill (AREE 5) will be sufficient to evaluate this AREE.

5.1.5 AREE 42 - POPPING FURNACE

MEP Recommendations

As recommended in the MEP, even though the potential for soil or water contamination is small, the site will be investigated because of its proximity to the wetlands and the Nashua River and because of the hydrological connection between the groundwater and the surface water. The following proposed actions are based on the assumption that any leachate would have migrated down the steeply sloping hillside and into the wetland. Soil, surface water, and sediment will be sampled to determine if contamination is present.

In the furnace area, four 3-ft soil borings will be drilled and sampled at 0.5 to 1.0 and 2.5 to 3.0 ft. In addition, three surface water and sediment samples will be collected from the wetlands downgradient from the site. All samples will be analyzed for TCL organics, TAL metals, and explosives. In addition, sediment samples will be analyzed for TOC and grain size. If significant contamination is detected, a more extensive investigation will be implemented. Depending on the results of the initial sampling, this could include additional sampling, groundwater monitoring, or both. All debris and metal objects found on the surface will be removed and disposed of in a properly designed and operated landfill. If necessary, remedial action will be taken at the site, in accordance with state and federal requirements, to prevent further contamination. If no contamination is detected, it is recommended that no further action be taken for this site.

Additional WESTON Recommendations

Based on the evaluation of the aerial photographs, noting an extended period of possible disposal, WESTON recommends that two surface soil samples (6 to 12 inches) be collected on the slope face using the aerial photographs and field observations to choose the locations. These two samples should be analyzed for the same parameters identified for the other samples at this site.

5.2 LANDFILL DISPOSAL AREAS

5.2.1 AREE 5 AND AREE 18 - SHEPLEY'S HILL LANDFILL (NO. 1) - MAIN POST NEAR SHEPLEY'S HILL

MEP Recommendations

Although the RI work has begun, the following description is based on the draft MEP, as details on the actual sampling methods and results are not available at this time.

Two of the monitoring wells (Nos. 1 and 2) are often dry and have been replaced, as recommended in the MEP. Five additional monitoring wells have been identified in order to better characterize the site and the nature and extent of contamination.

To evaluate upgradient conditions, upgradient wells will be sampled. Water levels should be measured in all wells quarterly for 1 year to determine the groundwater flow direction and gradient. Slug tests are recommended for all wells to determine the in situ parameter values of transmissivity and storativity; however, due to the possibly high hydraulic conductivity that is usually present in sand and gravel outwash aquifers, slug tests may not be adequate and aquifer pump tests may be required. After proper well development, samples will be obtained from the old and new wells and analyzed for TAL metals and TCL organics and explosives. After enough time has elapsed to allow recovery of normal groundwater levels, a second, complete round of well sampling should be conducted.

If leachate is visible flowing from the landfill, samples of the leachate should be collected and analyzed for priority pollutants and explosives. Soil samples from erosion gullies around the landfill should be obtained and analyzed for the same parameters indicated for the leachate. Because of the proximity of Plow Shop Pond, it is possible that contaminated groundwater and leachate may migrate to the pond. It is recommended that about 15 surface water and sediment samples be collected from the pond and analyzed for TAL metals, TCL organics, and explosives. In addition, sediments will be analyzed for TOC and grain size. This number of samples represents about one sample every 175 ft along the pond's shoreline.

Although the RI work has begun, the following description is based on the draft MEP, as details on the actual sampling methods and results are not available at this time.

5.2.2 AREE 6 - LANDFILL NO. 2 - SOUTH POST AREA 7b

MEP Recommendations

As recommended in the MEP, due to the type of wastes that would have been placed in this landfill (if it exists) and the time of its operation, there is very little reason to believe that the site is contaminated. An attempt will be made to locate the landfill through examination of aerial photographs and a field reconnaissance. A geophysical survey over a wide areal extent may aid in determining the boundary of the

landfill/refuse. If the landfill is located, samples will be collected and analyzed for indicator parameters. If the site cannot be located, it was recommended that no further action be taken.

5.2.3 AREE 7 - LANDFILL NO. 3 - SOUTH POST IMPACT AREA

MEP Recommendations

As recommended in the MEP, because of the type of wastes placed in this landfill and the time of its operation, there is very little reason to believe that the site is contaminated. An attempt will be made to locate the landfill through examination of aerial photographs and a field reconnaissance. A geophysical survey over a wide areal extent may aid in determining the boundary of the landfill/refuse. If the landfill is located, samples will be collected and analyzed for indicator parameters. If the site cannot be located, it was recommended that no further action be taken.

5.2.4 AREE 8 - LANDFILL NO. 4 - SOUTH POST AREA 8a

MEP Recommendations

As recommended in the MEP, because of the type of wastes placed in this landfill and the time of its operation, there is very little reason to believe that the site is contaminated. An attempt will be made to locate the landfill through examination of aerial photographs and a field reconnaissance. A geophysical survey over a wide areal extent may aid in determining the boundary of the landfill/refuse. If the landfill is located, samples will be collected and analyzed for indicator parameters. If the site cannot be located, it is recommended that no further action be taken.

5.2.5 AREE 9 - NORTH POST LANDFILL (NO. 5)

MEP Recommendations

As recommended in the MEP, the junked automobiles and car parts will be removed as a precautionary measure. Access to this landfill needs to be controlled.

To determine if the soil or groundwater is contaminated at this site, a geophysical survey and a sampling program will be conducted to characterize it and to locate the site boundaries. This program will include excavating test pits, collecting soil samples, and installing groundwater monitoring wells. Three test pits will be excavated and soil samples will be collected and analyzed for TCL organics, TPH, and asbestos.

If soil in the area of the abandoned cars is visibly stained, surface samples will be collected and analyzed for TAL metals, TCL organics, and TPH.

Five groundwater monitoring wells will be installed. Groundwater will be sampled and analyzed for TAL metals, TCL organics, and explosives. The results will indicate

whether contaminants are migrating from the site. A monitoring program should be established on the basis of the results.

If elevated contaminant levels are found, further investigation is recommended. If none are present, no further study is recommended.

5.2.6 AREE 10 - LANDFILL NO. 6 - NEAR SHIRLEY GATE

MEP Recommendations

As recommended in the MEP, the site boundaries will be located through a geophysical survey and examination of aerial photographs (if available). Test pits will be excavated in the landfill area, and samples from the pits will be analyzed for TCLP metals and asbestos. Results of those analyses would determine the need for further studies.

5.2.7 AREE 11 - LANDFILL NO. 7 - NEAR LOVELL STREET

MEP Recommendations

As recommended in the MEP, the disposal area boundaries will be located through a geophysical survey. To detect any contaminants, two monitoring wells will be placed downgradient and one will be placed upgradient of the site. The soil and wells will be sampled for TCL organics, pesticide/PCBs, and TAL metals. If leachate is detected, samples for TAL metals and TCL organics will be collected.

5.2.8 AREE 12 - LANDFILL NO. 8 - SOUTH POST COMBAT PISTOL RANGE

MEP Recommendations

As recommended in the MEP, the site will be thoroughly investigated because of its proximity to wetlands and the Nashua River and the hydrological connection between the groundwater and surface water, even though the potential for soil or water contamination is small. The proposed actions are based on the assumption that any leachate or runoff migrates down the steeply sloping hillside and accumulates at the base of the hill.

The landfill's areal extent will be determined through a reconnaissance of the site, examination of aerial photographs and, if practical, a surface geophysical survey. The reconnaissance should locate indicators of the landfill, such as metal objects, construction debris, etc.

When the landfill's extent is determined, a surface water and sediment sampling program will be conducted. Six surface water and sediment samples will be collected up- and downstream of the fill area in the wetland and the river. Sampling locations will be determined by best field judgment with regard to site conditions. This approach will determine the extent of any contamination, since any leachate would flow downhill.

All samples will be analyzed for TAL metals, TCL organics, and explosives, and sediment samples will include total organic carbon (TOC) and grain size.

If contamination is indicated, then a second, more comprehensive phase will be initiated to determine the extent of contamination. It may be necessary to collect additional surface water and sediment samples, collect surface soil samples, drill soil borings, and install groundwater monitoring wells. The number and locations of these sites will depend on the results of the initial surveys.

All debris and metal objects found lying on the surface will be removed and disposed of in a properly designed and operated landfill. If necessary, remedial action will be taken at the site, in accordance with state and federal requirements, to prevent further contamination.

5.2.9 AREE 13 - LANDFILL NO. 9 - NEAR LAKE GEORGE STREET

MEP Recommendations

As recommended in the MEP, because the site is located adjacent to a gully that leads to the Nashua River, there is a potential for the spread of any soil or water contamination. Because of the hydrological connection between the groundwater and surface water, the site should be thoroughly investigated to determine if any degradation by-products are present. A phased sampling and monitoring program will be conducted to locate the site and then characterize it.

During the first phase, areal extent of the former landfill will be determined. The site's location will be determined through examination of aerial photographs and a field reconnaissance to locate visible metal objects, construction debris, etc. The reconnaissance will be followed by a geophysical survey. When the boundaries of the abandoned landfill have been defined, the extent of groundwater and soil contamination will be determined by collecting and analyzing soil samples and installing groundwater monitoring wells around the site's perimeter. Surface soil samples (6 to 12 inches) will be collected from three locations in the gully leading from the site and analyzed for TAL metals, TCL organics, TPH, and explosives.

