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Exceeding Expectations
Albany Operations

October 5, 2010

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Ms. Ginny Lombardo
U.S. Environmental Protection Agency
1 Congress Street
Suite 1100 (Mailcode HBT)
Boston, MA 02114-2023

Re: Final 2010 Five-Year Review Report
Former Fort Devens Army Installation, Devens, Massachusetts
Contract Number: W9128F-04-D-0005 and
Contract Number: W911ZLK-05-D-0010

Dear Ms. Lombardo:

On behalf of the United States Army, HydroGeoLogic, Inc. (HGL) is pleased to submit one (1) hard copy of the revised text and one (1) electronic copy with revised text inserts of the Final 2010 Five-Year Review Report for the above referenced contracts at the Former Fort Devens Army Installation. The attached text was revised to correct minor formatting errors, punctuation and page breaks that were discovered after the submittal of the EPA coordination copy of the Five-Year Review Report. The copies that were distributed to the full BCT contained the revised text. There are no substantive changes in the revised version of the text. A copy of the USEPA concurrence letter was also included in binder cover pockets and on the final CD. Please replace text and CD in your copy of previously submitted document.

If you have any questions regarding the enclosed document, please call Mr. Robert Simeone, BRAC Environmental Coordinator at (978) 796-2205 or me at (518) 877-0390.

Sincerely,

Peter I. Dacyk, P.G.
Project Manager

Enclosure

SDMS DocID 471908

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1
5 POST OFFICE SQUARE, SUITE 100
BOSTON, MASSACHUSETTS 02109-3912

September 27, 2010

Mr. Robert Simeone
BRAC Environmental Coordinator
BRAC Environmental Office
30 Quebec Street, Box 100
Devens, MA 01434

Re: **2010 Five Year Review Report for Former Fort Devens Army Installation Devens, Massachusetts**

Dear Mr. Simeone:

EPA has received the final "2010 Five-Year Review Report for Former Fort Devens Army Installation," dated September 2010. EPA reviewed the report for compliance with the Comprehensive Five-Year Review Guidance (OSWER No. 9355.7-03B-P dated June 2001) and to ensure that EPA's comments on the draft and draft final reports were adequately addressed. EPA concurs with the final 2010 Five-Year Review Report and concurs with the protectiveness statements for each of the operable units covered by the report.

The Devens Consolidated Landfill and contributor sites (OU2), South Post Impact Area (OU3), Barnum Road Maintenance Yards, AOC 44 and 52 (OU4), AOCs 32 and 43A (OU5), AOCs 43G and 43J (OU6), AOC 69W (OU7), AOC 50 (OU8), and AOC 57 (OU9) were found to be protective of human health and the environment as implemented and exposure pathways that could result in unacceptable risks are being controlled. The 2010 Five-Year Review includes recommendations and follow-up actions for South Post Impact Area (OU3), AOCs 32 and 43A (OU5), and AOC 50 (OU8), but the recommendations do not affect protectiveness.

The protectiveness statement for the Shepley's Hill Landfill (OU1) site concludes that the remedy currently protects human health and the environment. However, in order for the remedy to be protective in the long-term, several recommendations and follow-up actions set forth in the final 2010 Five-Year Review must be completed.

EPA concurs with the Shepley's Hill Landfill recommendations and all other recommendations in the report and commits to work with the Army to address the recommendations by the milestone dates set forth in the 2010 Five-Year Review Report. EPA applauds the Army's commitment to perform the necessary follow-up actions to

ensure the continued and/or long-term effectiveness of the remedies at the former Fort Devens.

The 2010 Five-Year Review, the third comprehensive Five Year Review completed at the former Fort Devens Army Installation, was triggered by the second comprehensive Five Year Review completed in September 2005. Consistent with Section 121(c) of CERCLA, the next Five-Year Review must be finalized on or before September 30, 2015.

If you have any questions, please contact Ginny Lombardo, Remedial Project Manager, at (617) 918-1754 or at lombardo.ginny@epa.gov.

Sincerely,

for

James T. Owens, III, Director
Office of Site Remediation and Restoration

cc: Ginny Lombardo, EPA
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VOLUME I

2010
FIVE-YEAR REVIEW REPORT
FOR
FORMER FORT DEVENS ARMY INSTALLATION
DEVENS, MASSACHUSETTS

Prepared for:

U.S. Army Corps of Engineers
New England District

Contract No. W9128F-04-D-0005
Delivery Order 501

and

Army Base Realignment and
Closure Division
U. S. Army Garrison Fort Devens

Contract No. W91ZLK-05-D-0010
Delivery Order 0002

September 2010

VOLUME I

2010
FIVE-YEAR REVIEW REPORT
FOR
FORMER FORT DEVENS ARMY INSTALLATION
DEVENS, MASSACHUSETTS

Prepared for
Former Fort Devens Army Installation
Devens, Massachusetts

Prepared by

HydroGeoLogic, Inc.
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313 Ushers Road
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Approved by;

Date:

September 23, 2010

Robert J. Simeone
BRAC Environmental Coordinator – Devens
Army Base Realignment and Closure Division

September 2010

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LIST OF ACRONYMS AND ABBREVIATIONS

AAFES	Army Air Force Exchange Service
ABB-ES	ABB Environmental Services, Inc.
ABC®	Anaerobic BioChem
ACO	Administrative Consent Order
ADAF	age-dependent adjustment factors
AFCEE	Air Force Center for Engineering and the Environment
AFRC	Air Forces Reserve Center
AMSA	Area Maintenance Support Activity
AOC	area of contamination
ARAR	Applicable or Relevant and Appropriate Requirements
AREE	Areas Requiring Environmental Evaluation
Army	U.S. Army
ATP	Arsenic Treatment Plant
AWQC	Ambient Water Quality Criteria
BCT	BRAC Cleanup Team
bgs	below ground surface
BOH	Board of Health
BRAC	Base Realignment and Closure
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAAA	Corrective Action Alternatives Analysis
CAC	Citizen's Advisory Committee
CCC	Criteria Continuous Concentrations
CDR	Covenant Deferral Request
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
cis-1,2-DCE	*cis*-1,2-dichloroethene
CMC	Criteria Maximum Concentrations
CMR	Code of Massachusetts Regulations
COC	contaminants of concern
COD	chemical oxygen demand
Conti	Conti Environmental, Inc.
COPC	contaminants of potential concern
CSA	Comprehensive Site Assessment
CSF	cancer slope factor
CSM	conceptual site model
CVOC	chlorinated volatile organic compound
cy	cubic yards
1,2-DCB	1,2-dichlorobenzene
1,3-DCB	1,3-dichlorobenzene
1,4-DCB	1,4-dichlorobenzene
1,1-DCE	1,1-dichloroethene

DCL	Devens Consolidation Landfill
DDD	dichloro-diphenyl-dichloroethane
DDE	dichloro-diphenyl-dichloroethylene
DDT	dichloro-diphenyl-trichloroethane
DGA	data gap analysis
DO	dissolved oxygen
DoD	Department of Defense
DQO	data quality objective
DRMO	Defense Reutilization and Marketing Office
EBS	Environmental Baseline Survey
EOD	explosives ordnance discharge
EPH	extractable petroleum hydrocarbons
EPP	Environmental Protection Plan
ERA	Ecological Risk Assessment
ERD	enhanced reductive dechlorination
ESD	Explanation of Significant Differences
ESMA	Excavated Soils Management Area
°F	degrees Fahrenheit
FFA	Federal Facility Agreement
FFS	focused feasibility study
FORSCOM	United States Army Forces Command
Fort Devens	former Fort Devens Army Installation
FOSET	Findings of Suitability of Early Transfer
FOST	Findings of Suitability to Transfer
FR	Federal Register
FS	feasibility study
ft	feet
ft/day	feet per day
μg/g	micrograms per gram
GERE	Grant of Environmental Restriction and Easement
gpm	gallons per minute
GW-1	Groundwater Classification 1
GW-3	Groundwater Classification 3
HASP	Health and Safety Plan
Hg	mercury
HGL	HydroGeoLogic, Inc.
HHRA	Human Health Risk Assessment
HI	hazard index
HLA	Harding Lawson Associates
HMX	cyclotetramethylenetetranitramine
IC	institutional controls

IDW	investigation-derived waste
IMP	Installation Master Plan
INRMP	Integrated Natural Resources Management Plan
IRA	Intrinsic Bioremediation Assessment
IRIS	Integrated Risk Information System
ISCO	in situ chemical oxidation
IUR	inhalation unit risk
LEL	lower explosive limit
LGP	landfill gas probe
LIFOC	Lease in Furtherance of Conveyance
LTM	long-term monitoring
LTMP	Long-Term Monitoring Plan
LTMMP	Long-Term Monitoring and Maintenance Plan
LUC	land-use control
μg/L	micrograms per liter
MAAF	Moore Army Airfield
MANG	Massachusetts Army National Guard
MassDEP	Massachusetts Department of Environmental Protection
MassDevelopment	Massachusetts Development and Finance Agency
MCL	maximum contaminant level
MCP	Massachusetts Contingency Plan
mg/L	milligrams per liter
MMCL	Massachusetts Maximum Contaminant Level
MNA	monitored natural attenuation
MNAA	Monitored Natural Attenuation Assessment
MOGAS	motor vehicle gasoline
msl	mean sea level
mV	millivolt
NAE	North Atlantic Division, New England District
NCP	National Oil and Hazardous Substances Contingency Plan
NFA	No Further Action
Nobis	Nobis Engineering, Inc.
NPL	National Priorities List
NWR	National Wildlife Reserve
O&M	operations and maintenance
OMS	Organizational Maintenance Shop
ORP	oxidation-reduction potential
%	percent
PACE	People of Ayer Concerned about the Environment
PAH	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyl

PCE	tetrachloroethene
POL	petroleum, oils, and lubricants
POTW	Publicly Owned Treatment Works
PP	Proposed Plan
ppb	parts per billion
ppm	parts per million
ppmv	parts per million by volume
PRE	Preliminary Risk Evaluation
PRG	preliminary remediation goals
PVC	polyvinyl chloride
RAB	Restoration Advisory Board
RAGS	Risk Assessment Guidance for Superfund
RAO	remedial action objectives
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RDX	cyclotrimethylenetrinitramine
RfC	reference concentration
RfD	reference dose
RG	remedial goal
RI	remedial investigation
ROD	Record of Decision
RPMP	Real Property Master Plan
SA	study area
SAP	Sampling Analysis Plan
SARA	Superfund Amendment and Reauthorization Act
SG & LCA	Supplemental Groundwater and Landfill Cap Assessment
SHL	Shepley's Hill Landfill
SI	Site Investigation
SPIA	South Post Impact Area
SPM	South Post Monitoring
SSI	Supplemental Site Investigation
SVE	soil vapor extraction
SVOC	semi-volatile organic compound
SWETS	Stone and Webster Environmental Technology & Services
TAL	target analyte list
TBC	To Be Considered
TCE	trichloroethene
TCL	Target Compound List
TCLP	toxicity characteristic leaching procedure
TDA	Table of Distributions and Allowances
TNT	trinitrotoluene
TOC	total organic compound
TPH	total petroleum hydrocarbons

TPHC	total petroleum hydrocarbon compounds
USACE	U.S. Army Corps of Engineers
USAEC	U.S. Army Environmental Command
USAR	U.S. Army Reserve
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Services
USMCR	U.S. Marine Corps Reserve
UST	underground storage tank
VC	vinyl chloride
VOC	volatile organic compound
VPH	volatile petroleum hydrocarbons
WHRP	Wetland and Upland Habitat Restoration and Long-Term Adaptive Monitoring and Maintenance Program

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EXECUTIVE SUMMARY

HydroGeoLogic, Inc. (HGL) has prepared this comprehensive Five-Year Review of the remedial actions for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites at the former Fort Devens Army Installation (Fort Devens). This review, completed in accordance with the U.S. Environmental Protection Agency (USEPA) Comprehensive Five-Year Review Guidance, dated June 2001, was performed from March 2010 through August 2010. This is the third comprehensive Five-Year Review performed for the former Fort Devens Army Installation. The previous Five-Year Review was completed in September 2005.

The purpose of Five-Year Reviews is to determine whether the remedy at a site is protective of human health and the environment. In addition, Five-Year Review reports identify deficiencies, if any, found during the review, and identify recommendations to address them.

This review is required by statute and policy, and is being implemented consistent with CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Five-Year Reviews should be conducted by statute if both of the following conditions are true:

- Upon completion of the remedial action, hazardous substances, pollutants, or contaminants will remain on site; and
- The Record of Decision (ROD) for the site (or sites for a multiple site Five-Year Review) was signed on or after October 17, 1986 [the effective date of the Superfund Amendment and Reauthorization Act (SARA)] and the removal action was selected under CERCLA Section 121.

The following sites are categorized as statutory review sites:

- Barnum Road Maintenance Yards [Area of Contamination (AOC) 44 and 52];
- Shepley's Hill Landfill (SHL) (AOCs 4, 5, and 18);
- AOC 57;
- South Post Impact Area (SPIA), [AOCs 25, 26, 27, and 41(groundwater)];
- AOC 69W; and
- Devens Consolidation Landfill [AOCs 9, 40, and Study Area (SA) 13].

Five-year reviews should be conducted as a matter of policy for the following types of actions:

- A pre-or post-SARA remedial action that, upon completion, will not leave hazardous substances, pollutants on site above levels that allow for unlimited use and unrestricted exposure, but requires five or more years to complete; and
- A pre-SARA remedial action that leaves hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure.

- A removal-only site on the National Priorities List (NPL) where a removal action leaves hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure and where no remedial action has or will take place.

The following sites are categorized as policy review sites:

- AOCs 43G and 43J;
- AOCs 32 and 43A; and
- AOC 50.

A brief description of each site where a ROD has been executed along with a summary of findings of the Five-Year Reviews is provided below. An overall view of the former Fort Devens site is provided in Figure ES.1.

Barnum Road Maintenance Yards (AOCs 44 and 52): AOCs 44 and 52 comprise the Barnum Road Maintenance Yards at the former Fort Devens and are located in the northeast corner of the former Main Post, near Barnum Gate (Figure ES.2). The site consists of four former vehicle maintenance yards with a history of vehicle storage and repair. Contamination at the site was primarily attributed to petroleum and oil releases associated with maintenance activity. The ROD describing the selected cleanup remedy was signed in March 1995. Remedial actions consisting of soil excavation, asphalt batching of contaminated soil, repaving, and installation of a stormwater collection system were completed in April 1996. The site is presently undergoing reconstruction as an Armed Forces Reserve Center (AFRC) complex which includes a large training building at the location of the former vehicle maintenance shop and a new U.S. Army Reserve (USAR) and U.S. Marine Corps Reserve (USMCR) Organizational Maintenance Shop (OMS)/Area Maintenance Support Activities (AMSA) building. The new OMS/AMSA building footprint overlays a portion of the former AOC 44 and 52 remediation area. Construction of the AFRC complex began in May 2009 and activities were ongoing during the performance of this five-year review. Construction activities are performed in accordance with an Environmental Protection Plan (EPP) that incorporated the provisions of the 1995 ROD.

There were no areas of noncompliance or deficiencies noted during the review that would make the remedial actions at AOCs 44 and 52 noncompliant with the ROD. The remedy at AOCs 44 and 52 is protective of human health and the environment and exposure pathways that could result in unacceptable risks are being controlled. The remedial action at AOCs 44 and 52 is considered complete. The U.S. Army (Army) has no plans to transfer the property and is in the process of redeveloping the property into an enlarged AFRC as described above. The construction activity is being performed in compliance with the provisions of the ROD and does not compromise remedy protectiveness.

The Real Property Master Plan (RPMP) Long Range Component Addendum – September 2007 provides the Land-Use Controls (LUCs) to manage the long-term use of the land

formerly occupied by AOCs 44 and 52.

SHL Operable Unit (AOCs 4, 5, and 18): SHL encompasses approximately 84 acres in the northeast corner of the main post of the former Fort Devens, Massachusetts (ES.3). Landfill operations at SHL began at least as early as 1917, and ceased operation on July 1, 1992. Landfill capping was complete in May 1993. Remedial Investigation (RI) and RI Addendum investigations were performed between 1991 and 1993 and concluded potential human exposure to arsenic in groundwater is the primary risk at the site. A Feasibility Study (FS) was completed in 1995 to evaluate alternatives to reduce potential exposure risks, and in September 1995, the ROD was signed. The selected remedy consists of landfill closure, landfill maintenance, long-term groundwater and landfill gas monitoring, and institutional controls (IC).

Based on data collected since the ROD, the required incremental reduction in risk was not achieved and the Army and regulatory agencies decided to implement the contingent element of the selected remedy (Alternative SHL-9, Groundwater Extraction and Discharge to the Town of Ayer, publicly owned treatment works [POTW]). Modification to the implementation of the contingency remedy were detailed in the Final Explanation of Significant Differences (ESD), (CH2MHill, 2005) and included: 1) change the POTW from Ayer to Devens, and 2) provide pretreatment to meet Devens POTW discharge limitations. The contingency extraction treatment and discharge system has been constructed and the system is discharging to the Devens POTW. Alternative discharge options for treated water are currently under evaluation by the Army and the regulatory agencies.

The Army has performed additional investigations to address recommendations from the previous five-year review. The extent of capture provided by the groundwater treatment system extraction wells has been established, the extent of arsenic migration in off-site groundwater has been delineated, and modeling analysis performed by AMEC concluded that the MacPherson Well is not impacted by groundwater emanating from Shepley's Hill Landfill. An approximate redox boundary has been identified in the wetland area of the Nonacoicus Brook that appears to limit the further migration of arsenic along both sides of the brook. The Army is in the process of filling this data gap, as well as other data gaps to address remaining regulatory concerns via a Focused Feasibility Study (FFS) (AMEC, 2010) and a Supplemental Site Investigation (SSI) (Sovereign, 2010) as part of the SHL remedy update process.

The landfill cover is functioning as designed. Test pits excavated in areas of subsidence showed the geomembrane, although wrinkled, has no defects or penetrations that would compromise its integrity. The types of cover soils were appropriate for the drainage of water and were not causing any damage to the geomembrane.

ROD ICs are in place and functioning properly.

The 2009 hydraulic capture zone assessment indicates that, at the typical peak operating flow rate of 49 gpm, the extraction well field is containing the majority of arsenic mass migrating northward from the landfill. In general, arsenic concentrations in the *Long-Term Monitoring*

and Maintenance Plan (LTMMP) wells remain relatively stable or decreasing, compared to historic levels.

Even in the areas where the groundwater extraction and treatment system is expected to provide the greatest decreases in contaminant levels, the levels may not meet remediation objectives if the strong reducing conditions that have been established in the aquifer continue to mobilize naturally-occurring arsenic.

The AOC 72 RI (Plow Shop Pond) results indicate potential adverse effects on ecological receptors (i.e., benthic organisms) from arsenic and other contaminants. The sources of the contaminants appear to include current and historic releases of groundwater from SHL for arsenic in the Red Cove area.

The current remedy at SHL is considered protective in the short-term, because there is no evidence of current exposure. However, in order for the remedy to remain protective in the long-term, an updated SHL remedy must incorporate ICs that restrict the installation of private drinking water wells throughout the "Impacted Area" and effectively meet RAOs developed under the SHL FFS to address both groundwater restoration within the "Impacted Area" and groundwater discharging to Plow Shop Pond.

A Draft ROD ESD or ROD amendment is planned by April 30, 2011, based on completion of the SHL Focused FS and remedy update. The protectiveness of the SHL remedy will be enhanced once the remedy update has been completed.

AOC 57: AOC 57 is located between Barnum Road and Cold Spring Brook on the northeast side of what was formerly the Main Post of Devens in the town of Harvard, Massachusetts (Figure ES.4a and ES.4b). The portion of the former Devens site that includes AOC 57 was used primarily as a storage and maintenance area for military vehicles. AOC 57 consists of three sub areas (Area 1, Area 2, and Area 3) that are located south to southeast of Building 3713 and former buildings 3756, 3757, and 3758. The sub areas received stormwater runoff and waste from vehicle maintenance at former vehicle storage yards related to Building 3713 and former Buildings 3757 and 3758. These yards were eventually abandoned in 1998, and the pavement and fencing were removed, resulting in soil and grass-covered areas. Areas 2 and 3 are located within Lease Parcel A6a that the Army plans to transfer to the Massachusetts Development Finance Agency (MassDevelopment).

In June 2000, the Army completed a RI at AOC 57 Areas 2 and 3 that revealed the presence of residual contamination at both sites. A ROD was signed on September 28, 2001, for AOC 57 presenting selected remedial actions for soil and groundwater contamination at Areas 1, 2, and 3. The selected remedy for Area 1 was no further action. The selected remedy for Area 2 was excavation (for possible future use) and ICs. The selected remedy for Area 3 was excavation (to accelerate groundwater cleanup) and ICs. Excavation activities at AOC 57 were completed in 2003.

Data obtained and observations made at Area 2 between 2002 and 2003 during the soil

excavation activities and subsequent investigations prompted the submittal of an ESD in March 2004. The ESD expanded ROD mandated long-term monitoring (LTM) activities to include extractable petroleum hydrocarbons (EPH) C_{11}-C_{22} aromatics and polychlorinated biphenyls (PCB)as contaminants of concern (COC) for Area 2 groundwater, include EPH as a COC for Area 2 soil, monitor for the presence of petroleum waste at Area 2, and increase the soil volume and associated cost for Area 2 soil removal activities.

Three years of wetlands monitoring and maintenance was performed by U.S. Army Corps of Engineers (USACE) from 2004 through 2006. By the end of 2006, the wetland areas of AOC 57 were found to meet performance standards and the Habitat LTMP Program was terminated. A two-year operation and maintenance phase was implemented by USACE from 2007 through 2008. The 2008 Final Annual Report, Operations and Maintenance (O&M) Phase, Wetland & Upland Habitat Restoration and Long Term Adaptive Monitoring and Maintenance Program (WHRP), Devens Consolidation Landfill (DCL) Areas of Contamination 9, 11, 40, 41 & Study Areas 12 and 13, and Area of Contamination 57 Areas 2 and 3 (USACE, 2009) summarized the findings of the 2008 O&M activities, and concluded the wetlands monitoring, maintenance and reporting activities for AOC 57.

In 2008, construction of a solar panel manufacturing facility was initiated adjacent to AOC 57. Construction was completed in 2009 and the plant is currently active. One monitoring well was removed during the construction activities but the well had already been designated for removal from the LTM program. No other construction-related impact was noted for the site.

Groundwater sampling data from 2005 through November 2009 indicate that concentrations of organic COCs in groundwater are decreasing or steady. Tetrachloroethene and trichloroethene concentrations are below their respective cleanup goals in all Area 2 and Area 3 monitoring wells with the exception of Area 2 well 57M-03-02X, which is slightly side gradient of the excavation area. Results for these contaminants continue to hover slightly above or below the 5 micrograms per liter (μg/l) cleanup goal at well 57M-03-02X. 1,4-dichlorobenzene concentrations have periodically exceeded the 5 μg/l cleanup goal at Area 3 wells 57M-95-03X (13 μg/l in 2004 and 2007) and 57M-96-11X (5.1 μg/l in 2008 and 7.5 μg/l 2009). The exceedances are generally infrequent and/or close to the cleanup goal.

Groundwater sampling data from 2005 through November 2009 indicate that concentrations of arsenic in groundwater are decreasing in Area 2 and steady in Area 3. Arsenic concentrations in Area 2 monitoring wells are below the 10 μg/l cleanup goal with the exception of wells 57M-03-02X and 57M-03-05X. Arsenic concentrations in these two wells have hovered slightly above or below the cleanup goal for the last several sampling events. Area 3 monitoring wells 57M-95-03X and 57M-96-11X continue to show arsenic concentrations above the cleanup goal; however, arsenic concentrations in these wells have shown a general reduction from over the course of the sampling program. Surface water sampling results indicate that arsenic results are below the 150 μg/l USEPA Water Quality Criteria in Area 2 and Area 3.

There are no areas of non-compliance or deficiencies that have been noted during this review

that would make the remedial actions at AOCs 57 Areas 1, 2, and 3 non-compliant with the ROD or sufficient to warrant a finding of not protective. This finding is based upon a review of site reports that have been prepared since signing of the ROD, a review of ARARs triggered by the remedial action, and the findings from the site inspection and interviews. In 2008, the Army received regulatory concurrence for reducing the site LTM to annual sampling from the previous semiannual frequency. LTM activities at AOC 57 are ongoing.

The remedies at AOC 57 are protective of human health and the environment. Excavation activities at AOC 57 were completed in 2003. Exposure pathways that could result in unacceptable risks are being controlled.

AOC 43G and 43J: AOCs 43G and 43J are located in the central portion of the former main post of Fort Devens. The layout of AOC 43G is depicted on Figure ES.5a; the layout of AOC 43J is depicted on Figure ES.5b. AOC 43G consists of the former Army Air Force Exchange Service (AAFES) gas station and historic Gas Station G. The historic gas station was used as a motor pool to support military operations during World War II. Contamination at both sites is attributed to releases from gasoline and waste underground storage tanks (UST). Site Investigations (SI) and SSI were performed between 1992 and 1994 at both sites. A RI/FS that evaluated potential remedial alternatives was completed in June 1996. A ROD was then signed in October 1996 documenting intrinsic remediation as the final selected cleanup remedy at both AOCs 43G and 43J. Specific components of the selected remedy for both AOCs include: intrinsic bioremediation assessment, data collection and groundwater modeling, installation of additional monitoring wells, long term monitoring, and annual data reports.

In 2006, AOC 43J, part of Parcel C, was transferred from Army ownership to MassDevelopment to provide for a large redevelopment parcel for the Bristol-Myers Squibb facility. A Covenant Deferral Request (CDR) per CERCLA Section 120(h)(3) was issued to and approved by the USEPA in June 2006. Massachusetts Department of Environmental Protection (MassDEP) approved the "Nomination of AOC 43J, AREE 6AF, AREE 61J and AREE 63BB for Addition to Schedule I" (Parcel C) through an "Administrative Consent Order (ACO) and Covenant Not to Sue" and issued a GERE in June 2006. When the property transfer occurred in June 2006, the ICs were incorporated into the ESD, Grant of Environmental Restriction and Easement (GERE) and property deed. As part of the property transfer process a Technical Update of the Risk Assessment was prepared for the 1996 ROD and recommended remedial action objectives (RAO) that consisted of the addition of LUCs to prohibit residential site development and prevent access to the site's groundwater. The technical update also required that a vapor intrusion evaluation would be required prior to any commercial or industrial development to ensure appropriate safeguards are in place relative to building design to minimize vapor intrusion concerns. Remedial activities at the site are continuing after transfer of ownership and have included a test pit investigation, installation of monitoring well couplets, and a remedy enhancement pilot study consisting of substrate application to enhance the intrinsic remediation remedy. The pilot test phase is ongoing and full scale implementation has not yet been proposed. Results of the pilot study will be detailed in a pending 2011 report.

Review of the groundwater sampling data from 2005 through November 2009 indicates that groundwater concentrations of organic COCs are decreasing at source locations at AOCs 43G and are variable at AOC 43J based on groundwater fluctuations without a definitive decreasing concentration trend noted at AOC 43J; however, the plumes are not expanding or migrating off Devens property. Groundwater sampling results from sentry well locations are below cleanup goals for organic COCs and most metals, with the exception of manganese at AOC 43G and AOC 43J. A further downgradient sentry well at AOC 43G has bound the manganese exceedances observed at upgradient sentry wells, indicating that off site migration is not occurring. In addition, AOC 43J has sentry wells with non-detections that bound the locations with manganese exceedances and nearby aerobic conditions will likely cause manganese to attenuate (precipitate out of solution). The particular AOC 43J sentry wells with exceedances are located within the main portion of the site and are not perimeter wells. Analytical results are supportive of the intrinsic bioremediation assessment conclusion that migration of volatile petroleum hydrocarbons (VPH) concentrations in exceedances of GW-1 standards off Fort Devens property is not probable. Installation of groundwater monitoring wells and groundwater modeling has been completed as stipulated in the ROD, and groundwater monitoring is ongoing. No contingency action is required at this time at AOC 43G; however, as discussed above, additional measures to augment the intrinsic remediation process at AOC 43J may be required.

Current remedial action activity should continue and consist of implementing the remaining three components specified in the ROD; a long-term groundwater monitoring program, annual reporting, and Five-Year Reviews. These components enable continued assessment for compliance with performance standards and reporting of the remedial progress.

Based on a review of site data and the continued application of ICs, the remedies at AOC 43G and 43J are protective of human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled. Human health is not at risk at AOCs 43G and 43J because groundwater is not used as a drinking water source.

South Post Impact Area (AOCs 25, 26, 27, and 41-groundwater): SPIA is located within the 4,800-acre area known as the South Post of former Fort Devens. The SPIA is a 964-acre area that includes four AOCs to be addressed in this five-year review; AOCs 25, 26, 27 and 41. AOC 25 is known as the former explosives ordnance discharge (EOD) Range and was closed in 1996.AOC 26 is known as the Zulu Range and includes the Zulu 1 and Zulu 2 hand grenade ranges. AOC 27 is known as the Hotel Range (Figure ES.6). AOC 41 is known as the "Unauthorized Dumping Site." The SPIA was historically used for firearm and grenade training and also for open burning and detonation of explosives. The SPIA is an active weapons and ordnance discharge area that is used by the Army, the Massachusetts National Guard and nearby law enforcement agencies.

The portion of the SPIA covered by the ROD, issued in July 1996, encompasses AOCs 25, 26, 27, and 41; this area is referred to as the SPIA monitored area. The ROD documented No Action as the final selected remedy for the SPIA monitored area groundwater, surface water, soil, and sediment, and AOC 41 groundwater. The following components were included as

part of the selected No Action Remedy: groundwater monitoring for potential contaminant migration out of the SPIA monitored area, groundwater monitoring at the individual AOCs, sampling of Well D-1 (classified as a transient non-community supply well), developing a LTMP and Integrated Natural Resources Management Plan (INRMP), restricting development of new drinking water sources within the SPIA monitored area, and submitting annual reports to document the results of monitoring. The Army prepared a revised INRMP and it is included in the 2009 LTM report.

Groundwater sampling was discontinued at AOC 25 in 2003 and groundwater gauging is performed at five-year intervals prior to the five-year review period. Groundwater sampling at AOC 26 revealed the presence of RDX and perchlorate within several wells at this AOC. An investigation was performed in the fall of 2009 to determine the source of the contaminants and to determine if the contaminants were migrating from the site. The investigation revealed that the cyclotrimethylenetrinitramine (RDX) and perchlorate are likely transitory from active range activities and are confined to the site. A permanent downgradient sentry monitoring well is scheduled for installation in the fall of 2010 to monitor for potential contaminant migration beyond the site. AOC 27 is monitored on a biennial basis beginning with the 2008 sampling event. A low-level exceedance of RDX was detected at one well at AOC 27 and is confined to the center of the AOC 27 monitoring area. Groundwater sampling at AOC 41 was discontinued after the 2007 LTM event due to non-detection of groundwater contaminants at this AOC; however in 2006, trichloroethene (TCE) was detected above 5 μg/L GW-1 standard in one AOC 41 well. This well had sporadic detections of TCE in past events, but the 2006 exceedance was the first result above the GW-1 standard. All volatile organic compounds (VOC) results for groundwater obtained from this well, including TCE, were non-detections during the October 2008 sampling event. This well was added to the South Post Monitoring (SPM) well network for annual monitoring.

In addition to the individual AOC monitoring well network, the SPIA contains the SPM well network that serves as a series of sentinel sampling points, for determination of off-site migration. No explosive or perchlorate was detected within the SPM network.

The Army formalized ICs and property transfer procedures for Army-retained property such as the South Post in 2007. IC inspection activities conducted on site during LTM sampling and remotely by telephone interview indicated that there was no evidence of increased exposure potential. The remedy continues to be protective of human health and the environment.

The No Action remedy at AOCs 25, 26, 27, and 41 is protective of human health and the environment and exposure pathways that could result in unacceptable risk are being controlled.

AOCs 32 and 43A: AOC 32, Defense Reutilization and Marketing Office (DRMO) Yard, was used as a materials storage facility. Operational records indicate that the facility was active from at least 1964 to 1995. A former UST site (UST #13) has also been incorporated into AOC 32. This UST was used to store waste oil and was located just northeast of the DRMO Office. AOC 43A consisted of a fenced lot within a developed industrial area and was known

as the Petroleum, Oils and Lubricants (POL) Storage Area. This area served as the central distribution point for all gasoline and fuel at the former Fort Devens from the 1940s to base closure.

A ROD was signed in February 1998 documenting the selected remedies for AOC 32 and 43A. Key components of the remedy at AOC 32 include excavation of contaminated soils and annual groundwater monitoring. The groundwater remedy for AOCs 32 and 43A included establishing ICs, installing additional monitoring wells, collecting data to support monitored natural attenuation, groundwater modeling, performing annual long-term groundwater monitoring, and providing annual reports to regulators.

Land surfaces at AOCs 32 and 43A were modified by the construction of a large warehouse that was completed in 2001 (Figure ES.7). Bedrock outcrops east of the DRMO East Yard and east of the POL Storage Area were removed to make room for construction of the warehouse. The warehouse and pavements cover major portions of both AOCs, thereby altering local recharge patterns to overburden and bedrock and potentially altering the site hydrology. Most existing monitoring wells were destroyed in the process. New replacement monitoring wells were installed at locations to monitor groundwater flow patterns and contamination around former release points.

Groundwater from monitoring well 32M-01-18XBR continued to show exceedances of VOCs (1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, and chlorobenzene), VPH (C_9-C_{10} aromatic hydrocarbons), and manganese. However, the VOC contaminants have established a decreasing concentration trend.

Based on an evaluation of 2005 through 2008 data, it was determined that conditions warranted an augmented monitored natural attenuation (MNA) approach at AOCs 32 and 43A. A sodium persulfate injection was implemented in the vicinity of the source area well, 32M-01-18XBR, to augment the MNA process implemented at the site. Initial results indicated a rapid decrease in groundwater contaminants followed by a partial rebound in contaminant concentrations. The rebound was below the initial pre-injection concentrations and the latest (November 2009 to May 2010) groundwater data indicate a continued downward concentration trend maintained over two consecutive monitoring events. A vapor intrusion assessment was also completed and determined that no restrictions were necessary for usage of the building based on current conditions.

Contaminant concentrations at AOC 32 are above currently established groundwater classification 1 (GW-1) based clean up goals; however, the source of groundwater contamination has been removed, and contaminant concentrations are expected to decline in the future through MNA augmentation and natural processes.

The remedy at AOC 32 and AOC 43A currently protects human health and the environment because ICs are incorporated into the deed that prohibit the use of groundwater from the site, and contaminants are not migrating offsite. Due to the lack of a complete exposure pathway for the contaminants in the groundwater, the site currently does not pose a risk and is not

expected to pose a risk in the future.

AOC 69W: AOC 69W is located at the northeast corner of the intersection of Jackson Road and Antietam Street on the northern portion of what was formerly the Main Post at Devens (Figure ES.8). AOC 69W is composed of the former Devens Elementary School (Building 215) and its associated parking lot and adjacent lawn extending approximately 300 ft northwest to Willow Brook. Contamination at AOC 69W is attributed to two separate releases of No. 2 heating oil in 1972 and 1978. It is estimated that 7,000 to 8,000 gallons of No. 2 heating oil were released into soil from each release.

Based on the nature and distribution of contaminants, a Removal Action was undertaken in the winter of 1997 and 1998 to remove contaminated soil associated with the historic releases. Contaminated soil was removed near the school and extending to the UST. Confirmatory subsurface soil sample results from the Removal Action showed that concentrations of fuel-related contaminants exceeded Massachusetts Contingency Plan (MCP) S-1/GW-1 standards for EPH in subsurface soils immediately adjacent to the school building, but are generally low in downgradient areas. In 1999, a Limited Action ROD was signed. The Limited Action consists of long-term groundwater monitoring and ICs to limit potential exposure to contaminated soils and groundwater under both existing and future site conditions.

The Francis W. Parker Charter Essential School currently owns and occupies the property. MassDevelopment supplies potable water to the school.

Remaining organic groundwater contamination is limited to two wells located within and immediately downgradient of the former source area. Inorganic groundwater contamination, primarily manganese and arsenic, exists within four groundwater wells within and downgradient of the former source area. Additional groundwater contaminant delineation was performed in 2008 to determine if inorganic contaminants, primarily manganese, were migrating offsite. The delineation revealed that the inorganic contaminants that exceed established clean-up criteria extend approximately 300 ft downgradient of the former source area and do not pose a threat to downgradient receptors.

Based on the evaluated site data, the remedy at AOC 69W is protective of human health and the environment and exposure pathways that could result in unacceptable risk are being controlled. All soil and groundwater contamination remains within the monitored perimeter of this AOC and ICs are in place to limit exposure to the soil and groundwater at the site. ICs were implemented to limit potential exposure to contaminated soil and groundwater under existing and future site conditions. The controls ensure that the remaining contaminated soils beneath and adjacent to the building are not disturbed and extraction of groundwater from the site for industrial or potable water supply is not permitted.

The Army received certification from the USEPA in January 2006 on the Army's Operating Properly and Successfully demonstration document, which showed that the remedy is operating properly and successfully.

Human health is currently not at risk at AOC 69W because groundwater at the AOC is not being used for drinking water, is not expected to be used as a drinking water source, and COCs exceeding cleanup goals are not migrating offsite. In addition, the Army has conducted sampling and modeling since the second five-year review to evaluate the potential for vapor intrusion. The sampling and modeling results indicate that there is no need to restrict site use to mitigate exposures.

Devens Consolidation Landfill and Contributor Sites: In addition to the Consolidation Landfill, the DCL site review includes the seven contributor sites that were small former landfills and debris disposal areas and a former housing area at the former Fort Devens (Figure ES.9). The seven DCL contributor sites include:

- SA 12: A half-acre location where construction debris and yard waste were deposited (approximately 8,700 cubic yards [cy];
- SA 13: A one-acre area used from 1965 to the mid-1990s for yard-waste (approximately 10,000 cy);
- AOC 9: An area used for storing wood, concrete, asphalt, metal, brick, glass, and tree stumps (approximately 121,000 cy);
- AOC 11: A former landfill used from 1975 to 1980 for disposal of wood-frame hospital demolition debris (approximately 35,000 cy);
- AOC 40: Four acres used for construction debris, ash, stumps, and logs (approximately 125,400 cy);
- AOC 41: A one quarter-acre landfill in the SPIA that was used up to the 1950s for disposal of non-explosive material and household debris (approximately 1,500 cy); and
- Housing areas Grant, Locust, and Cavite: Soils contaminated with volatile organics or pesticides and walling material contaminated with volatiles or pesticides (approximately 2,290 tons of soil and approximately 1,240 tons of concrete).

A ROD was issued in July 1999 that presented the selected remedial action of surface debris and hot spot removal at SA12 and AOC 41; debris removal and consolidation or off-site transport at AOC 9, 11, 40, and SA 13; and wetlands restoration at AOCs 9, 11, and 40. An evaluation of the on-site versus off-site disposal option was conducted and the findings were presented in the Remedy Selection Report. The remedy selection process indicated that disposal of the remedial debris in an on-site landfill to be built at the former golf course driving range on Patton Road was determined to be the “best value” alternative. Construction of the DCL commenced in September 2000 and was completed in November 2002. The Remedial Action Closure Report prepared by Shaw Environmental (formerly Stone & Webster, Inc. [SWETS]) in September 2003 was accepted, certifying that the DCL was constructed and capped in accordance with the ROD, and met the performance standards and/or response objectives in the ROD.

All components of the ROD have been implemented. Per the ROD, DCL contributor sites

AOC 9, 11 and 40 and SA 13 were subject to institutional controls and five-year site reviews "if unrestricted future use is not achievable or economical." All four of these sites subsequently achieved the ROD preliminary remediation goals (PRG) for unrestricted use and did not require institutional controls and five-year site reviews. Contributor sites AOC 9, AOC 40 and SA 13 were transferred from the Army to MassDevelopment in March 2006. LUCs were incorporated into the quitclaim deed for parcels A2A (AOC 9), A8 (SA 13), and A4 (AOC 40) to prevent residential development of the properties. Due to the LUCs placed in the quitclaim deed, these three contributor sites were then subject to five-year site reviews. The AOC 11 site is on property that is retained by the Army, however, the March 2007 Addendum to the RPMP did not include this site since it is remediated to unrestricted use. Five-year reviews are not required for AOC 41 and SA 12 per the ROD because the remedial actions at these sites were considered non-CERCLA. No IC violations were noted during the IC inspections and no contingency actions are required at this time. Current remedial action activity consists of continued implementation of the components specified in the ROD: the long-term groundwater monitoring and landfill maintenance program at the Consolidation Landfill, annual reporting, ICs, and five-year site reviews. These components enable continued assessment for compliance with performance standards and reporting of remedy progress. WHRP activities were conducted from 2004 to 2006 at the DCL sites which retain ICs (AOC 9, AOC 40 and SA 13). The Habitat LTMP portion was discontinued due to its success and an "O&M phase" was conducted from 2007 to 2008.

The remedy at the DCL and associated contribution sites (AOC 9 AOC 40, and SA 13) are protective of human health and the environment, and exposure pathways that could result in unacceptable risk are being controlled. Long-term protectiveness of the remedial action will be verified by groundwater monitoring at the DCL to assess potential leachate migration. Current monitoring data indicate that the remedy is functioning as required.

AOC 50: AOC 50 is located on the northeastern boundary of the former Moore Army Airfield (MAAF), within the former Fort Devens North Post in Ayer, Massachusetts. The AOC 50 Source Area comprises less than 2 acres and includes Buildings 3803 (former parachute shop), 3840 (former parachute shakeout tower), 3824 (gazebo), and 3801 (former 10th Special Forces airplane parachute simulations buildings) (Figure ES.10). Sources of groundwater contamination within AOC 50 include two World War II fueling systems, a drywell, and the former Drum Storage Area. These sources are collectively referred to as the Source Area. Although these sources have been removed or decommissioned, groundwater underlying AOC 50 contains elevated concentrations of chlorinated volatile organic compounds (CVOC); most notably tetrachloroethene (PCE) and its degradation products: TCE, *cis*-1,2-dichloroethene (*cis*-1,2-DCE) and vinyl chloride (VC). The Southwest Plume extends from the Source Area approximately 3,000-ft downgradient to the Nashua River.

In March 2004, a ROD was signed to select a remedy with the following components: an enhanced reductive dechlorination (ERD) program and in-well stripping (IWS) system, soil vapor extraction (SVE), long-term groundwater monitoring, ICs, a contingency plan, and five-year reviews. The remedy was implemented and ongoing monitoring data indicate that significant degradation of PCE is occurring at the site as a result of the implementation of the

ERD treatment remedy and operation of the IWS system. Elevated concentrations of CVOCs continue to be detected in groundwater at AOC 50, however, significant decreases have been observed in the Source Area (Area 1) and throughout the Southwest Plume (Area 2, 3, 4, and 5) since the implementation of the ERD treatment remedy. Recommendations were made in March 2005 to increase ERD injection volumes. These recommendations were accepted by the Base Realignment and Closure (BRAC) Cleanup Team (BCT) and implemented in June 2005.

In 2008, the Army, with concurrence of the BCT, amended the ERD treatment approach by transitioning from a monthly injection strategy to a semi-annual injection strategy and switching the ERD substrate from molasses to a longer lasting time-release substrate. Subsequent monitoring revealed that the new approach maintains remedy effectiveness and has further reduced the CVOC concentrations throughout the plume. As demonstrated in the latest *Operations and Maintenance (O&M) and Monitoring Report* (HGL, 2010), the remedy in place at AOC 50 is operating as designed and in accordance with the 23 year timeframe estimated during the remedial design. The generation of secondary contamination through the solubilization of metals, primarily arsenic and manganese, within the reductive portions of the aquifer is an expected byproduct of the ERD remedy. The solubilized metals are expected to attenuate once the ERD remedy is terminated and the aquifer reverts to an aerobic state. The secondary inorganic contaminants are not expected to affect overall remedy duration. Upon achievement of Remedial Goals, the remedial action at AOC 50 is expected to allow unrestricted use and unlimited exposure to groundwater.

Currently, there are no areas of non-compliance or deficiencies noted during this review that would make the remedial actions at AOC 50 non-compliant with the ROD, or sufficient to warrant a finding of not protective. This finding is based upon a review of O&M and groundwater monitoring reports and other site reports that have been prepared since the signing of the ROD, a review of ARARs triggered by the remedial action, and the findings from the site inspection and interviews.

The current remedial action as specified in the ROD and detailed in the O&M and monitoring reports should continue. The monitoring component of the selected remedy allows for continued assessment for compliance with remedial goals established in the ROD and reporting of the remedial progress. Performance standards should continue to be followed and ongoing assessments of contaminant migration and evaluating site conditions that may affect the estimated remedial duration should continue. The remedy at AOC 50 is expected to be protective upon completion, and in the interim, exposure pathways that could lead to unacceptable risk are being controlled. Human health is currently not at risk at AOC 50 because groundwater at the site is not a potable water source nor is it planned to be used as a potable water source.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: Former Fort Devens		
EPA ID *(from WasteLAN)*: MA7210025154		
Region: 1	**State:** MA	**City/County:** Devens/Middlesex & Worcester
SITE STATUS		
NPL Status: √ Final Deleted Other (specify)		
Remediation Status: √Under Construction √ Operating Complete		
Multiple OUs? √Yes No	**Construction completion date:** September 2014	
Has site been put into reuse? √Yes No		
REVIEW STATUS		
Lead Agency: EPA State Tribe √ U.S. Army		
Author Name: U.S. Army Base Realignment and Closure (BRAC) Environmental Office, Devens, MA		
Review Period: 03/01/2010 to 08/31/2010		
Date(s) of Site Inspection: 03/30/2010 through 4/29/2010 (multiple sites)		
Type of Review: √Post SARA Pre-SARA NPL-Removal Only Non-NPL Remedial Action Site NPL State/Tribe-lead Regional Discretion		
Review Number: 1 (First) 2 (Second) √3 (Third) Other (Specify)		
Triggering Action: Actual RA On-Site Construction at OU# _ Actual RA Start at OU#__ Construction Completion √ Previous Five-Year Review Report Other (specify)		
Triggering Action Date (*From WasteLAN*): September 28, 2005		
Due date *(five years after triggering action date)*: September 28, 2010		

ISSUES

Barnum Road Maintenance Yards (AOCs 44 and 52):

The remedial action is complete and annual groundwater monitoring has been completed as of the Final Remedial Action Report, September 2005. The site is currently under construction and requires a post construction inspection and review of as-built construction plans to ensure the provisions identified in the ROD are in place.

SHL Operable Unit (AOCs 4, 5, and 18):

The ROD does not include ICs prohibiting groundwater use in the Impacted Area; the remedy

may not achieve the groundwater cleanup goals for arsenic; the ROD does not include specific Response Action Objective for the restoration of groundwater within the "Impacted Area"; and contaminated groundwater is discharging to Red Cove.

AOC 57:

No issues affecting remedy protectiveness were identified in the completion of this five-year review.

AOC 43G and 43J:

There are no issues that would make the remedial actions at AOCs 43G and 43J non-compliant with the ROD, or sufficient to warrant a finding of not protective.

South Post Impact Area (AOCs 25, 26, 27, and 41-groundwater):

This Five-Year Review for SPIA sites AOC 25, AOC 26, AOC 27, and AOC 41 indicates that no issues are present that currently prevent the "no action remedy" from being protective now or in the future.

AOCs 32 and 43A:

No issues affecting remedy protectiveness were identified in the completion of this five-year review.

AOC 69W:

No issues affecting remedy protectiveness were identified in the completion of this five-year review.

Devens Consolidation Landfill:

No issues affecting remedy protectiveness were identified in the completion of this five-year review.

AOC 50:

No issues affecting remedy protectiveness were identified in the completion of this five-year review.

RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Barnum Road Maintenance Yards (AOCs 44 and 52):

A post-construction site inspection and review of as-built construction plans should be performed to evaluate if the final site configuration maintains the two foot surface soil cover over the existing subsurface soils as stipulated in the ROD and the drainage system effectively channels surface drainage from the site and into the retention basin constructed across Barnum Road.

SHL Operable Unit (AOCs 4, 5, and 18):

Following completion of the SHL FFS, the Army will prepare a ROD ESD or a ROD Amendment that will formally specify the ICs that prohibit the use of groundwater within the Impacted Area. The Army will ensure that the ICs specified and already in place are sufficient such that no new private wells can be installed within or adjacent to the Impacted Area.

Complete the SHL FFS to develop a remedial alternative that will effectively meet RAOs and cleanup goals established as part of an updated remedy that specifically addresses the current site conditions. Additionally, complete the SHL FFS to develop a remedial alternative that will effectively meet RAOs and cleanup goals established as part of an updated remedy that addresses the groundwater discharge to Red Cove.

AOC 57:

No recommendations or follow-up actions are required this five-year review.

AOC 43G and 43J:

43G

No recommendations or follow-up actions are required this five-year review.

43J

If the pilot study evaluation currently in progress at AOC 43J indicates that sulfate addition is an effective and feasible augmentation to the intrinsic remediation remedy, the remediation timeframe should be reevaluated to determine if COCs will reach the ROD-projected clean up goal of complete remediation of the site by 2026. If the pilot study meets both these requirements a full scale injection will be implemented following the approval of an ESD for the ROD. MassDevelopment currently plans to issue a comprehensive report on the pilot study in 2011.

SPIA:

The current remedy is effective at meeting the site's remedial objectives. Therefore, it is recommended that the current monitoring actions implemented at SPIA be continued.

An additional recommendation that does not affect the remedy's protectiveness but will enhance the site's LTM monitoring program is that the Army should install a new permanent monitoring well near downgradient well point 26WP-09-02. The permanent well will replace the well points as a sentry well for perchlorate monitoring.

AOC 32 and 43A:

The Army should use spring 2010 LTM event data and an evaluation of long-term trends (i.e., the continuance of existing trends or the emergence of new trends) to evaluate the need for a fall 2010 persulfate injection performance monitoring event.

AOC 69W:

No recommendations or follow-up actions are required this five-year review.

Devens Consolidation Landfill:

This Five-Year Review indicates no issues are present at the DCL or any of its contributor sites subject to five-year reviews.

AOC 50:

The current remedy is effective at meeting the site's remedial objectives. Therefore, it is recommended that the current remedial actions implemented at AOC 50 be continued. A recommendation of this five-year review, although one that does not affect the remedy's protectiveness but will enhance the site's O&M and LTM monitoring program, is that the Army should revise the AOC 50 LTMP. The site conditions have changed since the remedy was implemented and the primary CVOC contaminants have degraded significantly within many portions of the treatment area. The revised monitoring network should place additional focus on areas where metals mobilization is well established and at areas where CVOC degradation is lagging relative to the more degraded areas of the plume. Solubilized metals, particularly arsenic and manganese, prevalent throughout the IRZs in all treatment areas may require more focused monitoring to confirm their attenuation within aerobic portions of the aquifer. Proposed revisions to the existing LTM monitoring program will be included in the LTMP revision.

PROTECTIVENESS STATEMENT

Barnum Road Maintenance Yards (AOCs 44 and 52):

The remedy at AOCs 44 and 52 is protective of human health and the environment and exposure pathways that could result in unacceptable risks are being controlled.

SHL Operable Unit (AOCs 4, 5, and 18):

The SHL remedy is considered protective in the short-term, because there is no evidence of current exposure. However, in order for the remedy to remain protective in the long-term, an updated SHL remedy must incorporate ICs that restrict the installation of private drinking water wells throughout the "Impacted Area" and effectively meet RAOs developed under the SHL FFS to address both groundwater restoration within the "Impacted Area" and groundwater discharging to Plow Shop Pond.

AOC 57:

The remedy at AOC 57 is protective of human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled.

AOC 43G and 43J:

43G

The remedy at AOC 43G is protective of human health and the environment, and exposure pathways that could result in unacceptable risks are being controlled.

43J

The remedy at AOC 43J is currently protective of human health and the environment and exposure pathways that could result in unacceptable risks are being controlled.

South Post Impact Area (AOCs 25, 26, 27, and 41-groundwater):

The "No Action" remedy at AOCs 25, 26, 27, and 41 is protective of human health and the environment and exposure pathways that could result in unacceptable risks are being controlled.

AOCs 32 and 43A:

The remedy at AOCs 32 and AOC 43A is protective of human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled.

AOC 69W:

The remedy at AOC 69W is protective of human health and the environment and exposure pathways that could result in unacceptable risk are being controlled.

Devens Consolidation Landfill:

The remedies at DCL contribution sites AOCs 9, 40, and SA 13are protective of human health and the environment, and exposure pathways that could result in unacceptable risk are being controlled.

AOC 50:

The remedy at AOC 50 is protective of human health and environment. Exposure pathways that could result in unacceptable risks are being controlled. The remedial actions at AOC 50 are expected to allow unrestricted use and unlimited exposure following achievement of groundwater remediation goals.

2010
FIVE-YEAR REVIEW REPORT
FOR
FORMER FORT DEVENS ARMY INSTALLATION
DEVENS, MASSACHUSETTS

1.0 INTRODUCTION

HydroGeoLogic, Inc. (HGL) has prepared this comprehensive Five-Year Review of the remedial actions for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites at the former Fort Devens Army Installation (Fort Devens). This review, completed in accordance with the U.S. Environmental Protection Agency (USEPA) Comprehensive Five-Year Review Guidance, dated June 2001, was performed from January 2010 through May 2010; and covers long-term monitoring (LTM) activities from January 2005 through December 2009.

Section 121(c) of CERCLA, as amended, and Section 300.430(f)(4)(ii) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) require that periodic (at least once every five years) reviews be conducted for sites where hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use or unrestricted exposure following the completion of all remedial actions for the site. As stated in the NCP, statutory five-year reviews are required no less than every five years after the initiation of the remedial action.

1.1 PURPOSE OF THE REVIEW

This report documents the methods, findings, and conclusions of the CERCLA five-year review conducted by the U.S. Army Corps of Engineers (USACE)–New England District (NAE), at Fort Devens, Devens, Massachusetts. As stated in the Executive Summary, the purpose of the five-year review is to determine whether the remedy at a site is protective of human health and the environment. In addition, five-year review reports identify deficiencies, if any, found during the review, and identify recommendations to address them.

This review is required by statute and policy, and is being implemented consistent with CERCLA and the NCP. This comprehensive review was performed at Fort Devens, where several CERCLA Records of Decision (ROD) have been executed.

Five-year reviews should be conducted by statute if both of the following conditions are true:

- Upon completion of the remedial action, hazardous substances, pollutants, or contaminants will remain on site; and
- The ROD for the site was signed on or after October 17, 1986 [the effective date of the Superfund Amendment and Reauthorization Act (SARA)] and the removal action was selected under CERCLA Section 121.

The Statute Review sites addressed under this five-year review include:

- Barnum Road Maintenance Yards (Area of Contamination [AOC] 44 and 52);
- Shepley's Hill Landfill (SHL) (AOCs 4, 5, and 18);
- AOC 57;
- South Post Impact Area (SPIA), (AOCs 25, 26, 27, and 41 – groundwater);
- AOC 69W; and
- Devens Consolidation Landfill (DCL) (AOCs 9, 40, and SA 13).

Five-year reviews should be conducted as a matter of policy for the following types of actions:

- A pre-or post-SARA remedial action that, upon completion, will not leave hazardous substances, pollutants on site above levels that allow for unlimited use and unrestricted exposure, but requires five or more years to complete;
- A pre-SARA remedial action that leaves hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure; and
- A removal-only site on the National Priorities List (NPL) where a removal action leaves hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure and where no remedial action has or will take place.

The Policy Review sites addressed under this five-year review include:

- AOCs 43G and 43J;
- AOCs 32 and 43A; and
- AOC 50.

1.2 BACKGROUND

Fort Devens is located approximately 35 miles west of Boston, Massachusetts. Fort Devens consists of approximately 9,280 acres divided into North, Main and South Posts. The South Post is approximately 4,800 acres, and the North and Main Post make up the remaining 4,480 acres. The facility is located in the towns of Devens, Ayer, Shirley, Lancaster and Harvard. Massachusetts. Highway 2 divides the South Post from the Main Post. The Nashua River trends through the North, Main and South Posts. The area surrounding Devens is largely rural residential property.

In 1991, the U.S. Army (Army) and the USEPA signed a Federal Facility Agreement (FFA) under Section 120 of CERCLA for environmental investigations and remedial actions at Fort Devens. The agreement required that Site Investigations (SI) be undertaken at each Study Area (SA) to verify whether a release or potential release of contaminants existed and to determine whether further investigations or response actions would be required.

In 1981, Fort Devens applied for a Resource Conservation and Recovery Act (RCRA) Part B Permit for its hazardous waste storage facility. The submission included a list of Solid Waste Management Units that showed potential for the release of hazardous substances to the environment. Under the FFA between the Army and the USEPA, these potential areas of contamination are referred to as SAs. A SA includes field activities with site characterization. These may include physical and chemical monitoring; however, an AOC is defined as an area where releases of hazardous substances may have occurred or a location where there has been a release or threat of release of a hazardous substance, pollutant, or contaminant.

Argonne National Laboratory's Environmental Assessment and Information Sciences Division completed an environmental assessment in November 1988, as part of the environmental restoration of Fort Devens. The objective of the assessment was to characterize on-site contamination and provide recommendations for potential response actions. Fort Devens was placed on the NPL, effective December 1989.

The results of this assessment are reported in the *Master Environmental Plan for Fort Devens, Massachusetts* (Biang et al., 1992). This plan summarizes preliminary assessment activities and provides a historical summary of the installation, discusses the geologic and hydrologic setting, discusses the nature and extent of contamination, and proposes response actions.

In 1991, Fort Devens was identified for closure by July 1997 under Public Law 101-510, the Defense Base Realignment and Closure (BRAC) Act of 1990. This resulted in accelerated schedules for the environmental investigations at Fort Devens. Since 1991, the U.S. Army Environmental Center (USAEC) and the USACE have tasked Army contractors to perform SIs, Remedial Investigations (RI), Feasibility Studies (FS) and other CERCLA related activities for the sites addressed in this report. To a significant extent, this Five-Year Review draws on information collected during the previous activities performed by Army contractors. Previous reports generated by prior activities, containing information used during the Five-Year Review, are referenced in this report.

1.3 COMMUNITY PARTICIPATION

In February 1992, the Army released a Community Relations Plan that outlined a program to address community concerns and keep citizens informed about, and involved in, remedial activities at Fort Devens. As part of this plan, the Army established a Technical Review Committee (TRC) in early 1992. The TRC, as required by SARA Section 211 and Army Regulation 200-1, included representatives from USEPA, USAEC, Fort Devens, Massachusetts Department of Environmental Protection (MassDEP), local officials, and the community. Until January 1994, when it was replaced by the Restoration Advisory Board (RAB), the TRC generally met quarterly to review and provide technical comments on schedules, work plans, work products, and proposed activities for the SAs and AOCs at Fort Devens. The RI, FS, Explanation of Significant Differences (ESD) and Proposed Plan (PP) reports, and other related support documents have been submitted to the RAB for their review and comment.

The Army, as part of its commitment to involve the affected communities, forms a RAB when an installation closure involves transfer of property to community. The Fort Devens RAB was formed in February 1994 to add members of the Citizen's Advisory Committee (CAC) to the TRC. The CAC had been established previously to address Massachusetts Environmental Policy Act/Environmental Assessment issues concerning the reuse of property at Fort Devens. The RAB consists of representatives from the Army, USEPA Region I, MassDEP, local governments and citizens of local communities.

The Army has held regular and frequent informal meetings, performed presentations, issued fact sheets and press releases, and held public meetings to keep the community and other interested parties informed of activities at Devens. Currently, the RAB meets quarterly, or more if needed. The RAB members provide advice to the installation and regulatory agency on Fort Devens cleanup programs. Specific responsibilities include:

- Addressing cleanup issues such as land use and cleanup goals;
- Reviewing plans and documents;
- Identifying proposed requirements and priorities; and
- Conducting regular meetings that are open to the public.

At the June 24, 2010, RAB meeting, the USACE announced the commencement of this Five-Year Review

A newspaper display advertisement announcing that USACE was conducting the Five-Year Review and welcoming public participation was published in two local newspapers and one regional paper in May 2010. Another advertisement will announce the availability of the final report and where to obtain the report, including its placement at the local information repository, Ayer Public Library.

In addition to informing the community of the Five-Year Review through the public RAB meeting and newspaper publications, an 800-number was designated for public inquiries. The messaging system allowed thirty-five business days, from May 17, 2010 through July 6, 2010, for public comment or questions in regards to the review. There were no inquiries in the designated mailbox during that time-frame.

Copies of the applicable community participation information are included in Appendix J of this Five-Year Review Report.

1.4 NEXT REVIEW

This is the third comprehensive Five-Year Review that has been performed for AOCs at the Former Fort Devens; however, this is the second Five-Year Review for AOC 50, AOC 57, and the DCL and the fourth Five-Year Review for SHL. The next review will be performed within five years of the completion of this Five-Year Review Report. The completion date is the date on which USEPA issues its letter to the Army either concurring with report's findings or documenting reasons for non-concurrence.

2.0 BARNUM ROAD MAINTENANCE YARDS (AOCS 44 AND 52) STATUTORY FIVE-YEAR SITE REVIEW

2.1 SITE CHRONOLOGY

Table 2.1
Chronology of Events
Barnum Road Maintenance Yards (AOCs 44 and 52)

Event	Date
Motor vehicle gasoline (MOGAS)(20 gallons) released at Cannibalization Yard [4 cubic yards (cy) contaminated soil removed]	April 1985
Exploratory test pits for spill containment basin in the Table of Distribution and Allowances (TDA) Maintenance Yards; petroleum contaminated soil detected (0-12 inches depth)	July 1991
Contaminated soil removed from TDA Maintenance Yard during spill containment basin construction	December 1991
Waste oil underground storage tank (UST) removed at Cannibalization Yard (120 cy of contaminated soil removed)	May 1992 July 1992
SI completed	April 1993
SSI completed, SAs designated as AOCs	June 1993
FS issued	January 1994
ROD signature and Remedial Design issued	March 1995
Remedial actions	August 1995 – April 1996
Groundwater Monitoring Plan issued	April 1998
Round 1 Annual Groundwater Sampling Report issued	October 1998
Round 2 Annual Groundwater Sampling Report issued with recommendations to discontinue groundwater sampling	October 1999
First Five-Year Review	September 2000
Round 3 Groundwater Sampling Report	April 2004
Draft Remedial Action Report issued	May 2004
Second Five-Year Review	September 2005
Final Remedial Action Report	September 2005
Real Property Master Plan Long Range Component - Addendum	September 2007
Devens RFTA MMRP Site Inspection	May 2008
Environmental Protection Plan AFRC Fort Devens	April 2009
AFRC construction activities begin	April 2009

2.2 BACKGROUND

The Barnum Road Maintenance Yards (AOCs 44 and 52) are former Army vehicle storage and maintenance yards located within the former Fort Devens. These sites were combined administratively under one ROD because of their proximity and similar petroleum releases. The sites are situated in the northeast corner of the former Main Post on Barnum Road, approximately ½ mile southwest of the former Barnum Road Gate. The total area of the Barnum Road Maintenance Yards is approximately 8.8 acres (Figure 2.1). The Maintenance Yards are bordered to the north by Massachusetts Army National Guard (MANG) property, which is used for similar vehicle storage activities as the Barnum Road Maintenance Yards. Boston and Maine Railroad property and Barnum Road border the site to the west and east,

respectively. Building 3713 (now demolished), was part of the maintenance yards infrastructure and was located adjacent to the south end of the yards. Through early 2009, the Maintenance Yards were fenced, paved, and were used for military vehicle parking. The site is presently undergoing reconstruction to be used by as an Armed Forces Reserve Center (AFRC). All traces of the former maintenance yards have been obliterated by the reconstruction activities. The ongoing construction activities include building demolition and construction of an AFRC building, maintenance shops, a multi-purpose classroom building, and a new parking area. Site reconstruction was initiated in March 2009 and the projected completion date is mid-2011.

Pre-reconstruction Background

Prior to base closure, AOC 44 was known as the Cannibalization Yard. It was an area where vehicles were stored before being dismantled for usable parts. AOC 52 was a maintenance yard where vehicles were stored awaiting repairs. AOC 52 was historically known as the TDA Maintenance Yard. Northwest of the Cannibalization Yard was a separately fenced vehicle storage yard known as the Regional Training Site Yard. An area that was fenced off southeast of the main portion of the TDA Maintenance Yard was known as K-Yard. All four of these yards had a long and continuing history of vehicle storage; hence at the direction of the Army, they were all included as AOCs 44 and 52 and combined as one operable unit. They are referred to collectively in the ROD and this Five-Year Review as the Maintenance Yards.

The groundwater in the aquifer underlying the Maintenance Yards has been assigned to Class 1 under Commonwealth of Massachusetts regulations. Class 1 consists of groundwater that is designated as a source of potable water supply. Based on a 1992 SI water level survey, inferred groundwater flow from the Maintenance Yards is northeast toward Grove Pond. The town of Ayer currently owns and maintains two water supply wells within 150 feet (ft) of the south side of Grove Pond and approximately ½ mile from the yards. There is no evidence that contamination found in the Maintenance Yards has or is affecting groundwater quality.

The soils of the site have been exposed to possible vehicle crankcase releases over a long duration. Gasoline, motor oil, and other automotive fluids have also likely been released during vehicle dismantling operations in the Cannibalization Yard. Individual releases were not likely to have been of significant volume, but numerous releases during the period in which the yard was used account for the soil contamination problem. The only recorded significant vehicle release was an estimated 20 gallons of MOGAS and hydraulic fluid released near the center of the Cannibalization Yard in 1985 during the cannibalization process. Approximately 4 cy of visibly contaminated soils were excavated immediately and containerized by Army personnel.

In July 1991, exploratory test pits were excavated for construction of a concrete spill-containment basin in the southeast corner of the TDA Maintenance Yard. The test pits revealed zones of petroleum-contaminated soil below the surface. In November and December 1991, the 100 by 160-foot proposed spill-containment basin area was excavated to begin construction. Excavation continued until field screening and visual observation indicated that

contaminated soils had been removed. The contaminated layer was present from the ground surface to 12 inches below ground surface (bgs). The contaminated soil was believed to be asphalt treated, gravel road base. Field screening of soil samples collected from the proposed basin's subgrade at the bottom of the excavation indicated total petroleum hydrocarbon (TPH) compounds concentrations ranging from non-detect to 7 parts per million (ppm).

A 1,000-gallon UST formerly used to store waste oil was removed from the Cannibalization Yard in May 1992. Laboratory analysis of soil samples detected TPH compound concentrations of 17,600 ppm and 9,780 ppm. After over-excavation of the tank site in July 1992, residual soil TPH compound concentrations ranged up to 2,740 ppm at the limits of the excavation. In total, an estimated 120 cy of contaminated soil was removed from the waste oil storage tank area and shipped to an off-site facility.

2.3 REMEDIAL ACTIONS

The following is a summary of the remedial action selected for the AOCs 44 and 52 sites:

A ROD was signed in March 1995 documenting asphalt batching as the final selected remedy for cleanup of contaminated surface soils and soils associated with two known releases at AOCs 44 and 52 (USAEC, 1995). Remedial Action Objectives (RAO) for the selected cleanup remedy at AOCs 44 and 52 include:

- Minimize direct contact/ingestion and inhalation with Maintenance Yards surface soils, which are estimated to contain contaminants exceeding the USEPA Superfund target range of one in 1.0 x 10-4 to one in 1.0 x 10-6 (excess cancer risks for carcinogens).
- Reduce off site run off of contaminants that may result in concentrations in excess of Ambient Surface Water Quality standards and background concentrations in sediments.
- Reduce or contain the source of contamination to minimize potential migration of contaminants of concern (COC), which may result in groundwater concentrations in excess of the federal drinking water maximum contaminant levels (MCL).

2.3.1 Selected Remedy

Per the 1995 ROD, the selected remedy at AOCs 44 and 52 addressed long-term worker exposure to contaminated surface soil, the principal known threat at the Maintenance Yards, and two known release areas (a reported release of MOGAS and leakage from a former waste oil UST, herein referred to as the hot spot areas). The selected remedial alternative relied on cold mix asphalt batching soils to control site risks. The following were the major components of the remedy.

- Excavate surface soil (top 2 ft across the site);
- Excavate the two hot spot areas;
- Stockpile soils for sampling and analysis;

- Cold mix asphalt batch soils exceeding site cleanup levels of 7 ppm (average) total carcinogenic polynuclear aromatic hydrocarbons (PAH) and 500 ppm TPH compounds;
- Backfill excavations with uncontaminated stockpiled soil and then place the asphalt batched material;
- Apply a pavement-wearing course for vehicle-parking surface;
- Expand the existing stormwater collection system;
- Perform groundwater monitoring; and
- As a precautionary measure, institute the following institutional controls (IC) deed restrictions:
    1) Prohibit residential development/use of the Maintenance Yards;
    2) Minimize the possibility of long-term (working lifetime) exposure to subsurface soils; and
    3) Require management of soils resulting from construction related activities.

2.3.2 Remedy Components Specified by the ROD

The ROD components are described below based on information presented in the ROD. The remedial components are complete and were implemented between 1995 and 1996. Groundwater monitoring was conducted between 1993 and 2003. No additional remedial actions or soil/groundwater sampling was performed during this Five-Year Review period. Details of the implementation of the remedy components are presented in Section 2.3.3. The following is a summary of the remedy components as specified in the ROD:

<u>Excavate Surface Soils</u>
Prior to implementation of the remedial design, pre-design test pits would be excavated to predict the typical soil characteristics (color, texture, and presence of pavement) and layers containing carcinogenic PAHs that may be encountered when the top 2 ft of soil is removed during remediation. This preview allowed for optimization of soil excavation and handling activities during the remedial action, improved estimates on the volume of soils that would require treatment, and yielded soil gradation data for the asphalt batching design.

<u>Excavated Hot Spot Areas</u>
Trench explorations are required to delineate hot spots near boring 44B-96-10X (potential MOGAS spill area), boring 44B-92-06X and the waste oil UST. Headspace and non-dispersive infrared spectroscopy screening should be performed on sidewalls and/or bottom of trench (if staining was not evident). Hot spots were to be fully excavated to the approximate dimensions as determined by the trench screening and excavation continued until laboratory analysis revealed concentrations of less than 500 ppm TPH compounds. All other hot spot areas observed during the excavation of the surface soils would also be excavated, segregated, stockpiled, and sampled in a similar manner.

Stockpiling, Sampling, and Analysis

The ROD specified that soils excavated from hot spot areas be placed on, and covered with a minimum 8-mil polyethylene tarp to prevent mixing of TPH contaminated soils with clean soils. Sample collection and analysis would be performed at the rate of one sample for every 100 cy of soil to determine if the excavated soil could be reused at the site without treatment. Stockpiled soils would be sampled for TPH compounds and the following carcinogenic PAHs:

- Benzo(a)anthracene,
- Benzo(b)fluoranthene,
- Benzo(k)fluoranthene,
- Chrysene,
- Dibenzo(a,h)anthracene, and
- Indeno(1,2,3-cd)pyrene.

Asphalt Batch Soils Exceeding Site Cleanup Levels

Stockpiled soils with contaminants exceeding an average carcinogenic PAH concentration of 7 ppm and 500 ppm TPH compounds would be cold mix asphalt batched on site. Asphalt batching site soils would immobilize the contaminants exceeding cleanup levels present in the top 2 ft of soil, thus minimizing direct contact/ingestion of the contaminated soils.

Backfill Excavations

Excavations would be backfilled with "clean" stockpiled soil and the asphalt batches. Site soil was classified as "clean" if it met the cleanup criterion of 500 ppm for TPH compounds and the risk-based criterion of 7 ppm (average) for total carcinogenic PAHs. This soil would be used to refill a portion of the excavated areas at the Maintenance Yards. The asphalt-batched material would be spread out and rolled to the thickness and contours to be detailed in the final design and would serve as the sub-base or base course for the paved parking lot.

Expand the Existing Storm Water Collection System

Construction of the paved parking lot at the Maintenance Yards would increase the amount of stormwater runoff during rain events. Therefore, the selected remedy included expansion of the existing storm water collection system, including: installation of additional collection basins, additional storm water piping, and oil and grease traps, as required. Additionally, potential effects on wetlands at storm water outfalls were to be investigated and, as needed, minimized by construction of detention basins and flow reducers.

Apply a Pavement Wearing Course

The Army chose to add a pavement wearing course for a vehicle parking surface over the asphalt batched material as an ancillary component. A pavement wearing course is a topcoat of pavement that is placed over the pavement base course to provide a smooth, durable surface in high traffic areas. A pavement wearing course placed over the batched material was not a required remedial component for the selected remedy.

Perform Groundwater Monitoring

The objective of groundwater monitoring was to provide assurance to the public and regulatory agencies that the groundwater in the aquifer underlying the facility remains

unaffected by past Maintenance Yard activities and that it has not been adversely affected by remedial activities. Sampling and analysis of groundwater was performed through 2003. Groundwater monitoring was discontinued after 2003 due to no exceedance of COCs.

Institute Deed Restrictions

The ROD stipulated that, as a precautionary measure, ICs in the form of deed restrictions would be implemented to prevent circumstances that may result in risk of harm to health, safety, public welfare or the environment. These restrictions included the following:

1) No residential development/use of the Maintenance Yards would be permitted. The quantitative risk evaluation and established cleanup level assume the property should remain zoned for commercial/industrial use.

2) Removal of the 2 ft cover or an asphalt barrier from the Maintenance Yards will be prohibited to prevent exposure to subsurface soils (2 ft to 5 ft level). This deed restriction will be implemented as a precautionary measure to minimize the possibility of long-term (working lifetime) exposure to subsurface soils. This restriction does not apply to excavations undertaken in connection with construction of building or other structures, utilities, infrastructures or any other construction related purpose where the cover is penetrated and/or temporarily removed and protection from long-term exposure to subsurface soil is not jeopardized. To comply with this deed restriction, the 2 ft layer of cover material (which may consist of one or a combination of the following: "clean" site soil used as backfill, asphalt batched material, off-site soils/aggregate and bituminous paving) should remain over the subsurface soil (existing 2 to 5 ft soil level) to minimize direct contact/ingestion to the present subsurface soils. The continuity of the paved surface need not be maintained providing the cover thickness of 2 ft is provided. As an alternative, a continuous and maintained paved surface, which would prevent exposure to subsurface soils, could be substituted for the 2 ft thick cover.

   This restriction would not apply to excavation and use that is within the scope of any response action. The deed restriction may be nullified, as approved by the regulatory agencies, should there be future evidence showing that contaminant concentrations within the 2 to 5 ft soil zone are below site surface soil cleanup levels.

3) Excavation below 2 ft at the Maintenance Yards, subsequent to completion of the remedial action established in the ROD, would require:

   a) Development and implementation of a Health and Safety Plan (HASP) for the work area; and

   b) Development and implementation of a Sampling and Analysis Plan (SAP) for management of the excavated soils in accordance with the following:

      i) Where reuse of soil within the Maintenance Yards is intended, sampling and analysis of stockpiled soils excavated below 2 ft would follow criteria detailed in the ROD for hot spot area soils. Soils with contaminants exceeding the 500 ppm cleanup level for TPH compounds will be treated in a manner consistent with the ROD. Soils with contamination below the established cleanup level may be

returned to the excavation. Soil excavated from below 2 ft that would be replaced to less than 2 ft (as surface soil) must also be sampled, analyzed and if required, treated for carcinogenic PAH contaminants as detailed in the ROD.

ii) Where reuse of soil outside the Maintenance Yards is intended, sampling/analysis and action levels for stockpiled soils excavated below 2 ft will follow criteria governed by regulations or policies in effect for the final disposal area.

