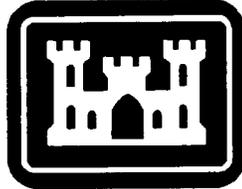


Superfund Records Center
SITE: FORT DEVENS SUDBURY
BREAK: B.3
OTHER: 34310



**U.S. Army Corps
of Engineers**
New England District
Concord, Massachusetts

Five-Year Review Report

DCN: 2SITES-090501-AAAR

September 2001

**First Five-Year Review Report
for
Sudbury Training Annex,
Sudbury, Massachusetts**

Contract No. DACA31-00-D-0023

Task Order No. 0007

01M-0007





United States Environmental Protection Agency
One Congress Street, Suite 1100 (HBT)
Boston, MA 02114-2023

September 25, 2001

Dr. Benjamin F. Goff
BRAC Environmental Coordinator, Sudbury Annex
Box 100 Room 334
30 Quebec Street
Devens, MA 01432-4429

Re: Five Year Review for the US Army Fort Devens -Sudbury Training Annex, Middlesex
County, Massachusetts

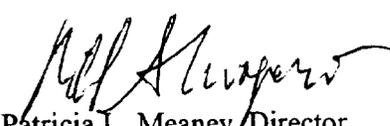
Dear Dr. Goff:

Thank you for the opportunity to review the *First Five-Year Review Report for Sudbury Training Annex, Sudbury, Massachusetts*, dated July 2001. Upon review, EPA concurs with the findings that all remedies that have been implemented are protective of human health and the environment.

EPA reviewed the document for compliance with OSWER Directive No. 9355.7-02A (July 26, 1994) and OSWER Directive No. 9344.7-03A (December 21, 1995). The report includes five-year reviews for the Old Gravel Landfill (Area of Concern(AOC) A-7) and Sudbury Road Dump (AOC P-58), along with descriptions of the other seventy one study areas that were closed out with no further action required under CERCLA. The selection of a TYPE IA review for these sites is consistent with the guidance provided in the OSWER directives. For the last operable unit that is in the operation and maintenance phase (AOC-A7) EPA is pleased to see the Army reiterate its commitment to continuing to fund the required monitoring in accordance with the Federal Facilities Agreement. Access is restricted at the Landfill to minimize potential threats to human health.

As indicated in EPA's letter dated September 1, 2000, this five-year review requirement was prompted by the remedial action start for the Old Gravel Landfill. Consistent with Section 121(c) of the CERCLA, the next five-year review must be finalized on or before July 31, 2006.

Sincerely,


Patricia L. Meaney, Director
Office of Site Remediation and Restoration

cc: Bob Campbell, MA DEP
Tim Prior, USF&WS
Jane Evers, FOCUS
Mary Sanderson, EPA ✓
Christine Williams, EPA



COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
ONE WINTER STREET, BOSTON, MA 02108 617-292-5500

JANE SWIFT
Governor

BOB DURAND
Secretary

LAUREN A. LISS
Commissioner

September 27, 2001

U.S. Army BRAC Environmental Office
Devens Reserve Forces Training Area
30 Quebec Street
P.O. Box 100
Devens, MA 01432

Attention: Benjamin F. Goff, BRAC Environmental Coordinator

RE: RTN 2-0722 Fort Devens/Sudbury Annex
First Five-Year Review Report for Sudbury Training Annex
Sudbury, MA

Dear Mr. Goff:

The Massachusetts Department of Environmental Protection (DEP) received the submittal entitled "First Five-Year Review for Sudbury Training Annex" dated September 2001. As noted in the report, the five-year review is required by statute when a period of five years has elapsed from the date of initiation of the first remedial construction completion activity and the review must encompass the entire period from the report initiation threshold.

DEP reviewed the submittal and found that it fulfilled the requirements outlined in the relevant U.S. Environmental Protection Agency (EPA) guidance for Five-Year Reviews and that it addressed DEP's initial concerns over the presence of a Class 1, uncontrolled Area of Concern (AOC) on the Sudbury Annex site. These

Memorandum of Agreement between the Army and U.S. Fish and Wildlife Service and in the property transfer documents. These assurances include the prohibition against disruption of surface soil below 4-ft. in any manner, and that future use of the property will remain in perpetuity as a wildlife refuge. A 10-foot wide vegetative strip of land on either side of the fence line or former railroad beds shall be used for human habitation unless such use is consistent with protection of human health and the environment.

The OUI AOC A7 landfill Operation and Maintenance (O&M) plan requires regular inspection of landfill integrity and security, scheduled mowing of vegetation, maintenance and repair of landfill perimeter fence and cover, appropriate signage, and groundwater monitoring. All are consistent with DEP's Solid Waste regulations.

DEP has also determined that the Five-Year Review contained sufficient data to continue to support No Further Action Decision Documents (NFADDs) at the 67 ACOs not included in the five Operable Units, and that the remedies established at these ACOs remained protective. Consistent with this finding, DEP concurs with the Army's

This information is available in alternate format by calling our ADA Coordinator at (617) 574-6572.

DEP on the World Wide Web: <http://www.state.ma.us/dep>

Printed on Recycled Paper

recommendation that redundant groundwater-monitoring wells E3-P31-M01, JO-P58-M24, E3-P58-M02 and E3-P58-M01 should be decommissioned, and that the monitoring of groundwater at the remaining observation wells during routine O&M activities will provide an adequate safeguard to ensure that the remedies in place remain protective.

DEP appreciates the opportunity to review and comment on the Five-Year Review for the Fort Devens/Sudbury Annex. If you have any questions regarding these comments, or if we can be of further assistance, please contact me at 617-292-5659 or the Project Manager, Robert Campbell, at 617-292-5732.

Sincerely,


Anne Malewicz
Federal Facilities Section Chief

AM/RC/rc

CC: File/Data Entry
Christine Williams, EPA
Tim Prior, USFWS

FIVE-YEAR REVIEW REPORT

**FIRST FIVE-YEAR REVIEW REPORT
FOR
SUDBURY TRAINING ANNEX
SUDBURY, MASSACHUSETTS**

SEPTEMBER 2001

Contract No. DACA31-00-D-0023
Task Order No. 0007
DCN: 2SITES-090501-AAAR

Submitted to:

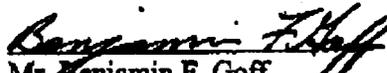
**U.S. Environmental Protection Agency-Region 1
One Congress Street
Suite 1100
Concord, Massachusetts 01742-2751**

Submitted by:

**U.S. Army
BRAC Environmental Office
Devens Reserve Forces Training Area
30 Quebec Street
Box 100
Devens, MA 01432**

Approved by:

Date:


Mr. Benjamin F. Goff
BRAC Environmental Coordinator
U.S. Army Devens Reserve Forces Training Area

7 Sept. 01

FIVE-YEAR REVIEW REPORT

**FIRST FIVE-YEAR REVIEW REPORT
FOR
SUDBURY TRAINING ANNEX
SUDBURY, MASSACHUSETTS**

SEPTEMBER 2001

**Contract No. DACA31-00-D-0023
Task Order No. 0007
DCN: 2SITES-090501-AAAR**

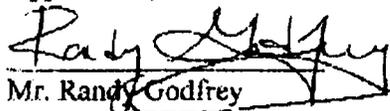
Prepared for:

**U.S. Army Corps of Engineers
New England District
696 Virginia Road
Concord, Massachusetts 01742-2751**

Prepared by:

**ROY F. WESTON, INC.
One Wall Street
Manchester, New Hampshire 03101-1501**

Approved by:


Mr. Randy Godfrey

Project Manager

U.S. Army Corps of Engineers, New England District

Date:

9/7/01

FIVE-YEAR REVIEW REPORT

**FIRST FIVE-YEAR REVIEW REPORT
FOR
SUDBURY TRAINING ANNEX
SUDBURY, MASSACHUSETTS**

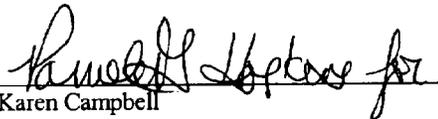
Prepared on behalf of:

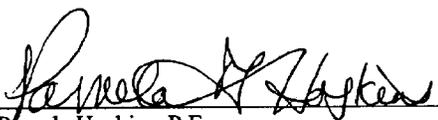
**U.S. Army Corps of Engineers
New England District
696 Virginia Road
Concord, MA 01742-2751**

Prepared by:

**Roy F. Weston, Inc.
One Wall Street
Manchester, New Hampshire 03101-1501**

September 2001


Karen Campbell
Project Engineer


Pamela Hoskins, P.E.
Quality Control Engineer Manager

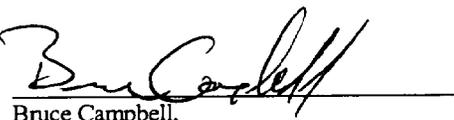

Bruce Campbell,
Project Manager

TABLE OF CONTENTS
(continued)

Section	Page
2.3.5 Remedial Actions	2-20
2.4 AOC P2-BUILDING T267 FUEL SPILLS	2-20
2.4.1 Site Location and Description	2-20
2.4.2 History of Contamination.....	2-21
2.4.3 Contaminants.....	2-21
2.4.4 Remedy Selection.....	2-21
2.4.5 Remedial Actions	2-21
2.5 AOC P16-BUNKERS 302,306, AND 309	2-22
2.5.1 Site Location and Description.....	2-22
2.5.2 History of Contamination.....	2-22
2.5.3 Contaminants.....	2-23
2.5.4 Remedy Selection.....	2-24
2.5.5 Remedial Actions	2-24
2.6 AOC P23-BUILDING T465 (DRUMS)	2-25
2.6.1 Site Location and Description.....	2-25
2.6.2 History of Contamination.....	2-25
2.6.3 Contaminants.....	2-25
2.6.4 Remedy Selection.....	2-26
2.6.5 Remedial Actions	2-27
2.7 AOC P28-ROCKET RANGE	2-28
2.7.1 Site Location and Description.....	2-28
2.7.2 History of Contamination.....	2-28
2.7.3 Contaminants.....	2-28
2.7.4 Remedial Actions	2-29
2.7.4.1 Site Inspection and Institutional Controls	2-30
2.7.4.2 Protectiveness Statement.....	2-30
2.8 AOC P39-DUMP AREA	2-30
2.8.1 Site Location and Description	2-30
2.8.2 History of Contamination.....	2-30
2.8.3 Contaminants.....	2-31
2.9 AOC P41-BUNKER 303 PESTICIDE STORAGE.....	2-31
2.9.1 Site Location and Description.....	2-31
2.9.2 History of Contamination.....	2-31
2.9.3 Contaminants.....	2-32
2.9.4 Remedy Selection.....	2-33
2.9.5 Remedial Actions	2-33

TABLE OF CONTENTS
(continued)

Section		Page
3.	OTHER CERCLA OUS	3-1
3.1	OU2 AOC A9-POL BURN AREA	3-1
	3.1.1 Site Location and Description	3-1
	3.1.2 History of Contamination	3-1
	3.1.3 Remedial Actions	3-1
3.2	OU3 AOC A4- WASTE DUMP	3-2
	3.2.1 Site Location and Description	3-2
	3.2.2 History of Contamination	3-2
	3.2.3 Remedy Selection	3-2
3.3	OU4 AOC P11-BUILDING T405 DUMP AREA AND AOC P13-MFFA	3-2
	3.3.1 Site Location and Description	3-2
	3.3.2 History of Contamination	3-3
	3.3.3 Remedy Selection	3-3
3.4	OU5 AOC A12-PCB SPILL REMEDIATION AREA, AOC P36-FORMER RAYTHEON BUILDING T104 AND AOC P37-BUILDING T106 UST	3-3
	3.4.1 Site Location and Description	3-3
	3.4.2 History of Contamination	3-4
	3.4.3 Remedial Actions	3-4
4.	SITES WITH NO FURTHER ACTION DECISION DOCUMENTS	4-1
4.1	AOC A3- GENERAL DUMP	4-1
	4.1.1 Site Location and Description	4-1
	4.1.2 History of Contamination	4-1
	4.1.3 Remedial Actions	4-1
4.2	AOC A5- SOLVENT/WASTE DUMP	4-2
	4.2.1 Site Location and Description	4-2
	4.2.2 History of Contamination	4-2
	4.2.3 Remedy Selection	4-2
4.3	AOC A6-DEMOLITION GROUND II	4-3
	4.3.1 Site Location and Description	4-3
	4.3.2 History of Contamination	4-3
	4.3.3 Remedy Selection	4-3
4.4	AOC A8- FOOD BURIAL AREA	4-3
	4.4.1 Site Location and Description	4-3
	4.4.2 History of Contamination	4-4
	4.4.3 Remedy Selection	4-4

TABLE OF CONTENTS
(continued)

Section	Page
4.5 AOC A10-RAILROAD PIT/UST AREA	4-4
4.5.1 Site Location and Description	4-4
4.5.2 History of Contamination	4-5
4.5.3 Remedial Selection	4-5
4.6 AOC A11-LEACHING FIELD	4-5
4.6.1 Site Location and Description	4-5
4.6.2 History of Contamination	4-5
4.6.3 Remedial Actions	4-6
4.7 AOC P1-UST ACROSS FROM BUILDING T223	4-6
4.7.1 Site Location and Description	4-6
4.7.2 History of Contamination	4-7
4.7.3 Remedy Selection	4-7
4.8 AOC P3-BUILDING T209 UST	4-7
4.8.1 Site Location and Description	4-7
4.8.2 History of Contamination	4-7
4.8.3 Remedy Selection	4-7
4.9 AOC P4-BUNKER DRUM AREA	4-8
4.9.1 Site Location and Description	4-8
4.9.2 History of Contamination	4-8
4.9.3 Remedial Actions	4-8
4.10 AOC P5-DRUM STORAGE AREA	4-9
4.10.1 Site Location and Description	4-9
4.10.2 History of Contamination	4-9
4.10.3 Remedial Actions	4-9
4.11 AOC P6-PUFFER POND POSSIBLE DUMP AREA	4-10
4.11.1 Site Location and Description	4-10
4.11.2 History of Contamination	4-10
4.11.3 Remedy Selection	4-10
4.12 AOC P7-PATROL ROAD DUMP AREA	4-11
4.12.1 Site Location and Description	4-11
4.12.2 History of Contamination	4-11
4.12.3 Remedy Selection	4-11
4.13 AOC P8-POSSIBLE TRANSFORMER DISPOSAL	4-11
4.13.1 Site Location and Description	4-11
4.13.2 History of Contamination	4-12
4.13.3 Remedy Selection	4-12