Four monitoring wells will be installed. One well will be located east (upgradient) of the site and three between the site and the Nashua River (downgradient). Final locations of all wells and sample sites will be determined by field inspection. Following proper well development (USATHAMA, 1987), groundwater samples will be collected from each well and analyzed for TAL metal and TCL organics and explosives. If TPH is detected in elevated soil samples, groundwater samples will be analyzed for TPH.

If contamination is indicated, then a second phase will be initiated to determine the extent of that contamination. The second phase may include collecting additional soil samples, drilling soil borings, and installing additional groundwater monitoring wells. The number and locations of these sampling sites will depend on the results of the initial surveys.

All debris and metal objects found lying on the survey will be removed and disposed of in a properly designed and operated landfill. If necessary, remedial action will be taken at the site, in accordance with state and federal requirements, to prevent further contamination.

5.2.10 AREE 14 - LANDFILL NO. 10 - SOUTH POST NEAR DIXIE ROAD

MEP Recommendations

As recommended in the MEP, contamination of surface and groundwater is possible from the illegal disposal of automobiles in this quarry. To determine if any contamination has occurred, two or three surface water and sediment samples will be collected and analyzed for TAL metals, TCL organics, TPH, and explosives. Sediment samples will also be analyzed for TOC and grain size. Information about the bedrock should be examined to determine the presence of any fractures that might form a pathway for contaminant migration. If contamination is detected, a remedial investigation should be performed.

If no evidence of contamination is found, it is recommended that the site be secured to prevent future disposal and that no further studies be conducted.

Additional WESTON Recommendations

A UXO sweep should be conducted in the area and an underwater survey should be made to determine if any vehicles remain in the quarry.

5.2.11 AREE 15 - LANDFILL NO. 11 - SOUTH POST NEAR HELIPAD

MEP Recommendations

As recommended in the MEP, the site characterization investigation started by Gates should be completed. The site boundaries will be defined by a geophysical survey. Four soil borings will be drilled to delineate the extent of any contamination. The location and depth of the soil borings will be determined by field personnel, depending on the presence of visible contamination and the depth of the water table. Samples should be collected at 2.5-ft intervals and analyzed for TPH, TAL metals, and TCLP metals.

If significant contamination is indicated, then a minimum of one upgradient and three downgradient monitoring wells will be installed. Groundwater samples will be collected and analyzed for the parameters with elevated concentrations (in the initial sampling). The sampling program will be reviewed after 1 year to determine which parameters will continue to be monitored or if the program should be terminated.

If necessary, all significantly contaminated soils will be excavated and disposed of in accordance with state and federal requirements.

5.2.12 AREE 16 - LANDFILL NO. 12 - MAIN POST NEAR SHOPPETTE

MEP Recommendations

As recommended in the MEP, the extent of the site will be determined by a geophysical survey. Two test pits will be excavated to verify the waste types. Three samples will be obtained from each pit and analyzed for TAL metals, TCL organics, and TPH. If significant contamination is found, a second, more extensive investigation will be conducted.

5.2.13 AREE 17 - LANDFILL NO. 13 - LITTLE MIRROR LAKE

MEP Recommendations

As recommended in the MEP, although the possibility for contamination is considered low, it should be addressed for several reasons. Since the lake is hydraulically connected to the unconsolidated aquifer, it may represent a pathway for migration of contaminants. Water supply wells within 2,000 ft of the lake could create a drawdown and contribute to contaminant movement.

It is recommended that the records of the 14th EOD be searched for details regarding the completeness of the removal action. An underwater metal survey will be conducted. Surface water and sediment samples will be collected and analyzed for explosives. If concentrations are elevated, a more comprehensive investigation will be conducted.

If the initial sampling indicates no contamination, no further action is recommended for this site.

5.2.14 AREE 40 - COLD SPRING BROOK LANDFILL

MEP Recommendations

Although the RI work has begun, the following description is based on the draft MEP, as details on the actual sampling methods and results are not available at this time.

As recommended in the MEP, because elevated levels of volatiles and metals were detected in the sampling discussed above, an RI/FS will be conducted for this area. The recommended RI/FS will include sampling of the surface water, sediment, soil, and groundwater. About 10 surface water and sediment samples will be collected along the fill area on the brook side and analyzed for TAL metals, TCL organics, explosives, and TPH. About 10 soil borings will be drilled and sampled at depths of 0.5 to 1.0, 2.5 to 3.0, and 4.5 to 5.0 ft. The samples will also be analyzed for priority pollutants, explosives, and TPH. In addition, sediment samples will be analyzed for TOC and grain size.

Samples from the eight existing monitoring wells will be collected and analyzed for TAL metals, TCL organics, explosives, and TPH. Water levels in all wells should be

measured quarterly to determine the groundwater flow direction and gradient. Quarterly measurements should continue until the area can be sufficiently characterized and any potential impact to water supply wells in the area identified. The flow direction or analytical results may indicate the need for additional monitoring wells.

5.2.15 AREE 41 - UNAUTHORIZED DUMPING AREA (SITE A)

MEP Recommendations

As recommended in the MEP, even though the potential for soil or water contamination is small, the site should be investigated because of its proximity to the small wetlands and the hydrological connection between the groundwater and the surface water. Soil, sediment, and surface water will be sampled to determine if the site is contaminated. Before sampling is conducted, a reconnaissance of the site will be made to determine the extent of dumping.

After the extent of the landfill is estimated, nine 10-ft soil borings will be drilled in the fill area. Samples will be taken from the top, middle, and bottom of each boring. In addition, five surface water and sediment samples will be collected from the area at the foot of the embankment. All samples will be analyzed for TAL metals, TCL organics, and explosives. In addition, sediment samples will be analyzed for TOC and grain size. If contamination is found, a more extensive investigation will be implemented. This may include geophysical surveys, additional sampling, and groundwater monitoring.

All debris and metal objects found on the surface will be removed and disposed of in a properly designed and operated landfill. If necessary, remedial action will be taken at the site in accordance with state and federal requirements to prevent further contamination. If no contamination is detected, it is recommended that no further action be taken for this site.

5.2.16 AREE 46 - TRAINING AREA 6d - SOUTH POST

MEP Recommendations

As recommended in the MEP, three surface soil (6 to 12 inches) samples from the areas near each abandoned tank will be collected and analyzed for TAL metals, TCL organics, explosives, and TPH. If the soil samples indicate areas of contamination, the extent of contamination will be determined by a more extensive investigation, which could include further sampling, soil borings, and groundwater monitoring.

If no contamination is found, the only recommended further action is to clear the site of debris.

5.3 AREEs 19, 20, AND 21 - WASTEWATER TREATMENT PLANT

MEP Recommendations

This section addresses AREEs 19, 20, and 21 related to the WWTP, as outlined in the MEP. The following proposed actions are based on the assumption that contamination from the Rapid Infiltration Basins and Sludge Drying Beds flows downgradient of these areas and enters the Nashua River. A phased sampling and monitoring program will be conducted to determine the nature and extent of soil or groundwater contamination at this site.

The initial phase of the program will consist of collecting 8 to 10 surface water and sediment samples from the Nashua River and analyzing them for TAL metals, TCL organics, and explosives. Sediment samples will also be analyzed for TOC and grain size. Samples will be collected from locations both upstream and downstream of the site. In addition, groundwater from the six current monitoring wells will be collected and analyzed for TAL metals and TCL organics; explosives; and the NO_2/NO_3 nitrogen, phosphate, chloride, sulfate, and coliform parameters. Wells installed at North Post Landfill (No. 5) (AREE 9) will monitor the southwestern corner of this study area.

Three surface soil samples will be collected from the wetlands area to determine any impact from past discharges (discontinued in 1985). If contamination is indicated, a more extensive investigation should begin. This may include further sampling, soil borings, and installation of additional groundwater monitoring wells. The extent of a second investigative phase will be determined by the results of the initial phase.

All significantly contaminated soil and groundwater will be removed or restored in accordance with state and federal requirements. After the cleanup operations, the soil and groundwater will again be sampled and tested to verify the completeness of cleanup.

Regardless of whether evidence of any soil or groundwater contamination is determined from these investigations, it is recommended that sampling of monitoring wells continue as long as the WWTP is active.

Additional WESTON Recommendations

Wells in the WWTP area that are no longer used to monitor groundwater levels or quality should be grouted and removed in accordance with MDEP guidelines.

5.4 STORAGE AREAS

5.4.1 AREE 22 - HAZARDOUS WASTE STORAGE FACILITY (BUILDING 1650)

MEP Recommendations

As recommended in the MEP, based on available information, permitting status, and observation, it is recommended that no further action be taken for this site.

Additional WESTON Recommendations

It should be noted that, as part of the RCRA Part B filed for the facility, a closure plan has been prepared for the facility. This plan outlines the requirements for closure of the unit, when the facility will no longer be used.

5.4.2 AREE 23 - PAPER RECYCLING CENTER (BUILDING 1650)

MEP Recommendations

As recommended in the MEP, based on the nature of the operation, no further action is recommended for AREE 23.

5.4.3 AREE 24 - WASTE EXPLOSIVE STORAGE BUNKER (BUILDING 3644)

MEP Recommendations

As recommended in the MEP, a visual inspection will be made of the bunker, the perimeter, and all loading areas. Any areas with visible staining or discoloration will be sampled and analyzed for explosives and TCLP metals. Three surface soil samples (0 to 6 inches) will be collected from random locations in the entry area and analyzed for the same parameters.