If property transfer occurs in the future, ICs will be incorporated into the property deed or other instrument of property transfer. Until that time, the Installation Master Plan (IMP) (R&K Engineering, 1999) would cover IC restrictions. The IMP has since been updated with an addendum in 2007.

2.3.3 Remedy Implementation

Remedy implementation consisted of completion of a remedial design and the remedial action, performing groundwater monitoring, and enforcing ICs. Remedial construction was completed by April 1996. The Remedial Action Completion Report was issued on June 1996 (Weston, 1996). Implementation of the remedy is described below.

2.3.3.1 Design

The design was performed by ABB Environmental Services, Inc. (ABB-ES), presently MACTEC Engineering and Consulting, under contract with the USACE, and was documented through submission of several interim deliverables. Pre-design field activities commenced July 1994 in anticipation that the ROD would be signed prior to completion of the remedial design. Pre-design field activities consisted of excavating test pits, evaluating the existing storm water system and performing a site topographic survey.

2.3.3.2 Remedial Actions

Construction commenced on August 1995 and entailed excavating and sampling of over 30,000 cy of surface soils from the top 2 ft of the site to segregate and treat soils exceeding the cleanup level of 7 ppm for carcinogenic PAH and 500 ppm for TPH. During the excavation, a total of three hot spots were excavated below the 2 ft surface soil depth. These areas included the suspected batch contaminated sub-base soil at the UST over-excavated area and the MOGAS spill area. Sampling of soils from in situ and stockpiles from these areas revealed that TPH concentrations were below the site cleanup level of 500 ppm.

Treatment was performed by cold mix asphalt batching 11,800 cy of contaminated soils and then backfilling/compacting both the uncontaminated excavated soils and the asphalt batched material as a sub-base material in the excavation. The top 9 inches of backfilled material consisted of batched material and the bottom 15 inches consisted of uncontaminated backfill soil. Four inches of bituminous pavement was placed over this sub-base material to complete a pavement wearing course for Army vehicle parking.

In addition to the excavation and soil treatment, a drainage system was installed throughout the Maintenance Yards to collect stormwater from the newly paved surface. A detention pond was constructed to store accumulated rainfall and minimize flow at the outfall at Cold Spring Brook during heavy storm events. In addition, an oil/water separator was installed within the storm drain system. The detention pond was constructed in the area of a suspected acid leaching pit associated with the TDA Building, SA 38D. The leaching pit was not located during construction activities. Remedial construction was completed by April 1996.

It should be noted that the recent construction activities removed the pavement and the oil water separator. The drainage system was modified to be compatible with the new site lay-out. Figure 2.2 shows the new site lay-out relative to the previous Maintenance Yards configuration. The detention pond located southeast of Barnum Road was not modified. The construction activities were performed in accordance with an Environment Protection Plan (EPP) for the AFRC reconstruction to meet the requirements of the ROD for remedy protectiveness during construction and to and ensure the remedy maintained its intended protectiveness after construction activities were complete (GeoInsight, Inc., 2009).

2.3.3.3 Groundwater Sampling

The objective of the groundwater monitoring required by the ROD was to provide assurance to the public and regulatory agencies that the groundwater in the aquifer underlying the facility remains unaffected by past Maintenance Yard activities and that it has not been adversely affected by remedial activities.

The need to investigate groundwater directly downgradient of the former waste oil tank and MOGAS spill was discussed during a draft FS review meeting held at Fort Devens on May 5, 1993 (ROD, Barnum Road Maintenance Yards, ABB-ES, 1995a). During the meeting, it was suggested that the existing monitoring wells located in and around AOCs 44 and 52 might not be positioned to readily detect the full impact of the UST and spill contamination sources on groundwater. In response, the Army installed two monitoring wells positioned to readily detect the full impact of the tank and spill contamination sources on the groundwater. The two monitoring wells, G3M-93-10X and G3M-93-11X, were installed at the edge of the Cannibalization Yard. G3M-93-10X was located approximately 50 ft downgradient of the former tank area and G3M-93-11Xwas located approximately 50 ft downgradient of the MOGAS spill area. The former monitoring well locations are shown on Figure 2.3.

Two rounds of samples were collected from wells G3M-93-10X and G3M-93-11X and analyzed for volatile organic compounds (VOC), semi-volatile organic compound (SVOC), TPH, and inorganics. Results from Round 1 (June 1991) showed no detections of TPH (quantization limit of 178 micrograms per liter [μg/L]) or VOCs. In Round 2 (September 1993), trace concentrations of toluene (2.6 μg/L and 1.25 μg/L in G3M-93-10X and -11X, respectively) and tetrachloroethene (PCE) (2.6 μg/L G3M-93-10X) were detected in the groundwater. Concentrations for these analytes were below state and federal drinking water MCLs and below MCP GW-1 standards. The only detected SVOC was bis(2-ethylhexyl)phthalate, a suspected laboratory contaminant, at 22 μg/L in the Round 1 sample from G3M-93-10X. The fact that no significant contamination was detected supported the

conclusion that surface soil contaminants at the Cannibalization Yard had not affected the aquifer and indicated that the waste oil UST and the MOGAS spill were not significant contributors to groundwater contamination. Based on these results, the ROD did not require installation of additional monitoring wells.

The SAP for groundwater LTM required by the ROD was issued in April 1998 (Weston, 1998a). This plan specified that annual sampling would be performed at three existing monitoring wells G3M-92-04X, G3M-92-05X, and MNG-1, for two years. These wells were located within the maintenance yard fence at the downgradient edge of the maintenance yards (G3M-92-04X), downgradient and outside the maintenance yard fence (MNG-1), and cross-gradient of the maintenance yards (G3M-92-05X). Monitoring well MHG-1, located on MANG property north of the Maintenance Yards, could not be located during sampling rounds and was likely destroyed during previous construction activities.

The first annual round of samples was collected at monitoring wells G3M-92-04X and G3M-92-05X in May 1998, and no concentrations of extractable petroleum hydrocarbons (EPH), volatile petroleum hydrocarbons (VPH) or lead were detected above MCP Method 1 GW-1 Standards. The analytical results were presented in the 1998 Annual Groundwater Sampling Report along with recommendation to discontinue monitoring if the 1999 sampling showed similar results (Weston, 1998b). The second annual round of sampling was completed in June 1999 with no reported exceedances of MCP GW-1 standards. Because 2 years of monitoring had been completed as planned and there were no exceedances of the standards, the 1999 Annual Groundwater Sampling Report recommended that groundwater monitoring be discontinued (Weston, 1999).

In response to the recommendations of the sampling reports, USEPA provided a letter of concurrence to the Army agreeing that groundwater monitoring was no longer needed at the site. USEPA stated that one more round of sampling would satisfy the ROD requirement that sampling be performed "…for a period of five years upon commencement of remedial activities" (USEPA, 1999). MassDEP questioned the recommendation to discontinue sampling and the matter was discussed at a BRAC Cleanup Team (BCT) meeting in April 2000. Meeting minutes indicate brief discussion with the outcome that the need for additional sampling was left to the discretion of the Army. The decision to terminate sampling was documented in the First Five-Year Review (HLA, 2000).

Subsequently, a third round of groundwater monitoring was performed in December 2003 to verify that the aquifer remained unaffected. Some PAHs were detected in the groundwater samples but all reported detections were below MCP GW-1 standards. This final round was completed more than five years after issuance of the Groundwater SAP and more than eight years after commencement of remedial activities. The requirements of both the SAP and ROD for the duration of groundwater monitoring were thereby satisfied. No additional groundwater sampling has been performed after the December 2003 event.

Analytical summary tables are provided in Appendix A of this report.

2.3.3.4 Institutional Controls

The ROD required implementation of ICs as a precautionary measure to prevent exposure to subsurface soils and possible long-term exposure to site workers. The ICs are described in Section 2.3.2 of this report.

There are no current or future plans for transfer of property from Army ownership at this time. The Real Property Master Plan (RPMP), Long Term Component, currently defines the ICs. If property transfer occurs in the future, ICs, if still required, will be incorporated into the Finding of Suitability to Transfer (FOST) and property transfer deed.

2.3.4 System Operation/Operations and Maintenance

At this time, other than standard maintenance requirements of the surface water drainage system and ensuring the subsurface soil remains capped by a 2-foot layer of clean soil or pavement, there are no long-term operations and maintenance (O&M) needs to maintain the integrity of the remedial action.

2.4 PROGRESS SINCE LAST FIVE-YEAR REVIEW

This is the third five-year review for AOC 44 and 52.

The following is the protectiveness statement from the 2005 Five-Year Review:

> *"The remedy at AOCs 44 and 52 is protective of human health and the environment and exposure pathways that could result in unacceptable risks are being controlled.*
>
> *Human health is protected at AOCs 44 and 52 because surface soils that were found to contain contaminants exceeding site cleanup levels were asphalt batched. The remedy effectively prevents direct human contact with these contaminants and minimizes the probability of contaminant migration.*
>
> *Although ICs are specified in the ROD noted changes in risk assessment methodology and updated analytical data would suggest that these ICs are more than sufficient at protecting human health and the environment."*

The following recommendations were made:

The remedial action is complete. Based on the noted conditions and finding of this review, the Army will be describing the O&M of the drainage system in the Draft Storm Water Management Plan, which will be updated in the spring 2006. In addition, the Army is currently updating the IMP, which will be finalized in spring 2006.

In the last five years, these recommendations were addressed as follows:

The LUCs that are applicable for AOCs 44 and 52 were included in the September 2007 Real Property Master Plan Long Range Component Addendum and were identified as Area F (3700

Area–Barnum Road Maintenance Yards). O&M of the AOC 44 and 52 drainage system was performed per the Storm Water Management Plan on a semi-annual basis or following storm events up until the time of the AFRC construction in April 2009. The selected remedy is complete and no additional site activities concerning remedy implementation are required. A new AFRC building located over a portion of the former AOC 44 and 52 area incorporated a vapor barrier beneath the building slab to alleviate any concerns with potential vapor intrusion from any potentially impacted subsurface soils. No impacted soils were noted in this area during construction. All site constructions activities followed provisions of the 2009 EPP. A Soils Management Plan, which detailed the ROD requirements during construction, was included as Appendix O of the EPP.

2.5 FIVE-YEAR REVIEW PROCESS

2.5.1 Document Review

The following documents were evaluated for this five-year review:

- Final Site Investigation prepared by ABB Environmental Services, Inc., April 1993.
- ROD, Barnum Road Maintenance Yards, AOCs 44 and 52, prepared by the U.S. Army Environmental Center, March 1995.
- Previous Five-Year Review Reports (2000 and 2005) prepared by Harding Lawson Associates (2000) and Nobis Engineering, Inc. (2005).
- Final Remedial Action Report, Areas of Contamination 44 and 52, prepared by Mactec Engineering and Consulting, Inc., September 2005.
- RPMP Long Range Component (September 2007 Addendum).
- Devens Reserve Forces Training Area Site Inspection Report for the Military Munitions Response Program, (2008).
- Environmental Protection Plan Armed Forces Reserve Center, Fort Devens, Ayer, Massachusetts. April 2009.

2.5.2 Data Review

No new soil or groundwater data was available for review during this Five-Year review. The latest groundwater data from the site was obtained during 2003 and evaluated during the previous Five-Year review. Comparison of the previous (2003) data to current standards revealed no COC exceedance.

According to the 2005 Final Remedial Action Report, the remedial action at AOCs 44 and 52 is considered complete and no additional sampling activities are required.

The Devens RFTA MMRP Site Inspection performed in 2008 at the Barnum Road Area, specifically the 3700 Parcel that includes the former Maintenance Yards and the area that is under construction for the AFRC, found that there is a low probability of MEC within this

area and recommended No Further Action (NFA) in regards to MEC (URS Group, Inc., 2008).

2.5.3 Site Inspection

On April 13, 2010, a HGL representative performed site inspections at AOCs 44 and 52. Conditions during the inspection were favorable with no precipitation and temperatures in the mid-40 degrees Fahrenheit (F°).

AOCs 44 and 52 are situated in the northeast corner of the former Main Post on Barnum Road, approximately ½ mile southwest of the Barnum Road Gate. The total area of the Barnum Road Maintenance Yards is approximately 8.8 acres. The Maintenance Yards are bordered to the north by Massachusetts Army National Guard property, which is used for similar vehicle storage activities as the former Barnum Road Maintenance Yards. The Army National Guard unit used the former Maintenance and Cannibalization Yards for vehicle storage. The vehicles are no longer parked within the former yards due to ongoing construction. Building 3713, located south of the site, was formerly used by the Army for vehicle maintenance activities but was demolished in late 2009, early 2010. The entire site was in a state of demolition and construction with very few recognizable features present from the former Maintenance Yards. The area consisted of semi-complete buildings, numerous sand and gravel piles, and piles of construction debris and building materials. Construction trailers were located on the northeastern perimeter of the former maintenance yards. The new Organizational Maintenance Shop (OMS)/Area Maintenance Support Activity (AMSA) building is located over a portion of the former Maintenance Yards footprint. The new AFRC training building is located over a portion of the site formerly occupied by Building 3713. No open excavation areas were noted during the site visit. Figure 2.2 shows an overlay of the new buildings over the former Maintenance Yards layout.

2.5.4 Interviews

The following individuals were interviewed as part of the five-year review:

- Ms. Ellen Iorio, USACE, New England District; and
- Mr. James Conway, CENAE-CO-WRO.

Ms. Iorio stated that she is unaware of any events, incidents, or activities that would impact the site but was aware of the site reconstruction activities. ICs are in effect for AOCs 44 and 52 (as discussed in other sections of this report).

Mr. Conway stated that his office has been administering the Ayer AFRC construction contract and has performed construction inspections over the last two years. He stated that they have not performed environmental inspections, except in support of construction activities. Mr. Conway added that during the construction activities, several buried training munitions were uncovered on the site. This resulted in the response activities to remove the training munitions from the site to proceed with construction. Additionally, he stated that there were a couple of instances over the last two years of vandalism to the site wherein local

authorities took care of those issues, in which motive concluded to be theft. Mr. Conway has no knowledge of continual remedial operations at the site and not aware of any ongoing community concerns involving the sites' O&M.

The detailed 2010 land-use control (LUC) interviews are included in Appendix J.

2.5.5 Community Participation

Community participation at former Fort Devens Army Installation is detailed in Section 1.3.

2.6 TECHNICAL ASSESSMENT

Question A: Is the remedy functioning as intended by the decision documents?

Yes, the remedy is functioning as intended by the ROD.

Remedial Action Performance: Remedial action and groundwater monitoring at AOCs 44 and 52 are complete. The asphalt batching of contaminated soils remains effective at immobilizing the petroleum related contaminants and has met the objectives of the remedial action. The cover over the untreated subsurface soils remains in place and recent on-site construction activities have complied with the provisions of the ROD concerning construction activity soil management practices. Previous groundwater monitoring has confirmed that migration of surface soil contaminants to the aquifer following the historic releases at the site, or because of remedial activities, has not occurred.

System Operations/Operation and Maintenance: Other than five-year site reviews and basic maintenance of the stormwater system, there is no system O&M requirement.

Opportunities for Optimization: Remedial action activities have been completed at this site. Therefore, there are no proposed opportunities for optimization.

Early Indicators of Potential Remedy Failure: No early indicators of potential remedy failure were noted during the review. No infractions of the IC requirements were noted during the site inspection; however, a post-construction site inspection is recommended to ensure provisions specified in the ICs are maintained.

Implementation of Institutional Controls and Other Measures: The property that consisted of the former Maintenance Yards remains under Army ownership and is in the process of redevelopment for Army use. ICs remain in place per the RPMP Long Range Component, September 2007 Addendum.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?

The remedy is complete and there were no changes that could affect the protectiveness of the remedy.

Remedy implementation excavation activities and asphalt batching of contaminated soils at AOC 44 and 52 were completed by April 1996. The RAOs for soil specified in the ROD have been permanently achieved. Because the remedy minimizes the exposure pathway, changes in exposure assumptions, toxicological values, or other aspects of the risk assessment process do not affect the remedy protectiveness. The recent construction activities were performed in accordance with ROD requirements for future construction activity at the site and the physical condition remains consistent with ROD requirements thus remedy protectiveness is not affected.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No information that would call into question the protectiveness of the remedy was noted. The new AFRC construction is compliant with the requirements of the ROD and there is no change or impact to the protectiveness of the remedy.

2.6.1 Summary of Technical Assessment

Excavation activities and asphalt batching of contaminated soils at AOCs 44 and 52 were completed by April 1996. The RAOs for soil specified in the ROD have been permanently achieved.

Annual groundwater monitoring has been completed, and a supplemental sampling round performed in December 2003 revealed no data exceeded the groundwater MCLs or MCP Method 1 GW-1 standards. The site reconstruction activities have not affected the protectiveness of the remedy and the remedy is functioning as intended by the ROD. There is no other information that calls into question the protectiveness of the remedy.

2.6.2 Applicable or Relevant and Appropriate Requirements Review

The Applicable or Relevant and Appropriate Requirements (ARAR) presented in Table 19 of the ROD are reprinted and appended in Appendix A. These standards and regulations, current at the signing of the ROD and for the first and second five-year reviews, have been reviewed for changes that could affect protectiveness.

A search was performed for any newly promulgated standards that could affect protectiveness at the site. No new ARARs were identified that would affect the protectiveness of the remedy.

2.7 ISSUES

The remedial action is complete and annual groundwater monitoring has been completed as of the Final Remedial Action Report, September 2005. The site is currently under construction and requires a post construction inspection to ensure the provisions identified in the ROD are in place.

Issues	Affects Protectiveness (Y/N)	
	Current	Future
The site is under construction during the period of this review	N	Y

2.8 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

A post-construction site inspection should be performed to evaluate if the final site configuration maintains the two foot surface soil cover over the existing subsurface soils as stipulated in the ROD and the drainage system effectively channels surface drainage from the site and into the retention basin constructed across Barnum Road.

Recommendations/Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Follow-up Actions: Affects Protectiveness (Y/N)	
				Current	Future
Perform post-construction inspection and review of as-built construction plans to ensure ROD provisions for maintaining a 2-foot surface cover over subsurface soil are maintained and stormwater drainage system is adequate and discharges to retention basin.	Army	EPA/ MassDEP	12/31/11	N	Y

2.9 PROTECTIVENESS STATEMENT

The remedy at AOCs 44 and 52 is protective of human health and the environment and exposure pathways that could result in unacceptable risks are being controlled.

Human health is protected by the elimination of long-term exposure to contaminated soil through excavation of the top 2 ft of soil cover, and replacing the soil cover with a mixture of clean backfill and asphalt batched contaminated soil. The asphalt batched contaminated soil was determined to pose no exposure risk. The remedy prevents direct human contact with any potentially contaminated subsurface soils and minimizes the probability of contaminant migration. There are no groundwater impacts and groundwater monitoring was discontinued at the site in 2003, and no additional groundwater monitoring is required. All remedial actions are complete.

Environmental risk was minimized by incorporating a stormwater runoff collection system to manage increased surface runoff from the area after resurfacing of the site. The stormwater system discharges into an engineered detention basin that moderates the release of surface runoff into the adjacent Cold Spring Brook

To ensure long-term protectiveness, ICs were put in place at the site to prevent residential construction and long-term worker exposure to subsurface soils (soil at 2 ft to 5 ft depth). The ICs allow excavations in connection with building or other infrastructure activities. The site is currently undergoing expansion of the Army facilities and the ongoing construction was designed to remain in compliance with the ROD.

2.10 NEXT REVIEW

See Section 1.4 for further details.

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3.0 SHEPLEY'S HILL LANDFILL (AOCS 4, 5, AND 18) STATUTORY FIVE-YEAR SITE REVIEW

3.1 SITE CHRONOLOGY

Table 3.1
Chronology of Events
Shepley's Hill Landfill

Event	Date
Fort Devens placed on NPL	December 1989
Waste disposal at SHL ends	July 1992
Landfill capping completed	May 1993
Supplemental RI completed	1993
RI/FS completed	February 1995
ROD signature	September 1995
LTM and Maintenance Plan completed	May 1996
LTM begins	November 1996
Final Capping Closure Report	1996
Per ROD - Contingency Remedy 60% Extraction design completed	November 1997
First SHL Five-year Review Report	August 1998
Second Five-Year Review Report	September 2000
Supplemental Groundwater Investigation completed to address the first five-year review findings, re-evaluate potential human health risks and evaluate remedial alternatives to control contaminant migration and associated risks	May 2003
Contingency Remedy - Remedial Design/Remedial Action Work Plan Final 100% Submittal for the SHL Groundwater Extraction, Treatment, and Discharge	May 2005
Final ESD for implementation of the Contingency Remedy	June 2005
SHL Contingency Remedy Construction Complete and Six Week Start-up/Testing of Groundwater Extraction, Treatment and Discharge Contingency Remedy commences	August 2005
Third Five-Year Review Report	September 2005
SHL Contingency Remedy Long-Term Operations, Maintenance and Monitoring commence	March 2006
Final Scope of Work for SHL Supplemental Groundwater & Landfill Cap Assessment for LTM & Maintenance (formerly CSA) to address the third five-year review finding and remedy protectiveness issues	May 2007
SHL Contingency Remedy - groundwater extraction pumping rate increased from 25 gallons per minute (gpm) to 45-50 gpm	July 2007
Draft Final SHL Supplemental Groundwater & Landfill Cap Assessment for LTM & Maintenance Report completed	June 2009
Draft Focused Feasibility Study for SHL Remedy Update (formerly CAAA)	September 2009

3.2 BACKGROUND

3.2.1 Physical Characteristics

SHL encompasses approximately 84 acres in the northeast corner of the Main Post of the former Fort Devens. The landfill reportedly began operations in 1917, and evidence from test

pits within the landfill suggests earlier usage, possibly as early as the mid-nineteenth century. The landfill ceased operation on July 1, 1992. The landfill contains a variety of waste materials, including incinerator ash, demolition debris, asbestos, sanitary wastes, spent shell casings, glass, and other wastes. During its last few years of use, the landfill received about 6,500 tons per year of household refuse and construction debris, and operated using the modified trench method. A portion of the waste was buried below the water table. Based on boring logs, the maximum depth of the refuse occurs in the central portion of the landfill and is estimated to be about 40 ft. The volume of the landfill has been estimated at over 1.3 x 10^6cy (USACE, 1995).

3.2.2 Land and Resource Use

The landfill is bordered to the east and northeast by Plow Shop Pond, to the north by Nonacoicus Brook (which drains the pond), to the west by Shepley's Hill, to the south by recent commercial development, and to the southeast by land formerly containing a railroad roundhouse.

3.2.3 History of Contamination

In 1991, the U.S. Army began an investigation to determine the nature and extent of contamination. SHL included three AOCs: AOC 4, the sanitary incinerator; AOC 5, sanitary landfill No. 1; and AOC 18, the asbestos cell. The three AOCs are collectively referred to as SHL.

AOC 4, the sanitary landfill incinerator, was located in former Building 38 near the end of Cook Street and within the area included in Phase I of the sanitary landfill closure. The incinerator, constructed in 1941, burned household refuse, and operated until the late 1940s. Ash from the incinerator was buried in the landfill. The incinerator was demolished and buried in the landfill in September 1967. The building foundation was removed and buried onsite in 1976.

AOC 18, the asbestos cell, is located in the section of the landfill closed during Phase IV. Between March1982 and November 1985, an estimated 6.6 tons of asbestos construction debris were placed in the section of the landfill closed during Phase IV-A. In 1990, a new asbestos cell was opened in the section closed during Phase IV-B, and was used until July 1992 for disposal of small volumes of asbestos-containing material.

AOC 5 was closed in five phases between 1987 and 1992-93 in accordance with Massachusetts Regulations 310 CMR 19.000 (Figure 3.1). The MassDEP approved the closure plan in 1985. The closure consisted of installing a 30-mil and 40-mil polyvinyl chloride (PVC) membrane cap, covered with soil and vegetation and incorporating gas vents. The closure also included installation of wells to monitor groundwater quality around the landfill, and construction of drainage swales to control surface water runoff. MassDEP issued a Landfill Capping Compliance Letter approving the closure in February 1996.

Subsequent to closure, the Army evaluated soil, sediment, surface water, and groundwater

conditions at and in the immediate vicinity of the landfill. The results confirmed the presence of various contaminants, particularly certain inorganics and VOCs, in groundwater, sediments and surface water at or adjacent to SHL. A FS and ROD for SHL (USACE, 1995) stipulated a final cleanup remedy that included cap improvements, LTM, and the design of a pump and treat contingency remedy. Table 3.2 lists all COCs and their target cleanup levels.

A Revised Draft Supplemental Groundwater Investigation completed in May 2003 presented data collected during supplemental investigations in 1999, 2000, and 2001 to assess the impacts of Shepley's Hill Landfill on groundwater. The investigation focused on arsenic, and served as a tool to guide decision-making regarding future data collection activities. Major conclusions of the investigation included:

- The cap diverts a substantial portion of groundwater formerly migrating towards Plow Shop Pond and Grove Pond to a more northerly path under the landfill. Most of the groundwater associated with the landfill flows north and discharges mainly to a section of Nonacoicus Brook in a wetland north of West Main Street.
- Benthic data indicated no significant risk of harm to macro invertebrates in Nonacoicus Brook. Wading birds, waterfowl, kingfishers, raccoons, and beavers use the wetland for food and shelter, suggesting that the larger ecological communities in the wetland are not being adversely affected.
- Given the high arsenic concentrations in groundwater with the landfill's footprint and at its downgradient edge, it is possible that arsenic levels in groundwater moving away from the landfill may increase from present concentrations over time. It is possible that reducing conditions within the landfill may last for 100 years or more, suggesting that the MCL for arsenic is unlikely to be achieved within any reasonable time frame.
- There is no current use of, or exposure to, groundwater migrating away from the landfill, and no current human health risk.

The September 2000 Five-Year Review included recommendations and actions that the Army has implemented or continues to implement to assess contamination. These recommendations include:

- Conduct annual landfill inspections and landfill gas sampling, and semiannual groundwater sampling with annual reporting to USEPA and MassDEP;
- Assess the list of parameters monitored as part of the long-term sampling program to eliminate parameters without significant site history and do not contribute to site risks or the understanding of groundwater chemistry;
- Collect groundwater samples from wells north of Shepley's Hill Landfill, along Molumco Road (i.e., SHM-99-31A, SHM-99-31B, SHM-99-31C, and SHM-99-32X) for parameters included in the long-term monitoring plan to assess arsenic migration;
- Continue to collect landfill gas readings to assess the potential for subsurface gas migration; and
- Re-evaluate the contingency remedy of groundwater extraction with discharge to a local

POTW, with the understanding that the contingency remedy would not prevent the release of arsenic from aquifer materials and would need to be performed for an indeterminate length of time. Due to the Town of Ayer POTW's inability to receive extracted groundwater, the groundwater extraction system's discharge was directed to the MassDevelopment POTW.

The ROD included a contingency provision, which required that a groundwater extraction and discharge system be installed if groundwater contaminant concentrations (primarily arsenic) did not meet risk-based performance standards over time. Due to continued elevated contaminant concentrations, the Army installed and began operating a groundwater extraction and treatment system (hereinafter referred to as the ATP—Arsenic Treatment Plant [ATP]) in 2005 to address groundwater contamination emanating from the northern portion of the landfill. Initially the system was operated at an extraction rate of 25 gpm. In July 2007, the extraction rate was increased from 25 gpm to its full design capacity of 50 gpm. Through 2008 and 2009, the system has been operated at full capacity and with implementation of system improvements in 2009, and is now achieving the design pumping rate of 50 gpm.

3.2.4 Basis for Taking Action

Between 1991 and 1993, the Army performed a RI and supplemental RI at SHL. The RI and RI Addendum reports identified potential human exposure to arsenic in groundwater as the primary risk at SHL. The RI Addendum Report also identified potential ecological risks to aquatic and semi-aquatic receptors from exposure to Plow Shop Pond surface water and sediments.

3.3 REMEDIAL ACTIONS

Based on types of contaminants, environmental media of concern, and potential exposure pathways, the following RAOs were documented in the ROD to mitigate existing and future potential threats to public health and the environment:

- Protect potential residential receptors from exposure to contaminated groundwater migrating from the landfill having chemicals in excess of MCLs; and
- Prevent contaminated groundwater from contributing to the contamination of Plow Shop Pond sediments in excess of human-health and ecological risk-based concentrations.

The ROD did not identify remedial objectives for surface soil, landfill gas, or leachate because the risk assessments did not identify potential risks from exposure to surface soil and ambient air. Leachate was not identified during the RI or supplemental RI activities.

The Plow Shop Pond OU was established to evaluate additional actions that may be necessary to manage potential risks from exposure to Plow Shop Pond surface water and sediment. The Army performed surface water and sediment characterization as well as sediment toxicity characterization in Plow Shop Pond and Grove Pond from 1992 through 1995. Results of these studies were reported in the RI Addendum Report (ABB-ES, 1993) and in the Draft

Plow Shop Pond and Grove Pond Sediment Evaluation (ABB-ES, 1995c).

To address groundwater contamination at SHL, Alternative SHL-2 (Limited Action) was selected, as the preferred alternative as part of the ROD, with Alternative SHL-9 (Groundwater Extraction and Discharge to the Ayer POTW) as the contingency remedy if Alternative SHL-2 proved not to be protective. Each component contained provisions for the containment of landfill waste and management of contaminant migration. Groundwater cleanup levels were developed using appropriate USEPA guidance at the time the ROD was signed and are listed in Table 3.2.

Table 3.2
Contaminants of Concern (COC) Cleanup levels
Shepley's Hill Landfill

Chemical of Concern [1]	Cleanup Level, μg/l	Selection Basis
Arsenic[2]	50	MCL
Chromium	100	MCL
1,2 – Dichlorobenzene	600	MCL
1,4 – Dichlorobenzene	5	Massachusetts MCL (MMCL)
1, 2 –Dichloroethane	5	MCL
Lead	15	Action Level
Manganese [3]	1,715	Background
Nickel	100	MCL
Sodium	20,000	Health Advisory
Aluminum	6,870	Background
Iron	9,100	Background

Notes:
(1) The LTM Program (Stone and Webster Technology and Services, 1996c) established arsenic, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 1,2-dichloroethane as trigger chemicals because of the carcinogenic risk associated with each of these compounds.
(2) Based on MCL at time of ROD. EPA lowered MCL to 10 μg/l in 2006.
(3) Revised ROD cleanup level based on background evaluation.

The ROD indicated that the residual human health risk from residential exposure for groundwater, after attainment of cleanup levels with an arsenic cleanup goal of 50μg/l, is estimated to be approximately 1×10^{-3}, or, if modified to account for the uncertainty associated with exposure to arsenic, 1×10^{-4}. This uncertainty relates to toxicological data that suggest the dose response curve for skin cancer may be sub-linear and, consequently, the CSF used to generate risk estimates may be overestimated.

3.3.1 Selected Remedy

Alternative SHL-2 contained components to maintain and potentially improve the effectiveness of the existing landfill cover system and to satisfy the Landfill Post-Closure Requirements of 310 CMR 19.142, and to reduce potential future exposure to contaminated groundwater. Key components of this alternative included:

- Landfill closure in accordance with applicable requirements of 310 CMR 19.000;
- Survey of SHL;

- Evaluation/improvement of storm water diversion and drainage;
- Landfill cover maintenance;
- Landfill gas collection system maintenance;
- Groundwater LTM;
- Landfill gas LTM;
- ICs;
- Educational programs;
- 60% design of an ATP;
- Annual reporting to MassDEP and USEPA; and
- Five-Year Site Reviews.

3.3.2 Status of Remedy Components Specified by the ROD

The status of the progress made on the implementation of the components of the selected remedy is described in greater detail below.

Landfill Closure in Accordance with Applicable Requirements of 310 CMR 19.000. The ROD required closure of SHL in accordance with 310 CMR 19.000. These regulations contain requirements for the submittal to and approval by MassDEP of plans and supporting materials to document that landfill closure occurs according to approved plans and applicable MassDEP requirements.

Status: The Army submitted a draft closure report for SHL to MassDEP in July 1995, and the MassDEP issued a Landfill Capping Compliance Letter approving the closure as of February 8, 1996 with review comments and specific recommendations to address issues of concern. Following review of the MassDEP comments, the Army submitted the final closure report in March 1996 pursuant to 310 CMR 19.000 (SWET, 1996b) and the LTM and Maintenance Plan in May 1996 (SWET, 1996c).

Survey of SHL. The ROD required an accurate topographical survey of the landfill surface, including the elevation and horizontal location of monitoring wells or piezometers installed as part of the remedy. The ROD also required an aerial survey of the landfill as part of the remedy.

Status: The landfill surface was surveyed as part of post-closure activities (SWET, 1996a) and was resurveyed in 2002 to monitor subsidence.

Evaluation/Improvement of Stormwater Diversion and Drainage. The ROD required an evaluation of stormwater diversion and drainage systems at and adjacent to SHL as part of the remedy. The focus of the evaluation was to include the following items of concern:

- Landfill cap runoff patterns and drainage ditch flow capacities.

- Potential run-under along the western edge of the landfill, particularly where the existing geomembrane cap may not have a good seal with the underlying bedrock.
- The effectiveness of storm water drainage systems upgradient of the landfill (i.e., at the transfer station, tire recycling station, Defense Reutilization and Marketing Office (DRMO) yards, and along Market Street) in diverting run-off from potential infiltration areas upgradient of the landfill.

Status: As part of LTM activities, the Army has performed routine maintenance on stormwater ditches at the landfill. Significant portions of drainage ditch have been re-graded and seeded or lined with rip-rap stone to reduce erosion. Periodic maintenance of the drainage swales have been performed as part of cap maintenance activities.

Potential run-under along the western edge of the landfill was initially evaluated as part of the SHL Supplemental Groundwater Investigation. Although test pits indicated that run under could occur, soils are sandy and the geomembrane cap did not fit the underlying bedrock surface tightly. The SHL Supplemental Groundwater Report concluded that potential run-under would have small effects on groundwater elevation and the direction of flow. The BCT did not reach consensus regarding the impact of potential run-under. Consequently, this issue was reevaluated in the *Supplemental Groundwater & Landfill Cap Assessment* (June 2009). The SG & LCA found no direct evidence that run-under was significantly contributing to groundwater recharge under the cap. The issue remains a component of the Conceptual Site Model, and is included in the groundwater model as a line of supplemental recharge along the west edge of the landfill area. It is believed that run-under, combined with the topographically induced upwelling of groundwater from bedrock to overburden beneath the landfill, accounts for the majority of groundwater recharge to overburden within the landfill.

Significant changes to stormwater drainage have been made in the area south of SHL as part of MassDevelopment Devens redevelopment activities. Runoff and drainage patterns that divert storm runoff away from SHL were reconfigured toward settling ponds that discharge predominantly away from the area upgradient of the landfill.

<u>Landfill Cover Maintenance</u>. The ROD required that a small area of ponded water in the northwestern section of the landfill be drained and regraded to minimize stress on the cover system and prevent future ponding and potential for leakage through the PVC geomembrane. The area was approximately 100 ft in diameter and was estimated to be about 1-foot deep. The water would be pumped out and the ponded area backfilled with common borrow to bring the area up to the desired grade. A new section of the PVC geomembrane would be installed on top of the fill and seamed to the existing geomembrane to provide low permeability surface in this area. This work was completed in 1993.

At the northern end of the landfill, erosion of cover soil in sections of the drainage swales has occurred in the past, exposing PVC geomembrane. That erosion was repaired in 1996, however it was noted that additional repair may be needed in the future.

Annual inspections were required to monitor the condition of the landfill cover, including

monitoring wells, cover surface, and drainage swales to decide if maintenance would be needed. Landfill maintenance and mowing were scheduled to minimize potential adverse effects to the Grasshopper Sparrow, a state-listed species of special concern that may nest on the cover.

Status: A LTM and Maintenance Plan were prepared for the SHL Operable Unit in 1995 to outline proposed monitoring, maintenance, and reporting activities (SWET, 1996c). Since that time, the Army has performed periodic maintenance on the landfill cap. These activities have been documented in annual reports (SWET, 1997a; SWET, 1997b; SWET 1998; USACE, 1999; USACE, 2000; USACE 2001, USACE, 2002; USACE, 2003; USACE, 2004; and USACE, 2005; CH2M Hill, 2007a, CH2M Hill, 2007b; ECC, 2008, 2009, 2010) and have included the following activities as recommended in the annual reports and in the past Five-Year Reviews:

- Performing annual inspections of the landfill surface;
- Draining a small area of ponded water in the northwestern section of the landfill to minimize stress on the cover system and re-grading to prevent further ponding;
- Re-grading and rip-rapping substantial portions of drainage ditches at the landfill;
- Filling animal burrows;
- Repairing roads; and
- Mowing the landfill vegetative cover.

<u>Landfill Gas Collection System Maintenance.</u> The ROD requires annual inspections to monitor the SHL gas collection system and perform any necessary repairs.

Status: The above ground portion of the landfill-gas collection system is inspected annually as part of landfill monitoring activities. During the most recent inspection in 2009 by the USACE, the gas vents were reported in good condition, and no repairs had been required. The 2010 inspection will occur in the fall.

<u>Long-Term Groundwater Monitoring.</u> The ROD required development of a long-term groundwater monitoring plan at SHL to evaluate remedy performance and assess future environmental effects. The Revised *Long Term Maintenance and Management Plan* (LTMMP), which was prepared in May 2007 and amended in December 2009, expanded the monitoring program to include evaluations of remedy performance. The ROD called for semi-annual groundwater monitoring for a minimum of 30 years.

Status: The groundwater monitoring program includes a total of 67 monitoring wells. Hydraulic monitoring is conducted at all 67 monitoring wells on a semi-annual basis. Water quality sampling (including analysis for arsenic) is conducted at 38 monitoring wells in the fall (October) and 16 of those 38 wells are sampled in the spring (April) (Figure 3.2). The analytical parameters are appropriately limited to field parameters, selected inorganic parameters, and seven metals (including arsenic, iron, and manganese).

Long-Term Landfill Gas Monitoring. The ROD required development of plans for monitoring the gas at landfill gas vents which was implemented in 1995.

Status: As part of scheduled monitoring activities, landfill gas samples have been collected annually from each of the 18 gas vents at the landfill and analyzed in the field by direct-reading instruments. Monitored parameters include:

- Total VOCs (ppm);
- % oxygen;
- Hydrogen sulfide (ppm);
- % of lower explosive limit;
- Carbon monoxide (ppm);
- % carbon dioxide; and
- % methane.

Landfill gas monitoring results have been submitted annually by the Army to USEPA and MassDEP. Landfill gas monitoring data summary tables reprinted from the Annual Reports are included in Appendix B.

The purpose of the landfill gas monitoring program was to establish long-term trends that landfill gas production and venting was occurring in a safe manner. Results from the spring, summer and fall 2009 landfill gas probe (LGP) sampling indicated the presence of elevated levels of methane and lower explosive limit (LEL) exceeding 25% in seven LGPs on the southern end of the landfill (LGP-05-5X, LGP-05-7X, LGP-05-8X, LGP-05-9X, LGP-05-10X, LGP-05-11X, and LGP-05-14X) and also the new co-located wells with deeper screens). Elevated levels of methane/LEL were not found at the northern end of the landfill. All three subsequent sampling events in 2009 found that methane/LEL is elevated in the several southern perimeter probes during periods of low atmospheric pressure weather conditions and return to low/ND levels immediately after atmospheric pressure had increased to normal levels (>29.86 inches Hg).

Results of the spring sampling effort are summarized in a SHL Perimeter Gas Technical Memorandum to Robert Simeone from Fred Santos and Willard Murray (ECC) dated June 22, 2009. This memo concludes that the elevated %LEL and methane gas levels are transient events and only persist for a short time while low barometric pressure resides over the landfill. Furthermore, the distance that landfill gas migrates away from the landfill during these low pressure events is less than 10 ft from the LGPs based on manual probing of shallow soil on November 30, 2009. Storm drains and manholes near the southern perimeter of the landfill and Cook Street were checked for landfill gas, as was the culvert outlet that drains the parking lots south of the landfill into the detention ponds. These results showed no detectable gas levels.

Based on the conclusion above, the evaluation of results from routine scheduled quarterly

monitoring of the perimeter landfill gas probes should consider barometric pressure conditions, such that exceedances of the 25% LEL standard are of concern only if detected when pressure conditions are above 29.86 inches Hg. The Draft 2009 Annual Report recommended cutting back the frequency of gas sampling to annually.

Institutional Controls. The ROD required implementation of ICs in the form of zoning and deed restrictions for any property released by the Army at SHL during Fort Devens base-closure activities. The Fort Devens Reuse Plan specifies that Army land bordering Plow Shop Pond is zoned for open space and rail-related uses. By pre-empting residential use, these controls helped limit human exposure. In addition, in 1996 the Army placed lease and deed restrictions on surrounding landfill area property to the south and east (parcels A.1SHL, A.1, A.1b, A.1c, A.3, A.3a and A.24) to prohibit installation of drinking water wells. This, in combination with landfill capping and long term groundwater monitoring, protects potential human receptors from risks resulting from exposure to contaminated groundwater. The ROD indicated that there were no current human receptors for groundwater exposure and that ICs would be drafted, implemented, and enforced in cooperation with state and local governments as necessary.

Status: ROD ICs are in place and functioning properly.

The landfill area property is a lease parcel included in the Lease in Furtherance of Conveyance (LIFOC) agreement between the Army and MassDevelopment and as such the current land use must comply with requirements in the ROD and the Devens Reuse Plan that designates this parcel for open space only. By pre-empting residential land use, these controls limit human exposure. The Army will convey this lease parcel to MassDevelopment by deed once the SHL remedy is determined to be Operating Properly and Successfully. The deed will include the same restrictions and environmental protection provision included in the current lease agreement.

Educational Programs. The ROD required periodic public meetings and presentations be conducted to increase public awareness. This would help keep the public informed of the site status, including both its general condition and remaining contaminant concentrations. This could be accomplished by holding public meetings every five years coincident with the five-year site reviews for SHL. The presentation would summarize site activities and the results of monitoring programs.

Status: Numerous public meetings and presentations have been held on the SHL remedy. The Devens Restoration Advisory Board meetings, which are held on a quarterly basis, have been the primary forum for this information exchange. Therefore, interested members of the community are kept informed of activities at the landfill.

60 Percent Design of a Groundwater Extraction System. The ROD required the Army to perform pre-design hydrogeologic studies and prepare a 60% complete engineering design for groundwater extraction and discharge to the Town of Ayer POTW.

Status: The 60% complete engineering design was completed in November1997.Post-ROD groundwater monitoring results indicated that the selected remedy, Alternative SHL-2, would not meet risk-based arsenic performance standards. Therefore, the Army issued an ESD, Groundwater Extraction, Treatment, and Discharge Contingency Remedy for SHL (CH2M Hill, 2005), and implemented the contingency remedy, Alternative SHL-9. The ATP was designed to extract groundwater and provide pretreatment of inorganics, primarily arsenic, prior to discharge to the POTW.

Annual Reporting to MassDEP and USEPA. The ROD requires annual reports to MassDEP and USEPA to describe site activities and summarize results of environmental monitoring. This reporting was stipulated to satisfy the requirements of 310 CMR 19.132 and 19.142.

Status: Annual Reports have been submitted to MassDEP and USEPA each year.

Five-Year Reviews. The ROD requires the Army to perform five-year reviews to assess whether the implemented remedy is protective of human health and the environment and whether the implementation of additional remedial action is appropriate. This is the fourth review to be completed and will be issued in September 2010. The ROD stipulates that the five-year reviews for Alternative SHL-2 will evaluate the alternative's effectiveness at reducing potential human health risk from exposure to groundwater and preventing groundwater from contributing to Plow Shop Pond sediment contamination in excess of human health and ecological risk-based values.

Status: Five-Year Review Reports were submitted in 1998, 2000, and 2005. This report is the Five-Year Review Report for 2010.

3.3.3 Remedy Operations & Maintenance - Landfill Cap System and ATP Operation

O&M activities for the landfill cap and the ATP are being performed in accordance with the Revised LTMMP, (May 2007), which was amended in December 2009, and the *Operations and Maintenance Manual for the SHL Arsenic Removal Water Treatment Plant, (*CH2MHill,November 2006*)*.

Several maintenance activities were completed in 2009, including air compressor repair, effluent sump level switch, and a change in the polymer used, to maintain the ATP in good working condition. Several upgrades were completed, including installation of a larger chlorine dioxide feed pump, a larger hot water tank, a bag filtration canister, and a 330-gallon contact tank. The treatment plant as presently operated and maintained consistently meets the effluent limit of 200μg/L for arsenic in the discharged water, as well as all other requirements of the discharge permit.

In March 2006, the ATP was operated at 25 gpm, half the design capacity of 50 gpm. The primary reason for the reduced flow rate was to determine the impact of groundwater extraction on the wooded wetlands to the north of the site. In July 2007, the extraction pumping rate was increased to 45 gpm and in April 2009 additional optimization measures on several ancillary system components allowed the system to operate at an instantaneous flow

rate close to 50 gpm.

O&M costs for the ATP are approximately $500,000. Major cost components include electricity ($25,000/yr), sodium chlorite ($40,000/yr), chlorine gas ($11,000/yr), polymers ($5,000/yr), waste disposal ($74,000/yr) and wastewater discharge ($81,000/yr).

3.4 PROGRESS SINCE LAST FIVE-YEAR REVIEW

3.4.1 Protectiveness Statement, Recommendations, and Actions from 2005 Five-Year Review

A protectiveness determination of the remedy at the SHL was deferred until further information was obtained by completing the recommendations and follow up actions in the 2005 Five-Year Review. These recommendations and actions included:

- Review the list of parameters monitored as part of the long-term sampling program and eliminate those that do not provide useful information;
- Continue to assess whether landfill gas is migrating;
- Start-up of the groundwater extraction and treatment system;
- Monitoring the performance of the groundwater extraction and treatment system;
- Completion of the maintenance of the landfill cap; and
- Completion of the *Comprehensive Site Assessment* (CSA) and the *Corrective Action Alternatives Analysis* (CAAA).

Review the list of parameters monitored as part of the long–term sampling program and eliminate those that do not provide useful information.
The 2005 Five-Year Review recommended eliminating parameters that have no significant site history, do not contribute to site risks, or do not aid the understanding of groundwater chemistry. The report specifically identified the elimination of copper, lead, nickel, selenium, silver, BOD5, and cyanide, and substituting total organic compound (TOC) for BOD.

The 2007 revised LTMMP provided a comprehensive LTMMP by merging previous LTM and contingency remedy performance monitoring into a single program. The report re-evaluated all analytes and in an effort to optimize data collection usefulness and efficiency, eliminated the above parameters because they had no significant site history, did not contribute to site risks, or did not aid the understanding of groundwater chemistry. The Draft 2009 Annual Report recommends further optimization of the monitoring program in future annual reports to reduce the numbers of wells and parameters which presently provide nominal performance monitoring value.

Continue to assess whether landfill gas is migrating.
The 2009 Draft Final SG & LCA evaluated the potential for landfill gas migration. According to the SG& LCA, after landfill closure, the initial landfill gas monitoring was limited to the monitoring of the passive landfill gas vents. These vents were installed during closure

construction, and were intended to vent gas which accumulates below the geomembrane liner. According to the closure plans, these vents did not penetrate into the waste layers, and, therefore, will only vent gas which rises vertically under the liner. This type of venting system has limited capacity to prevent gas from migrating horizontally beyond the limits of the liner system.

Since the 2005 Five-Year Review, nine additional landfill gas monitoring wells were installed along the commercial property at the south side of the landfill in November 2005. In 2006, the USACE installed 15 temporary soil gas probes at the north end of the landfill to further evaluate landfill gas migration.

The results of gas probe sampling conducted by ECC on five days in September to November 2008 showed high 100% LEL levels during low barometric pressure, and low levels during high barometric pressure. ECC concluded that periods of low barometric pressure appear to allow landfill gas to migrate for short periods of time, but periods of high barometric pressure appear to result in gas migration back towards the edge. (Another possible explanation for these results is that the gas probes are not air tight so that higher atmospheric pressures push clean ambient air into the vadose zone surrounding the probe, and this air is subsequently sampled during these periods.)

The SG & LCA concluded that the current landfill gas monitoring system may not be capable of fully monitoring compliance at the northern and southern property boundaries, because the gas probes are not fully monitoring the unsaturated zone soil column. Additional nested probes were recommended to monitor the deep and intermediate unsaturated zones. Given the proximity of structures to the northern and southern property boundaries, the report recommended increasing the frequency of testing of the gas probes wells to quarterly.

In 2009, 13 new gas wells were installed at the northern and southern ends of the SHL to supplement the existing landfill gas probes. Based on monitoring results from the passive gas vents and perimeter gas monitoring probes, the gas vents appear to be functioning properly and the sampling results indicate the landfill is producing gases that are consistent with what would be expected from a mature landfill

Start-up of the Groundwater Extraction System (ATP).
The 100% Design was completed in May 2005. Information subsequent to the ROD indicated that the Ayer POTW did not have the capacity to accept the extracted water. An ESD modified the discharge point to the Devens POTW and required treatment to remove arsenic to levels that meet the Devens POTW permit requirements.

The system began start-up testing in September 2005 but was interrupted due to higher than expected methane in the process water. Methane sensors were installed in the building, the process tanks exposed to air were covered and vented outside of the building, and the building electrical system was updated.

The system resumed operation in March 2006 at 25 gpm, half the design capacity of 50 gpm. The primary reason for the reduced flow rate was to determine the impact of groundwater extraction on the wooded wetlands to the north of the site.

In July 2007, the extraction pumping rate was increased to 45 gpm and in April 2009 additional optimization measures on several ancillary system components allowed the system to operate at an instantaneous flow rate close to 50 gpm. On a monthly basis, the plant averages 46 gpm, factoring in backwash cycles and plant shutdowns for microfilter cleaning and solids dewatering.

Monitoring the Performance of the Groundwater Extraction and Treatment System.
The 2009 Annual Report concluded that the ATP has been extremely effective at removing arsenic from groundwater. Average influent arsenic concentrations remain high at approximately 3,000 μg/L. Effluent arsenic concentrations have been consistently low, averaging 12.2 μg/L during the year, well below the permit level of 200 μg/L. Through 31 December 2009 the ATP has removed approximately 1,575 pounds of arsenic from the extracted groundwater.

Recent revisions to the groundwater model provided the latest capture zone assessment based on: 1) current data on operating flow rates and bedrock elevations, and 2) on current and historic arsenic detections. The assessment indicates that the source areas, whose flowpaths lead to the more easterly detections of arsenic under ambient conditions, are captured under the typical peak operating flow rate of 49 gpm. The hydraulic capture zone assessment indicates that the extraction well field is containing the majority of arsenic mass migrating northward from the landfill toe. In general, arsenic concentrations in the LTMMP wells remain relatively stable or decreasing, compared to historic levels. Only two wells in 2009 were reported to have concentrations greater than historical averages.

Completion of the Maintenance of the Landfill Cap.
The 2005 Five-Year Review identified the issue of ponding occurring on the northern half of the landfill and in swales located to the south and northwest of the landfill. A Landfill Cap Maintenance Contract was planned in the fall 2005 to address the areas of poor drainage and ponding, as well install fencing, vehicle gates and gas monitoring probes.

The Landfill Cap Maintenance work was completed between December 2008 and May 2009. Other work, including the repair of gates and fences, removal of trees and other vegetative growth, etc., was completed from 2006 through 2009. According to the SG & LCA, the landfill cover is functioning as designed. Test pits excavated in areas of subsidence showed the geomembrane, although wrinkled, has no defects or penetrations that would compromise its integrity. The types of cover soils are appropriate for the drainage of water and are not causing any damage to the geomembrane, although the cover soil thickness was less than the MassDEP requirement in some areas.

The CSA and CAAA.
The 2005 Five-Year Review identified the issue of data gaps and the need to address them,

including the lateral extent, flow directions, discharge points, importance of potential run-under, and nature of the arsenic contamination. The plan was to complete: 1) a CSA that would include an offsite groundwater contamination investigation, human health and ecological risk assessments and a landfill cap assessment, and 2) a CAAA that would review all prior FS alternatives, revise and/or validate the alternatives based on new data and develop any new alternatives as necessary.

A *Data Gaps Analysis* (DGA) Report (March 2006) was conducted as the first step in completing the CSA and CAAA. The purpose of the DGA was to assess existing site characterization data, identify major data gaps and outline the corresponding additional data needs, and define data quality objectives (DQO) necessary to support completion of the CSA and CAAA.

Future components of the CSA were expected to include an off-site groundwater contamination investigation, quantitative Human Health Risk Assessment (HHRA), qualitative Ecological Risk Assessment (ERA), and a landfill cap assessment.

The CAAA was to review all prior feasibility study alternatives, revise and/or validate these alternatives based on new data, and develop any new alternatives as necessary. The CAAA was to include a recommendation for a final corrective action alternative.

In late 2006, the Army decided to separate the components of the CSA/CAAA effort into two efforts. The CSA was redefined as the *Supplemental Groundwater and Landfill Cap Assessment for Long-Term Monitoring and Maintenance* effort and the *Remedial Investigation, Area of Contamination 72, Plow Shop Pond* effort. The CAAA was to follow these efforts as a separate FS effort. This work was delayed from the Five-Year Review milestone date of fall 2007. *The Final Scope of Work for SHL Supplemental Groundwater & Landfill Cap Assessment for Long-Term Monitoring & Maintenance* was completed in May 2007 and the subsequent field data collection occurred from May 2007 to early 2008. The Draft Supplemental & LCA, which is one component of the original CSA/CAAA effort, was submitted in December 2008, and the. Draft Final SG & LCA was completed in June 2009. Based on the conclusions and recommendations in the Final SG & LCA report, the Army prepared the *Draft Focused Feasibility Study (FFS) for Shepley's Hill Landfill(*September 2009) to begin updating the current remedy and evaluating new remedial alternatives for SHL.

3.4.2 Progress Made on Data Gaps Analysis

The DGA identified the following data gaps:

- Potential impact of landfill contaminants to McPherson Well;
- Extent of arsenic contamination north and northwest of the landfill;
- Magnitude of impact from landfill contaminants on Red Cove;
- Existence of completed exposure pathways and magnitude of current and future risk to human health and environment from landfill-derived contaminants; and

- Integrity and effectiveness of existing landfill cap, including unvegetated areas on southeastern portion of landfill cover.

The progress made in addressing each data gap is presented below.

Potential impact of landfill contaminants to MacPherson Well.
As part of the SG & LCA, the capture zone for the MacPherson well was modeled pumping at both its maximum permitted rate of 1,000 gpm and its estimated actual usage of 70 gpm as reported by the operator. Consistent with earlier model predictions, the capture zone for the MacPherson well is estimated to extend south from the wellhead area to the opposite side of Shepley's Hill, which suggests no potential for groundwater impacted by the landfill to reach this well.

Extent of arsenic contamination north and northwest of the landfill.
Hydrologic and chemical data collected in the SG & LCA generally support the belief that reduced groundwater carrying elevated arsenic concentrations ultimately discharges along Nonacoicus Brook, with the arsenic immobilized as a solid phase within the aquifer as groundwater transitions to the oxygenated conditions present near the stream. Thus, the stream represents the maximum northerly extent of the contamination. The data also suggest that deeper groundwater near the stream travels north along a ridge in the buried bedrock surface, before turning west along the valley axis and discharging to the stream. As a result, the ultimate discharge location for deeper groundwater coming from the landfill may occur further west along Nonacoicus Brook than previously believed. Along this flow path, the reducing groundwater mixes by dispersion within the oxygenated environment, which is expected to cause dissolved arsenic to precipitate as a solid prior to discharging to the stream.

Magnitude of impact from landfill contaminants on Red Cove.
The purpose of the *Draft RI for AOC 72, Plow Shop Pond* (March 2010) was to present the nature, extent, and associated risks to human health and the environment from contamination at Plow Shop Pond. An RI Work Plan that identified data gaps in the existing site characterization data was completed in 2009. The report presented the results of sediment and surface water sampling collected at the pond, as well as a summary of results from prior studies, including studies undertaken since the 2005 Five-Year Review.

The RI concluded that the source of arsenic in the Red Cove area is the current and historic release of groundwater from the SHL. Overall, the RI results are consistent with earlier investigations:

- The SHL *Remedial Investigation Addendum Report (ABB-ES, 1993)*.
- The SHL *Plow Shop Pond and Grove Pond Sediment Evaluation Report (ABB-ES, 1995)*.
- The *Expanded SI Remedial Oversight of Activities at Fort Devens Plow Shop and Grove Ponds (Gannett Fleming, 2006)*.
- The *SA 71 Sediment Risk Characterization (MACTEC, 2008)*.

- The *Final Report Arsenic Fate, Transport and Stability Study Groundwater, Surface Water, Soil and Sediment Investigation (USEPA, 2008).*
- The *Fort Devens 2008 Monitoring Update (USEPA, 2009).*

The SG & LCA evaluated whether significant risk to human health or the environment exists at SHL. The report concluded that no significant risk to human health currently exists at or to the north of SHL. Exposure pathways considered for the human health risk assessment included drinking water use, recreational use of Nonacoicus Brook, and landfill gas exposures from: 1) direct venting from the landfill; 2) lateral migration from the landfill through shallow soils; and 3) migration from groundwater containing dissolved gas.

Risks to aquatic benthic and terrestrial organisms in Nonacoicus Brook appear to be related to either: 1) sources in or upstream of Sawmill Brook (because the potential risks for some receptors in the upstream area were estimated to be higher than in the study area); and/or 2) related to chromium, which appears to have a source outside the landfill. (Note that a RI is underway to evaluate contaminant sources and potential risks upstream of Nonacoicus Brook in Plow Shop Pond.) A potential risk exists for benthic macroinvertebrates related to exposure to chromium (and to lesser extent manganese) in sediment. However, studies of invertebrates in Nonacoicus Brook found that the stream is likely to support a healthy or un-impacted benthic macroinvertebrate community. Terrestrial mammals showed no increased risk for the study area relative to the upstream area, while terrestrial birds demonstrated potential risks associated with exposure to chromium.

Integrity and effectiveness of existing landfill cap, including unvegetated areas on southeastern portion of landfill cover.

Another objective of the SG & LCA was to evaluate landfill cap integrity and its effectiveness at minimizing leachate generation and at venting landfill gas. The report concluded that, in general, the landfill cover is functioning as designed. The geomembrane observed in the test pits, although wrinkled, did not exhibit any defects or penetrations that would compromise its integrity. None of the factory or field seams observed in the test pits showed any sign of failure. The test pits that were excavated in areas of subsidence revealed that the geomembrane is in good condition and does not show any evidence of stress caused by the subsidence. The type of cover soils are appropriate for the drainage of water and are not causing any damage to the geomembrane, although the cover soil thickness was less than the MassDEP requirement in some areas. The surface drainage is functioning properly although the depressions due to subsidence create standing water and additional hydraulic pressure on the geomembrane.

As to the issue of run-under, the SG & LCA found no direct evidence hillside runoff was significantly contributing to groundwater recharge under the cap.

There is no evidence of significant erosion, and the vegetation covering the majority of the landfill is adequate, although the vegetation on the eastern area remains sparse due to the lack of topsoil. The landfill fence does not completely prevent access to the capped area.

3.4.3 Effectiveness of Measures

The landfill cover is functioning as designed.

The ATP as presently operated and maintained consistently meets the effluent limit of 200 μg/L of arsenic in the discharged water, as well as all other requirements of the discharge permit.

The 2009 hydraulic capture zone assessment indicates that, at the typical peak operating flow rate of 49 gpm, the extraction well field is containing the majority of arsenic mass migrating northward from the landfill. In general, arsenic concentrations in the LTMMP wells remain relatively stable or decreasing, compared to historic levels. Only two wells in 2009 were reported to have concentrations greater than historical averages.

Even in the areas where the ATP is expected to provide the greatest decreases in contaminant levels, the levels may not meet remediation objectives if the strong reducing conditions that have been established in the aquifer continue to mobilize naturally-occurring arsenic.

Overall, the Contingency Remedy when coupled with the landfill capping system and the ICs that prevent use of the aquifer as source of drinking water partially achieves the RAOs of the ROD.

3.5 FIVE-YEAR REVIEW PROCESS

3.5.1 Administrative Components of the Five-Year Review Process

Development of the third five-year review process included the following components that are described in this section:

- Document Review;
- Data Review;
- Site Inspection;
- Interviews; and
- Community Participation.

3.5.2 Document Review

The following documents were evaluated for this five-year review:

- ROD, Shepley's Hill Landfill Operable Unit, AOCs 4, 5, and 18, prepared by ABB-ES, Inc., September 1995.
- First Five-Year Review, Harding Lawson, September 2000.
- Explanation of Significant Differences (ESD) Groundwater Extraction, Treatment, and Discharge Contingency Remedy for Shepley's Hill Landfill prepared by CH2M

HILL, Inc., April 2005.

- Second Five-Year Review Report prepared by Nobis, September 2005.
- Final On-Site Discharge Evaluation – Shepley's Hill Groundwater Extraction, Treatment, and Discharge System prepared by CH2M HILL, Inc., December 2005.
- Data Gaps Analysis Report Shepley's Hill Landfill, prepared by AMEC, March 2006.
- Revised Long Term Monitoring and Maintenance Plan, prepared by CH2MHILL, November 2006.
- Final 2005 Annual Report, Shepley's Hill Landfill Long-Term Monitoring and O&M prepared by CH2M HILL, May 2007.
- Sampling and Analysis Plan Focused Bedrock Investigation at the Shepley's Hill Landfill, prepared by Gannett Fleming, August 2007.
- Final 2006 Annual Report, Shepley's Hill Landfill Long-Term Monitoring and O&M prepared by CH2M HILL, November 2007.
- Final 2007 Annual Report, Shepley's Hill Landfill prepared by ECC, August 2008.
- Final Report on Arsenic Fate, Transport and Stability Study, Groundwater, Surface Water, Soil and Sediment Investigation prepared by the USEPA National Risk Management Research Laboratory, September 2008.
- Draft Final Supplemental Groundwater and Landfill Cap Assessment for Long Term Monitoring and Maintenance prepared by AMEC June 2009.
- Final Supplemental Landfill Gas Monitoring Well Work Plan, Shepley's Hill Landfill prepared by ECC, June 2009.
- Devens Monitoring Update, prepared by EPA/ORD, June 2009.
- Final Remediation System Evaluation & Green Remediation Evaluation, Shepley's Hill Landfill prepared by USEPA Office of Superfund Remediation and Technology Innovation (OSRTI), August 2009
- Draft Focused Feasibility Study for Shepley's Hill Landfill, prepared by AMEC, September 2009.
- Final 2008 Annual Report, Shepley's Hill Landfill prepared by ECC, September 2009.
- Draft 2009 Annual Report, Shepley's Hill Landfill and Treatment Plant Long-Term Monitoring and O&M Services prepared by ECC, March 2010.
- *BCT Draft Remedial Investigation for AOC 72, Plow Shop Pond* prepared by AMEC, March 2010.

3.5.3 Data Review

The 2005 Annual Report (CH2M Hill, 2007) presented data from the June 2005 and January 2006 monitoring events. The 2006 Annual Report (CH2M Hill, 2007) presented data from the March, June and December 2006 monitoring events. The 2007 Annual Report (ECC, 2008) presented all data from the 2007 plant and groundwater monitoring events. The 2008 Annual Report (ECC, 2009) presented all data from the 2008 plant and groundwater monitoring events. A final report summarizing the data from the 2009 plant and groundwater sampling events has not yet been issued at the time that this five-year review was prepared. However, results from the 2009 events were available for review from the Draft 2009 Annual Report (ECC, 2010). A complete list of all validated COC results from 2005 through 2009 is presented in Appendix B.

ATP Effluent

Based on the 2006 through 2009 quarterly effluent data, all sampled parameters have remained below the respective discharge limits. However, the effluent arsenic concentration appears to be generally increasing since September 2008, yielding the highest reported concentration (43 μg/L in December 2009) since monitoring began. The POTW has established action levels and requires weekly sampling for one month when an arsenic effluent concentration exceeds 30μg/L. The manganese fluctuations are similar to arsenic, and a general concentration increase was also noted since September 2008. All other metals results have either remained non-detections since 2006 or exhibited a slow concentration decline, especially copper and magnesium.

Furthermore, the annual ATP influent VOC data and effluent VOC, SVOC, pesticide and polychlorinated biphenyl (PCB) results have consistently remained low or non-detect since monitoring began, yielding results below the corresponding discharge limits and Groundwater Classification-1 (GW-1) standards. The methane results also appear to be decreasing; however, as results were only reported for the 2008 and 2009 annual sampling events, no definitive trend can be determined at this time.

Groundwater Monitoring

Arsenic has generally remained either below or slightly above the revised 10 μg/L cleanup level since monitoring began in groundwater from each of the following wells: PSP-01, SHL-10, SHL-13, SHL-21, SHL-23, SHL-3, SHL-5, SHL-8D, SHL-8S, SHM-05-42A, SHM-93-10C, and SHM-93-10D. In addition, arsenic levels in wells SHL-4 and SHM-05-41A have declined since 1991 to detections either slightly above or below the cleanup goal in 2009. Although also exhibiting decreasing concentration trends, wells SHM-05-39B, SHM-05-41B, and SHP-99-29X continued to yield arsenic concentrations that are above the cleanup level as late as October 2009. Because wells SHM-05-39B, SHM-05-41A, and SHM-05-41B are directly downgradient from extraction wells EW-1 and EW-4 along the contamination's main trajectory, this indicates that the 2006 Contingency Remedy may already be influencing aquifer restoration.

By comparison, the following wells have yielded arsenic results above the cleanup goal since monitoring began and indicate a largely increasing trend: SHL-11, SHM-05-40X, SHM-05-

41C, and SHP-01-38A. Although arsenic at SHL-19 is apparently increasing, this well was only sampled in October 2008 and 2009, and no definitive trend can be determined at this time. Arsenic at well SHM-05-41C was initially detected in 2006 at a concentration of 636 μg/L and has increased an average of 10% per year, with the highest concentration of 895.3 μg/L detected in April 2009. Well SHL-11 has produced a similar pattern since 1991 with an initial concentration of 320 μg/L and a peak of 709.1 μg/L in October 2009, yielding an 8% average increase each year.

Wells SHL-19, SHL-20, SHL-22, SHM-96-5B and SHP-93-22B demonstrated a very different trend than those described previously. For wells SHM-96-5B, SHP-93-22B and SHL-22, arsenic has exhibited an overall parabolic trend that peaked between January and April 2006 and has since indicated a sharp decline to concentrations close to or below the initial data points measured in November 1996. Such behavior potentially indicates that the remedy has taken effect at these wells and arsenic should continue to decline. Comparatively, arsenic concentrations at wells SHL-19 and SHL-20 have shown inverted parabolic activity; specifically, arsenic declined from approximately 1991 through 1998 and remained relatively stable through the end of 2005 or beginning of 2006. This particular trend behavior would suggest that an arsenic equilibrium had been reached; however, the data for wells SHL-19 and SHL-20, and to a lesser extent wells SHL-15 and SHP-99-31B, indicate a sudden increase in arsenic concentrations throughout 2006 and an equally abrupt decline from 2007 through 2009 to arsenic levels equal to or below the plateau concentrations, of which the most severe changes are reported for well SHL-19. As this more recent activity coincides with the initial operations of the ATP, the trends indicate that the remedy upset the equilibrium by either directly or indirectly instigating desorption of arsenic entrained in the mineral matrix and may account for a portion of the arsenic increases noted for wells SHL-11 and SHP-01-38A.SHP-01-38A.

While continuing to exhibit arsenic concentrations above the 10 μg/L cleanup goal, all other wells sampled regularly for the LTM program have yielded consistent and stable concentrations since monitoring at each well began. Such behavior indicates that the arsenic contamination under these wells has reached equilibrium with the aquifer mineral matrix. Historical arsenic trends for wells, SHL-4, SHL-5, SHL-9, SHL-11, SHL-19 (unfiltered), SHL-20, SHL-22, SHM-93-22B, SHM-93-22C, SHM-96-5B and SHM-96-5C are included in Appendix B.

All target VOC results remained low and below the associated cleanup goals since monitoring began, and as a result the VOCs analyses were eliminated starting with the April 2007 sampling event. By comparison, COCs iron, manganese, and sodium consistently yielded cleanup goal exceedances in 17 to 20 of the 38 wells sampled from 2005 through October 2009. Although individual concentration behaviors are noted for each well, the iron and sodium results have exhibited an overall decreasing trend for SHL since 2005 (Figures 3.3-3.5), whereas the manganese content at the site has generally remained constant. Of the 20 wells that regularly reported iron concentrations above the 9,100 μg/L cleanup goal, wells SHL-11, SHL-05-40X, SHP-99-31B, SHM-05-41C, SHP-01-37X, SHP-01-38A, and N5-P2 exhibited relatively constant iron results, and all other wells indicated a decline in the associated iron plots. No

wells showed a general increase in iron content from 2005 through 2009. Similarly, 16 of the 18 wells with consistent sodium exceedances above the 20,000 μg/L cleanup goal exhibited a slow decline in the associated trend graphs. By comparison, sodium at well N5-P1 indicated a much more rapid concentration decrease, whereas well SHM-05-39B exhibited a general increase in sodium with a high concentration of 83,000 μg/L in October 2008. Finally, manganese at wells SHM-96-5B, SHL-22, SHX-99-32X, and SHM-96-22B has showed an increasing trend above the 1,715μg/L cleanup goal since 2006, and wells SHL-20, SHP-99-29X, SHM-05-39B, SHM-05-39A, and SHM-05-41B yielded slow to severe declines in manganese. All other wells with consistent manganese exceedances generally remained at a constant concentration.

3.5.4 Site Inspection

An HGL representative performed a site inspection of SHL on April 29, 2010. The inspection included the ATP and the landfill. Weather conditions were favorable with no precipitation and temperatures in the 60-70 °F range.

The ATP was operational during the site inspection. Representatives from the O&M contractor provided an overview of the treatment system operation. The system is operating at its intended flow rate of 50 gpm and run times are within design parameters.

The landfill is in good condition with no apparent signs of disturbance to the grass-covered landfill cap. No evidence of pooled or standing water was observed on the landfill. Landfill access is restricted by gates at the northern and southern ends of the site. The gates are typically closed except for times when O&M or other personnel are accessing the site. A representative from the O&M contractor was removing some small vegetation from the vicinity of the landfill during the inspection. It should be noted that detailed landfill inspections are performed annually by the Army as part of the LTM and maintenance activities. Inspection results and recommendations for follow-up actions are included in annual reports that are submitted to USEPA and MassDEP.

3.5.5 Interviews

The following individuals were interviewed as part of the five-year review:

- Ms. Ellen Iorio, USACE, New England District;
- Ms. Michelle Carlisle, Ayer Board of Health (BOH);
- Deputy Fire Chief Adams, Devens Fire Department; and
- Lieutenant Gill, Ayer Police Department.

Ms. Iorio stated that the site has been the subject of numerous ongoing investigations, including a CSA investigation to fill data gaps to complete an FFS. Additionally, numerous annual reports, sampling, landfill inspections, and methane evaluations have taken place to monitor the site. Ms. Iorio stated that there is community concern and involvement with the potential of arsenic migrating off site and the cost of the ongoing pump and treat at the ATP to

contain the arsenic. She stated that through RAB meetings, the public is updated on information regarding the landfill. This meeting also gives the community the opportunity to express their questions and concerns. Ms. Iorio is unaware of any problems or difficulties in the O&M procedures and has no knowledge of activities that would require emergency response from local authorities.

Ms. Carlisle stated that the Ayer BOH has concerns regarding the site remedy; however, it defers to the USEPA, MassDEP and Richard Dougherty of People of Ayer concerned about the Environment (PACE) for the expression of concerns. Concerns include arsenic contamination in groundwater, surface water and potentially in drinking water. The BOH is informed of site activities through RAB meetings and receives a copy of each report that is prepared for the site.

Deputy Fire Chief Adams stated that the Devens Fire Department has no problems with site activities to date. No on site responses have been required thus far.

Lieutenant Gill stated that the Ayer Police Department has no issues or concerns with site activities to date.

The detailed 2010 LUC interviews are included in Appendix B.

3.5.6 Community Participation

Community participation at former Fort Devens Army Installation is detailed in Section 1.3.

3.6 TECHNICAL ASSESSMENT

Question A: Is the remedy functioning as intended by the decision documents?

The contingency remedy, when coupled with the landfill capping system and the ICs that prevent use of the aquifer as source of drinking water, partially achieves the RAOs of the ROD.

Remedial Action Performance

The remedial actions are generally functioning as intended. The landfill cap system continues to prevent exposure to contaminants at the site, and the ATP is limiting arsenic migration in the north end of the landfill. The most recent capture zone assessment indicates that the source areas for captured water (under the typical peak operating flow rate of 49 gpm) correspond to the predicted source areas for arsenic impacted water downgradient. Overall, the system is containing the majority of arsenic mass migrating northward from the landfill.

Groundwater monitoring results show that the groundwater extraction and treatment system is potentially reducing arsenic concentrations down-gradient of the landfill. Historically, arsenic concentrations in wells SHM-96-5B and SHP-93-22B have increased over time, with an overall parabolic trend that peaked between January and April 2006. Since then, the extraction system was turned on and arsenic concentrations have sharply declined in these wells to

concentrations close to or below the initial data points measured in November 1996, indicating the remedy is taking effect and arsenic levels in these wells should continue to decline. However, the current remedy may not achieve the cleanup goals for arsenic due to elevated local background arsenic concentrations and the source strength of reducing conditions within the landfill and throughout the impacted area. These conditions are being further evaluated under the SHL FFS and remedy update.

System Operations/Operation and Maintenance

O&M activities for the ATP are being performed in accordance with the Revised LTMMP, (May 2007) which was amended in December 2009, and the *Operations and Maintenance Manual for the SHL Arsenic Removal Water Treatment Plant (*CH2MHill, November, 2006*)*.

Several maintenance activities were completed in 2009 to maintain the ATP in good working condition. Several upgrades were completed, including installation of larger chlorine dioxide feed pump, a larger hot water tank, a bag filtration canister, and a 330-gallon contact tank. The treatment plant as presently operated and maintained consistently meets the effluent limit of 200μg/L for arsenic in the discharged water, as well as all other requirements of the discharge permit.

O&M costs are approximately $500,000 per year under a fixed-price contract. Major cost components include electricity ($25,000/yr), sodium chlorite ($40,000/yr), chlorine gas ($11,000/yr), polymers ($5,000/yr), waste disposal ($74,000/yr) and wastewater discharge ($81,000/yr).

Opportunities for Optimization

As recommended in the 2005 Five-Year Review Report, the ATP was installed and operation/maintenance activities have continued. The Army has performed continuous optimization of ATP systems and performance monitoring under the LTMMP since the last five-year review and is evaluating additional optimization measures under the SHL FFS remedial alternatives which is expected to be completed during the next five-year review period.

In August 2009, the USEPA contractor GeoTrans also evaluated opportunities to optimize the ATP (*Remediation System and Green Remediation Evaluation Report*). The report included several optimization measures that are being evaluated in the SHL FFS remedial alternatives.

Early Indicators of Potential Remedy Failure

No early indications of potential remedy failure have been observed at this time. The remedy components are functioning as intended without excessive or unexpected costs. The effectiveness of the remedy components are evaluated regularly during monitoring and maintenance activities.

Implementation of Institutional Controls and Other Measures

ROD ICs are in place and functioning properly. The ROD required implementation of ICs in the form of zoning (i.e., Devens Reuse Plan) and deed restrictions for any property released

by the Army at SHL during Fort Devens base-closure activities. The Fort Devens Reuse Plan specifies that Army land bordering Plow Shop Pond be zoned for open space and rail-related uses. By pre-empting residential use, these controls helped limit human exposure. In addition, in May 1996, the Army placed deed restrictions on surrounding landfill area property to the south (parcels A.1, A.1b, A.1c, A.3, A.3a and A.24) previously transferred to MassDevelopment that prohibited the installation of drinking water wells.