TABLE OF CONTENTS
(continued)

Section	Page
4.14 AOC P9-STREAM DUMP SITES A7 AND A9	4-12
4.14.1 Site Location and Description	4-12
4.14.2 History of Contamination.....	4-12
4.14.3 Remedy Selection.....	4-12
4.15 AOC P10-CONFIDENCE COURSE DUMP AREA	4-13
4.15.1 Site Location and Description	4-13
4.15.2 History of Contamination.....	4-13
4.15.3 Remedy Selection.....	4-13
4.16 AOC P12-ABANDONED UST AT SITE A9	4-14
4.16.1 Site Location and Description	4-14
4.16.2 History of Contamination.....	4-14
4.16.3 Remedial Actions	4-14
4.17 AOC P14-EAST GATE BURIAL DUMP.....	4-14
4.17.1 Site Location and Description	4-14
4.17.2 History of Contamination.....	4-15
4.17.3 Remedy Selection.....	4-15
4.18 AOC P15-NAVY BURNING GROUND	4-15
4.18.1 Site Location and Description	4-15
4.18.2 History of Contamination.....	4-15
4.18.3 Remedy Selection.....	4-15
4.19 AOC P17-BUILDING T206	4-16
4.19.1 Site Location and Description	4-16
4.19.2 History of Contamination.....	4-16
4.19.3 Remedy Selection.....	4-16
4.20 AOC P18-CLOTH BURIAL AREA.....	4-16
4.20.1 Site Location and Description	4-16
4.20.2 History of Contamination.....	4-17
4.20.3 Remedy Selection.....	4-17
4.21 AOC P19-CLEARING AND TRACKED AREA	4-17
4.21.1 Site Location and Description	4-17
4.21.2 History of Contamination.....	4-17
4.21.3 Remedial Action.....	4-17
4.22 AOC P20-BURNED AREA AND DRUM.....	4-18
4.22.1 Site Location and Description	4-18
4.22.2 History of Contamination.....	4-18
4.22.3 Contaminants.....	4-18

TABLE OF CONTENTS
(continued)

Section	Page
4.22.4 Remedial Actions	4-18
4.23 AOC P21-POSSIBLE DUMP AREA	4-19
4.23.1 Site Location and Description	4-19
4.23.2 History of Contamination	4-19
4.23.3 Remedy Selection	4-19
4.24 AOC P22-OLD GRAVEL PIT	4-19
4.24.1 Site Location and Description	4-19
4.24.2 History of Contamination	4-20
4.24.3 Remedy Selection	4-20
4.25 AOC P24-CLEARED AREA	4-20
4.25.1 Site Location and Description	4-20
4.25.2 History of Contamination	4-20
4.25.3 Remedy Selection	4-21
4.26 AOC P25-TEST CHAMBER BUILDING T463	4-21
4.26.1 Site Location and Description	4-21
4.26.2 History of Contamination	4-21
4.26.3 Remedial Action	4-21
4.27 AOC P26-AIR DROP ZONE CLEARING	4-22
4.27.1 Site Location and Description	4-22
4.27.2 History of Contamination	4-22
4.27.3 Remedy Selection	4-22
4.28 AOC P27-PYROTECHNICS TEST AREA	4-22
4.28.1 Site Location and Description	4-22
4.28.2 History of Contamination	4-23
4.28.3 Contaminants	4-23
4.28.4 Remedial Actions	4-23
4.29 AOC P29-STATIC ROCKET FIRING	4-24
4.29.1 Site Location and Description	4-24
4.29.2 History of Contamination	4-24
4.29.3 Remedy Selection	4-24
4.30 AOC P30-PROPOSED TEST AREA	4-24
4.30.1 Site Location and Description	4-24
4.30.2 History of Contamination	4-24
4.30.3 Remedy Selection	4-25
4.31 AOC P31-OLD DUMP	4-25
4.31.1 Site Location and Description	4-25

TABLE OF CONTENTS
(continued)

Section	Page
4.31.2 History of Contamination.....	4-25
4.31.3 Remedial Actions	4-25
4.32 AOC P32-ROAD AND RAILROAD INTERSECTION	4-26
4.32.1 Site Location and Description	4-26
4.32.2 History of Contamination.....	4-26
4.32.3 Remedy Selection.....	4-26
4.33 AOC P33- GROUND SCAR	4-27
4.33.1 Site Location and Description	4-27
4.33.2 History of Contamination.....	4-27
4.33.3 Remedy Selection.....	4-27
4.34 AOC P34-VEGETATION STRESS AT MAIN GATE	4-27
4.34.1 Site Location and Description	4-27
4.34.2 History of Contamination.....	4-28
4.34.3 Remedy Selection.....	4-28
4.35 AOC P35-MAIN GATE GUARD SHACK.....	4-28
4.35.1 Site Location and Description	4-28
4.35.2 History of Contamination.....	4-28
4.35.3 Remedial Actions	4-28
4.36 AOC P38-FORMER RAILROAD INSPECTION PIT	4-29
4.36.1 Site Location and Description	4-29
4.36.2 History of Contamination.....	4-29
4.36.3 Remedy Selection.....	4-30
4.37 AOC P40- BUILDING T452 AREA	4-30
4.37.1 Site Location and Description	4-30
4.37.2 History of Contamination.....	4-30
4.37.3 Remedial Action.....	4-30
4.38 AOC P42- OFF-SITE DUMP	4-31
4.38.1 Site Location and Description	4-31
4.38.2 History of Contamination.....	4-31
4.38.3 Remedial Action.....	4-31
4.39 AOC P43 A/B-DISTURBED AREA/ STAINING SOILS AND STRESSED VEGETATION	4-32
4.39.1 Site Location and Description	4-32
4.39.2 History of Contamination.....	4-32
4.39.3 Remedy Selection.....	4-32
4.40 AOC P44 A/B-CLEARING WITH STAINS AND WHITE OBJECTS	4-33

TABLE OF CONTENTS
(continued)

Section	Page
4.40.1 Site Location and Description	4-33
4.40.2 History of Contamination.....	4-33
4.40.3 Remedy Selection.....	4-33
4.41 AOC P45-BURNED AREA OUTSIDE FENCE.....	4-33
4.41.1 Site Location and Description	4-33
4.41.2 History of Contamination.....	4-34
4.41.3 Remedy Selection.....	4-34
4.42 AOC P46-CLEARED/BURNED AREA/DEAD TREES	4-34
4.42.1 Site Location and Description	4-34
4.42.2 History of Contamination.....	4-35
4.42.3 Remedy Selection.....	4-35
4.43 AOC P47-DAMAGED VEGETATION	4-35
4.43.1 Site Location and Description	4-35
4.43.2 History of Contamination.....	4-35
4.43.3 Remedy Selection.....	4-35
4.44 AOC P48-FUEL BLADDER AREA	4-36
4.44.1 Site Location and Description	4-36
4.44.2 History of Contamination.....	4-36
4.44.3 Remedy Selection.....	4-36
4.45 AOC P49-TWO DRUMS NEAR ROAD/BUNKER 323.....	4-37
4.45.1 Site Location and Description	4-37
4.45.2 History of Contamination.....	4-37
4.45.3 Remedy Selection.....	4-37
4.46 AOC P50-ONE DRUM NEAR ROAD/BUNKER 325.....	4-37
4.46.1 Site Location and Description	4-37
4.46.2 History of Contamination.....	4-37
4.46.3 Remedy Selection.....	4-38
4.47 AOC P51-ONE DRUM NEAR WHITE POND ROAD.....	4-38
4.47.1 Site Location and Description	4-38
4.47.2 History of Contamination.....	4-38
4.47.3 Remedy Selection.....	4-38
4.48 AOC P52-POSSIBLE DRUM AREA NEAR FEMA PROPERTY	4-39
4.48.1 Site Location and Description.....	4-39
4.48.2 History of Contamination.....	4-39
4.48.3 Remedy Selection.....	4-39

TABLE OF CONTENTS
(continued)

Section	Page
4.49 AOC P53-BUILDING T210 UST.....	4-39
4.49.1 Site Location and Description.....	4-39
4.49.2 History of Contamination.....	4-40
4.49.3 Remedy Selection.....	4-40
4.50 AOC P54-BUNKERS 305,307, AND 314	4-40
4.50.1 Site Location and Description.....	4-40
4.50.2 History of Contamination.....	4-40
4.50.3 Remedy Selection.....	4-40
4.51 AOC P55-CLEARED AREA SOUTH OF BUNKER 301.....	4-41
4.51.1 Site Location and Description.....	4-41
4.51.2 History of Contamination.....	4-41
4.51.3 Remedy Selection.....	4-41
4.52 AOC P56-CLEARED AREA SOUTH OF BUNKER 313.....	4-41
4.52.1 Site Location and Description.....	4-41
4.52.2 History of Contamination.....	4-42
4.52.3 Remedy Selection.....	4-42
4.53 AOC P57-FORMER BUILDING S449.....	4-42
4.53.1 Site Location and Description.....	4-42
4.53.2 Remedy Selection.....	4-42
4.54 AOC P58-SUDBURY ROAD DUMP.....	4-43
4.54.1 Site Location and Description.....	4-43
4.54.2 History of Contamination.....	4-43
4.54.3 System Operations/Operation and Maintenance (O&M).....	4-43
4.54.4 Five-Year Review Findings	4-43
4.54.4.1 Data Review	4-43
4.54.4.2 Assessment.....	4-44
4.54.4.3 Deficiencies.....	4-44
4.54.4.4 Recommendations and Follow-up Actions	4-44
4.54.4.5 Protectiveness Statement.....	4-44
4.54.5 Site Location and Description.....	4-44
4.55 AOC P59-CANS/ METAL DEBRIS NORTH OF BUNKER 319.....	4-44
4.55.1 History of Contamination.....	4-44
4.55.2 Remedial Actions	4-46
4.56 AOC P60-THREE DRUMS WEST OF PATROL ROAD.....	4-46
4.56.1 Site Location and Description.....	4-46
4.56.2 History of Contamination.....	4-46
4.56.3 Remedial Actions	4-46

TABLE OF CONTENTS
(continued)

Section	Page
4.57 AOC P61-HONEY BROOK OLD DUMP	4-47
4.57.1 Site Location and Description	4-47
4.57.2 Remedial Actions	4-47
5. REFERENCES	5-1
APPENDIX A	SITE STATUS TABLES
APPENDIX B	GROUNDWATER ANALYTICAL RESULTS
APPENDIX C	FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

LIST OF TABLES

Title	Page
Table 2-1 GV-1 Landfill Gas Monitoring Results	2-5
Table 2-2 GV-2 Landfill Gas Monitoring Results	2-5
Table 2-3 GV-3 Landfill Gas Monitoring Results	2-5
Table 2-4 GV-4 Landfill Gas Monitoring Results	2-6
Table 2-5 Groundwater Monitoring Well OHM-A7-8 Hits Table.....	2-11
Table 2-6 Groundwater Monitoring Well OHM-A7-51 Hits Table.....	2-12
Table 2-7 Groundwater Monitoring Well OHM-A7-52 Hits Table.....	2-13
Table 2-8 Groundwater Monitoring Well JO-A07-M61 Hits Table.....	2-14
Table 2-9 Groundwater Monitoring Well JO-A07-M63 Hits Table.....	2-15
Table 4-1 AOC P58 O&M Monitoring for Arsenic Results	4-45

LIST OF FIGURES

Title

- Figure 1 Site Location Map
- Figure 2 Site Map
- Figure 3 A7 Site Map
- Figure 4 Groundwater Monitoring Well Location Map - May 2001
- Figure 5 Landfill From Main Gate Looking North
- Figure 6 Landfill From main Gate Looking North
- Figure 7 East Corner of Landfill
- Figure 8 West Swale at Landfill
- Figure 9 East Corner of Toe Drain
- Figure 10 East Corner of Toe Drain
- Figure 11 East Corner of Toe Drain
- Figure 12 East Corner of Toe Drain
- Figure 13 East Side of Large Boulder Rip Rap
- Figure 14 North Back Corner of Drainage Swale
- Figure 15 North Side of Landfill
- Figure 16 Northeast Back Corner, Rip Rap and Toe Drain
- Figure 17 North Side Toe Drain Tear/Hole
- Figure 18 Northwest Corner Looking East