If the results of the sampling show elevated concentrations of contaminants, contaminated soil will be removed as soon as practicable, followed by confirmation sampling for the contaminants with elevated concentrations.

Additional WESTON Recommendations

Because of the designated "waste" nature of the explosives stored at the bunker, it is possible that the storage area and the EOD range are regulated under RCRA because the explosives have been designated as waste explosives prior to being taken to the EOD range. WESTON recommends that Waste Explosive Storage Bunker be associated with the EOD range, which operates under interim status. When both the EOD range and the storage bunker are no longer to be used, a RCRA closure of the areas should begin.

A determination of the need for RCRA closure should be made when the bunker is no longer to be used.

Of course, prior to any excess of property in the magazine area, all explosives stored there would be removed and properly disposed of.

5.4.4 AREE 29 - TRANSFORMER STORAGE AREA (BUILDING 1438)

MEP Recommendations

As recommended in the MEP, the open yard will be closely inspected to identify visibly stained areas for sampling. Surface samples (6 to 12 inches) of all stained soil will be obtained and analyzed for PCBs. Six soil samples will be taken at random from the areas that are, or have been, used to store any PCB items and analyzed for PCBs. If PCBs are found at elevated levels (25 ppm or greater), soil borings will be drilled to 10 ft to determine the extent of contamination.

All contaminated areas will be excavated and disposed of as hazardous waste. Following removal of contaminated material, confirmation samples should be taken to ensure completeness of cleanup. Samples of the material for disposal will be collected and analyzed for TCLP.

5.4.5 AREE 30 - DRUM STORAGE AREAS - MAAF

MEP Recommendations

As indicated in the MEP, because of the high permeability and excellent drainage characteristics associated with soils at the site, the potential for contamination of surface water (Nashua River) is high.

The proposed actions are based on the assumption that runoff from the drum storage area migrates down the steeply sloping hillside and enters the Nashua River. To determine the extent of soil or groundwater contamination at this site, a phased sampling and monitoring program is recommended. The first phase will consist of collecting soil, surface water, and sediment samples. If needed, a second phase will include collecting additional soil, surface water, and sediment samples and monitoring groundwater quality. Visibly stained soils will be tested for TCLP (such as metals, volatiles, and semivolatiles).

During the initial phase, soil samples will be collected around the storage area and down the hill to the river at depths of 0.5 to 1.0 ft, 3.0 to 3.5 ft, and 4.5 to 5.0 ft at each location. One sample will be obtained from the center of each side of the pad. The other locations should be at 50-ft intervals along drainage paths between the pad and the river. About four surface water and sediment samples will be collected from the river. The number of samples and their locations will be based on any visible evidence of contamination or drainage. Samples will be analyzed for TAL metals, TCL organics, and TPH. Sediments will also be analyzed for TOC.

If the first phase indicates the presence of contamination, a second phase will be initiated to collect additional soil and surface water and sediment samples. It may be necessary to install groundwater monitoring wells in areas identified as contaminated during the first phase.

All significantly contaminated soil and groundwater will be removed or restored in accordance with state and federal requirements. After the cleanup operations, the soil and groundwater will again be sampled and tested to verify the completeness of cleanup.

5.4.6 AREE 32 - DRMO YARD

MEP Recommendations

As recommended in the MEP, a representative number (minimum of three) of surface soil samples (6 to 12 inches) will be taken from each area of exposed soil in the eastern yard. Eight additional samples will be collected from perimeter areas that receive runoff. All soil samples should be analyzed for TAL metals, TCL organics, TPH, TCLP metals, and platinum.

Additional WESTON Recommendations

The 1991 EPIC study findings for the DRMO Yard should be considered in sample location selection:

> In 1965, disturbed ground is seen east of [Building 204], and scattered objects are visible north and west of the building. By 1972, dark-toned staining that appears to originate from the building is noted to the south and east. A building has been razed, and no additional staining is seen in 1980. In 1991, the site remains with no significant change (EMSL, 1991).

If significant contaminant levels are found in the surface samples, soil borings should be drilled to groundwater to determine the extent of contamination. Because of the proximity of the landfill and the probability of mounded groundwater, the source of contamination in this area may be difficult to determine. If the soil borings indicate deeper contamination, monitoring wells should be installed. If no contamination is found, then no further field investigation is recommended.

In addition, based on a recent release of PCBs within the DRMO Yard, 20 surface soil samples, placed in a grid centered around the spill area, should be taken and analyzed for PCBs.

5.4.7 ENTOMOLOGY SHOPS

5.4.7.1 AREE 33 - DEH Entomology Shop (Building 262)

MEP Recommendations

As recommended in the MEP, to determine if the site is contaminated by pesticides, herbicides, or any degradation by-products, a surface soil sampling program will be conducted. Four surface soil samples (6 to 12 inches) will be collected near the entrance of the building. These samples will be analyzed for pesticides, herbicides, phosphate, and nitrate. If contamination is found, additional soil samples will be collected. If necessary, soil borings will be drilled to determine the depth of contamination, and groundwater monitoring wells will be installed in contaminated areas. All soil and water samples will be analyzed for parameters with elevated concentrations. If elevated levels of pesticides/herbicides are detected, samples will be collected and analyzed for TCLP pesticides as part of the second phase.

All significantly contaminated soils and groundwater will be removed or restored in accordance with state and federal requirements. After the cleanup, the soil will again be sampled and tested to verify the completeness of cleanup. If no evidence of any soil or groundwater contamination is determined from these investigations, it is recommended that no further action be taken at this time.

Materials should be managed properly through standard operating procedures, including segregation of materials, labeling, and storing on pallets. In addition, the building's ventilation system should be checked by a ventilation expert to ensure that it is performing adequately.

Additional WESTON Recommendations

WESTON recommends that two composite wipe samples from each room (one from the wall and one from the floor) be collected and analyzed for pesticides to ensure that residues do not remain in the building at the time it is closed.

5.4.7.2 AREE 34 - Former DEH Entomology Shop (Building 245)

MEP Recommendations

As recommended in the MEP, a surface soil sampling program will be conducted to determine if soil or groundwater is contaminated at this site. Four surface soil samples (6 to 12 inches) will be collected from the areas used to prepare pesticide and herbicide solutions, and the samples will be analyzed for pesticides, herbicides, phosphate, and nitrate. Three additional samples collected from the sink discharge outside the building will be analyzed for the same parameters. Because of the concern for possible contamination from the drainpipe, samples at this location should be collected at depths of 2, 4, and 6 ft and analyzed for pesticides and herbicides.

If contamination is found, additional soil samples will be collected. Four groundwater monitoring wells will be installed in contaminated areas. All samples will be analyzed for contaminants with VOAs, TPH, and pesticides/herbicides. If elevated levels of pesticides/herbicides are detected, samples will be collected and analyzed for TCLP pesticides as part of the second phase.

All significantly contaminated soil and groundwater will be removed or restored in accordance with state and federal requirements. After the cleanup, the soils will again be sampled and tested to verify the completeness of cleanup. If no evidence of any soil or groundwater contamination is detected from these investigations, it is recommended that no further action be taken for this site.

Additional WESTON Recommendations

WESTON recommends that two composite wipe samples from each room (one from the wall and one from the floor) be collected and analyzed for pesticides to ensure that residues do not remain in the building.

5.4.7.3 AREE 35 - Former DEH Entomology Shop (Building 254)

MEP Recommendations

As recommended in the MEP, although this site has not been used for storage or mixing of pesticides and herbicides for more than 9 years, a soil sampling program will be conducted to characterize the site and determine if contamination exists. Four surface soil samples (6 to 12 inches) will be collected from the areas used to prepare pesticides and herbicide solutions and analyzed for pesticides, herbicides, phosphate, and nitrate. If contamination is found, additional soil samples will be collected. All samples should be analyzed for contaminants with elevated concentrations in the initial testing. If elevated levels of pesticides/herbicides are detected, samples will be collected and analyzed for TCLP pesticides as part of the second phase.

All significantly contaminated soil will be removed in accordance with state and federal requirements. After the cleanup, the soil will again be sampled and tested to verify the completeness of cleanup. If no evidence of any soil or groundwater contamination is determined from these investigations, it is recommended that no further action be taken for this site.

Additional WESTON Recommendations

WESTON recommends that two composite wipe samples from each room (one from the wall and one from the floor) be collected and analyzed for pesticides to ensure that residues do not remain in the building.

5.4.7.4 AREE 36 - Former DEH Entomology Shop (Building 2728)

MEP Recommendations

As recommended in the MEP, although Building 2728 has not been used for storage or mixing of pesticides and herbicides for more than 13 years, a soil sampling program should be conducted to characterize the site and determine if any contamination exists. Eight surface soil samples (6 to 12 inches) will be collected from areas used to prepare pesticide and herbicide solutions and analyzed for pesticides, herbicides, TCL volatile organics, TPH, nitrates, and phosphate. If contamination is found, additional soil samples will be collected. If necessary, groundwater monitoring wells will be installed in contaminated areas. All samples will be analyzed for parameters with elevated concentrations.

All significantly contaminated soil and groundwater will be removed or restored in accordance with state and federal requirements. After the cleanup, the soil will again be sampled and tested to verify the completeness of cleanup. Samples will be collected and analyzed for TCLP on soil removed for disposal. If no evidence of any soil or groundwater contamination is determined from these investigations, it is recommended that no further action be taken for this site.

Additional WESTON Recommendations

WESTON recommends that two composite wipe samples from each room (one from the wall and one from the floor) be collected and analyzed for pesticides to ensure that residues do not remain in the building.