The landfill area property is a 118-acre lease parcel included in the LIFOC agreement between the Army and MassDevelopment and as such the current land use must comply with requirements in the ROD and the Devens Reuse Plan that designates this parcel for open space only. By pre-empting residential land use, these controls limit human exposure. The Army will convey this lease parcel to MassDevelopment by deed once the SHL remedy is determined to be Operating Properly and Successfully. The deed will include the same restrictions and environmental protection provision included in the current lease agreement and ROD. Other ICs currently in place at the landfill include the fencing, gates, and the landfill cap itself, which prevents exposure.

The groundwater beneath the area extending north of the landfill (off Army property) has been impacted with arsenic levels exceeding drinking water standard (referred to as the "Impacted Area"). All properties over the Impacted Area are serviced by the public water system and although there are no ICs specified in the ROD related to the Impacted Area property, there are existing ICs in place that are likely to prevent the use of groundwater north of SHL, based on the town zoning, regulations and requirements. Specifically, (1) the Town of Ayer Subdivision Control Regulations requires the connection to public water systems that are within 400 ft of a proposed subdivision; (2) the Ayer Board of Health (BOH) permit application for new private well construction requires the description and approximate distances to potential sources of contamination within 400 ft of the proposed well (potential sources of contamination are defined as various types of disposal sites and the term "disposal site" per the MCP is defined as a place or area where an uncontrolled release of oil and/or hazardous material from or at a site or vessel has come to be located); and (3) new house building permits issued by the Town of Ayer Building Department require the connection to public water and sewer utilities that are available at the property.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?

The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid.

Changes in Standards to be Considered

As part of this five-year review, ARARs and To Be Considered (TBC) guidance were reviewed. The results of this review will be discussed further in Section 3.5.2.

The MCLs are health-based standards established by the USEPA. The MCL for arsenic in effect at the time of the ROD (50 μg/L) was selected as a groundwater cleanup goal. Arsenic was present onsite at concentrations greater than its MCL during the RI and was a primary

risk driver for the ingestion of groundwater exposure. The MCL for arsenic has been updated since the 1995 ROD. Changes to the MCL for arsenic in association with changes of the USEPA National Primary Drinking Water Regulations for arsenic and implementation on January 23, 2006, effectively reduce the clean-up level for arsenic from 50 μg/L to 10 μg/L. Because the remedy includes prohibiting the use of groundwater as drinking water by preventing the installation of wells at the site; changes to groundwater standards do not affect the protectiveness of the implemented remedy.

Changes in Exposure Pathways

Land use at the site has not changed since the ROD was issued. Current land use complies with the proposed deed restrictions on groundwater extraction. No new contaminants, sources, or routes of exposure at the landfill have been identified at this time, and none appear to be planned.

The landfill property contains no occupied buildings. Accordingly, groundwater does not represent a source of vapors to indoor air. The SHL area is not used for residential or commercial purposes nor would ever be developed for such use due to the existence of the waste disposal landfill. Accordingly, it is unlikely that groundwater beneath the 84-acre landfill would be used as a source of drinking water. This assumption is supported by MassDEP policy (MassDEP, 1997b), which considers groundwater beneath landfills less than 100 acres in size and surrounded by urban uses such as at this site exempt from consideration as a potential drinking water source. Based on this evaluation, it is concluded that no current risk of harm exists at or in the immediate SHL area.

Contaminant pathways identified in the *Draft Supplemental Groundwater Investigation* (Harding–ESE, 2003) showed that groundwater beneath the landfill ultimately discharges to a surface water body (e.g., Red Cove, Nonacoicus Brook, Nashua River). The SG & LCA evaluated the existence of completed exposure pathways and the magnitude of current and future risk to human health and the environment from landfill-derived contaminants. The new exposure pathways that the report considered included: drinking water use, human health and ecological risks associated with surface water and sediment of the Nonacoicus Brook, and landfill gas exposures from: 1) direct venting from the landfill; 2) lateral migration from the landfill through shallow soils; and 3) migration from groundwater containing dissolved gas.

The report concluded:

Human Health Risk--No significant risk to human health currently exists associated with recreational use of the Nonacoicus Brook. Drinking Water Use--The ROD identified unacceptable risk from the following hypothetical exposure pathway: ingestion of groundwater as the primary drinking water source by future residents. Groundwater at the site and downgradient from the site is not used as a drinking water source.

Ecological risk associated with the Nonacoicus Brook--Risks to aquatic benthic and terrestrial organisms in Nonacoicus Brook appear to be related to either 1) sources in or upstream of Sawmill Brook, and/or 2) related to chromium, which appears to have a source outside the

landfill. A potential risk exists for benthic macroinvertebrates related to exposure to chromium (and to lesser extent manganese) in sediment. However, studies of invertebrates in Nonacoicus Brook found that the stream is likely to support a healthy or un-impacted benthic macroinvertebrate community. Terrestrial mammals showed no increased risk for the study area relative to the upstream area, while terrestrial birds demonstrated potential risks associated with exposure to chromium.

Landfill gas exposures--The landfill cover is functioning as designed. In 2010 the Army evaluated the possible pathway as to whether dissolved methane gas in groundwater from the landfill posed an unacceptable hazard to nearby structures. Dissolved methane had been detected in groundwater samples collected from monitoring wells north of the landfill. Methane is not toxic at concentrations up to the LEL and is an asphyxiant at higher concentrations. The primary concern was the possibility of a methane gas explosion within a structure.

The evaluation used USEPA's vapor intrusion model to estimate potential concentrations of methane in indoor air from dissolved methane in groundwater. The analysis used the conservative assumption that a dissolved methane concentration of 10 milligrams per liter (mg/L) existed 10 ft directly below the basement of a building. The evaluation concluded that dissolved methane at 10 mg/L in groundwater does not pose an explosive hazard, even within 10 ft of a building. Higher dissolved methane concentrations in groundwater, up to the approximate solubility limit of 22.7 mg/L, still would not yield indoor air concentrations in excess of the LEL for methane (50,000 ppm by volume [ppmv]).

Changes in Exposure Assumptions

Standard exposure assumptions (that were in practice at the time) were used in the original risk assessment to evaluate the groundwater ingestion pathway. Properties over the Impacted Area are serviced by the public water system. The Army has surveyed the downgradient area to ensure that no existing wells are located within the downgradient arsenic Impacted Area.

Changes in Toxicology and Other Contaminant Characteristics

Below is a summary of the changes in toxicity values:

No MCL has been established for manganese. The original cleanup level for manganese in the ROD was 291μg/l. This level was based on background concentrations because background concentrations exceed the risk-based concentration derived from the available reference dose (RfD) value (5 x 10^{-3} milligrams/kilogram/day). The current cleanup level for manganese was updated in the LTMMP (May 2007 amended December 2009) to 1,715 μg/l based on the risk-based concentrations derived from the revised updated RfD value (4.7 x 10^{-2} milligrams/ kilogram/day).

USEPA's Integrated Risk Information System (IRIS) database lists a slightly lower oral cancer slope factor (CSF) for arsenic (1.5 milligrams per kilogram [mg/kg]-day^{-1}) than the oral CSF used in the original risk assessment (1.75 mg/kg-day^{-1}). Also, the IRIS cancer assessment for inorganic arsenic is currently under review. USEPA's Office of Research Development has recently completed a 2010 draft titled: *Toxicological Review of Inorganic Arsenic: In Support*

of the Summary Information on the Integrated Risk Information System (IRIS). The draft assessment includes an updated CSF of 25.7 mg/kg-day^{-1}, which is much higher than the CSF used in the original risk assessment and the one currently listed on IRIS. Acceptance of this new, higher CSF could indicate that the cancer risk from arsenic may be underestimated.

Changes in Risk Assessment Methodology
The methods for evaluating groundwater ingestion exposure of the site COCs have not changed since the time of the risk assessment supporting the ROD. The hypothetical human health risks discussed in the ROD have been eliminated by ICs; including the proposed deed restriction prohibiting the use of groundwater water as drinking water and residential use of the property.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?
No.

Summary of Technical Assessment
The 2009 hydraulic capture zone assessment indicates that, at the typical peak operating flow rate of 49 gpm, the extraction well field is containing the majority of arsenic mass migrating northward from the landfill. In general, arsenic concentrations in the LTMMP wells remain relatively stable or decreasing, compared to historic levels.

The MCL for arsenic in effect at the time of the ROD (50 μg/L) was selected as a groundwater cleanup goal. Arsenic was present onsite at concentrations greater than its MCL during the RI and was a primary risk driver for the ingestion of groundwater exposure. The MCL for arsenic has been updated since the 1995 ROD. Changes to the MCL for arsenic, in association with changes of the USEPA National Primary Drinking Water Regulations for arsenic as implemented on January 23, 2006, effectively reduce the clean-up level for arsenic from 50 μg/L to 10 μg/L.

Monitoring wells upgradient and cross-gradient from the landfill, and well outside the influence of the groundwater extraction system, exhibit arsenic concentrations in excess of the MCL of 10μg/L. This suggests that the expectation that the Contingency Remedy can achieve the ROD objectives is potentially unrealistic due to elevated local background arsenic concentrations and the source strength of reducing conditions within the landfill and throughout the impacted area.

Overall, the Contingency Remedy when coupled with the landfill capping system and the ICs that prevent use of the aquifer as source of drinking water may only partially achieve the RAOs of the ROD.

3.6.1 Applicable or Relevant and Appropriate Requirements Review

ARARs that were presented in the ROD are included in Appendix B. Standards and regulations current when the ROD was signed in September 1995 have been reviewed for changes that could affect protectiveness of the remedy.

The following ARARs have been modified since the signing of the ROD and may affect the protectiveness of the implemented remedial action:

1. 40 Code of Federal Regulations (CFR) 141.11 Subpart B MCLs– updated July 1, 2001. Section 141.11 (a) and (b) were amended at 66 Federal Register (FR) 7061 on January 22, 2001 to state the following:

   - ****The analyses and determination of compliance with 0.05 mg/L MCL for arsenic use the requirements of 141.23.*
   - *The MCL for arsenic was 0.05 mg/L for community water systems until January 23, 2006.*

   On January 22, 2001, USEPA adopted a new standard for arsenic in drinking water at 0.01 mg/L, replacing the old standard of 0.05 mg/L (66 FR 6976). The rule became effective February 22, 2002. The date by which systems must comply with the new 0.01 mg/L standard was January 23, 2006.

2. 40 CFR 141.15 and 141.16 Subpart B MCLs– updated July 1, 2003. An effective date note (65 FR 76745) removed the sections from the CFR effective December 8, 2003. Sections 141.15 and 141.16 do not appear in 40 CFR 141 updated on July 1, 2004. These two sections addressed MCLs for radium-226, radium-228, gross alpha particle radioactivity, and beta and photon radioactivity, which do not affect the protectiveness of the remedy.

3. 40 CFR 141.51 Subpart F MCL Goals and Maximum Residual Disinfectant Level Goals – updated July 1, 2001. The table was amended in Section 141.51 by adding arsenic with an MCL goal of zero effective January 23, 2006 (66 FR 7063). Until then, no MCL goal applied for arsenic.

4. 310 Code of Massachusetts Regulations (CMR) 22.00 Massachusetts Drinking Water Standards and Guidelines – The arsenic MCL listed in Section 22.06 is effective for the purpose of compliance with the CFR (outlined above) on January 23, 2006. A perchlorate standard was also promulgated July 28, 2006. Because perchlorate is not a COC for the site, the ARARs are not affected by this change. Also, in December 2009, 310 CMR 22.26 was updated regarding microbial communities in groundwater that is also used for public consumption. As bacterial populations are not considered a COC for the site, the protectiveness of the remedy is not affected.

5. 310 CMR 6.00 Ambient Air Quality Standards – In July 2009, MassDEP proposed to amend the state ambient air quality standards to bring the standards for ozone, lead, and particulate matter into conformance with the existing National Ambient Air Quality Standards for these pollutants. However, none of the proposed revisions affect the protectiveness of the remedy.

6. 310 CMR 7.00 Air Pollution Control Regulations – In July 2009, MassDEP proposed to make amendments to definitions related to particulate matter in 310 CMR 7.00: Air Pollution Control, 310 CMR 7.54: Large Combustion Emission Units, and Appendix

A: Emission Offsets and Nonattainment Review. These changes are based upon a thorough review of the regulations encoded in 310 CMR 7.0 to ensure the addition of definitions for particulate matter (fine particles in the ambient air 2.5 micrometers or less in size) ($PM_{2.5}$) to all relevant sections. The proposed revisions would not affect the protectiveness of the remedy.

7. 310 CMR 10.00 Wetlands Protection – This regulation was updated October 2007 with a streamlined permit application process. There were no revisions that affect the protectiveness of the remedy.

8. 310 CMR 19.00 Solid Waste Management Regulations – This regulation was also updated October 2007 to provide clarification to the notification and cleanup requirements for asbestos fibers and asbestos-containing material in soil and to ensure that off-site management of soil containing asbestos meets all applicable state and federal requirements. There were no revisions that affect the protectiveness of the remedy.

9. 310 CMR 30.00 Hazardous Waste Regulations – In January 2007, an update to this regulation was proposed to streamline the cleanup requirements of any hazardous materials released to the environment at facilities, both active and closed, that are, or were, subject to a hazardous waste license. In April 2010, this regulation was updated to include the Amendments for Adoption of Federal Land Disposal Restriction Program. The update also includes revised definitions and technical corrections needed to clarify the regulatory status of specific wastes. There were no revisions that affect the protectiveness of the remedy.

10. 314 CMR 4.00 Surface Water Standards – updated January 2007. These standards were not considered during the development of the preliminary remedial goals for the site, but are now considered applicable because contaminated groundwater discharges to Red Cove. This revision should not affect the protectiveness of the selected remedy.

11. 314 CMR 6.00 Massachusetts Groundwater Quality Standards – rescinded March 20, 2009. Revisions made to 314 CMR 5.00 for a streamlined groundwater discharge permitting process negated the need for this section. As the selected groundwater quality standards for the site are mainly Federal MCLs and are also presented in 40 CFR 141 Section 11 and 13, the removal of 314 CMR 6.00 from Massachusetts regulations does not affect the protectiveness of the remedy.

In addition, a search was performed for any newly promulgated standards that could affect protectiveness at the site. No new ARARs were identified that would affect the protectiveness of the selected remedy.

3.7 ISSUES

The ROD Does Not Include Institutional Controls Prohibiting Groundwater Use in the Impacted Area.

The groundwater beneath the area extending north of the landfill (off Army property) has been impacted with arsenic levels exceeding drinking water standard (referred to as the "Impacted Area"). All properties over the Impacted Area are serviced by the public water system and although there are no ICs specified in the ROD related to the Impacted Area properties, there are existing ICs in place that are likely to prevent the use of groundwater north of SHL, based on the town zoning, regulations and requirements. Specifically, 1) the Town of Ayer Subdivision Control Regulations requires the connection to public water systems that are within 400 ft of a proposed subdivision; 2) the Ayer BOH permit application for new private well construction requires the description and approximate distances to potential sources of contamination within 400 ft of the proposed well (potential sources of contamination are defined as various types of disposal sites and the term "disposal site" per the Massachusetts Contingency Plan (MCP) is defined as a place or area where an uncontrolled release of oil and/or hazardous material from or at a site or vessel has come to be located); and 3) new house building permits issued by the Town of Ayer Building Department require the connection to public water and sewer utilities that are available at the property.

The Ayer BOH prohibits the installation of any new wells within or downgradient of the Impacted Area. Recent discussions with an agent for the BOH (August 19, 2010) confirmed that:1) processes are in place to prevent groundwater use in the southern part of Ayer; and 2) not many well installation requests are made because municipal water is available and its use is encouraged. The few requests for wells that have been received are for locations far away from the SHL part of town, near Groton, in rural areas where municipal water is not available. Well permits are reviewed on a case by case basis and the process is layered so that a building permit cannot be approved until the BOH approves the well permit.

The Remedy May Not Achieve the Groundwater Cleanup Goals for Arsenic; the ROD Does Not Include Specific Response Action Objective for the Restoration of Groundwater Within the "Impacted Area."

Monitoring wells upgradient and cross-gradient from the landfill, and well outside the influence of the groundwater extraction system, exhibit arsenic concentrations in excess of 400 times the MCL of 10 μg/L. Based on estimated groundwater velocities, it will take many years to flush currently impacted groundwater from areas outside the capture zone. Further, it will likely require additional time for new equilibrium redox conditions (presumably oxidizing) to be established, which in turn are expected to result in declines in arsenic concentration. This suggests that the expectation that the Contingency Remedy can achieve the ROD objectives is potentially unrealistic, due to the elevated local background arsenic concentrations and the source strength of reducing condition within the landfill and throughout the impacted area.

Contaminated Groundwater is Discharging to Red Cove.

An RI for Plow Shop Pond (AOC 72) is underway with sampling completed in June 2009 and a draft RI report submitted in March 2010. The report includes a risk assessment for Plow Shop Pond based on the recent RI Work Plan (AMEC, 2009) and data collected from 1991 to 2009.

The RI results indicate there is an arsenic flux to Red Cove which was estimated to be about

14 grams per day, given current groundwater conditions with the ATP operating and the cap in place. Concentrations in sediment and water are highest at the sediment/water interface where groundwater discharges to the pond. Arsenic in Red Cove sediment is concentrated in iron floc near the sediment surface, including the shoreline as far north as groundwater discharge occurs. The distribution of arsenic in Red Cove sediment is heterogeneous with levels varying by a factor of 10 between adjacent samples.

The RI concludes that the source of arsenic in the Red Cove area is the current and historic release of groundwater from the SHL. Overall, the RI results are consistent with earlier investigations.

Issues	Affects Protectiveness (Y/N)	
	Current	Future
ICs prohibiting the use of groundwater as drinking water in the Impacted Area are not explicitly stated in the ROD.	N	Y
The Remedy may not achieve the groundwater cleanup goals for arsenic; the ROD does not include specific Response Action Objective for the restoration of groundwater within the "impacted area".	N	Y
Contaminated groundwater with elevated arsenic is discharging to the Red Cove area of Plow Shop Pond and contaminating sediments. Human health and ecological risks in Plow Shop Pond are to be addressed under, Plow Shop Pond.	N	Y

3.8 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

The ROD Does Not Includes Institutional Controls (ICs) Prohibiting Groundwater Use in the Impacted Area.
Following completion of the SHL FFS, the Army will prepare a ROD ESD or a ROD Amendment that will formally specify the ICs that prohibit the use of groundwater within the Impacted Area. The Army will ensure that the ICs specified and already in place are sufficient such that no new private wells can be installed within or adjacent to the Impacted Area. If the existing ICs are insufficient, then the Army will coordinate with the Town of Ayer and other stakeholders to determine what changes to the ICs will be necessary and then incorporate them into the remedy.

The Remedy May Not Achieve the Groundwater Cleanup Goals for Arsenic; the ROD does Not Include Specific Response Action Objective for the Restoration of Groundwater Within the "Impacted Area".
Complete the SHL FFS to develop a remedial alternative that will effectively meet RAOs and cleanup goals established as part of an updated remedy that specifically addresses the current site conditions.

Contaminated Groundwater is Discharging to Plow Shop Pond.
Complete the SHL FFS to develop a remedial alternative that will effectively meet RAOs and cleanup goals established as part of an updated remedy that addresses the groundwater discharge to Plow Shop Pond. A final RI report for AOC 72 is expected by November 2010.

The results of the RI will be considered in a FS evaluating remedies for sediment contamination. The AOC 72 FS will be integrated with the final FFS for SHL to the maximum extent possible considering the project schedule and the interrelation between potential groundwater and sediment remedies.

Recommendations/ Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Follow-up Actions: Affects Protectiveness (Y/N)	
				Current	Future
The Army will prepare a draft ROD ESD or a ROD Amendment (based on the Final SHL FFS selected alternative) that will formally specify the ICs that prohibit the use of groundwater within the Impacted Area.	Army	EPA	4/30/11	N	Y
Following completion of the Draft Final SHL FFS, the Army will propose a remedial alternative that will effectively meet RAOs and cleanup goals established as part of an updated remedy that specifically addresses the current site conditions.	Army	EPA	01/31/11	N	Y
Following completion of the Draft Final SHL FFS, the Army will propose a remedial alternative that will effectively meet RAOs and cleanup goals established as part of an updated remedy that addresses the groundwater discharge to Plow Shop Pond.	Army	EPA	01/31/11	N	Y

3.9 PROTECTIVENESS STATEMENT

The SHL remedy is considered protective in the short-term, because there is no evidence of current exposure. However, in order for the remedy to remain protective in the long-term, an updated SHL remedy must incorporate ICs that restrict the installation of private drinking water wells throughout the "Impacted Area" and effectively meet RAOs developed under the SHL FFS to address both groundwater restoration within the "Impacted Area" and groundwater discharging to Plow Shop Pond.

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4.0 AREA OF CONTAMINATION 57 STATUTORY FIVE-YEAR SITE REVIEW

4.1 SITE CHRONOLOGY

The following tables outline the chronology of site events at Areas 1, 2, and 3 at AOC 57:

Table 4.1
Chronology of Events – AOC 57, Area 1

Event	Date
Initial discovery of problem and contamination	February 13, 1977
SI, Preliminary Risk Evaluation (PRE)	1992
Area Requiring Environmental Evaluation (AREE)	1994
Soil Removal Action	1997
RI completed	2000
ROD signed	September 28, 2001
First Five-Year Review	September 2005

Table 4.2
Chronology of Events – AOC 57, Area 2

Event	Date
Drainage ditch investigated as part of SI for Group 2 and 7 historic gas stations	1992
Soil removal action in response to new MCP standards	1994
Soil removal action discontinued due to contamination extending beyond original estimates (1,300 cy soil removed)	1994
RIs conducted, identified most significant soil contaminants to be PAHs, PCBs and lead	1995-1998
USACE conducted additional soil/groundwater investigations	2000
FS completed	2000
ROD signed for AOC Areas 1, 2, and 3	September 28, 2001
USACE completed additional soil removal actions	January-February 2003
Remedial Action Work Plan (RAWP) started	January-February 2003
Additional Remediation and Work Plan Amendment	2003
Site Restoration completed	October 2003
Transportation and Disposal/Stockpiles	December 2003
Remedial Action Report Completed	September 2004
ESD issued for additional soil removal volume and additional soil and groundwater COCs for Area 2	March 10, 2004
LTMP	2003/2004
First Five-Year Review	September 2005
Draft Operating Properly and Successfully Demonstration for Area of Contamination 57	December 2005
Revised LTMP completed	November 2008
Final Wetland & Upland Habitat and Long Term Adaptive Monitoring and Maintenance Plan, Area of Contamination 57 Areas 2 and 3	January 2007
2004 to 2006 Final Annual Reports, Wetland & Upland Habitat and Long Term Adaptive Monitoring and Maintenance Program, Area of Contamination 57 Areas 2 and 3	January 2007

Table 4.2 (continued)
Chronology of Events – AOC 57, Area 2

Event	Date
2007 & 2008 Final Annual Reports, Operation & Maintenance Phase, Wetland & Upland Habitat and Long Term Adaptive Monitoring and Maintenance Program, DCL Areas of Contamination 9, 11, 40, 41 & Study Areas 12 and 13, and Area of Contamination 57 Areas 2 and 3	May 2008 & June 2009
Final Operating Properly and Successfully Demonstration for Area of Contamination 57	February 2010
Annual LTM	2005-2009

Table 4.3
Chronology of Events – AOC 57, Area 3

Event	Date
Four test-pits excavated east of Area 2, results indicated PAH and chlorinated VOCs, area designated Area 3	1995
RIs conducted, identified most significant soil contaminants to be PAHs, PCBs, some SVOCs and arsenic, lower concentrations of VOCs	1996-1998
USACE conducted soil removal action 1,860 cy of TPH and PCB contaminated soil removed	1999
USACE performed additional soil sampling	2000
FS completed	2000
Groundwater monitoring points installed	2000
USEPA and MassDEP collected groundwater samples	April 3, 2001
ROD signed	September 28, 2001
Soil Removal Action completed	2002
Remedial Action Report/remedial work completed	2002-2003
LTMP	2003/2004
First Five-Year Review	September 2005
Draft Operating Properly and Successfully Demonstration for Area of Contamination 57	December 2005
Revised LTMP completed	November 2008
Final Wetland & Upland Habitat and Long Term Adaptive Monitoring and Maintenance Plan, Area of Contamination 57 Areas 2 and 3	January 2007
2004 to 2006 Final Annual Reports, Wetland & Upland Habitat and Long Term Adaptive Monitoring and Maintenance Program, Area of Contamination 57 Areas 2 and 3	January 2007
2007 & 2008 Final Annual Report , Operation & Maintenance Phase, Wetland & Upland Habitat and Long Term Adaptive Monitoring and Maintenance Program, DCL Areas of Contamination 9, 11, 40, 41 & Study Areas 12 and 13, and Area of Contamination 57 Areas 2 and 3	May 2008 & June 2009
Final Operating Properly and Successfully Demonstration for Area of Contamination 57	February 2010
Annual LTM	2005-2009

4.2 BACKGROUND

AOC 57 is part of the Bowers-Nonacoicus Brook Sub-basin, Nashua River Watershed, located

south of former Building 3713, between Barnum Road and Cold Spring Road on the northeastern side of the former Main Post of Fort Devens in the Town of Harvard, Massachusetts.

AOC 57 consists of three sub-areas; Area 1, Area 2, and Area 3, located south and southeast of former building 3713 and former buildings 3756, 3757, and 3758. These sub-areas received stormwater runoff and wastes from vehicle maintenance activities conducted at the storage yards. These yards were eventually abandoned in 1998, and the pavement and fencing were improved. The former storage yards are now soil and grass-covered areas. Areas 2 and 3 are located within Lease Parcel A6. Area 1 is not part of the LTM program, as discussed later in this section.

Areas 1, 2, and 3 include upland area [elevations between 228 ft and 240 ft mean sea level (msl)] that slopes downward to a delineated wetland area (elevations lower than 228 ft msl), which is part of the wetland system and feeder stream known as Lower Cold Spring Brook. At Area 2, the wetland boundary is located approximately 250 ft from Cold Spring Brook and at Area 3, the wetland boundary is located approximately 500 ft from Cold Spring Brook. The upland area is forested with trees and scrub bush. The wetland area is densely vegetated with brush and contains small areas of standing water. It should be noted that portions of Areas 2 and 3 are located within the 100-year floodplain of Cold Spring Brook. A portion of Area 1 is located outside the lease parcel A6a and outside of the 100-year floodplain, (i.e., at an elevation > 228 ft msl).

The AOC 57 ROD, dated September 2001, determined that Area 1 required No Further Action (NFA) and selected remedies for Areas 2 and 3 to protect human health and the environment under current and future land use scenarios. "Alternative II-3, Excavation (For Possible Future Use), Groundwater Monitoring, Surface Water Monitoring and Institutional Controls" was the selected remedy for Area 2 and "Alternative III-2a, Excavation (To Accelerate Groundwater Cleanup), Groundwater Monitoring, Surface Water Monitoring and Institutional Controls" was the selected remedy for Area 3. Public access to Area 2 and 3 is not restricted, but the presence of floodplains/wetlands and existing zoning currently prevents residential use/exposure.

Analysis of data obtained and observations made at Area 2 during the January 2002 soil removal work and subsequent investigations between 2002 and 2003 for petroleum waste recovery efforts, resulted in the determination that conditions at Area 2 were different from the presumed conditions upon which the September 2001 ROD had been based. An ESD dated March 2004 expanded the ROD recommendations to include EPH C_{11}-C_{12} aromatics and PCBs as COCs for Area 2 groundwater, include EPH as a COC for Area 2 soil, monitor for the presence of petroleum waste at Area 2, and increase the soil volume and associated cost for Area 2 soil removal activities.

4.2.1 AOC 57 – Area 1 Background

Area 1 consists of a former stormwater outfall and drainage area for runoff from paved areas proximal to former Building 3713. Drainage from Area 1 meanders and eventually flows into

Cold Spring Brook. An estimated 50- to 100-gallon spill of No. 4 fuel oil was discharged through the Area 1 outfall in 1977. Approximately 3,000 gallons of mixed oil and water were recovered through the use of contaminant dikes and absorbent booms in 1977, and approximately 25 cy of petroleum contaminated soil was removed in 1997. Available data indicate that the contamination associated with the fuel oil spill has been removed, and a risk assessment indicates that there are no unacceptable risks for unrestricted use (Final RI Report, AOC 57, HLA, 2000a). The 2001 ROD closed Area 1 with NFA.

4.2.2 AOC 57 – Area 2 Background

Area 2 is located approximately 700 ft north of Area 1 and adjacent to a former vehicle storage yard associated with the motor repair shops located in former Buildings 3757 and 3758. Area 2 grades down towards the wetlands associated with Cold Spring Brook and formerly consisted of an eroded drainage ditch created by rainfall runoff from vehicle storage yard associated with former Buildings 3757 and 3758. Initially, it was believed that contamination in Area 2 was the result of a No. 4 fuel release in Area 1. Subsequent investigations concluded that Area 2 was separate from Area 1. Following a soil removal action in 1994, Area 2 was re-graded and a permanent drainage swale was installed. Runoff drains into the swale and discharges east into Cold Spring Brook (Figure 4.1). Subsequent activities included subsurface investigations with soil sampling and monitoring well installation, removal of contaminated soil, construction of an interceptor trench, and operation of a petroleum product recovery system.

In 1992, the drainage ditch located at Area 2 was investigated as part of the SI (ABB, 1995) for Groups 2 and 7 Historic Gas Stations. Naphthalene and TPH were detected in soil samples. Fingerprint analysis of soil samples collected from the drainage ditch area indicated soil contamination was most likely derived from lubricating oil or vehicle crankcase oil, and not the 1977 release of No. 4 fuel oil.

During 1994, the Army performed a soil removal action at Area 2 in response to newly promulgated MCP standards. The 1994 soil removal action was discontinued due to soil contamination that extended below the water table and well beyond the area limits originally estimated. The site was transferred to the RI/FS process. A total of 1,300 cy of contaminated soil was removed during the 1994 removal action.

During 1995 through 1998, the Army conducted a RI at AOC 57 Areas 2 and 3. The most significant soil contaminants identified at Area 2 included PAHs, PCBs, and lead. The Army performed additional soil and groundwater investigations in 2000, and completed a FS for selection of final remedies at AOC 57 Areas 2 and 3. On September 28, 2001, a ROD was signed to select excavation and ICs as the remedy for Area 2.

Soil excavation conducted (in Area 2) as a ROD remedy was initiated in January 2002 and was conducted in phases until February 2003, when excavation activities were discontinued due to contamination extending beyond the limits identified in the ROD. The Army conducted further sampling to delineate the extent of contamination and completed site restoration in October 2003. An ESD dated March 2004 expanded the ROD COC to include LTM of EPH

C_{11}-C_{12} aromatics and PCBs for Area 2.

A solar panel manufacturing facility was constructed between Areas 2 and 3 of AOC 57 and Barnum Road between 2008 and 2009. Construction activities complicated site access but otherwise had minimal impact to AOC 57.

4.2.3 AOC 57 – Area 3 Background

During investigation activities completed in 1995, four test-pits were excavated east of Area 2 where historical photos indicated soil staining. Sample analysis showed the presence of PAHs and chlorinated VOCs. The area was designated AOC 57 Area 3. Area 3 is located approximately 600 ft to the northeast of Area 2, south of former vehicle maintenance motor pools (Figure 4.2).

During 1996 through 1998, RI field investigations were performed to assess the nature and extent of contamination at Area 3. The most significant soil contaminants identified at Area 3 included PAHs, PCBs, some SVOCs, and arsenic. Lower concentrations of VOCs were detected at some locations.

The Army conducted a soil removal action in 1999 that targeted soils with TPH and PCB concentrations exceeding soil standards published under the MCP. A total of 1,860 cy of materials was removed for off-site disposal.

During 2000, the Army performed additional soil and groundwater investigations, and completed a FS for selection of final remedy for Area 3. On September 28, 2001, a ROD was signed to select excavation and ICs as the remedy for Area 3.

Soil excavation was initiated in January 2002 and completed in February 2003. Area 3 was excavated to the target limits, and the planned volume of soil was removed within these limits to depths ranging between 2 and 4 ft. All confirmatory samples met the ROD cleanup criterion for EPH, and Area 3 was backfilled and the extent of removal was documented.

Area 3 monitoring well 57M-96-09X was destroyed by the solar panel manufacturing facility construction activities that were noted in Section 4.2.2. However, this well was slated for removal from the sampling program in 2008 with regulatory approval. The well had been slated for annual groundwater level measurements, but future groundwater contouring efforts will not be affected by the loss of the well.

4.3 REMEDIAL ACTION

A remedial action was not required for Area 1. The selected remedy for Area 2 is "Alternative II-3, Excavation (For Possible Future Use), Groundwater Monitoring, Surface Water Monitoring and Institutional Controls." The selected remedy for Area 3 is "Alternative III-2a, Excavation (To Accelerate Groundwater Cleanup), Groundwater Monitoring, Surface Water Monitoring and Institutional Controls." Key components of the selected remedies are summarized in Sections 4.3.3 and 4.3.4.

4.3.1 Remedial Action Objectives at AOC 57 – Area 2

Based on the results of the risk assessment, the following RAOs were developed for Area 2:

Area 2 – Possible Future Use Scenario (Construction Worker)

- Protect potential construction workers that might work with future recreational (wetlands) areas at Area 2 from ingesting soils containing Aroclor-1260 and lead in excess of preliminary remediation goal (PRG) concentrations considered protective of human health (3.5 and 600 mg/kg, respectively).

Area 2 – Unrestricted Land Use Scenario

- Prevent potential residential receptors from coming in dermal contact with and ingesting Area 2 wetland soils containing Aroclor-1260, arsenic, chromium, lead, and the EPH C_{11}-C_{22} aromatic carbon range in excess of PRG concentrations considered protective of human health (0.5, 21, 550, 400, and 930 mg/kg, respectively).
- Prevent residential potable use of Area 2 wetland groundwater containing arsenic, PCE in concentrations that exceed Federal MCL/MMCL drinking water standards (50 and 5 μg/L, respectively).

4.3.2 Remedial Action Objectives at AOC 57 – Area 3

Based on the results of the risk assessment, the following RAOs were developed for Area 3:

Area 3 – Possible Future Use Scenario (Construction/ Industrial Worker)

- Protect potential future commercial/industrial receptors from ingesting upland Area 3 groundwater that contains arsenic, cadmium, and 1,4-dichlorobenzene (1,4-DCB) at concentrations that exceed MCLs and MMCLs for drinking water.

Area 3 – Unrestricted Land Use Scenario (Residential)

- Prevent unrestricted residential potable use of Area 3 groundwater containing arsenic, cadmium, and 1,4-DCB at concentrations that exceed MCLs and MMCLs for drinking water.
- Prevent unrestricted residential dermal contact and ingestion of surface soils containing the EPH C_{11}-C_{12} aromatic carbon range at concentrations in excess of PRGs considered protective of human health.
- Prevent unrestricted residential potable use of Area 3 floodplain groundwater containing arsenic and PCE at concentrations that exceed MCLs and MMCLs for drinking water.

4.3.3 Selected Remedy

No further action was required for AOC 57 Area 1. The selected remedies for Areas 2 and 3 included soil excavation and treatment/disposal, wetland protection, ICs, and

groundwater/surface water LTM to evaluate the effectiveness of the remedy at controlling groundwater contamination and site risk. The remedy did not include active groundwater treatment but relies on natural attenuation. The major components of the selected remedy for Areas 2 and 3 are:

- Soil excavation and treatment/disposal;
- Wetland protection (inclusion of these wetlands as part of the Lower Cold Spring Brook wetland habitat);
- ICs;
- Groundwater and surface water LTM;
- IC inspections; and
- Five-Year Reviews.

In March 2004, the USEPA published an ESD for AOC 57. The ESD resulted from data collected during soil excavation activities at Area 2. The changes to the selected remedy for Area 2 were:

- Increased volume and cost of contaminated soil requiring removal to attain cleanup levels at Area 2;
- Inclusion of EPH as a COC for soil at Area 2; and
- Inclusion of EPH and PCBs as COC for Area 2 groundwater.

The original ROD established risk-based cleanup levels for Area 2 at AOC 57 for the PCBs, Aroclor-1260, and lead. Concerns about the persistent separate phase petroleum waste observed during removal and investigation work in 2002-2003 resulted in the addition of C_{11}-C_{22} aromatic hydrocarbons quantified by EPH (MassDEP EPH Method) as a COC. As a result of the addition of C_{11}-C_{12} as a COC, the ROD adopted the more stringent S3/GW-1 cleanup level of 200 mg/kg EPH C_{11}-C_{22} aromatic fraction for Area 2 soils. Subsequently, PCBs were added as a COC because of their association with the petroleum waste oil. Final cleanup levels for Area 2 are presented in the tables below:

Table 4.4
Contaminants of Concern Cleanup Levels in Soil
AOC 57 - Area 2

Contaminant of Concern	Final Cleanup Levels
PCB (Aroclor-1260)	3.5 mg/kg dry weight by USEPA Method 3540C/8082
Lead	600 mg/kg dry weight by USEPA Method 3050B/6010B
C_{11}-C_{22} Aromatic Hydrocarbons	200 mg/kg dry weight for EPH using MassDEP method

Table 4.5
Contaminants of Concern Cleanup Levels in Groundwater
AOC 57 - Area 2

Contaminant of Concern	Final Cleanup Levels
Arsenic	50 μg/L
Cadmium	5 μg/L
1,4-DCB	5 μg/L
Tetrachloroethylene	5 μg/L
EPH C_{11}-C_{22} Aromatics	200 μg/L
PCB (total of all Aroclors)	0.5 μg/L

The Area 3 soil cleanup objective was to remove organic material impacted by storm water runoff and wastes from vehicle maintenance at storage yards. The ROD established cleanup levels for one COC in soil, EPH C_{11}-C_{22} Aromatic Hydrocarbons, at AOC 57 Area 3, as presented in the table below:

Table 4.6
Contaminants of Concern Cleanup Levels in Soil
AOC 57 - Area 3

Contaminant of Concern	Final Cleanup Levels
C_{11}-C_{22} Aromatic Hydrocarbons	930 mg/kg dry weight for EPH using MassDEP method

The ROD identifies groundwater COCs at Area 3 as arsenic, cadmium, 1-4-DCB, and PCE.

Table 4.7
Contaminants of Concern Cleanup Levels in Groundwater
AOC 57 - Area 3

Contaminant of Concern	Final Cleanup Levels
Arsenic	50 μg/L
Cadmium	5 μg/L
1,4-DCB	5 μg/L
Tetrachloroethylene	5 μg/L

4.3.4 Remedy Components Specified by the ROD

4.3.4.1 Area 2 Selected Key Components

The selected remedy for AOC 57 Area 2, Alternative II-3, includes components to reduce potential human health risks associated with contaminated soil and groundwater at the Area 2 floodplain. A detailed description of Area 2 Alternative II-3 is presented in Section 12.1.2 of the ROD; the key components are summarized below.

Soil Excavation and Treatment/Disposal at an Off-site Facility
Alternative II-3 included excavation of soil with Aroclor-1260 and lead concentrations in excess of PRGs protective of construction workers. The actual extent of excavation and

volume of soil removed was to be determined by field screening methods. The ROD estimated an average excavation depth of 4 ft and approximately 640 cy (1,152 tons) of soil would be removed and treated/disposed of at an approved off-site treatment, storage, or disposal facility. Implementation of the soil removal is discussed in Section 4.3.5 of this report.

Wetland Protection

Soil excavated within the 100-year floodplain (220 ft msl) and within delineated bordering vegetated wetlands (based on a 1993 wetlands delineation), would likely require wetland protection in accordance with the Massachusetts Wetland Protection Act and Regulations (310 CMR 10.55).

Prior to any excavation activities, new wetland delineation would be performed at Area 2 to define construction area limits located within the delineated vegetated wetlands. A pre-construction mitigation study would be performed to determine the impact to the affected area and the compensatory mitigation required as a result of the excavation activities. Once the extent of anticipated impacts was known, a mitigation/restoration plan would be prepared for regulatory agency review and concurrence.

Compensatory mitigation and monitoring would be implemented according to the mitigation plan. A wetland scientist would monitor wetland restoration for a period of five years, beginning the year after wetland creation. Implementation of the wetland monitoring plan is discussed in Section 4.3.5 of this report.

Institutional Controls

In the event of future property transfer, the Army would include deed covenants to prohibit use of Area 2 groundwater and unrestricted use of floodplain property. All ICs would be stated in full or by reference within deeds, easements, mortgages, leases, or other instruments of property transfer. These controls would be drafted, implemented and enforced in cooperation with federal, state, and local governments. These covenants would be maintained as long as soil and groundwater contaminants remained at concentrations above cleanup levels. If future land use at AOC 57 is inconsistent with these ICs, then the site exposure scenarios for human health and the environment would be re-evaluated to assess whether this response action remains appropriate.

Institutional Control Inspections

The Army would prepare and submit an IC Monitoring Plan for agency review and concurrence as part of the site LTMP (HGL, 2008) to detail the ICs to be incorporated/referenced within instruments of property transfer and ensure that the IC requirements were met. The plan would include a checklist of elements to be assessed during regularly scheduled on-site inspections and interviews with the site property owner, manager, or designee.

Environmental Monitoring

Environmental monitoring includes performing long-term groundwater and surface water sampling. Long-term groundwater sampling would assess groundwater COC (arsenic,

cadmium, 1,4-DCB, PCE, EPH C_{11}-C_{12} aromatics and PCBs) migration and monitor COC concentration trends.

Surface water sampling would be a component of environmental sampling to assess for off-site migration of COCs via the groundwater to surface water pathway. The purpose of the surface water sampling would not be to collect additional ecological risk assessment data.

Sampling frequency, location, analytes, sampling procedures, and action levels for environmental monitoring would be detailed in the LTMP and submitted to USEPA and MassDEP for review and concurrence prior to implementation. Following attainment of groundwater cleanup levels, monitoring would be discontinued in accordance with the time frame specified in the LTMP.

Five-Year Reviews

Because Alternative II-3 would result in contaminants remaining onsite above concentrations allowing unrestricted land use and to the extent required by law, the Army would review the site at least once every five years to ensure that the remedial action remains protective of human health and the environment. Five-year reviews would be performed as long as hazardous substances, pollutants, or contaminants remain onsite above concentrations that allow for unrestricted exposure and unlimited use.

4.3.4.2 Area 3 Selected Key Components

The selected remedy for AOC 57 Area 3, Alternative III-2a, contains components to reduce potential human health risks associated with exposure to contaminated soil (floodplain) and groundwater (upland and floodplain) at Area 3. A detailed description of Area 3 Alternative III-2a is presented in Section 12.2.2 of the ROD; the key components are summarized below.

Soil Excavation and Treatment/Disposal at an Off-Site Facility

Alternative III-2a included excavation of floodplain soil with elevated concentrations of organics that were believed to contribute to reducing (i.e., anaerobic) conditions and the release of naturally occurring arsenic to groundwater. In lieu of other site-specific data that related concentrations of soil organics to arsenic in groundwater, the ROD used EPH C_{11}-C_{22} aromatic range concentrations as an indicator of the source of groundwater contamination. Because this alternative relies on ICs to achieve protection of human health under anticipated future land use scenarios, the ROD did not identify PRGs or cleanup criteria for the soil removal. The criteria would be developed during the design phase of the remedy.

It was anticipated that the excavation would occur in the floodplain around the southern edge of the 1999 soil excavation where concentrations of organics were believed to be the greatest. The ROD estimated an average depth of 3 ft and approximately 640 cy of soil would be removed to be treated/disposed of at an approved off-site facility. Implementation of the soil removal action is discussed in Section 4.3.5 of this report.

Wetland Protection

Soil excavated within the 100-year floodplain (<220 ft msl) and within delineated bordering

vegetated wetlands would likely require wetland protection in accordance with the Massachusetts Wetland Protection Act and Regulations at 310 CMR 10.55. Wetland protection activities would be performed as described for Alternative II-3, Section 4.3.4.1.

Prior to any excavation activities, wetlands delineation would be performed at Area 3. If the proposed construction area was confirmed to be within delineated vegetated wetlands, a pre-construction mitigation study would be performed to determine the impact to the affected area and the compensatory mitigation required as a result of the excavation activities. Once the extent of anticipated impacts was known, a mitigation/restoration plan would be prepared for regulatory agency review and concurrence. The primary goal of wetland restoration activities would be to restore affected freshwater wetlands within the excavation area and disturbed during remedial activities.

Institutional Controls

To protect possible future commercial workers and residents from exposure to groundwater and future residents from exposure to contaminated floodplain soil in the event of future property transfer, the Army would include deed covenants to prohibit potable use of Area 3 groundwater and residential use of floodplain property.

Institutional Control Inspections

The Army would prepare and submit an IC Monitoring Plan for regulatory agency review and concurrence as part of the site LTMP to detail the ICs to be incorporated or referenced within instruments of property transfer and ensure that the IC requirements were met. The plan would include a checklist of elements to be assessed during regularly scheduled on-site inspections and interviews with the site property owner, manager, or designee. If future land use at AOC 57 is inconsistent with these ICs, then the site exposure scenarios for human health and the environment would be re-evaluated to assess whether this response action is appropriate.

Environmental Monitoring

Environmental monitoring would consist of long-term groundwater and surface water sampling. Long-term groundwater sampling would be performed to assess for decreases in arsenic; maintenance of PCE, cadmium, and 1,4-DCB concentrations (upland and floodplain COCs) at or below cleanup levels; and for the need for continued groundwater ICs to protect human receptors.

Surface water sampling would assess off-site migration of human health COCs in excess of PRGs via the groundwater to surface water pathway. The purpose of the surface water sampling would not be to collect additional ecological risk assessment data.

Sampling frequency, location, analytes, sampling procedures, and action levels for environmental monitoring would be detailed in the Draft LTMP and submitted to USEPA and MassDEP for review and concurrence prior to implementation. Following attainment of groundwater cleanup levels, monitoring will be discontinued in accordance with the time frame specified in the LTMP.

Five-Year Reviews

Alternative III-2a would result in contaminants remaining on site above concentrations allowing unrestricted use. To the extent required by law, the Army would review the site at least once every five years to ensure that the remedial action remains protective of human health and the environment. Five-Year Reviews would be performed as long as hazardous substances, pollutants, or contaminants remain on-site above concentrations that allow for unrestricted exposure and unlimited use.

4.3.5 Remedy Implementation

Soil Excavation and Treatment/Disposal at an Off-site Facility

The Army performed soil removal in January-February 2003 at AOC 57 Areas 2 and 3 under a RAWP prepared to address the final ROD remedy for contaminated soils.

Area 3 was excavated to the target limits, and the planned volume of soil was removed within these limits to depths ranging from 2 to 4 ft. All confirmatory samples met the ROD cleanup criterion for EPH. Area 3 was backfilled and the extent of removal was documented.

At Area 2, the ROD-based soil excavation was performed between January 2002 and February 2003. However, contamination appeared to extend beyond the assumed limits of contamination. In addition, petroleum waste persistently seeped into the excavation. The excavation was left partially open to observe and remove the oil sheen and globules using absorbent pads and a belt-skimmer product recovery system.

During 2003, the Army continued operation of the petroleum product recovery system at Area 2 following a winter shutdown. The Army conducted additional soil sampling to delineate the extent of contaminated soils, and to identify the source of the petroleum waste. Based on the additional soil data, a Work Plan Amendment was developed to complete remediation of the remaining contaminated soils. The Army executed the Work Plan Amendment, which included contaminated soil removal and removal of excavation water to allow access to contaminated soils beneath the groundwater table. The Army installed and operated a petroleum product recovery system in the open excavation and installed four collection sumps at Area 2 within a groundwater interception trench installed between the soil excavation area and the wetlands. Site restoration activities at AOC 57 Areas 2 and 3 were performed in October 2003. Transportation and disposal of remaining stockpiled contaminated soils were completed by the end of December 2003.

A final Interim Remedial Action Completion Report was prepared in September 2004. The report summarizes the work performed to complete remediation of contaminated soils at AOC 57 during 2002 and 2003. The following is a summary of the materials removed during the remedial activities:

- 4,361 tons of contaminated material was excavated from Area 2 and 197 tons were removed from Area 3. All contaminated soils were transported offsite for treatment/recycling in a thermal desorption process at Environmental Soils Management, Inc., in Loudon, NH;

- Twenty four 55-gallon drums containing absorbent materials and PPE were transported to Onyx facility, TX, for thermal destruction;
- Two 55-gallon drums (an estimated 80-gallons) containing petroleum-contaminated liquids from skimming operations;
- One 20 cy container of plastic liner co-mingled with contaminated soils;
- Two 30 cy trash containers of construction wastes and decontaminated liner/cover materials; and
- 94,000 gallons of contaminated water from the excavations were discharged to the Devens sewer system under a temporary discharge permit.

Wetland Protection

The removal contractor, Conti Environmental, Inc. (Conti), restored delineated wetlands that were damaged during the excavation activities in Areas 2 and 3. The remediation and restoration were completed in October 2003. Final restoration activities were performed in October 2003 following completion of the soil remedial actions.

A wetland monitoring plan was outlined in the LTMP prepared by USACE in March of 2004. The objectives of the wetland restoration and monitoring plan were to evaluate the restoration measures implemented during the first two growing seasons to ensure success and to identify and take corrective actions, if any, based on the periodic monitoring. The key components of the Wetlands Monitoring Plan included: monitoring during construction, LTM, and compliance with performance standards presented in the LTMP. Wetlands within AOC 57 are part of the Lower Cold Spring Brook drainage and must be considered with any plans to restore Lower Cold Spring, Bowers and Nonacoicus Brooks.

Three years of wetlands monitoring and maintenance was performed by USACE from 2004 through 2006. By the end of 2006, the wetland areas of AOC 57 were found to meet performance standards and the Habitat LTMP Program was terminated. A two-year operation and maintenance phase was implemented by USACE from 2007 through 2008. The *2008 Final Annual Report, O&M Phase, Wetland & Upland Habitat and Long Term Adaptive Monitoring and Maintenance Program, DCL) Areas of Contamination 9, 11, 40, 41 & Study Areas 12 and 13, and Area of Contamination 57 Areas 2 and 3* (USACE, 2009) summarized the findings of the 2008 O&M activities, and concluded the wetlands monitoring, maintenance and reporting activities for AOC 57.

Institutional Controls

In accordance with the ROD, ICs that prohibit the use of groundwater as a potable source and residential use of flood plain property are currently in effect at AOC 57. ICs are included in the LIFOC currently in affect for all leased parcels including AOC 57. The LIFOC agreement identifies the general restrictions and required actions that are in place to protect the remedy for AOC 57. Administrative ICs would be developed and detailed in the FOST and included with the Deed prior to transfer of the land parcels associated with AOC 57.

Institutional Controls Inspections

IC inspections were developed as part of the Draft LTMP (USACE, 2004) and documented in the comprehensive LTMP (HGL 2008b). The plans include a checklist of elements to be assessed during regularly scheduled on-site inspections and interviews with the site property owner, manager, or designee. If future land use at AOC 57 is inconsistent with the ICs, then site exposure scenarios for human health and the environment will be re-evaluated to assess whether this response action is appropriate. As part of the inspections, information about whether any excavations that would involve soil and groundwater are planned, and any proposed plans for sale or development of the property are gathered from personnel with knowledge of the site and the ICs. Although public access to both Areas 2 and 3 is not restricted, recent construction of the Evergreen solar panel manufacturing facility between Barnum Road and AOC 57 has blocked direct access to the site, thereby making the site less accessible than in previous review periods.

Environmental Monitoring

LTM was performed by the USACE-NAE, Concord, Massachusetts in 2005, and was performed in accordance with the LTMP (USACE, 2004). LTM was performed by HGL from 2006 through 2010 in accordance with the 2004 USACE LTMP until it was superseded by the comprehensive LTMP (HGL, 2008). Section 3 of the comprehensive LTMP includes details for AOC 57 sampling and analysis activities.

If there is indication that contaminants are migrating downgradient from the former source area, the Army, in conjunction with MassDEP and USEPA representatives, will evaluate the need for additional action. Contaminants will be deemed to be migrating downgradient if any COCs are detected above their respective action levels in designated sentry wells. The groundwater and brook elevation data will be reviewed to determine if flow direction remains constant and if the monitoring locations continue to be strategically located for detecting off-site migration of COCs. If future proposed land use at AOC 57 is inconsistent with implemented ICs, then the site exposure scenarios to human health and the environment will be re-evaluated to ensure that the response action at AOC 57 is appropriate. More frequent reviews will be performed if site conditions change significantly.

Monitoring will continue until all monitored wells are below action levels for two consecutive sampling rounds and the Army, MassDEP, and USEPA agree that the site can be administratively closed out.

Assessment of Monitoring and Site Inspection Data

Groundwater and surface water monitoring, wetland inspection and ICs inspection data will continue to be reported in the Annual Reports. Data will continue to be evaluated for detection of COCs concentrations that exceed action levels at the downgradient sentry wells. Data at source area wells will also be evaluated to observe trends in contaminant concentrations. It is expected that, once sufficient data are available, the data will be tracked using a linear regression or other method appropriate to distribution of the data. A proposal for the modification of assessment of the data will be presented in the Annual Report for review and approval by the regulatory agencies prior to implementing a change. The results

of the IC checks will continue to be assessed and reported in the Annual Reports.

Five-Year Reviews

Because the selected remedies for Area 2 and 3 results in contaminants remaining onsite above concentrations allowing unrestricted use, review of the site is required every five years to ensure that the remedial action remains protective of human health and the environment. This is the second five-year review for AOC 57. Five-year reviews will be performed as long as hazardous substances, pollutants, or contaminants remain on site above concentrations that allow for unrestricted exposure and unlimited use.

4.3.6 System Operation/Operations and Maintenance

Groundwater and surface water monitoring is being performed in accordance with the LTMP (HGL, 2008b) for AOC 57. Estimated O&M costs for groundwater monitoring at AOC 57 Areas 2 and 3 based on actual costs for 2008 are estimated as $35,000 per year for groundwater monitoring, wetland monitoring, IC inspections, and reporting.

4.4 PROGRESS SINCE LAST FIVE-YEAR REVIEW

This is the second five-year review for AOC 57. The previous five-year review in 2005 recommended continued remedial action activity, which consisted of a long-term groundwater monitoring program, surface water monitoring, wetlands protection, ICs, IC inspections, annual reporting, and five-year site reviews.

The protectiveness statement from the 2005 Five-Year Review Report was as follows:

> *"The remedies at AOC 57 are protective of human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled. Excavation activities at AOC 57 were completed in 2003.*
>
> *A Health and Safety Plan (HASP) and Investigative Derived Waste (IDW) handling procedures are in place and are being properly implemented during groundwater and surface water sampling. The HASP and IDW procedures are sufficient to control risk to on-site workers and the public. Human health is currently not at risk at AOC 57 because groundwater at the AOC is not being used for potable use nor proposed for potable use and contaminated surface soils at AOC 57 have been excavated and removed from the site."*

Recommendations from the previous review include the following:

EPH was removed from the Area 3 analyte list following the spring 2005 LTM event.

The previous five-year review also recommended that reducing conditions observed at AOC 57 be assessed by the Army by plotting and contouring arsenic concentrations, as well as ORP and dissolved oxygen (DO). USACE performed and evaluation of arsenic data, including a temporal and spatial analysis of available arsenic historical site data, and issued a technical memo (USACE, 2006). The evaluation was inconclusive for both Areas 2 and 3, but did

indicate that there was a stronger case in Area 2 for naturally occurring conditions as the cause of observed arsenic concentrations. One conclusion from the USACE's evaluation was that the existing data sets were not sufficient to rule out the biodegradation of petroleum hydrocarbons as the cause of reducing conditions in Area 2 and 3. However, data collected from 2006 through spring 2010 continue to demonstrate the same trends noted in the USACE evaluation; Area 2 and 3 arsenic concentrations are generally decreasing over time although more recent results have indicated steady arsenic concentrations. The comprehensive LTMP (HGL, 2008b) provides a more detailed discussion of arsenic results and fate and transport and included a wider range of LTM data.

Additionally, it was recommended that piezometer 57P-98-04X be repaired and, along with piezometer 57P-98-03X, re-surveyed. Each of these action items were addressed by the Army during the June 2008 LTM event and the collection of water level data from these locations resumed.

The previous five-year review recommended that future surface water samples be analyzed for dissolved metals instead of total metals. June 2006 groundwater and surface water samples were analyzed for total and dissolved metals, in part to evaluate the concentration of mobilized metals versus the concentration of metals that had precipitated out of surface water or groundwater due to high oxidation-reduction potential (ORP) or oxygenated conditions or other mechanisms. Significant differences were not observed between total and dissolved metals in monitoring well and surface water sample results, therefore groundwater and surface water samples from subsequent LTM events were analyzed for total metals only. Starting with the 2009 LTM event, surface water samples have been analyzed for dissolved metals only.

The previous five-year review also recommended that future surface water samples be compared to National Recommended Water Quality Criteria to ensure compliance and determine if an impact to the protectiveness of the remedy has occurred. Beginning with the spring 2007 LTM event, surface water results have been compared to the USEPA Water Quality Criteria. Surface water sample results have been compliant with USEPA Water Quality Criteria, with the exception of trace levels of PCBs observed in one sample from the 2007 LTM event that were above the 0.014 μg/L criteria, or non-COCs such as iron and manganese. Arsenic surface water sample results have been well below the USEPA Water Quality Criteria. No impacts to the protectiveness of the remedy were observed from surface water sample results.

Additional progress since last Five-Year Review:

Well point 57WP-05-01 was installed along the edge of Cold Springs Brook, slightly upstream of AOC 57, during the November 2005 LTM event. The well point was installed to provide additional arsenic and water level data. Arsenic was generally not detected in samples collected through fall 2007, so sampling of the well point was discontinued in 2008. Water level data collected from the well point was used to supplement Area 2 water level data, but had no significant individual contribution to the LTM program. Two well points were installed in AOC 57 during the June 2006 LTM event to provide additional groundwater

elevation data; one was installed in Area 2 and one was installed in Area 3. Well point 57WP-06-02 was installed in Area 2 near well 57M-03-03X and well point 57WP-06-01 was installed in Area 3 near well 57M-96-11X. The well point water levels have been consistent with the adjacent monitoring wells.

Army efforts to monitor the effects of wetland restoration activities are discussed Section 4.3.5, Wetland Protection. In 2008, the Army concluded the wetland restoration monitoring and maintenance activities.

Annual reports issued for AOC 57 describe sampling and maintenance activities, IC inspections, analytical results and contaminant trends. The comprehensive LTMP (HGL, 2008b) represented a significant effort to evaluate site data, update the conceptual site model, review remedial timeframe estimates, and optimize the LTM program based on available information. The following LTM program optimization items were presented in the LTMP and received regulatory approval:

- Reduction of the groundwater monitoring frequency from semi-annual to annual (spring);
- Discontinuation of sampling water from Sumps 1, 2, 3, and 4 in Area 2;
- Discontinuation of sampling groundwater from wells 57M-03-06X and 57M-03-01X in Area 2;
- Discontinuation of sampling groundwater from well point 57WP-05-01;
- Discontinuation of sampling groundwater from well 57M-96-09X in Area 3; and
- Removal of cadmium, lead, and PCBs from the groundwater analyte list.

Several conclusions were included in the 2008 LTMP regarding AOC 57. The LTM data has confirmed the effectiveness of the remedy. VOC results are less than cleanup goals with the exception of results from three wells. At Area 2 well 57M-03-02X, PCE and TCE are present but concentrations are steady or decreasing, and fluctuate slightly above or below the cleanup goal. At Area 3 well 57M-96-11X, 1,4-DCE concentrations have been slightly above the cleanup goal during the spring 2008 and 2009 LTM events. At Area 3 well 57M-95-03X, 1,4-DCE concentrations are periodically above the cleanup goal. Cleanup goal exceedances at both Area 3 wells have been of insufficient frequency to develop temporal trends. Arsenic concentrations in Area 2 and 3, as discussed above, are generally decreasing over time but have been steady in recent LTM events. Arsenic concentrations in surface water continue to be below USEPA Water Quality Criteria, and trend analyses strongly suggest that arsenic concentrations in surface water will either decrease or remain stable. Conservative arsenic mass-loading calculations discussed in the 2008 LTMP suggest that arsenic accumulation in Cold Springs Brook sediment is not a significant concern. The LTM program is in its eighth year, which leaves ample time for residual VOC and arsenic concentrations to reach cleanup goals within a reasonable time frame.

The Draft Final Operating Properly and Successfully Demonstration for Area of

Contamination 57 (USACE, 2010) built upon the 2005 submittal of the draft document submittal by USACE and concluded that the remedial actions selected for AOC 57 were operating properly and successfully, consistent with the provisions of CERCLA, Section 120(h)(3). This conclusion was based on the following lines of evidence:

- The remedy for AOC 57 has been implemented as designed;
- The remedy will achieve the RAOs delineated in the ROD;
- The remedy is functioning in such a manner that it is expected to adequately protect human health and the environment when completed; and
- ICs have been enacted to provide further protection to human health.

4.5 FIVE-YEAR REVIEW PROCESS

4.5.1 Administrative Components of the Five-Year Review Process

Development of the third Five-Year Review process included the following components that are described in this section:

- Document Review;
- Data Review;
- Site Inspection;
- Interviews; and
- Community Participation.

4.5.2 Document Review

The following documents were evaluated for this five-year review:

- AOC 57 ROD prepared by the USEPA, 2001.
- AOC 57 Explanation of Significant Differences (ESD) prepared by USACE-NAE, March 2004.
- Second Five-Year Review Report prepared by Nobis, September 2005.
- Final Operating Properly and Successfully Demonstration for Area of Contamination 57 prepared by USACE, February 2010.
- Draft Operating Properly and Successfully Demonstration for Area of Contamination 57 prepared by USACE, December 2005.
- Final Long Term Monitoring Plan prepared by HGL, October 2008.
- Final 2005 Annual Report prepared by HGL, March 2007.
- Final 2006 Annual Report prepared by HGL, August 2007.
- Final 2007 Annual Report prepared by HGL, July 2008.

- Final Wetland & Upland Habitat Restoration and Long Term Adaptive Monitoring and Maintenance Plan, Area of Contamination 57 Areas 2 and 3 prepared by USACE, January 2007.
- Final 2004 Annual Report, Wetland & Upland Habitat Restoration and Long Term Adaptive Monitoring and Maintenance Program, Area of Contamination 57 Areas 2 and 3 prepared by USACE, January 2007.
- Final 2005 Annual Report, Wetland & Upland Habitat Restoration and Long Term Adaptive Monitoring and Maintenance Program, Area of Contamination 57 Areas 2 and 3 prepared by USACE, January 2007.
- Final 2006 Annual Report, Wetland & Upland Habitat Restoration and Long Term Adaptive Monitoring and Maintenance Program, Area of Contamination 57 Areas 2 and 3 prepared by USACE, July 2007.
- Final 2007 Annual Report, Operation & Maintenance Phase, Wetland & Upland Habitat Restoration and Long Term Adaptive Monitoring and Maintenance Program, Devens Consolidation Landfill (DCL) Areas of Contamination 9, 11, 40, 41 & Study Areas 12 and 13, and Area of Contamination 57 Areas 2 and 3 prepared by USACE, May 2008.
- Final 2008 Annual Report, Operation & Maintenance Phase, Wetland & Upland Habitat Restoration and Long Term Adaptive Monitoring and Maintenance Program, Devens Consolidation Landfill (DCL) Areas of Contamination 9, 11, 40, 41 & Study Areas 12 and 13, and Area of Contamination 57 Areas 2 and 3 prepared by USACE, June 2009.
- Final 2008 Annual Report prepared by HGL, September 2009.
- Final Operating Properly and Successfully Demonstration for Area of Contamination 57 prepared by USACE, February 2010.
- Draft-Final 2009 Annual Report prepared by HGL, April 2010.

4.5.3 Data Review

Data from the 2005 through 2009 LTM events are presented in their respective annual reports. Per approval of the 2008 LTMP, sampling at AOC 57 was reduced from a semi-annual event to an annual event each spring. A final report summarizing the data from the May 2009 sampling event was not yet issued at the time that this Five-Year Review Report was prepared. However, results from the May 2009 event were available for review from the draft final 2009 Annual Report (HGL, April 2010). Table 4.8 at the end of this subsection summarizes the AOC 57 COCs that have exceeded the site cleanup goals from fall 2003 through spring 2009. A complete list of all validated COC results for AOC 57 from 2005 through 2009 are presented in Appendix C.

With the exception of one short-lived spike in groundwater and two short-lived spikes in surface water observed during this review period, the historical arsenic data for Area 2 in Figure 4.3 convey a general downward trend, yielding results consistently close to or below

the 10 μg/L GW-1 standard and the 150 μg/L USEPA Water Quality Criteria since the October 2007 sampling event. In comparison, historical data for arsenic in Area 3 (Figure 4.4) present a more reciprocal pattern, with generalized high points during the fall months and low points during the spring events. Such regular intervals may result from higher precipitation totals during the fall and winter months, supporting desorption from native, arsenic-bearing soils and a re-establishment of equilibrium by the spring and summer months. Alternatively, the higher fall arsenic concentrations may be explained by less energetic groundwater conditions (lower groundwater velocity) and creation of an environment more conducive to generating reducing conditions, and, thus, greater mobilization of dissolved arsenic. Spring conditions are more dynamic and generally more conducive to oxygenation of the groundwater, and, thus are less conducive to arsenic dissolution. Overall, groundwater from Area 3 well 57M-96-11X consistently portrays an elevated arsenic concentration ranging from 12 to 27 times the MCL/GW-1 standard, whereas arsenic in well 57M-95-03X, with the exception of an anomaly in October 2004, has ranged from 5 times the groundwater standard to well below it.

Iron and manganese analyses were added to the AOC 57 analyte list in spring 2006 and have been reported only for the 2006 through 2009 sampling events. As a result, no significant trends can be deduced at this time. The iron concentrations at all three surface water sampling locations have varied widely from event to event; however, most results are above the USEPA Water Quality Criterion of 1,000 μg/L.

As demonstrated by the field parameter measurements for 2005 through 2009 in the Appendix C Tables, the iron, manganese and arsenic concentrations generally reflect the groundwater conditions under Areas 2 and 3. For instance, when the ORP of a well is below 50 millivolts (mV) and the DO concentration is below 1 mg/L, the metal concentrations are usually elevated. Such conditions are likely an inherent characteristic of a wetland environment.

PCE and TCE concentrations (Figures 4.5 and 4.6, respectively) at Area 2 well 57M-03-02X have remained relatively constant since the fall 2003 sampling event, fluctuating slightly around the 5.0 μg/L cleanup goal. All other Area 2 and Area 3 PCE and TCE results have either been non-detections or detections below the GW-1 standard since the second Five-Year Report (Nobis, September 2005).

The 1,4-DCB results have primarily been below the 5 μg/L cleanup goal at all AOC 57 wells since 2003. Four exceptions are documented: fall 2004 and 2007 (both 13 μg/L) at monitoring well 57M-95-03X, and spring 2008 and 2009 (5.1 μg/L and 7.5 μg/L, respectively) at monitoring well 57M-96-11X. These exceedances are infrequent and unpredictable in nature.

The EPH C_{11}-C_{22} aromatic carbon fraction results have largely been non-detections for groundwater from all AOC 57 wells since 2003, with the exception of the fall 2005 result (251 μg/L) at Sump-2.

Table 4.8
Summary of Exceedances for AOC 57

GROUNDWATER											
Well Number	**Fall 2003**	**Spring 2004**	**Fall 2004**	**Spring 2005**	**Fall 2005**	**Spring 2006**	**Fall 2006**	**Spring 2007**	**Fall 2007**	**Spring 2008**	**Spring 2009**
Arsenic - 10 µg/L Cleanup Goal											
57M-03-02X (AREA 2)	(4.2)	(6.4)	(8.9)	ND	(8.8)	14	13	(6)	(8)	13	10
57M-03-04X (AREA 2)	41	30	50	47	167	(3.7)	(6)	(3)	ND	ND	ND
57M-03-05X (AREA 2)	22	21	19	ND	18.6	15	11	(5)	(9)	11	12
SUMP-1 (AREA 2)	NC	55	(7.8)	ND	36.1	25	(9.0)	(4.1)	(7)	NC	NC
SUMP-2 (AREA 2)	NC	28	24	ND	36.2	38	17	(3.2)	28	NC	NC
SUMP-3 (AREA 2)	NC	22	25	ND	16.8	21	20	(4.7)	14	NC	NC
SUMP-4 (AREA 2)	NC	21	62	ND	24.8	23	37	ND	62	NC	NC
57M-95-03X (AREA 3)	36	44	230	25	13.6	(7)	49	(4.8)	51	23	21
57M-96-11X (AREA 3)	270	240	120	161	215	163	171	166	193	160	163
Trichloroethene - 5 µg/L Monitoring Criteria											
57M-03-02X (AREA 2)	(3.9)	(4.3)	5.3	5.3	6.1	5.3	(3.3)	(4.7)	(3.2)	6.2	(4.0)
Tetrachloroethene - 5 µg/L Cleanup Goal											
57M-03-02X (AREA 2)	(4.1)	(2.3)	(2.7)	(3.9)	6.0	(2.3)	(0.84)	5.8	(1.5)	(3.7)	(0.43 J)
C_{11}-C_{22} Aromatics - 200 µg/L Cleanup Goal											
SUMP-2 (AREA 2)	NC	ND	ND	ND	251	ND	ND	ND	ND	NC	NC
1,4-Dichlorobenzene - 5 µg/L Cleanup Goal											
57M-95-03X (AREA 3)	(1.4)	(2.2)	13	(0.5)	(0.8)	(1.4)	(4.5)	(1.4)	13	(0.9)	(2.4 J)
57M-96-11X (AREA 3)	(3.4)	(3.8)	(2.4)	(3.3)	(1.4)	(3.7)	(2.4)	(4.4)	(1.6)	5.1	7.5

Table 4.8 (continued)
Summary of Exceedances for AOC 57

SURFACE WATER											
Well Number	**Fall 2003**	**Spring 2004**	**Fall 2004**	**Spring 2005**	**Fall 2005**	**Spring 2006**	**Fall 2006**	**Spring 2007**	**Fall 2007**	**Spring 2008**	**Spring 2009**
Arsenic - 150 µg/L Water Quality Criteria											
57-AREA 2-SW-3 (AREA 2)	(14)	(8.1)	(46)	(96)	(39.9)	(7)	(46)	(63)	(11)	(6)	(2.6J)
Iron - 1,000 µg/L Water Quality Criteria											
57-AREA 2-SW-2 (AREA 2)	NC	NC	NC	NC	NC	1,100	(480)	3,900	1,200	2,600	(770)
57-AREA 2-SW-3 (AREA 2)	NC	NC	NC	NC	NC	(740)	8,300	4,500	1,100	1,500	7600
57-AREA 3-SW-1 (AREA 3)	NC	NC	NC	NC	NC	(600)	4,500	(520)	7,100	6,800	2500
Lead - 2.5 µg/L Water Quality Criteria											
57-AREA 2-SW-2 (AREA 2)	ND	ND	ND	ND	ND	(1.8)	(1.9)	12	ND	NC	NC
57-AREA 2-SW-3 (AREA 2)	2.6	ND	ND	5.2	3.3	2.8	ND	12	ND	NC	NC
57-AREA 3-SW-1 (AREA 3)	34	ND	(0.81)	3.4	ND	(2.3)	ND	(1.8)	14	NC	NC

Notes:

Number in parentheses denotes that the concentration is below the associated cleanup goal, monitoring criteria, or water quality criteria value.

Unadjusted C_{11}-C_{22} Aromatics result used beginning with Spring 2006 sample event.

ND = The analyte was analyzed for, but not detected. The associated numerical value is the laboratory reporting limit.
NC = Not collected; a sample was not collected and analyzed for this particular analyte.
J = Estimated value detected below the laboratory reporting limit.

4.5.4 Site Inspection

On May 20, 2010, an HGL representative performed site inspections at AOC 57. Conditions during the inspection were favorable with no precipitation and temperatures in the 70-80°F range.

Observed monitoring well protective casings were intact and secured. Staff gauges were observed to be in good condition. No evidence of excavation or groundwater use was noted at the site.

In addition, no groundwater pumping wells are in operation at the site. No other violations, modifications, or response actions were identified during the inspection. Finally, no enforcement actions associated with failure of the LUC program have occurred at AOC 57.

4.5.5 Interviews

The following individuals were interviewed as part of the five-year review:

- Ms. Ellen Iorio, USACE, New England District;
- Mr. Ron Ostrowski, MassDevelopment; and
- Mr. Henry Malone, Evergreen Solar, Inc.

Ms. Iorio stated that the site is operating properly and meeting all remedial objectives per the ROD. She is unaware of any events, incidents, or activities that would impact the remedy at the site.

Mr. Ostrowski stated that remedial work at AOC 57 is satisfactory and progressing forward. Furthermore, he stated that there were no outstanding issues with existing LUCs on the site.

Mr. Malone reported that during Evergreen Solar's first year of operation, there were discharges of hazardous materials; he further stated that these were properly reported and properly remediated with no adverse effect on the environment or the AOC 57 remedy. He stated that he was unaware of any issues or community concerns regarding remedial operations at the site.

The detailed 2010 LUC interviews will be included in Appendix J.

4.5.6 Community Participation

Community participation at former Fort Devens Army Installation is detailed in Section 1.3.

4.6 TECHNICAL ASSESSMENT

Question A: Is the remedy functioning as intended by the decision documents?

Yes. The remedy is functioning based on the long-term monitoring results and ICs implemented with no early indicators of remedy failure. Information to support this statement provided below.

Remedial Action Performance
Several years of groundwater and surface water monitoring have been performed at AOC 57. The LTMP (HGL, 2008b) details the site monitoring that is performed in order to meet the remedial goals for the site. LTM activities will continue to be performed until remedial goals are obtained. LTM activities and sampling results indicate that the remedial action is operating as intended and cleanup goals are likely to be achieved within a reasonable timeframe.

Based on the review of available data, ROD COC concentrations are generally decreasing or steady with some fluctuations over time. VOC results are generally at or below cleanup goals with a few exceptions of results slightly above cleanup goals. Arsenic results in Area 2 have decreased significantly over time to concentrations that are below or slightly above the cleanup goal. Arsenic results in Area 3 well 57M-95-03X have decreased significantly over time to concentrations that are slightly above the cleanup goal, although results in well 57M-96-11X appear to be steady at concentrations that are well above the cleanup goal. However, ample time remains for attenuation of residual VOCs and arsenic in groundwater. Data will continue to be evaluated to observe trends in contaminant concentrations and evaluate the potential for off-site migration.

System Operations/Operation and Maintenance (Long Term Groundwater Monitoring)
Groundwater monitoring is being performed in accordance with the LTMP (HGL, 2008b) for both Areas 2 and 3. On-site IC inspections and interviews continue to confirm that there are no exposures to contaminated groundwater. Annual reports continue to provide data that support the effectiveness of ongoing remedy activities.

Opportunities for Optimization
The frequency of monitoring and the analyte list have been reduced since the previous five-year review. No further optimization is recommended at this time.

Early Indicators of Potential Remedy Failure
No early indicators of potential remedy failure were noted during the review. Groundwater monitoring results have been steady or decreasing. Surface water monitoring results have been below USEPA Water Quality Criteria. The monitoring results indicate that off-site migration of contaminants is not a present concern. The Army will continue to evaluate the potential for off-site migration, impact to sensitive receptors, trend analysis and remedial duration as part of the AOC 57 monitoring program.

Implementation of ICs and other measures
In accordance with the ROD, ICs prohibiting the potable use of groundwater and residential use of floodplain property are currently in effect at AOC 57. ICs are included in the LIFOC currently in effect for all leased parcels, including the AOC 57. The LIFOC agreement

identifies the general restrictions and required actions that are in place to protect the remedy for AOC 57. Administrative ICs would be developed and detailed in the FOST and included with the deed prior to transfer the land parcels associated with AOC 57. There are no current or future plans for installation of potable water wells at either Area 2 or 3. The LIFOC can be located at the BRAC office library.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?

The exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy selection are still valid based on supporting information provided below, with the exception of the PRG for arsenic. The arsenic PRG was previously 50 μg/L and changed to 10 μg/L in January 2006.

Changes in Standards and To Be Considered

As part of this five-year review, ARARs and TBC guidance presented in the ROD were reviewed. This review will be discussed further in Section 4.6.2.

Excavation activities at AOC 57 were completed in October 2003. The RAOs for soil specified in the ROD have been permanently achieved. There are no current ARARs that apply to soil contaminants at the site. Following the 2002 removal work and the 2003 additional investigation work, the Army prepared an ESD adding EPH and PCBs as COCs in soil. These cleanup goals also have been met. Because the cleanup goals for soil at AOC 57 were based on HHRA levels determined specifically for the site and the contaminated soils were removed, changes to soil TBCs do not affect the protectiveness of the implemented remedy.

The MCLs are health-based standards established by the USEPA. The MCL for arsenic in effect at the time of the ROD (50 μg/L) was selected as a groundwater cleanup goal. Arsenic was present on site at concentrations greater than its MCL during the remedial investigation and was a primary risk driver for the ingestion of groundwater exposure. The MCL for arsenic has been updated since the 2001 ROD. Changes to the MCL for arsenic (effective February 2002) in association with changes of the EPA National Primary Drinking Water Regulations for arsenic and implementation on January 23, 2006, effectively reduced the clean-up level for arsenic from 50 μg/L to 10 μg/L. There have been no changes to the COC MCLs since the previous five-year review. Because the remedy includes prohibiting the use of groundwater as drinking water, changes to groundwater standards do not affect the protectiveness of the implemented remedy. However, with the revised arsenic standard, it is likely to increase the time necessary for elevated arsenic concentrations to decline to MCLs.

Because the MassDEP Surface Water Standards are taken from the USEPA National Recommended Water Quality Criteria (Office of Water, Office of Science and Technology – 4304T. 2009), this document is considered applicable to AOC 57. This document establishes Criteria Maximum Concentrations (CMC) and Criteria Continuous Concentrations (CCC). CMCs are an estimate of the highest concentration of a material in surface water to which an

aquatic community can be exposed briefly without resulting in an unacceptable effect. The CCCs are an estimate of the highest concentration of material to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect. Following the spring 2007 LTM event, it was determined that surface water sampling results at AOC 57 should be compared to the analyte-specific CCCs for chronic freshwater aquatic biota exposure, when available, rather than to the cleanup goals established for groundwater. Surface water sample results have been compliant with USEPA Water Quality Criteria, with the exception of trace levels of PCBs observed in one sample from the 2007 LTM event that were above the 0.014 μg/L criteria, or non COCs such as lead, iron and manganese. See the following paragraph regarding the limited use of iron and manganese analyses for the AOC 57 LTM program. PCBs and lead were removed from the AOC 57 list of analytes in accordance with 2008 LTMP recommendations that received regulatory approval. Accordingly, the use of USEPA Water Quality Criteria for surface water samples does not affect the protectiveness of the implemented remedy.

The inorganic COCs listed in the ROD for AOC 57 are arsenic, cadmium, and lead. In the 2006 through 2009 LTM events, iron and manganese were added to the analyte list. Although iron and manganese are not listed in the AOC 57 ROD, USEPA Region I requested that these metals be included in the sampling events as a measure of the potential for natural attenuation. AOC 57 does not have a site-specific cleanup goal for manganese and iron, as they were not groundwater COCs in the 2001 ROD. AOC 57 manganese and iron concentrations in groundwater are compared to their background levels of 291 and 9,100 μg/L, respectively. Cadmium and lead were removed from the COC list in accordance with the approved LTMP (HGL, 2008a).

Because the cleanup goals are based on drinking water standards, changes to the MCLs and MassDEP GW-1 standards influence the protectiveness of the cleanup goals. However, because the remedy includes prohibiting the use of groundwater as drinking water, changes to groundwater standards do not affect the protectiveness of the remedy.

Changes in Exposure Pathways

The ROD identified unacceptable risks from the following exposure pathways in Area 2 Wetland Area: ingestion, dermal contact, and inhalation of dust from subsurface soils by future construction workers and from surface and subsurface soils by future residents, and ingestion of groundwater as the primary drinking water source for future residents. The ROD identified unacceptable risks from the following exposure pathways in Area 3 Industrial Area: ingestion of groundwater as the primary drinking water source by future commercial/industrial workers and future residents. The ROD identified unacceptable risks from the following exposure pathways in Area 3 Wetland Area: ingestion, dermal contact, and inhalation of dust from subsurface soils and ingestion of groundwater as the primary drinking water source by future residents. Based on indications from analytical results of confirmatory soil samples collected from excavated areas, the excavation and removal of contaminated soil from AOC 57 have eliminated the potential soil exposure pathways.

ICs prohibiting the use of site groundwater as drinking water at AOC 57 have eliminated the potential groundwater exposure pathways. Zoning restrictions prohibit residential use of the wetland areas of AOC 57. Land use at the site has not changed since the ROD. Potential future uses remain consistent with potential future uses evaluated in the risk assessment supporting the ROD. Current land use is in compliance with the proposed deed restrictions. No new contaminants, sources, or routes of exposure were identified. There is no indication that hydrologic/hydrogeologic conditions are not adequately characterized.

Construction of a solar panel manufacturing facility between Areas 2 and 3 of AOC 57 and Barnum Road began in 2008 and was completed in 2009. Construction activities complicated site access but otherwise had minimal impact to AOC 57; however, Area 3 monitoring well 57M-96-09X was destroyed by construction activities. This well was slated for removal from the sampling program in 2008 with approval from the USEPA and MassDEP. The well was intended for annual measurement of groundwater levels, but future groundwater contouring efforts will not be affected by the loss of the well. Although significant construction activities were completed between AOC 57 and Barnum Road for the solar panel manufacturing facility, no changes in site use have taken place.

Changes in Exposure Assumptions

The risk assessment supporting the ROD for AOC 57 used exposure assumptions that were consistent with standard practice at the time.

Since the original risk assessment was prepared, USEPA has updated the recommended dermal contact exposure assumptions. The 1998 draft guidance for evaluating dermal contact exposures used in the RI was finalized in July 2004 (Risk Assessment Guidance for Superfund, Volume I – Human Health Evaluation Manual – Part E, Supplemental Guidance for Dermal Risk Assessment – Final). The final guidance includes slight changes in some dermal exposure assumptions. Because the remedy includes prohibiting the use of groundwater as drinking water and excavation of contaminated soils has been performed, changes to the exposure parameters do not affect the protectiveness of the implemented remedy.

Changes in Toxicology and Other Contaminant Characteristics

Since the completion of the HHRA, the USEPA has issued recent guidance recommending the use of additional sources of peer-reviewed toxicity values, and has updated several toxicity values. While a few of the toxicity values have been revised since the HHRA was performed, these revisions would not result in the identification of additional COCs, nor would it change the overall conclusions of the risk assessment. It should be noted that in Area 2, 1,2-dichloroethene and TCE would not have become groundwater COCs if screened by the 2009 risk criteria. In Area 3, 1,2-dichlorobenzene (1,2-DCB) would not have become a COC if screened by the 2009 risk criteria but ethylbenzene and xylenes would have been COCs. Also, zinc would have been selected in surface water CPC for both Area 2 and Area 3 when screening with the *2009 National Recommended Water Quality Criteria*. It is not expected that the inclusion of ethylbenzene, xylenes, and zinc in the risk assessment calculations would have altered the conclusion of the risk assessment.

Because the groundwater cleanup goals presented in the ROD are based on drinking water standards and not on risk-based calculated values, changes in toxicity values do not impact the protectiveness of the cleanup goals. Also, the remedy includes the prohibition of groundwater use as drinking water so any changes in toxicity of the COCs do not affect the protectiveness of the remedy. Because the soil cleanup goals at AOC 57 were based on site-specific HHRA, changes in toxicity values for soil contaminants could have affected the soil cleanup goals. However, because the contaminated soil has already been removed, changes to soil contaminant toxicity do not affect the protectiveness of the implemented remedy.

Below is a summary of the changes in toxicity values for each COC and the potential impact on the risk calculations:

The IRIS cancer assessment for inorganic arsenic is currently under review. USEPA's Office of Research Development has recently completed a 2010 draft titled: *Toxicological Review of Inorganic Arsenic: In Support of the Summary Information on the Integrated Risk Information System (IRIS)*. The draft assessment includes an updated CSF of 25.7 mg/kg-day^{-1}, which is much higher than the CSF used in the original risk assessment and the one currently listed on IRIS. Acceptance of this new, higher CSF could indicate that the cancer risk from arsenic may be underestimated. Also, a reference concentration has been included in the IRIS database for arsenic, as well as for cadmium. Therefore, the non-cancer hazards for the inhalation pathway may have been underestimated in the original risk assessment.

Tetrachloroethene and 1,4-DCB have revised CSFs that are more protective than those used in the original risk assessment. 1,4-DCB has a revised RfD that is slightly larger than that used in the risk assessment. Also, a surrogate RfD was used for Aroclor 1260 in the original risk assessment because there is no RfD for Aroclor 1260. Therefore, the risks and hazards may have been slightly underestimated for some COCs and overestimated for others in the original risk assessment.

Changes in Risk Assessment Methodology

Several new risk assessment methodologies have been introduced since the original risk assessment was performed in June 2000.

In 2004, USEPA published the final version of the Risk Assessment Guidance for Superfund (RAGS) Appendix E, which is the updated guidance for the dermal contact evaluation (USEPA, 2004). Current recommendations include updated dermal absorption factors for specific chemicals and updated oral to dermal adjustment factors for RfDs and CSFs. The final guidance includes slight changes in some dermal exposure assumptions from what was used in the original risk assessment. While this may indicate an underestimation of exposure in the original risk assessment, it is not expected that the slight change in the dermal exposure calculation would alter the conclusion of the risk assessment.

USEPA has identified several carcinogens that act via a mutagenic mode of action, and to account for their early-life exposures, the default age-dependant adjustment factors (ADAF) of "10" for ages 0 to 2 and "3" for ages 2 to 16 have now been incorporated into the risk

calculations. This approach is consistent with the 2005 *Guidelines for Carcinogen Risk Assessment and the Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens*. None of the AOC 57 COCs are considered to be mutagenic for the purposes of this risk assessment methodology. Therefore, this methodology change does not affect the conclusion of the original risk assessment.

In January 2009, USEPA introduced RAGS Part F, which updates the approach for determining risk from inhaled chemicals to be consistent with the inhalation dosimetry methodology described in *Methods for Derivation of Inhalation Reference Concentrations and Application of Inhalation Dosimetry* (USEPA, 1994). The new approach revises the equations for estimating inhalation exposure and risk, recommending that when estimating risk via inhalation, the concentration of the chemical in air should be used as the exposure metric (e.g., mg/m^3), rather than inhalation intake of a contaminant in air based on inhalation rates or body weight (e.g., mg/kg-day). It is not expected that this change in the inhalation calculation would alter the conclusion of the risk assessment.

While numerous methodologies have changed since the original risk assessment was prepared, the potential human health risks discussed in the ROD will be eliminated by the ICs that are in place to prohibit groundwater from being used as drinking water thus maintaining the protectiveness of the current remedy. Therefore, there are no risk assessment methodology changes that affect the protectiveness of the remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information other than that noted above has come to light that would call into question the protectiveness of the remedy was noted. No natural disaster impacts occurred at AOC 57 during this review period.

4.6.1 Summary of Technical Assessment

While several risk assessment methodologies have changed since the original risk assessment was prepared, ICs are in place to prohibit the groundwater from being used as drinking water thus maintaining the protectiveness of the current remedy.

4.6.2 Applicable or Relevant and Appropriate Requirements Review

ARARs that were presented in the 2001 ROD are included in Appendix C. Standards and regulations, current at the signing of the ROD and for the previous Five-Year Reviews, have been reviewed for changes that could affect protectiveness of the remedy.

The following ARARs have been modified since the signing of the ROD and may affect the protectiveness of the implemented remedial action:

1. 40 CFR 141.11 Subpart B MCLs – updated July 1, 2001. Section 141.11 (a) and (b) were amended at 66 FR 7061 on January 22, 2001 to state the following:

- ****The analyses and determination of compliance with 0.05 mg/L MCL for arsenic use the requirements of 141.23.*
- *The MCL for arsenic was 0.05 mg*/L for community water systems until January 23, 2006.

On January 22, 2001, USEPA adopted a new standard for arsenic in drinking water at 0.01 mg/L, replacing the old standard of 0.05 mg/L (66 FR 6976). The rule became effective February 22, 2002. The date by which systems must comply with the new 0.01 mg/L standard was January 23, 2006.

2. 40 CFR 141.15 and 141.16 Subpart B MCLs – updated July 1, 2003. An effective date note (65 FR 76745) removed the sections from the CFR effective December 8, 2003. Sections 141.15 and 141.16 do not appear in 40 CFR 141 updated on July 1, 2004. These two sections addressed MCLs for radium-226, radium-228, gross alpha particle radioactivity, and beta and photon radioactivity, which do not affect the protectiveness of the remedy.

3. 40 CFR 141.51 Subpart F MCL Goals and Maximum Residual Disinfectant Level Goals – updated July 1, 2001. The table was amended in Section 141.51 by adding arsenic with a MCL goal of zero effective January 23, 2006 (66 FR 7063). Until then, no MCL goal applied for arsenic.

4. 310 CMR 7.00 Air Pollution Control Regulations – In July 2009, MassDEP proposed to make amendments to definitions related to particulate matter in 310 CMR 7.00: Air Pollution Control, 310 CMR 7.54: Large Combustion Emission Units, and Appendix A: Emission Offsets and Nonattainment Review. These changes are based upon a thorough review of the regulations encoded in 310 CMR 7.0 to ensure the addition of definitions for $PM_{2.5}$ to all relevant sections. The proposed revisions would not affect the protectiveness of the remedy.

5. 310 CMR 10.00 The Wetlands Protection Act Regulations – updated in June 2009. The revisions promulgated in June 2009 make provision for necessary actions to eradicate Asian Longhorn Beetle infestations within the parameters of the Wetlands Protection Act. Related language has also been incorporated into 314 CMR 9.00, 401 Water Quality Certification for Discharge of Dredged or Fill Material, Dredging, and Dredged Material Disposal in Waters Within the Commonwealth. This revision does not affect the protectiveness of the remedy.

6. 310 CMR 22.0 Drinking Water – updated May 24, 2004. The arsenic MCL listed in Section 22.06 is effective for the purpose of compliance with the Code of Federal Regulations (outlined above) on January 23, 2006. A perchlorate standard was also promulgated July 28, 2006. Because perchlorate is not a COC for the site, the ARARs are not affected by this change. 310 CMR 22.26 was updated in December 2009 regarding microbial communities in groundwater that is also used for public consumption. As bacterial populations are not considered a COC for AOC 57, the protectiveness of the remedy is not affected.

7. 310 CMR 30.00 Hazardous Waste Regulations – In January 2007, an update to this regulation was proposed to streamline the cleanup requirements of any hazardous materials released to the environment at facilities, both active and closed, that are, or were, subject to a hazardous waste license. In April 2010, this regulation was updated to include the Amendments for Adoption of Federal Land Disposal Restriction Program. The update also includes revised definitions and technical corrections needed to clarify the regulatory status of specific wastes. There were no revisions that affect the protectiveness of the remedy.

8. 314 CMR 6.00 Massachusetts Groundwater Quality Standards – rescinded March 20, 2009. Revisions made to 314 CMR 5.00 for a streamlined groundwater discharge permitting process negated the need for this section. As the selected groundwater quality standards for AOC 69W are primarily Federal MCLs and are also presented in 40 CFR 141 Section 11 and 13, the removal of 314 CMR 6.00 from the CMR does not affect the protectiveness of the remedy.

9. 314 CMR 9.00 Water Quality Certification for Discharge of Dredged or Fill Material, Dredging, and Dredged Material Disposal in Waters Within the Commonwealth – Revised June 2009. Revisions promulgated in June 2009 address necessary actions to eradicate infestation by Asian Longhorn Beetles. The revised language is found in 314 CMR 9.12. Related language has also been incorporated into 310 CMR 10.00, the Wetlands Protection Act Regulations. Revisions promulgated January 2, 2008, encourage stormwater recharge, the increased use of low impact development techniques, improved operation and maintenance of stormwater best management practices, and the removal of illicit connections from stormwater management systems. MassDEP has accordingly revised the Stormwater Management Standards, which have been incorporated into 314 CMR 9.00. These regulations do not affect the protectiveness of the remedy.

In addition, a search was performed for any newly promulgated standards, which could affect protectiveness at the site. Although not an ARAR, the MCP is utilized by the Army in order to compare VPH/EPH data to "drinking water standards" for ROD compliance. The MCP has been revised several times since the signing of the ROD. In addition, MassDEP has issued policies regarding VPH/EPH sample collection and analyses. The most recent revision of this policy was issued in 2003. None of the MCP revisions note that the VPH/EPH policy revisions have influenced the protectiveness of the remedy. There were also revisions made to the MassDEP VPH and EPH Methods. Analytical laboratories should be performing these methods in accordance with the May 2004 analytical method protocol and the July 2010 Compendium of Analytical Methods protocol.

4.7 ISSUES

Based on the findings of this review, the remedial actions performed at AOC 57 are compliant with the ROD and are considered to be protective to human health and environment. This finding is based upon a review of site reports that have been prepared since the signing of the

ROD, a review of ARARs triggered by the remedial action, and the findings from the site inspection and interviews.

Existing land use and site conditions will be assessed during the regularly scheduled on-site inspections to ensure that the IC requirements are still being met. If the future proposed land use at AOC 57 is inconsistent with these ICs, then the site exposure scenarios to human health and the environment will be re-evaluated to ensure that this response action is appropriate.

4.8 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Based on the findings of this review, there are no recommendations or follow-up actions at this time.

4.9 PROTECTIVENESS STATEMENT

The remedy at AOC 57 is protective of human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled.

Human health is currently not at risk at AOC 57 because ICs are in place and are effective in prohibiting the use of site groundwater and preventing exposure to contaminated soil. Remedial actions have greatly reduced risk to the environment, as indicated by long-term groundwater and surface water monitoring results. HASP and IDW handling procedures are in place and are being properly implemented during groundwater and surface water sampling. The HASP and IDW procedures are sufficient to control exposure risk to on-site workers.

Current remedial action activity consists of the continued implementation of ROD components: the long-term groundwater monitoring program, utilizing ICs, annual reporting, and five-year site reviews. These components enable continued assessment for compliance with performance standards and reporting of remedy progress.

4.10 NEXT REVIEW

See Section 1.4 for further details.

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5.0 AREAS OF CONTAMINATION 43G AND 43J FIVE-YEAR POLICY SITE REVIEW

5.1 SITE CHRONOLOGY

Table 5.1
Chronology of Events for AOC 43G

Event	Date
Five gasoline USTs removed at Area 2	October 1990
One waste oil UST removed at Area 3	May 1992
SI Report issued	August 1992
SSI completed – NFA for Area 1, SA 43G designated as an AOC	January 1994
RI/FS completed for Areas 2 and 3	June 1996
Three replacement USTs (Area 2) and a sand and gas trap (Area 3) removed	August 1996
ROD signature	October 1996
Devens Public Water Supply Zone II and III were finalized	September 1997
Intrinsic Remedial Assessment completed	November 1999
Groundwater LTM initiated	December 1999
First Five-Year Review	September 2000
Second Five-Year Review	September 2005
Revised LTMP	November 2008
Annual LTM	2005-2009

Table 5.2
Chronology of Events for AOC 43J

Event	Date
Abandoned gasoline UST discovered	May 1992
Waste oil UST removed	May 1992
Gasoline UST removed	August 1992
SI Report complete	May 1993
Supplemental SI (SSI) completed – SA 43J designated as an AOC	January 1994
RI/FS completed	June 1996
Three replacement USTs (Area 2) and a sand and gas trap (Area 3) removed	August 1996
ROD signature	October 1996
Devens Public Water Supply Zone II and III were finalized	September 1997
Intrinsic Remedial Assessment completed	November 1999
Groundwater LTM Initiated	December 1999
First Five-Year Review	September 2000
Second Five-Year Review	September 2005
Environmental Baseline Survey	May 2006
Grant of Environmental Restriction and Easement (GERE)	June 2006
Approval of Covenant Deferral Request (USEPA)	June 2006
Approval of Nomination of AOC 43J, AREE 61AF, AREE 61J and AREE 63BB for Addition to Schedule I (MassDEP)	June 2006
Technical Update to the 1996 Risk Characterization Parcel C – AOC 43J	June 2006

Table 5.2 (continued)
Chronology of Events for AOC 43J

Event	Date
Environmental Assessment for the Commercial Redevelopment of Parcel C	June 2006
Explanation of Significant Differences for ROD AOC 43J	June 2006
Finding of Suitability for Early Transfer (FOSET) Parcel C	June 2006
Site transferred to MassDevelopment	June 2006
AOC 43J ESD prepared by Army BRAC incorporating ICs in deed	June 2006
Test Pit Investigation	July 2006
Monitoring Well Installation (four well pairs)	2006-2007
Quarterly Groundwater Monitoring	2007
Annual LTM	2005-2009
Sulfate Injection Pilot Test/Well Installation (two injection wells, 2 monitoring wells)	December 2009
Monthly Pilot Study Performance Monitoring	January 2010 - Date

5.2 BACKGROUND

Both AOCs 43G and 43J are historic gas stations located within the former Fort Devens in the Town of Harvard, Massachusetts. AOC 43G is located on Queenstown Road in the central portion of the former Main Post (Figure 5.1) AOC 43J is located on Patton Road in the southern portion of the former Main Post (Figure 5.2).

5.2.1 AOC 43G Background

AOC 43G consist of a decommissioned Army Air Force Exchange Service (AAFES) gas station and historic gas station G. For purpose of field investigations, AOC 43G was divided into three areas. Area 1 is the former location of historic gas station G. Areas 2 and 3 are associated with the AAFES gas station and represent the locations of former gasoline USTs and the former waste oil UST/sand and gas trap, respectively.

The original study area (SA 43G [Area 1]) was the historic gas station, which was used as a motor vehicle pool to support military operations during World War II. Operations concerning the motor pool were halted during the late 1940s or early 1950s. The reported location of the historic gas station was to the southwest of the AAFES gasoline station (Building 2008) and to the southwest of Building 2009. Based on the results of the 1992 SI and 1993 SSI, NFA was recommended for Area 1. Therefore, all further discussions in this Five-Year Review pertain only to Areas 2 and 3.

The location of the former AAFES gasoline station is approximately 120 ft northeast of the site of historic gas station G. At the time of the 1992 SI and 1993 SSI, it consisted of a service station (Building 2008), which housed three vehicle service bays and the AAFES store. It also included three 10,000-gallon USTs, associated pump islands, and a sand and gas trap (Area 3).

SA 43G was expanded to include the former AAFES gas station (Areas 2 and 3) as part of the

1993 SSI. The AAFES gas station was added to investigate the distribution of contamination observed during the removal of three former 9,000-gallon and two former 10,000-gallon gasoline USTs (removed in 1990 within Area 2). Contamination was also identified during the removal of a 500-gallon waste oil UST (completed in 1992 within Area 3). The excavation for the UST removals did not extend beyond 20 ft due to the limited reach of the excavator. Although soil samples were collected from the walls of the excavation, no samples were collected from the base of the excavation. The waste oil UST removal was stopped prior to the removal of all contaminated soil because of concerns that Building 2008 would be undermined.

The 1993 SSI identified fuel related compounds, principally benzene, toluene, ethylbenzene, and xylenes (BTEX), in site soil and groundwater attributed to leaking USTs and the sand and gas trap within Area 2 and 3. Due to the presence of soil and groundwater contamination, a RI and subsequent FS were recommended for Areas 2 and 3.

The HHRA completed for the RI identified no unacceptable threats to human health from exposure to contaminated soil, but did find potential threats to human health from future exposure to groundwater. In 1996, the Army completed a FS to analyze potential remedial alternatives for the groundwater contamination at AOC 43G.

The 10,000-gallon gasoline USTs, and associated piping at the former AAFES gas station, were removed by USACE-NAE in July/August 1996. In addition, the sand and gas trap and residual soil contamination in Area 3 were removed during this removal action.

5.2.2 AOC 43J Background

At the time of base closure in 1996, the area around AOC 43J was used as a vehicle storage yard and maintenance facility (former Buildings T-2446 and T-2479) for a Special Forces Unit of the Army. The former maintenance facility used a 1,000-gallon UST for storage of maintenance wastes. This UST was located just south of former Building T-2446. The yard and maintenance facility are paved with asphalt and surrounded by a chain-link fence with a locked gate located at the northern side of the yard. AOC 43J is within the Shebokin Supply Well Zone III.

Prior to construction of the vehicle maintenance facility, this area was used as a gas station/motor pool (historic gas station J) during the 1940s and 1950s. The structures of this historic gas station consisted of a pump island and a small gasoline pump house. This gas station was reported to be a Type A station, with one 5,000-gallon UST located between the gasoline pump house and pump island. The station was used during World War II as a vehicle motor pool to support military operations. The motor pool operations were discontinued during the late 1940s or early 1950s. No records were available on the decommissioning of this motor pool or the removal of the associated UST.

During the 1992 SI, an abandoned 5,000-gallon UST was found at historic gas station J. This UST was added to the Fort Devens UST removal program and removed in 1992. The former waste oil UST was also removed during the same year. During both UST removals,

contaminated soil was removed and disposed of by the Army. Based on the data and the findings of the 1992 SI, additional investigation was recommended.

In 1993, a SSI was performed to investigate the soil contamination observed during the SI and to install groundwater monitoring wells. The 1993 SSI investigations detected fuel related compounds, principally BTEX, in site soil and groundwater. Because of the presence of soil and groundwater contamination, a RI and subsequent FS were recommended. The site designation for SA 43J was administratively changed to AOC 43J at that time. The HHRA completed for the RI identified no unacceptable threats to human health from exposure to contaminated soil, but did find potential threats to human health from future exposure to groundwater. In 1996, the Army completed a FS to analyze potential remedial alternatives that addressed the groundwater contamination at AOC 43J. In October1996, the ROD was signed.

Another site, AREE 61 AF, also known as the 10th Special Forces Headquarters Motor Pool Buildings is located directly adjacent to AOC 43J. Various studies and removal actions have been previously performed at the site. The monitoring wells included in the AOC 43J LTMP are distributed across a major portion of AREE 61 AF. An NFA designation was approved by the USEPA in late 2003.

5.3 REMEDIAL ACTION

A ROD was signed in October 1996 documenting intrinsic remediation as the final selected cleanup remedy at both AOCs 43G and 43J (USAEC, 1996). RAOs for AOCs 43G and 43J are identified below.

5.3.1 Remedial Action Objectives at AOC 43G

The RAOs at AOC 43G are to:

- Protect potential commercial/industrial receptors located on Devens property from exposure to groundwater having chemicals in excess of the following remedial goals (RG): iron (9,100 μg/L), manganese (291 μg/L), nickel (100 μg/L), benzene (5 μg/L), ethylbenzene (700 μg/L), and xylenes (10,000 μg/L).
- Protect potential commercial/industrial receptors located off Devens property from exposure to groundwater having chemicals in excess of the above RGs.

The RGs for benzene, ethylbenzene, xylenes, and nickel are the MCLs and MMCLs in effect at the time. The RGs for iron and manganese are Devens background concentrations, because background concentrations exceeded the risk-based concentrations derived from available RfD values at the time of the RI/FS.

5.3.2 Remedial Action Objectives at AOC 43J

The RAOs at AOC 43J are to:

- Protect potential commercial/industrial receptors located on the Devens property from

exposure to groundwater having chemicals in excess of the following RGs; arsenic (50 μg/L), iron (9,100 μg/L), manganese (291 μg/L), benzene (5 μg/L), ethylbenzene (700 μg/L), toluene (1,000 μg/L), and carbon tetrachloride (5 μg/L).

- Protect potential commercial/industrial receptors located off the Devens property from exposure to groundwater having chemical in excess of the above RGs.

The RGs for benzene, carbon tetrachloride, ethylbenzene, toluene, and arsenic are the MCLs and MMCLs in effect at the time. Current values are used for evaluation of clean-up levels. The RGs for iron and manganese are Devens background concentrations because background concentrations exceeded the risk-based concentrations derived from available RfD values.

5.3.3 Selected Remedy

The selected remedy at each site addresses long-term commercial/industrial exposure to contaminated groundwater, the principal known threat at both AOC 43G and 43J. Both of these sites are upgradient or within Zone IIIs that directly connect to Zone IIs of public water supplies. AOC 43J is situated within the Shebokin Supply Well Zone III. The selected remedial alternative for both AOC 43G and 43J relies on intrinsic remediation, groundwater and contaminant modeling, and groundwater LTM to evaluate the effectiveness of the alternative at controlling groundwater contamination and site risk. The remedy will mitigate existing groundwater contamination through natural attenuation and reduce the potential risk of future commercial/industrial exposure to contaminated groundwater. The major components of the selected remedy for both AOC 43G and 43J include:

1.) Intrinsic bioremediation;
2.) Intrinsic bioremediation assessment data collection and groundwater modeling;
3.) Installation of additional groundwater monitoring wells;
4.) Groundwater LTM;
5.) Annual data reports to USEPA and MassDEP; and
6.) Five-year reviews.

The ROD states that if the intrinsic bioremediation assessment results at AOC 43G and 43J indicate that: 1) the groundwater contaminant plume increases in size on Army property and/or, 2) the groundwater contaminant plume remains the same size, but cannot be remediated within 30 years, then a soil vapor extraction (SVE) system will be installed at the AOC 43G source area and an additional cleanup action (not defined in the ROD) will be implemented at AOC 43J. Furthermore, if at any time during this remedy there is an indication that contaminants are migrating off Army property at either AOC above drinking water standards (MCLs/MMCL or risk-based concentration [i.e., groundwater cleanup levels]) and/or if the Five-Year Review indicates that the intrinsic remediation alternative is not protective of human health, the Army will implement an additional cleanup action to protect human health and the environment as required under CERCLA.

Should the Army change the use of either AOC, additional assessment and/or possible remedial action may be needed. In addition, if the Army transfers either AOC by lease or

deed, an Environmental Baseline Survey (EBS) will be performed, and a determination will be made by the Army and USEPA whether the remedy remains protective of human health and the environment.

The general description of the selected remedy, which applies to both AOCs 43G and 43J, is presented below.

5.3.4 Remedy Components Specified by the ROD

The following text describes the remedial components as presented in the ROD for comparison with the activities completed at the site that are described in sub-section 5.3.5. The remedial action addresses long-term commercial/industrial exposure to contaminated groundwater, the principle known threat at both AOC 43G and 43J. The selected remedial alternative for both AOC 43G and 43J will mitigate existing groundwater contamination through natural attenuation and reduce the potential risks of future commercial/industrial exposure to contaminate groundwater. The major components of the selected remedy as identified in Section 5.3.3 are described below.

<u>Intrinsic Bioremediation</u>
As present in the ROD Section 10.B.1, intrinsic bioremediation was listed as the principal component in the selected remedy to meet the cleanup criteria specified in the ROD (Component No. 1). Based upon organic and inorganic speciation in the aquifer, it appears the biological degradation of the petroleum hydrocarbons is naturally occurring at both AOCs. Alternatives 2A (AOC 43G) and 2 (AOC 43J) allow the natural biological degradation (intrinsic remediation) of the COCs to continue at the site without interruption. To assess the effectiveness of biological degradation at the site, groundwater monitoring would be performed on a scheduled basis. FS solute transport calculations, based upon degradation rates from literature, indicated that contaminants would not migrate off Army property.

<u>Intrinsic Bioremediation Assessment (IRA) Data Collection and Groundwater Modeling</u>
As presented in the ROD Section 10.B.1, prior to installation of additional groundwater monitoring wells and refinement of a LTMP, additional data collection and modeling would be required. A work plan would be prepared detailing the proposed activities of the IRA and would be submitted to the USEPA and MassDEP for review prior to implementation. The additional data collection would consist of supplemental soil sampling and free product assessment in bedrock below the former gasoline USTs (at AOCs 43G), and installation of additional bedrock groundwater monitoring wells (at AOC 43J). Additional rounds of groundwater sampling and analysis to refine estimates of intrinsic remediation effectiveness in protecting downgradient receptors would be performed at both AOCs. Data would include groundwater elevation, intrinsic remediation indicators, and COC concentrations. Groundwater elevation data would supplement the existing Devens water level data base for both sites and would be used to refine groundwater flow direction. Intrinsic remediation indicator data (i.e., electron acceptor concentrations, nutrient concentrations, and ORP) would be used to evaluate the natural attenuation process. COC concentration data would assist directly in estimating site-specific degradation rates and the effectiveness of intrinsic remediation in achieving groundwater cleanup levels. Criteria for contaminant evaluations

would use risk-based concentrations, MCL and/or MMCLs.

Data collected from the IRA groundwater sampling would be incorporated into fate and transport modeling. This modeling would assess the degradation and migration of the organic COCs and refine current estimates of intrinsic remediation effectiveness. Initial intrinsic remediation modeling would be performed as part of the alternative LTM. The existing and the new groundwater information would be examined to determine the best location for additional groundwater monitoring wells and to finalize site-specific indicator data as required for the LTM program. As additional monitoring data are collected during LTM (see Long-Term Groundwater Monitoring in this subsection), the fate and transport modeling would be updated to allow the most accurate depiction of current and future groundwater conditions. The fate and transport model used for monitoring intrinsic remediation (such as Bioplume II or III) would be selected based upon the type of groundwater monitoring information gathered and market availability. Details of the model would be proposed as part of the IRA work plan.

Installing Additional Groundwater Monitoring Wells

As presented in the ROD Section 10.B.1, additional groundwater monitoring wells would be required to improve data collection coverage in the overburden and bedrock within and downgradient of the AOCs. The ultimate number and location of additional wells for monitoring intrinsic remediation at the site would depend upon the fate and transport modeling results. These wells would be used to monitor contaminant plume location and concentration on Army property in the overburden and bedrock and to collect intrinsic biodegradation indicators. Final monitoring well locations and details would be submitted for regulatory review and concurrence.

Long-Term Groundwater Monitoring

Groundwater LTM was proposed to enable assessment of the intrinsic remediation progress and permit detection of any potential migration of contaminants that exceed groundwater cleanup levels beyond Army property. Dependent upon the results of the fate and transport modeling, groundwater monitoring would be performed on an annual basis until three consecutive sampling rounds indicate that cleanup objectives have been met. The last two years of monitoring (confirmation) would be for only the COCs.

Annual Data Reports

Annual reports would be submitted to USEPA and MassDEP and would include a description of site activities, a summary of the long term groundwater monitoring program results, and any modeling updates. The final detailed LTMP shall include a performance standard that would determine the effectiveness of the remedial action. The final detailed LTMP would be developed in conjunction with regulatory agency review and comment.

Five-Year Reviews

Under CERCLA, any remedial action that results in contaminants remaining on site in excess of levels that allow for unrestricted reuse must be reviewed at least every five years. During the Five-Year Reviews, an assessment is made of whether the implemented remedy continues

to be protective of human health and the environment or whether the implementation of additional remedial action is appropriate.

The Five-Year Review will evaluate the alternative's effectiveness at reducing potential human-health risk from exposure to groundwater on site and downgradient considering current and potential future receptors. This evaluation will be based on how successful the alternative is at attaining groundwater cleanup levels at the LTM wells.

If the data generated from the modeling or the long-term groundwater monitoring efforts indicate that groundwater cleanup cannot be met within 30 years, a more aggressive remedial action will take place to enhance the intrinsic remediation alternative.

5.3.5 Remedy Implementation

Remedial Component 2 (IRA and groundwater modeling) and Component 3 (installation of additional groundwater monitoring wells) were completed by SWETS and HLA between 1998 and 1999. The results of the IRA and associated field efforts are detailed in a Final IRA Report for each site (SWETS, 1999a, 1999b).

The IRA performed at both sites demonstrated that intrinsic remediation was working and the Army did not need to conduct additional cleanup actions. The model predicted that COCs would be less than the groundwater cleanup levels within 30 years and COCs would not migrate off the Army property. Uncertainties identified for the model included the degradation rates of the heavier hydrocarbon fractions and the timeframe for the evolution of redox conditions (and consequently, inorganic concentrations). The predictions presented in the IRA have subsequently been evaluated using trend analyses taken from LTM data collected since the IRA was performed and additional model evaluations were performed during the 2008 LTMP revision. The 1999 IRA methodology and results are presented below.

5.3.5.1 IRA Lines of Evidence

The IRA considered the following lines of evidence:

- Statistically significant historical trends in contaminant concentrations to show that a reduction in the total mass of concentrations was occurring at the site;
- Chemical analytical data in mass balance concentrations to show that electron acceptor concentrations in groundwater (oxygen, nitrate, sulfate, or iron) were sufficient to facilitate degradation of dissolved contaminants; and
- A solute fate and transport model to predict future migration of contaminants and estimate concentrations at potential receptor locations.

5.3.5.2 IRA Field Activities

AOC 43G

Field work commenced in March 1997, and entailed soil sampling and assessment of free product on the groundwater below the former USTs that were removed in 1990. Field

activities included advancement of three soil borings and sampling of soil and sampling for groundwater from one groundwater monitoring well.

Sampling results from the March 1997 field work identified several contaminants exceeding MCP Method S-3/GW-1 standards. However, statistical and modeling assessments performed as part of the intrinsic remediation assessment suggested that source groundwater contamination had been substantially reduced by UST and soil removal in this area.

Eight rounds of groundwater sampling were conducted quarterly during 1997 and 1998 for the months of March, June, September, and December. Results of the eight rounds of groundwater sampling indicated a decrease in BTEX concentrations over time since the early SI/RI rounds.

AOC 43J

Field work commenced in March 1997, and entailed installation of one bedrock monitoring well at the source area and two bedrock monitoring wells at downgradient locations. The objective was to measure the hydraulic gradient between the overburden and bedrock aquifer to determine whether a vertical gradient exists. Additionally, the data would provide information on whether VOCs and chlorinated solvents were present in bedrock groundwater at these three locations. Results of the vertical gradient monitoring suggested that seasonal downward/upward gradients may occur.

Eight rounds of groundwater sampling were conducted quarterly during 1997 and 1998 for the months of March, June, September, and December. Results of the eight rounds of groundwater sampling indicated a decrease in BTEX concentrations over time since the early SI/RI rounds.

5.3.5.3 Statistical Analysis

The Mann-Kendall test for trends was used as the first line of evidence to assess, at 95% confidence level, whether contaminant concentrations at AOC 43G and AOC 43J have been decreasing throughout the Groundwater Sampling Program. Data used in the statistical analyses were collected from eight quarterly IRA groundwater sampling rounds (March 1997 through December 1998) and from up to four rounds of historical data (SSI/RI September 1993, January 1994, December 1994, and March 1995 rounds).

Input parameters, variables, and the statistical approach considered during the Mann-Kendall test are included in the Final IRA Report (SWETS, 1999a, 1999b).

AOC 43G

The statistical results for BTEX showed that all but four well/parameter pairs evaluated (or 28 of 32 combinations) exhibited a statistically significant downward trend at the 95% confidence level. The four well/parameter pairs that did not meet this confidence level exhibited a decreasing trend in concentration, but at the 80 to 90% confidence level. Only two of these four pairs had MCL exceedances in 1997 through 1998 (AAFES-6/benzene and XGM-97-12X/benzene). Using the most conservative data set, the regression models predicted that

benzene concentrations in all selected wells would be at or below the MCL by October 2011, which followed the signing of the ROD by only 15 years. This duration was within the 30-year remedial duration (year 2026) specified by the ROD. It was noted that uncertainties involved in predicting the course of contaminant reduction existed and the estimates were dependent upon the assumption that concentrations would continue to decline at rates consistent with the historical data. As a result, LTM was proposed to evaluate the predicted decline in contaminant concentrations.

Statistical trends within VPH data were not as evident as with the BTEX data. Groundwater from three of the eight wells exhibited a statistically significant downward trend at the 95% confidence level for only one of the three VPH carbon chain groups. However, VPH performance standards were being met at the time of the analysis. The Army would develop risk-based VPH values if MCP Method 1 GW-1 concentrations for VPH were exceeded at the boundary or other compliance point. Long-term groundwater for VPH was recommended to continue assessment of VPH trends. These trends were not used to assess progress towards meeting on-site remediation goals. Rather, the data were used in assessing the potential for off-site migration of VPH concentrations that exceeded boundary performance standards.

AOC 43J

The Mann-Kendall test results for BTEX trends revealed that the source area overburden groundwater from monitoring wells at AOC 43J exhibited a statistically downward trend at the 95% confidence level for almost all the well/contaminant pairs that historically had exceeded MCLs. The only exception in the source area occurred in XJM-97-05X for ethylbenzene and toluene. A downward trend was distinguishable at a slightly lower (92 to 94%) confidence level for ethylbenzene and toluene. However, consideration of seasonal effects (i.e., changes in groundwater elevation) resulted in the finding that the ethylbenzene concentrations in XJM-94-05X had significantly decreased since 1994, a result not identified in the less powerful, non-parametric Mann-Kendall trend analysis.

With the exception of monitoring well 2446-02, the regression model predicted that compliance with the MCLs would be achieved by the end of 2004. This was only 8 years following signature of the ROD and within the 30-year monitoring period defined by the ROD. The regression analysis for well 2446-02 predicted that all MCLs would be achieved by the year 2001. However, because of the relatively weak correlation coefficients for the three regression models for well 2446-02, no meaningful conservative upper bound estimate of cleanup duration for well 2446-02 could be derived at the time of the IRA. The COC concentrations detected in well 2446-02 during the December 1998 sampling event deviated greatly from the generally decreasing trend observed during the previous six years, contributing to the weak correlation in the regression analysis. It was premature to calculate that downward trends at this well would continue. Additional sampling of this well was required as part of the LTM program to refine estimates of cleanup duration and to enable continued assessment and reporting of the remedial process.

Groundwater from the bedrock well XJM-97-12X, within the source area, did not show a decreasing statistical trend for benzene and ethylbenzene using the Mann-Kendall test,

primarily because of elevated concentrations detected in the previous three groundwater sampling rounds (performed in 1998). These concentrations were expected to decrease with degradation of the overburden contamination. Further sampling was expected to improve statistical analysis of variability in vertical gradients and flow direction. Consideration of seasonal effects resulted in the finding that ethylbenzene concentrations in XJM-97-12X had decreased significantly since 1997, a result not identified in the less powerful non-parametric Mann-Kendall trend analysis.

Statistical trends of the VPH data were not as evident as the BTEX data, but VPH performance standards were being met at the time of the IRA. As detailed in the IRA Work Plan (SWETS, 1997a), the Army would develop risk-based VPH values if MCP Method 1 GW-1 concentrations are exceeded at the boundary or other compliance point. Long-term groundwater monitoring for VPH were recommended to continue assessment of VPH trends.

Overall, the trend and regression analysis for BTEX in groundwater from the source area wells strongly supported the finding that degradation was occurring, and that the concentrations above groundwater cleanup levels, MCLs, or MMCLs were not likely to expand or migrate to established compliance points. Furthermore, subject to refinement of the cleanup period for well 2446-02, MCLs were believed to be achievable with the 30-year period specified by the ROD. It should be noted, however, that these predictions were dependent upon the assumption that concentrations would continue to decline at historical rates. Long-term groundwater monitoring would be performed to verify these statistical predictions.

5.3.5.4 Assimilative Capacity Calculations

Analytical field data were evaluated to assess whether sufficient electron acceptors were present to support degradation of the contaminants. The calculations verified that electron acceptor concentrations in groundwater (i.e., primarily sulfate, manganese, iron and oxygen at AOC 43G and sulfate and oxygen at AOC 43J) were sufficient to facilitate degradation of dissolved contaminants.

5.3.5.5 Fate and Transport Modeling

Solute fate and transport modeling was used in conjunction with assimilative capacity calculations, to support the viability of intrinsic remediation as an acceptable remedial alternative. BIOSCREEN modeling suggested that even with continuing residual sources (both sites have undergone substantial removal actions) the extent of the contamination as defined by the remedial goals would be limited to about 25 ft from one of the source area wells at AOC 43G and to about 90 ft from the assumed center of the source area at AOC 43J. These distances put the furthest predicted extent of the groundwater contamination (above RGs) within the existing Devens site boundary.

Results from the BIOPLUME II modeling were used to estimate remedial duration and contamination migration potential. Modeling demonstrated an unlikely potential for benzene contamination migration off Army property and general agreement with regression analysis

results. The modeling also considered added demands from other competitors (non-BTEX petroleum hydrocarbons). It revealed that this additional demand added only about 2 years to the time to reach remedial goals at each site. The benzene criterion at AOC 43G was estimated to be achieved approximately in the years 2007 to 2009, or between 11 to 13 years total following signing of the ROD, which is compliant with the 30-year criterions in the ROD. Benzene criterion at AOC 43J is predicted to be achieved between 7 to 9 years total (from the baseline event in 1997), or about in the years 2004 to 2006, which is compliant with the 30-year criterion in the ROD. The BIOPLUME II modeling determined that aerobic degradation was the overriding process at these sites.

Long-Term Monitoring. Remedial action implementation at both AOCs consisted of continued LTM and data reporting. The first long-term groundwater monitoring round was performed in December 1999. LTM has been performed annually since 1999. The resulting LTM data was evaluated against the groundwater performance and VPH boundary standards as detailed below.

Groundwater Performance Standards. Groundwater performance standards are used to ensure that the effectiveness criteria set forth in the ROD and presented in the LTMP continue to be met and remedial objectives are ultimately achieved. Two sets of performance standards were developed, one to address contaminant migration and the other to address remedial duration. These standards are described below.

Contaminant Migration Assessment. Intrinsic remediation at AOCs 43G and 43J would continue to be considered effective if the extent of groundwater contamination with concentrations exceeding the clean-up goals does not increase in size and migrate off Army property. Recommendations for additional field actions would be made with revisions to the LTMP if monitoring data indicate the potential for off-site migration of site COCs.

Remedial Duration Assessment. Intrinsic remediation at AOCs 43G and 43J would continue to be considered effective if COC concentrations will be reduced to cleanup levels within the expected duration criteria specified in the ROD. The need for additional assessment/remedial action would be evaluated if source area well data indicate that COC concentrations will not achieve remedial goals within 30 years of ROD signature.

Data evaluation would be performed on a continual basis after receipt of annual LTM data and the data evaluation would be presented in the annual LTM report

5.3.5.6 VPH Boundary Standard

The Army uses the MCP Method 1 GW-1 concentrations for VPH boundary performance standards. RGs within the plume are not established for VPH. However, if Method 1 GW-1 concentrations are exceeded at the boundary or compliance point, the Army will develop risk-based VPH concentrations.

5.3.5.7 Additional AOC 43J Investigations Post-2005 Five-Year Review

Test Pit Investigation

A test pit investigation was conducted by MassDevelopment in July 2006. Approximately twenty-sixty locations were evaluated and are depicted on Figure 5.3. Some of the test pit locations corresponded to potential source areas identified by MassDEP for investigation. MassDEP identified potential source areas included two former dry wells, potential cesspool location, former cesspool, and potential 5,000 gallon diesel UST location. Additional specific locations investigated included former gasoline UST and former waste oil UST locations. Results of the investigation are detailed in the "Draft Monitored Natural Attenuation Assessment (MNAA) Report AOC 43J Long-Term Groundwater Monitoring" submitted in July 2008 (H&A, 2008).

Additional Monitoring Well Installations/Quarterly Monitoring

Four new well couplets (bedrock-overburden) pairs were installed between December 2006 and January 2007. The new wells, along with existing wells, were sampled quarterly in 2007. In 2008, the new wells were incorporated into the annual LTM event. The new wells helped to provide groundwater plume delineation.

Sulfate Injection Pilot Study

A sulfate injection pilot study was conducted in December 2009 to address the concerns of the intrinsic remediation remedy likely not meeting the remedial duration timeline in the ROD. The target area for the pilot study was determined based on monitoring data from quarterly sampling in 2007 and one sample event in 2008. Two injection wells and two additional monitoring wells were installed at the locations detailed on Figure 5.2. Following the injection event performance groundwater monitoring was initiated. Prior to the pilot study injection event, a baseline groundwater sampling event was conducted in November 2009. MassDevelopment will proceed with full scale sulfate injections if results of the pilot study are promising. MassDevelopment plans on issuing a comprehensive report in 2011 detailing the sulfate injection pilot study. An ESD will be prepared should the implementation of the full scale injections be approved.

5.3.6 System Operation/Operations and Maintenance

Groundwater monitoring is performed in accordance with the LTMP (HGL, 2008b) for AOC 43G. AOC 43J is currently being monitored by MassDevelopment. Yearly O&M costs for implementation for AOC 43G is approximately $30,000. O&M costs for 43J are estimated to be similar to AOC 43G.

5.4 PROGRESS SINCE LAST FIVE-YEAR REVIEW

This is the third five-year review conducted for AOCs 43G and 43J. Progress since the 2005 five-year review is detailed below for both AOCs and includes the 2005 five-year protectiveness statement.

The following is the Protectiveness Statement from 2005 Five-Year Review Report:

"The remedies at AOCs 43G and 43J are protective of human health and the environment, and exposure pathways that could result in unacceptable risks are being controlled. Human health is not currently at risk at AOCs 43G and 43J because groundwater is not used as a drinking water source.

A HASP and IDW handling procedures are in place and are sufficient to control risk to on-site workers and the public, and are being properly implemented during groundwater sampling. Human health is currently not at risk at AOCs 43G and 43J because groundwater at the AOCs is not being used for potable use, and organic COCs exceeding drinking water standards are not migrating off RFTA property.

Review of the groundwater sampling data from 1999 through October 2004 indicate that groundwater concentrations of organic COCs are decreasing at source locations at AOCs 43G and 43J and that the plumes are not expanding or migrating off RFTA property. Groundwater sampling results from sentry well locations are below cleanup goals/VPH boundary standards for organic COCs and most metals, with the exception of manganese at AOC 43G and arsenic, manganese, and iron at AOC 43J. Concentrations of VPH aromatics C9-C10 have exceeded VPH boundary standards in one sentry well during the October 2004 sampling round. No further field action is warranted at either site before the next scheduled sampling round in November or December 2005.

Analytical results are supportive of the intrinsic remediation conclusion that migration of VPH concentrations in exceedances of GW-1 standards off RFTA property is not probable. Installation of groundwater monitoring wells and groundwater modeling has been completed, as stipulated in the ROD, and groundwater monitoring is ongoing."

The following recommendations were made:

- Update LTMP;
- Replace damaged well, AAFES-6 at 43G; and
- Incorporate ICs in the IMP.

In the last five years, these recommendations were addressed as follows:

AOC43G

"Update Long-Term Monitoring Plan"
The Army issued an updated LTMP in October 2008. Below are some key components of the update.

- The cleanup level for manganese was revised from 291 μg/L to 375μg/L. The new value is a risk-based cleanup goal that is protective of a residential child drinking water scenario. The Army will revisit the manganese cleanup goal after the Groundwater Use and Value Determination has been revisited.
- Nickel has been removed from the AOC 43G cleanup list metals target analyte list (TAL).

- The BIOSCREEN modeling assumptions and predictions were evaluated. The modeling assumptions were determined to be valid based upon current conditions. The model predictions were matching up with current site data but the benzene degradation rates onsite exceeded the model prediction. This indicated that degradation rates onsite were faster for benzene than predicted over the past 7 years. The duration predicted by the 1999 model was determined to be valid.
- Trend analysis indicated that manganese levels were in exceedance of cleanup goals but were showing a downward trend. The downward trend was likely due to the decreasing hydrocarbon concentrations on site.
- Additional monitoring wells were to be sampled downgradient of sentry wells which had exceedances of manganese. Two wells were initially to be sampled then an evaluation was to be made concerning future sampling.
- MassDEP had agreed to reevaluate their Groundwater Use and Value Determination to assess whether GW-3 standards are applicable to AOC 43G. If GW-3 standards were applicable the Army would seek to revise the ROD to adopt GW-3 standards as the cleanup goals standards via issuance of an ESD. Upon approval of the ESD, the Army would petition for site closure of AOC 43G based on all groundwater data being below their associated GW-3 standards.

"Replace damaged well AAFES-6 at AOC43G"
The damaged well AAFES-6 was abandoned and replaced with a new monitoring well identified as AAFES-6R in June 2006.

"Incorporate ICs in revised IMP"
AOC 43G was included in the "Real Property Master Plan Long Range Component for Devens Reserve Forces Training Area Addendum – September 2007" (Appendix K). This document provided supplemental information on LUCs established under BRAC and CERCLA programs. The document indicated that the Army would have to assure the property is not used for residential purposes and prohibit the use of groundwater beneath the site. The document detailed procedures to take if the Army changes the land-use, procedures to take if the property is transferred by lease or deed and construction work considerations. IC inspections are conducted annually as detailed in the 2008 LTMP.

Additional progress since last review:

The annual LTM monitoring program was conducted in the fall during the five-year review period in accordance with the approved LTMP. Downgradient monitoring well AAFES-7 has been sampled for manganese and has remained below the 375 μg/L action level, indicating that the extent of the elevated manganese concentrations observed at the source and sentry wells has been defined. Geochemical parameters collected from LTM wells indicate metal exceedances are found within wells with low ORP and low dissolved oxygen. The perimeter wells, such as AAFES 7 have aerobic conditions (high ORP and high dissolved oxygen). The reduction in organic contaminants at the source area is unlikely to provide substantial anthropogenic carbon that would allow the reducing conditions to reach the AOC 43G

perimeter and present a potential for offsite metals migration. The sentry wells with manganese exceedances have indicated all other COCs were below cleanup levels detailed in the LTMP and did not require analysis at the wells located further downgradient.

The Army is currently preparing the Groundwater Use and Value Determination for AOC 43G which would affect the remedial duration at AOC 43G. If the Groundwater Use and Value Determination is deemed applicable by MassDEP an ESD will be submitted to revise the ROD groundwater cleanup goals from MCLs to GW-3 standards. The MCLs were consistent with Federal MCLs and State of Massachusetts GW-1 standards that are included in the MCP. Upon approval of the ESD the Army would petition for site closure of AOC 43G based on meeting GW-3 standards and the ROD duration remedy component would be addressed successfully.

AOC 43J

"Update Long-Term Monitoring Plan"
A groundwater monitoring plan was prepared by MassDevelopment after the property was transferred from Army ownership in June 2006.

"Incorporate ICs in revised IMP"
The property was transferred from the Army to MassDevelopment in June 2006. The ICs were detailed in a June 2006 GERE issued by MassDEP. MassDevelopment was directed by MassDEP to record the GERE with the appropriate Registry of Deeds.

Details on the Transfer and Management of AOC 43J
Parcel C, which includes AOC 43J, was transferred from the Army to MassDevelopment in June 2006. A Covenant Deferral Request (CDR) per CERCLA Section 120(h)(3) was issued to and approved by the USEPA in June 2006. The intent of the CDR is to facilitate efforts to stimulate the economy through productive reuse of the property while final remediation work is being conducted. MassDEP approved the "Nomination of AOC 43J, AREE 61AF, AREE 61J and AREE 63BB for Addition to Schedule I" (Parcel C) through an "Administrative Consent Order (ACO) and Covenant Not to Sue" and issued a GERE in June 2006. A FOSET was prepared and included in the CDR package for concurrence from the Governor of Massachusetts and approval by the Regional Administrator, USEPA Region 1.

The FOSET was issued to document the environmental suitability of Parcel C at Devens for early transfer to MassDevelopment prior to the completion of all remedial action associated with the former Fort Devens CERCLA site known as AOC 43J and consistent with CERCLA section 120(h)(3) and DoD policy. In addition, the FOSET identified use restrictions, as specified in the EPPs, necessary to protect human health and the environment after the early transfer, prevent unauthorized access to the environmental sites, and to prevent interference with any existing or planned restoration activities. The EPPs were prepared based upon a "Technical Update to the 1996 Risk Characterization Parcel C" (H&A, 2006).

Based on the FOSET and EBS, an ESD was prepared which was then approved by the USEPA. The ESD incorporates ICs into the AOC 43J ROD that provide for a residential and

groundwater use restriction, a building project notification, and a condition that a proposed building construction project may require a subsurface vapor intrusion evaluation as part of the building design process. In addition, the deed for the property between the Army and MassDevelopment and the GERE between MassDevelopment and MassDEP includes these restrictions.

As part of the transfer of property between the Army and MassDevelopment, MassDevelopment made an agreement to assume the responsibilities for all remaining cleanup actions for AOC 43J. MassDevelopment would conduct the remaining response actions to comply with the terms of the ROD, ESD, five-year review and the ACO. MassDEP had assumed over-site responsibilities for the remedial actions conducted by MassDevelopment. The USEPA had agreed to suspend the Army's remedial schedule under the ROD and 2005 Five-Year Review for AOC 43J in deference to the completion of any remedial activities under M.G.L.c.21E. The USEPA indicated that if the work conducted by MassDevelopment under the ACO was insufficient or deficient, USEPA retains the authority to require the Army to resume the work under the applicable cleanup schedules in the ROD, ESD and Five-Year Review. The USEPA agreed to continue to coordinate with the Army and work to document milestones, including an operating properly and successfully designation and the completion of remedial action at AOC 43J.

Bristol Myers-Squibb has developed the property to the north of Parcel C. The portion of Parcel C corresponding to AOC 43G is currently unoccupied and has remained unchanged since the last five-year review. The portion of Parcel C to the northeast of AOC 43G contains temporary office trailers positioned over a blacktop parking lot based on aerial imagery.

5.5 FIVE-YEAR REVIEW PROCESS

5.5.1 Administrative Components of the Five-Year Review Process

Development of the third Five-Year Review process included the following components that are described in this section:

- Document Review;
- Data Review;
- Site Inspection;
- Interviews; and
- Community Participation.

5.5.2 Document Review

The following documents were evaluated for this five-year review:

- AOC 43G and 43J ROD prepared by the USAEC, October 1996.
- Second Five-Year Review Report prepared by Nobis, September 2005.

- Technical Update to the 1996 Risk Characterization Parcel C – AOC 43J prepared by Haley & Aldrich (H&A), June 2006.
- Environmental Assessment for the Commercial Redevelopment of Parcel C prepared by EA Engineering, Science, and Technology, June 2006.
- Finding of Suitability for Early Transfer (FOSET) prepared by USACE, June 2006.
- AOC 43J Explanation of Significant Differences (ESD) prepared by USACE, June 2006.
- Grant of Environmental Restriction and Easement (GERE) for Parcel C prepared by MassDEP, June 2006.
- Approval of Nomination of AOC 43J, AREE 61AF, AREE 61J and AREE 63BB for Addition to Schedule I prepared by MassDEP, June 2006.
- Approval of Covenant Deferral Request (CDR) prepared by USEPA, June 2006
- Final 2005 Annual Report prepared by HGL, March 2007.
- Final 2006 Annual Report prepared by HGL, August 2007.
- Draft Monitored Natural Attenuation Assessment Report AOC 43J Long-Term Groundwater Monitoring by Haley & Aldrich, July 2008
- Final 2007 Annual Report prepared by HGL, July 2008.
- Final Long-Term Monitoring Plan prepared by HGL, October 2008.
- Draft Report on Annual Groundwater Monitoring at AOC 43J prepared by Haley & Aldrich, Inc., March 2009.
- Final 2008 Annual Report prepared by HGL, September 2009.
- AOC 43J Sulfate Injection Pilot Test Work Plan prepared by Haley & Aldrich, Inc., December 2009.
- Draft-Final 2009 Annual Report prepared by HGL, April 2010.

5.5.3 Data Review

5.5.3.1 AOC 43G Data Review

Table 5.3 (at the end of this subsection) summarizes the AOC 43G COCs that have exceeded the site cleanup goal/VPH boundary standards from 1999 through fall 2009. A complete list of all validated COC results for AOC 43G from 2005 through 2009 are presented in Appendix D.

The benzene concentrations for wells AAFES-2, XGM-93-02X, and XGM-97-12X in Figure 5.4 indicate a downward trend, most notably since the November 2002 sampling event, and wells AAFES-2 and XGM-93-02X have maintained benzene detections below the 5 μg/L cleanup objective since October 2007 with the exception of well XGM-97-12X. Benzene

detections in this well remain above the remedial goal. All other AOC 43G wells have maintained benzene concentrations below the GW-1 standard.

Toluene was detected above the 1,000 μg/L cleanup goal in groundwater at source well XGM-97-12X during the November 2000 and 2002 sampling events. A distinct concentration decline is noted for this well since the spike in 2002, and toluene has remained below the cleanup goal at well XGM-97-12X since 2003. All other AOC 43G wells have maintained toluene concentrations below the cleanup standard since monitoring began.

The VPH C_9-C_{10} aromatic carbon fraction results indicate a variable trend since the November 2002 sampling event (Figure 5.5), with an apparent plateau after the October 2005 event. The C_9-C_{10} aromatic concentration in well XGM-93-02X has remained close to or below the boundary standard since the October 2007 sampling event, whereas wells AAFES-2 and XGM-97-12X are consistently and considerably above the standard. All other AOC 43G wells have maintained C_9-C_{10} aromatic fraction concentrations below the boundary standard since 2001.

The VPH C_5-C_8 aliphatic fraction trends were also variable (Figure 5.6); however, according to the historical data, significant troughs, such as that shown in 2008, occur regularly every two to four years during the fall months. This cyclic pattern may result from changes in precipitation. Groundwater from wells AAFES-5, XGM-94-04X, XGM-94-07X, and XGM-94-08X consistently yielded C_5-C_8 aliphatic concentrations below the 300 μg/L boundary standard since the November 2000 event. All other wells exude the cyclic pattern of C_5-C_8aliphatics above the goal. For the November 2009 event, the AOC 43G rinsate blank exhibited a VPH C_5-C_8aliphaticscontamination that qualified as questionable all detections in the wells depicted in Figure 5.5. If the C_5-C_8aliphatics detections were taken into account on Figure 5.5, the concentrations for wells AFFES-2, AAFES-6/6R, XGM-93-02X, and XGM-97-12X would continue the downward trend established since the November 2005 sampling event.

From monitoring inception in December 1999 through the October 2004 event, the VPH C_9-C_{12}aliphatic carbon fraction in groundwater consistently remained well below the 700 μg/L boundary standard (Figure 5.7). However, during the November 2005 event, a spike in concentration occurred. Between 2005 and 2006, concentrations decreased substantially. Since 2006, the concentration at each well has fluctuated. Concentrations at XGM-93-02X are less than the boundary standard, while concentrations at AAFES-2 and XGM-97-12X exceed the boundary standard. All other AOC 43G wells have maintained C_9-C_{12} aliphatic fraction concentrations below the boundary standard since 2003.

The iron concentrations in groundwater at wells AAFES-2, XGM-93-02X, and XGM-97-12X have consistently remained above the 9,100 μg/L cleanup goal since 1999. Abandoned well AAFES-6 and replacement well AAFES-6R also retained high iron concentrations until the 2008 sampling event. All other AOC 43G wells have maintained iron concentrations below the cleanup standard since 2003.

The manganese concentration at wells XGM-97-12X, XGM-94-10X, and XGM-94-08X (Figures 5.8 and 5.9) indicate a general downward trend since sampling began in fall 1993. By comparison, manganese detections in wells XGM-94-07X and XGM-97-08X (Figure 5.9) remains variable. With the exception of well AAFES-5, all other wells at AOC 43G exhibit manganese concentrations above the 375 μg/L cleanup goal, which was increased from the ROD established goal of 291 μg/L in 2008. The increase in metals at AOC 43G is likely due to a reducing groundwater environment induced through biodegradation of the site's organic contaminants. Well AAFES-7, sampled for metals beginning in 2008 is below the clean up goal for iron and manganese. AAFES-7 is located on the downgradient perimeter of the Army property indicating that the metals remain confined to Army property.

Table 5.3
Summary of Exceedances for AOC 43G

Well Number	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Benzene- 5 µg/L Cleanup Goal											
Source Wells											
AAFES-2	62	36	43	26	9	6.6	6.1	(1.3)	ND[2]	ND[2]	(3.93J)
XGM-93-02X	81	32	12	140	24	39	29	18.5	8.8	(2.6)	(0.997 J)
XGM-97-12X	270	550	700	780	290	260	35.6	129	22.8	13.7 J	27.9J
Toluene- 1,000 µg/L Cleanup Goal											
Source Wells											
XGM-97-12X	(390)	1,100	(870)	1,000	(610)	(460)	(53.4)	(239)	(15.9)	(11.4 J)	(5.3J)
C9-C10 Aromatics - 200 µg/L Boundary Standard											
Source Wells											
AAFES-2	9,400	7,200	5,300	13,000	6,600	6,700	3,130	3,710	2,420	2,120	2660
XGM-93-02X	510	2,300	1,100	3,600	1,600	3,700	918	766	228	325	(110.0)
XGM-97-12X	4,500	5,500	5,400	7,500	8,700	7,400	3,810	4,010	4,220	5,260	4110
Sentry Wells											
XGM-94-04X	200	570	(170)	(28)	ND	ND	ND	ND	ND	ND	ND
C5-C8 Aliphatics[1] - 300 µg/L Boundary Standard											
Source Wells											
AAFES-2	ND	1,400*	ND	1,200	1,200	ND	2,070	1,430	1,400	ND[2]	ND
AAFES-6	(370)	420*	(290)	ND	NC	NC	NC	NC	NC	NC	NC
AAFES-6R**	NC	NC	NC	NC	NC	NC	NC	(305)	ND[2]	ND	ND
XGM-93-02X	ND	570*	(270)	790	410	ND	788	519	ND	ND[2]	ND
XGM-97-12X	970	1,300	1,100	1,100	1,100	ND	2,370	1,740	1,230	ND[2]	4,050
Sentry Wells											
XGM-94-04X	ND	420*	(140)	ND	ND	ND	ND	ND	ND	ND	ND
C9-C12 Aliphatics[1] - 700 µg/L Boundary Standard											
Source Wells											
AAFES-2	ND	(81)	ND	(200)	ND	(57)	5,220	987	1,000	1,020	950
XGM-93-02X	ND	(39)	ND	(58)	(33)	(34)	1,570	268	(94)	(182)	(55.5)
XGM-97-12X	96	ND	ND	(130)	ND	(90)	7,310	1,340	1,080	2,210	1,450

Table 5.3 (continued)
Summary of Exceedances for AOC 43G

Well Number	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Iron, total - 9,100 µg/L Cleanup Goal											
Source Wells											
AAFES-2	24,000	20,000	27,000	26,000	14,000	20,000	21,900	12,000	20,000	18,000	16,000
AAFES-6	11,000	9,200	13,000	9,400	NC	NC	NC	NC	NC	NC	NC
AAFES-6R**	NC	NC	NC	NC	NC	NC	NC	11,000	11,000	(6,500)	4,300
XGM-93-02X	30,000	18,000	11,000	24,000	15,000	28,000	11,500	13,000	(5,800)	11,000	(8,500)
XGM-97-12X	32,000	26,000	33,000	46,000	33,000	32,000	20,100	18,000	22,000	25,000	25,000
Sentry Wells											
XGM-94-08X	(4,800)	13,000	(4,500)	(4,600)	(3,200)	(2,500)	(4,520)	(6,100)	(4,600)	(2,200)	1,300
Manganese, total[3] - 375 µg/L Cleanup Goal											
Source Wells											
AAFES-2	4,600	3,900	4,800	3,700	3,100	4,000	3,590	2,700	3,790	3,600	3,320
AAFES-6	2,900	9,200	3,400	3,000	NC	NC	NC	NC	NC	NC	NC
AAFES-6R**	NC	NC	NC	NC	NC	NC	NC	2,900	3,090	3,630	907
XGM-93-02X	3,900	2,500	1,900	2,500	1,900	2,600	1,450	2,000	1,800	1,420	1,630
XGM-97-12X	6,300	4,100	4,200	3,900	4,100	3,000	437	1,800	2,070	3,060	2,390
Sentry Wells											
AAFES-5	710	180*	(190)	(27)	(21)	(89)	(118)	(50)	(34)	ND	ND
XGM-94-04X	2,900	2,200	3,400	2,000	1,400	1,400	1,580	1,100	559	(68)	2,730
XGM-94-07X	5,700	3,700	6,100	4,500	3,600	1,000	6,120	5,100	4,120	5,100	4,990
XGM-94-08X	4,500	4,600	4,900	3,600	3,600	3,800	7,260	4,200	3,380	3,100	2,150
XGM-94-10X	830	2,000	2,600	(31)	(120)	960	960	330	NC	NC	NC

Notes:
Number in parentheses denotes that concentration is below cleanup goal /VPH boundary standard.
* = Analyte detected 5 times of the amount detected in the equipment blank sample.
**=AAFES 6R was installed in January 2006 to replace abandoned well AAFES-6.
[1] Adjusted result used beginning with the 2006 sample event.
[2] Detection limit was above the cleanup goal/VPH boundary standard.
[3] USEPA approved revised cleanup goal effective October 2008.
ND = The analyte was analyzed for, but not detected. The associated numerical value is the laboratory reporting limit.
NC = Not collected; a sample was not collected and analyzed for this particular analyte.
J = Estimated value detected below the laboratory reporting limit.

5.5.3.2 AOC 43J Data Review

Table 5.4 at the end of this subsection summarizes the AOC 43J COCs in groundwater that have exceeded the site cleanup goal/VPH boundary standards from 1999 through November 2009 (Baseline Pilot Study Sampling event). A sulfate injection pilot test was performed in December 2009 and pilot test monitoring was performed in February and March 2010. A complete list of all validated COC results for AOC 43J from 2005, 2007, 2008 and 2009 are presented in Appendix D. Pilot study analytical data from February 2010 is included in Table 5.4 and Appendix D but is not reviewed because additional data is still being acquired and is needed for an accurate review.

Source area wells 2446-02 and XJM-97-12X have exhibited a general decline in benzene concentrations since the 2001 sampling event, whereas benzene in well 2446-03 has remained below the 5 μg/L cleanup goal since 2002. Well XJM-94-05X has exhibited sporadic detections above the cleanup goal since 1999, the most recent of which was in December 2008 at a concentration of 12 μg/L. Benzene in sentry wells XJM-93-02X and XJM-97-11X has remained below the goal since 2000 and 2002, respectively. Benzene concentrations in the four well couplets, installed in 2006/2007 to delineate the plume, were mainly below the cleanup goal in 2007 and 2008. The exceptions were the HA-1S/1B couplet and HA-2B through 2008. The HA-1S/1B well couplet has maintained concentrations above the cleanup goal whereas HA-2B has shown a decreasing trend and is just above the action level. These well couplets are bounded by non-detections at surrounding wells. These trends indicate that the benzene contamination is largely removed and not a threat to off-site locations.

Toluene was detected above the 1,000 μg/L cleanup goal at source well 2446-02 during the 1999 through 2002 sampling events. A general concentration decline is noted for this well since the spike in 2000, and toluene has remained below the cleanup goal at well 2446-02 since 2003; however, the concentrations remain below the clean-up goal but have shown an increasing concentration trend since the 2007 LTM event. All other AOC 43J wells have maintained toluene concentrations below the cleanup standard since monitoring began.

In general, from 2000 through 2005, the ethylbenzene contamination at the source wells declined; however, after a low point during the January 2007 sampling event, the concentrations have steadily increased back to levels close to or above those reported in 2000-2001. Ethylbenzene in wells 2446-03 and XJM-94-05X has generally remained below the 700 μg/L cleanup goal, whereas wells 2446-02 and XJM-97-12X have shown an increasing concentration trend (Figure 5.10). HA-1B had similar trends to 2446-02 and XJM-97-12X but had a decrease in 2008. Ethylbenzene in sentry well 2446-04 has remained far below the goal or non-detect since 2001.

The C_5-C_8 aliphatic carbon contamination at source wells 2446-02, 2446-03 and XJM-97-12X show an increasing concentration trend. Wells XJM-94-05X (source area), HA-1S, and HA-1B revealed a variable concentration trend with a slight decrease in concentrations relative to 2007 results. Concentrations in sentry well 2446-04 were variable with no clear trend but the 2007 and 2008 results revealed concentrations above the 400 μg/L clean-up goal. Concentrations were in exceedance of the boundary standard at sentry well XJM-97-11X

during two of the quarterly sampling events in 2007 dropped below the cleanup level in 2008 (Figure 5.11).

From 2000 through 2005, the C_9-C_{10} aromatic carbon contamination at source wells 2446-02 and XJM-97-12X declined; however, after a low point between the 2005 to June 2007 sampling events, the concentrations have steadily increased back to levels close to or below those reported in 1999. By comparison, concentrations in source wells 2446-03 and XJM-94-05X have remained largely unchanged, yielding C_9-C_{10} aromatic carbon concentrations well above the 200μg/L boundary standard since 1999. With the exception of several spikes, C_9-C_{10} aromatic carbon at sentry wells 2446-04 and XJM-97-11X maintains concentrations near or below the boundary standard (Figure 5.12). Well couplet set HA-1S/HA-1B maintained concentrations above the boundary standard in 2007 and 2008, with a decrease into 2008.

Arsenic has been detected above the 10 μg/L remediation goal in source wells 2446-02, 2446-03, XJM-94-05X, and XJM-97-12X, and sentry well 2446-04 since 1999. The arsenic data for these sentry and source wells have varied from 1999 through 2008, with no discernable increasing or decreasing trends. By comparison, arsenic concentrations at sentry well XJM-93-02X have, with one exception in 2000, remained below the cleanup goal and then non-detect since 2002 (Figure 5.13 a and b). Well HA-1S had arsenic concentrations above the cleanup goal through 2007 and into 2008 with no discernable trend. Well HA-1B was initially in exceedance of the cleanup goal in 2007 but was below the cleanup goal in 2008.

Iron detected in source wells 2446-02, 2446-03, XJM-94-05X, and XJM-97-12X, and sentry well 2446-04 have generally yielded iron concentrations above the 9,100 μg/L background concentration since 1999. The concentrations have varied with no consistent trend. One exception is source well XJM-97-12X, where the iron concentration increased substantially between December 2007 and 2008 (Figure 5.14). HA-1B had iron concentrations above the background concentration throughout 2007 and into 2008, with a slight decrease into 2008. HA-1S had iron increase to above background in 2007 and maintained the concentration in 2008.

Sentry wells 2446-04, XJM-93-02X, XJM-94-08X, and XJM-97-11X, and all source wells have generally yielded manganese concentrations above the 291 μg/L cleanup goal since 1999 and have remained unchanged through 2008, with no discernable increasing or decreasing trends. One exception is source well XJM-97-12X, which indicates an increasing manganese trend since December 2007. Sentry well XJM-94-10X has largely maintained manganese concentrations close to or below the cleanup goal (Figure 5.15). Well couplet sets HA-1S/HA-1B and HA-2S/HA-2B and well HA-4S have generally yield manganese concentrations above the cleanup goal throughout 2007 and into 2008.

The November 2009, January 2010 and February 2010 data tables are included in the Five-Year Review Report but due to the on-going nature of the Pilot Study, the results are not complete and cannot be accurately evaluated. A pilot study evaluation report will be presented by MassDevelopment following completion of the plot study.