**LIST OF FIGURES
(CONTINUED)**

Title

Figure 21 Picture Location Map – May 8, 2001

Figure 22 1,1,2,2,-Tetrachloroethane

Figure 23 1,2 Dichloroethane

Figure 24 Lead

Figure 25 Lindane

Figure 26 Naphthalene

Figure 27 Tetrachloroethene

Figure 28 Trichloroethene

LIST OF ACRONYMS

1,1,2,2 PCA	1,1,2,2 Tetrachloroethane
1,2 DCA	1,2-Dichloroethane
ABB	ABB Environmental Services, Inc.
ACM	asbestos-containing materials
amsl	above mean sea level
AOC	Area of Concern
ARARs	applicable or relevant and appropriate requirements
ARMY	U.S. ARMY
ASTs	above-ground storage tanks
AWQC	Ambient Water Quality Criteria
BCT	Base Closure Team
BEC	Base Environmental Coordinator
bgs	below ground surface
BNAs	Base/Neutral/Acid extractable compounds
BRAC	Base Realignment and Closure List
CENAE	U.S. Army Corps of Engineers, New England District
CFHA	Capehart Family Housing Area
COCs	contaminants of concern
CX	categorical exclusion
DDD	1,2-Bis(4-Chlorophenyl)-2 Dichloroethane
DDE	1,2-dichloro-2,2-bis(4-chlorophenyl)ethane
DDT	dichlorodiphenyltrichloroethane
DOD	Department of Defense
E&E	Ecology & Environment, Inc.
EE/CA	Engineering Evaluation/Cost Analysis
ERL	Effects-Range Low
EWT	Environmental Waste Technology
FEMA	Federal Emergency Management Agency
FFA	Federal Facilities Agreement
ft	feet
ft ²	square feet

LIST OF ACRONYMS (continued)

GZA	GZA Geoenvironmental Inc.
HLA	Harding Lawson Associates
HMX	ciclotetramethalynetetranitramine
IC	Institutional Control
IRP	Installation Restoration Program
LTMMMP	Long-term Maintenance and Monitoring Plan
MADEP	Massachusetts Department of Environmental Protection
MCL	maximum contaminant level
MFFA	Massachusetts Fire Fighting Academy
mg/kg	milligrams per kilogram
MOA	Memorandum of Agreement
Natick Labs	U.S. Army Natick Research and Development Command
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act
NFADDs	No Further Action Decision Document
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
O&M	operations and maintenance
OMEE LEL	Ontario Ministry of the Environment Lowest Effect Level
OUs	Operable Units
PAHs	polycyclic aromatic hydrocarbons
PCBs	Polychlorinated biphenyls
PCE	Tetrachloroethene
PID	photoionization detector
POL	petroleum, oil, lubricants
ppm	parts per million
PREs	preliminary risk evaluations
RAAs	Remedial Action Alternatives
RBC	risk-based calculations
RCRA	Resource Conservation and Recovery Act

LIST OF ACRONYMS (continued)

RDX	cyclotrimethylenetetranitramine
RI	Remedial Investigation
ROD	Record of Decision
S&W	Stone & Webster
SC	source control
SMCLs	secondary maximum contaminant levels
SSI	Supplemental Site Investigation
SVOCs	semi-volatile organic compounds
TAL	Target Analyte List
TCE	Trichloroethylene
TCLP	Toxicity Characteristic Leaching Procedure
TOCs	total organic compounds
TPH	Total petroleum hydrocarbons
TRC	Technical Review Committee
TSCA	Toxic Substances Control Act
USAEC	United States Army Environmental Center
USAEHA	United States Army Environmental Hygiene Agency
USAF	U.S. Air Force
USAFCL	USAF Cambridge Research Laboratory
USEPA	U.S. Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UST	underground storage tank
VAT	vinyl asbestos tile
VOCs	Volatile Organic Compounds
WESTON	Roy F. Weston, Inc.
XRF	X-ray fluorescence
yd ³	cubic yard(s)
µg/g	micrograms per gram
mg/kg	milligrams per kilogram
µg/L	micrograms per liter

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

Roy F. Weston, Inc. (WESTON®) has conducted a five-year review in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA; 1980) of the remedial actions implemented at the Sudbury Training Annex site in Sudbury, Massachusetts. This review was conducted from April 2001 through June 2001 in accordance with relevant U.S. Environmental Protection Agency (USEPA) guidance. This report documents the results of the review. The U. S. Army Corps of Engineers, New England District (CENAE) provided support for this five-year review. This is the first five-year review for the Sudbury Training Annex site. The triggering action for the statutory review is the initiation date of the construction of the landfill cap in Area of Concern (AOC) A7 on July 31, 1996.

The purpose of a five-year review is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of review are documented in five-year review reports. In addition, five-year review reports identify deficiencies found during the review, if any, and recommendations to address them.

This five-year review is required by statute. The U.S. ARMY (ARMY) must implement five-year reviews with the CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

The Sudbury Training Annex is composed of the following Operable Units (OUs):

- OU1 AOC A7 - Old Gravel Pit Landfill
- OU2 AOC A9 - Petroleum, oil, lubricants (POL) Burn Area
- OU3 AOC A4 - Waste Dump
- OU4 AOC P11 - Building T405 Dump Area
 AOC P13 - Massachusetts Fire Fighting Academy (MFFA)

- OU5 AOC A12 - Abandoned underground storage tank (UST) at Site A9;
 AOC P36 - Former Raytheon Building T104
 AOC P37 - Building T106 UST

The following AOCs, not associated with any of the five CERCLA OUs, were closed out by No Further Action decision documents (NFADDs) signed by the Base Closure Team (BCT):

- AOC A1 - Decontaminated Mustard Area,
- AOC A2 - Demolition Ground I
- AOC A3 - General Dump
- AOC A5 - Solvent/Waste Dump
- AOC A6 - Demolition Ground II
- AOC A8 - Food Burial Area
- AOC A10 - Railroad Pit/UST Area
- AOC A11 - Leaching Field
- AOC A12 - Polychlorinated biphenyls (PCBs) Spill Remediation Area
- AOC P1 - UST Across from Building T223
- AOC P2 - Building T267 Fuel Spills
- AOC P3 - Building T209 UST
- AOC P4 - Bunker Drum Area
- AOC P5 - Drum Storage Area
- AOC P6 - Puffer Pond Possible Dump Area
- AOC P7 - Patrol Road Dump Area
- AOC P8 - Possible Transformer Disposal
- AOC P9 - Stream Dump Sites A7 and A9
- AOC P10 - Confidence Course Dump Area
- AOC P14 - East Gate Burial Dump
- AOC P15 - Navy Burning Ground
- AOC P16 - Bunkers 302,306, and 309
- AOC P17 - Building T206
- AOC P18 - Cloth Burial Area
- AOC P19 - Clearing and Tracked Area
- AOC P20 - Burned Area and Drum
- AOC P21 - Possible Dump Area
- AOC P22 - Old Gravel Pit
- AOC P23 - Building T465 (Drums)
- AOC P24 - Cleared Area
- AOC P25 - Test Chamber Building T463
- AOC P26 - Air Drop Zone Clearing
- AOC P27 - Pyrotechnics Test Area
- AOC P28 - Rocket Range
- AOC P29 - Static Rocket Firing
- AOC P30 - Proposed Test Area
- AOC P31 - Old Dump
- AOC P32 - Road and Railroad Intersection
- AOC P33 - Ground Scar
- AOC P34 - Vegetation Stress at Main Gate
- AOC P35 - Main Gate Guard Shack
- AOC P38 - Former Railroad Inspection Pit
- AOC P39 - Dump Area

- AOC P40 - Building T452 Area
- AOC P41 - Bunker 303 Pesticide Storage
- AOC P42 - Off-Site Dump
- AOC P43 - A/B-Disturbed Area/ Staining Soils and Stressed Vegetation
- AOC P44 - A/B-Clearing with Stains and White Objects
- AOC P45 - Burned Area Outside Fence
- AOC P46 - Cleared/Burned Area/ Dead Trees
- AOC P47 - Damaged Vegetation
- AOC P48 - Fuel Bladder Area
- AOC P49 - Two Drums Near Road/ Bunker 323
- AOC P50 - One Drum Near Road/ Bunker 325
- AOC P51 - One Drum Near White Pond Road
- AOC P52 - Possible Drum Area near FEMA Property
- AOC P53 - Building T210 UST
- AOC P54 - Bunkers 305,307, and 314
- AOC P55 - Cleared Area South of Bunker 301
- AOC P56 - Cleared Area South of Bunker 313
- AOC P57 - Former Building S449
- AOC P58 - Sudbury Road Dump
- AOC P59 - Cans/ Metal Debris North of B-319
- AOC P60 - Three Drums West of Patrol Road
- AOC P61 - Honey Brook Old Dump

A landfill cap that included the installation of an impermeable cover system was placed on AOC A7 in 1996. Semi-annual groundwater sampling has been conducted at this site over the past 5 years. The persistence of the pre-remedial action Contaminants of Concern (COCs) at levels exceeding the Massachusetts Contingency Plan (MCP) Method 1 GW-1 standards, suggests that further actions at the AOC A7 site may be required. These actions may include:

- Continued semi-annual monitoring of groundwater using the 13 well network associated with the landfill at AOC A7. The analyte list should remain the same as for previous rounds.
- Continued inspections and assessments of the integrity of the institutional controls.
- Continued semi-annual gas monitoring of 4 Passive gas vents.

Institutional controls (ICs) required by the Long-Term Monitoring and Maintenance Plan (LTMMP) are the security fence, access road and monitoring well casings and locks. The security fence is free of damage, breeches and is secure. Repairs were made to the access road to eliminate potholes and rutting during October 1999. Monitoring well casings are free of damage.

One additional IC concerning ordnance and explosives (OE) was put in place in 2000. In the Memorandum of Agreement (MOA) between the ARMY and the U.S. Fish and Wildlife Service (USFWS) dated September 28, 2000, a Site-Wide IC dealing with OE is discussed. It states, "The USFWS acknowledges that the ARMY has informed it that as of the Date of Transfer, the subsurface soil below the depth of 4-feet (ft) on the Transfer Parcel may contain OE or OE-related material as a result of past ARMY activities on the Transfer Parcel. The USFWS covenants on behalf of itself and its successors and assigns that except as provided herein, no activity or use shall be undertaken on the Transfer Parcel that might disrupt or otherwise negatively impact the subsurface soil below the depth of 4-ft. Such prohibited activities and uses shall include any disturbance of the subsurface soil below the depth of 4-ft in any manner, including but not limited to construction activities such as filling, drilling, excavation or change of topography."

In the MOA between the ARMY and the USFWS, it states, "the USFWS acknowledges that the arsenic-based herbicides were applied in the vicinity of the fence line along Patrol Road and on the former railroad beds on the northern and southern portions of the Sudbury Training Annex, and that the Army has concluded, after completing a facility-wide investigation, that the resulting concentrations of arsenic in the soil do not pose an unacceptable risk to human health of the environment based on the future use of the Transfer Parcel as a National Wildlife Refuge. The USFWS covenants on behalf of itself and its successors and assigns that no portion of a 50-ft strip of land on either side of the center of the above-described fence line or former railroad beds shall be used for residential habitation unless the then-owner of the Transfer Parcel can demonstrate to USEPA that such use is consistent with the protection of human health and the environment." This IC is valid for all sites along Patrol Road and the former railroad beds on the Sudbury Training Annex.

Based on site inspections and interviews with the USFWS and ARMY, all of the ICs are still in place at the Sudbury Training Annex and are still protective. No violations of any of the ICs have been recorded.

Semi-annual operation and maintenance groundwater sampling has been conducted on wells E3-P31-M01, JO-P58-M24, E3-P58-M02 and E3-P58-M01. With the exception of two October

rounds of sampling at well E3-P31-M01, all of the arsenic sample results were found below the USEPA maximum contaminant level (MCL) of 50 micrograms per liter ($\mu\text{g/L}$). Because there is no apparent trend in the sampling data to suggest that the arsenic groundwater concentrations are increasing, continued semi-annual groundwater monitoring is not warranted. These wells should be abandoned.

AOC A7 contains contamination above levels that would allow for unrestricted use and therefore the NCP, 40 CFR 430 (f) (4) (ii), requires five-year reviews. The next review should be performed within five years of completion of this review. The completion date is the date on which USEPA issues its letter to the ARMY either concurring with its findings, or documenting reasons for non-concurrence. The next five-year review should be conducted on site AOC A7 and on the ICs implemented by the Base Realignment and Closure List (BRAC) transfer process.

SECTION 1

INTRODUCTION

1. INTRODUCTION

Roy F. Weston, Inc. (WESTON®) has conducted a five-year review in accordance with the Comprehensive Environmental Response, Compensation and liability Act (CERCLA; 1980) of the remedial actions implemented at the Sudbury Training Annex site in Sudbury, Massachusetts. This review was conducted from April 2001 through June 2001 in accordance with relevant U.S. Environmental Protection Agency (USEPA) guidance. This report documents the results of the review. The U. S. Army Corps of Engineers, New England District (CENAE) provided support for this five-year review. This is the first five-year review for the Sudbury Training Annex site. The triggering action for the statutory review is the initiation date of the construction of the landfill cap in Area of Concern (AOC) A7 on July 31, 1996.

The purpose of a five-year review is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of the reviews are documented in five-year review reports. In addition, five-year review reports identify deficiencies found during the review, if any, and recommendations to address them.

This five-year review is required by statute. The U.S. ARMY (ARMY) must implement five-year reviews in accordance with CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

1.1 PHYSICAL CHARACTERISTICS

The former ARMY Sudbury Training Annex lies in Middlesex County, Massachusetts, some 20 miles west of Boston, and occupies approximately 2,300 acres within the towns of Hudson, Stow, Maynard and Sudbury, Massachusetts (see Figure 1 - Site Location Map). The combined population of these four towns is approximately 50,000. AOCs A7 and A9 are both located close together on the northern boundary of the Sudbury Training Annex, adjacent to the Assabet River and within the boundaries of the town of Stow. In areas where developed land is adjacent to the Sudbury Training Annex, it is residential.

Green Meadow elementary school is approximately 1,000 feet (ft) northeast of the Sudbury Training Annex boundary and Maynard High School is approximately 2,000-ft northeast.