5.4.7.5 AREE 37 - Golf Course Entomology Shop (Building 3622)

MEP Recommendations

As recommended in the MEP, a soil sampling program will be conducted to determine the extent of contamination present at this site. Six surface soil samples (6 to 12 inches) will be collected at equal intervals around the perimeter of the building. The samples will be analyzed for nitrate, phosphate, pesticides, and herbicides. If contamination is found, additional soil samples will be collected, and, if necessary, groundwater monitoring wells will be installed in contaminated areas if the existing wells do not provide adequate coverage. All samples will be analyzed for TCL volatile organics, TPH, and pesticides/herbicides.

All significantly contaminated soil and groundwater will be removed in accordance with state and federal requirements. After the removal, the soil will be resampled and tested to verify the completeness of cleanup. Monitoring wells will be sampled quarterly for TPH and TCL volatile organics. If no evidence of soil or groundwater contamination is determined from these investigations, it is recommended that no further action be taken for this site. If organic contaminants are detected, remedial action should be taken.

Additional WESTON Recommendations

WESTON recommends that two composite wipe samples from each room (one from the wall and one from the floor) be collected and analyzed for pesticides to ensure that residues do not remain in the building.

5.5 WASTE HANDLING AREAS

5.5.1 WASTE EXPLOSIVES DETONATION RANGES

5.5.1.1 AREE 25 - EOD Range - South Post

MEP Recommendations

As recommended in the MEP, because the soil contamination has already been thoroughly investigated by Porter (1986), no further soil samples are recommended. It was recommended that one upgradient and three downgradient groundwater monitoring wells be installed. Following proper well development (USATHAMA, 1987), groundwater samples should be collected and analyzed for TAL metals, TCL organics, explosives, and TPH. Porter (1986) reported the existence of springs downgradient of the site. Water from these springs should be sampled and analyzed for the same parameters. The need for additional investigation should be based on the results of these analyses.

All debris and metal objects found on the surface should be removed and disposed of in a properly designed and operated landfill. If necessary, remedial action should be taken in accordance with state and federal requirements.

Additional WESTON Recommendations

It should be noted that because the unit is regulated under RCRA, a RCRA closure plan for the unit will be available and implemented at the time the unit is closed.

The operation of the EOD range is such that unexploded ordnance (UXO) should be minimal, but its possible presence cannot be ruled out. WESTON recommends a UXO sweep of the range at the time of RCRA closure. Pathways to any sampling locations and the locations themselves should be cleared for UXOs.

5.5.1.2 AREE 26 - Zulu I and II Ranges - South Post

MEP Recommendations

As recommended in the MEP, sampling is recommended for both Zulu ranges to address the potential of contaminant migration. Because the sites are large, personnel familiar with the use of the ranges should first lay out sample grids in the portions used most frequently. The proposed sampling programs for each site are detailed below.

Regardless of whether elevated contaminant levels are found, it is recommended that Fort Devens implement annual or biannual sampling at both Zulu ranges to monitor the potential for the release of contaminants. This would continue during active use.

As an initial phase, about 12 soil borings will be drilled to 10 ft throughout the grid area of Zulu I. Samples from the top, middle, and bottom of the boring cores will be analyzed for TAL metals, TCL organics, explosives, TCLP metals, and TPH. In addition, about 10 surface water and sediment samples will be collected from the wetland area and analyzed for the same parameters.

As an initial phase, between 6 and 10 soil borings will be drilled to 10 ft throughout the grid area of Zulu II. Samples from the top, middle, and bottom of the boring cores will be analyzed for TAL metals, TCL organics, explosives, TCLP metals, and TPH.

If contaminant levels in the soil borings are significantly elevated, then groundwater monitoring wells will be installed upgradient and downgradient of the site and monitored on a regular basis.

Additional WESTON Recommendations

WESTON recommends that a UXO sweep be conducted at Zulu I and II Ranges.

5.5.1.3 AREE 27 - Hotel Range - South Post

MEP Recommendations

As recommended in the MEP, a geophysical survey will be completed to characterize the underlying geology. To assess any impacts on Cranberry Pond and the local groundwater, a soil sampling program is recommended. As an initial phase, about eight soil borings will be drilled to 10 ft in the areas most likely to be contaminated. Samples from the top, middle, and bottom of the cores will be analyzed for TAL metals, TCL organics, explosives, TCLP metals, and TPH. Three samples of surface water and sediment will be obtained and analyzed for the same parameters. In addition, sediment samples will be analyzed for TOC and grain size.

If contaminant levels in the soil borings are elevated, then groundwater monitoring wells will be installed upgradient and downgradient of the site and monitored on a regular basis.

Additional WESTON Recommendations

WESTON recommends that a complete UXO sweep be conducted at the Hotel Range when the ranges are no longer in use. Pathways to sampling locations and sampling locations themselves should be cleared for UXOs.

5.5.1.4 AREE 28 - Training Area 14 - South Post

MEP Recommendations

As recommended in the MEP, although this site does not fit the definition of a study area (no hazardous wastes have ever been disposed of at this site), a site reconnaissance will be conducted and soil samples will be collected and analyzed for explosives.

Additional WESTON Recommendations

WESTON recommends that a UXO sweep be conducted at Training Area 14 when current operations are terminated. Sampling locations and pathways to locations should be cleared for UXOs.

5.5.2 AREE 31 - FIRE-FIGHTING TRAINING AREA - MAAF

MEP Recommendations

As recommended in the MEP, a phased sampling and monitoring program will be conducted to determine if contamination is present at this site. The program will consist of collecting and analyzing soil samples and installing groundwater monitoring wells.

Following coring through the pavement, five subsurface soil sample locations (10 ft in depth) will be collected from beneath the pad. Samples from the top, middle, and bottom sections will be obtained and analyzed for TAL metals, TCL organics, and TPH. In addition, four groundwater monitoring wells will be installed; one well should be located upgradient of the site and three downgradient. Well placement should be based on best field judgment of a qualified hydrogeologist. The monitoring wells should be screened at the water table to detect floating contaminants. After proper well development (USATHAMA, 1987), groundwater samples will be collected at each location and analyzed for TAL metals, TCL organics, and TPH. Visibly stained soils will be sampled and analyzed for TCLP (such as metals, volatiles, and semivolatiles) during the second phase.

All significantly contaminated soils and groundwater will be removed or restored in accordance with state and federal requirements. After the cleanup operations, the soil and groundwater will again be sampled and tested to verify the completeness of cleanup. If no evidence of contamination of any media is determined from this investigation, it is recommended that no further action be taken for this site.

5.5.3 AREE 38 - BATTERY REPAIR AREA (BUILDING 3713)

MEP Recommendations

As recommended in the MEP, even though no water or soil contamination has been reported, the site will be thoroughly investigated because of its proximity to Cold Spring Brook and the Grove Pond well field.

Four groundwater monitoring wells will be installed. One well should be placed upgradient of the site, and three should be placed downgradient. Groundwater from the wells should be analyzed for TAL metals and TCL organics. Three surface water and sediment samples will be collected from Cold Spring Brook. The samples will be collected at the upper end of the site, in the middle of the site, and at the lower end of the site. The water and sediment samples will be analyzed for TAL metals and TCL organics. Sediment samples will also be analyzed for TOC and grain size. If contamination is found, remedial action will be taken at the site, in accordance with state and federal requirements, to prevent further contamination.

5.5.4 AREE 45 - WASH RACK AT LAKE GEORGE STREET

MEP Recommendations

As noted in the MEP, several remedies could resolve any violations of allowable discharge from the wash racks: (1) investigating the location of the outfall and the types of discharges from activities, (2) instituting a monitor to oversee site activities, or (3) closing the site.

The sewer lines should be traced on a sewer map of the area in order to determine whether and how the drains are connected. If the drains are connected to the sewer, installation of a sand filter, an oil-water separator, or both may be required. If the drains are not connected to the sewer, an investigation will be made to locate and eliminate the outfall. At the point of discharge, surface soil samples will be collected and analyzed for TAL metals and TCL organics, PCBs, and TPH.

If contaminant concentrations are elevated, additional soil samples will be collected along drainage paths to the river. Based on the level of contamination, groundwater monitoring may be necessary.

5.6 SPILLS AND LEAKING UNDERGROUND STORAGE TANK AREAS

5.6.1 AREE 39 - TRANSFORMER NEAR FORMER BUILDING 4250

MEP Recommendations

As indicated in the MEP, the EPA adopted spill requirements in April 1987 under the Toxic Substance Control Act (TSCA) for cleanup of all spills that occur after that date. The level of required cleanup of any spill before April 1987 is subject to approval by

EPA Region I. The original sample results detected concentrations above 50 ppm only in Quadrant I, considered the obvious leak site. Following the soil removal, all of the PCB concentrations in all Quadrant I samples were below 50 ppm. Further action recommended for this site is to present the results to MDEP for approval.

Additional WESTON Recommendations

WESTON recommends that details on the removal of the UST in the area of Building 4250 be obtained. This tank removal should be addressed as those outlined in Subsection 5.7.3.2 for former UST locations.

5.6.2 AREE 44 - CANNIBALIZATION YARD

MEP Recommendations

As recommended in the MEP, even though no contamination has been reported, the site should be investigated because it is near Cold Spring Brook and the Grove Pond well field. A record search should be conducted to better define past and current activities.