Table 5.4
Summary of Exceedances for AOC 43J

Well Number	1999	2000	2001	2002	2003	2004	2005	Jan 2007	June 2007	Oct 2007	Dec 2007	2008	2009	Feb 2010
	Benzene- 5 µg/L Cleanup Goal													
Source Wells														
2446-02	34	20	40	21	6.3	14	ND	ND	ND	10	11	ND	ND	ND
2446-03	ND	(1.2)	5.8	(0.8)	(1.0)	(2)	ND	ND	ND	ND	ND	ND	ND	NC
XJM-94-05X	16	ND	13	ND	ND	ND	ND	5.5	10	5.4	ND	12	ND	ND
XJM-97-12X	27	24	31	25	21	19	(3.9)	13	12	ND	ND	ND	ND	NC
Sentry Wells														
XJM-93-02X	22	(0.6)	ND	ND	(1.3)	(3.8)	ND	ND	ND	(1.6)	ND	ND	NC	NC
XJM-97-11X	ND	ND	13	(4)	ND	ND	(3.9)	ND	ND	ND	(3.6)	ND	NC	NC
Couplet Wells														
HA-1S	-	-	-	-	-	-	-	22	18	43	51	12	NC	NC
HA-1B	-	-	-	-	-	-	-	24	15	68	69	ND(25)	NC	NC
HA-2B	-	-	-	-	-	-	-	(3.1)	(1.2)	7.9	13	5.3	NC	NC
	Toluene- 1,000 µg/L Cleanup Goal													
Source Wells														
2446-02	2,400	2,600	1,900	1,200	(430)	(700)	ND	ND	(11)	(400)	(550)	(810)	(453)	(11.4)
	Ethylbenzene - 700 µg/L Cleanup Goal													
Source Wells														
2446-02	2,600	3,100	2,600	2,700	1,200	2,500	(54.2)	ND	(51)	1,600	2,500	5,300	1,480	(202)
2446-03	780	(0.5)	1,100	(160)	(210)	(410)	(190)	(290)	(390)	(690)	790	(690)	(440)	NC
XJM-94-05X	(110)	(150)	1,300	(7.3)	(58)	(620)	1,250	(180)	900	730	2,000	(500)	750	(475)
XJM-97-12X	(620)	720	1,800	840	1,000	1,500	1,090	760	1,100	1,400	2,000	3,100	2,210	749
Couplet Wells														
HA-1B	-	-	-	-	-	-	-	(410)	(390)	940	1100	(360)	NC	NC
Sentry Wells														
2446-04	(7.7)	720	(0.9)	ND	ND	ND	ND	(1.7)	(7.8)	ND	ND	(74)	(13.3)	NC
	C5-C8 Aliphatics - 400 µg/L Boundary Standard													
Source Wells														
2446-02	2,800	5,400	ND	2,100	2,700	4,600	1,040	ND	(216)	9,580	10,200	9,630	7,370	792

Table 5.4 (continued)
Summary of Exceedances for AOC 43J

Well Number	1999	2000	2001	2002	2003	2004	2005	Jan 2007	June 2007	Oct 2007	Dec 2007	2008	2009	Feb 2010
2446-03	ND	(360)	ND	1,200	950	1,900	2,780	2,320	2,230	5,490	5,610	3,550	3,030	NC
XJM-94-05X	(240)	ND	ND	ND	ND	480	NC	3,500	5,530	13,900	8,800	5,380	5,310	5,930
XJM-97-12X	2,100	5,100	6,700	5,700	6,900	8,500	13,700	7,220	4,080	4,700	8,440	7,640	12,200	8,100
Sentry Wells														
2446-04	ND	1900	ND	(240)	(110)	(320)	793	(114)	550	(117)	704	2,290	2,200	NC
XJM-97-11X	(110)	(290)	ND	1,100	ND	ND	3,570	ND	ND	1,440	1,060	(77.2)	NC	NC
Couplet Wells														
HA-1S	-	-	-	-	-	-	-	7520	3690	8210	6580	4360	NC	NC
HA-1B	-	-	-	-	-	-	-	8410	4060	11400	10500	4120	NC	NC
C9-C10 Aromatics - 200 µg/L Boundary Standard														
Source Wells														
2446-02	7,100	9,400	4,300	6,400	4,500	8,100	424	ND	(116)	2,930	3,850	3,920	3,580	812
2446-03	3,600	330	3,300	1,500	1,300	2,900	668	1,070	1,130	2,160	2,820	1,700	1,480	NC
XJM-94-05X	1,200	330	3,900	(38)	240	1,800	2,330	1,150	2,050	5,710	4,280	1,930	1,500	2,100
XJM-97-12X	4,400	6,300	4,000	4,700	5,000	6,500	2,550	3,130	2,430	1,310	4,780	3,710	4,920	2,630
Sentry Wells														
2446-04	430	4,600	350	(170)	(170)	310	(137)	(65.4)	224	(146)	307	543	504	NC
XJM-97-11X	(33)	260	590	380	ND	ND	(192)	ND	ND	(178)	236	ND	NC	NC
Couplet Wells														
HA-1S	-	-	-	-	-	-	-	1360	1090	1270	1820	1010	NC	NC
HA-1B	-	-	-	-	-	-	-	1660	1270	2340	2650	1110	NC	NC
Arsenic, total - 10 µg/L Cleanup Goal														
Source Wells														
2446-02	80	150	110	110	150	93	336	(6)	35	90	75	60	87	NC
2446-03	69	48	110	31	46	78	66	39	55	98	89	68	84	NC
XJM-94-05X	32	730	130	(4.5)	13	40	56	26	44	86	159	42	78	NC
XJM-97-12X	54	130	94	87	72	78	59	54	47	74	105	96	132	NC

Table 5.4 (continued)
Summary of Exceedances for AOC 43J

Well Number	1999	2000	2001	2002	2003	2004	2005	Jan 2007	June 2007	Oct 2007	Dec 2007	2008	2009	Feb 2010
Sentry Wells														
2446-04	17	110	70	24	30	100	51	11	13	39	93	48	106	NC
XJM-93-02X	ND	54	ND	(4.7)	ND	ND	ND	ND	ND	ND	ND	ND	NC	NC
Couplet Wells														
HA-1S	-	-	-	-	-	-	-	39	25	42	40	39	NC	NC
HA-1B	-	-	-	-	-	-	-	18	16	54	44	(7)	NC	NC
Iron, total - 9,100 µg/L Cleanup Goal														
Source Wells														
2446-02	33,000	30,000	26,000	31,000	35,000	34,000	41,200	(710)	(4,900)	21,000	25,000	32,000	73,000	NC
2446-03	33,000	10,000	21,000	16,000	26,000	38,000	21,200	21,000	25,000	20,000	26,000	29,000	47,000	NC
XJM-94-05X	13,000	14,000	31,000	(550)	(3,600)	15,000	15,500	(7,000)	11,000	19,000	13,000	14,000	98,000	NC
XJM-97-12X	18,000	17,000	12,000	16,000	15,000	15,000	15,500	13,000	12,000	14,000	44,000	51,000	110,000	NC
Sentry Wells														
2446-04	(7,600)	32,000	19,000	10,000	13,000	25,000	10,500	(5,700)	9,400	16,000	26,000	24,000	52,000	NC
Couplet Wells														
HA-1S	-	-	-	-	-	-	-	(8800)	(8000)	10000	12000	12000	NC	NC
HA-1B	-	-	-	-	-	-	-	11000	10000	19000	19000	11000	NC	NC
Manganese, total - 291 µg/L Cleanup Goal														
Source Wells														
2446-02	17,000	16,000	11,000	13,000	7,700	12,000	7,010	2,920	2,440	6,520	9,310	11,900	26,300	NC
2446-03	11,000	4,800	6,600	4,500	7,400	10,000	5,420	7,520	8,310	4,310	5,880	9,270	11,000	NC
XJM-94-05X	5,400	6,600	5,800	340	2,100	6,400	3,990	2,380	3,040	3,600	3,950	4,950	28,500	NC
XJM-97-12X	6,400	6,300	5,800	5,500	5,000	5,100	5,160	4,640	4,590	5,120	11,500	11,700	25,000	NC
Sentry Wells														
2446-04	6,400	11,000	4,900	4,000	5,400	4,300	5,800	1,180	2,000	6,580	5,390	5,860	13,200	NC
XJM-93-02X	3,100	(61)	630	(200)	330	12,000	2,170	4,380	(56)	2,600	5,060	2,300	NC	NC
XJM-93-03X	(110)	(45)	1,200	(23)	(67)	660	(129)	(18)	1,670	1,640	1,220	593	1,850	NC
XJM-94-08X	540	780	3,400	1,000	1,200	640	1,840	1,000	1,550	3,600	1,490	1,140	421	NC
XJM-94-10X	330	(58)	3,400	(240)	(120)	(33)	(106)	ND	ND	(11)	(77)	ND	NC	NC
XJM-97-11X	390	1,300	2,800	2,800	690	640	2,280	ND	ND	1,360	2,140	ND	NC	NC

Table 5.4 (continued)
Summary of Exceedances for AOC 43J

Well Number	1999	2000	2001	2002	2003	2004	2005	Jan 2007	June 2007	Oct 2007	Dec 2007	2008	2009	Feb 2010
Couplet Wells														
HA-1S	-	-	-	-	-	-	-	11700	9450	12900	14400	11400	NC	NC
HA-1B	-	-	-	-	-	-	-	6250	5620	9800	9960	5240	NC	NC
HA-2S	-	-	-	-	-	-	-	963	1460	1740	820	1690	NC	NC
HA-2B	-	-	-	-	-	-	-	(216)	619	381	302	(210)	NC	NC
HA-4S	-	-	-	-	-	-	-	695	4130	1030	403	(20)	NC	NC

Notes:
Number in parentheses denotes that concentration is below cleanup goal/VPH boundary standard.
ND = The analyte was analyzed for, but not detected. The associated numerical value is the laboratory reporting limit.
NC = Not collected; a sample was not collected and analyzed for this particular analyte.
J = Estimated value detected below the laboratory reporting limit.

5.5.3.3 VPH Boundary Standards

The analytical data from January 2005 through November 2009 (43G) and February 2010 (43J) were evaluated with respect to the VPH Boundary Standard described in the intrinsic remediation assessment. Remedial goals within the plume are not established for VPH. However, if the MassDEP GW-1 concentrations are exceeded at the AOC boundary, the Army will develop risk-based VPH concentrations.

AOC 43G

Sentry well XGM-94-04X exceeded the VPH GW-1 standard for the C_5-C_8 aliphatic carbon and C_9-C_{10} aromatic carbon fractions during the November 2000 sampling event. Sentry well XGM-94-04X has not exhibited a VPH exceedance since that time and has remained non-detect for all VPH carbon fractions since 2003. For the December 1999 through November 2009 sampling period, no VPH exceedances were reported for the other three monitored sentry wells, AAFES-5, XGM-94-07X, and XGM-94-08X. A fourth sentry well, XGM-94-10X, also exhibited VPH non-detections since 1999 until sampling was discontinued following the 2006 sampling event. Well XGM-94-04X is downgradient of the source area but is not located at the site boundary

AOC 43J

The following VPH exceedances were reported during the January 2005 through December 2008 sampling period for sentry well 2446-04: C_5-C_8 aliphatic carbon fraction in October 2005 (793 μg/L), June 2007 (550 μg/L), December 2007 (704 μg/L),December 2008 (2,290 μg/L), and November 2009 (2,200μg/L) ; and the C_9-C_{10} aromatic carbon fraction in June 2007 (224 μg/L), December 2007 (307 μg/L), December 2008 (543 μg/L) and November 2009 (504μg/L) . Exceedances were also noted for sentry well XJM-97-11X: the C_5-C_8 aliphatic carbon fraction in October 2005 (3,570 μg/L), September 2007 (1,440 μg/L), and December 2007 (1,060 μg/L); and the C_9-C_{10} aromatic carbon fraction in December 2007 (236 μg/L). These detections are consistent with historical observations at both wells.

As shown in Figure 5.2, sentry well 2446-04 is approximately 50 ft downgradient and southeast of the former waste oil UST and not located at the AOC 43J site perimeter. An evaluation of historical data for this well reveals that a majority of the groundwater sampling events since 1999 have yielded GW-1 exceedances for the C_5-C_8 aliphatic and C_9-C_{10} aromatic carbon fractions. By comparison, VPH compound and carbon fraction concentrations were below the associated GW-1 standard at well XJM-93-03X, located approximately 65 ft downgradient of the UST, and were non-detections for sentry wells XJM-93-02X, XJM-93-03X, XJM-94-08X, XJM-94-10X, and XJM-97-13X (in bedrock).

VPH compound and carbon fraction concentrations were generally below the associated GW-1 standard at well XJM-94-09X, located approximately 60 ft downgradient of the potential UST, and were non-detections at sentry well XJM-94-10X, located about 10 ft southeast of well XJM-97-11X.

5.5.3.4 Remedial Duration Assessment

AOC 43G

Benzene, which has a relatively low molecular weight and easily degrades aerobically, has undergone a dramatic reduction in concentration from a high of 2,000 μg/L in December 1994 to 22 μg/L in October 2007. These empirical results supported conclusions of the BIOSCREEN modeling conducted in 1999 to estimate remedial duration and plume migration potential (SWETS and HLA, 1999). The results of this model demonstrated the unlikelihood that benzene contamination would migrate off Army property. Furthermore, the benzene cleanup goal was estimated to be achieved approximately between 2007 and 2009, or between 11 and 13 years following remedy implementation, which is compliant with the 30-year criteria stated in the ROD. The BIOSCREEN modeling determined that aerobic degradation was the overriding process at these sites, although the relatively high hydraulic conductivity of these sediments suggests that dilution and plume movement could also account for the dramatic reduction in observed benzene concentrations.

The reliability of the BIOSCREEN modeling was re-evaluated during the completion of the 2008 LTMP (HGL, 2008), and included an investigation of the model input parameters and a comparison of the model predictions to the observed benzene distribution. An evaluation of the input parameters indicated that the hydrogeologic input parameters are consistent with conditions currently observed at the site. A comparison of the modeling results to benzene concentrations observed during the fall 2007 sampling event revealed that the 2007 benzene concentrations were consistent with the model predictions. However, the model did not predict the increase in benzene observed at the site from 1999 to 2002, nor did the model predict the sharp decrease in benzene observed from 2002 through 2007. It was speculated in the 2008 LTMP (HGL, 2008) that the cause of the increase was a thin layer of light, non-aqueous phase liquid that was historically documented as a sheen in well AAFES-2. This NAPL may have served as a source of dissolved groundwater contamination, and once this source was depleted through dissolution and degradation, a much more rapid decline in dissolved benzene occurred. The rapid decline in observed benzene over the past seven years was also not predicted by the model and indicates that the degradation rate assigned in the model may underestimate ongoing degradation.

A regression analysis was performed on ROD COC benzene analytical data from source area well XGM-97-12X to determine remedial duration for this five-year review. No other wells have exceeded the benzene action level over the past two consecutive sampling events. The dataset analyzed was from the September 1993 to November 2009 timeframe. An exponential regression analysis of this dataset indicates that the benzene cleanup goal will be reached in 2013, 13 years before the 2026 ROD deadline. A logarithmic regression analysis of benzene was in agreement with the earlier findings of the BIOSCREEN model (between 2007 and 2009). The correlation coefficient (R^2) was closer to 1 for the exponential regression analysis in comparison with the logarithmic regression analysis.

AOC 43J

In general, COC concentrations have declined in wells in the source areas since the Army implemented monitoring in 1993; however, based on recent monitoring performed by

MassDevelopment, which took over site compliance work in 2006, the AOC 43J COCs have increased in source area wells, particularly during the 2007 and 2008 LTM events.

Natural attenuation does not appear to be degrading the site's COCs in the overburden at the rate predicted in the 1999 IRA. MassDevelopment speculates that the slow rate of degradation is due, in part, to changing redox conditions within the overburden groundwater, specifically due to the depletion of oxygen and other available electron acceptors. The diminished degradation in bedrock groundwater is thought to be a result of the lack of organic carbon (typical of fractured crystalline bedrock) that may be limiting the growth of a microbial community. Transport modeling results performed during an intrinsic remediation assessment for AOC 43J in March 2009 indicate that intrinsic remediation is working, but the ROD RGs may not be met by the 30-year target (i.e., in the year 2026, measured as 30 years from the 1996 ROD date).

MassDevelopment performed a sulfate injection pilot test in December 2009 and is presently evaluating the effectiveness of the injection to augment intrinsic remediation at the site and possibly perform a full scale injection if the pilot test is successful. A remedy duration reassessment should be performed after implementation of any technology meant to augment the intrinsic remediation remedy to determine if the ROD's RGs will be met by the predicted 2026 timeframe.

5.5.3.5 Contaminant Migration Assessment

The analytical data from January 2005 through November 2009 were reviewed with respect to the Contaminant Migration Assessment Performance Standard described in the intrinsic remediation assessment and summarized in Subsection 5.3.6.1. This standard states that additional field actions will be implemented if COC concentrations exceeding clean up goals are likely to migrate beyond the site boundary.

AOC 43G

No detections above the cleanup goals for benzene and toluene have been reported for any of the AOC 43G sentry wells since monitoring began. All organic contaminant detections are confined to the general vicinity of the source area with no detections of organic contaminants noted in the sentry wells.

Metals, primarily manganese exceeding the clean up goal of 375 μg/L, were detected within most source area wells and three sentry wells. The Army performed groundwater monitoring in 2008 and 2009 to bound the extent of metals contamination at the site. Well AAFES 7, located at the downgradient perimeter of the AOC 43G area, was added to the LTM program and sampled for total and dissolved metals. There were no metals exceedances detected at this well, indicating metal contaminants are not migrating off Army property. Geochemical parameters collected from LTM wells indicate metal exceedances are found within wells with low ORP and low dissolved oxygen. The perimeter wells, such as AAFES 7 have aerobic conditions (high ORP and high dissolved oxygen as detailed in the analytical data tables). The reduction in organic contaminants at the source area is unlikely to provide substantial

anthropogenic carbon that would allow the reducing conditions to reach the AOC 43G perimeter and present a potential for offsite metals migration.

AOC 43J

The COC concentrations observed in AOC 43J source and sentry wells fluctuate between sampling events but recent sampling data indicate that organic contaminant concentrations that exceed the clean-up goal are generally increasing within the source area while only one sentry well shows an organic contamination exceedance; however this sentry well (2446-02) is located near the center of AOC 43J. Based on these observations, no potential for off site migration of organics exists at AOC 43J but increasing concentrations in the source area have been the focus of a current ongoing sulfate injection pilot study.

All source wells and sentry well 2446-04 have routinely yielded arsenic, iron and manganese concentrations above the respective cleanup goal since 1999and have remained unchanged through 2008, with no overall discernable increasing or decreasing trends. Moreover, sentry wells XJM-93-02X, XJM-94-08X, and XJM-94-03X have yielded manganese concentrations above the 291 μg/L cleanup goal since 1999. By comparison, arsenic at sentry well XJM-93-02X has remained below the cleanup goal since 2001, and sentry well XJM-97-10X has largely maintained manganese concentrations close to or below the cleanup goal since 1999. Based on the 2008 groundwater sampling event, manganese is the only metal that could possibly be interpreted to show a potential for offsite migration at a few sentry wells. However, migration is not occurring as indicated by nearby site sentry wells with manganese concentrations below the background concentration.

Overall, the analytical results indicate that intrinsic bioremediation may be occurring for benzene and toluene at AOC 43J; however, there is contrary evidence to support the same conclusion for the VPH carbon fractions and target metals. Based on the most recent analytical results, it appears that the COC exceedances and fluctuations are consistent with historic data and lack a definitive decreasing concentration trend.

5.5.4 Site Inspection

On March 30, 2010, an HGL representative performed site inspections at AOCs 43G and 43J. Conditions were poor with consistent precipitation and temperatures ranging between approximately 40-45 °F. AOC 43G consists of an inactive gas station and car wash, with paved and wooded areas. AOC 43J consists of a paved lot with perimeter landscaping and adjacent wooded areas.

No major changes to the site were noted during the site inspections. The former gas station at 43G remains inoperative, but the building is used by janitorial staff as office and storage space. AOC 43J has a new perimeter fence as part of the new Bristol-Myers Squibb facility and access to the site is restricted. The well protective casings and flush mounts were intact and secured. No evidence of excavation was noted during the inspection at either site.

5.5.5 Interviews

The following individuals was interviewed as part of the five-year review:

- Ms. Ellen Iorio, USACE, New England District;
- Mr. Dan Noberini, Bristol Myers Squibb; and
- Ron Ostrowski, Mass Development.

Ms. Iorio stated that although she is not actively involved with this AOC, she is unaware of any events, incidents, or activities that would impact the remedy at the sites. Mr. Noberini indicated that he is unaware of any events, incidents, or activities that would affect the remedy at AOC 43J. Mr. Ostrowski had a similar response for AOC 43J, but further indicated that future plans do not include a new building at AOC 43J, and will remain an asphalt lot. ICs are in effect for AOC 43G & 43J (as discussed in other sections of this report).

The detailed 2010 LUC interviews will be included in Appendix D.

5.5.6 Community Participation

Community participation at former Fort Devens Army Installation is detailed in Section 1.3.

5.6 TECHNICAL ASSESSMENT

Question A: Is the remedy functioning as intended by the decision documents?

Yes, the remedy is functioning as intended by the ROD for AOC 43G; however, the remedy may not be functioning as intended for AOC 43J. Details are provided in the following subsections.

Remedial Action Performance

Long-term groundwater monitoring is performed on an annual basis to determine if contaminants are migrating off the site and to ensure that the intrinsic remediation remains protective of human health and the environment. Increasing organic contaminants were observed at some AOC 43J source wells. The increase in contaminant concentrations placed the remedy completion per the timeframe stipulated in the ROD in question. A pilot study consisting of sulfate injection was implemented in December 2009 to evaluate the effectiveness of sulfate injection as an augmentation of the intrinsic remediation process specified in the ROD. The pilot test is ongoing and an evaluation report is pending at the time of this review. In addition, groundwater monitoring results are elevated in several sentry wells at AOC 43J for manganese but other sentry wells exhibit non-detections that bound these exceedances and nearby aerobic conditions will likely cause manganese to attenuate (precipitate out of solution). The particular sentry wells are located within the main portion of the site and are not perimeter wells. Manganese exceedances detected at AOC 43G sentry wells are bounded by wells further downgradient of the impacted wells but within the AOC 43G boundary. Organic contaminants at AOC 43G continue to degrade and have not shown the same recalcitrant trend as observed at AOC 43J. There is no off site contaminant migration occurring at either site.

System Operations/Operation and Maintenance (Long-term Groundwater Monitoring)
Groundwater monitoring is performed in accordance with the approved LTMP (HGL, 2008b) for AOCs 43G. Groundwater at AOC 43J is performed under MassDevelopment oversight.

Opportunities for Optimization
AOC 43J is undergoing a pilot study evaluation and no optimization is proposed at this time. An optimization at AOC 43G was performed in conjunction with implementation of the 2008 LTMP and no additional optimization is required at this time.

Early Indicators of Potential Remedy Failure
Manganese was detected in sentry wells in both AOCs but concentrations are anticipated to attenuate with further degradation of the hydrocarbon source areas. Manganese is not migrating off site from either of these AOCs at this time but continued monitoring will be performed to confirm. The recent increase of organics (ethlybenzene) at AOC 43J indicated that intrinsic remediation was inhibited and that the ROD required remedial duration may need to be reevaluated. A sulfate injection pilot study was initiated in 2009 at AOC 43J to address the increase in organics and will go full scale if results of the pilot study are promising.

Implementation of Institutional Controls and Other Measures
There are no current or future plans for installation of potable water wells at AOC 43G or 43J. In 2006, AOC 43J was combined with other adjacent properties and transferred to MassDevelopment to provide for a large redevelopment parcel for the Bristol-Myers Squibb facility. When the property transfer occurred, the ICs were incorporated into the property deed. The deed can be located at the BRAC office library. AOC 43G was included in the "Real Property Master Plan Long Range Component for Devens Reserve Forces Training Area Addendum – September 2007" (Appendix K). This document provided supplemental information on LUCs established under BRAC and CERCLA programs. IC inspections at AOC 43G are conducted annually as detailed in the 2008 LTMP.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?

Yes, the assumptions remain valid however; there have been several changes in cleanup levels since the time of remedy selection. These changes are described below:

Changes in Standards and To Be Considered
As part of this five-year review, ARARs and TBC guidance presented in the ROD, and current ARARs were reviewed. This review will be discussed further in Section 5.6.2.

The MCLs are health-based standards established by the USEPA. The MCL for arsenic in effect at the time of the ROD (50 μg/L) was selected as a groundwater cleanup goal. Arsenic was present on site at concentrations greater than its MCL during the remedial investigation and was a primary risk driver for the ingestion of groundwater exposure. The MCL for arsenic has been updated since the 1997 ROD. Changes to the MCL for arsenic in association with changes of the EPA National Primary Drinking Water Regulations for arsenic and

implementation on January 23, 2006, effectively reduce the clean-up level for arsenic from 50 to 10 μg/L. There have been no changes to the COC MCLs since the previous five-year review. Because the remedy includes restricting access to groundwater as drinking water, changes to groundwater standards do not affect the protectiveness of the implemented remedy.

The nickel MCL used in the 1997 ROD has since been revoked. EPA promulgated an MCL of 100 μg/L for nickel on July 17, 1992. However, in September 1992, the Nickel Development Institute challenged the methodology used to establish the MCL in a petition to the U.S. Court of Appeals. Subsequently, EPA agreed with the challenge and filed a joint motion along with the nickel industry petitioners to voluntarily remand the MCL on February 9, 1995. The court granted the motion and the remand became effective on the same date. Nickel was removed from the AOC 43G analyte list in 2007 with the concurrence of the USEPA Region I and MassDEP.

Groundwater monitoring data at each AOC suggest that organic COC concentrations are decreasing at AOC 43G source wells, but likely will remain above cleanup goal/VPH boundary standards for some time. Contaminant degradation at AOC 43J is occurring at a slower rate than anticipated and the remediation time frame is uncertain pending an evaluation of an intrinsic remediation enhancement pilot test; however, groundwater data from sentry wells at both AOCs support the position that the BTEX groundwater plume with concentrations exceeding MCLs is not expanding or migrating. Because the cleanup goal/VPH boundary standards are based on drinking water standards, changes of the MCLs and MassDEP GW-1 standards influence the protectiveness of the cleanup goal/VPH boundary standards. However, because the remedy includes prohibiting the use of groundwater as drinking water, changes to groundwater standards do not affect the protectiveness of the remedy.

Changes in Exposure Pathways

The ROD identified unacceptable risk from the following exposure pathways: ingestion of groundwater as the primary drinking water source for commercial/industrial workers at both AOC 43G and AOC 43J. There are no current complete exposure pathways at the site. Land use at the site has not changed from the industrial use evaluated prior to the ROD and is not expected to change. No new contaminants, sources, or routes of exposure were identified. There is no indication that hydrologic/hydrogeologic conditions are not adequately characterized.

Groundwater at this site is not currently used as drinking water. The exposure to groundwater through drinking water and commercial/industrial use is of concern to future receptors on a hypothetical basis only. ICs prohibiting the use of site groundwater as drinking water at AOCs 43G and 43J will eliminate this potential pathway.

The Bristol-Myers Squibb facility currently occupies property to the north of Parcel C (AOC 43J is part of Parcel C) and MassDevelopment supplies potable water to the facility. Significant construction has taken place since 2008 to build the Bristol-Myers Squibb facility but no building construction has occurred at AOC 43J, including areas with groundwater

contaminated with VOCs. Potential risks associated with the reuse of Parcel C were reviewed prior to the approval of the property transfer. The results of the technical assessment performed prior to transfer confirm the conclusions of the 1996 risk assessment, which were that subsurface soil did not pose an unacceptable risk to the utility/maintenance worker or construction worker, yet the use of groundwater as a drinking water source would pose an unacceptable risk to human health. Based on the anticipated development plans for AOC 43J and the current groundwater monitoring data, the technical update indicated an unacceptable risk to human health may exist due to the possibility of VOCs in the subsurface migrating into indoor air of future occupied buildings. The June 2006 ESD indicated that the modified remedy will incorporate LUCs to provide assurance that the potential risk to future commercial employees from the inhalation of vapors migrating from the subsurface into the indoor air of these structures shall not exceed acceptable risk levels. The ICs provide for a residential and groundwater use restriction, a building project notification, and a condition that a proposed building construction project may require a subsurface vapor intrusion evaluation as part of the building design process.

Changes in Exposure Assumptions

The risk assessments supporting the RODs for AOCs 43G and 43J used exposure assumptions for the ingestion of groundwater pathway that are consistent with standard practice at the time.

Since the original risk assessments were prepared, USEPA has updated the recommended dermal contact exposure assumptions. New guidance for evaluating dermal contact exposures was finalized in July 2004 (Risk Assessment Guidance for Superfund, Volume I – Human Health Evaluation Manual – Part E, Supplemental Guidance for Dermal Risk Assessment – Final). The final guidance includes changes to dermal exposure assumptions. Because the remedies include prohibiting the use of groundwater as drinking water, changes to the exposure parameters do not affect the protectiveness of the implemented remedy.

Changes in Toxicology and Other Contaminant Characteristics

Since the completion of the HHRA, the EPA has issued recent guidance recommending the use of additional sources of peer-reviewed toxicity values, as well as updated several toxicity values. Because the groundwater cleanup goals presented in the ROD are based on drinking water standards and not on risk-based calculated values, changes in toxicity values do not impact the protectiveness of the cleanup goals. Also, the remedies include the prohibition of groundwater use as drinking water any changes in toxicity of the COCs do not affect the protectiveness of the remedies.

Below is a summary of the changes in toxicity values for each COC and the potential impact on the risk calculations:

USEPA's IRIS database lists a slightly lower oral CSF for arsenic (1.5 mg/kg-day^{-1}) than the oral CSF used in the original risk assessments (1.75 mg/kg-day^{-1}). Also, the IRIS cancer assessment for inorganic arsenic is currently under review. EPA's Office of Research Development has recently completed a 2010 draft titled: *Toxicological Review of Inorganic Arsenic: In Support of the Summary Information on the Integrated Risk Information System*

(IRIS). The draft assessment includes an updated CSF of 25.7 mg/kg-day^{-1}, which is much higher than the CSF used in the original risk assessment and the one currently listed on IRIS. Acceptance of this new, higher CSF could indicate that the cancer risk from arsenic may be underestimated. Also, an RfC has been included in the IRIS database. Therefore, the non-cancer hazards for the inhalation pathway may have been underestimated in the original risk assessments.

USEPA's IRIS database lists a range of oral CSFs for benzene. Because the risk assessments used a CSF within the current range, risks from exposure to benzene would be higher if the CSF from the high end was used and lower if the CSF from the low end of the range was used. As a result, cancer risks from exposure to benzene may be overestimated or underestimated. Also, an RfC has been included in the IRIS database. Therefore, the non-cancer hazards for the inhalation pathway may have been underestimated in the original risk assessments.

Iron was identified as a COC in the ROD because non-cancer hazards from exposure to iron in groundwater exceeded a hazard index of 1. A current provisional subchronic and chronic RfD for iron is available and was derived from the lowest-observed-adverse-effect-level of 1mg/kg-day for total daily iron intake for adverse gastrointestinal effects. The p-RfD (subchronic and chronic) derived value is 0.7 mg/kg-day and is applied in USEPA's RSL tables.

The manganese RfD published in the IRIS database includes manganese from all sources, including diet. USEPA Region I supports an oral RfD for manganese of 0.07 mg/kg/day for ingestion of soil, sediment, or food and an oral RfD of 0.024 mg/kg/day for manganese in drinking water. Also, USEPA issued a Lifetime Health Advisory of 0.3 mg/L for manganese. This value should be used for infants younger than six months even for an acute exposure of 10 days. The advisory is a to-be-considered value. A revised cleanup goal for the site has been developed based on the updated RfD value for water intake. A revised manganese risk-based cleanup level of 375μg/L was approved by the USEPA and MassDEP in 2008.

Toluene and xylene have revised RfDs that are more conservative than those used in the original risk assessment. Therefore, the non-cancer hazards for toluene and xylenes may have been underestimated. An ethylbenzene CSF was developed by the Cal EPA since the time of the original risk assessment. The cancer risk may have been slightly underestimated based on this new information

An RfC has been established for carbon tetrachloride, xylenes, cadmium, and nickel since the original risk assessment was performed. Similarly, an IUR has been established for ethylbenzene, cadmium, and nickel. Therefore, the cancer risks and non-cancer hazards for the inhalation pathway may have been underestimated in the original risk assessment.

As mentioned above, because the groundwater cleanup goals presented in the ROD are based on drinking water standards and not on risk-based calculated values, changes in toxicity values do not impact the protectiveness of the cleanup goals.

Changes in Risk Assessment Methodology

Several new risk assessment methodologies have been introduced since the original risk assessments were performed in 1996.

In 2004, USEPA published the final version of the RAGS Appendix E, which is the updated guidance for the dermal contact evaluation (EPA, 2004). Current recommendations include updated dermal absorption factors for specific chemicals and updated oral to dermal adjustment factors for RfDs and CSFs. The final guidance includes slight changes in some dermal exposure assumptions from what was used in the original risk assessment. While this may indicate an underestimation of exposure in the original risk assessments, it is not expected that the slight change in the dermal exposure calculation would alter the conclusion of the risk assessments.

USEPA has identified several carcinogens that act via a mutagenic mode of action, and to account for their early-life exposures, the default age-dependent adjustment factors (ADAFs) of 10 for ages 0-2 and 3 for ages 2-16 have now been incorporated into the risk calculations. This approach is consistent with the 2005 Guidelines for Carcinogen Risk Assessment and the Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens. None of the groundwater COPCs are considered to be mutagenic for the purposes of this risk assessment methodology. Therefore, this methodology change does not affect the conclusion of the original risk assessments.

In January 2009, USEPA introduced RAGS Part F, which updates the approach for determining risk from inhaled chemicals to be consistent with the inhalation dosimetry methodology described in Methods for Derivation of Inhalation Reference Concentrations and Application of Inhalation Dosimetry (USEPA, 1994). The new approach revises the equations for estimating inhalation exposure and risk, recommending that when estimating risk via inhalation, the concentration of the chemical in air should be used as the exposure metric (e.g., mg/m^3), rather than inhalation intake of a contaminant in air based on inhalation rates or body weight (e.g., mg/kg-day). It is not expected that this change in the inhalation calculation would alter the conclusion of the risk assessments.

While numerous methodologies have changed since the original risk assessments were prepared, the potential human health risks discussed in the ROD will be eliminated by the ICs that are in place to prohibit groundwater from being used as drinking water thus maintaining the protectiveness of the current remedy. Therefore, there are no risk assessment methodology changes that affect the protectiveness of the remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

In 2006, MassDevelopment noted that while the COC concentrations had declined in wells in the AOC 43J source area since the monitoring was implemented in 1993, the site COC concentrations increased in source area wells in recent monitoring (2007 and 2008). This increase was attributed to drier conditions signaled by a pronounced decrease in groundwater

levels late in 2007. However, due to the concentration increases, the effectiveness and rate of intrinsic bioremediation were questioned. In December 2009, a pilot test was initiated to perform sulfate injections into the saturated zone to treat the AOC 43J site COCs in situ. Once the pilot test and evaluation of the system is complete, a full-scale program will be considered. Implementing a full-scale sulfate amendment program would constitute enhanced biodegradation, which may require submittal and approval of an ESD. Provided the ICs are maintained, protectiveness should not be affected.

No additional information has come to light that would call into question the protectiveness of the remedy was noted. No natural disaster impacts occurred at AOC 43G or AOC 43J during this review period.

5.6.1 Summary of Technical Assessment

While several risk assessment methodologies have changed since the original risk assessment was prepared, ICs are in place to prohibit the groundwater from being used as drinking water thus maintaining the protectiveness of the current remedy. Additional ICs are in place at AOC 43J should further development activities, such as building construction take place at the site.

Groundwater sampling results at AOC 43G indicate that ROD COC concentrations are decreasing over time and are expected to meet cleanup goals within the 30-year period specified in the ROD. Off-site migration of ROD COCs, manganese in particular, is not suspected at this time based on analysis of current LTM sampling results and data obtained from a downgradient perimeter monitoring well.

Organic contaminant degradation at AOC 43J is occurring slower than expected and recent groundwater data reveal an increasing concentration trend at the source area. A sulfate injection pilot study is currently underway to evaluate the effectiveness of augmenting the intrinsic remediation remedy to speed up the degradation process. Groundwater contaminants, primarily manganese detected at AOC 43J sentry wells show a stable concentration trend and do not show evidence of migration.

In 2006, AOC 43J was bundled with other adjacent properties and transferred to provide for a large redevelopment parcel for the Bristol-Myers Squibb facility. Additional ICs were placed in the transfer deed to restrict residential development and provide for a vapor inhalation assessment if buildings are placed on the site.

5.6.2 Applicable or Relevant and Appropriate Requirements Review

ARARs that were presented in the 1996 ROD are included in Appendix D. Standards and regulations, current at the signing of the ROD and for the previous Five-Year Reviews, have been reviewed for changes that could affect protectiveness of the remedy.

The following ARARs have been modified since the signing of the ROD and may affect the protectiveness of the implemented remedial action:

1. 40 CFR 141.11 Subpart B Maximum Contaminant Levels – updated July 1, 2001. Section 141.11 (a) and (b) were amended at 66 FR 7061 on January 22, 2001 to state the following:

   - ****The analyses and determination of compliance with 0.05 mg/L MCL for arsenic use the requirements of 141.23.*
   - *The MCL for arsenic was 0.05 mg/L for community water systems until January 23, 2006.*

   On January 22, 2001, EPA adopted a new standard for arsenic in drinking water at 0.01 mg/L, replacing the old standard of 0.05 mg/L (66 FR 6976). The rule became effective February 22, 2002. The date by which systems must comply with the new 0.01 mg/L standard was January 23, 2006.

2. 40 CFR 141.15 and 141.16 Subpart B MCL – updated July 1, 2003. An effective date note (65 FR 76745) removed the sections from the CFR effective December 8, 2003. Sections 141.15 and 141.16 do not appear in 40 CFR 141 updated on July 1, 2004. These two sections addressed MCLs for radium-226, radium-228, gross alpha particle radioactivity, and beta and photon radioactivity, which do not affect the protectiveness of the remedy.

3. 40 CFR 141.51 Subpart F MCL Goals and Maximum Residual Disinfectant Level Goals – updated July 1, 2001. The table was amended in Section 141.51 by adding arsenic with an MCL goal of zero effective January 23, 2006 (66 FR 7063). Until then, no MCL goal applied for arsenic.

4. 310 CMR 22.0 Drinking Water – updated May 24, 2004. The arsenic MCL listed in Section 22.06 is effective for the purpose of compliance with the CFR (outlined above) on January 23, 2006. A perchlorate standard was also promulgated July 28, 2006. Because perchlorate is not a COC for these sites, the ARARs are not affected by this change. 310 CMR 22.26 was updated in December 2009 regarding microbial communities in groundwater that is also used for public consumption. As bacterial populations are not considered a COC for these sites, the protectiveness of the remedy is not affected.

5. 310 CMR 30.00 Hazardous Waste Regulations – In January 2007, an update to this regulation was proposed to streamline the cleanup requirements of any hazardous materials released to the environment at facilities, both active and closed, that are, or were, subject to a hazardous waste license. In April 2010, this regulation was updated to include the Amendments for Adoption of Federal Land Disposal Restriction Program. The update also includes revised definitions and technical corrections needed to clarify the regulatory status of specific wastes. There were no revisions that affect the protectiveness of the remedy.

6. 310 CMR 6.00 Ambient Air Quality Standards – In July 2009, MassDEP proposed to amend the state ambient air quality standards to bring the standards for ozone, lead, and particulate matter into conformance with the existing National Ambient Air Quality

Standards (NAAQS) for these pollutants. However, none of the proposed revisions affect the protectiveness of the remedy.

7. 310 CMR 7.00 Air Pollution Control Regulations – In July 2009, MassDEP proposed to make amendments to definitions related to particulate matter in 310 CMR 7.00: Air Pollution Control, 310 CMR 7.54: Large Combustion Emission Units, and Appendix A: Emission Offsets and Nonattainment Review. These changes are based upon a thorough review of the regulations encoded in 310 CMR 7.0 to ensure the addition of definitions for $PM_{2.5}$ to all relevant sections. The proposed revisions would not affect the protectiveness of the remedy.

8. 310 CMR 7.18 Volatile and Halogenated Organic Compounds – This May 1998 regulation was updated in 2002 and is applicable to facilities that emit VOCs. This revision does not affect the protectiveness of the remedy and only pertains should an SVE system be required as a contingency measure at AOC 43G.

9. 310 CMR 10.00 Wetlands Protection – This regulation was updated October 2007 with a streamlined permit application process. There were no revisions that affect the protectiveness of the remedy.

10. 314 CMR 4.00 Surface Water Standards – updated January 2007. Because these standards were not considered during the development of the preliminary remedial goals for the site, this revision should not affect the protectiveness of the selected remedy.

11. 314 CMR 6.00 Massachusetts Groundwater Quality Standards – rescinded March 20, 2009. Revisions made to 314 CMR 5.00 for a streamlined groundwater discharge permitting process negated the need for this section. As the selected groundwater quality standards for AOC 69W are primarily Federal MCLs and are also presented in 40 CFR 141 Section 11 and 13, the removal of 314 CMR 6.00 from the Code of Massachusetts Regulations does not affect the protectiveness of the remedy.

The nickel MCL used in the 1997 ROD has since been revoked. USEPA promulgated an MCL of 100 μg/L for nickel on July 17, 1992. However, in September 1992, the Nickel Development Institute challenged the methodology used to establish the MCL in a petition to the U.S. Court of Appeals. Subsequently, USEPA agreed with the challenge and filed a joint motion along with the nickel industry petitioners to voluntarily remand the MCL on February 9, 1995. The court granted the motion and the remand became effective on the same date. Nickel was removed from the AOC 43G analyte list in 2007 with the concurrence of the USEPA Region I and MassDEP.

A search was performed for any newly promulgated standards that could affect protectiveness at the site. No new ARARs were identified that would affect the protectiveness of the remedy.

5.7 ISSUES

There are no issues that would make the remedial actions at AOCs 43G and 43J non-compliant with the ROD, or sufficient to warrant a finding of not protective.

Currently, groundwater is not used for drinking water purposed in these AOCs and ICs restrict development of the site's groundwater. Because municipal water is available in these areas, it is unlikely that future properties would utilize groundwater as a potable water source.

5.8 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

If the pilot study evaluation currently in progress at AOC 43J indicates that sulfate addition is an effective and feasible augmentation to the intrinsic remediation remedy, the remediation timeframe should be reevaluated to determine if COCs will reach the ROD-projected clean up goal of complete remediation of the site by 2026. If the pilot study meets both these requirements a full scale injection will be implemented following the approval of an ESD for the ROD. MassDevelopment currently plans to issue a comprehensive report on the pilot study in 2011.

5.9 PROTECTIVENESS STATEMENT

Protectiveness statements for AOCs 43G and43J were combined together during the previous five-year review due to both sites being addressed under the same 1996 ROD and both AOCs were under Army ownership. Separate protectiveness statements are provided below due to transference of AOC 43J from the Army to MassDevelopment for commercial redevelopment and development of an ESD for AOC 43J in 2006.

AOC 43G

The remedy at AOC 43G is protective of human health and the environment, and exposure pathways that could result in unacceptable risks are being controlled. Human health is not currently at risk at 43G because groundwater is not used as a drinking water source. AOC 43G remains under Army ownership and is within the confines of the Army Garrison at Fort Devens and access to the site is restricted. ICs are in place that prevent exposure to contaminated soil and groundwater at the site.

HASP and IDW handling procedures are in place and are sufficient to control risk to on-site workers and the public, and are being properly implemented during groundwater sampling. Human health is currently not at risk at AOC 43G because groundwater at the AOC is not being used for potable use, and organic and inorganic COCs exceeding cleanup goal/VPH boundary standards are not migrating off Army property.

Current remedial action activity consists of intrinsic bioremediation, intrinsic bioremediation assessment data collection and groundwater modeling, annual long-term groundwater monitoring, annual reporting, ICs, and five-year site reviews. These components enable continued assessment for compliance with performance standards and reporting of remedy progress.

AOC 43J

The remedy at AOC 43J is currently protective of human health and the environment and exposure pathways that could result in unacceptable risks are being controlled. In 2006, AOC 43J was joined with other adjacent properties and transferred from Army ownership to MassDevelopment to provide for a large redevelopment parcel for the Bristol-Myers Squibb facility. When the property transfer occurred, the existing ICs were incorporated into the property deed. As part of the property transfer process a technical update of the risk assessment was prepared for the 1996 ROD and recommended RAO that consisted of the addition of LUCs to prohibit residential site development and access to the site's groundwater. The technical update also required that a vapor intrusion evaluation would be required prior to any commercial or industrial development to ensure appropriate safeguards are in place relative to building design to minimize vapor intrusion concerns. The site is currently vacant and remains undeveloped.

Current remedial action activity consists of intrinsic bioremediation, intrinsic bioremediation assessment data collection and groundwater modeling, a long-term groundwater monitoring program, annual reporting, and five-year site reviews. A sulfate injection pilot study is currently ongoing to determine if enhanced intrinsic remediation will address the increasing organic concentrations in source area groundwater at AOC 43J and ensure long term protectiveness. An ESD will be submitted for the ROD to implement a full scale sulfate injection if the pilot study is proved to be effective and can meet the remedial duration requirement of the ROD. These components enable continued assessment for compliance with performance standards and reporting of remedy progress.

5.10 NEXT REVIEW

See Section 1.4 for further details.

5.11 REFERENCES

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6.0 SOUTH POST IMPACT AREA, AOCS 25, 26, 27, AND 41 (GROUNDWATER) STATUTORY FIVE-YEAR SITE REVIEW

6.1 SITE CHRONOLOGY

Table 6.1
Chronology of Events
South Post Impact Area 25

Event	Date
1,200 pounds per year (lbs/yr) disposal of explosives and ammunition by open burn or open detonation	From 1979 to 1992
Groundwater Measurements	1992-1998
Groundwater Sampling	1992-2004
Monitoring well installation	1992-1997
RI	1996
ROD signed	1996
LTMP issued	May 1997
First Five-Year Review	September 2000
Second Five-Year Review	September 2005
Revised LTMP	October 2008
Annual LTM & Maintenance	2005-2009

Table 6.2
Chronology of Events
South Post Impact Area 26

Event	Date
Open burn and open detonation of waste explosives	Prior to 1979
Demolition training	Ongoing
Groundwater Measurements	1992-1998
Groundwater Sampling	1992-Present
Monitoring well installation	1992-1997
RI	1996
ROD signed	1996
LTMP issued	May 1997
First Five-Year Review	September 2000
Second Five-Year Review	September 2005
Annual LTM & Maintenance	2005-2009
Revised LTMP	October 2008
Perchlorate Source Investigation	November 2009
AOC 26 Perchlorate Injection Letter Report	February 2010

Table 6.3
Chronology of Events
South Post Impact Area 27

Event	Date
Open burn and open detonation of grenades and pyrotechnics	Prior to 1979
Firing of small-caliber automatic weapons	Ongoing
Groundwater Measurements	1992-1998
Groundwater Sampling	1992-Present
Monitoring well installation	1992-1997
RI	1996
ROD signed	1996
LTMP issued	May 1997
First Five-Year Review	September 2000
Second Five-Year Review	September 2005
Revised LTMP	October 2008
Annual LTM & Maintenance	2005-2009

Table 6.4
Chronology of Events
South Post Impact Area 41

Event	Date
Groundwater Measurements	1992-1998
Groundwater Sampling	1992-Present
Monitoring well installation	1992-1997
RI	1996
ROD signed	1996
LTMP issued	May 1997
First Five-Year Review	September 2000
Waste debris removed to DCL	2002
Second Five-Year Review	September 2005
Annual LTM & Maintenance	2005-2006
LTM discontinued	April 2007

6.2 BACKGROUND

The SPIA is located within the 4,800-acre area known as the South Post of former Fort Devens. The SPIA is a 964-acre area that includes four AOCs to be addressed in this Five-Year Review: AOC 25, AOC 26, AOC 27, and AOC 41. For AOC 41, the provisions of the July 1996 ROD only apply to AOC 41 groundwater. AOC 25 is known as the former explosives ordnance discharge (EOD) Range and was closed in 1996. AOC 26 is known as the Zulu Range and includes the Zulu 1 and Zulu 2 training ranges. AOC 27 is known as the Hotel Range. A SPIA site location map showing the locations of AOCs 25, 26, 27 and 41 is provided as Figure 6.1. Close-up views of AOCs 25, 26, 27 and 41 are depicted on Figures 6.2 through 6.5, respectively. The SPIA was historically used for firearm and grenade training and also for open burning and detonation of explosives. The SPIA is currently an

active weapons and ordnance discharge area that is used by the Army, the Massachusetts National Guard and local law enforcement agencies.

Investigations performed at the SPIA have detected the presence of explosives, metals and VOCs in soil and groundwater at AOCs 26 and 27. The investigations also determined that groundwater discharges to surface water before leaving the South Post and therefore site contaminants are not a threat to off-site wells. A ROD was issued in July 1996 for the SPIA sites that selected "No Action" as the remedy for groundwater. Cleanup goals and ARARs were not specified in the "No Action" ROD but MCP GW-1and GW-3 groundwater standards, or background, if no MCP standard is available, have been adopted as a point of comparison for the required LTM groundwater monitoring. The remedy did not include any formal remedial action, but did include LTM activities and an Integrated Natural Resources Management Plan (INRMP). The INRMP was written to monitor impacts of the current land use to ecosystems within the SPIA monitoring area.

6.2.1 AOC 25 (EOD Range) Background

The EOD Range is located east of Firebreak Road, approximately 2 miles south of the main entrance to the South Post. The site is rectangular and measures approximately 600 ft by 1,500 ft.

From 1979 to 1992, approximately 1,200 pounds per year of explosives and munitions were disposed of at the disposal area at the east end of the range by either open burning or open detonation. The 1994 RI indicated that the EOD Range currently operates with RCRA emergency permit status on a case-by-case basis. Open burning involved the placement of ordnance (small arms ammunition, smoke grenades, cartridge activated devices, and pyrotechnics) in a pit or a trench within the designated 2-acre area. The items were completely covered with packing material, wooden crates, or cardboard; soaked with diesel fuel, oil, and non-serviceable waste flammables; and ignited with smokeless powder charges. The pit was allowed to burn out and to cool for 24-hours before the items were inspected for completeness of burn. Typically, if the pit was to be reused, the items were excavated and buried nearby. If the pit was not to be reused, the pit was generally backfilled (E&E, 1994).

Open detonation was used on munitions and ordnance that contain explosive fillers. They were detonated with an explosive counter charge, such as Composition C-4 (Harrisite) or trinitrotoluene (TNT), in open pits or on a flat surface. The procedure involved the placement of railroad ties side by side on a flat surface and the attachment of explosives to the uppermost exposed surface of the ordnance. This was designed to direct the force of the explosive counter charge downward, destroying the item through detonation (E&E, 1994).

Possible metals contaminants, per the 2004 SPIA Annual Report, within AOC 25 include: copper and zinc from brass shell casings at disposal areas; lead from bullets in the impact areas; and iron, aluminum and possibly other metals (barium and cobalt) from pyrotechnics at impact or training areas. Manganese, chromium and nickel could also come from armored target vehicles, but these metals are in metallic form, which are relatively insoluble. The use of pyrotechnics could leave a more varied residue of several heavy metals (USACE, 2005).

The range was closed as part of the 1996 ROD (Figure 6.2).

6.2.1.1 Groundwater

Groundwater elevation data collected during the RI, performed in 1994, indicated groundwater flow moving to the northeast away from Slate Rock Brook. The topographic depression at the impact area could influence contaminants that are located in the EOD Range. Unfiltered samples collected from the EOD Range during the RI indicated concentrations of iron, aluminum, and other metals above established background concentrations. Filtered samples showed concentrations several orders of magnitude lower than in the unfiltered samples. Four explosives compounds were detected in the samples; however, only the cyclotrimethylenetirnitramine (RDX) detection exceeded the screening value.

6.2.1.2 Surface Water

Surface water runoff within the EOD Range was determined to be limited to seasonal events such as snowmelts, runoff over frozen ground, or during exceptional storms. Evidence of surface water has not been reported to be present within or adjacent to the EOD Range.

6.2.1.3 Soil

Surface and subsurface soil samples collected during the RI at the EOD Range in November 1993 were analyzed for TAL metals, explosives, and TPH compounds. Several metals were detected at concentrations above background in at least one sample. Copper and zinc exceeded the background concentration in three surface samples. Two explosives were also detected in EOD Range surface soil samples: nitrocellulose (detected in two samples) and nitroglycerine (detected in one sample). Low concentrations of TPH compounds were detected with a maximum concentration of 45.2 μg/g. None of the detections exceeded the health-base soil screening criteria established for the RI.

6.2.1.4 Investigative Conclusions and Recommendations

Soils at the EOD Range ordnance detonation area contained compounds that exceeded the 1994 RI background concentrations in beryllium, cobalt, copper, iron, manganese, mercury, nickel, selenium, and zinc, although only zinc and copper exceeded background in three samples, and only beryllium, manganese, and selenium exceeded background in two samples. The remaining four metals exceeded background in only one sample, which was significantly higher in silt and clay than other samples from the site. Nitrocellulose, nitroglycerine, and TPH compounds were also found in surface soils. TPHC and a trace of PCE were noted in subsurface soils. The two RCRA Toxicity Characteristic Leaching Procedure (TCLP) soils samples showed no concentrations exceeding soil toxicity characteristics. Metals in filtered groundwater samples showed increased concentrations and increased frequency of detection in downgradient wells when compared to an upgradient background well, but only manganese exceeded its site health-based screening value as presented in the ROD. Several explosives were noted in groundwater within in the AOC, but only RDX exceeded its screening value.

The EOD Range is under Army control and there are no future plans to remove this site from Army control. Groundwater from the vicinity of AOC 25 will not be available to the public for human consumption and will not be a completed pathway of exposure. As such, the risk of groundwater consumption was not estimated. Other pathways of exposure examined gave reasonable maximum exposures resulting in the assessed risks being below those deemed acceptable by the USEPA under current superfund policy.

The completed ecological risk assessment concluded that there were potential risks to small mammals and to plants in the ordnance detonation area, under reasonable maximum exposures, but not under average exposures. Based on the marginal exceedances of toxicity reference values, the potential for adverse ecological toxicological effects were determined to be minimal. The EOD range had not adversely affected the ecosystems in the general vicinity of the site, and the analytes detected were not ecologically significant. The ecological risk assessment concluded that no action was necessary at the EOD range to further investigate or mitigate ecological risks from soil or other media.

The RI concluded that no further investigation or remediation was warranted at AOC 25, due to the continued use of this land by the military.

6.2.2 AOC 26 (Zulu Ranges) Background

AOC 26 (Zulu Ranges 1 and 2) is located 2,000 ft north of the EOD Range, approximately 1.6 miles southwest of the main entrance to the South Post (Figure 6.3). The Zulu Ranges cover approximately 16 acres and consist of two adjacent land tracts, Zulu 1 and Zulu 2. Prior to 1979, the range was used for Open Burn/Open Detonation (OB/OD) of waste explosives and associated waste items. From 1979 to the present (2009), Zulu 1 has been primarily used for demolition training. The demolition training area is located in the center of Zulu 1. Zulu 2 has been historically used as a practice range for hand grenade training. The grenade training area is located on the eastern end of Zulu 2 and consists of two concrete bunkers, which are used for cover and protections, and two sand pits that are used for receiving grenades. Training Ammunition Usage by Facilities reports from January 1, 2004, through July 29, 2009, included as Appendix E.

Possible metals contaminants, per the 2004 SPIA Annual Report, within AOC 26 include: copper and zinc from brass shell casings at disposal areas; lead from bullets in the impact areas; and iron, aluminum and possibly other metals (barium and cobalt) from pyrotechnics at impact or training areas. Manganese, chromium and nickel could also come from armored target vehicles, but these metals are in metallic form, which are relatively insoluble. The use of pyrotechnics could leave a more varied residue of several heavy metals (USACE, 2005).

6.2.2.1 <u>Groundwater</u>

Based on confirmation from recent (2009) groundwater elevation data, the general groundwater flow path in the Zulu range was confirmed as being from south to north/northeast towards a pond/wetland area with an overall flow direction oriented towards the interior of the SPIA and away from the SPM boundary. The 1996 RI findings revealed total metals

concentrations in groundwater at the Zulu range wells had exceeded established background concentrations; however, filtered samples showed much lower concentrations. Explosive and explosive related compounds RDX, cyclotretramethylenetetranitramine (HMX), and TNT were detected in Zulu Range groundwater samples. Only RDX was detected above its health-based screening value. Monitoring wells located in the vicinity of the grenade throwing and demolitions areas showed the highest concentrations of explosive-related substances.

6.2.2.2 Surface Water

Thirteen surface water samples were collected during the 1996 RI. Analytes detected above Ambient Water Quality Criteria (AWQC) included the metals arsenic and lead and the pesticide dichloro-diphenyl-dichloroethane (DDD). In addition, the explosives RDX and HMX, and several organic compounds, were detected in Zulu range surface water samples.

6.2.2.3 Sediment

Several metals in the Zulu Range sediment samples were detected above background concentrations in at least one sample. Explosives, pesticides, VOCs, and TPHC were also detected.

6.2.2.4 Soil

Soils at AOC 26 were described as very well drained. It was suggested that, due to the permeability of soils in AOC 26, contaminants could be leached to groundwater. Surface and subsurface soil samples were collected at the Zulu Ranges as part of the SI and RI. These samples were analyzed for target compound list (TCL) organics, TAL metals, explosives, and TPHC. Results indicated several metals exceeded background concentrations in at least one surface and subsurface sample, none of the metals exceeded the health-based screening values. PAHs were detected in up to three surface and subsurface samples. One of the PAHs, benzo(b)fluranthene (0.81 μg/g), exceeded the screening concentration (0.7 μg/g). RDX and TPHC were also detected. The maximum concentration of RDX in subsurface soil (38 μg/g) exceeded the health-based screening level (26 μg/g).

6.2.2.5 Investigative Conclusions and Recommendations

Results of the RI indicated soils at AOC 26 were contaminated with several chemicals, including explosives, primarily RDX; pesticides, 2,2bis(para-chlorophenyl)-1, 1-1 trichloroethane (DDT); some PAHs; and traces of PCBs and volatiles. TCLP testing for surface soils showed only barium and chloroform present, both below RCRA toxicity characteristic concentrations. Lead, zinc antimony, arsenic, beryllium, and cadmium exceeded background, but only lead and zinc could be related to possible site activities. Groundwater was contaminated with explosives, primarily RDX (exceeding a Drinking Water Health Advisory level used as a screening value) and HMX, and by bis(2-ethylhexyl) phthalate, also at concentrations exceeding a screening value. Groundwater was identified as discharging to surface water and sediment in the wetland north of the ranges. Unfiltered groundwater showed several elevated metals, but filtered groundwater only showed exceedances of health-based screening values for manganese. Surfacewater showed

explosives, primarily RDX, and methylphenol and traces of VOCs. Sediments in the wetlands showed explosives, mainly RDX, and methylphenol and traces of volatiles. Many metals exceeded background. Because the ranges will remain active as a training facility and under DoD jurisdiction for the foreseeable future, risk from groundwater consumption was not assessed although there is a drinking water well, D-1, in the SPIA. In addition, the estimated human-health risks of exposure under any probable scenario do not exceed the upper limit of acceptable risks use by the USEPA under the current Superfund guidance. The upper limit was a one in 1,000,000 excess lifetime risk of cancer, and a non-cancer hazard index (HI) of one.

The ecological risk assessment found that some soils data exceeded reference values for plants, small mammals, and songbirds, but those exceedances were of such limited extent and the habitat is so disturbed at those locations from ongoing military training activities as to be ecologically insignificant. Concentrations of lead in surface water exceeded water quality criteria, but site specific toxicity testing indicated no toxicity attributed to lead for aquatic receptors. The ecosystems at AOC 26 did not appear to be adversely affected, as indicated by the thriving communities of benthic invertebrates and wildlife observed during the field surveys.

6.2.3 AOC 27 (Hotel Range) Background

Hotel Range is located adjacent to Cranberry Pond and is located approximately 1 mile south of the main entrance to the South Post (Figure 6.4). The Hotel Range covers approximately 23 acres and is currently used exclusively for firing small caliber weapons. The AOC is presently located entirely south of Old Turnpike Road; however, prior to 1979, the Hotel Range extended to the north side of the Old Turnpike Road and used for M16s and small caliber weapons. The range has also been used as an M-70 range and after 1989 the range was modified for use as an M60-SAW range.

Possible metals contaminants, per the 2004 SPIA Annual Report, within AOC 27 include: copper and zinc from brass shell casings at firing areas; lead from bullets in the impact areas; and iron, aluminum and possibly other metals (barium and cobalt) from pyrotechnics at impact or training areas. Manganese, chromium and nickel could also come from armored target vehicles, but these metals are in metallic form, which are relatively insoluble. The use of pyrotechnics could leave a more varied residue of several heavy metals (USACE, 2005).

6.2.3.1 <u>Groundwater</u>

RI results indicated general groundwater flow is heading north and west away from Cranberry Pond towards the wetland (North of Old Turnpike Road). Metals concentrations detected in the site's groundwater were similar to AOCs 25 and 26. All wells in this area indicated some levels of explosives contamination. RDX and 1,3-dinitrobenzene exceeded their health-based screening values.

6.2.3.2 Surface Water

During the RI, nine surface water samples were collected from Cranberry Pond, adjacent to Hotel Range. Several metals were detected in the samples, but only lead exceeded the AWQC. Trace concentrations of explosives were detected in these samples.

6.2.3.3 Sediment

The majority of sediment samples collected in Cranberry Pond contained some metal concentrations in excess of those naturally occurring in the sediment. However, the data indicated that only one sample was obviously contaminated with metals. The explosive 4-amino 2, 6-dinitrotoluene was detected in several samples. VOCs, pesticides, TPHC and two PAHs were also detected.

6.2.3.4 Soil

Subsurface soil samples were collected from boreholes at the Hotel Range and analyzed for TPHC, TAL metals, explosives, and TCL organics. Analytical results indicated that no metals exceeded the screening values. Low concentrations of TPHC (maximum concentration of 75.6 μg/g), below the screening level of 5,000 μg/g, were detected in some samples. VOCs and pesticides were also detected at concentrations just above the detection limit. These concentrations were well below screening values.

6.2.3.5 Investigative Conclusions and Recommendations

Soil and groundwater at AOC 27 are affected by military training activities, shown primarily by the presence of explosives, pesticide, and TPHC in soil, groundwater, surface water, and sediment. Previous investigation results had indicated that lead concentrations were elevated in subsurface soil and in surface water. The pesticides, mostly DDT and its derivatives DDD and dichloro-diphenyl-dichloroethylene (DDE) were below background in soils and were not present in groundwater, which only showed low concentrations of delta-BHC (0.045ug/L in the one confirmed result). Pesticide residues are likely to be a result of pest control rather than training activities at the site. Explosives in the groundwater are by far the most conclusive evidences of effects from site operations. During the RI investigation, groundwater from all wells showed at least some concentrations of explosives related compounds, with RDX, HMX, and 1,3-dinitrobenzene the most frequently observed compounds. The groundwater affected by the site flows north across Old Turnpike Road to a wetland within the northern part of Hotel Range, or possibly continuing towards Slate Rock Pond.

The risk to human health at AOC 27 has been calculated for users, site workers, and trespassers. All estimated potential risks for carcinogens and non-carcinogens were below current USEPA superfund policy lower limits for lifetime risks. The occurrence of carcinogenic effects is below one in 1,000,000 excess risks per lifetime, and non-carcinogenic health effects are highly unlikely.

No evidence of site related chemical stress to plants or wildlife was observed during the field surveys. The toxicity testing done at Zulu Ranges (AOC 26) implied that the level of lead in Cranberry Pond water does not pose a hazard to aquatic biota. The mean concentrations of COPC were unlikely to pose a risk to the selected receptors, mallards, and raccoons, with the possible exception of the effect of copper on mallards. Potential risks to benthic invertebrates from several metals in sediments (antimony, copper, lead, mercury, and nickel), and also from 4-amino-2,6-dinitrotoluene, were noted. These risks have high levels of uncertainty and did not apply to average concentrations but only to reasonable maximum exposure concentrations. In general, this risk assessment was more likely to overestimate risks than to underestimate them.

Periodic review of the risk assessment in light of increased toxicological information of the effects of the existing levels of contamination should be used to improve the assessment of risk to the environment. Based on the results of the environmental investigations and the human health and ecological risk assessments, no contamination is present at concentrations that pose unacceptable risks to human health or the environment. AOC 27 will continue to be used as a firing range by the Army, and no further investigation or remedial action is recommended at the Hotel Range.

6.2.4 AOC 41 (Unauthorized Dumping Site) Background

AOC 41 is located immediately north of New Cranberry Pond (separate from Cranberry Pond), east of Delta Range, and west of Harvard Road, approximately 2 miles southeast of the main entrance to South Post. AOC 41 is approximately 6 acres in size. The dumping site occupies an area approximately 75 square ft in the central portion of the site. It appears to have been associated with a historic brick making kiln that was operated in this area in the 1800s. The AOC is overgrown with trees and swampy vegetation and no records are available detailing when the site was used or what type of material was disposed of in this area. It is believed that this AOC was used until the 1950s for disposal of non-explosive military and household debris. Miscellaneous debris was scattered over a small hill located approximately 75 ft north of New Cranberry Pond (Figure 6.5).

6.2.4.1 <u>Groundwater</u>

According to the RI, groundwater flow near AOC 41 is complex. The majority of flow enters the general groundwater flow pattern northeast toward the Nashua River. This general movement, away from New Cranberry Pond, was based upon RI analysis where long-term water level monitoring was performed at the pond and at wells 41M-92-01X and 41X-93-03X. Groundwater models developed in conjunction with the RIs indicated that there are several groundwater divides in the area and that most groundwater discharges to surface water before leaving SPIA.

The water level of New Cranberry Pond is significant in defining the direction of the groundwater flow in the lower sand. The water level in the pond has been controlled by a culvert located on the eastern shore, impeding flow and maintaining a high water level. The

pond recharges the aquifer and helps direct the local groundwater flow toward the north and east.

The aquifer below AOC 41 can be classified as an unconfined overburden aquifer. The aquifer is reportedly recharged by surface water infiltration, percolation, and recharge from surface water from new Cranberry Pond. Hydraulic conditions at AOC 41 are influenced by a road culvert located at the eastern end of the pond that artificially raises the surface water elevation in the pond, causing the surface water to recharge groundwater below AOC 41. The predominant local groundwater flow direction at AOC 41 is to the northeast, eventually discharging into the Nashua River.

Results of RI groundwater sampling and field analysis indicated that the existing groundwater contaminant plume is confined to the upper portion of the aquifer and it is oriented in a northeast-southwest direction. The groundwater was shown to contain several VOCs including: PCE, trichloroethene (TCE), and 1,1,2,2-tetrachloroethane. Results also indicated several metals were present above established background concentrations in the unfiltered samples. Significantly lower metals concentrations were observed in the filtered samples. Coupled with elevated TSS, measurements suggest that elevated concentrations in unfiltered samples are likely the result of suspended solids and not dissolved site-related contaminants. Based on the chemical properties of the contaminants, the slow rate of groundwater flow in the clayey silt, and the existing downgradient groundwater results (41M-94-09A and B), it appears that the distribution of the groundwater contamination had been determined, and that the likelihood of contaminant migration to any exposure point (i.e., Well D-1) was unlikely.

6.2.4.2 Soil

In March 1995, a soil gas survey was performed in the shallow soils around monitoring wells 41M-93-03X and 41M-94-03B in an attempt to find the source area for the chlorinated solvent contamination detected in the groundwater. The soil gas survey identified two detections of TCE around the two wells. Soil samples collected from the same TerraProbe points used in the soil gas survey, indicated TCE to be present in soils adjacent to the two wells at the 30 to 37 ft bgs.

Soil samples collected from five test pits in the area did not indicate the presence of any target analytes. Soil samples collected from the monitoring well borings during their emplacement in October 1994 indicated the presence of TCE beneath 30 ft bgs level. The distribution of the TCE contamination coincides with the depth of the water in the boring. Therefore, it appeared that the TCE contamination resulted from absorption of TCE from groundwater to soil particles within the zone of the water table fluctuation. The area around 41M-93-03X and 41M-94-03B did not appear to be the source of the groundwater contamination.

6.2.4.3 Investigative Conclusions and Recommendations

The following conclusions are based on interpretation of data collected from each of the previous investigations completed at AOC 41.

Results of RI groundwater sampling and field analysis completed during the RI, indicated that the existing groundwater contaminant plume appears to be confined to the upper portion of the aquifer and it is oriented in a northeast-southwest direction. Based on the chemical properties of the contaminants, the slow rate of groundwater flow in the clayey silt, and the existing downgradient groundwater results (41M-94-09A and B), it appears that the distribution of the groundwater contamination has been determined, and that the likelihood of contaminant migrations to any exposure point (i.e., well D-1) is minimal.

Surface water and sediment from New Cranberry Pond were sampled during previous investigations. An assessment of the potential surface soil migrations pathways showed that no migration pathway exists between the contaminants detected in the surface soil on the waste material and New Cranberry Pond surface water and sediment. Because of these reasons, the previous surface water and sediment data were not evaluated in the RI.

The baseline HHRA was limited to an evaluation of the exposure potential to groundwater at AOC 41, and a summary of quantitative risk evaluation for groundwater from transient non-community supply well D-1. The risk assessment concluded that there are no unacceptable risks to human health from the groundwater well D-1 for troops that consume the water for approximately 14 days per year, and that no further action would be required under CERCLA. Based on the results and interpretation of the physical and chemical data, and taking into account that the future land and groundwater use of this AOC will be similar to the present use, it was recommended that the Army complete a Proposed Plan and monitoring ROD for the groundwater at AOC 41 and to include the AOC 41-related contaminants in the analysis of the groundwater.

6.3 REMEDIAL ACTION

A ROD for the SPIA sites was signed in July 1996 documenting "No Action" as the final selected remedy for the SPIA monitored-area groundwater, surface water, soil, and sediment, and AOC 41 groundwater. Because "No Action" was selected and approved as the remedy, a FS was not performed and RAOs were not developed.

6.3.1 Selected Remedy

The selected remedy is described below. Implementation of the remedy is described in Subsection 6.3.2.

- Groundwater monitoring; 1) monitoring wells will be used to monitor the groundwater from the EOD Range, Zulu Ranges, Hotel Range, and AOC 41; 2) Monitoring wells will be used to monitor the north, northeast, southeast, and east sides of the SPIA monitored-area.
- Monitoring wells will be sampled for explosives, TCL organics, and TAL metals.
- A groundwater monitoring plan for the South Post will be developed that will include detailed groundwater monitoring at discharge points. The plan may include installation of additional monitoring wells to monitor for off-site groundwater flow.

- Well D-1 will be sampled and samples will be analyzed for explosives and Massachusetts and federal drinking water requirements (MMCLs/MCLs).
- The Army will not develop new drinking water sources within the SPIA monitored area.
- An INRMP will be developed and implemented to monitor adverse affects on the ecosystem in the SPIA monitored area.
- Monitoring reports will include a description of site activities and a summary of analytical results. The Army will submit these reports annually. If there is an indication of contamination emanating from the SPIA monitored-area, the Army will evaluate the need for additional assessment.
- As required by CERCLA, the site will be subject to five-year reviews to assess if the No Action remedy remains protective of human health and the environment.
- Should the Army close, transfer or change the use of this property, an EBS will be performed, and the "no action" decision of this ROD will be re-examined in light of the changed use and risk factors resulting from this closure/transfer.

6.3.2 Remedy Implementation

Implementation of the remedy is described below.

Long-Term Groundwater Monitoring Plan

The initial LTMP for the SPIA was issued in May 1997. The plan details the individual wells to be sampled on an annual basis. The plan also provides sampling methodology and analytical requirements. Additional monitoring wells were installed at AOC 26 and within SPIA to act as sentinel wells.

The LTMP was revised and reissued in October 2008. The 2008 LTMP incorporated changes to the SPIA monitoring program and included the following:

- Four monitoring wells and two well points sampled annually at AOC26. All wells sampled for explosives and TAL total metals. One monitoring well and both well points additionally sampled for perchlorate.
- Four monitoring wells sampled for TAL total metals and explosives biennially at AOC27.
- Eight SPM wells sampled for TAL metals and explosives annually. One SPM monitoring well, formerly part of AOC41, additionally sampled for VOCs.
- One drinking water well sampled annually for explosives.
- Gauge water levels at all monitoring wells at AOCs 25 and 41 every 5 years. Discontinuation of groundwater sampling at AOC 41 was approved after the 2006 LTM event with one well re-designated/retained as a SPM well. Discontinuation of groundwater sampling at AOC25 was approved based on recommendations in the 2004 LTM Report (USACE-NAE, 2005).

The SPM wells are used to monitor the north, northeast, southeast, and east sides of the SPIA monitored-area. One AOC 41 well was retained as an SPM well based on a detected VOCs constituent. Monitoring wells at AOC 26 and 27 are sampled based on historic use of the sites for firearms and grenade training, as well as burning/open detonation of explosives. Three additional well points, not detailed in the 2008 LTMP, were installed in November 2009 at AOC 26 to delineate groundwater per an AOC 26 Perchlorate Work Plan (HGL, 2009).

Integrated Natural Resources Management Plan

An Ecological Sampling Work Plan was developed and implemented in 1998 to characterize surface water and sediment quality within the SPIA. Since 1998, the Army has completed various assessments including sensitive area characterizations, review of wetland complexes, benthic and mollusk studies, and review of impacted species. These studies have been submitted to the appropriate Fish and Wildlife Agencies.

The ROD issued for AOCs 25, 26, and AOC 27 in July 1996 selected "No Action" as the remedy for groundwater. The remedy did not include any formal remedial action but did include LTM activities and an INRMP. The ROD required INRMP was developed to assess if there were threats posed from SPIA ongoing or residual activities. The INRMP guided implementation of the natural resources program at Fort Devens, Massachusetts. The program provides conservation of Fort Devens land and natural resources and helps ensure compliance with environmental laws and regulations. The INRMP helps ensure the maintenance of quality training lands to accomplish Fort Devens critical military mission on a sustained basis and to ensure that natural resources conservation measures and U.S. Army Reserve military mission activities are integrated and consistent with federal stewardship requirements. The 2005 through 2009 INRMP accomplished the following:

- The capstone for this five-year period was an interagency agreement between Fort Devens and the national refuge system of the U.S. Fish and Wildlife Services (USFWS), Region 5. The agreement authorized the two agencies to cooperate on natural resource management action that are mutually beneficial to wildlife species, the two agencies, and the public. This achievement aided in the following:

    1) The Army contributed to the cost of radio telemetry units and other supply items in support of the Service's efforts to help populate threatened species in the Oxbow National Wildlife Refuge (NWR) area to the Assabett NWR. The radios allowed biologists to monitor movements and survival, specifically, of the Blanding's turtle population. The goal has been to repopulate historical habitats with this species.

    2) A second example of cooperative action involved habitat restoration on both sides of the Nashua River. The Army provided funds and contract specifications through the contracting office of the Service. The result was additional bare ground for nesting turtles on the Oxbow NWR and a 3-acre clear-cut to regenerate a stand of aspen and maple on Army land. That stand will provide early succession forest habitat for species such as American woodcock and Woodland Jumping mouse.

- Continuation of surveying breeding bird populations on the South Post with emphasis on grassland birds on the Turner Drop Zone.
- Continuation of work with Mass Wildlife by hosting "Becoming an Outdoors Woman" program events, and supporting the state's annual deer season for mobility impaired hunters.

The Army is currently in the process updating the INRMP for submittal in the fall 2010. The updated INRMP will guide the implementation of natural resources program at Fort Devens from 2010 through 2015. The objectives of the INRMP will continue to ensure land remains available for missions; land is maintained in the best natural conditions to preserve ecosystems; and to minimize land-related restrictions on training.