1.2 LAND AND RESOURCE USE

The Sudbury Training Annex became a military installation in the early 1940s as the Maynard Ammunition Depot. During World War II, the Sudbury Training Annex was used for holding munitions, and after the war it became known as the Maynard Ordnance Test Station. In 1958, the command was turned over to U.S. Army Natick Research and Development Command (Natick Labs). Between 1980 and 1983, custody of most of the Sudbury Training Annex was turned over to Fort Devens. The installation has been used for troop training, product and equipment testing, munitions/explosives testing, disposal, and disposal of wastes from Natick Labs. The Sudbury Training Annex contains 50 concrete ammunition bunkers and 27 abandoned buildings.

1.3 BACKGROUND

The Sudbury Training Annex was placed on the USEPA National Priorities List (NPL) as a Superfund Site in 1990 and in May 1991 the ARMY signed an Interagency Agreement with the USEPA stipulating that site investigations and cleanup actions would follow CERCLA and its amendments under the regulatory guidance of the NCP 40 CFR Part 300. A Technical Review Committee (TRC) was formed at this time also. A map of the Sudbury Training Annex with the site locations is located in Figure 2.

In 1995 the Sudbury Training Annex was placed on the Base Realignment and Closure (BRAC) list under BRAC95. The plans were for the Sudbury Training Annex to be transferred in three parts to (1) the United States Fish and Wildlife Service (USFWS) 2205.2 acres, (2) U.S. Air Force (USAF) 4.148 acres and (3) the Federal Emergency Management Agency (FEMA) 71.525 acres. Puffer Pond (approximately 24 acres), which is defined by Massachusetts' law, to be a Great Pond (i.e., a natural pond with an area of 20 acres or more), is owned by the Commonwealth of Massachusetts and wholly located within property that has been transferred to USFWS.

1.4 SITE CHRONOLOGY

The Department of Defense (DOD) in 1978 created the Installation Restoration Program (IRP). The IRP was to identify, investigate, and clean up contamination from hazardous substances at federal facilities. The United States Army Environmental Center (USAEC) conducted a site assessment of the Sudbury Training Annex in 1980. The site assessment resulted in designation of AOCs A1 through A11. The United States Army Environmental Hygiene Agency (USAEHA) conducted a Hydrogeological and Subsurface Investigation on AOCs A1 through A11 in 1983.

NUS Corporation conducted a Preliminary Assessment/Site Investigation in 1985/1987 of the Sudbury Training Annex. Dames & Moore conducted a Remedial Investigation (RI) in 1986 of AOCs A1-A11 and potential contamination sources in the vicinity of the Capehart Family Housing Area (CFHA), Puffer Pond, and associated streams. Dames & Moore conducted an expanded site inspection in 1990. In 1991, GZA Geoenvironmental Inc. (GZA) conducted a site investigation of the 100-acre area that was excised from the Sudbury Training Annex in 1977 and 1979. The site was listed on the NPL by USEPA as a Superfund site on 21 February 1990. A Federal Facilities Agreement (FFA) was signed between the ARMY and USEPA in April 1991.

1.5 OPERABLE UNITS AND AREAS OF CONCERN

The Sudbury Training Annex is composed of the following Operable Units (OUs):

- OU1 AOC A7 - Old Gravel Pit Landfill
- OU2 AOC A9 - petroleum, oil, lubricants (POL) Burn Area
- OU3 AOC A4 - Waste Dump
- OU4 AOC P11 - Building T405 Dump Area
 AOC P13 - Massachusetts Fire Fighting Academy (MFFA)

- OU5 AOC A12 - Abandoned underground storage tank (UST) at Site A9;
 AOC P36 - Former Raytheon Building T104
 AOC P37 - Building T106 UST

The following AOCs, not associated with any of the five CERCLA OUs, were closed out by No Further Action decision documents (NFADDs) signed by the Base Closure Team (BCT):

- AOC A1 - Decontaminated Mustard Area,
- AOC A2 - Demolition Ground I
- AOC A3 - General Dump
- AOC A5 - Solvent/Waste Dump
- AOC A6 - Demolition Ground II
- AOC A8 - Food Burial Area
- AOC A10 - Railroad Pit/UST Area
- AOC A11 - Leaching Field
- AOC A12 - Polychlorinated biphenyls (PCBs) Spill Remediation Area
- AOC P1 - UST Across from Building T223
- AOC P2 - Building T267 Fuel Spills
- AOC P3 - Building T209 UST
- AOC P4 - Bunker Drum Area
- AOC P5 - Drum Storage Area
- AOC P6 - Puffer Pond Possible Dump Area
- AOC P7 - Patrol Road Dump Area
- AOC P8 - Possible Transformer Disposal
- AOC P9 - Stream Dump Sites A7 and A9
- AOC P10 - Confidence Course Dump Area
- AOC P14 - East Gate Burial Dump
- AOC P15 - Navy Burning Ground
- AOC P16 - Bunkers 302,306, and 309
- AOC P17 - Building T206
- AOC P18 - Cloth Burial Area
- AOC P19 - Clearing and Tracked Area
- AOC P20 - Burned Area and Drum
- AOC P21 - Possible Dump Area
- AOC P22 - Old Gravel Pit
- AOC P23 - Building T465 (Drums)
- AOC P24 - Cleared Area
- AOC P25 - Test Chamber Building T463
- AOC P26 - Air Drop Zone Clearing
- AOC P27 - Pyrotechnics Test Area
- AOC P28 - Rocket Range
- AOC P29 - Static Rocket Firing
- AOC P30 - Proposed Test Area
- AOC P31 - Old Dump
- AOC P32 - Road and Railroad Intersection
- AOC P33 - Ground Scar
- AOC P34 - Vegetation Stress at Main Gate
- AOC P35 - Main Gate Guard Shack
- AOC P38 - Former Railroad Inspection Pit
- AOC P39 - Dump Area

- AOC P40 - Building T452 Area
- AOC P41 - Bunker 303 Pesticide Storage
- AOC P42 - Off-Site Dump
- AOC P43 - A/B-Disturbed Area/ Staining Soils and Stressed Vegetation
- AOC P44 - A/B-Clearing with Stains and White Objects
- AOC P45 - Burned Area Outside Fence
- AOC P46 - Cleared/Burned Area/ Dead Trees
- AOC P47 - Damaged Vegetation
- AOC P48 - Fuel Bladder Area
- AOC P49 - Two Drums Near Road/ Bunker 323
- AOC P50 - One Drum Near Road/ Bunker 325
- AOC P51 - One Drum Near White Pond Road
- AOC P52 - Possible Drum Area near FEMA Property
- AOC P53 - Building T210 UST
- AOC P54 - Bunkers 305,307, and 314
- AOC P55 - Cleared Area South of Bunker 301
- AOC P56 - Cleared Area South of Bunker 313
- AOC P57 - Former Building S449
- AOC P58 - Sudbury Road Dump
- AOC P59 - Cans/ Metal Debris North of B-319
- AOC P60 - Three Drums West of Patrol Road
- AOC P61 - Honey Brook Old Dump

Appendix A has a list of sites and their current status. See Figure 2 - Site Map for the location of all 75 sites that comprise the Sudbury Training Annex.

SECTION 2

**OU1
AOC 7- OLD GRAVEL PIT LANDFILL**

2. OU1 AOC A7- OLD GRAVEL PIT LANDFILL

This section discusses the history and remedy at AOC A7, the Old Gravel Pit Landfill, as well as those AOCs from which materials were excavated and consolidated in the AOC A7 Landfill.

2.1 AOC A7 - OLD GRAVEL PIT LANDFILL

2.1.1 Site Location and Description

AOC A7 is located near the northern boundary of the installation between Patrol Road and the Assabet River, see Figure 3 – AOC A7 Site Map. The Old Gravel Pit Landfill is about 2 acres in extent within a fenced area of 10 acres and is enclosed within a 10-ft tall chain link fence with barbed wire. A thin strip of forest separates AOC A7 from Patrol Road and forest also surrounds the remaining sides of the site. Entrance to the site is made from Patrol Road through a locked gate on an unpaved access road. About 400-ft north on Patrol Road there is a large sandy clearing. A soil mound runs along the northern and northeastern edge of the clearing. Beyond this mound is a steep ridge leading down to Track Road and the Assabet River on the northern side and to a small stream and wetland terrain on the northeastern side. This soil mound also separates AOC A7 from AOC P8.

2.1.2 History of Contamination

AOC A7 was used as a dump for general refuse, demolition debris and chemical lab waste disposal. The lab waste area was limited to a pit of about 5,000 square feet (ft²). General refuse was reportedly buried at shallow depths from 1941 until the 1980's, with occasional burning to reduce volume. AOC A7 was also used by the public, for unauthorized surface dumping during the 1970's, until access was restricted. Another dump area, AOC P8, is located within AOC A7 (WESTON 1997).

AOC A7 was used as a general refuse and laboratory dump. Disposal of drums and other chemical containers was carried out between the late 1950s and 1971. It was indicated by Natick Labs employees that quart to gallon-sized metal and glass containers of chemicals from the Natick Labs were disposed of in this area on a weekly basis, (OHM, January 1994).

Occasionally, a house cleaning would take place at the laboratory and excess chemicals and waste temporarily stored in a bunker would also be disposed, possibly in this area.

Prior to 1991, this site had also been used as a recreational area by local residents. Dirt bike tracks, shotgun shells, bullet riddled waste, and hunters have been noted in this area. In October 1991, as a site control measure, AOC A7 was enclosed by a 10-ft tall chain link fence with barbed wire.

2.1.3 Contaminants

Surface soil samples were collected from the site and were analyzed for Volatile Organic Compounds (VOCs), Base/Neutral/Acid extractable compounds (BNAs), PCBs, pesticides, herbicides, explosives and metals. BNAs were detected at two locations, one of which contained 12 BNAs. The pesticides dieldrin, 1,1-dichloro-2,2-bis(4-chlorophenyl)ethane (DDE), and dichlorodiphenyltrichloroethane (DDT) were detected at several sample locations. The PCB Aroclor 1260, herbicides, and lead were also detected. In addition, subsurface soil samples collected from 19 test pits, 27 borings, and two hand auger locations detected pesticides and BNAs. Pesticides, metals, semi-volatile organic compounds (SVOCs), and VOCs were detected in groundwater samples.

2.1.4 Remedy Selection

The remedy selection for AOC A7 was the installation of an impermeable landfill cover system that met Resource Conservation and Recovery Act (RCRA) Subtitle C requirements. In addition, laboratory waste was to be excavated and transported off site for treatment and disposal at an approved facility. The laboratory waste was removed because it is considered to be the primary source of groundwater contamination.

The metals contaminated soil from AOC A9 was excavated and consolidated at AOC A7 beneath the cover system. Excavated materials from other areas on the Sudbury Training Annex were used at AOC A7 as fill material to meet the subgrade design specifications for the AOC A7 landfill cap.

A multi-layer cap was placed over the landfill area. To minimize the size of the final cap, contaminated soil and other solid waste at AOC A7 were consolidated using heavy equipment.

After construction of the RCRA Subtitle C double barrier landfill cap, groundwater monitoring and operations and maintenance (O&M) of the containment system were to be conducted and the monitoring program would be submitted for regulatory review and approval. O&M of the landfill cap included inspection and, if needed, repair and/or maintenance of portions of the cap, fencing, and monitoring wells.

This remedy required institutional controls and land use restrictions to prevent future re-use of the land at AOC A7 for anything other than a landfill.

2.1.5 Remedial Actions

WESTON conducted the remedial action between July and November 1996. Approximately 1,000 cubic yards (yd³) of contaminated soils and hazardous waste materials were excavated from the lab waste area. Soils and waste were placed into 76 roll-off containers. Soils in each of the roll-off containers were sampled and analyzed for full Toxicity Characteristic Leaching Procedure (TCLP) and waste characterization. Analytical results of soils from 72 roll-offs indicated that the materials were non-RCRA. Soils from four roll-offs contained lead, lindane, and carbon tetrachloride above the RCRA limits. The non-RCRA soils that did not contain lab waste materials or debris (49 roll-offs) were placed back into the landfill. The remaining 27 roll-offs, including the four RCRA hazardous ones, contained debris and laboratory containers and they were segregated as describe below.

The lab waste area was backfilled with a clean granular soil to an elevation that was above the water table. The remaining volume was backfilled with soils from other AOC hot spots. The other hot spots that were excavated and used as subgrade fill material are as follows: A1, A2, A9, P2, P16, P23, P28, P39, and P41 (WESTON 1997).

The lab waste containers were segregated from the contaminated soils by placing the soils/containers from the 27 roll-offs onto lined containment pads and manually removing the containers (WESTON 1997). Segregation and characterization was performed by Environmental

Waste Technology (EWT), Newton, Massachusetts. After segregation, soils that were previously characterized as RCRA hazardous for lindane were transported to Envotech Management Services, Inc. in Belleville, Michigan. Soils that were previously characterized as RCRA hazardous for carbon tetrachloride and lead were transported to City Environmental, Inc. in Detroit, Michigan. Profiling of the soils that were previously characterized as non-hazardous, showed levels of PCBs. Additional soil samples collected by WESTON to verify the presence of PCBs in the profile samples showed levels of PCBs below the Toxic Substances Control Act (TSCA) regulatory limit of 50 parts per million (ppm). PCB contaminated soils were disposed of in City Environmental, Inc. Lab waste containers (i.e. intact containers containing liquids, solids or sludges) screened from the soils were characterized and sorted by hazard class and placed into 55-gallon drums and properly disposed of.

2.1.6 System Operations/Operation and Maintenance (O&M)

Groundwater samples were collected by WESTON and CENAE from 13 wells on a semi-annual basis from October 1997 through May 2001. Well locations can be found on Figure 4. The April sampling events were intended to monitor the high groundwater conditions of spring while the October events provided data regarding low groundwater conditions of early fall. Groundwater was sampled for VOCs, Pesticides/PCBs, Metals, and general water quality measurements were taken. Appendix B summarizes the data for the groundwater sampling rounds by well.