The extent of contamination will be determined by drilling about six soil borings to 10 ft. Locations will include any areas of stained soil. Borings will be sampled continuously at 2.0-ft intervals for TAL metals, TCL organics, and TPH. If the deepest samples contain contaminants in significant quantities, monitoring wells will be installed both upgradient and downgradient of the contaminated areas.

Regardless of whether contamination is detected, Fort Devens should monitor the use of this lot and periodically check for soil contamination.

5.6.3 AREE 43 - HISTORIC GAS STATION SITES

MEP Recommendations

As recommended in the MEP, the remainder of the USTs at the Historic Gas Station Site should be located. This will be followed by a geophysical survey and a soil gas analysis. Because of the length of time elapsed, there does not appear to be a reliable method to determine if leaks occurred or to what extent. Therefore, after locating the tanks, the prudent approach would be to excavate around the tank and sample the surrounding soil for TPH.

If elevated levels of contamination are detected, the soil will be removed to the extent of contamination and disposed of according to MDEP requirements. If no contamination is apparent, a cost-effective approach may be to leave the tank in place.

The USTs that have been removed or show no evidence of further releases should be deleted from the list of study areas requiring further action.

Additional investigation will be conducted at the sites where tanks have been removed but soil with residual contamination has been left.

5.6.4 AREE 47 - BUILDING 3816 LUST SITE - MAAF

MEP Recommendations

As indicated in the MEP, there is a potential for contaminant migration because of the permeable nature of the soils in this area. There are limitations to further excavation because the structural integrity of the flight tower may be jeopardized; therefore, this site will be monitored. Three groundwater monitoring wells will be installed and sampled regularly for TPH and TCL volatile organics. Subsurface soil samples will be collected from each borehole and analyzed for TPH and TCL volatile organics. If contaminant concentrations are elevated, the extent of migration should be determined and remedial action should be implemented.

5.6.5 AREE 48 - BUILDING 202 LUST SITE

MEP Recommendations

As indicated in the MEP, there is a potential for contaminant migration because of the permeable nature of the soils in this area. To delineate the extent of the contamination, soil borings will be drilled to groundwater and samples obtained from the top, middle, and bottom sections. The soil borings should be located at the limit of the area known to be contaminated. Samples will be analyzed for TCL volatile organics and TPH. If contaminant concentrations are significantly elevated, three groundwater monitoring wells will be installed and sampled regularly for TPH and TCL volatile organics. If contaminant concentrations are elevated, the extent of migration will be determined, and remedial action will be implemented.

5.6.6 AREE 49 - BUILDING 3602 LUST SITE

MEP Recommendations

As indicated in the MEP, there is a potential for contaminant migration because of the permeable nature of the soils in this area and the proximity of the Nashua River. To delineate and monitor the extent of the contamination, groundwater monitoring wells at this site will be sampled for at least two quarters for TCL volatile organics and TPH. If contaminant concentrations are elevated, the extent of migration will be determined by further investigation, and remedial action will be implemented.

5.6.7 AREE 50 - WWII FUEL POINTS - MAAF

MEP Recommendations

As indicated in the MEP, because of the permeable nature of the soils in this area and the proximity of the Nashua River, there is a potential for some contaminant migration;

however, the fuels used in this area were highly volatile aviation fuels. The integrity of the piping systems will be investigated and traced. If the piping shows signs of leakage, samples from the soils surrounding the pipes will be obtained and analyzed for TCL volatile organics and TPH. If contaminant concentrations are significantly elevated, groundwater monitoring wells will be installed and sampled regularly for TPH and TCL volatile organics. If contaminant concentrations are elevated, the extent of migration will be determined and remedial action will be implemented.

5.6.8 AREE 51 - BUILDING 3412, O'NEIL BUILDING SPILL SITE

MEP Recommendations

As indicated in the MEP, there is a potential for contaminant migration because of the permeable nature of the soils in this area and the proximity of the Nashua River. A site reconnaissance will be performed, and soil samples from stained areas will be collected and analyzed for TPH and TCL volatile organics. To delineate the extent of the contamination, soil borings from significantly stained areas will be drilled to groundwater and samples obtained from the top, middle, and bottom sections. The soil borings will be placed at the limit of the area known to be contaminated. Samples will be analyzed for TCL volatile organics and TPH. If contaminant concentrations are significantly elevated, groundwater monitoring wells should be installed and sampled regularly for TPH and TCL volatile organics. If the groundwater contains significantly elevated contaminant concentrations, the extent of migration will be determined and remedial action will be implemented.

5.6.9 AREE 52 - TDA MAINTENANCE YARD

MEP Recommendations

As recommended in the MEP, the site should be investigated because of the proximity of surface water and the Grove Pond well field. The extent of contamination will be determined by drilling soil borings to groundwater. Boring locations will include any areas of significantly stained soils. Samples will be obtained from the top, middle, and bottom sections of each boring and analyzed for TCL volatile and semivolatile organics and TPH. If the deepest samples contain contaminants in significant concentrations, monitoring wells will be installed and sampled regularly for elevated contaminants.

Regardless of whether contamination is detected, Fort Devens should monitor the use of this lot and periodically check for soil contamination.

5.6.10 AREE 53 - POL SPILL AREAS - SOUTH POST

MEP Recommendations

As recommended in the MEP, all of these sites will be inspected for visible contamination. As appropriate for each site, surface soil samples and surface water and sediment samples will be collected. All samples will be analyzed for TCL volatile

organics and TPH. If the deepest samples contain contaminants in significant concentrations, monitoring wells will be installed and sampled regularly for TPH and TCL volatile organics. If contaminant concentrations in the groundwater samples are elevated, the extent of migration will be determined, and remedial action will be implemented.

5.6.11 AREE 55 - SHIRLEY HOUSING AREA TRAILER PARK FUEL TANKS

MEP Recommendations

As recommended in the comments to the MEP, the tanks should be removed and a determination of the extent of contamination from the tanks should become part of this remedial program. Surface and subsurface soils will be sampled for TCL volatile organics and TPH. If contaminant concentrations are significantly elevated, groundwater monitoring wells will be installed and sampled regularly for TPH and TCL volatile organics. If contaminant concentrations are elevated, the extent of migration will be determined and remedial action will be implemented.

5.6.12 AREE 56 - BUILDING 2417 LUST SITE

MEP Recommendations

As recommended in the comments to the MEP, the site should be immediately backfilled until further action can be taken. Groundwater monitoring wells will be installed around this site and analyzed for TCL volatile organics and TPH. The water main should be located, perhaps through geophysical methods, and soil should be further removed under the roadway. The contaminated soil under the building should be removed. If contamination is detected in the wells, the extent of migration will be determined, and remedial action will be implemented.

5.6.13 AREE 57 - BUILDING 3713 FUEL OIL SPILL SITE

MEP Recommendations

As recommended in the comments to the MEP, surface and subsurface soil sample will be sampled for TCL volatile organics and TPH. If contaminant concentrations are significantly elevated, groundwater monitoring wells will be installed and sampled regularly for TPH and TCL volatile organics. If contaminant concentrations are elevated, the extent of migration will be determined, and remedial action will be implemented.

5.6.14 AREE 58 - BUILDINGS 2648 AND 2650 LUST SITES

MEP Recommendations

As recommended in the comments to the MEP, groundwater monitoring wells will be installed around this site and analyzed for TCL volatile organics and TPH. If

contamination is detected in the wells, the extent of migration will be determined and remedial action will be implemented.

5.6.15 AREE 59 - BRIDGE 526

MEP Recommendation

The spill at Bridge 526 is not addressed in the MEP.

WESTON Recommendations

WESTON recommends that five surface soil samples be collected from a depth of 0 to 6 inches under and adjacent to the bridge. The surface soil samples should be analyzed for TAL metals. One background soil sample should be collected upgradient from the bridge (far enough away to be unimpacted by the sandblasting) and analyzed for TAL metals.

In addition, five sediment samples should be collected downstream from the bridge. The samples should be collected in depositional areas where the sediments would drop out. One sediment sample should be collected upstream in any area unimpacted by sandblasting on the bridge. The sediment samples should be analyzed for TAL metals and TOC. Surface water samples also should be collected at the sediment sampling locations and analyzed for total metals.

5.7 FACILITY-WIDE AREES

These additional facility-wide AREEs and recommendations have been developed by WESTON as part of the enhanced PA.

5.7.1 AREE 60 - TRAINING AREAS AND RANGES

An additional detailed review of documentation on the current and former uses of the training areas and ranges should be made. While many of the environmental concerns in these areas are being addressed under the MEP, other possible environmental concerns could be present. This may include problems such as UXOs in the Impact Area or shell fragments at pistol and rifle ranges.

Activities in the South Post and Training Areas in the North Post have been documented in the 1991 EPIC study of available aerial photographs (1943 to 1991). It is important to note that disturbed areas were identified. However, it is difficult to distinguish in an aerial photograph those training exercises and activities that present environmental concerns from those that do not.

Because every acre of the South Post could not be inspected during the site visit, site inspections should be conducted based on any environmental concerns identified.

5.7.2 AREE 61 - MAINTENANCE AND WASTE ACCUMULATION AREAS

Documentation of the design and operation of the waste accumulation areas, motor pools, and maintenance areas at Fort Devens will require further review. Location and building numbers as well as current and former uses should be verified. All drains and oil/water separators should be traced to determine whether they discharge to a surface water body, to the ground, or to the WWTP sewage system. Waste storage areas (current and past) should be reviewed to determine if containment was adequate and where spills and leaks would migrate (if any did occur).