Groundwater Sampling

Annual groundwater monitoring has been performed since 1997. The most recent LTM sampling event occurred in October 2009. Annual reports have been provided for the 1997 through 2009 sampling events. The 1998 Annual Report also included results of the ecological surface water and sediment sampling. The Hydrant/drinking water well, Well D-1, was sampled during each sampling event.

Other Control Measures

The Army will not develop new drinking water sources within the SPIA-monitored area. Should the Army close, transfer, or change the use of this property, an EBS will be performed, and the "No Action" decision of this ROD will be re-examined in light of the changed use and risk factors resulting from this closure/transfer.

Five-Year Reviews

As required by CERCLA, the site is subject to five-year reviews to assess if the "No Action" remedy remains protective of human health and the environment.

6.3.3 System Operation/Operations and Maintenance

Groundwater monitoring is performed in accordance with the LTMP (HGL, 2008) for the SPIA. Costs for implementation of the remedy are estimated to be approximately $55,000 per year and includes costs associated with monitoring, sample analysis, and data reporting.

6.4 PROGRESS SINCE LAST FIVE-YEAR REVIEW

This is the third five-year site review for SPIA. The Army will continue, as recommended in the 2005 Five-Year Review, to evaluate the potential for off-site migration, impact to sensitive receptors, trend analysis, and remedial duration as part of the 2008 LTMP for SPIA.

The following is the complete Protectiveness Statement from 2005:

> *"The No action remedy at AOCs 25, 26, 27, and 41 is protective of human health and the environment and exposure pathways that could results in unacceptable risks are being controlled.*

Human health risk is currently limited at AOCs 25, 26, 27, and 41 because groundwater at the AOCs is being used for potable use on a limited basis by a small, healthy population (by soldiers, during short-term military training exercises). Current conditions at the South Post Impact area (including eliminating the use of D-1) are consistent with the assumptions made during the risk assessment portion of the Remedial Investigation (ABB-ES, 1996).

The Army has installed groundwater monitoring wells and initiated long-term monitoring. The 2003 annual groundwater monitoring report and the groundwater sampling data from fall 2004 document that groundwater concentrations of VOCs and metals, at AOCs 25, 26, 27, and 41, are generally below drinking water standards.

Current remedial action activity consists of continued long-term groundwater monitoring, annual reporting, and five-year site reviews. These components enable continued assessment for compliance with performance standards and reporting of remedial progress."

The "Recommendations and Follow-up" actions table of the 2005 Five-Year Review stated the following:

- "Finalize the Integrated Natural Resource Management Plan."

The INRMP was finalized and issued in 2005. A 2010 revision to the document is pending. Agencies that had prepared comments for preparation of the INRP included "U.S. Department of the Interior, USFWS, Central New England Fishery Resources Office" and "Commonwealth of Massachusetts, Division of Fisheries & Wildlife."

In addition, the last Five-Year Review included the following statement under the Recommendations table:

- "The Army should continue to evaluate the potential for off-site migration, impact to sensitive receptors, trend analysis, and remedial duration at part of the established LTMP for SPIA."

The Army has continually evaluated these factors against the original LTMP and then the later 2008 LTMP. The resultant information from the evaluations was detailed in annual reports which were reviewed by regulatory agencies.

6.5 FIVE-YEAR REVIEW PROCESS

6.5.1 Administrative Components of the Five-Year Review Process

Development of the third Five-Year Review process for former Fort Devens included the following components that are described in this section:

- Document Review;
- Data Review;
- Site Inspection;

- Interviews; and
- Community Participation.

6.5.2 Document Review

The following documents were evaluated for this five-year review:

- Remedial Investigations for AOCs 25, 26, and 27 prepared by EEP, March 1994.
- Final Remedial Investigation Report, AOC 41, prepared by ABB-ES, February 1996.
- ROD for SPIA, AOC 41 Groundwater, and AOCs 25, 26, and 27 prepared by USEPA, July 1996.
- Final Long-Term Monitoring Plan prepared by Stone & Webster, May 1997.
- Second Five-Year Review Report prepared by Nobis, September 2005.
- 2004 Semi-Annual Report prepared by USACE, January 2005.
- Final 2005 Annual Report prepared by HGL, March 2007.
- Final 2006 Annual Report prepared by HGL, August 2007.
- Final 2007 Annual Report prepared by HGL, July 2008.
- Revised Long-Term Monitoring Plan (LTMP) prepared by HGL, Inc., October 2008.
- Final 2008 Annual Report prepared by HGL, September 2009.
- Perchlorate Investigation Report for AOC 26 prepared by HGL, February, 2010.
- Draft-Final 2009 Annual Report prepared by HGL, April 2010.

6.5.3 Data Review

Tables 6.5-6.8 and Figures 6.10a and 6.10b summarize the trends of SPIA contaminants that have exceeded regulatory standards from 1992 through November 2009. A complete list of all validated contaminant analytical sampling results from 2005 through 2009 is presented in Appendix E.

A majority of the explosives, perchlorate, VOCs, and metals results were low to non-detect, and COC concentrations are generally declining. AOC 26 (Zulu Ranges) is the only AOC where there was an observed rise in COCs during this five-year review period but focused monitoring at AOC 26 beginning in 2009 revealed a declining concentration trend for the observed COCs.

<u>AOC 25 Groundwater</u>
Groundwater sampling at AOC 25 (a total of two wells) was discontinued after the 2004 annual event based on recommendations in the 2004 Annual Report. The recommendation to

discontinue sampling was based on the eight year history of LTM efforts (1997 to 2004) during which none of the studied parameters exceeded state or federal MCLs at either well. Additional support for the discontinuation of sampling included the observation that only two exceedances of Devens background levels occurred during that time period. No LTM activities were performed during the current five-year reporting period. However, groundwater level data was collected periodically at AOC 25, with the latest measurements taken in October 2006.

AOC 26 Groundwater

Total metals detections at the AOC 26 wells have been below the respective GW-3 and GW-1 standards since 2003 and below the background levels since 2006. Since metals monitoring started at downgradient locations 26WP-06-01 in 2007 and at 26WP-08-02 in 2008, both well points have yielded groundwater exhibiting detections above the iron and the zinc background levels, theGW-3 standard and, most recently for well point 26WP-08-02 in 2009, an exceedance of the GW-1 standard. In addition, well point 26WP-08-02 has yielded arsenic detections in groundwater above the GW-1 standard since 2008, and a single lead detection above the GW-1 and GW-3 standards in 2008. Although iron and zinc in groundwater from well point 26WP-06-01 indicate the initialization of a downward trend, both AOC 26 well points have only been included in the metals analysis program for a maximum of three years, and no confirmed trend can be determined at this time. In a few cases, elevated turbidity may be responsible for the total metals exceedances, specifically at 26WP-08-02 after its installation and development. It should also be noted that the well points were installed for the purpose of monitoring explosives and perchlorate and are not optimal for total metals.

Explosives have not been detected at well 26M-92-02X or 26WP-08-02. The latter well has been sampled only twice. At the other AOC 26 wells, explosive compounds have been detected. Since sampling began in 1992, all HMX detections have been below the recently promulgatedGW-1 value of 200 μg/L (Figure 6.6). By comparison, the majority of RDX detections have been above the new 1.0 μg/L GW-1 standard. In general, RDX concentrations in wells 26M-92-03X, 26M-92-04X, and 26M-97-08X indicate a mixed but generally downward trend since the 2004 sampling event (Figure 6.8); however, such a decline was also evident between the 1997 and 1999 events and is likely transient, as suggested by the November 2009 results.

Perchlorate was permanently added to the AOC 26 contaminants list in 2006 and was reported for the 2006 through 2009 sampling events. The 2008 LTMP incorporated perchlorate as a sampling requirement for AOC 26 per agreement reached between the Army and regulatory agency. Well 26M-92-04X and well points 26WP-08-02, 26WP-09-01, 26WP-09-02, and 26WP-09-03 have consistently yielded groundwater perchlorate results close to or below the 2 μg/L GW-1 standard, whereas well point 26WP-06-01 ground water has indicated a concentration incline since monitoring began. Supplemental perchlorate sampling was performed in the months of May, August, October, and November 2009 to determine whether the elevated perchlorate concentration detected at 26WP-06-01 accurately represented an increasing concentration trend. This sampling revealed that perchlorate peaked at 305 μg/L in May 2009 and has continued a steady decline during subsequent events.

The Army performed a perchlorate investigation at AOC 26 and determined that there is no indication that perchlorate is migrating off the SPM area. Groundwater flow direction at AOC 26 would direct contaminants, if present, in the direction of AOC 27 towards Slate Rock Brook and not towards the western SPM boundary. The Army's findings, presented in a January 2010 letter report, indicate that perchlorate is decreasing and there is no significant perchlorate source present at the site. The detected perchlorate is likely the result of recent range activities and is transient in nature. The Army will continue supplemental perchlorate monitoring in 2010 to confirm the decreasing concentration trend and will be installing a new monitoring well near downgradient well point 26WP-09-02.

Based on analytical results from 2005 through 2009, arsenic, iron and zinc exceedances above the respective groundwater standard or background level are confined to AOC 26. The groundwater flow direction is to the northeast based on the 2009 groundwater elevation data and any potential migration would be confined within the SPM boundary. The November 2009 concentrations reported for groundwater from downgradient well point 26WP-08-02 are as follows: 46 μg/L arsenic 15,000 μg/L iron, and 11,000 μg/L zinc. It should be noted that some of the elevated total metals are likely due to elevated turbidity, notably at 26WP-08-02. The total metals exceedances, even without turbidity issues, are not unanticipated because the well points were installed for perchlorate and explosives monitoring and are not optimal for metals analyses. The well points contain galvanized metals and are a potential contributor of iron and zinc. The well points will be replaced with the permanent well discussed previously. Total metals exceedances of background concentrations at permanent wells were also observed but did not show an increasing trend. Based on this information a potential for total metals migration does not exist.

AOC 27 Groundwater

All metals detections in groundwater for the AOC 27 wells have remained below the respective GW-1 and GW-3 standards since 1997. Various metals have, however, periodically surpassed the respective background levels, such as lead in well 27M-93-06X (7.8 μg/L), potassium in well 27M-93-05X (2,600 μg/L), and zinc in well 27M-92-01X (25 μg/L) as observed during the October 2008 event.

At AOC 27 the only well with consistent detections for RDX and HMX in groundwater is 27M-93-06X, whereas wells 27M-92-01X, 27M-93-05X, and 27M-93-08X have followed a general downward trend to non-detection in October 2006. HMX in groundwater from well 27M-93-06X is consistently below the 200 μg/L GW-1 standard (Figure 6.7). RDX concentrations in groundwater from this well fluctuated slightly above and below the 1.0 μg/L GW-1 standard since the 1999 sampling event (Figure 6.9).

AOC 41 Groundwater

Groundwater LTM was discontinued at AOC 41 following the 2006 LTM event. All target VOC and explosives results for groundwater from wells 41M-94-09A, 41M-94-09B, 41M-94-11X, 41M-94-12X, 41M-94-13X, and 41M-94-14X were below the groundwater standards between 1994 and October 2006, and the majority of these results were non-detections. Consequently, the USEPA and MassDEP approved a discontinuation of groundwater monitoring at these wells in 2007. Groundwater elevation data is collected on a periodic basis.

Due to a minor exceedance of the TCE GW-1 standard in October 2006, annual sampling at well 41M-93-04X, groundwater sampling at this well was continued as part of the SPM well network. Historically, target VOCs and RDX have been detected intermittently at well 41M-93-04X since 1994. Only two detections were greater than groundwater standards: 3.6 μg/L vinyl chloride (VC)(above the 2 μg/L GW-1 standard) in 1999; and 9.1 μg/L TCE (above the 5 μg/L GW-1 standard) in 2006. VC has not been detected since 1999. Although the 2006 TCE detection was above the historic results for well 41M-93-04X, TCE was not detected in October 2007 and 2008.

Samples from the water supply well, D-1, were analyzed for explosives from 2002 through 2009 and for perchlorate in 2004 and 2005. Both perchlorate results were below the 2 μg/L groundwater standard, and all explosives results were non-detections with the exception of RDX in October 2006 (0.176 J μg/L), which was below the 1.0 μg/L groundwater standard.

<u>South Post Monitoring Well Network</u>

Explosives analytical results in groundwater at the SPM wells have largely been non-detections since monitoring began in 1993, with the exception of two HMX and three RDX detections. All HMX detections were singular instances below 1 μg/L. The RDX detection at well SPM-97-24X in 2004 was above the 1 μg/L GW-1 standard (revised in 2008) at 1.5 μg/L; however, the RDX detections at wells SPM-97-24X and SPM-93-08X were below the GW-1 for the October 2006 sampling event. Explosives have not been detected in any SPM well for the past 3 years.

Arsenic concentrations at SPM wells SPM-93-06X, SPM-93-10X, and SPM-97-24X indicated an increasing trend from 2000 through 2005 (Figure 6.10a and 6.10b).Since the 2005 sampling event, however, concentrations in these three wells have exhibited a relative downward trend; all other SPM wells have typically retained a non-detect status for arsenic. Except for a transitory elevated detection, arsenic in wells SPM-93-10X and SPM-97-24X has remained below the 10 μg/L GW-1 standard, whereas arsenic in well SPM-93-06X has remained above the standard since 2003 and was documented at 11 μg/L during the November 2009 sampling event. The arsenic concentrations associated with well SPM-93-06X may result from a significant difference in the aquifer conditions surrounding this well, where the conditions are less aerobic compared to the other seven SPM wells.

All other metals detections, including perchlorate in 2004 and 2005, at the SPM wells have generally been low and below the associated background level since 1998. While metals exceedances above the background levels or GW-1 standards have occurred, the most recent of which was antimony at well SPM-93-16X (8.5 J μg/L) in November 2009, these instances are infrequent. By comparison, well SPM-93-06X has exhibited an elevated metals content since monitoring began in 1993, specifically for arsenic, barium, calcium, potassium, and sodium, and may be a characteristic of the groundwater environment surrounding this well.

Historical data for well SPM-93-06X indicates periodic exceedance of arsenic. The November 2009 arsenic concentration reported for groundwater from this well was 11 μg/L. Low levels of arsenic above the 10 μg/L standard have been detected since 1993 but typically remain within a narrow detection range ($<$ 50 μg/L) with no indication of an increasing concentration

trend. Based on the well being located centrally at SPIA, instead of at the perimeter, no potential of off-site migration exists.

Table 6.5
Summary of Exceedances for South Post Impact Area

Well Number	1992	1993	1993	1993	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	May-09	Nov-09
Area of Contamination 26																						
RDX - 1 μg/L GW-1 Standard																						
26M-92-03X	75	83.4	58	NC	NC	NC	NC	NC	23	8.9	97	12	62	260	6.7	18	17	7.79	12.9	12.5	NC	17.3
26M-92-04X	270	390	198	NC	NC	NC	NC	NC	NC	227.4	240	260	200	180	210	260	210	196	184	165	NC	170
26M-97-08X	NC	NC	NC	NC	NC	NC	NC	NC	29	28.5	46	30	57	63	37	45	41	45.1	44	32.8	NC	26.7
26WP-06-01	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	190	NC	137
Perchlorate - 2 μg/L GW-1 Standard																						
26WP-06-01	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	3.1	5.6	133	305	114
26M-92-04X	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	3.1	NC	2.3	(1.8)	(1.7)	(1.5)	2.98
Arsenic, total - 10 μg/L GW-1 Standard; 10.5 μg/L Background Level																						
26M-92-04X	100	[7.46]	[6.61]	NC	NC	NC	NC	NC	NC	ND	(1.5)	ND	ND	ND	ND	ND	ND	ND	ND	ND	NC	ND
26WP-08-02	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	128	NC	46
Lead - 15 μg/L GW-1 Standard; 4.25 μg/L Background Level																						
26M-92-04X	27	(6.4)	ND	NC	NC	NC	NC	NC	NC	ND	ND	ND	ND	ND	ND	[1.7]	ND	ND	ND	ND	NC	ND
26WP-08-02	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	20	NC	ND
Area of Contamination 27																						
RDX -1 μg/L GW-1 Standard																						
27M-92-01X	12.1	12.3	NC	NC	NC	NC	NC	NC	4.6	2.8	3.0	2.6	3.0	1.8	ND	1.3	ND	ND	NC	ND	NC	NC
27M-93-06X	NC	1.56	1.77	NC	NC	NC	NC	NC	2.2	2.2	1.3	0.96	0.91	0.95	0.75	0.91	1.50	3.4	NC	1.8	NC	NC
Arsenic, total - 10 μg/L GW-1 Standard; 10.5 μg/L Background Level																						
27M-92-01X	25.3	25.9	NC	NC	NC	NC	NC	NC	ND	ND	ND	(6.5)	(4.5)	ND	ND	ND	ND	(3.0)	NC	ND	NC	NC
27M-93-05X	NC	[4.96]	[5.22]	10.8	(6.64)	NC	NC	NC	ND	ND	[3.3]	[6.6]	[4.1]	ND	ND	ND	ND	(7.0)	NC	ND	NC	NC
Lead - 15 μg/L GW-1 Standard; 4.25 μg/L Background Level																						
27M-92-01X	17.4	15.3	NC	NC	NC	NC	NC	NC	ND	ND	[1.6]	[2.2]	[2.2]	[2.2]	ND	[2.3]	ND	ND	NC	[2.3]	NC	NC
1,3-Dintrobenzene-No Groundwater Standard																						
27M-93-05X	NC	NC	NC	0.288	1.3	NC	NC	NC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NC	ND	NC	NC
27M-93-06X	NC	NC	NC	NC	1.09	NC	NC	NC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NC	ND	NC	NC
27M-93-08X	NC	NC	NC	(1.82)	1.03	NC	NC	NC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NC	ND	NC	NC
Area of Contamination 41																						
Vinyl Chloride - 2 μg/L GW-1 Standard																						
41M-93-04X	NC	NC	NC	NC	NC	NC	NC	NC	ND	ND	3.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	NC	NC
TCE - 5 μg/L GW-1 Standard																						
41M-93-04X	NC	NC	NC	NC	NC	1.3	<0.5	NC	<0.5	1 J	<1.0	<1.0	0.24 J	<1.0	<5.0	<1.0	<1.0	9.1	ND	ND	NC	NC

Table 6.5 (continued)
Summary of Exceedances for South Post Impact Area

Well Number	1992	1993	1993	1993	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	May-09	Nov-09
South Post Monitoring Wells																						
Arsenic, total - 10 μg/L GW-1 Standard; 10.5 μg/L Background Level																						
SPM-93-06X	NC	33.6	21.7	33.3	19.8	NC	NC	NC	ND	ND	[8.1]	15.4	[7.4]	[9.8]	11.7	10.9	35.2	24	31	27	NC	11
SPM-93-10X	NC	ND	ND	ND	ND	NC	NC	NC	ND	ND	[6.4]	[5.6]	[5.8]	[3.7]	[7.8]	[5.2]	13.2	[7.0]	(5.0)	(7.0)	NC	ND
1,3-Dintrobenzene - No Groundwater Standard																						
SPM-93-08X	NC	NC	NC	ND	3.84	NC	NC	NC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NC	ND
SPM-93-10X	NC	NC	NC	3.25	ND	NC	NC	NC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NC	ND
SPM-93-16X	NC	NC	NC	4.37	2.06	NC	NC	NC	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NC	ND
Antimony, total - 6 μg/L GW-1 Standard; 3.03 μg/L Background Level																						
SPM-93-06X	NC	ND	ND	ND	ND	NC	NC	NC	ND	ND	ND	ND	(2.2)	ND	ND	ND	ND	ND	7.8	ND	NC	ND
SPM-93-16X	ND	ND	ND	ND	ND	NC	NC	NC	ND	ND	ND	ND	ND	ND	ND	ND	13.8	ND	ND	ND	NC	8.5 J

Notes:

Number in parentheses denotes that concentration is below GW-1 standard.

Number in brackets denotes that concentration is below background level.

* = Analyte detected at 5 times of the amount detected in the equipment blank sample.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

6.5.4 Site Inspection

On April 12, 2010, an HGL representative performed site inspections at the SPIA (AOCs 25, 26, 27, and 41). Conditions during the inspection were favorable with no precipitation and temperature in the 60 degree Fahrenheit range.

Other than normal range use, there was no evidence of land disturbance at any of the sites. Monitoring well protective casings in AOC 25, 26 and 27 were locked and secured. However, many locks were replaced at AOC 41 due to damage stemming from lack of use.

6.5.5 Interviews

The following individuals were interviewed as part of the Five-Year Review:

- Ms. Maryellen Iorio, USACE, New England District; and
- Mr. Thomas O'Donnell, Range Control, Range Safety Officer.

Both personnel completed a Five-Year Review site survey questionnaire. Ms. Iorio and Mr. O'Donnell were not aware of any violations of the ICs. Maryellen Iorio stated that the remedy is ongoing and operating successfully. Mr. O'Donnell stated that the continued monitoring of the groundwater should provide conclusive evidence of any future problems and serve to reassure the surrounding communities that no changes have occurred.

The detailed 2010 LUC interviews will be included in Appendix J.

6.5.6 Community Participation

Community participation at Former Fort Devens Army Installation is detailed in Section 1.3.

6.6 TECHNICAL ASSESSMENT

Question A: Is the remedy functioning as intended by the decision documents?

Yes. The remedy is functioning as intended by the decision documents as detailed below.

Remedial Action Performance
Long-term groundwater monitoring is performed on an annual basis to determine if contaminants are migrating off the SPIA-monitored area and to ensure that the no-action alternative remains protective of human health and the environment.

System Operations/Operation and Maintenance (Long-Term Groundwater Monitoring)
Groundwater monitoring is performed in accordance with the approved LTMP (HGL, 2008b) for SPIA. Supplemental groundwater monitoring is being performed at AOC 26 to track recent detections in perchlorate and explosives compounds.

Opportunities for Optimization
No reduction in sample locations or frequency is recommended at this time.

Early Indicators of Potential Remedy Failure
No early indicators of potential remedy failure were noted during the review. Based on the observed RDX and perchlorate concentrations in groundwater at AOC 26, additional monitoring downgradient of the existing well network was initiated in the fall of 2007 to ensure the perchlorate and RDX was not migrating beyond the immediate confines of the site. Current downgradient well points have delineated the extent of perchlorate and RDX to non-detections. A permanent monitoring well will be installed in 2010 near well point 26WP-09-02 based on a 2009 perchlorate investigation. The SPM sentinel well network, as currently established (including the addition of a new SPM permanent monitoring well at AOC 26), remains sufficient to track any potential off-site contaminant migration.

Implementation of Institutional Controls and Other Measures
There are no current or future plans for installation of potable water wells within the SPIA. The Army will maintain possession of the SPIA for the foreseeable future. If the property transfers in the future, ICs will be incorporated into the property deed or other instrument of property transfer.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?

Yes. The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy are still valid as detailed below.

Changes in Standards and To Be Considered
As part of this five-year review, ARARs and TBC guidance for the site were reviewed, as well as a review of current ARARs. This review will be discussed further in Section 6.6.2. The SPIA is a "No Action" site with no established RAOs but the reviews are performed to evaluate current site conditions with established or revised standards as discussed below.

The MCLs are health-based standards established by the USEPA. The MCL for arsenic in effect at the time of the ROD was 50 μg/L. Arsenic was present on site at concentrations greater than its MCL during the remedial investigation. The MCL for arsenic has been updated since the 1996 ROD. Changes to the MCL for arsenic in association with changes of the USEPA National Primary Drinking Water Regulations for arsenic and implementation on January 23, 2006, effectively reduce the MCL for arsenic from 50 μg/L to 10 μg/L.

In spring 2005, the MassDEP published new draft groundwater standards for RDX and HMX, which are military explosives. The adopted Method 1, GW-1, groundwater standards are 1.0 μg/L and 200 μg/L for RDX and HMX, respectively. It should be noted that at the time of this Five-Year Review a reassessment of the RDX toxicity is being considered by the EPA.

In January 2003, the USEPA OSWER issued an Interim Status Guidance for perchlorate. This

document cited a range of 4 parts per billion (ppb) to 18 ppb, which was intended to be used as a screening tool to see if site-specific risk assessment is needed. A perchlorate standard was promulgated on July 28, 2006. In 2008, USEPA determined that a national drinking water regulation for perchlorate would not present "a meaningful opportunity for health risk reduction for persons served by public water systems." The USEPA is currently reconsidering their decision not to regulate perchlorate in drinking water. In January 2009, USEPA issued an Interim Health Advisory for perchlorate to assist state and local officials in addressing local contamination of perchlorate in drinking water while the Agency evaluates the opportunity to reduce risks through a national primary drinking water standard. A Federal Register notice issued August 19, 2009, contains USEPA's re-evaluation of their decision and includes new evaluations of the impacts and risks of perchlorate on infants and children and associated health risk limits for drinking water. Specifically, USEPA is considering a broader range of alternatives for interpreting the available data on: the level of health concern, the frequency of occurrence of perchlorate in drinking water, and the opportunity for health risk reduction through a national primary drinking water standard. This re-evaluation is currently in the public comment stages.

Because the MassDEP Surface Water Standards are taken from the USEPA National Recommended Water Quality Criteria (Office of Water, Office of Science and Technology – 4304T. 2009) this document is considered applicable. This document establishes CMCs and CCCs. CMCs are an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed briefly without resulting in an unacceptable effect. The CCCs are an estimate of the highest concentration of material to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect. If surface water samples are collected in the future, they should be filtered, analyzed for dissolved metals, and compared to this document.

Changes in Exposure Pathways

The ROD did not identify any unacceptable risks from exposure to site contaminants in groundwater (i.e., limited to 2 weeks during a year) or soils under current use conditions. Because the remedy includes limiting the use of groundwater as drinking water (specifically the transient, non-community supply well, D-1), no excessive or unacceptable risks currently exist at the site.

Land use has not changed since the original BLRA and future use is expected to remain unchanged. If land use does change, risks would need to be re-evaluated to determine if the potential for exposure had increased. No new contaminants, sources, or routes of exposure at the landfill have been identified at this time. There is no indication that hydrogeologic conditions are not adequately characterized.

Changes in Exposure Assumptions

The risk assessments supporting the ROD for AOCs 25, 26, 27, and 41 used exposure assumptions based on actual site frequency of use and standard recommended assumptions for other contact rates. Since that time, USEPA has updated some of the recommended dermal contact exposure assumptions. New guidance for evaluating dermal contact exposures was

finalized in July 2004 (Risk Assessment for Superfund, Volume I – Human Health Evaluation Manual – Part E, Supplemental Guidance for Dermal Risk Assessment – Final). Because the remedy presumes continued site use on an infrequent basis and prohibiting more extensive use of groundwater as drinking water, changes to the exposure parameters do not affect the protectiveness of the implemented remedy. If site land-use changes; these changes to dermal exposure parameters should be considered.

Changes in Toxicology and Other Contaminant Characteristics

The original HHRA identified no health threats to current receptors. To assess whether this conclusion is still valid, the changes in toxicity values associated with site contaminants were reviewed. The results are discussed below.

USEPA's IRIS database lists a slightly lower oral CSF for arsenic (1.5 mg/kg-day^{-1}) than the oral CSF used in the original risk assessment (1.75 mg/kg-day^{-1}). Also, the IRIS cancer assessment for inorganic arsenic is currently under review. USEPA's Office of Research Development has recently completed a 2010 draft titled: *Toxicological Review of Inorganic Arsenic: In Support of the Summary Information on the Integrated Risk Information System (IRIS)*. The draft assessment includes an updated CSF of 25.7 mg/kg-day^{-1}, which is much higher than the CSF used in the original risk assessment and the one currently listed on IRIS. Acceptance of this new, higher CSF could indicate that the cancer risk from arsenic may be underestimated.

The toxicity values for PCE and TCE are under review. Following the toxicity hierarchy, the California Environmental Protection Agency's toxicity values for cancer risk have been selected as provisional values. The provisional values are greater than the previous CSFs indicating that they may be more toxic than previously thought. However, these toxicity values have not yet been finalized. Also, USEPA has elected not to select any non-cancer toxicity values for TCE believing that the cancer risk considerations will be protective of the non-cancer risks.

The USEPA IRIS database contains revised oral CSF and IUR for VC that are less potent toxicity values than that used in the risk assessment. Therefore, the calculated cancer risk from exposure to VC may have been overestimated. In addition, an oral RfD and an RfC have been added to the IRIS database, therefore, the non-cancer hazards from VC exposure were underestimated. VC is a carcinogen that has been identified to also have mutagenic properties. The toxicity of this chemical changes with the age of the receptor, with the greater toxicity being experienced by younger receptors. To account for this varying toxicity over time, ADAFs are applied during the risk characterization process. Default values of "10" for age 0 to 2 years and "3" for age 2 to 16 years are suggested. Because these mutagenic ADAFs were not included in the original risk assessment calculations, it is possible that the cancer risks from exposure to VC were underestimated.

Changes in Risk Assessment Methodology

Several new risk assessment methodologies have been introduced since the original risk assessments were performed in 1996.

In 2004, USEPA published the final version of the RAGS Appendix E, which is the updated guidance for the dermal contact evaluation (EPA, 2004). Current recommendations include updated dermal absorption factors for specific chemicals and updated oral to dermal adjustment factors for RfDs and CSFs. The final guidance includes slight changes in some dermal exposure assumptions from what was used in the original risk assessment. While this may indicate an underestimation of exposure in the original risk assessment, it is not expected that the slight change in the dermal exposure calculation would alter the conclusion of the risk assessment.

USEPA has identified several carcinogens that act via a mutagenic mode of action, and to account for their early-life exposures, the default ADAFs of "10" for ages 0 to 2 and "3" for ages 2 to 16 have now been incorporated into the risk calculations. This approach is consistent with the 2005 *Guidelines for Carcinogen Risk Assessment and the Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens*. VC is the only groundwater contaminant that is considered to be mutagenic for the purposes of this risk assessment methodology. The analyte list for groundwater monitoring at SPIA included VC without the additional mutagenic factors, therefore its exclusion did not negatively impact the results of the original risk assessment.

In January 2009, USEPA introduced RAGS Part F, which updates the approach for determining risk from inhaled chemicals to be consistent with the inhalation dosimetry methodology described in *Methods for Derivation of Inhalation Reference Concentrations and Application of Inhalation Dosimetry* (USEPA, 1994). The new approach revises the equations for estimating inhalation exposure and risk, recommending that when estimating risk via inhalation, the concentration of the chemical in air should be used as the exposure metric (e.g., mg/m^3), rather than inhalation intake of a contaminant in air based on inhalation rates or body weight (e.g., mg/kg-day). It is not expected that this change in the inhalation calculation would alter the conclusion of the risk assessment.

While numerous methodologies have changed since the original risk assessment was prepared, there are no risk assessment methodology changes that affect the protectiveness of the remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No other information has come to light that would call into question the protectiveness of the remedy was noted.

6.6.1 Summary of Technical Assessment

While several risk assessment methodologies have changed since the original risk assessments were prepared, the Army maintains ownership of the SPIA and controls are in place to limit groundwater use as drinking water source.

6.6.2 Applicable or Relevant and Appropriate Requirements Review

ARARs were not specifically identified in the ROD. However, the ROD does state that Well D-1 will be sampled and analyzed for explosives TCL organics, and TAL metals.

The site groundwater is compared to current groundwater standards per the approved LTMP (HGL, 2008b); however the following update is provided for informational purposes. The following ARARs associated with drinking water standards have been modified since the signing of the ROD:

1. 40 CFR 141.11 Subpart B Maximum Contaminant Levels – updated July 1, 2001. Section 141.11 (a) and (b) were amended at 66 FR 7061 on January 22, 2001 to state the following:

   - ****The analyses and determination of compliance with 0.05 mg/L MCL for arsenic use the requirements of 141.23.*
   - *The MCL for arsenic was 0.05 mg/L for community water systems until January 23, 2006.*

   On January 22, 2001, USEPA adopted a new standard for arsenic in drinking water at 0.01 mg/L, replacing the old standard of 0.05 mg/L (66 FR 6976). The rule became effective February 22, 2002. The date by which systems must comply with the new 0.01 mg/L standard was January 23, 2006.

2. 40 CFR 141.15 and 141.16 Subpart B Maximum Contaminant Levels – updated July 1, 2003. An effective date note (65 FR 76745) removed the sections from the CFR effective December 8, 2003. Sections 141.15 and 141.16 do not appear in 40 CFR 141 updated on July 1, 2004. These two sections addressed MCLs for radium-226, radium-228, gross alpha particle radioactivity, and beta and photon radioactivity, which would not affect the protectiveness of the remedy.

3. 40 CFR 141.51 Subpart F Maximum Contaminant Level Goals and Maximum Residual Disinfectant Level Goals – updated July 1, 2001. The table was amended in Section 141.51 by adding arsenic with a MCL goal of zero effective January 23, 2006 (66 FR 7063). Until then, no MCL goal applied for arsenic.

4. 310 CMR 10.00 The Wetlands Protection Act Regulations – updated in June 2009. The revisions promulgated in June 2009 make provision for necessary actions to eradicate Asian Longhorn Beetle infestations within the parameters of the Wetlands Protection Act. Related language has also been incorporated into 314 CMR 9.00, 401 Water Quality Certification for Discharge of Dredged or Fill Material, Dredging, and Dredged Material Disposal in Waters within the Commonwealth. This revision would not affect the protectiveness of the remedy.

5. 310 CMR 22.00 Massachusetts Drinking Water Standards and Guidelines – The arsenic MCL listed in Section 22.06 is effective for the purpose of compliance with the Code of Federal Regulations (outlined above) on January 23, 2006. A perchlorate standard

was also promulgated July 28, 2006. Also, in December 2009, 310 CMR 22.26 was updated regarding microbial communities in groundwater that is also used for public consumption. As bacterial populations are not considered a CPC for the site, the protectiveness of the remedy would not be affected.

6. 314 CMR 6.00 Massachusetts Groundwater Quality Standards – rescinded March 20, 2009. Revisions made to 314 CMR 5.00 for a streamlined groundwater discharge permitting process negated the need for this section. As the selected groundwater quality standards for the site are mainly federal MCLs and are also presented in 40 CFR 141 Section 11 and 13, the removal of 314 CMR 6.00 from the Code of Massachusetts Regulations does not affect the protectiveness of the remedy.

In addition, a search was performed for any newly promulgated standards that could affect protectiveness at the site. No new ARARs were identified that would affect the protectiveness of the selected remedy.

6.7 ISSUES

This Five-Year Review for SPIA sites AOC 25, AOC 26, AOC 27, and AOC 41 indicates that no issues are present that currently prevent the "no action remedy" from being protective now or in the future.

6.8 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

The current remedy is effective at meeting the site's remedial objectives. Therefore, it is recommended that the current monitoring actions implemented at SPIA be continued.

An additional recommendation that does not affect the remedy's protectiveness but will enhance the site's LTM monitoring program is that the Army should install a new permanent monitoring well near downgradient well point 26WP-09-02. The permanent well will replace the well points as a sentry well for perchlorate monitoring.

6.9 PROTECTIVENESS STATEMENT

The "No Action" remedy at AOCs 25, 26, 27, and 41 is protective of human health and the environment and exposure pathways that could result in unacceptable risks are being controlled.

6.10 NEXT REVIEW

See Section 1.4 for further details.

6.11 REFERENCES

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7.0 AREA OF CONTAMINATION 32 AND 43A FIVE-YEAR POLICY SITE REVIEW

7.1 SITE CHRONOLOGY

Table 7.1
Chronology of Events for AOC 32

Event	Date
SI initiated	1991
RI completed	1994
FS completed	1997
ROD signature	1998
First Five-Year Statutory Review	September 2000
MNA Assessment	2000
Replacement monitoring well and piezometer installation	2001
Groundwater LTM	2002 to present
Second Five-Year Review	2005
Draft Technical Memorandum: Analysis of Bedrock Structure, Implications to LTM	May 2006
LTMP	November 2008
Persulfate Injection Work Plan	January 2009
Persulfate Injection	February 2009
Persulfate Injection Evaluation Report	June 2009
Draft Final Technical Memorandum, Sampling and Evaluation of Vapor Intrusion	August 2009
Annual LTM	2005-2009

Table 7.2
Chronology of Events for AOC 43A

Event	Date
SI initiated	1991
RI completed	1994
FS completed	1997
ROD signature	1998
First Five-Year Statutory Review	September 2000
MNA Assessment	2000
Replacement monitoring well and piezometer installation	2001
Groundwater LTM	2002 to 2005
Second Five-Year Review	September 2005
Groundwater Monitoring Discontinued	October 2005
Semiannual water level gauging	2005-2009

7.2 BACKGROUND

AOCs 32 and 43A are historically contaminated locations within the former Fort Devens property. AOC 32, the Defense Reutilization and Marketing Office Yard (DRMO) was located on the west side of Cook Street (West Yard) in the northeast portion of the former

Main Post. AOC 43A was located to the south of AOC 32, across from the former Market Street. Market Street was removed during construction of a distribution warehouse. Figures 7.1 and 7.2 show where AOC 32 and 43A were located prior to construction of the warehouse. Figure 7.3 shows current conditions with a new buildings and roads.

The two sites were combined administratively under one ROD, but are described separately in the following subsection for clarity. Subsections 7.2.1 and 7.2.2 provide the site description and history for AOCs 32 and 43A, respectively.

7.2.1 AOC 32 Background

AOC 32 was known as the Defense Reutilization and Marketing Office (DRMO) Yard and consisted of three fenced areas. The West Yard, located on the west side of Cook Street, was a paved area used for the storage of used equipment with lead-acid batteries, and telecommunications and administrative equipment. The East Yard, located on the east side of Cook Street, was a paved area used for disassembling vehicles for reusable parts. This yard previously contained scrap metal, tires, stored items for sale, and used photographic solutions. The third fenced area was an unpaved area located just north of the East Yard. It was used for the storage and recycling of tires. AOC 32 also contains a former UST site (UST #13) located just northeast of Building T-204 (DRMO Office) that was incorporated into AOC 32. The UST was used to store waste oil. Operational records indicated that the facility was active from at least 1964 to 1995.

In 1991, the Army performed a SI at AOC 32 and reported contamination exceeding screening concentrations for soil and groundwater. A RI was initiated to determine the nature and distribution of contamination at AOC 32, assess the risk to human health, and provide a basis for performing a FS. The final RI report, issued in 1994, concluded that soil contamination and groundwater contamination required a remedial action evaluation.

A FS designed to develop and analyze potential remedial alternatives for cleanup at AOC 32 was issued in January 1997. After submission of the Army's PP and receipt of public comments on the preferred remedial alternatives, the Army issued a ROD, documenting the final choice of remedy for cleanup of soils by excavation with off-site disposal and cleanup of groundwater by monitored natural attenuation. The ROD was signed in February 1998.

An evaluation of monitored natural attenuation as was performed for AOC 32. The Monitored Natural Attenuation Assessment (MNAA) Report (SWETS, 2000b) summarized the data collected from MNA field activities that began in January 1999, and presented the final assessment and recommendations concerning natural attenuation effectiveness based on ROD criteria. The report concluded that natural attenuation, supplemented with long-term groundwater monitoring and establishment of ICs, would be an effective remedial action at AOC 32.

7.2.2 AOC 43A Background

AOC 43A, known as the POL (petroleum, oils and lubricants) Storage Area at the time of base

closure in 1996, was located across Market Street from AOC 32. AOC 43A consisted of a fenced lot located within an industrial area and served as the distribution point for all gasoline and other fuels at Fort Devens during the 1940s and 1950s.

The former distribution facility consisted of a main gasoline station building (T250), a pump house, four 12,000-gallon USTs, one 10,000-gallon UST, two 12,000-gallon above ground storage tanks (ASTs), and two 8,000-gallon ASTs. Gasoline was delivered to the facility via railroad and was transferred to the storage tanks. The railroad tracks formerly used to transport fuels to the site, formed the site's northern boundary. An asphalt driveway led into the POL storage area from Antietam Street. The driveway was bermed to contain potential spills. A pump station was located in the center of the fenced area and the USTs were located on the eastern side of the site.

During the 1992 SI of the POL storage area, field screening and confirmation sampling indicated that a low level of xylene and an elevated level of petroleum hydrocarbons existed within the subsurface soils. An RI was performed and the final report concluded that groundwater contamination required a remedial action evaluation.

A FS, performed to develop and assess potential remedial alternatives for cleanup at AOC 43A, was issued in January 1997. Following submission of the Army's PP and receipt of public comments on the preferred remedial alternatives, the Army issued a ROD to document the final choice of a remedy for cleanup of groundwater by MNA. The ROD was signed in February 1998.

A separate (from AOC 32) MNA evaluation was performed for AOC 43A. The MNAA Report (SWETS, 2000c) summarized the data collected from MNAA field activities that began in January 1999 and presented the final assessment and recommendations concerning natural attenuation effectiveness based on ROD criteria. The report concluded that natural attenuation, supplemented with long-term monitoring and establishment of institutional controls, would be an effective remedial action at AOC 43A.

7.2.3 AOC 32 and 43A

In 2000, AOCs 32 and 43A underwent significant redevelopment. The two AOCs, now lot 10, were modified by the construction of a large warehouse that was completed in 2001. Bedrock outcrops east of the DRMO East Yard and east of the POL Storage Area were removed to accommodate the construction of the distribution warehouse. The warehouse and pavement cover major portions of both AOCs, thereby altering local recharge patterns to overburden and bedrock which potentially altered the site hydrology. Most of the pre-construction monitoring wells were destroyed or were decommissioned during the construction phase. Replacement monitoring wells and piezometers were installed from November 2001 to January 2002 (HAS, 2002) to monitor groundwater flow patterns and contamination around former release points. The destroyed wells and replacement wells are listed below.

- Installed wells include: 32M-01-13XBR, 32M-01-14XOB, 32M-01-14XBR, 32M-01-15XBR, 32M-01-16XBR, 32M-01-17XBR, 32M-01-18XBR, 43M-01-16XOB, 43M-

01-16XBR, 43M-01-17XOB, 43M-01-17XBR, 43M-01-20XOB, and 43M-01-20XBR. Installed piezometers included: 32M-01-04XBR, 32M-01-05XOB, 32M-01-06XBR, 32M-01-07XOB, 32M-01-08XOB, 32M-01-09XOB, 32M-01-10XBR, 32M-01-11XBR, and 32M-01-12XBR.

- Destroyed monitoring points include: 32M-92-03X, 32M92-04X, 32M-92-05X, 32M-92-06X, 32M-92-07X, 32-99-08X, 32M-99-09X, 32M-99-11X, 43MA-93-04X, 43MA-93-05X, 43MA-93-06X, 43MA-93-07X, 43MA-93-08X, A3MA-93-10X, 43MA-99-11X, 43MA-99-12X, 43MA-99-13X, 43MA-99-14X, 43MA-99-15X, POL-1, POL-2, and POL-3.

7.3 REMEDIAL ACTIONS

The RAOs for AOCs 32 and 43A are discussed in the following subsections.

7.3.1 Surface and Subsurface Soil Remedial Objectives

The RAOs for surface and subsurface soils were:

- Prevent direct and indirect contact, ingestion, and inhalation of the soil contaminated with COCs at levels that could pose risks to human and ecological receptors.
- Prevent erosion and migration of soil contaminated with COCs to storm sewers and surface water bodies.
- Prevent COC migration to the groundwater at levels that could adversely affect human health and the environment.

Cleanup goals for soils were calculated from the risk assessment as candidate goals for all contaminants except PCBs. The PCB cleanup goal is an ARAR that existed from the Toxic Substances Control Act. Other contaminants, not addressed by these two sources, used the lower of the USEPA Region III risk-based concentration or the RCRA corrective action level. If these values were below the background concentration, the background value was used as the cleanup goal. Because cleanup goals were not established in the ROD for extractable petroleum hydrocarbons (EPH)/volatile petroleum hydrocarbons (VPH), the MCP S-2 standard was used as the effective cleanup goal.

7.3.2 Groundwater Remedial Objectives

The RAOs for groundwater included the following:

- Prevent off-site migration of COCs at levels that could adversely affect flora and fauna.
- Prevent lateral and vertical migration of COCs at levels that could adversely affect potential and existing drinking water supply aquifers.
- Prevent seepage of groundwater from AOC 32 and 43A that could result in surface water concentrations in excess of ambient water quality standards.

The Main Post groundwater cleanup goals were developed from numerous sources and were

presented in the ROD. These cleanup goals were used to screen groundwater data from both AOC 32 (UST #13) and AOCs 32 and 43A (DRMO/POL). When available, the most stringent of the ARARs was selected as a potential candidate cleanup goal. If no risk values were established, then the most stringent of the USEPA Office of Drinking Water Health Advisories, USEPA Region III tap water criteria, or the MassDEP Office of Research and Standards Guidance Levels, for chemicals for which MMCLs have not been promulgated, was selected. If measurable concentrations were below background values, the background concentrations were established as the goal. Because cleanup goals were not established in the ROD for EPH/VPH, the MCP GW-1 standard was used as the effective cleanup goal. Site-specific cleanup goals were developed for cis-1,2-dichloroethene (*cis*-1,2-DCE), 1,1,1-trichloroethene, and C_{19}-C_{36}aliphatics. Current groundwater cleanup goals for COCs are shown in the following Table 7.3.

Table 7.3
Contaminants of Concern Cleanup Goals in Groundwater
AOCs 32 and 43A

Contaminant of Concern	Cleanup Goals [1,4] (μg/L)
VOCs	
Vinyl Chloride	2
trans-1,2-dichloroethene(trans-1,2-DCE)	100
cis-1,2-dichloroethene(*cis*-1,2-DCE)	55[3]
1,1,1-trichloroethane	5[3]
Trichloroethene (TCE)	5
Benzene	5
Chlorobenzene	100
Ethylbenzene	700
Toulene	1,000
1,1,2-trichloroethane	5
1,2-dichlorobenzene (1,2-DCB)	600
1,3-dichlorobenzene (1,3-DCB)	40[2]
1,4-dichlorobenzene (1,4-DCB)	5[2]
VPH	
Benzene	5
Ethylbenzene	700
Tuolene	1,000
C_5-C_8Aliphatics (adjusted)	300
C_9-C_{12}Aliphatics (adjusted)	700[2]
C_9-C_{10} Aromatics	200
Total Xylenes	10,000
EPH	
C_9-C_{18}Aliphatics	700[2]
C19-C36 Aliphatics	5,000[3]
C11-C22 Aromatics	200
INORGANICS	
Arsenic – total	10
Manganese - total	3,500

[1]Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 standard (310 CMR 40 Subpart P).
[2] The groundwater standard is lower than the site-specific cleanup goal.
[3] The site-specific cleanup goal is lower than the groundwater standard.
[4] GW-1 standard effective June 26, 2009.

7.3.3 Selected Remedy

7.3.3.1 Area 32 (DRMO Soils Operable Unit) Selected Remedial Components

The selected remedy for AOC 32 (DRMO Soils operable unit) is Alternative A6. This alternative did not treat or destroy soil contamination, but completely removed it from the site by placing it in an off-site, non-hazardous landfill. A description of key components of Alternative A6 is presented in Section 10.C.1 of the ROD and summarized below.

- Excavate contaminated soil and collect confirmation samples prior to backfilling;
- Transport soils to an off-site, non-hazardous landfill for disposal;
- Backfill the excavated area with clean material, and re-vegetate the area; and
- Monitor groundwater on an annual basis and review the site at five-year intervals for 30 years or until contamination is reduced to remedial goals.

Excavate Contaminated Soil
Contaminated soil was found in four areas:

- The southern portion of the tire storage area, adjacent to the northern border of the DRMO yard;
- The center of the East Yard;
- The drainage swale along the western edge of the yard; and
- The drainage swale along the eastern edge of the yard.

Based on data collected during the RI, the excavated volume was to be 1,300 cy of soil.

Confirmation sampling was required to verify that cleanup goals were achieved. If sampling results exceeded cleanup goals, additional excavation would be required. If results of confirmation sampling were acceptable, excavations would be considered complete and prepared for backfilling.

Transport Soil Off-Site
The ROD specified the collection of waste characterization samples for the excavated soil. Once characterized, the waste would be transported to the appropriate off-site disposal facility. The facility would be selected based on the waste characteristics.

Backfill and Re-vegetate
Once confirmation samples verified attainment of RGs, the excavation for the area would be considered completed. Excavated areas would then be regraded or backfilled to grade with clean soils and re-vegetated for stabilization.

Monitoring Groundwater
Based on removal of the source area, the groundwater remedy would rely on natural attenuation. A review of site conditions, including groundwater monitoring, would be

conducted in five years to assess residual contamination and contamination migration.

7.3.3.2 Areas 32 and 43A Areas Selected Remedial Components

The selected remedy for AOC 32 (UST #13 Groundwater OU) was Alternative B3 in the ROD. The selected remedy for AOC 32 and 43A (POL/DRMO Groundwater OU) was Alternative C3 in the ROD. Alternatives B3 and C3 are equivalent and were combined for this section in the 2000 and 2005 Five-Year Reviews. This alternative relies on natural attenuation to remediate groundwater contaminants in the subsurface. The Army would follow the *Technical Protocol for Implementing Intrinsic Remediation with Long-Term Monitoring for Natural Attenuation of Fuel Contamination Dissolved in Groundwater* (USEPA/AFCEE, 1995). During the period of restoration, access to the site for some uses, such as water supply, would be restricted, because the groundwater contaminant levels exceed ARARs. MNA is differentiated from institutional action by the degree of site characterization, modeling of the groundwater flow and contaminant migration, and the LTM effort to assess whether that natural attenuation is working. A description of key components of Alternative B3 and C3, as presented in Sections 10.C.2 and 10.C.3 of the ROD, respectively, is summarized below.

- Establish ICs;
- Install additional groundwater monitoring wells;
- Collect data on MNA, assess the data, and performing groundwater modeling;
- Perform groundwater LTM on a semiannual basis;
- Review the site at five-year intervals for 30 years or until contamination is reduced to remedial goals;
- Provide annual data reports to USEPA and MassDEP; and
- Incorporate data into groundwater flow and transport models. Field data and model predictions were to be reviewed as part of the Five-Year Review.

Establish Institutional Controls

As presented in the ROD Sections 10.C.2 and 10.C.3, land use would be limited to restricted development, including a ban on drinking water well installation.

Install Additional Groundwater Monitoring Wells

Additional groundwater monitoring wells would be installed to improve data collection coverage within the source area, as well as downgradient of the site. The ultimate number and location of additional wells selected for groundwater LTM would depend on the results of the fate and transport modeling. A LTMP would be developed as part of the MNA remediation assessment and would undergo regulatory review. These wells would be used to monitor contaminant plume location and concentration in relation to the AOC boundary and to collect intrinsic degradation indicators.

Allow for Monitored Natural Attenuation

The remedy would allow natural processes, such as biodegradation and dispersion, to decrease

contaminant mass and concentration with time.

Collect and Incorporate Additional Field Data into Groundwater Models
Prior to developing a groundwater LTMP, additional data collection and modeling may be required. MNA Assessment Work Plan would be developed and be provided for regulatory review. Data collected would include groundwater elevation, MNA indicators, and COCs, including TPHC by MassDEP method for EPH and VPH. MNA indicator data would be used to provide additional evidence that MNA is occurring and to determine future intrinsic bioremediation potential. COC data, including VPH/EPH via MassDEP methods would directly assist in estimating site-specific degradation rates and the effectiveness of MNA in achieving groundwater cleanup goals.

Monitor Groundwater Over the Long-Term and Annual Report on Groundwater Quality
Groundwater LTM would be performed to assess the MNA progress and detect any potential migration of contaminants that exceed groundwater cleanup goals. Groundwater monitoring would be conducted annually for 30 years or until groundwater contamination has been reduced to acceptable levels.

The Army may request a reduction in frequency of groundwater monitoring if warranted by site conditions. Annual monitoring would be required unless USEPA and MassDEP agree to a reduced frequency. Annual reports would be submitted to USEPA and MassDEP and would include a description of site activities, a summary of groundwater LTM program results, and any modeling updates.

Review Field Data, Modeling Predictions, and Compliance with ARARs at Five-Year Intervals
Under CERCLA 121 (c) (42 USC 9621), any remedial action that results in contaminants remaining on site must be reviewed at least every five years. During Five-Year Reviews, the existing data, monitoring program, and model predictions would be evaluated and modified, as necessary. Whether the implemented remedy continues to be protective of human health and the environment or if implementation of additional remedial action is appropriate would be assessed.

7.3.4 Remedy Implementation

Soil Remedial Action
Excavation and disposal activities were completed between October 1998 and December 1998, as summarized within the USACE *Final Soils Remedial Action Operable Unit Completion Report: Soil, Asphalt, and Debris Removal* (Weston, 2000) and outlined below:

- Removal and disposal of approximately 50 cy of metal debris;
- Removal and disposal of approximately 1,200 cy of petroleum-contaminated soil;
- Removal and disposal of approximately 800 cy of non-hazardous soil with shredded tire scrap;
- Removal and disposal of approximately 400 cy of soil contaminated with lead and

containing shredded tire scrap; and

- Removal and disposal of approximately 600 cy of soil and asphalt contaminated with low levels of PCBs and pesticides.

The Removal Action for AOC 32, performed by the Army in October and November 1998, appeared to have permanently achieved the RAOs specified in the ROD as discussed in the *Operating Properly and Successfully (OPS) Report* (SWETS, 2000a). The final confirmation data indicated that not only were cleanup levels met, sample concentrations were actually lower than the more conservative MCP S-1 criteria.

An evaluation of the remedial actions was performed. The OPS Report (SWETS, 2000a) demonstrated that the selected remedial actions for AOC 43A were operating properly and successfully in accordance with applicable USEPA guidance.

Building Construction/Well Replacement

AOCs 32 and 43A underwent redevelopment in 2000. The two AOCs, now Lot 10, were modified by the construction of a large warehouse that was completed in 2001. As a result, major demolition, re-grading, and building/paving construction has altered the site's physical setting and hydrogeologic conditions. The groundwater monitoring wells, sampled as part of the original MNA network, were destroyed. From November 2001 to January 2002, thirteen new wells and nine piezometers were installed to replace those destroyed during construction (HAS, 2002).The replacement wells and piezometers were installed based on the groundwater remedy detailed in the ROD requiring additional wells. Factors that determined locations were historic release areas, known bedrock locations, needed gradient monitoring points, and spatial distribution.

The new warehouse and associated paved areas have significantly altered the ground surface and its capacity for recharge. Bedrock contour maps were developed by Shaw (USACE, 2005) for the areas beneath the site building to show how bedrock can influence groundwater flow directions and affect contaminant transport related to the former source area that are now encompassed by the warehouse footprint. The warehouse slab foundation is likely founded directly on bedrock along its eastern side. Two localized bedrock highs remain under the warehouse, one beneath the northeast corner and another beneath the southeast corner. Bedrock outcrops remain north-northeast of the warehouse beyond the pavement and perimeter fence line. The bedrock slopes downward to the west and east away from the rock mounds under the warehouse, separating groundwater flow directions in the area. Previous annual sampling events concluded that there is likely little or no groundwater in the thin overburden under the warehouse, this combined with reduced recharge of precipitation due to the building and paved surfaces reduces the transport and attenuation of some residual VOC contamination in the overburden.

Monitored Natural Attenuation Assessment

The original MNAA was performed separately for each AOC. The MNAA Report (SWETS, 2000b and 2000c) summarized the data collected from MNAA field activities that began in January 1999, and presented the final assessment and recommendations concerning natural

attenuation effectiveness based on ROD criteria. The report concluded that natural attenuation, supplemented with groundwater LTM and establishment of ICs, would be an effective remedial action at AOCs 32 and 43A.

Long-Term Monitoring

The current sequence of semiannual long-term groundwater sampling was initiated in the spring of 2002. Groundwater samples were collected once in the spring (April/May) and once in the fall (October/November). The purpose of the LTM program is to monitor the potential for off-site migration of contaminants and to verify that concentrations of contaminants are decreasing over time.

As part of the LTM program, through the 2007 events, groundwater from eight monitoring wells (three source wells and five down-gradient/sentry wells) was sampled for EPH, VPH, and metals (total) on a semiannual basis (spring/fall). Beginning in 2008, the fall event was changed to a performance monitoring event. Per the 2008 LTMP recommendations, annual sampling will commence in 2010. Source wells include: 32M-01-13XBR, 32M-01-15XBR, and 32M-01-18XBR. Down-gradient/sentry wells include: 32Z-99-02X,32M-01-14XOB, 32M-01-14XBR, 32M-01-16XBR and 32M-01-17XBR. Upgradient wells SHL-15 and 32M-92-01X were removed from the LTM sampling program due to their location upgradient of all potential source areas within a separate flow regime from the main source areas. No AOC 43A wells are sampled due to an absence of contaminant exceedances in the 43M series wells since 2002. The six AOC 43A wells are gauged during the LTM sampling as are an additional 12 AOC 32 wells to determine groundwater flow patterns across the site.

Institutional Controls

The ROD stipulated that ICs should be imposed on the properties to limit potential exposure to groundwater under both existing and future site conditions. ICs would ensure that exposure to and extraction of groundwater from the site for industrial and/or potable water supply would not be permitted. The ICs for AOCs 32 and 43A were specified in the FOST, dated May 2000 and were incorporated into the deed prior to property transfer. The deed restriction on parcel A-3 (the subject site), preventing groundwater extraction, was recorded in June 2000. A copy of the deed is included in Appendix F. Based on information collected during this review, the IC is effective in limiting potential exposure to groundwater.

In Situ Chemical Oxidation (ISCO) Remedial Action

Based on LTM analytical data a residual hydrocarbon “hot spot” remained within groundwater in a source area well near the former UST grave (UST#13). The Army proposed an ISCO injection for the “hot spot” at a BCT meeting and a work plan was prepared and approved. Sodium persulfate was chosen as the chemical to inject based on its proven effectiveness in treating the dissolved phase of the contaminants of concern present on site while minimizing secondary contamination through dissolution of arsenic and manganese. The work plan detailed the installation of four injection wells as shown on Figure 7.4. Three of the injection wells were installed near the former waste oil UST grave source area well 32M-01-18XBR (one to the east, one to the north and one to the south) and extended into bedrock. The fourth injection well was installed further north of the 32M-01-18XBR within the former UST pit

grave and straddled bedrock and overburden. A total of 1,800-gallons of water/sodium persulfate solution was injected into the four injection wells in February 2009. Sodium hydroxide was used as the catalyst with the sodium persulfate to form sulfate radicals. Groundwater sampling results at source area well 32M-01-18XBR following the injection remedial action indicated a drop in COCs concentrations one month after injection (March 2009), a rebound in COC concentrations three months after injection (May 2009), a decrease in concentrations 9 months after injection (November 2009) and a continuing trend of decreasing COC concentrations 15 months after injection (May 2010). The May 2010 analytical data indicated several COCs had dropped below action levels that were in exceedance prior to the injection event. The February 2009 ISCO remedial action appears to have effectively augmented the site's MNA remedy and continued groundwater monitoring will determine if remnant contaminants continue their decreasing concentration trends.

7.3.5 System Operation/Operations and Maintenance

Groundwater monitoring is being performed in accordance with the LTMP (HGL, 2008) for AOCs 32 and 43A. Yearly O&M costs for implementation are approximately $50,000.

7.4 PROGRESS SINCE LAST FIVE-YEAR REVIEW

This is the third five-year review for AOCs 32 and 43A.

The following is the protectiveness statement from the 2005 Five-Year Review:

> *"The remedy at AOC 32 and 43A currently protects human health and the environment because ICs are incorporated into the deed that prohibit the extraction of groundwater from the site for industrial and/or potable use and contaminants are not migrating off-site. However, in order for the remedy to be protective in the long-term, the recommendations and follow-up actions need to be taken to ensure long-term protectiveness.*
>
> *Current remedial action activity consists of implementing the remaining components specified in the ROD: the long term groundwater monitoring program, utilizing ICs, modeling, annual reporting, evaluation of the MNA performance and five-year site reviews. These components enable continued assessment for compliance with performance standards and reporting of remedial progress.*"

The following recommendations/follow-up actions were presented in the 2005 Five-Year Review:

- Submit updated LTMP;
- Repair damaged monitoring wells; and
- Vapor intrusion evaluation.

In the last five years, these recommendations/follow-up actions were addressed as follows:

"Submit updated Long Term Monitoring Plan"

Updated plan was submitted in 2008 to reflect current site conditions. The previous LTMP, which was in effect during the 2000–2005 time period, was based on the former site configuration and well network. The current 2008 LTMP is effective in meeting requirements of the remedy based on current site conditions.

"Repair damaged monitoring wells"
Monitoring well repairs were performed. Additional well repairs have been performed to address damage noted during LTM well inspections. Details on repairs noted in annual LTM reports. Repairs to the monitoring wells have achieved the purpose of maintaining an effective LTM well network.

"Vapor Intrusion Evaluation"
A Vapor Intrusion Evaluation was performed based on existing groundwater analytical data, building site inspection, predictive modeling, air sample data (sub-slab, indoor air, outside background) and risk analysis as presented in a 2007 Draft Final Technical Memorandum (USACE, 2007). Results of the evaluation supported the conclusion that indoor air quality is not compromised in the warehouse building. The technical memorandum recommended groundwater be monitored periodically to ensure conclusions remain valid and if conditions worsen perform an additional evaluation of vapor intrusion. The technical memorandum additionally recommended promoting best management practices for future building efforts to prevent creation of significant vapor intrusion pathways. The Vapor Intrusion study achieved its purpose and ensures protectiveness in accordance with the existing ROD.

Additional progress in the last five years, not detailed in the 2005 Five-Year Review, included the following:

"EPA Microwell Investigation"
The USEPA performed a microwell investigation in June 2007 based on comments and questions related to the 2006 USEPA Region 1 Technical Memorandum (USEPA, 2006). The issues raised by the Technical Memorandum were addressed by evaluating the microwell sampling results, issuance of the 2008 LTMP and by performing the ISCO effort.

"ISCO Injection Event"
The Army performed an ISCO injection in February 2009, as first proposed by the Army at a BCT meeting, in the vicinity of the former waste oil UST source area well 32M-01-18XBR. The injection was performed to augment the MNA remedy in an effort to mitigate the remaining site contaminants in the localized "hot spot" area near 32M-01-18XBR and not as a comprehensive site-wide cleanup of AOCs 32 and 43A. The ISCO treatment consisted of injecting a mixture of water and sodium persulfate. Post-injection groundwater analytical data indicated a reduction in COC concentrations followed by a rebound in COC concentrations, and then two rounds of continual COC concentration declines. Many COCs above action levels prior to the injection event are now below action levels based on May 2010 analytical data. The activated sodium persulfate injection achieved its purpose of "hot spot" remediation in the vicinity of 32M-01-18XBR.

7.5 FIVE-YEAR REVIEW PROCESS

7.5.1 Administrative Components of the Five-Year Review Process

Development of the third Five-Year Review process for Former Fort Devens included the following components that are described in this section:

- Document Review;
- Data Review;
- Site Inspection;
- Interviews; and
- Community Participation.

7.5.2 Document Review

The following documents were evaluated for this five-year review:

- Remedial Investigation Volume II and III prepared by Ecology and Environment, Inc., August 1994.
- Final ROD for the Defense Reutilization and Marketing Office Yard (AOC 32) and Petroleum, Oil, and Lubricants Storage Area (AOC 43A) prepared by Horne Engineering Services, Inc., February 1998.
- Second Five-Year Review Report prepared by Nobis, September 2005.
- Draft Technical Memorandum: Analysis of Bedrock Structure, Implications to LTM Optimization, Sites 32-43A, prepared by USEPA Region I, May 2006.
- Final 2005 Annual Report for AOCs 32 and 43A prepared by Mactec Engineering and Consulting, Inc., March 2007.
- Final 2007 Annual Report prepared by HGL, July 2008.
- Draft Final Technical Memorandum Sampling and Evaluation of Vapor Intrusion at Devens AOC 32 and 43A, prepared by USACE, May 2007.
- Final 2006 Annual Report prepared by HGL, August 2007.
- Final Long-Term Monitoring Plan prepared by HGL, October 2008.
- Sodium Persulfate Injection Work Plan prepared by HGL, January 2009.
- Final 2008 Annual Report prepared by HGL, September 2009.
- Persulfate Injection Summary Report prepared by HGL, June 2009.
- Draft-Final 2009 Annual Report prepared by HGL, April 2010.

7.5.3 Data Review

The data review is primarily focused on AOC 32 as groundwater sampling was discontinued at AOC 43A in 2004. The 2005 Annual Report (Mactec, 2007) presented data from the June and October 2005 sampling events. The 2006 Annual Report (HGL, 2007) presented data from the June and October 2006 monitoring events. The 2007 Annual Report (HGL, 2008) presented data from the May and October 2007 monitoring events. The 2008 Annual Report (HGL, 2009) presented data from the June and October 2008 monitoring events. A final report summarizing data from the June and October 2009 sampling events had not been issued at the time that this Five-Year Site Review Report was prepared. However, results from the June and October 2009 events were available for review from the draft final 2009 Annual Report (HGL, April 2010). Results from the May 2010 sampling event were reviewed and will be issued in the 2010 Annual Report in 2011. Table 7.4 below summarizes the COCs for AOC 32 that has exceeded the site cleanup goals from spring 2002 through fall 2009. A complete list of all validated COC results for AOCs 32 from 2005 through 2009 are presented in Appendix F.

The concentration of TCE in well 32M-01-18XBR has generally decreased since the April 2002 sampling event (Figure 7.5) and has remained below the 5 μg/L cleanup goal since October 2004. Groundwater from well 32M-01-18XBR also had single reported exceedances for bromodichloromethane (19 J μg/L) and chloroform (39 J μg/L) in June 2006; all other sampling events have yielded non-detections for these two analytes. All other AOC 32 wells have exhibited target VOC concentrations in groundwater below the respective cleanup goal since April 2002, with the exception of the chlorinated benzenes.

Target analytes 1,2-DCB, 1,3-DCB, 1,4-DCB, and chlorobenzene have been detected in groundwater above the associated cleanup goals at well 32M-01-18XBR since monitoring began in Spring 2002 (Figures 7.6 through 7.9). The 1,2-DCB detections ranged from 6,500 to 690 μg/L prior to the February 2009 persulfate injection event and dropped to below the action level in May 2010. The 1,3-DCB detections ranged from 850 to 120 μg/L prior to the February 2009 persulfate injection event and dropped to 59 μg/L in May 2010. The 1,4-Dichlorobenzene detections ranged from 540 to 67 μg/L prior to the February 2009 persulfate injection event and dropped to 26 μg/L in May 2010. The chlorobenzene detections ranged from 1,600 to 83 μg/L prior to the February 2009 persulfate injection event and dropped to 88 μg/L in May 2010.

Since June 2003, VPH and EPH carbon fractions have been detected above the respective cleanup goals only in well 32M-01-18XBR. VPH C_9-C_{10} aromatics have consistently fluctuated above the 200 μg/L cleanup goal since monitoring began in spring 2002. Figure 7.10 presents the trend data for well 32M-01-18XBR prior to and after the ISCO injection event.VPH C_9-C_{10} aromatics concentrations showed a more extreme downward trend after the ISCO injection event, with a short lived rebound in March 2009, which has continued into May 2010. Comparatively, the VPH C_9-C_{12} and EPH C_9-C_{18} aliphatic concentrations suggest a more distinct downward trend (Figure 7.11) prior to the ISCO injection event. With the exception of the 2004 data, the C_9-C_{12} aliphatic fraction has remained below the 700 μg/L cleanup goal since June 2003, and the C_9-C_{18}aliphatics have generally fluctuated above and

below this goal since April 2002, until consistently yielding detections below 700 μg/L from October 2007 through May 2010.

Arsenic was detected in groundwater, either consistently or sporadically, above the 10 μg/L cleanup goal in all AOC 32 wells between April 2002 and October 2005. Since June 2006, wells 32M-01-14XOB and 32M-01-18XBR have yielded elevated arsenic concentrations. Other AOC 32 wells have presented downward trends to the point of non-detection in2007. The residual arsenic concentration at 32M-01-14XOB likely reflects the reducing environment that consistently surrounds this well compared to the less reducing/aerobic environments found around the other AOC 32 wells. This same reducing environment scenario also existed at 32M-01-18XBR prior to the 2009 persulfate injection. Subsequent groundwater monitoring at 32M-01-18XBR in 2009 indicated a less reducing environment around this well, likely due to the effects of the persulfate injection and/or actual injection well installation. The persulfate injection mixture possibly had a high DO due to mixing and the air used during drilling possibly induced elevated DO in the groundwater. The DO and other MNA parameters, such as pH and conductivity, have been under a continual decline into May 2010 indicating the effects of the injection mixture are dissipating within the bedrock aquifer. The induced aerobic environment around 32M-01-18XBR have resulted in lower metals concentrations in groundwater.

Since May 2004, the only wells with exceedances of the manganese cleanup goal are 32M-01-18XBR and 32M-01-14XOB. The manganese concentration for well 32M-01-14XOB has generally remained slightly below the cleanup goal, although exceedances have been reported as recently as May 2009 (3,660 μg/L). In comparison, 32M-01-18XBR which is just east on the warehouse building and a former waste oil UST source area well, has consistently produced manganese concentrations above the cleanup goal since April 2002, yielding a trend that is relatively increasing up through October 2008. The March 2009 data, collected one month after the ISCO injection, indicated manganese was below action levels at 32M-01-18XBR. A May 2009 rebound in manganese concentrations occurred, which coincided with the rebound of most COCs, followed by a continuing reduction in concentrations through May 2010. The May 2010 sampling event was also notable in that all monitoring wells sampled were below action levels for manganese.

Table 7.4
Summary of Well Contaminant Exceedances
AOCs 32 and 43A

Well	April 2002	October 2002	June 2003	December 2003	May 2004	October 2004	June 2005	October 2005	June 2006	October 2006	May 2007	October 2007	June 2008	October 2008	June 2009	October 2009	May 2010
AOC 32 WELLS - EXCEEDANCES																	
32M-01-18XBR (Source Well)	VOCs and Manganese	VOCs and Manganese	VOCs and Manganese	VOCs and Manganese	VOCs, VPH, Manganese and Arsenic	VOCs, VPH, Manganese	VOCs, VPH, Manganese and Arsenic	VOCs, VPH, Manganese	VOCs, VPH, Manganese and Arsenic	VOCs, VPH, Manganese and Arsenic	VOCs, VPH, EPH, Manganese and Arsenic	VOCs, VPH and Manganese	VOCs, VPH, Manganese and Arsenic	VOCs, VPH, Manganese and Arsenic	VOCs, VPH, Manganese and Arsenic	VOCs, VPH, Manganese and Arsenic	VOCs, VPH and Arsenic
32M-01-14XBR (Sentry Well)	No Exceedances	Arsenic and Lead	Arsenic	No Exceedances	Arsenic	Arsenic	No Exceedances	Arsenic and Lead	No Exceedances	No Exceedances	No Exceedances	No Exceedances	No Exceedances	Not Sampled	No Exceedances	Not Sampled	No Exceedances
32M-01-14XOB (Sentry Well)	No Exceedances	No Exceedances	Manganese and Arsenic	Manganese and Arsenic	No Exceedances	Arsenic	Manganese and Arsenic	Arsenic and Lead	Arsenic	Arsenic	Arsenic	Arsenic	Arsenic	Manganese and Arsenic	Manganese and Arsenic	Not Sampled	Arsenic
32M-01-15XBR	No Exceedances	No Exceedances	Manganese and Arsenic	Manganese and Arsenic	No Exceedances	No Exceedances	No Exceedances	No Exceedances	No Exceedances	1,4-Dichlorobenzene	No Exceedances	1,4-Dichlorobenzene	1,4-Dichlorobenzene	1,4-Dichlorobenzene	No Exceedances	No Exceedances	No Exceedances
32M-01-17XBR	No Exceedances	No Exceedances	Manganese and Arsenic	Manganese and Arsenic	No Exceedances	No Exceedances	No Exceedances	No Exceedances	No Exceedances	1,4-Dichlorobenzene	No Exceedances	No Exceedances	No Exceedances	No Exceedances	No Exceedances	1,4-Dichlorobenzene	1,4-Dichlorobenzene
32Z-99-02X (Distant Sentry Well)	Not sampled	Arsenic and Lead	No Exceedances	No Exceedances	No Exceedances	No Exceedances	No Exceedances	Not Sampled	No Exceedances	No Exceedances	No Exceedances	No Exceedances	No Exceedances	Not Sampled	No Exceedances	Not Sampled	No Exceedances
SHL-15	Arsenic and Manganese	Arsenic	Arsenic	Arsenic	Arsenic	Arsenic	Arsenic	No Exceedances	No Exceedances	Arsenic	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	Not Sampled	No Sampled

7.5.3.1 Natural Attenuation

Natural attenuation parameters DO and ORP are only useful from bedrock source area well 32M-01-18XBR, as it is the only well with groundwater that continues to show exceedances of organic parameters. Prior to the ISCO remedial injection event low values of DO and ORP were well into the ranges indicating anaerobic conditions. Both had decreased markedly since 2002 and remained low to October 2008. This well is located beneath pavement adjacent to the warehouse and the lack of groundwater recharge was reflected in the DO values and slow rate of contaminant attenuation.

The persulfate injection implemented in February 2009 was a response to the slow contaminant attenuation at the 32-M-01-18XBR well. The contaminant concentrations dropped rapidly after the initial injection, based on March 2009 analytical data, but rebounded in May 2009. The rebound appeared to be transitory based on the resumption of a decreasing contaminant concentration trend that began with the November 2009 sampling event and continued into the May 2010 sampling event. Additional groundwater data are required to establish an increasing, stable, or decreasing concentration trend; however, preliminary data indicate a decreasing concentration trend. Analytical and monitoring data from June 2006 through May 2010 is included in Appendix F.

7.5.3.2 New Bedrock Topography

The warehouse was completed in 2001 and is depicted on Figure 7.3. The new warehouse and its associated pavement have significantly altered the ground surface and its capacity for recharge. Shaw Environmental, Inc., developed a an updated contour map for bedrock under the warehouse that shows how the bedrock can influence groundwater flow directions and affect contaminant transport related to the former source areas that are now encompassed by the warehouse footprint. The warehouse slab foundation is likely founded directly on the bedrock along its eastern side and overlies two topographic mounds. Test pits dug in these areas showed shallow bedrock as high as 270 ft above msl. The finish floor is at elevation 263.5 ft above msl, and it is likely that excavation for the slab foundation extended several ft below this level. Therefore, rock was probably removed to at least an elevation of 260 ft above msl in places (USACE, 2004).

7.5.3.3 Groundwater Flow in Bedrock

The post-construction bedrock contours, as depicted on Figure 7.3, show the rock surface slopes east and west away from the two bedrock mounds under the warehouse, separating groundwater flow directions in the area. Flow in the bedrock is likely to follow fractures and topographic gradients toward these depressions to the east and west. However, the actual presence of groundwater and flow paths in the bedrock is unknown under the building. The warehouse and its surrounding pavements significantly prevent recharge to the bedrock from infiltration through the overburden.

7.5.3.4 Groundwater Flow in Overburden

The post-construction bedrock contours on Figure 7.3 show the overburden under the warehouse is absent to thin along the east side, and thickens to about 45 ft at well 43M-01-17XOB along the building's west margin. Hydraulic gradients in the overburden follow those contours. The residual contamination in the source areas lies east of the bedrock divide and appears to be encapsulated under the warehouse structure with little to no groundwater in the thin overburden, thus preventing the transport and attenuation of some residual VOC contamination in the overburden. The warehouse and its surrounding pavement also significantly limit recharge to the overburden from surface infiltration.

7.5.4 Site Inspection

On April 12, 2010, an HGL representative performed site inspections at AOCs 32 and 43A. Conditions during the inspection were favorable with no precipitation and temperature approximately 60 ˚F.

The warehouse occupying the site is currently up for lease and unoccupied. The monitoring well network was observed to be in good condition with no evidence of damage.

7.5.5 Interviews

The following individual was interviewed as part of the five-year review:

- Ms. Ellen Iorio, USACE, New England District;
- Mr. Ron Ostrowski, MassDevelopment; and
- Mr. Brian Poitras, Calare Properties, Inc.