Landfill gas has also been monitored on a semi-annual basis using four passive gas vents (GV-1, GV-2, GV-3 and GV-4) and the data is summarized in Tables 2-1 through Table 2-4.

Table 2-1**GV-1 Landfill Gas Monitoring Results**

	April 1998	October 1998	April 1999	October 1999	April 2000	October 2000	May 2001
VOC (ppm ¹)	0	0	2	0	0	0	0
O ₂ (%)	20.9	20.5	20.5	20.9	20.5	20.3	20.7
LEL (%)	0	0	0	0	0	0	0
CO ₂ (%)	0	0	0	0	0	0	0
CH ₄ (%)	0	0	0	0	0	0	0
ATM pressure MM Hg	29.76	30.20	29.9	29.9	29.35	29.7	29.7

¹ – As measured using a photoionization detector (PID)

Table 2-2**GV-2 Landfill Gas Monitoring Results**

	April 1998	October 1998	April 1999	October 1999	April 2000	October 2000	May 2001
VOC (ppm ¹)	0	0	0	0	0	0	0
O ₂ (%)	20.7	20.5	20.5	20.7	20.3	20.3	19.7
LEL (%)	0	0	0	0	0	0	0
CO ₂ (%)	0	0	0	0	0	0	0.8
CH ₄ (%)	0	0	0	0	0	0	0
ATM pressure MM Hg	29.76	30.20	29.9	29.9	29.35	29.7	29.7

¹ – As measured using a photoionization detector (PID)

Table 2-3**GV-3 Landfill Gas Monitoring Results**

	April 1998	October 1998	April 1999	October 1999	April 2000	October 2000	May 2001
VOC (ppm ¹)	0	0	3	0	0	0	0
O ₂ (%)	20.9	20.4	20.4	20.6	20.5	20.3	20.9
LEL (%)	0	0	0	0	0	0	0
CO ₂ (%)	0	0	0	0	0	0	0.2
CH ₄ (%)	0	0	0	0	0	0	0
ATM pressure MM Hg	29.76	30.20	29.9	29.9	29.35	29.7	29.7

¹ – As measured using a photoionization detector (PID)

Table 2-4**GV-4 Landfill Gas Monitoring Results**

	April 1998	October 1998	April 1999	October 1999	April 2000	October 2000	May 2001
VOC (ppm ¹)	0	0	0	0	0	0	0
O ₂ (%)	20.8	20.4	20.5	20.9	20.5	20	20.8
LEL (%)	0	0	0	0	0	0	0
CO ₂ (%)	0	0	0	0	0	0	0
CH ₄ (%)	0	0	0	0	0	0	0
ATM pressure MM Hg	29.76	30.20	29.9	29.9	29.35	29.7	29.7

¹ – As measured using a photoionization detector (PID)

2.1.7 Five-Year Review Findings**2.1.7.1 Interviews**

Informal interviews were conducted with Mr. Tom Strunk, former Base Environmental Coordinator (BEC) for the Sudbury Training Annex. During the interviews, Mr. Strunk explained the basis for the source control (SC) actions undertaken at AOC A7, as well as the concurrent removal actions at AOCs A1, A2, A9, P2, P16, P23, P28, P39, and P41. He confirmed that as a result of the SC and removal actions, no residual contamination remains at any of the eight sites described above, which would pose a threat to human health or the environment. He also indicated that none of the other AOCs mentioned in this five-year review had ongoing O&M activities or residual contamination posing unacceptable risk to human health or the environment. No formal interviews were conducted.

2.1.7.2 Site Inspection and Institutional Controls

Personnel from CENAE inspected the Sudbury Training Annex Landfill at AOC A7 on 20 April and 27 October 1998, 19 April and 5 October 1999, 5 April and 31 October 2000, and 14 May 2001. Institutional controls required by the Long-term Monitoring and Maintenance Plan (LTMMP) are the security fence, access road and monitoring well casings and locks. The security fence is free of damage, breaches and is secure. Repairs were made to the access road to eliminate potholes and rutting during October 1999. Monitoring well casings are free of damage.

In addition, another institutional control that includes AOC A7, was placed in 2000. In the Memorandum of Agreement (MOA) between the ARMY and the USFWS dated 28 September 2000, a Site-Wide Institutional Control (IC) dealing with OE is discussed. It states, "The USFWS acknowledges that the ARMY has informed it that as of the Date of Transfer, the subsurface soil below the depth of 4-ft on the Transfer Parcel may contain OE or OE-related material as a result of past Army activities on the Transfer Parcel. The USFWS covenants on behalf of itself and its successors and assigns that except as provided herein, no activity or use shall be undertaken on the Transfer Parcel that might disrupt or otherwise negatively impact the subsurface soil below the depth of 4-ft. Such prohibited activities and uses shall include any disturbance of the subsurface soil below the depth of 4-ft in any manner, including but not limited to construction activities such as filling, drilling, excavation or change of topography."

Also in the 28 September 2000 MOA between the ARMY and the USFWS, an arsenic related IC is acknowledged. This is discussed in more detail with SA P28, in Section 2.7.

WESTON performed a Site Inspection on AOC A7 May 8, 2001 to observe current site conditions, (see Appendix C for Site Inspection Checklist). Pictures were taken of the Sudbury Training Annex Landfill at AOC A7 during the Site Inspection, see Figures 5 through 20. There are several tears to the toe drain but, based on a conversation with Ms. Heather Rausch from CENAE, that does not appear to be a concern due to the subcontractor use of extra materials in construction of the toe drain.

Based on site inspections/interviews the institutional controls are still in place and are still protective and no violations have been recorded.

2.1.7.3 Changes to Standards and To Be Considered

No changes to applicable or relevant and appropriate requirements (ARARs) or to be considereds have occurred since the implementation of the remedies for A1, A2, A7, A9, P2, P16, P23, P28, P39, and P41.

2.1.7.4 Changes in Exposure Pathways, Toxicity and Other Contaminant Characteristics

There have been no changes in site-specific assumptions regarding the exposure pathways, toxicity, or other characteristics of the contaminants of concern listed in the Record of Decision (ROD) for A7 and A9 (OHM, September 1995).

2.1.7.5 Data Review

As described in previous subsections, 15 groundwater wells at AOC A7 have been monitored on a semi-annual basis over the last four years. A total of 8 sampling rounds have been completed as of May 2001. Landfill gas data indicate the production of landfill gas at rates that would be expected, given the volume and type of waste buried, and the nature of the cap and surrounding media. The data does not indicate any increased production of landfill gas.

Groundwater data has been compared to Massachusetts' standards and are more stringent than USEPA MCLs. The eight rounds of O&M monitoring conducted to date have been compared to MADEP MCP Method 1 GW-1 Standards, per the CENAE LTMMP (CENAE, 1998). Tables 2-5 through 2-9 and Figures 22 through 28, provide a summary of monitor well data for all wells and analytes for which MCP Method 1 GW-1 Standards have been exceeded during the course of O&M monitoring. Monitoring well data from 1992/93 (See the *Year 2000 O&M Annual O&M Report* by CENAE) through the present indicate that for the majority of the detected contaminants, groundwater concentrations following installation of the cap are not significantly different from those before installation, or at the time of installation, depending on when the particular well was installed.

However groundwater concentrations of several contaminants have increased slightly, or have remained at levels exceeding applicable standards as discussed below.

- Trichloroethylene (TCE) consistently has been reported in wells OHM-A7-M51, M52, M61, and M63 over all eight monitoring rounds conducted since cap installation. TCE was found in groundwater during the RI and also is a degradation product of tetrachloroethene (PCE). It has been consistently detected at levels exceeding the Method 1 GW-1 standard of 5 micrograms per liter ($\mu\text{g/L}$) in wells M61 and M63, and has slightly increased from 25 $\mu\text{g/L}$ in October 1997 to 37 $\mu\text{g/L}$ in October 2000. In general, higher results have been reported during fall sampling events (low water), although the differences, and the gradual increase may not be significant.
- 1,1,2,2 Tetrachloroethane (1,1,2,2, PCA) has been consistently reported in wells OHM-A7-M51, M52, M61, and M63 over all eight monitoring rounds conducted since cap installation. This is not a degradation product of PCE, but is a common laboratory solvent and may have been disposed at AOC A7. Source materials (lab wastes) for this contaminant have been removed from the site.
- 1,2-Dichloroethane (1,2 DCA) has been consistently reported in well M63 over all eight monitoring rounds conducted since cap installation. This is a common chlorinated solvent that could have resulted from research lab waste materials. Source materials (lab waste) for this contaminant have been removed from the site.

In addition, concentrations of lindane, 1,1-Bis(4-Chlorophenyl)-2,2 Dichloroethane (DDD), DDT, and thallium have been observed above MCP standards at one or more times over the course of O&M monitoring. PCE concentrations in well OHM-A7-8 have exceeded the MCP Method 1 GW-1 standard of 5 $\mu\text{g/L}$ consistently, with a high of 140 $\mu\text{g/L}$ in October 1997, and a low of 43 $\mu\text{g/L}$ in April 2000. There is no apparent increasing or decreasing trend in these concentrations. Some seasonal fluctuations have been noted.

For all contaminants, it is evident that contaminant plumes extend from beneath the middle of the landfill at well OHM-A7-8 (See Figure 4) to the furthest downgradient well, closest to the Assabet River (OHM-A7-M63 – See Figure 4).

2.1.7.6 Assessments

Assumptions used to select and implement the remedial action at AOC A7 (including consolidation of materials from other study areas onto the AOC A7 landfill), appear to remain valid.

These assumptions include assessments regarding:

- contaminant toxicity, and mobility,
- exposure pathways and land and groundwater use,
- groundwater and surface water flow regime, and
- rainwater infiltration through the cap, and subsequently through the unsaturated waste.

The remedy appears to be functioning as intended by the ROD, in that concentrations of groundwater contaminants of concern (COCs) have not significantly increased in the eight rounds of sampling following installation of the cap. For those AOCs whose waste materials were consolidated at the AOC A7 landfill (A1, A2, A9, P2, P16, P23, P28, P39, and P41), no residual contamination remains, which would pose unacceptable risk to human health and the environment.

2.1.7.7 Deficiencies

No deficiencies were noted, however some groundwater standards are slightly elevated above applicable standards. All institutional controls were observed to be in place and were functioning as designed.

2.1.7.8 Recommendations and Follow-up Actions

The persistence of the pre-remedial action COCs at levels exceeding the MCP Method 1 GW-1 standards, suggest that further actions at the site may be required. These actions may include:

- Continued semiannual groundwater monitoring; using the 13 well network associated with the landfill at AOC A7. The analyte list should remain the same as for previous rounds.
- Continued inspections and assessments of the integrity of the institutional controls.
- Continued semi-annual gas monitoring of 4 Passive gas vents.

**TABLE 2-5
Sudbury Training Annex Five Year Review Report
Groundwater Monitoring Well OHM-A7-8 Hits Table**

Well ID/Screened interval OHM-A7-8/20.6-35.6 ft

Compound	GW-1 µg/L	GW-2 µg/L	AWQC µg/L	Oct-97		Apr-98		Oct-98		Apr-99		Oct-99		Apr-00		Oct-00		May-01	
				GW Elevation ft msl	Result µg/L														
				Chloroform	5	400	5.7	196.41	4	195.81	ND	194.84	ND	195.5	ND	194.21	ND	196.56	ND
1,2-Dichloroethane	5			196.41	ND	195.81	ND	194.84	ND	195.5	ND	194.21	ND	196.56	ND	193.51	ND	195.96	ND
Tetrachloroethene	5	3000	0.8	196.41	140	195.81	96	194.84	130	195.5	94	194.21	91	196.56	43	193.51	71E	195.96	40
1,1,2,2-Tetrachloroethane	2	20	0.17	196.41	ND	195.81	ND	194.84	ND	195.5	ND	194.21	ND	196.56	ND	193.51	ND	195.96	ND
Trichloroethene	5	300	2.7	196.41	0.8	195.81	ND	194.84	ND	195.5	ND	194.21	ND	196.56	ND	193.51	2.4	195.96	0.67J
Lindane	0.2	N/A	0.019	196.41	ND	195.81	15	194.84	14	195.5	12	194.21	6.7	196.56	9.6	193.51	5.1J	195.96	ND
DDD	0.1	N/A	0.00083	196.41	0.35	195.81	<5	194.84	<5.6	195.5	0.3J	194.21	<5	196.56	0.28J	193.51	<2	195.96	0.86J
DDT	0.3	N/A	0.00059	196.41	0.24	195.81	ND	194.84	ND	195.5	ND	194.21	ND	196.56	ND	193.51	ND	195.96	0.19J
Lead	15	N/A	2.5	196.41	450	195.81	17	194.84	10	195.5	8.7	194.21	10J	196.56	11	193.51	5.8	195.96	10
Thallium	2	N/A	1.7	196.41	ND	195.81	<30	194.84	<1	195.5	<10	194.21	<10	196.56	3.5J	193.51	<10	195.96	ND
Naphthalene	20	6000	N/A	196.41	37	195.81	3.6	194.84	28	195.5	12	194.21	15	196.56	ND	193.51	9.2J	195.96	1.5J

J= Estimated Value (based on data evaluation of laboratory results)
 B= Analyte was also present in the method blank
 U= Analyte not detected at or above reporting limit
 E= Compound was detected beyond the calibration range
 N/D= Not detected
 N/A= Not Applicable