WESTON recommends that each area receive the following:

- Complete detailed review of SOPs, operating records, building drawings, personnel contacts, etc.
- Complete visual site inspection of drains, oil/water separators, containment, spills or discharges, and evidence of ASTs and USTs.
- Focused employee interviews, as appropriate, to ascertain past practices.

Based on the results of the above investigation, assessment should be made of the potential for contamination. Site-specific work plans can be developed as necessary.

5.7.3 UNDERGROUND STORAGE TANKS (USTs)

5.7.3.1 AREE 62 - USTs - Existing

The underground storage tank (UST) management program at Fort Devens should be maintained and staffed. Careful documentation of tank removals, sample results from excavations, leak testing results, and tank usage must be maintained. The contents of USTs no longer in use should be removed. The Base Closure Care and Custody Plan should include management for USTs.

5.7.3.2 AREE 63 - USTs - Previously Removed

A careful review of available records of all USTs previously removed should be conducted. Information to be gathered includes:

- Date of tank removal.
- Tank contents and size.
- Location.
- Integrity of tank noted (i.e., leaking or intact).
- Staining noted (surface - due to overfill or tank leakage).
- Report of contamination found and removed.
- Samples collected following removal.
- Contamination known to be left in place.

A summary of this information should be provided to the MDEP and EPA to document that there are no further environmental concerns or LUST sites currently being addressed under the MEP. Site-specific work plans can be developed as necessary.

5.7.4 AREE 64 - ABOVEGROUND STORAGE TANKS (ASTs)

The ASTs at Fort Devens should be managed similarly to the USTs. A listing of ASTs should be maintained along with records of usage. Tanks that are no longer in use should be emptied and, depending upon future use, may be removed.

ASTs should be inspected and spill records reviewed. Tanks without secondary containment should have surface soil samples collected and analyzed for TPH and TAL metals. Tanks with secondary containment should have the outlet of the containment area inspected and sampled if staining is noted. The Base Closure Care and Custody Plan should include management of ASTs.

5.7.5 AREE 65 - ASBESTOS

Fort Devens should maintain and staff the asbestos management program currently in place. Known, exposed friable asbestos should be removed or encapsulated. In addition, actions to be taken should be coordinated with current abatement activities. Following remedial activities, ambient air sampling should be conducted inside buildings. All areas to be excessed should be surveyed for friable and non-friable asbestos prior to demolition or property disposal. The Base Closure Care and Custody Plan should include management of asbestos.

5.7.6 AREE 66 - TRANSFORMERS

The transformer maintenance and inspection program should be maintained and staffed at Fort Devens. Care should be taken to ensure that the transformers are properly inspected, taken out of service, stored, and disposed of. The Base Closure Care and Custody Plan should include management of transformers that contain PCBs.

5.7.7 AREE 67 - RADON

Radon testing program records at Fort Devens should be maintained. Mitigation of excess radon levels in accordance with AR-200 should continue. Buildings showing elevated levels should be retested following mitigation and prior to property disposal.

5.7.8 AREE 68 - LEAD PAINT

The data currently being generated on the lead paint samples from Fort Devens must be carefully reviewed. As long as the building surfaces remain intact, the material is not classified as a hazardous waste. However, when these surfaces are removed or demolished, this presents a concern. An inventory of structures possibly exhibiting the lead paint should be made as well as a determination of disposal options. Soil around

these buildings of concern may also contain lead, which should be investigated prior to property disposal.

5.7.9 AREE 69 - PAST SPILL SITES

WESTON recommends the following:

- Spill records should be catalogued. Spill records for all off-post areas should be segregated by region and site. All actions regarding a spill event should be consolidated, such as reportable quantity notification, waste and soil removal, sampling results, and any other documentation.

- Based on the results of the documentation review, a determination should be made as to the adequacy of the cleanup. If no documentation exists regarding cleanup or if cleanup does not appear to be adequate, a site inspection is recommended.

- During the site inspection, determination of the location of the spill should be made. This may be based on description, maps, or photographs. Any site personnel who may be familiar with the spill event should be consulted. The area at and around the spill should be inspected for evidence of remaining contamination. The contamination may be evident through staining of the soil, sheen on nearby water, or stressed vegetation.

- Based on the review of the documentation and the site inspection, screening sampling may be desirable. A sampling plan should be developed identifying the nature and location of the spill material, the types of samples to be collected (i.e., soil borings, surface soil, sediment), and analyses that should be performed on the samples. In addition, the following considerations may apply:

    - Background samples are recommended for samples collected for metals analysis (due to naturally occurring metals in the environment) and for locations where upgradient impacts are possible.

    - Soil samples for volatile organic analysis should not be collected directly from the surface (i.e., 0 to 6 inches) but rather from a deeper, undisturbed sample to represent more accurately the volatile organic compound concentration.

    - Sediment samples should be collected in depositional areas and analyzed for total organic carbon as well as other analytes of concern; associated surface water samples should be collected.

5.8 AREAS WITH MINIMAL POTENTIAL FOR ENVIRONMENTAL PROBLEMS

The Enhanced Preliminary Assessment report is based primarily on the environmental conditions observed at Fort Devens, Massachusetts, during the period of this study. Past site conditions and management practices were evaluated based on readily available records and the recollections of people interviewed. Every effort was made, within the scope of the task, to interview all identified site personnel, especially those personnel with a historical perspective on site operations.

Based on WESTON's review of the available information, site visits, and interviews with facility personnel, those site areas that can potentially be excessed (undergo real estate transfer) with minimal additional environmental investigation have been identified. These site areas are included in Figure 5-2.

Many buildings, such as schools, the day care center, and administration buildings, may be excessed with a minimum of additional investigation, including but not limited to asbestos, radon, and lead paint surveys and sampling.

It should be noted that even though the above areas may have a minimal potential for environmental problems, the subsurface and/or groundwater could be contaminated by operations adjacent to or upgradient of these areas, and that the scope of WESTON's work included no actual sampling of environmental media.

SECTION 6

REFERENCES

ABB (ABB Environmental Services, Inc.). 1992. SI Work Plan Groups 3, 5, 6, p 5-1.

AEHA (U.S. Army Environmental Hygiene Agency). 1979. Evaluation of Land Treatment Systems at Army Installations. Water Quality Special Study No. 32-24-0199-80. Aberdeen Proving Ground, MD.

Alston, W. 1988. Personal communication from Cutler Army Hospital, Fort Devens. November 1988.

Barbour, F.A. 1941. Fort Devens, Mass., General Layout Plan. Plan No. 6101-710.lB. Prepared for Construction Division, Office of the Quartermaster General.

Berry, W.E. 1988. Personal communication from Chief Property Disposal Officer, Fort Devens. November 1988.

Biang, C.A., R.W. Peters, R.H. Pearl, and S.Y. Tsaio. 1991. Draft Master Environmental Plan for Fort Devens, Massachusetts. Prepared by Argonne National Laboratory Environmental Assessment Information Sciences Division for U.S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, MD. July 1991.

Black, N. 1989. Personal communication from Chief, DEH Technical Services Branch, Fort Devens. August 1989.

Brackley and Hansen. 1977. Groundwater Resources of the Nashua River Basin.

Brooks, C. 1988. Personal communication from Superintendent, Golf Course, Fort Devens. November 1988.

Brown, M.J. 1981. Hazardous Waste Management Survey No. 37-26-0132-82, Fort Devens, Massachusetts, 20-24 October 1981. U.S. Army Environmental Hygiene Agency, Waste Disposal Engineering Division, Aberdeen Proving Ground, MD, 29 April 1981.

Buck, J.P. 1982. Base Closure Division Asbestos Protocol. U.S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, MD.

Burrs, L. 1988. Personal communication from Veterinarian, Veterinary Clinic, Fort Devens. November 1988.

Con-Test. 1989. Sampling and analytical data for the Fort Devens landfill. Prepared by Con-Test Water and Air Engineering, East Longmeadow, MA, for Fort Devens. February 1989.

Cowardin, L.M., M. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Fish and Wildlife Service, Washington, D.C. NTIS: PB80-168784.

Daubel, K.J. 1985. Nonmetal Analytical Results for Fort Devens Sludge with Chemical Methodologies and Quality Assurance Program. Letter report to Commander, Fort Devens. 9 January 1985.

DEH (Directorate of Engineering and Housing). 1985a. PCB Spill Report, Sylvania Building 4250, Fort Devens, Massachusetts. Submitted to Massachusetts Department of Environmental Quality Engineering by DEH Environmental Management Office, Fort Devens. January 1985.

DEH. 1985b. Solid Waste Management Unit Report. Submitted to Massachusetts Department of Environmental Quality Engineering by DEH Environmental Management Office, Fort Devens.

Emerson, B.K. 1917. Geology of Massachusetts and Rhode Island. U.S. Geological Survey Bulletin 597.

EMSL (Environmental Monitoring Systems Laboratory). 1991. EPA, Installation Assessment, Fort Devens, Ayers, Massachusetts, (Vols. 1 and 2). Prepared for U.S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, MD. September 1991.

Environmental Engineering & Geotechnics, Inc. 1989. Tank Removal Monitoring Report, Fort Devens Military Reservation, Building Locations 202, 602, 604, and 2517. Prepared for Fort Devens, Massachusetts. 15 November 1989.

ESE (Environmental Science and Engineering, Inc.). 1982. Installation Assessment of Headquarters, Fort Devens. Rept. No. 326. August 1982.