Ms. Iorio stated that since its closure, other than the construction of the new warehouse distribution building, she is unaware of any events, incidents, or activities that would impact the remedy at the site. ICs are in effect for AOCs32 and 43A (as discussed in other sections of this report).

Mr. Ron Ostrowski with MassDevelopment was also interviewed and stated that remedial action work conducted at the site is progressing in a positive manner. Mr. Ostrowski also stated that the vapor intrusion was a concern was being addressed, and that it would not lead to an IC. He reported no events, incidents or activities that would require emergency response from local authorities.

Mr. Brian Poitras stated that he is not aware of any events, incidents, or activities that have occurred at the site; and that the remedial action appears to be progressing normally.

The detailed 2010 LUC interviews will be included in Appendix J.

7.5.6 Community Participation

Community participation at former Fort Devens Army Installation is detailed in Section 1.3.

7.6 TECHNICAL ASSESSMENT

Question A: Is the remedy functioning as intended by the decision documents?

Yes. The remedy is functioning based on the long-term monitoring results and ICs implemented with no early indicators of remedy failure. Information to support this statement provided below.

Remedial Action Performance
The excavation and off-site disposal of contaminated soils have been effective at removing any contaminant source soils and has met the objectives of the remedial actions.

Analysis of groundwater data has indicated that off-site migration is not occurring. The data, however, suggest that attenuation at the well to the south and adjacent to the grave of the former waste oil UST is slow. The 2008 LTMP suggested implementation of additional remedial activities at AOC 32 to expedite the MNA process. A catalyzed sodium persulfate injection was performed in the vicinity of the former UST area in February 2009 to expedite the cleanup process. Sodium hydroxide was used as a catalyst to activate the persulfate. A total of approximately 1,800 gallons of persulfate/water solution was injected into four new injection wells near and within the residual contaminant source area (former UST grave) near AOC 32 monitoring well 32M-01-18XBR.

Post-injection groundwater sampling revealed a marked decrease in contaminant concentrations followed by a contaminant increase. The increased concentrations were still below baseline (fall 2008) pre-injection concentrations, and subsequent sampling performed in November 2009 revealed a decreasing concentration trend that continued into May 2010. The May 2010 dataset is significant in that all wells were below action levels for manganese. The source area well 32M-01-18XBR also had 1,2-DCB and chlorobenzene concentrations below their respective action levels in May 2010. May 2010 concentrations of 1,3-DCB and 1,4-DCB also showed promising sustained decrease trends based on November 2009 and May 2010 data, to just above their action levels. Based on these trends, the MNA remedy has been positively impacted by the ISCO injection conducted near former waste oil UST source area well 32M-01-18XBR.

Systems Operations/Operation and Maintenance (Long-Term Groundwater Monitoring)
Groundwater monitoring is performed in accordance with the LTMP (HGL, 2008b) for AOCs 32 and 43A. As stated previously, groundwater sampling was discontinued at AOC 43A in 2004 due to two consecutive years of contaminant non-detections within groundwater wells at this AOC. Groundwater gauging is performed at AOC 43A on an annual basis. Groundwater sampling was performed at AOC 32 on a semiannual basis through 2009. In 2008, the fall event was designated as a pre-injection (ISCO) baseline monitoring event and subsequent fall events would be designated as performance monitoring events. Beginning in 2010, AOC 32

will be sampled annually during the spring event; however, as mentioned above, additional fall sampling may occur at AOC 32 to monitor results of the persulfate injection treatment. Based on the May 2010 32M-01-18XBR groundwater analytical data, a further decrease of COCs was observed that indicted a fall 2010 performance monitoring event may no longer be needed.

Opportunities for Optimization

The Army will transition to the annual sampling protocol described in the LTMP beginning with the spring 2010 LTM event and evaluate the need for a second (fall 2010) performance monitoring event if post-injection contaminant rebound is observed at 32M-01-18XBR. Conversely, a fall event may be added if substantial contaminant reductions are observed in order to establish trend data.

Early Indicators of Potential Remedy Failure

Review of historical LTM data indicated that natural attenuation was not effectively remediating contamination in a localized area, as defined by 32M-01-18XBR, near AOC 32 former waste oil UST grave (source area). Other AOC 32 and 43A monitored areas did indicate that natural attenuation was a valid remedy. The February 2009 ISCO injection was performed. The performance monitoring data indicated that the initial contaminant reduction was significant followed by a rebound of approximately 50% of pre-injection concentrations. Additional monitoring indicates decreasing concentrations from March 2009 through May 2010 but additional data are required to establish a definitive trend. A second injection may be required if data reveal increasing concentrations or a return to the pre-injection status quo of variable but stagnant concentration trends.

Implementation of Institutional Controls and other Measures

There are no current or future plans for additional development or installation of potable drinking water wells at AOCs 32 and 43A. Based on information collected during this review, this IC is effective in ensuring the remedy's protectiveness because exposures to contaminants are not allowed to occur. The deed can be located at the BRAC office library.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?

The exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy selection are still valid based on supporting information provided below, with the exception of the PRG for arsenic and 1,3-DCB. The arsenic PRG was previously 50 μg/l and changed to 10 μg/l in January 2006. The GW-1 standards in the MCP were revised and the GW-1 standard for 1,3-DCB was lowered from 600 μg/L to 40 μg/L.

Changes in Standards and To Be Considered

As part of this five-year review, ARARs and TBC guidance presented in the ROD and current ARARs were reviewed. This ARARs review will be discussed further in Section7.6.2.

Excavation activities at AOC 32 were completed in 1998. The RAOs for soil specified in the ROD have been permanently achieved. There are no current ARARs that apply to soil contaminants at the site. Because the cleanup goals for soil at AOC 32 were based on HHRA levels determined specifically for the site and the contaminated soils were removed, changes to soil TBCs do not affect the protectiveness of the implemented remedy.

The MCLs are health-based standards established by the USEPA. The MCL for arsenic in effect at the time of the ROD (50 μg/L) was selected as a groundwater cleanup goal. Arsenic was present on site at concentrations greater than its MCL during the remedial investigation and was a primary risk driver for the ingestion of groundwater exposure pathway at AOC 32. The MCL for arsenic has been updated since the 1998 ROD. Changes to the MCL for arsenic (effective February 2002) in association with changes of the EPA National Primary Drinking Water Regulations for arsenic and implementation on January 23, 2006, effectively reduce the clean-up level for arsenic from 50 μg/L to 10 μg/L. There have been no changes to the COC MCLs since the previous five-year review. Because the remedy prohibits the use of groundwater as drinking water, changes to groundwater standards do not affect the protectiveness of the implemented remedy.

After the completion of the fall 2005 LTM event, the GW-1 standards in the MCP were revised and the GW-1 standard for 1,3-DCB was lowered from 600 μg/L to 40 μg/L. This change in standard does not affect the remedy. Concentrations of 1,3-DCB have decreased substantially over the latest five year monitoring period covered by this review and are only slightly above (59 μg/L) the new standard in one well.

Changes in Exposure Pathways

The ROD identified unacceptable risks from the following exposure pathways: ingestion of groundwater as the primary drinking water source at both AOCs 32 and 43A; and direct contact with, and ingestion of, contaminated soils by current and future site workers and future construction workers at AOC 32. Based on analytical results of confirmatory soil samples collected from excavated areas, the excavation and removal of contaminated soil from AOC 32 have eliminated the direct contact exposure pathway to contaminated soils.

ICs prohibiting the use of site groundwater as drinking water at both AOCs 32 and 43A have effectively eliminated exposure via ingestion of groundwater. The construction of a large warehouse was completed in 2001. The warehouse and associated pavements now cover much of both AOCs 32 and 43A. Land use at the site has not changed from the presumed future industrial use evaluated prior to the ROD and is not expected to change. Current use is in compliance with deed restrictions on groundwater extraction recorded in November 1997 for parcel A-3, which includes AOCs 32 and 43A.

The construction of the warehouse was evaluated as a potential exposure pathway for inhalation of vapors diffusing from groundwater via soil gas into indoor air. This potential pathway was evaluated for future on-site workers in the RI for AOC 32. No unacceptable risks were found based on modeled indoor air concentrations from site groundwater and soil concentrations at the time of the RI preparation (circa 1994). The Army has conducted

sampling and modeling since the second five-year review to further evaluate the potential for vapor intrusion (USACE, 2009). The sampling and modeling results indicate that there is no reason to restrict site use due to vapor intrusion. The potential for vapor intrusion should be reevaluated if there are consistent increasing contaminant trends in the groundwater monitoring data or if significant structural modifications are made to the building foundation.

Changes in Exposure Assumptions

The risk assessment supporting the ROD for AOCs 32 and 43A used exposure assumptions that were consistent with standard practice at the time. Since the original risk assessment was prepared, USEPA has updated the recommended dermal contact exposure assumptions. The 1998 draft guidance for evaluating dermal contact exposures used in the RI was finalized in July 2004 (Risk Assessment Guidance for Superfund, Volume I – Human Health Evaluation Manual – Part E, Supplemental Guidance for Dermal Risk Assessment – Final). The final guidance includes slight changes in some dermal exposure assumptions. Because the remedy includes prohibiting the use of groundwater as drinking water and excavation of contaminated soils has been performed, changes to the exposure parameters do not affect the protectiveness of the implemented remedy.

Changes in Toxicology and Other Contaminant Characteristics

Because the groundwater cleanup goals presented in the ROD are not risk-based calculated values, changes in toxicity values do not impact the protectiveness of the cleanup goals. Also, the remedy includes the prohibition of groundwater use as drinking water so any changes in toxicity of the COCs do not affect the protectiveness of the remedy. Because the soil cleanup goals at AOCs 32 and 43A were based on site-specific HHRA, changes in toxicity values for soil contaminants could have affected the soil cleanup goals. However, because the contaminated soil has already been removed, changes to soil contaminant toxicity do not affect the protectiveness of the implemented remedy.

Below is a summary of the changes in toxicity values for each COC and the potential impact on the risk calculations:

The IRIS cancer assessment for inorganic arsenic is currently under review. EPA's Office of Research Development has recently completed a 2010 draft titled: *Toxicological Review of Inorganic Arsenic: In Support of the Summary Information on the Integrated Risk Information System (IRIS)*. The draft assessment includes an updated CSF of 25.7 mg/kg-day^{-1}, which is much high than the CSF currently listed in IRIS. Acceptance of this new, higher CSF could indicate that the cancer risk from arsenic may be underestimated.

The manganese RfD published in the IRIS database includes manganese from all sources, including diet. USEPA Region I supports an oral RfD for manganese of 0.07 mg/kg/day for ingestion of soil, sediment, or food and an oral RfD of 0.024 mg/kg/day for manganese in drinking water. Also, USEPA issued a Lifetime Health Advisory of 0.3 mg/L for manganese. This value should be used for infants younger than six months even for an acute exposure of 10 days. The advisory is a to-be-considered value. Therefore, potential cancer risks from exposure to manganese are lower than calculated in the risk assessment.

Changes in Risk Assessment Methodology

Several new risk assessment methodologies have been introduced since the original risk assessment was performed.

In 2004, USEPA published the final version of the RAGS Appendix E, which is the updated guidance for the dermal contact evaluation (EPA, 2004). Current recommendations include updated dermal absorption factors for specific chemicals and updated oral to dermal adjustment factors for RfDs and CSFs. The final guidance includes slight changes in some dermal exposure assumptions from what was used in the original risk assessment. While this may indicate an underestimation of exposure in the original risk assessment, it is not expected that the slight change in the dermal exposure calculation would alter the conclusion of the risk assessment.

USEPA has identified several carcinogens that act via a mutagenic mode of action, and to account for their early-life exposures, the default ADAFs of "10" for ages 0 to 2 and "3" for ages 2 to 16 have now been incorporated into the risk calculations. This approach is consistent with the 2005 Guidelines for Carcinogen Risk Assessment and the Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens. No currently detected AOC 32 COC is considered to be mutagenic for the purposes of the risk assessment methodology. This change would not affect the conclusion of the original risk assessment.

In January 2009, USEPA introduced RAGS Part F, which updates the approach for determining risk from inhaled chemicals to be consistent with the inhalation dosimetry methodology described in *Methods for Derivation of Inhalation Reference Concentrations and Application of Inhalation Dosimetry* (USEPA, 1994). The new approach revises the equations for estimating inhalation exposure and risk, recommending that when estimating risk via inhalation, the concentration of the chemical in air should be used as the exposure metric (e.g., mg/m^3), rather than inhalation intake of a contaminant in air based on inhalation rates or body weight (e.g., mg/kg-day). It is not expected that this change in the inhalation calculation would alter the conclusion of the risk assessment.

While numerous methodologies have changed since the original risk assessment was prepared, the potential human health risks discussed in the ROD will be eliminated by the ICs that are in place to prohibit groundwater from being used as drinking water thus maintaining the protectiveness of the current remedy. Therefore, there are no risk assessment methodology changes that affect the protectiveness of the remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No other information has come to light that would call into question the protectiveness of the remedy. No natural disaster impacts occurred at AOCs 32 or 43A during this review period.

7.6.1 Summary of Technical Assessment

Groundwater data indicates that contaminant concentrations are declining and that off-site migration is not occurring. While several risk assessment methodologies have changed since the original risk assessments were prepared, ICs are in place to limit the groundwater use as drinking water, thus maintaining the protectiveness of the current remedy.

Vapor intrusion exposures related to groundwater are not problematic at AOCs 32 and 43A. Further evaluation may be necessary if groundwater concentrations of VOCs in the area are found to increase over time or if significant modifications are make to the building foundation.

Organic contaminant degradation via monitored natural attenuation was not effectively remediating localized contamination based on monitoring well 32M-01-18XBR, near former waste oil UST grave. A sodium persulfate injection event was performed to augment the MNA remedy and was followed by performance groundwater sampling. The latest performance groundwater monitoring in May 2010 indicates a reduction in contamination concentrations. May 2010 monitoring data from all wells has indicated that manganese concentrations have dropped below its associated action level.

7.6.2 Applicable or Relevant and Appropriate Requirements Review

ARARs that were presented in the ROD are included in Appendix F. Standards and regulations, current at the signing of the ROD and for the previous Five-Year Reviews, have been reviewed for changes that could affect protectiveness of the remedy.

ARARs including the ROD that pertains to the excavation and off-site disposal of soil and subsurface soil were not reviewed for this five-year review. Excavation activities were completed in 1998 and the RAOs specified in the ROD have been permanently achieved.

The following ARARs have been modified since the signing of the ROD and may affect the protectiveness of the implemented remedial action:

1. 40 CFR 141.11 Subpart B Maximum Contaminant Levels – updated July 1, 2001. Section 141.11 (a) and (b) were amended at 66 FR 7061 on January 22, 2001 to state the following:

   - ****The analyses and determination of compliance with 0.05 mg/L MCL for arsenic use the requirements of 141.23.*
   - *The MCL for arsenic was 0.05 mg/L for community water systems until January 23, 2006.*

   On January 22, 2001, USEPA adopted a new standard for arsenic in drinking water at 0.01 mg/L, replacing the old standard of 0.05 mg/L (66 FR 6976). The rule became effective February 22, 2002. The date by which systems must comply with the new 0.01 mg/L standard was January 23, 2006.

2. 40 CFR 141.15 and 141.16 Subpart B MCLs – updated July 1, 2003. An effective date note (65 FR 76745) removed the sections from the CFR effective December 8, 2003. Sections 141.15 and 141.16 do not appear in 40 CFR 141 updated on July 1, 2004. These two sections addressed MCLs for radium-226, radium-228, gross alpha particle radioactivity, and beta and photon radioactivity, which do not affect the protectiveness of the remedy.

3. 40 CFR 141.51 Subpart F MCL Goals and Maximum Residual Disinfectant Level Goals – updated July 1, 2001. The table was amended in Section 141.51 by adding arsenic with an MCL goal of zero effective January 23, 2006 (66 FR 7063). Until then, no MCL goal applied for arsenic.

4. 310 CMR 22.0 Drinking Water – updated May 24, 2004. The arsenic MCL listed in Section 22.06 is effective for the purpose of compliance with the CFR (outlined above) on January 23, 2006. A perchlorate standard was also promulgated July 28, 2006. Because perchlorate is not a COC for the site, the ARARs are not affected by this change. 310 CMR 22.26 was updated in December 2009 regarding microbial communities in groundwater that is also used for public consumption. As bacterial populations are not considered a COC for AOCs 32 and 43A, the protectiveness of the remedy is not affected.

5. 310 CMR 30.00 Hazardous Waste Regulations – In January 2007, an update to this regulation was proposed to streamline the cleanup requirements of any hazardous materials released to the environment at facilities, both active and closed, that are, or were, subject to a hazardous waste license. In April 2010, this regulation was updated to include the Amendments for Adoption of Federal Land Disposal Restriction Program. The update also includes revised definitions and technical corrections needed to clarify the regulatory status of specific wastes. There were no revisions that affect the protectiveness of the remedy.

6. 314 CMR 6.00 Massachusetts Groundwater Quality Standards – rescinded March 20, 2009. Revisions made to 314 CMR 5.00 for a streamlined groundwater discharge permitting process negated the need for this section. As the selected groundwater quality standards for AOC 32 and 43A are primarily Federal MCLs and are also presented in 40 CFR 141 Section 11 and 13, the removal of 314 CMR 6.00 from the CMR does not affect the protectiveness of the remedy.

7.7 ISSUES

The effectiveness of the persulfate injection is still under evaluation and additional actions may be necessary to augment the MNA remedy at the former AOC 32 former waste oil UST grave source area if contaminant concentrations rebound or show no change over time.

7.8 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

In accordance with the revised LTMP (HGL, 2008), the Army transitioned to annual LTM sampling events beginning with the spring 2009 LTM event. In 2009, the Army performed an additional fall monitoring event to evaluate the performance of the prior persulfate injection. Data from each spring LTM event would be used to evaluate whether fall performance monitoring should continue for another year or could be terminated. The Army should use spring 2010 LTM event data and an evaluation of long-term trends (i.e., the continuance of existing trends or the emergence of new trends) to evaluate the need for a fall 2010 performance monitoring event.

7.9 PROTECTIVENESS STATEMENT

The remedy at AOCs 32 and AOC 43A is protective of human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled. Post construction groundwater flow patterns have been defined and no new potential receptors have been identified. ICs that prohibit access to the site's groundwater for residential or commercial use are in place. Current remedial action activity consists of implementing the remaining components specified in the ROD: the long-term groundwater monitoring program, utilizing ICs, annual reporting, evaluation of the monitored natural attenuation performance, and five-year site reviews. These components enable continued assessment for compliance with performance standards and reporting of remedy progress.

7.10 NEXT REVIEW

See Section 1.4 for further details.

7.11 REFERENCES

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8.0 AREA OF CONTAMINATION 69W STATUTORY FIVE-YEAR SITE REVIEW

8.1 SITE CHRONOLOGY

Table 8.1
Chronology of Events
AOC 69W

Event	Date
Fuel line crimp during UST installation leaked approximately 8,000 gallons of No. 2 fuel oil released to the ground	1972
Oil recovery system was installed	1972-1973
Underground fuel line failed at a pipe joint and approximately 8,000 gallons of No. 2 fuel oil was released to the ground	1978
SI performed	1994
Removal action of contaminated soil from 1972 leak and oil recovery system	1997-1998
RI completed	1998
Limited Action ROD signed	1999
Final LTMP	March 2000
First Five-Year Review	September 2000
Final OPS Demonstration for AOC 69W	November 2005
Second Five-Year Review	September 2005
Finding of Suitability to Transfer (FOST)	November 2006
Property transferred from Army to MassDevelopment	August 2007
Final Indoor Air Soil Vapor Intrusion Study for Parker Charter School	February 2008
Revised LTMP	November 2008
Semiannual LTM	2000-2005
Annual LTM	2006-2009

8.2 BACKGROUND

AOC 69W is located at the northeast corner of the intersection of Jackson Road and Antietam Street on the northern portion of what was formerly the Main Post at Fort Devens. AOC 69W consists of the Former Fort Devens Elementary School (Building 215), the associated parking lot, and adjacent lawn extending approximately 300 ft northwest to Willow Brook. All contamination at AOC 69W is attributed to No. 2 heating oil, which leaked from underground piping in two separate incidents; in 1972 and in 1978. Approximately 7,000 to 8,000 gallons of fuel oil were released to soil from each release. A site map showing various features is included as Figure 8.1.

The following items summarize the history for AOC 69W.

- 1951. The Fort Devens Elementary School was built and consisted of the east/southeast half of the present school. The school was heated by an oil-fired boiler, and the heating oil was stored in a 10,000-gallon UST located in what is currently the school courtyard. The school was operated and maintained by the Ayer School Department.

- 1972. An addition to the school was built that formed the current school structure. Although a new boiler room was constructed, the old boiler room remained operational. The original 10,000-gallon UST was removed and a new 10,000-gallon UST was installed north of the school in the middle of the current parking lot. During the UST installation, the underground fuel line leading to the new boiler room was accidentally crimped, causing the pipe to split and leak approximately 7,000 to 8,000 gallons of No. 2 fuel oil to the ground.
- 1972-1973. As a result of the fuel release, an oil recovery system was installed in the vicinity of the 10,000-gallon UST. The system consisted of underground piping connected to a buried 250-gallon concrete vault that acted as an oil/water separator. The vault collected oily water and was pumped out approximately every 3 months.
- 1978. Underground fuel piping near the original boiler room failed at a pipe joint. Approximately 7,000 to 8,000 gallons of oil were released into the soil during the incident. Soil was excavated to locate the source of the release. The excavation remained open to collect the residual oil for 1 month before the damaged piping was found and replaced. A maximum of 2,600 gallons of residual oil was pumped from the oil recovery system.
- 1993. The Ayer School Department closed the school because the facility was excess to its needs. As part of the Base closure process, the Army performed a base wide evaluation of past spill sites and designated the elementary school spill site as Areas Requiring Environmental Evaluation (AREE) 69W. Based on document reviews and site visits, the evaluation concluded that residual fuel contamination might have been present in the soil and groundwater at the site.
- 1994. The Army performed a SI, which revealed the presence of fuel-related contaminants in both soil and groundwater between the school and the existing UST, and in an area extending northwest from the existing fuel UST to near Willow Brook. The Army re-designated the site as AOC 69W and proposed a RI be performed.
- 1995-1998. An RI was performed to define the AREE SI, and to determine whether remediation was warranted. Investigation activities included an historical record search and personnel interviews, a geophysical survey and test pitting, sediment and toxicity sampling in Willow Brook, surface and subsurface soil sampling, groundwater monitoring well installation, groundwater sampling and groundwater level measurements, aquifer testing, ecological survey and wetland delineation, air quality sampling within the elementary school, and human health and ecological risk assessments. The RI data showed that fuel-related compounds, primarily TPHC and SVOCs were present in soils extending from the new (1972) boiler room to approximately 300 ft northwest. Fuel-related VOCs, SVOCs, TPHC, and inorganics comprised the observed groundwater contaminants. Soil and groundwater contamination appeared to be largely a result of the 1972 fuel oil release. The underground oil recovery system apparently acted as a conduit for contaminant migration in soil and groundwater. Observed contamination from the 1978 release did not appear to be migrating downgradient and further migration was considered unlikely

considering the age of the release and the paved parking lot, which inhibited precipitation infiltration.

- 1996. Fort Devens officially closed. AOC 69W was slated for future transfer to the Massachusetts Government Land Bank (now MassDevelopment). The existing school building was expected to be re-opened.
- 1997-1998. The Army performed a removal action and excavated approximately 3,500 cy of petroleum-contaminated soil associated with the 1972 fuel oil leak. The 10,000-gallon fuel oil UST, oil recovery system's 250-gallon vault, and associated piping were also removed. The 10,000-gallon fuel oil UST was confirmed to be intact (i.e., no holes or leaks were observed). Confirmatory soil sampling in excavated areas indicated that EPH and VPH concentrations immediately adjacent to the school still exceeded MCP S-1/GW-1 soil standards after the removal action. Because of the proximity of the school, this soil could not be excavated without potential building structural damage.
- 1999. Limited Action ROD signed. The Limited Action consists of groundwater LTM and ICs to limit the potential exposure to contaminated soils and groundwater under both the existing and future site conditions. Because groundwater in this site's recharge area is not planned for as a drinking water source and because Devens has a municipal water supply, the Army's position has been that residual contamination of groundwater in this area does not pose an unacceptable risk. The Limited Action ROD has been in effect since 1999.
- 2000. The former Fort Devens Elementary School was reopened in September 2000 as the Parker Charter School and currently occupies the site.
- 2006-2007. The Army finalized the FOST for AOC 69W in November 2006 and the property was formally transferred from Army ownership to MassDevelopment in August 2007. The current property owner, Francis Charter School, is abiding by the ICs imposed on the property, and annual groundwater sampling continues as recommended in the current LTMP.

8.2.1 Summary of Site Geology and Hydrogeology

The predominant soil type at AOC 69W consists of dark yellowish-brown fine to coarse sands, gravely sands, and silty sands. Explorations in the vicinity of Willow Brook and its associated wetlands revealed a 4- to 5-ft layer of dark grayish-brown, sandy silt overlying the sands. Organic material, believed to be from undisturbed native peat deposits, is located in the area north of the school at a maximum depth of 4 ft bgs. Near surface soils beneath the school and parking lot consist of reworked native soils. During the remedial investigation in 1998, bedrock was not encountered in any of the soil borings, which reached depths of up to 16 ft. The water table aquifer at AOC 69W occurs in the overburden at depths ranging from 4 ft to 6 ft bgs on the north side of the school building to approximately 1-ft bgs adjacent to Willow Brook. Groundwater flow direction is predominately from the south-southeast to north-northwest. Groundwater discharges to Willow Brook at times of high groundwater levels and is a losing stream during low groundwater conditions. Vertical gradients were not calculated as

there are no deep overburden wells; however, the intermittent discharge to Willow Brook indicates locally upward gradients. Calculated groundwater flow velocities are consistent with the observed sandy soils with a maximum calculated flow velocity of 2 ft/day and a mean flow velocity of 0.7 ft/day. AOC 69W is located within the delineated Zone II for the MacPherson production well located approximately 3,000 ft to the north, and downgradient of AOC 69W (USACE, 1998).

8.2.2 Soil Contamination

A review of the field and analytical data from the 1995 and 1996 RIs (HLA, 1998) indicated that there were two areas of fuel-related soil contamination at AOC 69W. The larger area extended from the new boiler room to the oil recovery system 250-gallon concrete vault that acted as an oil water separator, in the wooded area approximately 300 ft northwest of the school. The contamination was attributed to the 1972 release of fuel oil from piping between the 10,000-gallon UST and the new boiler room. Analytical data and visual evidence suggested that the release may have been inside or near the new boiler room. Because of the release, an oil recovery system was installed in 1972 to remove oil from the source area and presumably from near surface soils in the grassy area north of the school. Contaminant distributions established by the RI indicated that the trench for the underground piping associated with this system may have acted as a conduit for contaminant migration. Detected contaminants were primarily TPHC, PAHs, and EPH/VPH at approximately 6 ft to 10 ft bgs adjacent to the school and 0 to 4 ft bgs downgradient in the grassy area and in the vicinity of the 250-gallon underground concrete vault. Subsurface contaminants were located primarily at or near the water table. Surficial contamination downgradient of the school (near Willow Brook) is attributed to sorption during times of high groundwater levels.

Based on the nature and distribution of contaminants, a Removal Action (Weston, 1998) was undertaken in the winter of 1997 and 1998 to remove contaminated soil associated with the 1972 release. Soil was excavated to a maximum depth of 13 ft bgs near the school, and 8 ft bgs near the 250-gallon underground concrete vault. Confirmatory subsurface soil sample results from the removal action showed that concentrations of fuel-related contaminants still exceed MCP S-1/G-1 standards for EPH in subsurface soils immediately adjacent to the school building, but are generally low in downgradient areas (Weston, 1998).

The other identified area of soil contamination is located adjacent to the school building outside of the original boiler room. This contamination is attributed to the 1978 fuel oil release from ruptured piping. An excavation at the time of the release showed visible fuel oil contamination emanating from underneath the school. Analytical data indicated that the contaminants were primarily TPHC at depths of 4 ft to 7 ft bgs beneath the parking lot. Contaminants appeared to be localized to the area immediately adjacent to the school. Site related contaminants were absent from adjacent soils (e.g., ZWR-95-27X, ZWR-95-54X, and ZWR-955-5X). Future leaching is not likely as the area is paved, thereby inhibiting leaching of soils via precipitation infiltration.

8.2.3 Groundwater Contamination

Fuel-related VOCs, SVOCs, TPHC, and inorganics comprise the observed groundwater contaminants at AOC 69W. Varying degrees of groundwater contamination, as identified by field and off-site analysis, were observed to extend from the new boiler room towards the 250-gallon underground concrete vault located approximately 300 ft to the northwest. The area of groundwater contamination was coincident with the underground piping associated with the oil recovery system installed in response to the 1972 fuel oil release. Contaminant concentrations were highest between the new boiler room and monitoring well 69W-94-13, which was also the area of highest observed soil contaminant concentrations. The soil around monitoring wells 69W-94-10 and 69W-94-13 exhibited the highest contaminant and inorganic concentrations. This soil was removed during the soil Removal Action (Weston, 1998).

Arsenic, calcium, iron, manganese, potassium, and sodium were detected in filtered groundwater samples at concentrations in excess of calculated Devens background concentrations and in some cases in excess of cleanup values based on the MCP GW-1/GW-2 groundwater standards. The greatest number of background exceedances and the only noted Federal MCL/Massachusetts Groundwater Quality Standards 310 CMR 6.0 exceedance in the initial groundwater sampling events were observed in groundwater from monitoring wells 69W-94-10 and 69W-94-13. Analytes that exceeded MCLs in these wells included arsenic, naphthalene, and the EPH and VPH aromatic fractions. Contaminated soils surrounding these wells were removed during the soil Removal Action (Weston, 1998).

The RI (HLA, 1998) did not reveal significant groundwater contamination associated with the 1978 fuel oil release in the vicinity of the old boiler room. Low concentrations of chlorinated VOCs were detected during the 1995 field analysis and the first round of groundwater sampling. No chlorinated VOCs were detected during the next three subsequent rounds of groundwater sampling efforts.

8.2.4 Summary of Site Risks

The RI report (HLA, 1998) completed a HHRA following a four-step process: (1) contaminant identification; (2) exposure assessment; (3) toxicity assessment; and (4) risk characterization. Detailed discussion of the HHRA approach and results is presented in the RI report.

As presented in the RI report (HLA, 1998), under the current land use conditions the estimated excess carcinogenic risks for exposure of a pupil, trespasser and site maintenance worker to soil, sediment, and groundwater were within the USEPA acceptable risk range of $1x10^{-4}$ to $1x10^{-6}$. Similarly, potential non-cancer risks did not exceed the USEPA HI threshold value of "1". Excess carcinogenic risks under future land use were estimated for a pupil (exposure to surface soil, sediment, groundwater, and indoor air) and utility worker (exposure to surface soil and subsurface soil). The excess carcinogenic risk for a pupil is within the USEPA acceptable risk range while the utility worker was below $1x10^{-6}$. Again, potential non-cancer risks did not exceed the USEPA upper threshold limit of HI = 1 (HLA, 1998).

At the time of the RI, there was no use of (or known exposure to) groundwater at AOC 69W; therefore, risk assessment evaluated the potential risks associated with hypothetical residential use of water. Estimated cancer and non-cancer risks associated with this hypothetical future exposure exceeded levels generally considered acceptable by the USEPA. These risks resulted primarily from the presence of arsenic in the groundwater.

Potential risks for ecological receptors were evaluated during the RI report for chemicals detected in surface soil, sediment, and groundwater at AOC 69W. The RI report concluded that contamination posed minimum threat to ecological receptors.

In June 1999, a Limited Action ROD was signed. The Limited Action consists of groundwater LTM and ICs to limit the potential exposure to any residual contaminated soils and groundwater under both existing and future site conditions.

8.3 REMEDIAL ACTION

The RAOs, as stipulated in the ROD, are:

- Restore the aquifer to drinking water standards within a reasonable period;
- Monitor potential future migration of groundwater contamination;
- Eliminate risk from potential consumption of groundwater; and
- Reduce or eliminate the direct contact threat of contaminated soils.

The current groundwater monitoring criteria for COCs are shown in Table 8.2.

Table 8.2
Groundwater Contaminants of Concern Monitoring Criteria
AOC 69W

Contaminant of Concern	Monitoring Criteria (μg/L)
VPH/EPH	
VPH C_9-C_{10} Aromatics	200
EPH C_{11}-C_{22} Aromatics	200
INORGANICS	
Arsenic, dissolved	50[2]
Manganese, dissolved	375

Notes:
[1] Monitoring Criteria is based upon the lower of the site-specific monitoring criteria or the MCP GW-1 Standard (310 CMR 40 Subpart P).
[2] Based on MCL at time of ROD. EPA lowered MCL to 10 μg/l in 2006.

The rationale for implementing the Limited Action alternative is two-fold:

1) The groundwater will not be used as a drinking water source. The town of Devens has a municipal water supply. Therefore, the groundwater poses no excessive risk to human health or the environment.

2) The Army will monitor arsenic, manganese, and EPH/VPH levels in groundwater and place ICs on the property to ensure protectiveness with regard to current and future land use.

For the purpose of assessing the VPH/EPH monitoring results there are no potential MCLs identified in the ROD, so the Army has elected to compare the results to the MCP standards for a GW-1/GW-2 aquifer. A GW-1 aquifer is defined as either a current or potential drinking water source area. A GW-2 aquifer is defined as any groundwater monitoring point that is located within 30 ft of an existing occupied structure and the average annual groundwater level is within 15 ft of the ground surface.

8.3.1 Selected Remedy

The ROD for AOC 69W, signed in June 1999, identified Limited Action as the selected remedy. A FS was not performed prior to the ROD as previous source removal activities had been performed.

The Limited Action alternative for AOC 69W included the following key components:

- ICs, including deed and/or use restrictions, would be established and enforced to restrict or prevent potential human exposure to site soil and groundwater contaminants left in place.
- A LTMP would be developed to monitor for any potential off-site migration of contaminants and to verify that elevated concentrations decrease overtime. The LTMP details the installation of groundwater monitoring wells in the source area and downgradient sentry wells to monitor for off-site migration. Eight wells would be monitored semiannually for EPH, VPH, iron, manganese, arsenic, and bis (2-ethylhexyl) phthalate.
- Five-year reviews would be performed to review the data collected and assess the effectiveness of the remedy.

The LTMP states that if there is an indication that contaminants are migrating downgradient from the former source area, the Army, in conjunction with MassDEP and USEPA representatives, will evaluate the need for additional action. Under the LTMP, downgradient migration is defined by the presence of a COC concentration in groundwater in any of the designated sentry wells (ZWM-95-15X, ZWM-95-18X, ZWM-99-23X, and ZWM-99-24X) above its monitoring criteria.

8.3.2 Remedy Implementation

The final post-ROD LTMP for AOC 69W was issued in October 2000. The plan detailed the individual wells to be sampled on a semiannual basis. The plan also provides sampling methodology and analytical requirements. Groundwater from monitoring well ZWM-99-23X exhibited contamination beginning at the inception of monitoring in 2000. In 2001, two additional sentry wells were installed crossgradient and downgradient of monitoring well ZWM-99-23X.

The 2002 Draft Interim Remedial Action Report indicated that, based upon evaluation of previous analytical data, bis (2-ethylhexyl) phthalate was dropped from the LTM program because it was found to be a common laboratory contaminant. Iron was also eliminated as a COC, but was retained in the monitoring program as an indicator of remedial progress.

Current action consists of continued implementation of the components specified in the ROD: ICs; a groundwater LTM program; annual reporting; and five-year reviews. These components enable continued assessment for compliance with established performance standards and reporting of performance standards.

The first round of groundwater LTM was performed in the spring of 2000 with semiannual sampling performed through 2005. Annual sampling was initiated in 2006 and a revised LTMP was prepared in 2008. MassDevelopment currently supplies potable water to the school. The Excavated Soil Management Area (ESMA) is monitored during sampling events for broken ground or excavations. Work is being performed in accordance with the approved LTMP (HGL, 2008).

The first five-year review was completed for AOC 69W in September 2000. The second five-year review was performed and completed in September 2005. Five-year reviews must be completed within five years of the previous five-year report's completion date.

ICs are currently in place as administered by the ROD in June 1999, which were enforced in the transfer of the property from the Department of the Army to MassDevelopment in 2007 (Deed, 2007). Specifically, the ICs include: educational, institutional and open space use restriction, groundwater restriction, soil excavation restriction, modification or release of environmental protection provisions, and project notifications if any of the above restrictions are modified. The deed included a parcel boundary map that encompasses the restrictions, which is demonstrated in Figure 8.2. The full deed can be located at the BRAC office library.

8.3.3 System Operation/Operations and Maintenance

Groundwater monitoring is performed in accordance with the LTMP (HGL, 2008) for AOC 69W. Yearly O&M costs for implementation of the remedy are approximately $30,000 per year.

8.4 PROGRESS SINCE LAST FIVE-YEAR REVIEW

This is the third five-year review for AOC 69W.

The following is the protectiveness statement from the 2005 Five-Year Review Report:

> *"The remedy at AOC 69W is protective of human health and the environment and exposure pathways that could results in unacceptable risk are being controlled. The Army believes that the remedy is operating properly and successfully and submitted a draft OPS demonstration document for certification from the USEPA.*

> *A Health and Safety Plan (HASP) and Investigation Derived Waste (IDW) handling procedures are in place, are sufficient to control risk to on-site workers and the public, and are being properly implemented during groundwater sampling. Human health is currently not at risk at AOC 69W because groundwater at the AOC is not being used for potable use, is not proposed for potable use, and COCs exceeding cleanup goals are not migrating off-site.*
>
> *Current remedial action activity consists of long-term groundwater monitoring, semi-annual reporting, and five-year site reviews. These components enable continued assessment for compliance with performance standards and reporting of remedial progress."*

Although there were no areas of non-compliance or deficiencies were noted during the 2005 review, the following recommendations were made:

- Evaluate previous indoor air assessments.
- Reduce sampling frequency and remove three wells from the sampling program.
- Continue to evaluate the potential for off-site migration, impact to sensitive receptors, trend analysis and remedial duration as part of the established LTMP for AOC 69W.

In the last five years, these recommendations were addressed as follows:

Evaluation of the 2007 Indoor Air Sampling Technical Evaluation report was completed by Mactec Engineering that summarized the results from the previous indoor air assessments performed in 1997, 1998, and 1998. The evaluation concluded that neither the ABB-ES nor the USEPA air studies were performed under meteorological and building conditions where the Heating, Ventilation, and Air Conditioning operation would simulate worst-case conditions for potential vapor intrusion. Neither of these studies was performed under worst case winter heating conditions which is requirement of the MassDEP guidance Indoor Air Sampling and Evaluation Guide Policy WSC 02-430 April 2002. However, available information concerning seasonal differences in indoor air impacts from vapor intrusion suggested that this uncertainty is not substantial and would not change the conclusions of the health risk characterization. In addition, the conditions during the sampling event likely simulated typical to conservative representation of potential vapor intrusion and indoor air impact in seasons that do not require heating, i.e., mid-spring to mid-fall, albeit this represents only portion of the school year, the balance being in the heating season (MACTEC, Inc., 2007).

Another vapor intrusion study was completed by the USEPA in June 2008. This concluded that all of the individual chemicals or petroleum hydrocarbon fractions with RfC values had a hazard quotient less than one. In addition, the sum of the hazard quotients was also less than 1, indicating that the risk health effects other than cancer is below USEPA's acceptable level. Similarly, all individual chemicals with IUR values had elevated lifetime cancer risk levels less than 0.85 in one million (i.e., 8.5×10^{-7}). The total elevated lifetime cancer risk for all the carcinogenic chemicals combined was 2.3-in-one million (i.e., 2.3×10^{-6}), indicating that the risk of cancer is below USEPA's level of concern. Based on this analysis, USEPA concluded

that there is no unacceptable risk of adverse health effects to workers due to indoor air exposure at the Parker Charter School (EPA, 2008b).

The Revised LTMP, which was completed in October 2008, evaluated the sampling program for AOC 69W. It was concluded that until site closure is achieved, the Army recommends that monitoring at AOC 69W be continued on an annual basis with no changes. It was stated that if site closure had not been achieved by the 2010 Five-Year Review, the Army may request a further reduction in the sampling frequency. Additionally, in order to delineate the extent of elevated manganese in groundwater, it was suggested to install and sample a new sentry well point, which would be located downgradient of monitoring well ZWM-01-25X, which has shown exceedances in the manganese monitoring criteria. This sentry well point, 69WP-08-01, was installed in 2008 and both fall 2008 and 2009 data demonstrated that sample results have not exceeded manganese monitoring criteria. Sentry well point 69WP-08-01 is depicted on Figure 8 which illustrates current site conditions. It was also noted in the revised LTMP, the property was transferred in August 2007 from Army ownership to MassDevelopment, where deed covenants were included to prevent potable use of groundwater and unrestricted use of the property (Deed, 2007). The continued LTM program remained implemented to ensure that contaminants do not migrate off site, rather than to demonstrate that monitoring criteria are met.

The 2008 Revised LTMP also included an evaluation of the AOC 69W remedial duration. Data collected since the previous five-year review and long-term groundwater monitoring trends indicate that the remedy will meet cleanup goals within a reasonable timeframe. EPH and VPH concentrations have exhibited a steady decline since the inception of monitoring activities. Arsenic and manganese concentrations are expected to attenuate as petroleum concentrations continue to decline. Data collected from the 2008 and 2009 monitoring events support the Revised LTMP evaluation. Furthermore, 2009 monitoring data confirms that off-site migration and potential impacts to sensitive receptors are not a concern at this time.

8.5 FIVE-YEAR REVIEW PROCESS

8.5.1 Administrative Components of the Five-Year Review Process

Development of the third five-year review process for the Former Fort Devens included the following components that are described in this section:

- Document Review;
- Data Review;
- Site Inspection;
- Interviews; and
- Community Participation.

8.5.2 Document Review

The following documents were evaluated for this five-year review:

- Final Remedial Investigation, AOC 69W, prepared by HLA, August 1998.
- AOC 69W ROD prepared by USACE-NAE, June 1999.
- Second Five-Year Review Report prepared by Nobis, September 2005.
- 2004 Semi-Annual Report prepared by USACE, January 2005.
- Final 2005 Annual Report prepared by HGL, March 2007.
- Final 2005 OPS Demonstration for AOC 69W, prepared by USACE, November 2005.
- Deed. 2007, Quitclaim Deed, Parcel A.15, Between United States of America, acting by and through the Department of the Army and Massachusetts Development Finance Agency. BK 50024. Pg 85. July 2007.
- Final 2006 Annual Report prepared by HGL, August 2007.
- Final 2007 Annual Report prepared by HGL, July 2008.
- 2007 Letter Report: RCL for Comments received on Draft Final Indoor Air Sampling Technical Evaluation, AOC 69W. February 2007.
- Final (Revised) LTMP prepared by HGL, October 2008.
- Final 2008 Annual Report prepared by HGL, September 2009.
- Final 2008 Indoor Air Soil Vapor Intrusion Study for Parker Charter School prepared by USEPA, February 2008.
- Draft-Final 2009 Annual Report prepared by HGL, April 2010.

8.5.3 Data Review

The 2005 Annual Report (HGL, 2007) presented data from the May and November 2005 sampling events. The 2006 Annual Report (HGL, 2007) presented data from the June 2006 monitoring event. The 2007 Annual Report (HGL, 2008) presented data from the October 2007 monitoring event. The 2008 Annual Report (HGL, 2009) presented data from the October 2008 monitoring event. A final report summarizing the data from the November 2009 sampling event was not yet issued at the time that this Five-Year Site Review Report was prepared. However, results from the November 2009 event were available for review from the draft-final 2009 Annual Report (HGL, 2010). Table 8.3 below summarizes the AOC 69W COCs that have exceeded the monitoring criteria from spring 2000 through fall 2009. A complete list of all validated COC results for AOC 69W from 2005 through 2009 are presented in Appendix G.

Per recommendations in the 2004 Semiannual Report (USACE, 2005), sampling frequency at AOC 69W was reduced to annual beginning with the June 2006 event, and two monitoring wells (ZWM-95-17X and XWM-01-26X) have been used for groundwater gauging and purged for field parameters (no samples collected) since November 2005.

The EPH concentrations, specifically the C_{11}-C_{22} aromatic carbon fraction in Figure 8.3, exhibited a variable but generally downward trend between May 2000 and November 2002. Subsequent to this decline, the C_{11}-C_{22} aromatic concentrations in groundwater from wells 69W-94-13, ZWM-99-22X, ZWM-99-23X, and ZWM-95-15X have remained relatively constant. Since the November 2002 event, wells ZWM-99-23X and ZWM-95-15X have maintained C_{11}-C_{22} aromatic fraction concentrations below the 200 μg/L monitoring criterion, whereas well 69W-94-13 has fluctuated slightly above and below this level. In comparison, well ZWM-99-22X has generally maintained a C_{11}-C_{22} aromatic fraction concentration slightly above the monitoring criterion. All other sampled AOC 69W wells have yielded EPH carbon fraction results below the respective monitoring criterion since monitoring began.

The C_9-C_{10} aromatics concentration at well ZWM-99-23X has remained below the 200 μg/L monitoring criteria since May 2000, whereas well 69W-94-13 has consistently remained below the monitoring criteria since May 2005 (Figure 8.4). The C_9-C_{10} concentrations at well ZWM-99-22X decreased between spring 2004 and fall 2004 and have been around the 200 μg/L goal for the past 2 years. All other sampled AOC 69W wells have yielded VPH carbon fraction results below the respective criterion since monitoring began.

With the exception of two data points, all arsenic results have remained above the 10 μg/L criterion since May 2000 for wells 69W-94-13, ZWM-99-22X, and ZWM-99-23X (Figure 8.5). Moreover, the data indicate a consistent upward trend since April 2004, with well ZWM-99-22X yielding the most pronounced concentration increase. An apparent increase in arsenic concentration at these three wells may stem from a reducing environment at or below 50 mV, DO concentrations at or below 1.0 mg/L, and elevated turbidity levels. By comparison, all other sampled AOC 69W wells, with the exception of ZWM-95-15X, have exhibited arsenic concentrations below the monitoring criteria since 2001. Well ZWM-95-15X has experienced periodic arsenic detections above the criterion, with the most recent detection reported in October 2007 at 16 μg/L. This detection is consistent with historic results. The manganese concentrations in wells 69W-94-13, ZWM-95-15X, and ZWM-99-23X fluctuate significantly between sampling events and no apparent trend can be deduced (Figure 8.6). For wells ZWM-99-22X and ZWM-01-25X, an increasing trend in manganese is apparent and the increase associated with well ZWM-01-25X is greater, especially within the past four years. All five wells have consistently yielded manganese concentrations above the 375 μg/L criterion since the June 2006 sampling event. Combined with the arsenic trends, this may further demonstrate the gradual change to a more reduced groundwater environment throughout AOC 69W. By comparison, all other sampled AOC 69W wells, including the new well point 69WP-08-01 installed in 2008 to monitor potential metal migration, have exhibited manganese concentrations below the criterion.

Based on the most recent analytical results, manganese above the 375 μg/L criterion is present in several monitoring wells downgradient of the former source area. The highest manganese concentration reported for a downgradient well was 5,830 μg/L in the fall of 2009, located approximately 250 downgradient of the source area. Manganese concentrations have fluctuated in the downgradient wells since its detection in 2000 with no sustained increasing or decreasing concentration trends. Two monitoring locations placed approximately 350 (ZWM-

95-18X) and 450 (69WP-08-01) ft downgradient of the former source area show no manganese exceedance, thus, the manganese remains confined within the AOC 69W boundary.

Table 8.3
Summary of Exceedances
AOC 69W

Well Number	Spring 2000	Fall 2000	Spring 2001	Fall 2001	Spring 2002	Fall 2002	Spring 2003	Fall 2003	Spring 2004	Fall 2004	Spring 2005	Fall 2005	Spring 2006	Fall 2007	Fall 2008	Fall 2009
C11-C22 Aromatics[1] - 200 µg/l Monitoring Criterion																
69W-94-13	690	1,400	720	790	1,900	290	ND	(160)	ND	(110)	ND	ND	209	311	(152)	225
ZWM-95-15X	ND	ND	ND	ND	1,400	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
ZWM-99-22X	2,500	1,400	2,100	370	620	210	380	330	270	400	320	280	627	(166)	356	276
ZWM-99-23X	(170)	520	200	(140)	(140)	ND	ND	ND	ND	ND	ND	ND	(174)	(107)	(80)	ND
C9-C10 Aromatics - 200 µg/l Monitoring Criterion																
69W-94-13	(120)	270	(160)	320	(150)	200	(62)	(140)	(130)	230	(110)	(140)	(84)	(144)	(81)	(105)
ZWM-99-22X	620	(150)	550	(83)	(88)	(150)	840	450	650	600	460	460	330	(113)	217	(120)
ZWM-99-23X	(46)	(62)	(40)	(34)	ND	ND	(53)	(59)	ND	ND	(100)	ND	ND	ND	(28)	(35.2)
Arsenic, dissolved - 10 µg/l Monitoring Criterion																
69W-94-13	54	110	85	150	52	130	35	69	27	88	56	60	69	142	73	86
ZWM-95-15X	ND	(7.9)	ND	22	36	40	ND	16	(7.7)	30	ND	ND	ND	16	ND	ND
ZWM-99-22X	150	130	230	140	86	140	150	160	140	140	120	120	159	244	223	408
ZWM-99-23X	23	70	67	55	15	ND	27	ND	44	61	46	47	56	56	52	62
69WP-08-01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ND	N/A
Manganese, dissolved - 375 µg/l Monitoring Criterion																
69W-94-13	2,300	1,700	1,500	1,600	2,100	2,400	2,800	4,100	2,500	1,300	3,000	1,600	2,600	1,120	1,940	2110
ZWM-95-15X	(28)	1,300	(25)	(100)	1,500	2,200	1,600	970	4,600	980	850	(130)	860	1,230	438	502
ZWM-99-22X	2,000	1,800	2,300	2,400	2,000	1,500	2,700	2,300	3,100	1,900	3,400	3,200	3,700	3,120	3,790	2660
ZWM-99-23X	4,200	3,600	5,800	1,500	550	1,700	5,300	4,300	2,500	2,300	5,200	2,500	2,700	1,320	2,500	3080
ZWM-01-25X	N/A	N/A	N/A	(280)	(61)	1,000	(89)	(230)	(140)	(300)	(140)	490	1,400	3,210	1,320	5830
69WP-08-01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	(174)	(89)

Notes:

Number in parentheses denotes that concentration is below monitoring criteria.

[1] Unadjusted result used beginning with Spring 2006 sample event.

8.5.4 Site Inspection

On April 12, 2010, a representative from HGL performed site inspections at AOC 69W. Conditions during the inspection were favorable with no precipitation and temperatures in the 60s.

The Francis W. Parker Charter Essential School, formerly known as Fort Devens Elementary School (Building 215), currently occupies the site. The site consists of one main building, a smaller modular building, paved parking areas and landscaped areas that extend northwest to Willow Brook. A modular building expansion occurred between 2007 and 2008 at the rear of the school building. A small storm retention basin was also installed in 2008 near the grassy areas of Willow Brook, as a part of the construction activities. There were no observed excavations or other violations of ICs anywhere at the site. All wells were intact and secured.

8.5.5 Interviews

The following individuals were interviewed as part of the five-year review:

- Ms. Maryellen Iorio, USACE, New England District; and
- Ms. Michelle Kenna, Francis W. Parker Charter Essential School, Business Manager.

Both personnel completed a five-year review site survey questionnaire in May 2010. Personnel were not aware of any violations of the ICs. Maryellen Iorio stated that the remedy is ongoing and operating successfully. Michelle McKenna stated that she is not aware of any events, incidents, or activities that have occurred at the site; and that she is content with the remedial efforts.

The detailed 2010 LUC interviews are included in Appendix G.

8.5.6 Community Participation

Community participation for the Former Fort Devens is detailed in Section 1.3.

8.6 TECHNICAL ASSESSMENT

Question A: Is the remedy functioning as intended by the decision documents?

Remedial Action Performance

Ten years of groundwater monitoring have been performed following the LTMP (HGL, 2008). The LTMP details the site monitoring that will be performed in order to meet the remedial goals for the site. These goals include: restoration of the aquifer to drinking water standards within a reasonable period, natural attenuation, monitoring of potential migration of groundwater contamination, elimination of risk from potential consumption of groundwater, and reduction or elimination of the direct contact threat of contaminated soils through implementation of ICs.

Based on the review of available data, COCs exceeding monitoring goals have not migrated off site. The 2005 Five-year Review found the remedy to be protective and, in January 2006, EPA approved the Army's demonstration of operating properly and successfully for this site. The Army transferred this site from Army ownership in 2007 but is continuing LTM at the site. EPA and local citizens were concerned that residual soil contamination from fuel oil spills in 1972 and 1978 at the Parker Charter School might have a potential health risk to students and staff. This health risk might occur if vapors from the residual soil contamination intrude into the indoor air of the school at concentrations sufficiently high to cause an unacceptable risk. To address this concern, EPA sampled indoor air and soil gas for petroleum constituents and other VOCs in February 2008. In order to evaluate the potential for health risk in indoor air at the Parker Charter School, EPA calculated the risks for the maximum concentrations detected in this study. The results showed no unacceptable risks (USEPA, 2008a).

System Operations/Operation and Maintenance

Groundwater monitoring is being performed in accordance with the approved LTMP for AOC 69W (HGL, 2008). Yearly O&M costs for implementation of the remedy at AOC 69W are approximately $30,000.

Opportunities for Optimization

Based on historical results, the 2009 LTM data shows that the ROD COCs have not migrated off site and the organic contaminants are generally decreasing over time. Metals, primarily manganese showed an increasing trend and an additional well point was installed in 2008, downgradient of well ZWM-01-25X to bound the extent of metals contamination.

Early Indicators of Potential Remedy Failure

Organic COC degradation is occurring; however, the increase in metals, primarily manganese should be monitored to ensure that off-site migration does not occur. In order to delineate the extent of elevated manganese in groundwater, a new sentry well point, 69WP-08-01, was installed downgradient of monitoring well ZWM-01-25X. Both the 2008 and 2009 sample event results have demonstrated there has been no exceedance of the manganese monitoring criteria, therefore the data confirm that the manganese is not migrating off-site (HGL, 2009 a and b). It was also noted in the revised LTMP, the property was transferred in August 2007 from Army ownership to MassDevelopment, where deed covenants were included to prevent potable use of groundwater and unrestricted use of the property (Deed, 2007). The Army should continue to evaluate the potential for off-site migration, impact to sensitive receptors, trend analysis and remedial duration as part of the established 2008 LTMP for AOC 69W.

Implementation of Institutional Controls and Other Measures

The property was transferred in August 2007 from Army ownership to MassDevelopment, where deed covenants were included in the deed to prevent potable use of groundwater and prevent unrestricted use of the property. There are no current or future plans for installation of potable water wells at AOC 69W. The deed can be located at the BRAC office library.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?

Changes in Standards and To Be Considered

As part of this five-year review, ARARs and TBC guidance for the site presented in the ROD and current ARARs were reviewed. This review will be discussed further in Section 8.6.2.

The MCLs are health-based standards established by the USEPA. The MCL for arsenic in effect at the time of the ROD (50 μg/L) was selected as a groundwater monitoring criteria. Arsenic was present on-site at concentrations greater than its MCL during the RI and was a primary risk driver for the ingestion of groundwater exposure. The MCL for arsenic has been updated since the 1999 ROD. Changes to the MCL for arsenic in association with changes of the EPA National Primary Drinking Water Regulations for arsenic and implementation on January 23, 2006, effectively reduce the remedial goal for arsenic from 50 to 10 μg/L. The change to this standard does affect the effectiveness or duration of the remedy.

MassDEP MCP Method 1 standards are used as monitoring goals for petroleum hydrocarbon fractions because no EPA or state MCL is available and no cleanup goals were developed in the ROD. The lower of MassDEP GW-1 and GW-2 standards were used as monitoring criteria for petroleum hydrocarbon fractions. GW-1 standards are protective of groundwater used as drinking water. GW-2 standards are protective of groundwater with the potential to volatilize into indoor air spaces. Correction of the GW-1 standard for the VPH C_9–C_{10} aromatic fraction in June 2003 resulted in a decrease from 1,000 μg/L to 200 μg/L.

Because monitoring criteria are based on drinking water standards, changes to the MCLs and MassDEP GW-1 standards influence the protectiveness of the monitoring goals. However, because the remedy includes prohibiting the use of groundwater as drinking water, changes to groundwater standards do not affect effectiveness of the remedy.

In the previous five-year review, it was suggested that the previously completed indoor air assessment performed as part of the RI (HLA, 1998) should be reviewed to confirm that is consistent with the 2002 EPA draft guidance for evaluating vapor intrusion. This health risk might occur if vapors from the residual soil contamination intrude into the indoor air of the school at concentrations sufficiently high to cause an unacceptable risk. To address this concern, indoor air and soil gas were sampled for petroleum constituents and other VOCs in February 2008. In order to evaluate the potential for health risk in indoor air at the Parker Charter School, risks were calculated for the maximum concentrations detected in this study. The results showed no unacceptable risks.

Changes in Exposure Pathways

There are no current complete exposure pathways at the site. There has been no change in exposure pathways since the original risk assessment was performed. The ROD identified potential risk from the following future exposure pathways: potential ingestion of groundwater as the primary drinking water source at AOC 69W. Exposure risks were also considered for

indoor air and site worker exposure to soil but these risks were determined to be acceptable (no unacceptable risk).

The Francis W. Parker Charter Essential School currently occupies the property and MassDevelopment supplies potable water to the school. Significant construction has taken place since June 2006; however, no excavations or penetrations through pavement were observed within the ESMA. No groundwater extraction wells have been installed on the site. No evidence of increased exposure potential has been observed.

No evaluation of inhalation while showering or dermal contact with groundwater used for household use was provided in the RI supporting the ROD. Lack of consideration of these pathways may yield an underestimation of risks from future hypothetical household water use. However, ICs are in place to prohibit groundwater from being used as drinking water thus maintaining the protectiveness of the current remedy.

Groundwater at this site is not currently used as drinking water. The exposure to groundwater through drinking water and household use is of concern to future receptors on a hypothetical basis only. ICs prohibiting the use of site groundwater as drinking water at AOC 69W have eliminated this potential pathway. Land use at the site has not changed and is not expected to change, and current land use complies with the deed restrictions for AOC 69W. Hydrogeologic conditions have been adequately characterized and no new contaminants, sources, or routes of exposure have been identified.

Changes in Exposure Assumptions

The risk assessment supporting the ROD for AOC 69W used exposure assumptions for the ingestion of groundwater pathway that were consistent with standard practice at the time.

Since the original risk assessment was prepared, USEPA has updated the recommended dermal contact exposure assumptions. The 1998 draft guidance for evaluating dermal contact exposures used in the RI was finalized in July 2004 (Risk Assessment Guidance for Superfund, Volume I – Human Health Evaluation Manual – Part E, Supplemental Guidance for Dermal Risk Assessment – Final). The final guidance includes slight changes in some dermal exposure assumptions. Because the remedy includes prohibiting the use of groundwater as drinking water and excavation of contaminated soils, changes to the exposure parameters do not affect the protectiveness of the implemented remedy.

Changes in Toxicology and Other Contaminant Characteristics

Since the completion of the HHRA, the EPA has issued recent guidance recommending the use of additional sources of peer-reviewed toxicity values, as well as updated several toxicity values. While a few of the toxicity values have been revised since the HHRA was performed, these revisions would not result in the identification of additional COCs, nor would it change the overall conclusions of the risk assessment. It should be noted that ethylbenzene would have been identified as a potential COC based on the current USEPA Regional Screening Levels. However, ethylbenzene was detected in only one sample at a maximum concentration that was below the MCL. It is not expected that the inclusion of ethylbenzene in the

groundwater risk assessment calculations would have altered the conclusion of the risk assessment.

No groundwater cleanup goals are presented in the ROD, only a requirement to monitor the groundwater. The monitoring criteria are intended to track migration and trends of the groundwater. Also, the remedy includes the prohibition of groundwater use as drinking water any changes in toxicity of the COCs do not affect the protectiveness of the remedy. Because the contaminated soil has already been removed, changes to soil contaminant toxicity do not affect the protectiveness of the implemented remedy.

Below is a summary of the changes in toxicity values for each COC and the potential impact on the risk calculations:

The IRIS cancer assessment for inorganic arsenic is currently under review. EPA's Office of Research Development has recently completed a 2010 draft titled: *Toxicological Review of Inorganic Arsenic: In Support of the Summary Information on the Integrated Risk Information System (IRIS)*. The draft assessment includes an updated CSF of 25.7 mg/kg-day^{-1}which is much higher than the CSF used in the original risk assessment and the one currently listed on IRIS. Acceptance of this new, higher CSF could indicate that the cancer risk from arsenic may be underestimated. Also, a RfC has been included in the IRIS database. Therefore, the non-cancer hazards for the inhalation pathway may have been underestimated in the original risk assessment.

The manganese RfD published in the IRIS database includes manganese from all sources, including diet. USEPA Region I supports an oral RfD for manganese of 0.07 mg/kg/day for ingestion of soil, sediment, or food and an oral RfD of 0.024 mg/kg/day for manganese in drinking water. Also, USEPA issued a Lifetime Health Advisory of 0.3 mg/L for manganese. This value should be used for infants younger than 6 months even for an acute exposure of 10 days. The advisory is a to-be-considered value. Also, a RfC has been included in the IRIS database. Therefore, potential cancer risks from exposure to manganese are lower than calculated in the risk assessment and the non-cancer hazards were underestimated because the inhalation pathway was not quantitatively evaluated in the original risk assessment.

The Provisional Peer-Reviewed Toxicity Values for aliphatic and aromatic hydrocarbons were revised in April 2010. This revision included the addition of provisional inhalation toxicity values for the carbon range C9-C18 aliphatic and aromatic fractions. For the C9-C18 aliphatic fraction, an RfC of 0.1 mg/m^3 and a provisional IUR of 4.5×10^{-6} μg/m^3 was introduced. Only an RfC of 0.1 mg/m^3 was presented for the C9-C18 aromatic fraction. The addition of these new inhalation toxicity values could impact the results groundwater inhalation pathway and the groundwater vapor intrusion pathway. Therefore, the cancer risk and non-cancer hazards for the inhalation pathway may have been underestimated in the original risk assessment for medium carbon range aliphatic and aromatic hydrocarbon fractions.

Changes in Risk Assessment Methodology

Several new risk assessment methodologies have been introduced since the original risk assessment was performed in August 1998.

In 2004, USEPA published the final version of the RAGS Appendix E, which is the updated guidance for the dermal contact evaluation (EPA, 2004). Current recommendations include updated dermal absorption factors for specific chemicals and updated oral to dermal adjustment factors for RfDs and CSFs. The final guidance includes slight changes in some dermal exposure assumptions from what was used in the original risk assessment. While this may indicate an underestimation of exposure in the original risk assessment, it is not expected that the slight change in the dermal exposure calculation would alter the conclusion of the risk assessment.

USEPA has identified several carcinogens that act via a mutagenic mode of action, and to account for their early-life exposures, the default ADAFs of "10" for ages 0 to 2 and "3" for ages 2 to 16 have now been incorporated into the risk calculations. This approach is consistent with the 2005 *Guidelines for Carcinogen Risk Assessment and the Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens*. None of the groundwater COCs are considered to be mutagenic for the purposes of this risk assessment methodology. Therefore, this methodology change does not affect the conclusion of the original risk assessment.

In January 2009, USEPA introduced RAGS Part F, which updates the approach for determining risk from inhaled chemicals to be consistent with the inhalation dosimetry methodology described in *Methods for Derivation of Inhalation Reference Concentrations and Application of Inhalation Dosimetry* (USEPA, 1994). The new approach revises the equations for estimating inhalation exposure and risk, recommending that when estimating risk via inhalation, the concentration of the chemical in air should be used as the exposure metric (e.g., mg/m^3), rather than inhalation intake of a contaminant in air based on inhalation rates or body weight (e.g., mg/kg-day). Based on the indoor air concentrations, it is not expected that this change in the inhalation calculation would alter the conclusion of the risk assessment.

While numerous methodologies have changed since the original risk assessment was prepared, the potential human health risks discussed in the ROD will be eliminated by the ICs that are in place to prohibit groundwater from being used as drinking water. In addition, ICs are in place to restrict excavation at the site and limit any exposure to potential residual soil contamination. Therefore, there are no risk assessment methodology changes that affect the protectiveness of the remedy.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No other information has come to light that would call into question the protectiveness of the remedy as noted. No natural disaster impacts occurred at AOC 69W during this review period.

8.6.1 Summary of Technical Assessment

While several risk assessment methodologies have changed since the original risk assessment was prepared, ICs are in place to prohibit the groundwater from being used as drinking water thus maintaining the protectiveness of the current remedy.

8.6.2 Applicable or Relevant and Appropriate Requirements Review

ARARs that were presented in the Final 1999 ROD are included in Appendix G. Standards and regulations, current at the signing of the ROD and for the previous five-year reviews, have been reviewed for changes that could affect protectiveness of the remedy.

The following ARARs have been modified since the signing of the ROD and may affect the protectiveness of the implemented remedial action:

1. 40 CFR 141.11 Subpart B Maximum Contaminant Levels – updated July 1, 2001. Section 141.11 (a) and (b) were amended at 66 FR 7061 on January 22, 2001 to state the following:

   - ****The analyses and determination of compliance with 0.05 mg/L MCL for arsenic use the requirements of 141.23.*
   - *The MCL for arsenic was 0.05 mg/L for community water systems until January 23, 2006.*

   On January 22, 2001, EPA adopted a new standard for arsenic in drinking water at 0.01 mg/L, replacing the old standard of 0.05 mg/L (66 FR 6976). The rule became effective February 22, 2002. The date by which systems must comply with the new 0.01 mg/L standard was January 23, 2006. Because ICs are in place restricting access to groundwater, this change does not affect the protectiveness of the remedy.

2. 40 CFR 141.15 and 141.16 Subpart B Maximum Contaminant Levels – updated July 1, 2003. An effective date note (65 FR 76745) removed the sections from the CFR effective December 8, 2003. Sections 141.15 and 141.16 do not appear in 40 CFR 141 updated on July 1, 2004. These two sections addressed MCLs for radium-226, radium-228, gross alpha particle radioactivity, and beta and photon radioactivity, which do not affect the protectiveness of the remedy.

3. 40 CFR 141.51 Subpart F MCL Goals and Maximum Residual Disinfectant Level Goals – updated July 1, 2001. The table was amended in Section 141.51 by adding arsenic with an MCL goal of zero effective January 23, 2006 (66 FR 7063). Until then, no MCL goals applied for arsenic.

4. 310 CMR 22.0 Drinking Water – updated May 24, 2004. The arsenic MCL listed in Section 22.06 is effective for the purpose of compliance with the CFR (outlined above) on January 23, 2006. A perchlorate standard was also promulgated July 28, 2006. Because perchlorate is not a COC for the site, the ARARs are not affected by this change. 310 CMR 22.26 was updated in December 2009 regarding microbial

communities in groundwater that is also used for public consumption. As bacterial populations are not considered a COC for AOC 69W, the protectiveness of the remedy is not affected.

5. 310 CMR 30.00 Hazardous Waste Regulations – In January 2007, an update to this regulation was proposed to streamline the cleanup requirements of any hazardous materials released to the environment at facilities, both active and closed, that are, or were, subject to a hazardous waste license. In April 2010, this regulation was updated to include the Amendments for Adoption of Federal Land Disposal Restriction Program. The update also includes revised definitions and technical corrections needed to clarify the regulatory status of specific wastes. There were no revisions that affect the protectiveness of the remedy.

6. 314 CMR 6.00 Massachusetts Groundwater Quality Standards – rescinded March 20, 2009. Revisions made to 314 CMR 5.00 for a streamlined groundwater discharge permitting process negated the need for this section. As the selected groundwater quality standards for AOC 69W are primarily Federal MCLs and are also presented in 40 CFR 141 Section 11 and 13, the removal of 314 CMR 6.00 from the CMR does not affect the protectiveness of the remedy.

In addition, a search was performed for any newly promulgated standards that could affect protectiveness at the site. Although not an ARAR, the MCP is utilized by the Army to compare VPH/EPH data to state-derived "drinking water standards", as to fulfill the monitoring requirement of the ROD. The MCP has been revised several times since the signing of the ROD. In addition, MassDEP has issued policies regarding VPH/EPH sample collection and analyses. The most recent revision of this policy was issued in 2003. None of the MCP revisions or the VPH/EPH policy revisions has influenced the protectiveness of the remedy. There were also revisions made to the MassDEP VPH and EPH Methods. Analytical laboratories should be performing these methods in accordance with the May 2004 analytical method protocol and the upcoming July 2010 Compendium of Analytical Methods protocol.

8.7 ISSUES

There are no areas of non-compliance or deficiencies that have been noted during this review that would make the remedial action at AOC 69W non-compliant with the ROD, or sufficient to warrant a finding of not protective. This finding is based upon a review of site reports, a review of ARARs and the findings from the site inspection and interviews with personnel familiar with the site.

8.8 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

There are no recommendations or follow-up actions associated with this five-year review for AOC 69W.

8.9 PROTECTIVENESS STATEMENT

The remedy at AOC 69W is protective of human health and the environment and exposure pathways that could result in unacceptable risk are being controlled. All soil and groundwater contamination remains within the confines of this AOC and ICs are in place that limits exposure to the soil and groundwater at the site. The Army received certification from the USEPA in January 2006 on the Army's Operating Properly and Successfully demonstration document, which showed that the remedy is operating properly and successfully.

Human health is currently not at risk at AOC 69W because groundwater at the AOC is not being used for potable use, nor proposed for potable use, and COCs exceeding monitoring goals are not migrating off-site. During transfer of the property in 2007 from Army ownership to MassDevelopment, deed covenants were included to prevent potable use of groundwater and unrestricted use of the property. Additionally, the Army has conducted sampling and modeling since the second five-year review to evaluate the potential for vapor intrusion. The results of the vapor intrusion evaluation concluded that there is no vapor intrusion pathway or risk attributable to a vapor intrusion pathway. HASP and IDW handling procedures are in place, are sufficient to control risk to on-site workers and the public, and are being properly implemented during groundwater sampling.

The continued LTM program remains implemented to track remnant organic and inorganic contaminant trends and to ensure that contaminants do not migrate off site. This strategy is also consistent with risk management decisions that attempt to balance the overall goals of protecting human health and the environment with practical realities involving the allocation of resources. Other remedial action activity consists of annual reporting, ICs, and five-year site reviews. These components enable continued assessment for compliance with performance standards and reporting of remedy progress.

8.10 NEXT REVIEW

See Section 1.4 for further details.

8.11 REFERENCES

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9.0 DEVENS CONSOLIDATION LANDFILL (AOCS 9, 40, AND SA 13) (SOLID WASTE) STATUTORY FIVE-YEAR SITE REVIEW

9.1 SITE CHRONOLOGY

Table 9.1
Chronology of Events
Devens Consolidation Landfill

Event	Date
Landfill Consolidation FS Report	September 1995
Contributor Sites (SA 6, SA 12, SA 13, AOC 9, AOC 11, AOC 40, and AOC 41) Site Inspections/Remedial Investigations	1994-1996
PP issued describing the Army's preferred remedy	December 1997
Landfill Remediation FS Report	January 1997
Off-site disposal evaluated	Spring/Summer 1998
Expanded on-site landfill site search	Spring/Summer 1998
Landfill Remediation FS Addendum Report	November 1998
Second PP issued describing the Army's Alternative 4C as the preferred option	December 1998
ROD signed	July 1999
First Five-Year Statutory Review	September 2000
Commenced Landfill Construction	September 25, 2000
Mobilized at AOCs 11 and 40, and SAs 12 and 13	October 2000
Mobilized at AOC 9	January 2001
Easement Agreement Tract No. 400E (DCL)(between MassDevelopment & Army)	June 2001
Work completed at AOCs 11 and SA 13	May 2002
Mobilized at AOC 41	July 2002
Work completed at AOC 41	September 2002
Landfill cap construction completed; work completed at AOC 40	November 2002
Work completed at AOC 9	December 2002
Work completed at SA 12	January 2003
Landfill site restoration	Spring 2003
O&M activities at landfill and remedial sites begins	July/August 2003
Remedial action complete	October 2003
Second Five-Year Statutory Review	September 2005
AOC 9, AOC 40, and SA 13 transferred to MassDevelopment via Quitclaim Deed	March 2006
DCL Incorporated into revised Devens LTMP	November 2008
Annual LTM	2005-2009

9.2 BACKGROUND

The DCL was constructed on the former Fort Devens golf course driving range in order to accommodate excavated material from seven remedial areas consisting of two SAs, four AOCs, and one pesticide removal project at three Devens housing areas. A current site map for the DCL is presented as Figure 9.1. The seven DCL contributor sites are depicted relative one another on Figure 9.1. The contributor sites are presented in Figures 9.2 through 9.7. Descriptions of each site are as listed below:

- AOC 9: An area used for storing wood, concrete, asphalt, metal, brick, glass, and tree stumps (121,000 cy);
- AOC 11: A former landfill used from 1975 to 1980 for disposal of wood-frame hospital demolition debris (35,000 cy);
- SA 12: A half-acre location where construction debris and yard waste were deposited (8,700 cy);
- SA 13: A one-acre area used from 1965 to the mid-1990s for yard-waste (10,000 cy);
- AOC 40: Four acres used for construction debris, ash, stumps, and logs (125,400 cy);
- AOC 41: A one quarter-acre landfill in the SPIA that was used up to the 1950s for disposal of non-explosive material and household debris (1,500 cy); and
- Housing areas Grant, Locust, and Cavite: Soils contaminated with VOCs or pesticides and walling material contaminated with VOCs or pesticides (2,290 tons of soil and 1,240 tons of concrete).

The USEPA approved the ROD for landfill remediation of the first six areas in July 1999. It included provisions for either on-site or off-site disposal options. The on-site landfill construction alternative was selected as the best option. Construction of the DCL commenced in September 2000 and was completed in November 2002. The Remedial Action Closure Report prepared by Shaw Environmental (formerly Stone & Webster, Inc.) in September 2003 was accepted, certifying that the DCL was constructed and capped in accordance with the ROD, and met the performance standards and/or response objectives in the ROD.

The Closure Report provides the O&M manual for the DCL. Currently, the USACE is responsible for operating and inspecting the landfill and gas vent monitoring. HGL is responsible for groundwater and leachate discharge sampling and IC Inspections. Leachate is being generated with permitted wastewater discharge to the Devens sewage system by the terms of the authorized industrial wastewater discharge permit. Effluent criteria and reporting requirements are specified in the leachate discharge permit, which was updated August 01, 2009. The volume of effluent has steadily diminished over time.

MassDevelopment maintains ownership of the DCL property and agreed to grant the Army a permanent easement to build and operate the landfill (Easement Agreement Track No. 400E, June 2001). The easement additionally details LUC between the Army and MassDevelopment for the DCL. The 1999 ROD had indicated ICs "were planned for the proposed Consolidation Landfill." DCL LUCs have been evaluated through IC inspections that have been conducted annually over the five-year review period covered in this report. IC inspections are conducted per the "IC Monitoring Plan" included in the 2008 LTMP.

9.2.1 Contributor Site Background

The following sections provide a summary of the primary DCL contributor sites that were transferred from Army control to the MassDevelopment for redevelopment and retain deed-recorded restrictions not allowing the property to be used for residential purposes. These sites

include AOC 9, 40, and SA 13. AOC 41 is inclusive of the SPIA site and is discussed in the SPIA portion of the five-year review. As per the ROD, the remediation of contributor sites AOC 41 and SA 12 were considered non-CERCLA actions and are not subject to five-year site review requirements. In 2005, the Army provided clarification to the EPA indicating that AOC 11 was remediated to allow for unrestricted use. Based on the clarifications to the EPA, ICs and five-year site reviews were no longer needed for AOC 11.