**TABLE 2-6
Sudbury Training Annex Five Year Review Report
Groundwater Monitoring Well OHM-A7-51 Hits Table**

Well ID/Screened Interval OHM-A7-51/ 7.6-22.6 ft

Compound	GW-1 µg/L	GW-2 µg/L	AWQC µg/L	Oct-97		Apr-98		Oct-98		Apr-99		Oct-99		Apr-00		Oct-00		May-01	
				GW Elevation ft msl	Result µg/L														
Chloroform	5	400	5.7	177.98	8	181.59	4.2	180.31	2.2	180.73	2.3 B	180.52	3.2	182.5	1.6	178.83	<1.1	180.93	ND
1,2-Dichloroethane	5			177.98	ND	181.59	ND	180.31	ND	180.73	ND	180.52	ND	182.5	ND	178.83	<1	180.93	ND
Tetrachloroethene	5	3000	0.8	177.98	20	181.59	7.3	180.31	8.4	180.73	7.9	180.52	13	182.5	8.3	178.83	6.8	180.93	2.1J
1,1,2,2-Tetrachloroethane	2	20	0.17	177.98	29	181.59	11	180.31	9	180.73	6.5	180.52	19	182.5	7.7	178.83	4.9	180.93	1J
Trichloroethene	5	300	2.7	177.98	10	181.59	4.1	180.31	3.8	180.73	3	180.52	4.4	182.5	2.6	178.83	2.7	180.93	0.62J
Lindane	0.2	N/A	0.019	177.98	0.17	181.59	0.27	180.31	0.59	180.73	0.29	180.52	0.42	182.5	0.25	178.83	0.37	180.93	0.078
DDD	0.1	N/A	0.00083	177.98	ND	181.59	<.10	180.31	<.11	180.73	<0.1	180.52	<0.1	182.5	<0.1	178.83	<0.1	180.93	1J
DDT	0.3	N/A	0.00059	177.98	ND	181.59	<.10	180.31	<.11	180.73	0.1J	180.52	<0.1	182.5	<0.1	178.83	<0.1	180.93	1J
Lead	15	N/A	2.5	177.98	ND	181.59	<3	180.31	<1	180.73	18	180.52	<5	182.5	<5	178.83	<5	180.93	ND
Thallium	2	N/A	1.7	177.98	ND	181.59	<10	180.31	<1	180.73	<10	180.52	<10	182.5	<10	178.83	<10	180.93	ND
Naphthalene	20	6000	N/A	177.98	1	181.59	<1	180.31	<1	180.73	<1	180.52	<1	182.5	<1	178.83	<1	180.93	ND

J= Estimated Value (based on data evaluation of laboratory results)
 B= Analyte was also present in the method blank
 U= Analyte not detected at or above reporting limit
 E= Compound was detected beyond the calibration range
 N/D= Not detected
 N/A= Not Applicable

TABLE 2-7
Sudbury Training Annex Five Year Review Report
Groundwater Monitoring Well OHM-A7-52 Hits Table

Well ID/Screened interval OHM-A7-52/ 6.7-21.7 ft

Compound	GW-1 µg/L	GW-2 µg/L	AWOC µg/L	Oct-97		Apr-98		Oct-98		Apr-99		Oct-99		Apr-00		Oct-00		May-01	
				GW Elevation ft msl	Result µg/L														
Chloroform	5	400	5.7	179.19	3	184.47	1.3	182.88	1.1	184.32	<1	183.37	0.82J	183.87	<1	179.97	<1	184.33	0.78J
1,2-Dichloroethane	5			179.19	2	184.47	ND	182.88	ND	184.32	ND	183.37	ND	183.87	ND	179.97	ND	184.33	ND
Tetrachloroethene	5	3000	0.8	179.19	9	184.47	4.6	182.88	4.1	184.32	2.2	183.37	3.8	183.87	3.2	179.97	3.6	184.33	6.1J
1,1,2,2-Tetrachloroethane	2	20	0.17	179.19	14	184.47	3.6	182.88	4.2	184.32	1.4	183.37	3.4	183.87	2.1	179.97	2.8	184.33	5.2J
Trichloroethene	5	300	2.7	179.19	14	184.47	2.5	182.88	1.8	184.32	1.1	183.37	1.1	183.87	1.7	179.97	1.9	184.33	1.6J
Lindane	0.2	N/A	0.019	179.19	0.086	184.47	0.15	182.88	0.085	184.32	0.082	183.37	0.1	183.87	0.085	179.97	0.11	184.33	0.26
DDD	0.1	N/A	0.00083	179.19	ND	184.47	<.10	182.88	<.11	184.32	<0.1	183.37	<0.1	183.87	<0.1	179.97	<0.1	184.33	1J
DDT	0.3	N/A	0.00059	179.19	ND	184.47	<.10	182.88	<.11	184.32	<0.1	183.37	<0.1	183.87	<0.1	179.97	<0.1	184.33	1J
Lead	15	N/A	2.5	179.19	ND	184.47	<3	182.88	<1	184.32	<5	183.37	<5	183.87	<5	179.97	<5	184.33	ND
Thallium	2	N/A	1.7	179.19	ND	184.47	<10	182.88	<1	184.32	3.5J	183.37	<10	183.87	<10	179.97	<10	184.33	ND
Naphthalene	20	6000	N/A	179.19	ND	184.47	<1	182.88	<1	1874.32	<1	183.37	<1	183.37	<1	179.97	<1	184.33	ND

J= Estimated Value (based on data evaluation of laboratory results)
B= Analyte was also present in the method blank
U= Analyte not detected at or above reporting limit
E= Compound was detected beyond the calibration range
N/D= Not detected
N/A= Not Applicable

TABLE 2-8
Sudbury Training Annex Five Year Review Report
Groundwater Monitoring Well JO-A07-M61 Hits Table

Well ID/Screened Interval JO-A07-M61/ 1-6 ft

Compound	GW-1 µg/L	GW-2 µg/L	AWQC µg/L	Oct-97		Apr-98		Oct-98		Apr-99		Oct-99		Apr-00		Oct-00		May-01	
				GW Elevation ft msl	Result µg/L														
Chloroform	5	400	5.7	176.44	6	179.73	<1 J	178.59	<1	178.94	<1	178.59	<1	179.97	<1	177.34	<1	178.80	ND
1,2-Dichloroethane	5			176.44	ND	179.73	ND	178.59	ND	178.94	ND	178.59	ND	179.97	ND	177.34	ND	178.80	ND
Tetrachloroethene	5	3000	0.8	176.44	12	179.73	1.1 J	178.59	3.1	178.94	3.5	178.59	3	179.97	1.5	177.34	3.6	178.80	1.2
1,1,2,2-Tetrachloroethane	2	20	0.17	176.44	21	179.73	1 J	178.59	1.6	178.94	2.3	178.59	2.2	179.97	1	177.34	2.6	178.80	1.2
Trichloroethene	5	300	2.7	176.44	3	179.73	<1 J	178.59	<1	178.94	<1	178.59	<1	179.97	<1	177.34	0.47J	178.80	ND
Lindane	0.2	N/A	0.019	176.44	0.26	179.73	<.05	178.59	0.13	178.94	0.92	178.59	0.16	179.97	0.66	177.34	0.16	178.80	0.056
DDD	0.1	N/A	0.00083	176.44	ND	179.73	<.10	178.59	<.12	178.94	<0.1	178.59	<0.1	179.97	<0.1	177.34	<0.1	178.80	1J
DDT	0.3	N/A	0.00059	176.44	ND	179.73	<.10	178.59	<.12	178.94	<0.1	178.59	<0.1	179.97	<0.1	177.34	<0.1	178.80	1J
Lead	15	N/A	2.5	176.44	ND	179.73	<3	178.59	<1	178.94	<5	178.59	<5	179.97	<5	177.34	<5	178.80	ND
Thallium	2	N/A	1.7	176.44	ND	179.73	<10	178.59	<1	178.94	<10	178.59	<10	179.97	<10	177.34	<10	178.80	ND
Naphthalene	20	6000	N/A	176.44	2	179.73	<1 J	178.59	<1	178.94	<1	178.59	<1	179.97	<1	177.34	<1	178.80	ND

J= Estimated Value (based on data evaluation of laboratory results)

B= Analyte was also present in the method blank

U= Analyte not detected at or above reporting limit

E= Compound was detected beyond the calibration range

N/D= Not detected

N/A= Not Applicable

TABLE 2-9
Sudbury Training Annex Five Year Review Report
Groundwater Monitoring Well J0-A07-M63 Hits Table

Well ID/Screened interval J0-A07-M63/ 2-7 ft

Compound	GW-1 µg/L	GW-2 µg/L	AWQC µg/L	Oct-97		Apr-98		Oct-98		Apr-99		Oct-99		Apr-00		Oct-00		May-01	
				GW Elevation ft msl	Result µg/L														
Chloroform	5	400	5.7	175.85	0.6	177.06	2.8 J	176.24	2.5	176.47	1.5 B	176.26	1.4	177.39	1.4	176.14	<1	176.48	ND
1,2-Dichloroethane	5			175.85	6	177.06	6.7 J	176.24	5.9	176.47	6.7	176.26	4.6	177.39	2.7	176.14	5.3	176.48	1
Tetrachloroethene	5	3000	0.8	175.85	21	177.06	28 J	176.24	32	176.47	30	176.26	24	177.39	17	176.14	25	176.48	40
1,1,2,2-Tetrachloroethane	2	20	0.17	175.85	26	177.06	20	176.24	31	176.47	23	176.26	22	177.39	12	176.14	20	176.48	12
Trichloroethene	5	300	2.7	175.85	25	177.06	<1 J	176.24	36	176.47	36	176.26	30	177.39	21	176.14	37	176.48	17
Lindane	0.2	N/A	0.019	175.85	0.31	177.06	<.05	176.24	0.38	176.47	0.32	176.26	0.33	177.39	0.22	176.14	<.05	176.48	ND
DDD	0.1	N/A	0.00083	175.85	<.1	177.06	<.12	176.24	<.1	176.47	<.1	176.26	<.1	177.39	<.1	176.14	<.1	176.48	1J
DDT	0.3	N/A	0.00059	175.85	<.1	177.06	<.12	176.24	<.1	176.47	<.1	176.26	<.1	177.39	<.1	176.14	<.1	176.48	1J
Lead	15	N/A	2.5	175.85	ND	177.06	<3	176.24	<.1	176.47	3.9 J	176.26	<5	177.39	1.9 J	176.14	<0.05	176.48	ND
Thallium	2	N/A	1.7	175.85	ND	177.06	<10	176.24	<.1	176.47	<10	176.26	<10	177.39	<10	176.14	<10	176.48	ND
Naphthalene	20	6000	N/A	175.85	1	177.06	<1 J	176.24	<.1	176.47	<.1	176.26	<.1	177.39	<.1	176.14	<.1	176.48	ND

J= Estimated Value (based on data evaluation of laboratory results)
B= Analyte was also present in the method blank
U= Analyte not detected at or above reporting limit
E= Compound was detected beyond the calibration range
ND= Not detected
N/A= Not Applicable

2.1.7.9 Protectiveness Statement

The selected remedy (Landfill Capping and Consolidation and O&M Groundwater Monitoring) for AOC A7, appears to be protective for current land and groundwater use. However, continued monitoring, as described above is required to determine whether the selected remedy will remain protective. Based on site inspections and interviews with the USFWS and the Army, all of the institutional controls are still in place at the Sudbury Training Annex and are still protective. No violations of any of the institutional controls have been recorded.

2.1.7.10 Next Five Year Review

AOC A7 contains groundwater contamination above levels that would allow for unrestricted use and therefore the NCP, 40 CFR 430 (f) (4) (ii), requires five-year reviews. The next review should be performed within five years of completion of this review. The completion date is the date on which USEPA issues its letter to the Army either concurring with its findings, or documenting reasons for non-concurrence. The next five-year review should be conducted on site AOC A7 and to determine if all of the ICs implemented by the BRAC transfer process are still protective.

2.2 AOC A1-DECONTAMINATED MUSTARD AREA

2.2.1 Site Location and Description

AOC A1 is located near the northern border of the Annex in Maynard, approximately 2,200-ft southeast of the Green Meadow Elementary School (E&E 1994). The site is bounded on the north by Patrol Road, on the south and west by Taylor Brook, and is accessed by a dirt road that diverges southwest from Patrol Road. The dirt road continues southwest approximately 100-ft and terminates in a clearing.

2.2.2 History of Contamination

Area A1 is the site of a former research and development project and experiments performed by the Natick Labs and included the flame testing of clothing and equipment, field testing of foamed

plastics, determining the effect of toxic fumigants on insects, and determining the stability of various fungicides in materials (WESTON 1997). The Sudbury Training Annex was utilized for this type of research by the Natick Labs between 1962 and 1982. During this time, experiments were performed to determine the absorptive properties of clothing using mustard agent. Approximately 50% of the clothing (one to two dozen bags) used in this experimentation was reportedly disposed of by burial at AOC A1. It was also estimated that approximately 90 cubic centimeters of mustard agent might have been expended during test activities.

2.2.3 Contaminants

In 1995, ABB Environmental Services, Inc. (ABB) conducted human health and ecological preliminary risk evaluations (PREs) for the surface soil at AOC A1. The PRE, using conservative assumptions, concluded that metal contaminants in surface soils at AOC A1 could present a threat to human or ecological receptors through direct contact with or ingestion of the soil. The metals contamination was isolated in a single surface soil sample where a drum was located during the OHM investigations. An additional drum was found during the E&E 1994 site investigation.

2.2.4 Remedy Selection

Stone & Webster (S&W) conducted an Engineering Evaluation/Cost Analysis (EE/CA) that described the recommended removal action at AOC A1. The removal of the contaminated soil at the drum location, found during the OHM investigation, was recommended to remove the source of inorganic contamination and reduce the potential risks associated with exposure to this sample location. It was also recommended that the drum discovered during the Ecology & Environment, Inc. (E&E) investigation be removed and any soil associated with it to reduce potential human or ecological risks at this location. The soil that was excavated was to be used as subgrade at the AOC A7 Landfill Cap.