Etnier, E. 1987. Water Quality Criteria for 2,4-Dinitrotoluene and 2,6-Dinitrotoluene. Oak Ridge National Laboratory Report AD-ORNL-6312. August 1987.

Fenneman, N.M. 1946. Physical Divisions of the United States. U.S. Geological Survey Map, Scale 1:7,000,000.

FICWD (Federal Interagency Committee on Wetlands Delineation). 1989. Federal Manual for Identifying and Delineating Jurisdictional Wetlands.

Ford, C. 1989. Personal communication from Chief, DEH Solid Waste Section. August 1989.

FORSCOM (U.S. Army Forces Command) 1980 (rev.). Environmental Impact Statement, On-Going Mission Activities, Fort Devens, MA. Prepared by the

Environmental Management Office, Fort Devens, MA. 30 June 1979; revised 1 May 1980.

Fort Devens Wildlife Management Group. 1980 (rev.). Fish and Wildlife Management Plan.

Fox, W.A. 1988a. Geohydrologic Study No. 38-26-0326-88, Fort Devens, Massachusetts, 11-19 July 1988. U.S. Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD. July 1988.

Fox, W.A. 1988b. Geohydrologic Study No. 38-26-0326-89, Fort Devens, Massachusetts. U.S. Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD. 11-19 July 1988.

Gale Engineering. 1985. Design Report, Fort Devens Sanitary Landfill, Fort Devens, Mass. Prepared by Gale Engineering Company, Inc., Braintree, MA, for Department of Army Headquarters, Fort Devens. January 1985.

Gates, W.C.B. 1987. Hydrogeologic Assessment Plan No. 38-26-0653-87, Fort Devens, Massachusetts. U.S. Army Forces Command, Fort Gillem, Forest Park, GA. 10 February 1987.

Gates, W.C.B. 1989. Additional Information on SA No. 25, Fort Devens, MA. Memorandum for Record, 4 January 1989.

Gates, W.C.B. et al. 1986. Multimedia Environmental Operational Review No. 37-26-1625-86, Fort Devens, Massachusetts, 12-22 November 1985. U.S. Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD. 28 May 1986.

Goldberg-Zoino & Associates, Inc. 1976. Surficial Geology Map with Major Aquifers & Saturated Thickness Contours. Prepared for Montachusett Regional Planning Commission.

GZA Remediation. 1990. Tank Replacement Project, Hydrogeological Investigation, Fort Devens, Massachusetts. Contract DAKF31-89-C-0761.

Heppner, M.E. 1989. Personal communication from U.S. Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, MD, March 1989.

Hopkins, S. 1988. Personal communication from DEH Environmental Management Office, Fort Devens. November 1988.

HUB. 1978. Fort Devens Asbestos Materials Survey Analysis and Assessment. Contract No. DAKF31-87-C-0025. HUB Testing Laboratories, Waltham, MA.

Jahns, Richard H. 1953. Surficial Geologic Map of Ayer Quadrangle, Massachusetts.

Keene, C.R. 1967. Fort Devens Master Plan of Existing Facilities, Permanent and Temporary. Drawing No. 18-20-07. Engineering Planning and Services Division. September 1967.

Kurtz Associates, Inc. 1991. Underground Storage Tank Removal and Related Environmental Investigations. Performed for DEH, Fort Devens, MA.

Lewis, B. 1989. Personal communication from DEH Environmental Management Office, Fort Devens. March 1989.

MacLean, D.A. 1989. Hydrogeologic Study Conducted at Fort Devens Sanitary Landfill for Fort Devens. Con-Test Water and Air Engineering, East Longmeadow, MA. 25 April 1989.

McMaster, B.N. et al. 1982. Installation Assessment of Headquarters Fort Devens, Mass. Report DRX7H-AS-IA-82326. Prepared by Environmental Science and Engineering, Inc., Gainesville, FL, for U.S. Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD. August 1982.

MHC (Massachusetts Historical Commission). 1985. Historical and Archeological Resources of Central Massachusetts. Boston, MA.

Nicholls, W.R. et al. 1980. Environmental Impact Statement: On-Going Mission Activities, Ft. Devens, MA (revised). Department of the Army, Headquarters Forces Command. 1 May 1980.

Nicholls, W.R. 1986a. Fort Devens - Groundwater Discharge Permit Application Number 0-251 (Subsurface Sewage Disposal), letter dated 18 November 1985. Letter from Department of Army, Headquarters Fort Devens to T. McMahon, Department of Environmental Quality Engineering, Division of Water Pollution Control, MA. 28 February 1986.

Nicholls, W.R. 1986b. Request for Information Pursuant to Section 3007 of the Resource Conservation and Recovery Act, 42 USC Section 6927 and 104 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 USC Section 9604. Letter from Department of the Army Headquarters Fort Devens to U.S. Environmental Protection Agency. 8 April 1986.

Nickelson, M.D. 1986. Water Quality Engineering Study No. 32-24-0585-86, Permit Assistance for Land Treatment of Sludge and Ground-Water Discharge, Fort Devens, Massachusetts, 16-25 October 1985. U.S. Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD. 11 June 1986.

PAL, Inc. (Public Archeology Laboratory, Inc.). 1989. Historic and Prehistoric Reconnaissance Survey, Fort Devens, Massachusetts. PAL Rept. #315-2. Prepared by Virginia A. Fitch and Suzanne Glover for Daylor Consulting Group. Submitted to U.S. Army Corps of Engineers, New England Division. August 1989.

Peck, J.H. 1975. Preliminary Bedrock Geologic Map of the Clinton Quadrangle, Worcester County, Mass. U.S. Geological Survey Open-File Report 75-638.

Pierce, J.F. 1989. Personal communication from Chief, DEH Environmental Management Office, Fort Devens. March 1989.

Pierce, J.F. 1990. Memorandum to Commander, U.S. Army Toxic and Hazardous Materials Agency. Department of the Army Headquarters Fort Devens, MA. 31 January 1990.

Poole, T. 1988. Personal communication from Forester, DEH Technical Services Branch, Fort Devens.

Poole, T. 1992. Personal communication from Forester, DEH Technical Services Branch, Fort Devens.

Porter, G.S. 1986. Hazardous Waste Study No. 37-26-0581-86, Soils Contamination at the Explosive Ordnance Disposal Range, Fort Devens, Massachusetts, 7-16 October 1985 and 8-9 April 1986. U.S. Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD. 30 September 1986.

Prior, T. 1989. Personal communication from Environmental Specialist, DEH, Fort Devens. September 1989.

Prior, T. 1991. Personal communication from Environmental Specialist, DEH, Fort Devens. May 1991.

Protocol, Wastewater Management Study No. 32-24-0067-91, Ground and Surface Water Quality Investigation Near Wastewater Treatment Facility. 1991. Fort Devens, Massachusetts.

Robinson, G.R. Jr. 1978. Miscellaneous Field Studies Map MF 957: Bedrock Geology of Pepperell, Shirley, Townshend, and Ayer Quadrangles, Massachusetts and New Hampshire.

Russell, S.L. and R.W. Allmendinger. 1975. Interim Geologic Map of the Shirley Quadrangle, Massachusetts. U.S. Geological Survey Open-File Map 76-267.

Satterwhite, M.B. et al. 1976a. Rapid Infiltration of Primary Sewage Effluent at Fort Devens, Massachusetts. U.S. Army Corps of Engineers, Cold Regions Research and Engineering Laboratory, Hanover, NH. December 1976.

Satterwhite, M.B. et al. 1976b. Treatment of Primary Sewage Effluent by Rapid Infiltration. Report 76-49, U.S. Army Corps of Engineers, Cold Regions Research and Engineering Laboratory, Hanover, NH. December 1976.

SEA Consultants. 1986. Hydrogeologic Investigations, Fort Devens Military Reservation Sanitary Landfill. Prepared for Barsons Construction Co., Inc., Schenectady, NY, by SEA Consultants, Inc., Cambridge, MA. November 1986.

Sharma, H. 1988. Personal communication from DEH Environmental Management Office, Fort Devens. November 1988.

Spelfogel, R. 1984. Internal correspondence about sampling and cleanup of Building 4250, DEH Environmental Management Office, Fort Devens.

STV/LYON Associates, Inc. 1987a. Environmental Assessment of Proposed Master Plan Update, Phases II & III, Fort Devens, Massachusetts. Prepared for U.S. Army Corps of Engineers, New England Division. August 1987.

STV/LYON Associates, Inc. 1987b. Tabulation of Existing and Required Facilities (AR 210-20), Fort Devens, Massachusetts. Prepared for U.S. Army Corps of Engineers, New England Division. Waltham, MA.

USATHAMA (U.S. Army Toxic and Hazardous Materials Agency). 1987. Geotechnical Requirements for Drilling, Monitor Wells, Data Acquisition, and Reports. Aberdeen Proving Ground, MD.