2.2.5 Remedial Actions

Two empty 55-gallon drums were removed from the site in 1996. Approximately 38 cubic yards (yd³) Contaminated soils were removed from AOC A1 and consolidated as part of the

subgrade beneath the AOC A7 landfill cap. Clean-up goals for AOC A1 were 30 milligrams per kilogram (mg/kg) for copper, 50 mg/kg for lead, 500 mg/kg for manganese, and 40 mg/kg for zinc. These were determined from residential exposure risk-based screening values. Soils were excavated until confirmation sample results were below clean-up goals. The AOC A1 excavations were subsequently backfilled with fill from AOC P22 in 1996.

Remedial actions were conducted at this site to ensure that hazardous substances, pollutants, contaminants, or oil did not remain at levels that would not be protective of human health and the environment. This property was transferred from the Army to the USFWS in September 2000. As part of the property transfer documentation, the MOA between the ARMY and the USFWS dated 28 September 2000 includes institutional controls to notify the USEPA if the use of the land is to be changed from recreational and wildlife refuge.

2.3 AOC A2-DEMOLITION GROUND I

2.3.1 Site Location and Description

AOC A2 is located near the northern border of the Annex, approximately 1,000-ft west of Site A1 and 300-ft south of Patrol Road (E&E 1994). The site is bordered on the north by Patrol Road, on the east by Taylor Brook, and is accessed by a dirt road that diverges either southwest from Patrol Road or north from Puffer Pond.

The majority of Site A2 is encircled by the dirt access road, which divides in two for approximately 800-ft, creating an oval shaped parcel of land. A 10-ft³ square-shaped concrete pad (former Building T413), bordered by two semi-circular, 8-ft earthen berms is located in the southern portion of the parcel. A 10-ft³ building (Building T413A) is built into the embankment of a depression and covered with soil located north of the parcel. A 25-ft high steel observation tower is located northeast of the parcel.

2.3.2 History of Contamination

AOC A2 was used from 1942 to 1955 for the destruction of reject ammunition, mortars, and rockets (WESTON 1997). Building T413 was built in 1952 and Building T413A and the semi-circular earthen berms were built by 1955.

Building T413, designated as an instrument house, and Building T413A, designated as a personnel bunker, were assigned to the Watertown Arsenal according to records dated 1959. A 1967 facility map indicated AOC A2, along with the eastern portion of the Sudbury Training Annex, as being assigned to Natick Labs. From 1969 through 1978, Building T413A was identified as an equipment storage building. In late 1969, the USAF Cambridge Research Laboratory (USAFCL) requested and was granted use of AOC A2 and Building T413 as an area to test explosive-activated, rocket nose cone ejection devices and as a storage area for explosives. Testing reportedly consisted of detonating several 2-ft strips of cyclotrimethylenetetranitramine (RDX) fixed against an aluminum nose cone. Testing did not include rocket launching. It is unknown if the USAFCL utilized this area for the full length of their five-year lease.

2.3.3 Contaminants

In 1995, ABB conducted human health and ecological PREs for the surface soil at AOC A2. The PRE, using conservative assumptions, concluded that contaminants in surface soils at AOC A2 could present a threat to human or ecological receptors through direct contact with or ingestion of the soil. The inorganic contamination at AOC A2, with the exception of a lead hot spot, was generally isolated to two surface soil samples (located next to each other in the berm area) suggesting that this contamination is not representative of the overall study area conditions. With the exception of these two locations, potential exposures to contaminant levels at other locations across the site were deemed unlikely to be associated with unacceptable risks to human and ecological receptors. The PRE concluded that the lead hot spot should be removed to address the primary contributors to potential human health and ecological risks at the site. In addition, the PRE concluded that the two hot spots with cadmium, cyclotetramethylenetetranitramine (HMX), and PCB Aroclor-1254 (found in exceedance of

human health screening values) should also be removed to address the primary contributors to potential human health and ecological risks at the site.

2.3.4 Remedy Selection

S&W conducted an EE/CA in 1995 that described the removal action at AOC A2. Removal of the contaminated soil in the above referenced locations was recommended to remove the source of contamination at AOC A2 and reduce the potential risks associated with exposure to these locations.

2.3.5 Remedial Actions

Approximately 150 yd³ of contaminated soils were removed and consolidated as part of the subgrade beneath the AOC A7 landfill cap in 1996. Confirmatory soil sample results were below the clean-up levels indicating that the clean-up goals for AOC A2 were achieved. The areas were backfilled with fill from P22 in 1996.

Remedial actions were conducted at this site to ensure that hazardous substances, pollutants, contaminants, or oil did not remain at levels that would not be protective of human health and the environment. Clean up goals for AOC A2 were 30 mg/kg for copper, 40 mg/kg for zinc, 52 mg/kg for camphor, 3.5 mg/kg for antimony, 2 mg/kg for cadmium, and 5.8 mg/kg for HMX. These were determined from residential exposure risk-based screening values. This property was transferred from the Army to the USFWS in September 2000. As part of the property transfer documentation, the MOA between the ARMY and the USFWS dated 28 September 2000 includes institutional controls to notify the USEPA if the use of the land is to be changed from recreational and wildlife refuge.

2.4 AOC P2-BUILDING T267 FUEL SPILLS

2.4.1 Site Location and Description

AOC P2 is situated on the southeastern side of Patrol Road about 2,000-ft northeast from the main gate of the Annex (E&E 1994). This aluminum building stands in a cleared area. Two large openings exist on the northern side of the structure.

2.4.2 History of Contamination

AOC P2 was identified in a Fort Devens memorandum. Interviews with former and current employees of Natick Labs described numerous small spills in the area (WESTON 1997). Building T267 was built in 1960, and was used for the repair and storage of motor vehicles and engineering equipment. The building was referred to as Building T467 through the late 1960s when its designation was changed to Building T267. Property records indicated that the building was used for engineering and maintenance purposes.

2.4.3 Contaminants

AOC P2 soils within the Building had elevated levels of pesticides and PCBs. Soils exterior to the building were determined to have elevated levels of pesticides and metals.

2.4.4 Remedy Selection

S&W conducted an EE/CA that described the removal action at AOC P2. Removal of the contaminated soil in the above referenced locations was recommended to remove the source of contamination at AOC P2 and reduce the potential risks associated with exposure to these locations.

2.4.5 Remedial Actions

A 5-gallon container of the pesticide Malathion was spilled on the dirt floor inside the building. This spill was cleaned up immediately by removing soil to a depth of 6-inches below the visible stain (OHM, 1994). Analysis of the soil, after the excavation was done in 1988, indicated only 0.062 milligrams per gram ($\mu\text{g/g}$) of Malathion (OHM, 1994).

Building T267 was demolished in 1996. Metal debris from the demolition was transported to Prolerized of New England located in Everett, Massachusetts. Wood debris was transported to Wood Waste of Boston located in Everett, Massachusetts. Concrete from the footings and floor slab was pulverized and disposed of beneath the AOC A7 landfill cap in 1996.

Approximately 693 yd³ of contaminated soils were removed and consolidated as part of the subgrade beneath the AOC A7 landfill cap in 1996. Confirmatory soil sample results were below the clean-up levels for all site COCs indicating that the clean-up goals for AOC A2 were achieved. The clean up goals were determined from residential exposure risk-based screening values. The areas were backfilled with fill from P22 in 1996.

Remedial actions were conducted at this site to ensure that hazardous substances, pollutants, contaminants, or oil did not remain at levels that would not be protective of human health and the environment. This property was transferred from the Army to the USFWS in September 2000. As part of the property transfer documentation, the MOA between the ARMY and the USFWS dated 28 September 2000 includes institutional controls to notify the USEPA if the use of the land is to be changed from recreational and wildlife refuge.

2.5 AOC P16-BUNKERS 302,306, AND 309

2.5.1 Site Location and Description

AOC P16 is located in the north central part of the Sudbury Training Annex on slightly higher ground between a wetland on the west and Puffer Pond to the east (E&E 1994). AOC P16 consists of three bunkers (302, 306, and 309) that are located 800 ft west of Puffer Pond along a dirt road which, in this area, runs parallel to Puffer Pond Road. The three bunkers are surrounded by forest and their entrances face the direct road. Surface elevations range from approximately 195-ft above mean sea level (amsl) at Bunker 309 to over 200-ft amsl at Bunker 302. Depth to groundwater is estimated to be less than 16-ft below ground surface (bgs). Surface water flows from the site to the northwest to the wetland and east toward Puffer Pond.

2.5.2 History of Contamination

Bunkers 302, 306, and 309 were constructed during the early 1940s as part of the ammunition storage activities of the Maynard Ordnance Depot (OHM 1994). The bunkers have been used by Natick Labs as storage and may have been used to store waste chemicals collected at Natick Labs prior to dumping on site. An inspection of the bunkers in 1990 showed that Bunker 302

contained stacks of empty wooden pallets, Bunker 306 contained sheet metal ductwork and heat exchangers, and Bunker 309 contained surplus packaged foods and food preparation equipment.

2.5.3 Contaminants

A Phase I investigation was conducted by OHM in 1994. Soil samples were collected near the three bunker locations and were laboratory analyzed. Concentrations of pesticides and polycyclic aromatic hydrocarbons (PAHs) were detected at levels exceeding risk-based levels in soils at Bunkers 306 and 309. SVOCs were detected in a soil sample collected at a former drum location between Bunkers 306 and 309.

E&E conducted a Phase II investigation of AOC P16 in 1994 by sampling soils along the drainage pathways from the bunkers. Arsenic and SVOCs were detected above screening levels in the soil samples.

In 1995, ABB conducted a Supplemental Site Investigation (SSI) consisting of additional sampling to characterize the lateral distribution of analytes in the surface soil; to determine whether subsurface soil had been affected; to determine the source of the analytes; and to evaluate the groundwater quality and aquifer conditions. Surface soil samples results exhibited DDT, DDD, and DDE at concentrations above background levels in soils located near Bunkers 302, 306, and 309. The SSI included human health and ecological PREs. The PREs concluded that the human receptors potentially exposed to isolated areas of PAH and pesticide surface soil contamination in the vicinity of the bunkers may be at risk, but exposure to average site PAH and pesticide soil concentrations did not pose a substantial risk. Exposure to average concentrations of soil pesticides contamination to terrestrial vertebrate receptors does not pose a substantial risk and populations of these receptors were likely to be unaffected. The PRE concluded that it was unlikely that these analytes posed a substantial risk to plant or invertebrate receptors. The SSI recommended that a removal action of the pesticide-contaminated soil be implemented.

2.5.4 Remedy Selection

Remedial Action Alternatives (RAAs) considered were off-site disposal and on-site treatment. However, because costs for both of these options were not economical, further evaluation for off-site disposal, or on-site treatment, were not considered for this removal action.

At the time of the proposed removal action in 1996, additional work was being performed at the Sudbury Training Annex. This work included the construction of a RCRA Subtitle C landfill cap at the AOC A7 Landfill. The construction of the cap required placement of fill in order to achieve the design elevations and grades for the subgrade. As a sandy-gravelly material, the contaminated soil from AOC P16 met the requirements for subgrade fill material. Because it was possible to fill the needs of the landfill cap construction and complete the removal of contaminated soil from AOC P16, a determination was made to remove the soil from AOC P16 and place it in the landfill.

2.5.5 Remedial Actions

In 1994 OHM conducted an investigation of AOC P16, which include removal of an empty 55-gallon drum located between Bunker 306 and 309.

The proposed action for the pesticide-contaminated areas E5 and E6 of AOC P16 was to excavate and remove the soil containing DDD, DDE, and DDT concentrations greater than the site-specific clean-up levels of 2 mg/kg, which is equivalent to MCP GW-1/S-1 standards. The volume of contaminated soil that was excavated was 38 yd³.

The AOC P16 soil removal action took place on August 1, 1996. The soils were loaded directly into dump trucks for transportation to the landfill located at A7. Soils from the two excavation areas were used as fill for the subgrade preparation of the landfill cap. The excavations took place within the established work areas. Site backfilling was completed on 27 August 1996.

Confirmation soil sample results identified no area within the removal action location as containing DDD, DDT or DDE above the clean up goal. Therefore, no further action was recommended for this area.

Remedial actions were conducted at this site to ensure that hazardous substances, pollutants, contaminants, or oil did not remain at levels that would not be protective of human health and the environment. This property was transferred from the Army to the USFWS in September 2000. As part of the property transfer documentation, the MOA between the ARMY and the USFWS dated 28 September 2000 includes institutional controls to notify the USEPA if the use of the land is to be changed from recreational and wildlife refuge.

2.6 AOC P23-BUILDING T465 (DRUMS)

2.6.1 Site Location and Description

AOC P23 is located on the south side of Puffer Road in the central portion of the Annex, and includes Building T465 and a concrete pad near the building (E&E 1994). P23 is on the broad crest of a ridge that slopes southeastward toward the northeastern most bunkers and slopes northwestward across Puffer Road toward Honey Brook.

2.6.2 History of Contamination

AOC P23 was used by the Air Drop Engineering Division of Natick Labs, for aerial delivery testing on the concrete pad and for testing aircraft rollers, (WESTON 1997). AOC P23 was also used by GCA Corporation of Bedford, Massachusetts for optical electronic instrument evaluation in measuring smoke obscuration. Building T465 was constructed in 1960. The building was used by Dames & Moore to store drilling supplies during a 1984 investigation.

2.6.3 Contaminants

A Phase I investigation was conducted by OHM in 1994. The investigation consisted of the removal of two empty 55-gallon drums and confirmatory sampling at each drum location. Pesticides, PAHs and metals were detected in the soils at these locations. Lead was detected at a concentration of 16,000 mg/kg at one of the locations.

A Phase II investigation was conducted by E&E in 1994 and consisted of surface soil sampling around the concrete pad.

Total petroleum hydrocarbons (TPH) were detected at concentrations of 2,300 mg/kg and 15,000 mg/kg in soil samples near Puffer Road. Lead was detected in one soil sample at 320 mg/kg.

A SSI was conducted by ABB in 1995 and consisted of soil sampling for TPH near the concrete pad; sampling for lead in the area of the previously detected lead near the concrete pad; and sampling for lead and arsenic at the former railroad bed. In addition, one 8-ft deep boring was drilled at the railroad bed and was sampled for lead and arsenic.

TPH was detected at 847 mg/kg in one out of six samples collected near the concrete pad. Lead was not detected in the eight samples collected near the concrete pad. Lead was detected above Sudbury Training Annex background levels in six of the twelve samples collected at the former railroad bed. Arsenic was detected above Sudbury Training Annex background levels in ten of the twelve samples collected at the former railroad bed. Arsenic and lead were not detected in the subsurface soils in the boring drilled in the former railroad bed.

ABB's SSI included human health and ecological PREs of AOC P23. The PREs concluded that potential exposures to arsenic and TPH in surface soils may pose a risk to human receptors. Both analytes were detected at concentrations above risk screening values in several locations across AOC P23, although exposures to surface soil at this site would not occur at the magnitude assumed in the risk screening analyses. In addition, the PREs concluded that a potential may exist for inhalation exposures to dusts generated from the sandy soils at this site. Potential exposures to lead on a single surface soil sample may pose a risk to human and ecological receptors. Lead and PAH concentrations throughout the remainder of the site did not pose a substantial risk. The SSI recommended that a removal action of TPH contaminated soil from the south side of Puffer Road be implemented.

2.6.4 Remedy Selection

Remedial action alternatives considered were off-site disposal and on-site treatment. However, because costs for both of these options were not economical, further evaluation for off-site disposal, or on-site treatment, were not considered for this removal action.

At the time of the proposed removal action in 1996, additional work was being performed at the Sudbury Training Annex. This work included the construction of a RCRA Subtitle C landfill cap at the AOC A7 Landfill. The construction of the cap required placement of fill in order to achieve the design elevations and grades for the subgrade. As a sandy-gravelly material, the contaminated soil from AOC P23 met the requirements for subgrade fill material. Since it was possible to fill the needs of the landfill cap construction and complete the removal of contaminated soil from AOC P23, a determination was made to remove the soil from AOC P23 and place it beneath the landfill cap in AOC A7.

2.6.5 Remedial Actions

The proposed action for the TPH contaminated areas E2, E3, and E4 of AOC P23 was to excavate and remove the soil containing TPH concentrations greater than the site-specific clean-up levels of 500 mg/kg. The volume of contaminated soils that were excavated AOC P23 is yd³.

The removal action at AOC P23 took place on 2 August 1996. Soils were loaded directly into dump trucks for transportation to the landfill located at Site A7. Soils from the two excavation areas were used as fill for the subgrade preparation of the landfill cap. The excavations took place within the established work areas. Site backfilling was completed on 28 August 1996.

Confirmation soil sample results identified no area within the removal action location as containing TPH above the clean up goal. Therefore, no further action is recommended for this area.

Remedial actions were conducted at this site to ensure that hazardous substances, pollutants, contaminants, or oil did not remain at levels that would not be protective of human health and the environment. This property was transferred from the Army to the USFWS in September 2000. As part of the property transfer documentation, the MOA between the ARMY and the USFWS dated 28 September 2000 includes institutional controls to notify the USEPA if the use of the land is to be changed from recreational and wildlife refuge.

2.7 AOC P28-ROCKET RANGE

2.7.1 Site Location and Description

AOC P28 is located in the northern section of the southern part of the Sudbury Training Annex (E&E 1994). The southern part of the Sudbury Training Annex is just south of Hudson Road, which divides the Sudbury Training Annex into north and south sections. The AOC P28 location is also situated adjacent to the CFHA, a residential area.

The main corridor consists of an area about 3600-ft long and 100-ft wide and includes a gravel roadway. This area consists of a sandy-gravelly surface that is relatively flat. No vegetation exists along this corridor. The surrounding area contains tall grass and brush, and is moderately forested. AOC P28 is located in the southern portion of the Sudbury Training Annex (south of Hudson Road).

2.7.2 History of Contamination

AOC P28 was described as being used as a rocket range test area (WESTON 1997). Historical aerial photographs and maps show the area was used for railroad car classification, including railroad inspections and car switching operations. Other information suggests that rocket testing took place here. Evidence also indicates that the area has been used recreationally, for such activities as walking, jogging, and dirt biking.

Site investigations suggest that there may have been previous use of herbicides. The application of herbicides was likely performed for railroad and "line-of-sight" maintenance.

2.7.3 Contaminants

A site investigation performed by ABB in 1995 revealed a presence of arsenic in soil, above background levels in the area. Concerned by the levels of contamination, the Massachusetts Department of Environmental Protection (MADEP) requested the performance of an Imminent Hazard Evaluation.

2.7.4 Remedial Actions

An unauthorized removal of soil from AOC P28 occurred in March of 1995. Surface soil in the AOC P28 area was excavated and stockpiled and some was used to fill in a roadway in the area. After learning of this activity, the Fort Devens Environmental Management Office had the stockpiled soil covered and limited access to the area. The incident was reported to the MADEP and the USEPA.

The area of contamination was delineated through sampling efforts by ABB in 1995. The area of AOC P28 designated for removal can be described as a section 100-ft by 250-ft in area with a depth of 4-ft. The excavation and removal was performed by WESTON in August 1996.

Approximately 4,700 yd³ of contaminated soil was removed and consolidated as part of the subgrade at AOC A7 where a landfill cap was being constructed as part of another remedy. The placement of the soil at the site landfill was appropriate in that it allowed for a timely removal, saved costs associated with typical disposal scenarios, and it decreased the need for additional fill required for the construction of the landfill cap. The RCRA Subtitle C landfill cap was completed in November 1996.

Confirmation soil sampling at AOC P28 revealed no residual concentrations of arsenic above the risk-based clean up level of 250 mg/kg for the risk for dirt-bikers in the area. Therefore, the excavation was successful in eliminating the human health risk associated with AOC P28.

Remedial actions were conducted at this site to ensure that hazardous substances, pollutants, contaminants, or oil did not remain at levels that would not be protective of human health and the environment. Arsenic at this site was determined to be a concern within the facility-wide arsenic issue. This property was transferred from the Army to the USFWS in September 2000. As part of the property transfer documentation, the MOA between the ARMY and the USFWS dated 28 September 2000 includes institutional controls to notify the USEPA if the use of the land is to be changed from recreational and wildlife refuge.

2.7.4.1 Site Inspection and Institutional Controls

A site inspection was not conducted for AOC P28. In the MOA between the ARMY and the USFWS, it states, "the USFWS acknowledges that the arsenic-based herbicides were applied in the vicinity of the fence line along Patrol Road and on the former railroad beds on the northern and southern portions of the Sudbury Training Annex, and that the ARMY has concluded, after completing a facility-wide investigation, that the resulting concentrations of arsenic in the soil do not pose an unacceptable risk to human health of the environment based on the future use of the Transfer Parcel as a National Wildlife Refuge. The USFWS covenants on behalf of itself and its successors and assigns that no portion of a 50-ft strip of land on either side of the center of the above-described fence line or former railroad beds shall be used for residential habitation unless the then-owner of the Transfer Parcel can demonstrate to USEPA that such use is consistent with the protection of human health and the environment." This institutional control is valid for all sites along Patrol Road and the former railroad beds on the Annex.

2.7.4.2 Protectiveness Statement

Based on site inspections and interviews with the USFWS and ARMY, all of the institutional controls are still in place at the Sudbury Training Annex and are still protective. No violations of any of the institutional controls have been recorded.

2.8 AOC P39-DUMP AREA

2.8.1 Site Location and Description

AOC P39 is located in the southwestern corner of the installation (E&E 1994). It is accessed by an unpaved road, which diverges northeast from Firehouse Road. The site can also be reached by heading west on a trail or old road behind the weather station at AOC P48. The site consists of a partially cleared area and a dumping ground on sloping terrain on the side of a wetland.

2.8.2 History of Contamination

AOC P39 was identified by OHM as a possible source of contamination during a March 1991 site reconnaissance. Partially buried drums were observed in a swampy section of the area. Metal

pipes, cables, wood, engine parts, glassware, and a crushed drum were some examples of the items included in the refuse at AOC P39 (WESTON 1997).

2.8.3 Contaminants

During the excavation of areas under CERCLA Action Memorandum in 1996, WESTON collected and analyzed field screening soil samples from AOC P39. Field screening and confirmatory samples were collected for PAH only. Samples were found to be below the MCP GW-1/ S-1 standards, therefore it was determined not to require any further action. No removal was required at AOC P39 because sample results collected by WESTON did not detect any contamination above MCP GW-1/S-1 standards.

As part of the property transfer documentation, the MOA between the ARMY and the USFWS dated 28 September 2000 includes institutional controls to notify the USEPA if the use of the land is to be changed.

2.9 AOC P41-BUNKER 303 PESTICIDE STORAGE

2.9.1 Site Location and Description

AOC P41 is located in the north central part of the Sudbury Training Annex, north of Buildings T206 and T267 and 900 ft due west of Puffer Pond (E&E 1994).

2.9.2 History of Contamination

Bunker 303 was constructed prior to 1973 and was used for pesticide and herbicide storage (WESTON 1997). During a 1977 inspection of Bunker 303, approximately three-hundred 50-pound bags of the herbicide Ureabor were observed, some of which had spilled on the bunker floor. During a 1979 inspection, eight 55-gallon drums of 20% DDT/oil solution and approximately seventy 50-pound bags of Ureabor were stored in Bunker 303.

2.9.3 Contaminants

A Phase I investigation was performed by OHM in 1994 and it consisted of the collection of two surface soil samples from AOC P41. The two soil samples were analyzed for VOCs, SVOCs, pesticides, PCBs, metals, explosives, and chlorinated herbicides. DDT and cadmium were detected at concentrations of 30 mg/kg and 55 mg/kg, respectively, which were above established risk-based levels for the Sudbury Training Annex. Several other metals were detected above background concentrations.

A Phase II investigation conducted by E&E in 1994, identified DDT (59 mg/kg), DDD (30 mg/kg) and DDE (3.4 mg/kg) above risk-based screening levels in six surface soil samples. Herbicides and metals detected in the surface soil samples were below risk screening levels.

An SSI conducted by ABB in 1995 consisted of soil sampling in front of the drains and the loading dock of Bunker 303 and the installation of one soil boring at the base of the slope below the northeast drain of Bunker 303. The samples were analyzed for Target Analyte List (TAL) metals and TAL pesticides. DDT, DDD, and DDE were detected at a maximum concentration of 1.7 mg/kg, 0.64 mg/kg, and 0.139 mg/kg, respectively, in some of the surface samples and in the subsurface samples. These concentrations were above Sudbury Training Annex background levels but were below risk-based screening levels.

The SSI included human health and ecological PREs for AOC P41. The PREs concluded that human receptors potentially exposed to average concentrations of DDD and DDT contamination in surface soils at the site may be at risk.

Ecological receptors exposed to isolated areas of pesticide surface soil contamination in the vicinity of the bunkers may be at risk, but exposure to average site pesticide soil concentrations did not pose a substantial risk. Exposure of average concentrations of soil pesticides contamination to terrestrial vertebrate receptors did not pose a substantial risk and populations of these receptors were likely to be unaffected. Some of the DDT and inorganic analyte contamination exceeded plant and invertebrate benchmark values. However, the PRE concluded

that it was unlikely that these analytes posed a substantial risk to plant or invertebrate receptors. The SSI recommended that a removal action of the pesticide-contaminated soil be implemented.

2.9.4 Remedy Selection

Remedial action alternatives considered were off-site disposal and on-site treatment. However, because costs for both of these options were not economical, further evaluation for off-site disposal, or on-site treatment, were not considered for this removal action.

At the time of the proposed removal action, additional work was being performed at the Sudbury Training Annex. This work included the construction of a RCRA Subtitle C landfill cap at the AOC A7 Landfill. The construction of the cap required placement of fill in order to achieve the design elevations and grades for the subgrade. As a sandy-gravelly material, the contaminated soil from AOC P41 met the requirements for subgrade fill material. Since it was possible to fill the needs of the landfill cap construction and complete the removal of contaminated soil from AOC P41, a determination was made to remove the soil from AOC P41 and place it in the landfill.

2.9.5 Remedial Actions

The proposed action for the pesticide-contaminated area E1 of AOC P41 was to excavate and remove the soil containing DDD, DDE, and DDT concentrations greater than the site specific clean-up level of 2 mg/kg for each contaminant, which is based upon MCP GW-1/S-1 standards. The volume of contaminated soil that was excavated for E1 was 89 yd³.

The removal action at AOC P41 took place on 1 August 1996. Soils were loaded directly into dump trucks for transportation to the landfill located at Site A7. Soils from the two excavation areas were used as fill for the subgrade preparation of the landfill cap. The excavations took place within the established work areas. Site backfilling was completed on 28 August 1996 (WESTON 1997).

Confirmation soil sample results identified no area within the removal action location as containing DDD, DDE, or DDT above the clean up goal. Therefore, no further action was recommended for this area.

Remedial actions were conducted at this site to ensure that hazardous substances, pollutants, contaminants, or oil did not remain at levels that would not be protective of human health and the environment. This property was transferred from the Army to the USFWS in September 2000. As part of the property transfer documentation, the MOA between the ARMY and the USFWS dated 28 September 2000 includes institutional controls to notify the USEPA if the use of the land is to be changed from recreational and wildlife refuge.