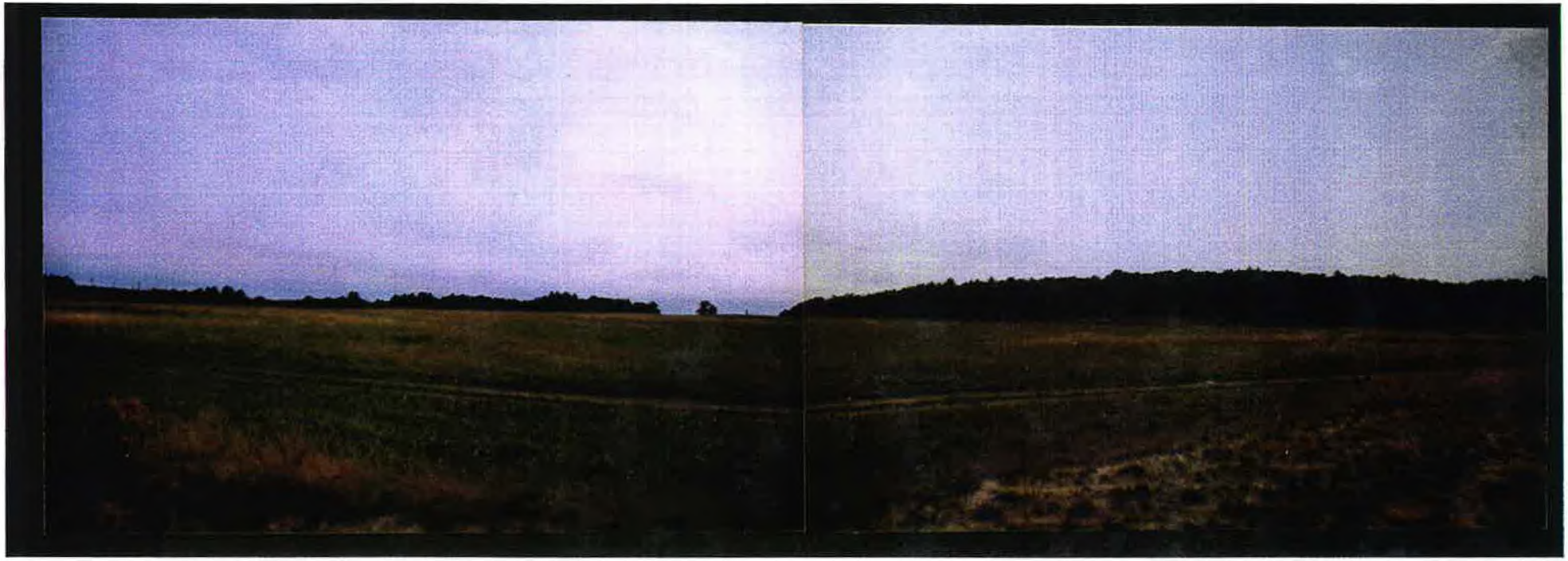
WESTON (Roy F. Weston, Inc.). 1988. USATHAMA Property Report, Fort Devens, Massachusetts. Prepared for U.S. Army Toxic and Hazardous Materials Agency, Aberdeen Proving Ground, MD.

SECTION 7

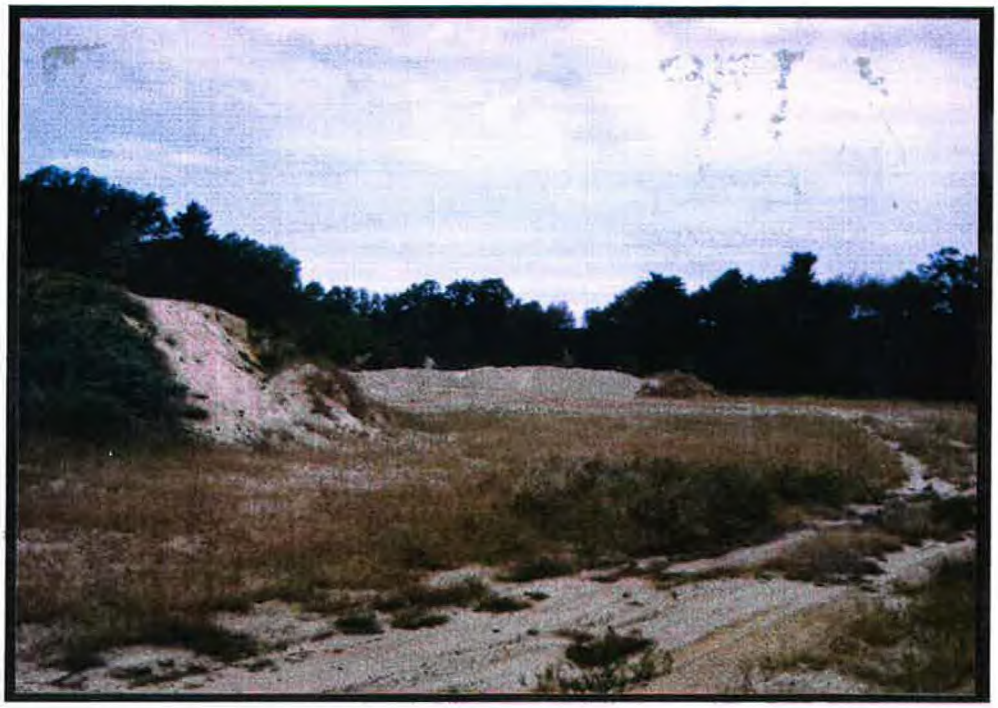
PHOTOGRAPHS

1. AREE 1 - CUTLER ARMY HOSPITAL INCINERATOR

2. AREE 5 - SHEPLEY'S HILL LANDFILL (NO.1) (FOREGROUND) AND LEACHATE DISCHARGE POINT IN PLOW SHOP POND (BACKGROUND)



3. AREE 5 - SHEPLEY'S HILL LANDFILL (NO.1)



4. AREE 9 - GENERAL CONDITIONS AT NORTH POST LANDFILL (NO. 5)

5. AREE 14 - FORMER QUARRY AS LANDFILL NO. 10

6. AREE 15 - GENERAL CONDITIONS AT LANDFILL NO. 11

7. AREE 16 - GENERAL CONDITIONS AT LANDFILL NO. 12

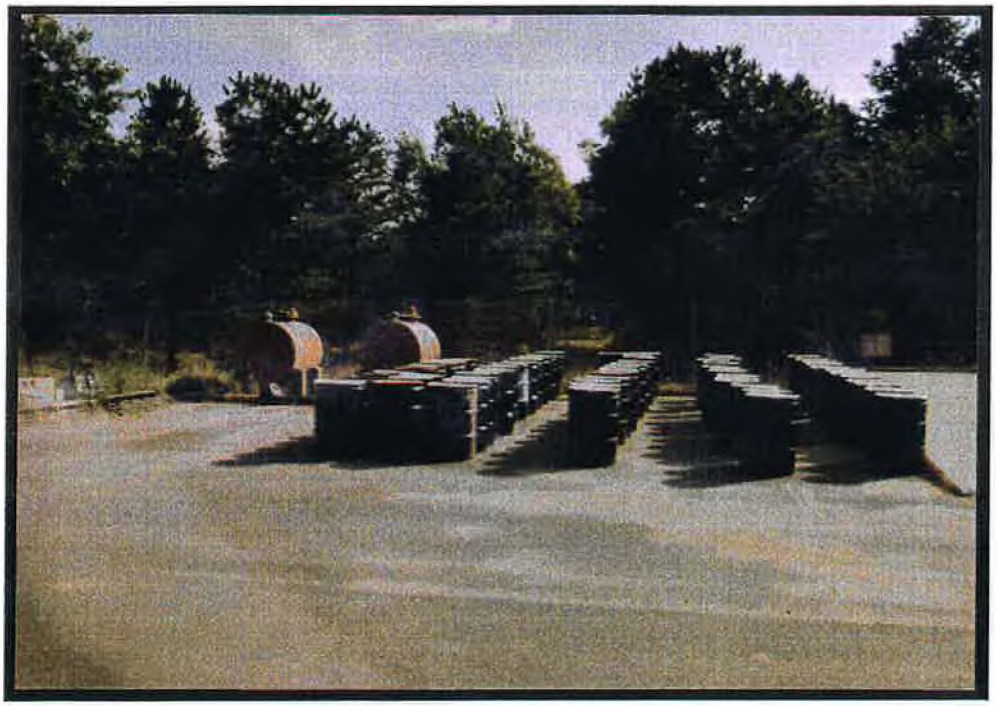
8. AREE 40 - GENERAL CONDITIONS AT COLD SPRING BROOK LANDFILL

9. AREE 41 - GENERAL CONDITIONS AT THE UNAUTHORIZED DUMP

10. AREE 19 - IMHOFF TANKS AT THE WWTP

11. AREE 20 - TYPICAL RAPID INFILTRATION BASIN

12. AREE 21 - SLUDGE DRYING BEDS



13. AREE 22 - DRUMS LOCATED BEHIND HAZARDOUS WASTE STORAGE FACILITY (BUILDING 1650)

14. AREE 30 - ONE OF THREE FORMER DRUM STORAGE AREAS AT MAAF

15. AREE 25 - TYPICAL CONDITIONS AT EOD RANGE

16. AREE 26 - TYPICAL CONDITIONS AT ZULU I RANGE

17. AREE 26 - TYPICAL CONDITIONS AT ZULU II RANGE

18. AREE 31 - FORMER FIRE-FIGHTING TRAINING AREA AT MAAF

19. AREE 47 - FORMER LUST SITE AT MAAF (BUILDING 3816)

20. AREE 50 - WWII ERA LUST SITE NEAR MAAF

21. AREE 52 - GENERAL CONDITIONS AT THE TDA MAINTENANCE YARD

22. AREE 53 - CURRENT CONDITIONS AT TYPICAL POL SPILL SITE

23. AREE 61 - CURRENT CONDITIONS AT TYPICAL UST