9.2.1.1 AOC 9

AOC 9 is located on the former North Post, north of Walker Road and west of the wastewater treatment plant. The landfill was operated from the late 1950s until 1978 and was used by the Army, National Guard, site contractors, and off-post personnel. Landfill materials at AOC 9 were generally demolition debris, including wood, concrete, asphalt, metal, brick, glass, and tree stumps. Debris volume was estimated to be 112,000 cy.

A geophysical survey was performed during the 1996 SI to supplement information derived from evaluation of aerial photographs and to delineate the actual limits of the landfill. The results of the survey assisted in the placement of test pits and groundwater monitoring wells, and provided insight into the distribution of landfill debris. Results of the geophysical survey indicated that the landfill encompassed 5 acres with a larger northern pod containing the majority of landfill material and four smaller southern pods adjacent to the wetlands containing mostly near-surface debris.

Surface Water Contamination

During the 1996 SI at AOC 9, surface water samples were collected from the Nashua River and the swampy area south of the debris landfill. Concentrations of some inorganics, including aluminum, iron, and lead were measured above ecological benchmark concentrations. The SI report suggested that detected inorganic concentrations in the river were generally representative of Nashua River water quality in the area. The SI report concluded that contaminant effects on surface water from AOC 9 debris were not likely significant.

Sediment Contamination

Relatively low concentrations of TPHC and some inorganics were present in sediment samples collected from the swampy area south of the debris landfill. Relatively low concentrations of VOCs and SVOCs were measured in sediment samples collected from the Nashua River. Concentrations of inorganics in Nashua River sediment samples were relatively consistent upstream and downstream of AOC 9 and likely represent typical Nashua River sediment quality in the area. The SI report concluded that contaminant effects on sediment from AOC 9 debris were likely typical of other contaminated reaches along the Nashua River.

Surface Soil Contamination

Organic contaminants were not detected in surface soil samples collected at AOC 9. The inorganics copper, lead, and nickel were detected at concentrations above background concentrations for Devens, but below residential standards set by USEPA. Arsenic was

detected at a concentration above USEPA residential standards, but below Devens background concentrations.

Subsurface Soil Contamination

Organic compounds detected in AOC 9 subsurface soil consist mostly of PAHs and TPHC. Because of their consistent co-location in samples collected from AOC 9, PAHs and TPHC were believed to be associated with charred lumber and ashes mixed with the demolition debris. Except for arsenic and beryllium, maximum concentrations of inorganics detected in subsurface soil were below screening standards established by USEPA for protection of a commercial/industrial worker. The maximum concentration of beryllium (1.0 μg/L) was higher than the commercial/industrial standard (0.67 μg/L).

Groundwater Contamination

Two rounds of groundwater samples were collected from monitoring wells at the site during the SI. Chloroform and TPHC were detected in AOC 9 groundwater. Chloroform was detected in one of ten samples collected during Round 1. The chloroform concentration was below Massachusetts drinking water standard. TPHC was detected in three of ten samples, once in Round 1 and twice in Round 2. No drinking water standards or guidelines existed for TPHC at the time this work was performed.

Inorganics were detected above background concentrations in nearly all groundwater samples collected from AOC 9 groundwater monitoring wells. Several organics were detected in upgradient, downgradient, and cross-gradient wells. Eight of the 18 inorganics detected in unfiltered Round 1 samples exceeded their respective drinking water standard or guideline. The eight inorganics were aluminum, arsenic, chromium, cobalt, iron, lead, manganese, and nickel. Filtered samples collected during Round 2 showed reductions in concentrations of these inorganics, suggesting that the elevated concentrations detected in Round 1 were the result of suspended solids present in the samples. During Round 2, reported concentrations of chromium, lead, and nickel were below their respective drinking water standards or guidelines.

9.2.1.2 AOC 40

AOC 40 is located along the edge of Patton Road, in the southeastern portion of the Main Post. This area was used for the disposal of construction debris (masonry, asphalt, wire and metal), ash, stumps, and logs.

AOC 40 covers approximately 4 acres and was estimated to contain 110,000 cy of debris. Portions of the landfill area were situated in a wetland, and were subsequently submerged under Cold Spring Brook Pond. The area was densely populated with trees and other vegetative cover. The northern edge of the landfill area dropped off abruptly to the wetland or to the pond with a difference in elevation ranging between 10 and 20 ft. The area is also within a recharge zone for the Patton water supply well.

Surface Water Contamination

Inorganic analytes were detected in surface water samples collected from Cold Spring Brook

Pond. Surface water contamination did not pose a risk to ecological receptors at the debris disposal area, based on comparison to ecological benchmarks developed to be protective of aquatic organisms.

Sediment Contamination
Sediments in Cold Spring Brook Pond contained PAHs, pesticides, and inorganics. Risk to ecological receptors at two locations in the pond was attributed to arsenic and the pesticide DDD.

Surface Soil Contamination
Samples collected from the landfill soil cover contained PAHs, pesticides, and inorganics. The relatively low concentrations of surface soil contaminants posed neither human health nor ecological risks.

Groundwater Contamination
Groundwater quality at AOC 40 was investigated by two rounds of sampling as part of the RI, and by two rounds of sampling as part of the supplemental RI. Contaminants detected in groundwater were primarily inorganics. The supplemental RI concluded that AOC 40 was not the source of contamination.

9.2.1.3 Study Area 13

SA 13 was used between 1965 and 1990 for disposal of construction debris, stumps, and brush. Debris volume was estimated to be approximately 10,000 cy. The landfill is less than one acre in size and is located on the west side of Lake George Street near Hattonsville Road on the former Main Post. SA 13 is surrounded by large trees, but no trees were growing on the landfill itself. Tree stumps, limbs, and trunks were deposited on the surface of the landfill and down the steep lower slope. A wetland is located at the base of this slope.

Surface Water Contamination
Organic and inorganic chemicals were detected in surface water samples collected from the wet area at the toe of the debris area. Nitroglycerine was detected in one of four surface water samples, at a concentration above its drinking water standard. Inorganic chemicals in surface water, particularly mercury, presented potential risks to sensitive aquatic ecological receptors.

Sediment Contamination
Sediment at SA 13 contained PAHs, TPHC, pesticides, and inorganics. Pesticides in sediment presented a potential risk to sensitive aquatic ecological receptors.

Surface Soil Contamination
Soil samples collected from stained areas directly over the debris area contained PAHs, TPHC, pesticides, and inorganics. Surface soil samples collected from the debris area contained higher concentrations of contaminants than those collected down slope of the landfill.

Groundwater Contamination

Contaminants detected in groundwater at SA 13 were primarily inorganics. Elevated detections were attributed to turbidity in unfiltered samples, not to the landfill.

9.2.2 Post-Site Investigation History

A history of post-site investigation activities related to Fort Devens landfill remediation is presented in this subsection.

The *Landfill Consolidation FS Report* (ABB-ES, 1995a) contains an evaluation of options to consolidate debris from other landfills into a single waste disposal site. After reviewing the FS Report, the United States Army Forces Command (FORSCOM) requested evaluation of non-consolidation, containment options such as capping landfills in-place. In response to FORSCOM comments, the *Debris Disposal Area Technical Memorandum* (ABB-ES, 1996b), was issued in February 1996. The memorandum evaluated a cap-in-place and a consolidation option for each of the seven landfills.

To respond further to the FORSCOM comments, the *Landfill Remediation FS Report* was prepared (ABB-ES, 1997). This FS report evaluated nine debris management alternatives, including various combinations of NFA, capping in place, and debris removal and consolidation.

In the December 1997 PP, the Army proposed an alternative that consisted of debris removal at three of the debris disposal areas (AOCs 9 and 40, and SA 13), with consolidation at a new landfill to be constructed near the SHL. Public comment on the Plan indicated a community preference for debris disposal either in an off-site landfill, or in a new on-site landfill. Also, because of AOC11's proximity to the Nashua River floodplain, the community indicated a preference that this AOC be fully excavated and the debris consolidated at the new landfill.

In response to public comment, the Army issued a second PP in November 1998. The proposed alternative included full debris removal at AOCs 9, 11, and 40, and SA 13, with disposal at either an off-site landfill, or at a new on-site landfill to be constructed at the former golf course driving range. The proposed alternative was evaluated in detail in the *Landfill Remediation FS Addendum Report* (HLA, 1998).

A ROD was issued in July 1999 (HLA, 1999). The ROD presented the selected remedial actions for seven debris disposal areas. In accordance with the ROD, the option of either on-site consolidation or off-site disposal of the debris would be based on a "best value" evaluation of proposal to be solicited upon completion of the design for both options. Methods and practices for construction and operations and closure of the DCL were documented in the *Final Design Technical Specifications and Drawings for Consolidation Landfill* (USACE, 1999). An evaluation of the on-site versus off-site disposal option was conducted and the findings were presented in the *Remedy Selection Report* (S&W, 2000). The remedy selection process indicated that disposal of the remedial debris in an on-site landfill to be built at the former golf course driving range on Patton Road was the "best value" alternative. The approved remedial alternative (Alternative 4c) documented in the ROD called for NFA at SA

6, limited removal at SA 12, and AOC 41, and full excavation of AOCs 9, 11, and 40, and SA 13, with on-site consolidation or off-site disposal.

9.3 REMEDIAL ACTIONS

The landfill RAOs are:

- Prevent human exposure to groundwater contaminants released from Fort Devens landfills that exceed acceptable risk thresholds;
- Protect human and ecological receptors from exposure to landfill soils having concentrations of contaminants exceeding acceptable risk thresholds;
- Prevent landfill contaminant releases to surface water that result in exceedance of AWQC or acceptable ecological risk-based thresholds;
- Prevent exposure by ecological receptors to landfill-contaminated sediments exceeding acceptable risk-based thresholds;
- Reduce adverse effects from contaminated landfill media to the environment that would reduce the amount of land area available for natural resource use; and
- Support the civilian redevelopment effort at Devens.

9.3.1 Selected Remedy

Key components of the selected remedy for the sites where consolidation of landfill debris was recommended are described below.

<u>AOC 9, 11, and 40 and SA 13</u>

- Mobilization/demobilization;
- Site preparation;
- AOC 40 sediment removal with disposal either in the DCL or in an off-site landfill;
- AOC 40 drum removal with disposal either in the DCL or in an off-site landfill (It should be noted that this remedy was included in the ROD, but no drums were encountered during removal and consolidation construction operations.);
- Debris excavation, backfill, and re-grading;
- Wetland restoration at AOC 9, 11, and 40;
- Consolidation of excavated debris at the DCL, or transport to an off-site landfill;
- If required, cover system monitoring and maintenance at the DCL; and
- ICs and Five-Year Site Reviews at those sites where unrestricted future use is not achievable or economical.

9.3.2 Remedy Implementation

The decision to proceed with on-site consolidation was issued June 30, 2000, and a temporary (120 day) access agreement to begin construction was signed on September 15, 2000. The DCL was constructed at the former golf course driving range. Debris from six landfill areas and former housing areas was excavated, characterized, transported and disposed at either the new on-site landfill or an off-site licensed TSDF/Recycling facility if characterization results exceeded on-site disposal requirements. Materials disposed off-site included wood, scrap metal, tires and creosote wood, for a total waste volume of 12,270 cy. Soils disposed at the DCL included those contaminated with petroleum, pesticides, PCBs, PAHs, and asbestos, for a total waste volume of 365,000 cy. Excavations were then backfilled and/or re-graded to restore the sites to pre-construction conditions. After completing the removal actions, the DCL was graded and permanently capped. A current site map of the DCL is included as Figure 9.9.

9.3.2.1 Remedial Action AOC 9

Debris was excavated from the 8.9-acre disposal area and transported to staging areas, which were used for material holding during sampling and waste characterization activities. Excavation activities began in January 2001 and were completed in June 2002. Excavated debris was analyzed for waste disposal characteristics designated in the SAP (S&W, 2000). Characterized debris material was transported to the DCL for disposal. A total of 161,477 tons of debris materials from AOC 9 were disposed in the DCL.

During the excavation process, larger debris (i.e., wood, scrap steel, concrete debris and tires) was segregated from the stockpiled material and stored separately in an effort to recycle and reduce the volume of material to be disposed in the landfill. Segregated material was disposed of off-site at a licensed facility. Concrete debris was processed through a crushing plant for possible reuse as backfill in other areas, if analytical results indicated the material met the PRGs.

A total of 156,000 cy of debris was removed from AOC 9, 44,000 cy more than the original estimated volume of 112,000 cy. The 44,000 cy of additional debris was attributed to greater excavation depths due to extended debris limits than originally estimated. The actual debris limits extended to the south of the proposed landfill limits, which accounted for an additional 0.7 acres resulting in a total disposal area of 9.6 acres. Debris materials primarily consisted of concrete, scrap steel, tires, soil, and miscellaneous demolition debris.

Following verification that confirmatory sampling results met the PRGs and the excavation limits had been reached, restoration activities commenced. Restoration activities were completed in accordance with the Habitat Restoration Work Plan (S&W, 2002). The majority of the site was restored as upland areas. Upland areas were seeded with a restoration seed mixture that contained native grasses. The wetland area was restored by backfilling with clean fill and manufactured wetland soil. The restored wetland was stabilized with a custom wetland seed mix. The wetland and upland habitat restorations were evaluated semiannually through

implementation of the Wetland & Upland Habitat Restoration and Long Term Adaptive Monitoring and Maintenance Program (WHRP) during the first three growing seasons.

The property was transferred from Army ownership to MassDevelopment for redevelopment purposes in 2006. LUCs were recorded in the March 2006 deed to prevent residential development of the property.

9.3.2.2 Remedial Action AOC 40

Debris was excavated from the 3.9-acre disposal area and transported to the staging areas, which were used for material holding during sampling and waste characterization activities. Excavation activities began in November 2000 and were completed in September 2002. Excavated debris was analyzed for waste disposal characteristics. Characterized debris material was transported to the DCL for disposal. A total of 166,799 tons of debris materials from AOC 40 were disposed in the DCL.

A total of 148,450 cy of debris was removed from AOC 40, 38,450 cy more than the original estimated volume of 110,000 cy. The 38,450 cy of additional debris was attributed to greater excavation depths than originally anticipated. The increased depths accounted for an additional 0.2 acres resulting in a total disposal area of 4.1 acres. Debris materials primarily consisted of concrete, scrap steel, stumps, soil and miscellaneous demolition debris. It should be noted that although drum removal was included in the selected remedy, no drums were encountered during these remedial actions. Excavation limits to remediate the extent of debris encroached onto the existing roadway (Patton Road) adjacent to the disposal site. Road realignment was designed and constructed that detoured traffic during the remedial activities.

Following verification that confirmatory results met the PRGs and the excavation limits had been reached, restoration activities began in September 2002 and were completed in October 2002. Due to the steep gradient, the side slopes adjacent to Patton Road were stabilized and protected by rip rap. Rip rap was placed from the base of the slope to approximately 10 ft above the waterline. Remainder of the slope was stabilized with six inches of loam and seeded with a native grass seed mixture. The restoration activities were completed in accordance with the Habitat Restoration Work Plan (S&W, 2002). The wetland and upland habitat restorations were evaluated semiannually through implementation of the WHRP during the first three growing seasons.

The property was transferred from Army ownership to MassDevelopment for redevelopment purposes in 2006. LUCs were recorded in the March 2006 deed to prevent residential development of the property.

9.3.2.3 Remedial Action SA 13

Debris was excavated from the 0.8-acre disposal area and transported to the staging area, which was used for material holding during sampling and waste characterization activities. Characterized debris material was transported to the DCL for disposal. A total of 13,715 tons of debris materials from SA 13 were disposed in the DCL.

During the excavation process, larger debris (i.e., wood, scrap steel, concrete debris and tires) was segregated from the stockpiled material and stored separately in an effort to recycle and reduce the volume of material to be disposed in the landfill. Material that resulted from these efforts was disposed of off-site at a licensed facility. Although the concrete was segregated and processed, the end product did not meet the requirements for reuse as backfill or road base material. Processed concrete was mixed with the debris stockpile and was disposed at the DCL.

A total of 13,900 cy of debris was removed from SA 13, 3,900 cy more than the original estimated volume of 10,000 cy. The 3,900 cy of excess debris was attributed to deeper excavation over extended debris limit than originally anticipated. The actual debris limits extended to the north of the original disposal area limits, which accounted for an additional 0.3 acres resulting in a disposal area of 1.1 acres. The actual excavation depths ranged from 4 ft to 8 ft deeper than proposed excavation grades throughout the center of the excavation area.

In addition to the added debris quantities and excavation area, the constituents of the excavated disposal material varied from the anticipated stumps and trees originally thought to make up the "stump dump." Debris materials primarily consisted of concrete, scrap steel, soil and miscellaneous demolition debris (i.e., glass and wood) along with some stumps and brush.

Following verification that confirmatory results met PRGs and the excavation limits had been reached, restoration activities commenced in October 2001. Minimal restoration operations took place at SA 13. Slopes were graded as necessary to provide a safe area and to promote drainage to feed the small wetland area to the south. Topsoil was placed over disturbed areas that were then seeded to stabilize and reestablish vegetation of the wetland and upland areas. Restoration activities were completed in accordance with the Habitat Restoration Work Plan (S&W, 2002).The wetland and upland habitat restorations were evaluated semiannually through implementation of the WHRP during the first three growing seasons.

The property was transferred from Army ownership to MassDevelopment for redevelopment purposes in 2006. LUCs were recorded in the March 2006 deed to prevent residential development of the property.

9.3.2.4 Construction of the Consolidation Landfill

Construction of the DCL was performed between September 2000 and November 2002. Construction oversight was performed by Stone and Webster Construction, Inc. The landfill was constructed in accordance with MassDEP Landfill Technical Guidance Manual (May 1997) and the Final Design Technical Specifications prepared by EA Engineering, Science and Technology (October 1999).

Over the course of construction, approximately 591,804 tons of materials were placed at the landfill. Materials disposed of at the landfill included the debris excavated from the contributor AOCs and is described in previous sections. The approved landfill easement occupies 16.88 acres with approximately 8.0 acres used for debris disposal. The landfill construction consisted of several components, performed in three phases. The first phase

involved construction of the landfill liner system, leachate collection system, and sedimentation pond. The second phase primarily consisted of transportation and disposal of excavated debris, debris placement, and compaction and grading. The final phase involved capping of the landfill which included installation of gas vents and a gas venting layer, a dual composite and 40-mil flexible polyethylene (VFPE) liner, a sand drainage layer, and vegetation support layers.

9.3.2.5 Current Status

This is the third five-year review for AOC 9, 40, and SA 13, and second review since construction of the DCL. All components of the ROD have been implemented. No contingency action is required at this time at the SA, AOCS or DCL.

Current actions consist of continued implementation of the components specified in the ROD:

- Groundwater monitoring and maintenance program for DCL;
- Annual reporting; and
- Five-year reviews.

These components enable continued assessment for compliance with established performance standards and reporting of performance standards.

The first groundwater monitoring and landfill inspection was performed in November 2003. Work is presently performed in accordance with the approved *Long-Term Monitoring Plan* (HGL, 2008b).

The most recent semiannual groundwater monitoring event was conducted in May 2010 with no exceedances of MCP GW-1 standards, consistent with previous monitoring events.

Groundwater monitoring in May and October 2009 indicated a southwest to northeast groundwater flow pattern, consistent with previous years. A profile of the landfill is presented in Figure 9.8 for May and October 2009 that illustrates the relationships between the landfill liner, the water table and bedrock relative to monitoring wells LFM-99-02B and LFM-99-05B. The subsurface bedrock topography is similar to the groundwater flow pattern, in that it slopes from the southwest to the northeast. Pre-landfill construction investigations revealed that overlying most of the bedrock on site was till, except in the southwestern part of the site, followed by sand. Based on Figure 9.8 the water table was below the landfill liner during both 2009 monitoring events, consistent with previous semiannual events.

The most recent post-closure inspection of DCL was conducted in November 2009. The features that were inspected included signs of erosion and settlement, vegetative cover, vegetation types, and other general conditions. The physical features of the cap were in good condition and there were no significant deficiencies.

9.3.3 System Operation/Operations and Maintenance

O&M is performed in accordance with the approved LTMP (HGL, 2008b), which specifies the DCL O&M activities. O&M includes monthly leachate sump pit inspections, pump preventative maintenance, system alarm inspections and simulation tests, manual operation of flow valves, totalizer readings, sanitary sewer pit inspection, and an inspection of the pump enclosure integrity. Leachate monitoring takes place on an annual basis; groundwater monitoring wells are sampled semi-annually; and passive gas vents are monitored annually for potential explosive hazards.

In addition, settlement and cover system monitoring is conducted on a visual basis during the scheduled annual inspections. The landfill is mowed on an annual basis, typically in the fall months. Order of magnitude costs for yearly O&M are $75,000.

9.4 PROGRESS SINCE LAST FIVE-YEAR REVIEW

The following is the complete Protectiveness Statement from 2005:

> *"The remedies at AOCs 9, 11, 40, and 41 and SAs 6, 12 and 13 are protective of human health and the environment, and exposure pathways that could result in unacceptable risk are being controlled.*
>
> *A HASP and IDW handling procedures are in place, are sufficient to control risk to on-site workers and the public, and are being properly implemented during groundwater sampling. Human health is currently not at risk at AOCs 9, 11, 40, and 41 and SAs 6, 12 and 13 because contaminated soils have been excavated and placed in the Consolidation Landfill where it has been capped.*
>
> *All components of the ROD have been implemented. No contingency action is required at this time. Current remedial action activity consists of continued implementation of the components specified in the ROD: the long-term groundwater monitoring and maintenance program at the Consolidation Landfill, annual reporting, and Five-Year Reviews. These components enable continued assessment for compliance with performance standards and reporting of remedial progress."*

The following recommendations were made:

- Incorporate ICs into the revised IMP; and
- The north-northeast gabion slope drain of the landfill should be repaired to correct the erosion and probable construction deficiencies.

Per the ROD, the DCL contributor sites AOC 9, 11 and 40 and SA 13 were subject to institutional controls and five-year site reviews if "unrestricted future use is not achievable or economical." All four of these sites subsequently achieved the ROD established clean up goals for unrestricted use and did not require institutional controls and five-year site reviews. Contributor sites AOC 9, AOC 40 and SA 13 were transferred from the Army to MassDevelopment in March 2006. LUCs were incorporated into the quitclaim deed for

parcels A2A (AOC 9), A8 (SA 13), and A4 (AOC 40) to prevent residential development of the properties. Due to the LUCs placed in the quitclaim deed, these three contributor sites were then subject to five-year site reviews. The AOC 11 site is on property that is retained by the Army however, the March 2007 Addendum to the Real Property Master Plan did not include the LUCs for this site since it was remediated to unrestricted reuse.

Repairs were made to the north-northeast gabion slope drain in August and September of 2005. The entire northern gabion slope drain was reconstructed according to the original Contract Plans and Specifications. The repair included the reconstruction and re-grading of the fill required beneath the gabion baskets that had eroded; placement of a new 10-oz non-woven geotextile protection/filter layer; new gabion baskets; and repositioning of the bench drainage pipe within the swale that had been displaced from the erosion. The work was detailed in Appendix A of the 2005 Annual Report. The repairs achieved the purpose of addressing the erosion and probably construction deficiencies.

The 2005 Five-Year Review Report contained a recommendation that O&M for the DCL and wetland and upland habitat restorations be evaluated during the first three post construction growing seasons (2004-2006). After three complete growing seasons, the habitats had met the performance standards and the Habitat LTMP program was terminated. The program transitioned to an O&M phase for two years beginning in 2007 and ending in 2008. The O&M phase was successful in monitoring and performing invasive/exotic plant corrective actions during the visits in 2007 and 2008.

Additionally, it was recommended that quarterly leachate sampling be continued per the MassDevelopment permit, semiannual Consolidation Landfill LTM inspections be continued, and that recommendations highlighted in the 2004-2005 Annual LTM Reports be implemented. Since these recommendations were made, leachate sampling has since been approved as an annual sampling requirement and LFM-99-06A was added as a downgradient monitoring well to sample to comply with MassDEP regulations.

9.5 FIVE-YEAR REVIEW PROCESS

9.5.1 Administrative Components of the Five-Year Review Process

Development of the third five-year review process for former Fort Devens included the following components that are described in this section:

- Document Review;
- Data Review;
- Site Inspection;
- Interviews; and
- Community Participation.

9.5.2 Document Review

The following documents were evaluated for this five-year review:

- Final ROD, Landfill Remediation Study Areas 6, 12, and 13 and AOCs 9, 11, 40, and 41 prepared by USACE-NAE, July 1999.
- Remedial Action Closure Report prepared by Shaw Environmental (formerly Stone & Webster, Inc.), September 2003.
- Operation and Maintenance Plan prepared by Shaw Environmental (formerly Stone & Webster, Inc.), September 2003.
- Second Five-Year Review Report prepared by Nobis, September 2005.
- Appendix H: Final Wetland & Upland Habitat Restoration and Long Term Adaptive Monitoring and Maintenance Plan & 2004 Annual Program in 2004 Annual Report, DCL prepared by USACE, December 2005.
- 2005 Annual Report, Wetland and Upland Habitat Restoration and Long Term Adaptive Monitoring and Maintenance Program, DCL, prepared by USACE, January 2007.
- 2006 Annual Report, Wetland and Upland Habitat Restoration and Long Term Adaptive Monitoring and Maintenance Program, DCL, prepared by USACE, July 2007.
- 2007 Annual Report, Operation & Maintenance Phase, Wetland and Upland Habitat Restoration and Long Term Adaptive Monitoring and Maintenance Program, DCL and AOC57 prepared by USACE, May 2008.
- 2008 Annual Report, Operation & Maintenance Phase, Wetland and Upland Habitat Restoration and Long Term Adaptive Monitoring and Maintenance Program, DCL and AOC57 prepared by USACE, June 2009.
- Final Long-Term Monitoring Plan prepared by HGL, October 2008.
- Final 2006 Annual Report prepared by HGL, August 2007.
- Final 2007 Annual Report prepared by HGL, July 2008.
- Final 2008 Annual Report prepared by HGL, September 2009.
- Draft-Final 2009 Annual Report prepared by HGL, April 2010.

9.5.3 Data Review

No sampling was conducted at any of the contributor sites to the DCL as all of these sites are closed and no sampling is required. The DCL monitoring analytical results are described below. Evaluation of the IC Inspections and Wetland and Upland Habitat Restoration and Long Term Adaptive Monitoring and Maintenance information is detailed below.

9.5.3.1 Long-Term Monitoring

Four groundwater monitoring wells associated with the DCL, identified as LFM-99-02B, LFM-99-05A, LFM-99-06A, and LFM-03-07 are sampled semiannually. LFM-99-06A was added to the monitoring program in 2006 as a third downgradient monitoring well in response to MassDEP comments on the groundwater monitoring program. From 2003 through May 2010, all VPH, EPH, and organochlorine pesticide results for groundwater from the four wells were either non-detections or detections below the respective MCP GW-1 and GW-3 standards, with the following exception. Groundwater from monitoring well LFM-99-02B had a detection above the GW-1 standard for the C_{11}-C_{22} aromatics at 398 μg/L during the November 2009 sampling event. Groundwater from the well was resampled in December 2009 and the resampling event revealed a non-detect of the C_{11}-C_{22} aromatics. No PCBs were detected during the 2003 through 2005 monitoring period or during the 2009 five-year sampling event.

Metals concentrations were consistently below the respective MCP GW-1 and GW-3 standards in groundwater at all four DCL wells between May 2004 and May 2010.

With the exception of a minor chloride spike in November 2009, the wet chemistry parameters for wells LFM-99-05A, LFM-99-06A, and LFM-03-07 have generally remained consistent since 2003. Chloride and total dissolved solids spikes in well LFM-99-02B during the 2006 sampling event were transitory. A complete list of all validated COC results from 2005 through May 2010 is presented in Appendix H.

Overall, although some analyte concentrations have fluctuated over the past five years, there is no evidence that the DCL is leaching contaminants into the groundwater beneath the site.

9.5.3.2 Leachate Monitoring

Leachate monitoring results were reported during the following months of this five-year period: April, June, October, and December 2005; March, May, and October 2006; October 2007; October 2008; and October 2009. All results were below the local effluent limitations as specified by the industrial wastewater discharge permit.

9.5.4 Site Inspection

An HGL representative performed a site inspection of the DCL on April 29, 2010. The inspection included the leachate pumping system and the landfill. Weather conditions were favorable with no precipitation and temperatures in the 60-70 °F range.

The leachate pumping system was operational during the site inspection. Operating logs indicate that the volume of leachate emitted from the landfill each year has generally decreased over time.

The landfill is in good condition with no apparent signs of disturbance to the grass-covered landfill cap. No evidence of pooled or standing water was observed on the landfill. A few

moss-dominated areas and areas of sparse vegetation were observed during the inspection. These observations suggest that the soil pH may be too acidic, which would hinder the growth of preferred vegetation. The application of a lime treatment may be useful in promoting the growth of preferred vegetation. It should be noted that detailed landfill inspections are performed annually by the Army as part of the LTM and maintenance activities. Inspection results and recommendations for follow-up actions are included in annual reports that are submitted to USEPA and MassDEP.

9.5.5 Interviews

The following individuals were interviewed as part of the five-year review:

- Ms. Maryellen Iorio, USACE, New England District; and
- Mr. Ron Ostrowski, MassDevelopment.

Both personnel completed a five-year review site survey questionnaire in May 2010. Personnel were not aware of any violations of the ICs. Maryellen Iorio stated that the remedy is ongoing and operating successfully. Ron Ostrowski stated that he is not aware of any events, incidents, or activities that have occurred at the site; and that the site's groundwater maintenance is non-problematic.

The detailed 2010 LUC interviews are included in Appendix J.

9.5.6 Institutional Control Inspections (AOC 9, AOC 40, SA 13 and DCL)

The DCL contributor sites with ICs include AOC 9, 40, and SA 13. The three contributor site properties were transferred from the Army to MassDevelopment in March 2006. The ICs were incorporated into the deed to prevent residential development of the properties. In addition, the DCL has IC inspection requirements. IC inspections were performed over the five-year period to identify the following:

- Any signs of increased exposure potential to the public from soil and/or surface water contaminants;
- Any evidence that groundwater extraction wells had been installed at the site;
- Any evidence of site use changes; and
- Any evidence of residential use (DCL contributor sites only).

The site inspection findings over the five-year period covered by this review revealed no abnormalities or changes in land use at the DCL and its three contributor sites with retained ICs.

9.5.7 Wetland and Upland Habitat and Long Term Adaptive Monitoring and Maintenance (AOC 9, AOC 40 and SA 13)

The wetland and upland habitat restorations were evaluated semiannually through implementation of the WHRP during the first three growing seasons, beginning in 2004 and finishing in 2006. The plan established performance standards for the wetland and upland habitats and the protocol of controlling invasive/exotic plants. After the three complete growing seasons, the habitats had met the performance standards and the Habitat LTMP program was terminated. The program transitioned to an O&M phase for two years beginning in 2007 and ending in 2008. The O&M phase was successful in monitoring and performing invasive/exotic plant corrective actions during the visits in 2007 and 2008.

9.5.8 Community Participation

Community participation at former Fort Devens Army Installation is detailed in Section 1.3.

9.6 TECHNICAL ASSESSMENT

Question A: Is the remedy functioning as intended by the decision documents?

Yes. The remedy is functioning as intended by the decision documents as detailed below.

Remedial Action Performance and Monitoring Results
Based on indications from analytical results of confirmatory samples collected from the areas that were excavated, and disposal of excavated materials into the Consolidation Landfill or off-site as applicable, site cleanup goals established in the Sampling and Analysis Plan and RAOs established in the ROD had been satisfied. Groundwater monitoring and leachate sampling analytical results to date have indicated that landfill contamination constituents have not leached to groundwater and were not emanating from the landfill. Cross sectional views of the DCL have additionally indicated that groundwater has maintained levels below the landfill liner. Physical on-site inspections of the DCL have indicated that the landfill is in good condition and the leachate pump system is operating per design. Physical on site inspections at DCL contributor sites that retain ICs (AOC 9, AOC 40 and SA 13) indicate compliance with the ICs. WHRP activities were conducted from 2004 to 2006 at the DCL sites with retained ICs. The Habitat LTMP portion was discontinued due to its success and an "O&M phase" was conducted from 2007 to 2008.

System Operations/Operation and Maintenance (Long-term Groundwater Monitoring)
O&M, leachate sampling and long-term groundwater monitoring are performed in accordance with the LTMP (HGL, 2008b).

Opportunities for Optimization
Remedial action and construction activities have been completed at this site, and therefore, there are no proposed opportunities for optimization.

Early Indicators of Potential Remedy Failure
No early indicators of potential remedy failure were noted.

Implementation of Institutional Controls and Other Measures
Transfer of AOCs 9, 40, and SA 13 to MassDevelopment occurred in March 2006 and ICs for these sites were included in the FOST and incorporated into the deeds. The ICs specify the restriction of residential development within the three sites. The DCL ICs include inspection of the DCL to ensure no changes to the site that could compromise the landfill have occurred. The deeds can be located at the BRAC office library.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?

Yes. The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy are still valid as detailed below.

Changes in Standards and To Be Considered
As part of this five-year review, ARARs and TBC guidance for the site presented in the ROD and current ARARs were reviewed. Some changes have been promulgated since the ROD was signed in 1999. This review will be discussed further in Section 7.1.2.

Excavation activities at DCL contributor sites AOCs 9, 40, and SA 13 were completed in 2003. Cleanup goals for the disposal areas were established in the Sampling and Analysis Plan (S&W, 2000b) by using USEPA Region 9 PRGs for residential soil and/or MCP S-1 soil standards, whichever was more stringent. PRGs were attained and verified through confirmation sampling. The RAOs for soil specified in the ROD have been achieved. Contaminated soils were removed and placed in the DCL; therefore, changes to soil TBCs do not affect the protectiveness of the implemented remedy.

Well LFM-99-06A was added to the sampling scheme after 2005, and PCB sampling frequency was reduced to once every five years. MassDevelopment correspondence dated August 23, 2006, discussed changes to the LTM program that include the reduction of leachate sampling frequency from quarterly and semiannually to annually and the elimination of biochemical oxygen demand and fats, oil and grease as leachate sample methods. Starting with the 2007 sampling event, the leachate sampling frequency was changed to annual, and analyses for oil and grease, fats, and 5-day biochemical oxygen demand were discontinued.

Effluent criteria and reporting requirements are specified in the leachate discharge permit, which was updated August 21, 2006. MassDevelopment established new effluent criteria beginning in August 2009.

Changes in Exposure Pathways
The ROD identified unacceptable risk from the following exposure pathways: direct contact with and ingestion of contaminated soils by future residents at DCL contributor sites AOCs 9, 40, and SA 13. Based on analytical results of confirmatory soil samples collected from

excavated areas, and implementation of ICs prohibiting residential site use, the direct contact with and ingestion of contaminated soil exposure pathways have been eliminated. Land use has not changed and is not expected to change. These sites have been restored to wetland and upland habitats.

Changes in Exposure Assumptions

HHRAs were performed for AOC 40. Preliminary risk evaluations (screening risk evaluations) were performed for AOC 9 and SA 13. The risk assessments supporting the RODs for AOC 40 used exposure assumptions consistent with standard practice at the time. Since that time, USEPA has updated some of the recommended dermal contact exposure assumptions. New guidance for evaluating dermal contact exposures was finalized in July 2004 (Risk Assessment Guidance for Superfund, Volume I – Human Health Evaluation Manual – Part E, Supplemental Guidance for Dermal Risk Assessment – Final). Because the remedy includes excavation of contaminated soils, changes to the exposure parameters do not affect the protectiveness of the implemented remedy.

Changes in Toxicology and Other Contaminant Characteristics

Because the remedy includes excavation of contaminated soils, changes to the toxicity of soil contaminants do not affect the protectiveness of the implemented remedy.

Changes in Risk Assessment Methodology

The methods for evaluating dermal contact exposures have changed since the time of the risk assessments supporting the ROD for AOC 40, based on USEPA's Risk Assessment Guidance for Superfund, Volume I – Human Health Evaluation Manual – Part E, Supplemental Guidance for Dermal Risk Assessment – Final, July 2004. Because the remedy includes excavation of contaminated soils, changes to the exposure parameters do not affect the protectiveness of the implemented remedy. The human health and ecological risks discussed in the ROD have been eliminated by the excavation and removal of soils and the implementation of ICs to prevent residential development. Therefore, while the methods for evaluating dermal contact exposures have changes since the time of the risk assessments, these risk assessment methodology changes do not affect the protectiveness of the remedy.

USEPA has identified several carcinogens that act via a mutagenic mode of action, and to account for their early-life exposures, the default ADAFs of 10 for ages 0 to 2 and 3 for ages 2 to 16 have now been incorporated into the risk calculations. This approach is consistent with the 2005 *Guidelines for Carcinogen Risk Assessment and the Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens*. Based on the site COPCs, it is not expected that this change in methodology would alter the conclusion of the risk assessment.

In January 2009, USEPA introduced RAGS Part F; which updates the approach for determining risk from inhaled chemicals to be consistent with the inhalation dosimetry methodology described in *Methods for Derivation of Inhalation Reference Concentrations and Application of Inhalation Dosimetry* (USEPA, 1994). The new approach revises the equations for estimating inhalation exposure and risk, recommending that when estimating risk via

inhalation, the concentration of the chemical in air should be used as the exposure metric (e.g., mg/m^3), rather than inhalation intake of a contaminant in air based on inhalation rates or body weight (e.g., mg/kg-day). This change in the inhalation calculation does not alter the conclusion of the risk assessment.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No other information has come to light that would call into question the protectiveness of the remedy was noted. No natural disaster impacts occurred at the DCL during this review period.

9.6.1 Summary of Technical Assessment

Because the remedy at the DCL contribution sites included excavation of contaminated soils, changes to exposure parameters do not affect the protectiveness of the implemented remedy. The human health and ecological risks discussed in the ROD have been eliminated by the excavation and removal of soils and implementation of ICs to prevent exposure. Therefore, while some methods have changed since the time of the risk assessments supporting the ROD, these risk assessment methodology changes do not affect the protectiveness of the remedy.

9.6.2 Applicable or Relevant and Appropriate Requirements Review

ARARs that were presented in the ROD are included in Appendix H. Standards and regulations current when the ROD was signed in July 1999 have been reviewed for changes that could affect protectiveness of the remedy.

Some standards relative to landfill remediation and construction determined to be applicable, relevant, and appropriate, or to be considered, have been updated since the signing of the ROD in 1999. Changes in these standards do not affect the protectiveness of the remedy. In addition, no new standards promulgated since the ROD signing were identified.

The following are changes in the standards concerning groundwater and surface water:

1. 40 CFR 141.11 Subpart B Maximum Contaminant Levels – updated July 1, 2001. Section 141.11 (a) and (b) were amended at 66 FR 7061 on January 22, 2001 to state the following:

   - ****The analyses and determination of compliance with 0.05 mg/L MCL for arsenic use the requirements of 141.23.*
   - *The MCL for arsenic was 0.05 mg/L for community water systems until January 23, 2006.*

   On January 22, 2001, EPA adopted a new standard for arsenic in drinking water at 0.01 mg/L, replacing the old standard of 0.05 mg/L (66 FR 6976). The rule became effective February 22, 2002. The date by which systems must comply with the new 0.01 mg/L standard was January 23, 2006.

2. 40 CFR 141.15 and 141.16 Subpart B MCLs – updated July 1, 2003. An effective date note (65 FR 76745) removed the sections from the CFR effective December 8, 2003. Sections 141.15 and 141.16 do not appear in 40 CFR 141 updated on July 1, 2004. These two sections addressed MCLs for radium-226, radium-228, gross alpha particle radioactivity, and beta and photon radioactivity, which do not affect the protectiveness of the remedy.

3. 40 CFR 141.51 Subpart F MCL Goals and Maximum Residual Disinfectant Level Goals – updated July 1, 2001. The table was amended in Section 141.51 by adding arsenic with an MCL goal of zero effective January 23, 2006 (66 FR 7063). Until then, no MCL goal applied for arsenic.

4. 310 CMR 7.00 Air Pollution Control Regulations – In July 2009, MassDEP proposed to make amendments to definitions related to particulate matter in 310 CMR 7.00: Air Pollution Control, 310 CMR 7.54: Large Combustion Emission Units, and Appendix A: Emission Offsets and Nonattainment Review. These changes are based upon a thorough review of the regulations encoded in 310 CMR 7.0 to ensure the addition of definitions for $PM_{2.5}$ to all relevant sections. The proposed revisions would not affect the protectiveness of the remedy.

5. 310 CMR 10.00 Wetlands Protection – This regulation was updated October 2007 with a streamlined permit application process. There were no revisions that affect the protectiveness of the remedy.

6. 310 CMR 19.00 Solid Waste Management Regulations – This regulation was also updated in October 2007 to clarify the notification and cleanup requirements for asbestos fibers and asbestos-containing material in soil to ensure that off-site management of soil containing asbestos meets all applicable state and federal requirements. There were no revisions that affect the protectiveness of the remedy.

7. 310 CMR 22.00 Massachusetts Drinking Water Standards and Guidelines – The arsenic MCL listed in Section 22.06 is effective for the purpose of compliance with the CFR (outlined above) on January 23, 2006. A perchlorate standard was also promulgated July 28, 2006. Since perchlorate is not a COC for the site, the ARARs are not affected by this change. Also, in December 2009, 310 CMR 22.26 was updated regarding microbial communities in groundwater that is also used for public consumption. As bacterial populations are not considered a COC for the site, the protectiveness of the remedy is not affected.

8. 314 CMR 4.00 Surface Water Standards – updated January 2007. Since these standards were not considered during the development of the preliminary remedial goals for the site, this revision should not affect the protectiveness of the selected remedy.

9. 314 CMR 6.00 Massachusetts Groundwater Quality Standards – rescinded March 20, 2009. Revisions made to 314 CMR 5.00 for a streamlined groundwater discharge

permitting process negated the need for this section. As the selected groundwater quality standards for the site are mainly Federal MCLs and are also presented in 40 CFR 141 Section 11 and 13, the removal of 314 CMR 6.00 from Massachusetts regulations does not affect the protectiveness of the remedy.

10. 314 CMR 9.00 Water Quality Certification for Discharge of Dredged or Fill Material, Dredging, and Dredged Material Disposal in Waters Within the Commonwealth – Revised June 2009. Revisions promulgated in June 2009 address necessary actions to eradicate infestation by Asian Longhorn Beetles. The revised language is found in 314 CMR 9.12. Related language has also been incorporated into 310 CMR 10.00, the Wetlands Protection Act Regulations. Revisions promulgated January 2, 2008, encourage stormwater recharge, the increased use of low impact development techniques, improved O&M of stormwater best management practices, and the removal of illicit connections from stormwater management systems. MassDEP has accordingly revised the Stormwater Management Standards, which have been incorporated into 314 CMR 9.00. This change does not affect the remedy as the DCL design maximizes stormwater recharge through the adjacent stormwater retention basin.

In addition, a search was performed for any newly promulgated standards that could affect protectiveness at the site. No new ARARs were identified that would affect the protectiveness of the selected remedy.

9.7 ISSUES

This five-year review indicates no issues are present at the DCL or any of its contributor sites subject to five-year reviews.

9.8 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

This five-year review indicates that no "Recommendations and Follow-Up Actions" are needed at the DCL or any of its contributor sites subject to five-year reviews.

9.9 PROTECTIVENESS STATEMENT

The remedy at the DCL and the DCL contribution sites AOCs 9, 40, and SA 13 are protective of human health and the environment, and exposure pathways that could result in unacceptable risk are being controlled.

Long-term protectiveness of the remedial action will be verified by groundwater monitoring at the DCL to assess potential leachate migration. Current monitoring data indicate that the remedy is functioning as required.

9.10 NEXT REVIEW

See Section 1.4 for further details.

9.11 REFERENCES

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10.0 AOC 50 FIVE-YEAR POLICY SITE REVIEW

10.1 SITE CHRONOLOGY

Table 10.1
Chronology of Events
AOC 50

Event	Date
NPL listing	December 1989
Remedial Actions (Pre-ROD)	SVE 1996 Pilot ERD 2001
RI initiated	1996
RI completed	January 2000
FS complete	December 2002
PP	January 2003
ROD signed	March 2004
Actual Remedial Action Start (Post ROD)	May 2004
Final Remedial Action Work Plan (RAWP)	June 2005
Five-Year Review (All Devens AOCs)	September 2005
Demonstration of Remedial Action Operating Properly and Successfully Report	March 2007
AOC 50 Interim Five-Year Remedy Review	January 2008
ERD O&M Manual Addendum I	March 2009
Annual O&M and Monitoring Reports	2005-2009

10.2 BACKGROUND

The AOC 50 site is located on the northeastern boundary of the former Moore Army Airfield (MAAF), within the former North Post portion of Fort Devens, Ayer, Massachusetts. The AOC 50 Source Area comprises less than 2 acres and includes Buildings 3803 (the former parachute shop), 3840 (the former parachute shakeout tower), 3824 (a gazebo), and 3801 (the former 10th Special Forces airplane parachute simulation building).

AOC 50 is currently defined by three distinct areas; the Source Area, Southwest Plume, and North Plume (Figure 10.1). The Army currently leases the areas designated as the Source Area to MassDevelopment. The Source Area buildings are included in the lease but are abandoned except for a small area within Building T-3803 that is used as environmental field equipment storage.

The Army intends to convey this property to MassDevelopment now that determination has been made that the remedy is operating properly and successfully and once a FOST is issued by the Army. Appropriate LUCs and CERCLA Right of Access will be incorporated into the conveyance.

The Army, MassDevelopment, and the USFWS own portions of the area overlying the Southwest Plume, including the majority of the former airfield. The former airfield is closed to aircraft traffic and is currently leased by the Massachusetts State Police for training and

vehicle storage. The area designated as the North Plume is currently owned and occupied by Merrimack Warehouse Realty Co., Inc.

The Army retained approximately 14 acres of the former airfield for use by the Devens RFTA for vehicle storage, maintenance, and office space. The 14 acre area includes the AOC 50 source area. The Army transferred the remaining 246 acres of the property to MassDevelopment in 1996 for reuse. The area owned by MassDevelopment has several buildings and a former airfield. Currently, the airfield is closed to aircraft traffic and is used by the Massachusetts State Police for training and vehicle storage. Under the Devens Reuse Plan (November 14, 2004), the area is zoned for Special Use II and Innovation and Technology Business. Under the Devens Reuse Plan, Special Use II and Innovation and Technology Business includes a broad range of industrial, light industrial, office, and research and development uses. Discussions concerning developing a portion of this site for solar electrical power generation have taken place but no further actions concerning implementing this development initiative have occurred. There are currently no other plans for development of the MAAF, although the area can be developed if interested parties are identified. Zoning of the MAAF property could change. The portion of the property managed by the USFWS located adjacent to the Nashua River, within the floodplain, is generally forested and heavily vegetated with steep terrain and limited access. There are presently no plans to develop this area. Due to its designation as a wildlife refuge and location within the floodplain, future development is unlikely.

The Merrimack Warehouse Realty Co., Inc., owns the area overlying the North Plume. The property is zoned commercial and is developed with a building used for the manufacture of windshield washer fluid and as a storage facility. A fire pond is located on the property and would be used for fire suppression source water in the event of a fire.

Groundwater beneath AOC 50 (Source Area, Southwest Plume, and North Plume) is not used as a source of drinking water or industrial use water. The entire area is supplied by municipal water and sewer service. Future residential use of land at AOC 50 is not likely, based upon Town of Ayer zoning restrictions and the Army has no plans on using their portion of the property for residential use. The Devens Reuse Plan does not include residential development of land in the vicinity of AOC 50, and the privately owned land (North Plume) is not zoned for residential use. Because the aquifer underlying portions of the AOC 50 site is classified as either a high or medium yielding aquifer, however, the underlying groundwater must be considered a potential future potable water resource.

Sources of contamination within AOC 50 include two World War II fueling systems, a drywell, the PCE drum storage area and cesspool. These sources are collectively referred to as the Source Area. Other potential sources of contamination may include a former dry well and floor drain associated with Building 3840. Although these sources have been removed or taken out of commission, groundwater underlying AOC 50 contains elevated concentrations of chlorinated volatile organic compound (CVOC) most notably PCE. The primary area of groundwater contamination at AOC 50 is referred to as the Southwest Plume, which extends from the Source Area approximately 3,000 ft downgradient to the Nashua River. The plume overlay is shown on Figure 10.3.

10.2.1 Fueling Systems

During World War II, two fueling systems were used in the area subsequently designated as AOC 50; one system was used for fueling aircraft and trucks (System A), and the other for fueling trucks only (System B). These systems were not used for refueling operations after the late 1940s (Biang, et al., 1992). The two separate fueling systems were filled by gasoline shipments on a Boston & Maine Railroad spur (which no longer exists) located adjacent to Fueling System B.

Releases of fuel associated with incidental spills at the former aircraft fuel pits, truck-fill stands, and railroad fuel-delivery points were considered possible sources of contamination. Because the systems were approximately 50 years old, UST were also considered possible continuing sources of releases. The potential for migration of contaminated groundwater to the Nashua River was a concern.

At the time of the initial SI in 1992 (ABB, 1993), several fueling system components were still visible in their original locations. Fort Devens removed all of these components in 1992. In addition, approximately 450 tons of contaminated soil was removed from under the water-separator, water control pits, and three 25,000-gallon USTs. The excavation extended to a depth of approximately 19 ft bgs. All excavations were backfilled to grade. Field screening results and post-excavation sample analyses are presented in the RI (Harding Lawson Associates [HLA], 2000).

10.2.2 Dry Well

In 1969, Building 3840 was constructed and attached, via an enclosed walkway, to Building 3803. In addition, two large sinks, and a janitor's room were added to Building 3803. The design drawings for Building 3840 indicated that a floor drain was constructed in the center of the concrete floor. This floor drain, the additional sinks in Building 3803, and the roof drains for Building 3840 were piped to a drywell located approximately 20 ft northeast of Building 3840. The drywell and associated piping were removed between November and December 1996 (Weston, 1997). The resulting excavation was 9.5 ft deep and covered an area 21 ft by 30 ft, equating to 225 bank cy of soil.

In addition, a 750-gallon fuel UST associated with the Building 3840 heating system was removed. In conjunction with the tank removal, 787 gallons of oil, water, and residual sludge were recovered from the tank and approximately 25 cy of contaminated soil were excavated. Solid and liquid wastes generated during removal of the drywell and fuel USTs were taken off site for proper treatment and disposal. Details regarding the removal activities are documented in a Removal Action Report (Weston, 1997).

10.2.3 PCE Drum Storage Area

A PCE drum storage area, east of Building 3801, was identified during field investigation activities completed in 1992. Historical records and interviews with former Fort Devens personnel indicated that this area was used to store single drum quantities of PCE (HLA,

2000). The PCE was used by Army personnel in Buildings 3803 and 3840 for spot cleaning of parachutes. Parachute cleaning was performed only as needed to maintain the integrity of the parachute material. Unused PCE was either reused or may have been washed down into the drywell system associated with Buildings 3803 and 3840. This information was supported by a review of the historic hazardous waste manifest, which did not include the removal of waste chlorinated solvents from AOC 50 (Mott, 1997). The use of this area for drum storage was discontinued in 1992. The length of time or total number of drums stored in this area of AOC 50 is unknown.

Analytical data from several investigations indicated that PCE in vadose zone soils beneath the former drum storage area was likely contributing to groundwater contamination. An interim removal action for PCE-contaminated soil at the former drum storage area was implemented as a source-control measure while additional investigation activities were conducted across the site (HLA, 2000). An additional interim action consisted of the installation of an in situ SVE system adjacent to the former drum storage area. The system was installed between December 1993 and January 1994. Five soil vapor extraction wells (SVE-1 through SVE-5) were installed, one in the center of the presumed PCE source and four on the periphery. Details regarding the installation, operation, and performance of the SVE system between February 1994 and July 1996 are documented in a November 1996 report titled *Summary Report, SVE Monitoring*, AOC 50 (ABB, 1996). The SVE system was shut down in 1996 due to poor PCE recovery but was operated again for a brief period in December 1998, May and June 1999, and October and November 1999, again experiencing poor PCE recovery. Following a brief start-up, the system was permanently shut down in September 2004 due to continued poor recovery of PCE. The system was decommissioned and disconnected from the recovery piping in November 2005. The treatment system building and SVE system components remain on site.

10.2.4 Cesspool

A cesspool associated with the bathroom in Building 3803 was identified on the site drawing as the only septic system structure for the building. The drywell and cesspool were investigated as potential contaminant sources for the various volatile contaminants, including PCE. The cesspool was removed concurrent with the drywell and UST removal actions described in previous sections. During the cesspool removal activities, a total of 25cy of soil, sludge, and concrete were excavated and taken off site for treatment and disposal (HLA 2000).

10.2.5 Basis for Response Action

Exposure of future workers and residents to groundwater contaminants resulted in estimated cancer risks greater than 1E-04 and non-cancer HI greater than "1". In addition, the screening-level ecological risk assessment indicated potential but low ecological risks (hazard quotients for benthic organisms greater than "1" indicating low potential risk). Therefore, actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in the ROD, would have presented an imminent and substantial endangerment to public health, welfare, or the environment. Groundwater is the focus of remedial actions at AOC 50.

10.3 REMEDIAL ACTIONS

There are three main areas of contamination identified for AOC 50; the Source Area, the Southwest Plume and the North Plume. The limits of LUC for each of these areas are presented on Figure 10.2 and RAOs per the ROD for each of these areas are as follows:

Source Area

- Protect potential residential and commercial/industrial receptors from ingesting contaminated groundwater.
- Protect commercial/industrial workers from inhaling vapors released from groundwater used as "open" process water.
- Prevent potential construction/occupation of residential dwellings and inhalation of vapors released from contaminated groundwater to indoor air.

Southwest Plume

- Protect potential residential and commercial/industrial receptors from ingesting contaminated groundwater.
- Prevent low to moderate potential ecological effects to benthic organisms.

North Plume

- Protect potential residential receptors from ingesting contaminated groundwater.

10.3.1 Selected Remedy

The selected remedial technologies for AOC 50, per the AOC 50 ROD include SVE, ERD, IWS/aerobic bioremediation, monitoring, and IC. In addition, geochemical additives and ISCO are included as contingencies to address inorganics and VOC, respectively, in the event that monitoring data indicate that implementation of these contingencies is warranted. This remedy is a comprehensive approach that addresses all current and potential future risks caused by groundwater contamination and mitigates residual soil contamination in the Source Area.

The components of remedy selected for AOC 50 were chosen to reduce potential human health and ecological risks associated with contaminated groundwater under current and anticipated future land use scenarios. The remedial system for AOC 50 is also protective to the environment, attains ARAR, offers long-term and short-term effectiveness, and is readily implementable at a reasonable cost. The principal components of the remedial systems for AOC 50 consist of the following:

- SVE in the Source Area;
- ERD throughout the site;
- IWS along the downgradient portion of the Southwest Plume;

- Contingency for chemical oxidation in the North Plume;
- Contingency for evaluation and manipulation of aquifer chemistry for re-precipitation of solubilized inorganics associated with the ERD process;
- LTM;
- IC; and
- Five-year site reviews.

In accordance with the ROD, the RD (ARCADIS, 2004b) included four active remedial elements:

- ERD;
- IWS;
- SVE; and
- Contingency remedies.

These components are described in detail in the RD, and are summarized with other remedial components in the following sections.

Pre-Design Investigation Activities

Beginning in 1993, the Army performed field investigations at AOC 50 to assess the nature and extent of PCE impacts. A pilot test of the ERD technology was completed between December 2001 and July 2002, the results of which were documented in a report incorporated into the Final FS (ARCADIS, 2002). Additional investigation activities were conducted to support the development of the remedial design (ARCADIS, 2004b). This included collection and analysis of groundwater and soil samples, installation and testing of the IWS technology, and the installation of additional permanent SVE and monitoring wells, as necessary. The post-pilot study investigation verified that the mobilization of metals is a byproduct of the ERD process and addressing the mobilized metals in the remedial design is required to ensure secondary contamination created by the ERD process is adequately controlled and a monitoring network established to track migration of any dissolved metals.

Application of SVE in the Source Area

The SVE system that was formerly operated in the Source Area at AOC 50 was refurbished for use as the preferred alternative based on the results of the pre-design investigation, as documented in the RAWP (ARCADIS, 2005a). The SVE system applies a vacuum to wells completed within the unsaturated soils, capturing CVOC mass in the vapor phase as soil gases are withdrawn. The soil gases extracted from the subsurface are treated as needed with activated carbon prior to being discharged to the atmosphere. Operation of the SVE system in the Source Area provides indirect remediation of groundwater impacts if recoverable CVOC mass is present in the unsaturated zone. Specifically, the removal of adsorbed phase mass from vadose zone soils eliminates a potential continuing source of groundwater contamination.

One new SVE well (SVE-6) was installed as part of the pre-design investigation and was incorporated into the system during the start-up.

ERD Implementation

The ERD process is an engineered bioremediation technique that falls into a class of remedial options known as in situ reactive zone (IRZ) technologies. ERD employs an easily degradable carbohydrate solution (e.g., molasses), which is injected into the groundwater treatment area. The carbohydrate injection provides excess organic carbon, which initiates a succession of microbial processes in the subsurface, all of which contribute to enhancing the rates of CVOC reduction. The reductive dechlorination process results in the in situ transformation of PCE and TCE to the progressively less chlorinated intermediates *cis*-1,2-DCE, VC, and ethene via microbially mediated processes (Nyer, 2001; Suthersan, 1997). In addition, abiotic processes also contribute to the dechlorination of the TCE and its degradation products. PCE concentrations observed in groundwater in October 2009 are shown on Figure 10.3.

The application of ERD source remediation at AOC 50 is accomplished via organic carbon injections in the source areas (Area 1) and downgradient treatment at four reactive zone barriers (Areas 2, 3, 4, and 5). Perpendicular to groundwater flow, these barriers are configured as treatment transects across the width of the plume and break the plume into smaller sections. This configuration accelerates the attenuation of mass in the area that falls outside the active treatment zones between each transect. This design was based on an updated version of the groundwater flow model presented in the Final FS for AOC 50 (ARCADIS, 2002), as well as on the empirical results of the long-term pilot test in the ERD Area 5 transect. In March 2005, a recommendation was made subsequent to the remedial design, to increase ERD injection volumes in the wells. This recommendation was accepted by the BCT and implemented in June 2005. Other system modifications included the addition of several injections/monitoring wells along transects 2 and 4.

It was estimated that reagent injections would continue for 10 to 23 years (based on the groundwater modeling results) for successful treatment of the CVOCs by the ERD remedy. A summary of the ERD strategy implemented at AOC 50 is included in the *Final Demonstration of a Remedial Action Operating Properly and Successfully Report* (ARCADIS 2007).

Solubilized Inorganics Controls

As outlined in the Final FS (ARCADIS, 2002) and confirmed during the ERD pilot test, inorganics including iron, manganese and arsenic are solubilized within the reducing zones created by ERD technology. Inorganics solubilized within reducing zones are not expected to migrate beyond the boundary of reducing conditions, and are not expected to persist once the prevailing aerobic groundwater environment is restored. Outside of the zone of reducing conditions (i.e., under the naturally aerobic conditions present in the groundwater at AOC 50), the inorganic constituents will be oxidized and subsequently immobilized through precipitation and/or adsorption. Inorganic groundwater quality data collected during performance monitoring of the ERD system are used to evaluate whether the adequate restoration of natural aerobic groundwater conditions and re-precipitation of inorganics have been achieved. Contingency measures were developed to address the re-precipitation of inorganics through the

manipulation of groundwater chemistry and/or application of other treatment technologies along the length of the plume. It is recognized that, if necessary, a subsequent phase of remediation would be implemented should groundwater monitoring indicate that the inorganics have migrated beyond the established reductive zones and persist within the aquifer at elevated concentrations (above established remediation goals) with no indication of a diminishing concentration trend.

The need for contingency measures will be determined after the ERD remedy is completed within individual sections of the plume as the individual injection transects have been phased out. The inorganic data collected during performance and post-remedial monitoring will be evaluated to confirm that adequate restoration of natural aerobic conditions and that the re-precipitation of inorganics has been achieved or is occurring as evidenced by diminishing concentrations.

IWS/Circulation Well Transect

The AOC 50 remedy includes the installation of an IWS system in the downgradient portion of the Southwest Plume, upgradient of the Nashua River. The IWS system consists of two IWS wells located such that the radial influence captures the ERD-treated PCE plume migrating towards the Nashua River. The two IWS well locations serve to re-oxygenate groundwater exiting the anaerobic ERD zones, with the primary purpose of enhancing the aerobic biodegradation and volatilization of any residual CVOC constituents.

Each well consists of an inlet (lower) screen interval that is positioned to intercept the zone of highest CVOC concentrations and a recharge (upper) screen interval positioned at the upper limit of the impacted zone (to prevent cross contamination of un-impacted zones).Groundwater intercepted by the lower screen is treated through aeration and re-injected through the upper screen. The lower screen is also situated such that it intercepts the zone of highest potential solubilized inorganics if downgradient impacts are observed. Therefore, the secondary purpose of the IWS is to create aerobic conditions conducive to the precipitation of solubilized inorganics. Groundwater sampling of the influent and effluent of the IWS wells in being performed on a monthly basis.

Sentinel Groundwater Monitoring Wells

Monitoring wells were placed in strategic locations between the Nashua River and the most downgradient ERD injection transect to serve as sentinel wells. The sentinel well network consists of a series of three wells installed approximately 400 ft from the most downgradient ERD injection transect. These wells are located laterally and vertically across the plume to monitor the possible presence of solubilized inorganics beyond the expected extent of the reducing conditions created by the ERD application. Data collected from these locations are used to evaluate the need to trigger a contingency for the treatment of solubilized inorganics discussed above. However, recent monitoring data show that at least one sentry well is located within an established IRZ. Well G6M-04-03-10X has had intermittent reducing conditions since its installation in 2003 and has possessed elevated manganese and methane concentrations since 2004. Since early 2008, this Area 5 “sentry” well has maintained consistent reducing conditions with a corresponding increase in dissolved arsenic. Use of this well as a sentry well

is questionable since a determination of the assumptions of the remedy concerning contamination present and persistent within the aerobic portions of the aquifer cannot be made. A different well should be designated as a sentry well.

Monitoring

Performance monitoring has been performed in conjunction with the remedy to evaluate overall performance and to confirm that COC concentrations are being reduced to remediation goals. Monitoring events are conducted on a semiannual basis based on the Revised LTMP (ARCADIS, 2008) and the LTMP Addendum (HGL, 2008). Samples are analyzed for CVOCs, dissolved metals (arsenic, iron, and manganese), nitrate, redox couples (sulfate/sulfide, and carbon dioxide/methane), and dissolved gases (e.g. ethane, and ethene). Field parameters (e.g., DO, ORP, pH, conductivity, turbidity, and temperature) are also collected. Details of the monitoring activities are outlined in the Revised LTMP (ARCADIS, 2008) and LTMP Addendum (HGL, 2008).

Institutional Controls

ICs have been implemented in each area of the plume (i.e. North, Source Area, and Southwest) through formal negotiations with the different entities that own the properties overlying these areas. ICs are necessary to restrict land and groundwater use at the site to prevent unacceptable risk for the duration of the remedy. The implementation and maintenance activities conducted as parts of the IC program were presented in the RAWP, submitted in June 2005 by ARCADIS, and are summarized below.

- **North Plume –**A LUC agreement between the Army and the Merrimack Warehouse Nominee Trust was executed on July 2006. The ICs for this portion of the plume include preventing exposure to groundwater by restricting any groundwater withdrawal and protecting the integrity of existing monitoring wells on this property (Merrimack Warehouse Realty Co., Inc.). In addition, a secondary layer of ICs for this portion of the plume includes: (1) local permitting (including building and well);and (2) Planning Board reviews with the Town of Ayer to restrict the installation of wells used for pumping groundwater.
- **Source Area –** The ICs for this portion of the plume include existing zoning and lease terms (1996 LIFOC) between the Army and MassDevelopment. Existing zoning in the Source Area includes Special Use II and Innovation and Technology Business which includes; environmental, full and small scale office, light industrial, industrial, research and development, healthcare, academic/institutional/civic, municipal, small scale retail, group residences, and incubator (as outlined in the November 18, 1994 Devens By-Laws). The 1996 LIFOC restricts the use of groundwater, limits building construction, and interference of the remedy as outlined in the Environmental and Safety Provisions section of the lease. In addition, there are further restrictions on land-use including; no residential dwellings or schools/child care facilities, no pumping or use of groundwater, stormwater discharge limited to existing municipal infrastructure, no new building construction, excavation is subject to prior approval and soil management/safety planning and Army site access for monitoring/remediation will also

be incorporated into the transfer deed prior to conveyance of the property to MassDevelopment.

- **Southwest Plume –**A quick claim deed between the Army and MassDevelopment, and a Memorandum of Agreement (MOA) between the Army and the USFWS are used as the primary layer of ICs for this portion of the plume. These legal agreements restrict activities that would interfere with the operation of the remedy including the construction of structures, groundwater withdrawal for any purpose, stormwater discharge/recharge, and provision of Army access to the properties during the operation of the remedy to install and maintain monitoring wells and treatment systems. A secondary layer of LUCs include: Planning Board reviews, building permits, and restricting the potable use of groundwater through public and private well regulations. The deed can be located in the BRAC office library.

10.3.2 Remedy Implementation

The ROD for AOC 50 Fort Devens was issued by the Army and USEPA on January 2, 2004, and was signed in March 2004. Remedy implementation was initiated in May 2004 and is summarized below.

10.3.2.1 SVE System Summary

The SVE system was operated for approximately six months over a one-year period, between September 2004 and November 2005, when soil conditions were relatively dry and the potential for removal of residual CVOC vadose zone soil vapor was high. The data from 2005 showed a very low mass removal rate that indicated that the bulk of the recoverable CVOC mass had been removed from the vadose zone in the former drum storage area. As a result, the Army provided a recommendation to the USEPA and the MassDEP that the system be shut down due to the limited CVOC mass removal potential remaining in the soil.

The BCT approved decommissioning of the SVE system in November 2005, and the system components and wells were decommissioned between December 2005 and June 2006. On September 27, 2006, the vapor phase carbon from the two 700-pound vessels was removed for disposal and the SVE system piping was disconnected from the recovery wells. Additional details regarding the SVE decommissioning activities are documented in the November 2006 *O&M and Groundwater Monitoring Report* (ARCADIS G&M, 2006). The SVE treatment shed and most of the former SVE system remain on site.

10.3.2.2 Enhanced Reductive Dechlorination

The objective of the ERD is to expedite the degradation of VOCs in the groundwater by stimulating microbial activity by adding an electron donor. Sustained organic carbon concentrations are supplied during the ERD activities to serve as the electron donor supporting biological VOC degradation within the treatment area.

The as-built construction of the ERD system is documented in the remedial design (ARCADIS, 2004b). As detailed in this report, injection infrastructure (43 injections wells,

injection trailer, and storage area) were constructed as designed to facilitate injection of the carbohydrate solution through AOC 50. Full-scale injection events at AOC 50 began in September 2004 and have been conducted on a monthly basis. Until March 2005, approximately 5,000 gallons of substrate was delivered to 40 injection wells, after which the injection volumes were increased (10,000 gallons total) to improve distribution of organic carbon in the aquifer in a shorter period of time. In the fall of 2008, the Army transitioned to a semiannual injection schedule and replaced the former molasses ERD substrate with Anaerobic BioChem® (ABC®) which is a formulated timed-release compound that allows better control of the development of reducing conditions within the aquifer that helps minimizes the development of a secondary inorganic, primarily arsenic and manganese, contamination. The total volume of ABC® substrate injected during a particular semiannual injection event varies based on the number of wells selected for injection but each selected well receives approximately 500 gallons of water/substrate mix at a mixture ratio of 12:1.

O&M Reports submitted since system installation summarize each injection event, including injection volume delivered, injection flow rates to each well, and well head pressures observed during each event. These results are gauged against historical injection trends to ensure that subsurface formation changes are not occurring as a result of the remedial program. During operation, the injection well network has been expanded from 40 to 45 wells to improve distribution of organic carbon to the dissolved plume where appropriate. Since 2009, the distribution of ERD substrate has been tailored to the individual contaminant and geochemical characteristics of each injection transect. Groundwater sampling is performed prior to each event and the sampling results are analyzed for ERD treatment effectiveness. Injection quantities are adjusted to maintain aquifer-reducing conditions in areas of persistent VOC contamination; while reducing the ERD substrate loading in areas where VOC contaminant concentrations have been reduced and secondary inorganic concentrations are increasing.

10.3.2.3 In-Well Stripping

The mechanical and control components of the IWS system were constructed and activated in May 2004, and consist of two recirculation wells located on the downgradient portion of the AOC 50 plume (Figure 10.4). The IWS system is located on the USFWS property at the southwestern portion of the site, south of the main airfield complex. The IWS system consists of two recirculation wells (IWS-1 and IWS-2) that are positioned to intercept the zone of highest CVOC impact in groundwater and treat volatile compounds in situ. The IWS system also creates aerobic conditions in the event that reducing conditions extend beyond the area of the ERD treatment.

The objective of an IWS application is to reduce the potential for migration of elevated VOC concentrations downgradient toward the Nashua River, thereby mitigating the potential for future ecological risk. In addition, the IWS application provides an aerobic and oxidizing barrier capable of inhibiting the potential downgradient migration of dissolved inorganic compounds and residual VOCs that exist hydraulically downgradient of the ERD treatment areas.

10.3.3 System Operation/Operations and Maintenance

The full-scale start-up of the ERD and IWS treatment systems began in May through September 2004 and routine O&M of these systems has been conducted pursuant to the site O&M Manual (ARCADIS, 2005b) and the O&M Manual Addendum I (HGL, 2009a). The ERD and IWS systems have operated normally since the May 2004 initialization with only minor IWS system downtime for mechanical and electrical system maintenance. A summary of the annual O&M costs to date is included in Appendix I.

10.3.3.1 Enhanced Reductive Dechlorination Operation and Maintenance

O&M activities for the ERD remedy include semiannual injection events in the Source Area and the Southwest Plume, and semiannual sampling conducted in accordance with the revised LTMP (ARCADIS, 2008) and the LTMP Addendum (HGL, 2008). Data collected from the semiannual sampling have been used to evaluate the effectiveness of the ERD remedy. The data are also used to optimize the ERD injection process described in Section 10.3.2.2.

Since ERD operations began in 2004, the injection well network has been expanded on several occasions to address the dissolved plume. These expansions have included the transition of former monitoring wells to injection wells, in addition to new well installation. Two additional wells were added to both Area 2 and Area 4 injection transects between 2006 and 2007. These additional locations facilitate distribution of TOC for treatment and monitoring across the entire width of the plume.

Currently, the ERD system consists of 45 substrate injection wells located in the Source Area and in the Southwest Plume. There are 21 ERD injection wells located in the Source Area/Area 1 (IW-7 through IW-12, IW-13S through IW-19S, IW-13D through IW-19D and IW-38) and 24 ERD injection wells are located in four transects (Areas 2 to 5) along the Southwest Plume (IW-1 through IW-6, IW-20 through IW-23, IW-24 through IW-28, and IW-29 through IW-37).

Substrate injections are conducted via each wellhead through a trailer-mounted injection pump and substrate tank which distributes pre-mixed substrate from a 500-gallon tank. Two non-adjacent wells are injected simultaneously during the injection sequence. The injection sequencing is arranged to minimized groundwater mounding during injection, and is repeated until all pre-selected injections wells receive the ERD substrate.

Between June 2005 and July 2006, ferrous sulfate was added to the molasses substrate mix to evaluate the viability of controlling arsenic solubility within the anaerobic IRZ through interactions with freshly formed iron sulfide minerals. It was determined that arsenic has not migrated beyond the strongly reducing IRZ and therefore, ferrous sulfate addition was discontinued prior to the December 2006 injection event. In October 2008, the Army transitioned to the slower release ABC® ERD substrate and reduced the injection frequency to semiannual from the previous monthly injection program.

As described in Section 10.3.2.2, in the fall of 2008, the ERD substrate was changed from the use of molasses substrate to ABC®. ABC® is a patented mixture of lactates, fatty acids, and a phosphate buffer. The ABC® substrate contains soluble lactic acid as well as slow- and long-term releasing components. The phosphate buffer provides phosphates, which are a micronutrient for bioremediation. In addition, the buffer helps to maintain the pH in a range that is best suited for DHC. ABC® is composed of several water soluble and metabolically available fractions. The decision to change the substrate was made in an effort to optimize the implementation of the remedy and was based upon a review of the AOC 50 groundwater sampling results. Although PCE concentrations have been reduced at AOC 50 relative to pre-ERD levels, sampling results indicated that as of June 2008, the degradation process appeared to have difficulty advancing beyond *cis*-1,2-DCE at several locations within the IRZs. In addition, a number of wells in the target treatment area retained elevated DO (>2 mg/L) and ORP in the positive range, which indicated that the aquifer may not be sufficiently reducing. Conversely, the prevalence of elevated methane concentrations within the IRZs indicated that methane-producing bacteria may be outcompeting DHC, resulting in slower degradation of PCE daughter products. Lastly, the frequent (monthly) injection of molasses for several years within all injection transects and the source area had contributed to the mobilization of inorganics within the IRZs. The size of the IRZs is controlled by the distribution of organic carbon within the aquifer. To control TOC distribution and arsenic solubility, the substrate application was evaluated prior to each injection event beginning in 2009. Based on the particular transects contaminant and geochemical characteristics, each transect is evaluated individually for the necessity to inject or not inject in individual wells or whether to bypass a transect in its entirety.

10.3.3.2 In-Well Stripping System Operation and Maintenance

IWS O&M summaries are presented in the annual AOC 50 O&M reports. Currently, the IWS wells are pumping, re-circulating, and treating groundwater at a total of approximately 25 gpm, which is in excess of the PCE-impacted groundwater flow into the area. An evaluation of the capture zone effectiveness and radius of influence for the IWS system were included in the IWS system startup and operation memo dated October 10, 2004. The IWS operation delivers sparge air to the groundwater to remove dissolved VOC contaminants and to saturate the groundwater within the upper screen with DO prior to re-injection. The groundwater oxygenation allows inorganic contaminants created in the IRZs to precipitate out of solution.

To provide adequate monitoring for the evaluation of the IWS system, downgradient and upgradient monitoring wells were installed in the shallow and deeper portion of the aquifer as proposed in the RD (ARCADIS, 2004b). Monitoring data collected from these wells ensures that elevated concentrations of CVOCs are not migrating downgradient towards the Nashua River and that migration of dissolved inorganic compounds from the IRZ zones does not occur beyond the recovery zone. In addition to these monitoring locations, influent and effluent samples are collected for the IWS system on a monthly basis to evaluate PCE removal by the IWS system.

During system operation conducted between May 2004 and December 2009, the groundwater recirculation rate has ranged from 10 gpm to 18 gpm per well, each with an airflow between

85 and 100 cfm. The variance in flow rates is due to changes in groundwater levels and extraction pump performance. Monitoring of influent and effluent PCE concentrations indicate that removal efficiency of the IWS system has been approximately 90%. As of December 2009, it was estimated that approximately 60 pounds of PCE have been removed from the groundwater by the IWS system.

Periodic maintenance of the IWS system has included the replacement of pumps and pump parts, lubrication of the system components, and modification of the well packer system that separates the inlet and recharge intervals. No maintenance issues were noted in 2005 through 2007. A number of repairs were made to the IWS system during the 2008 reporting period. System fuses were replaced during April, May, September, October, November, and December monthly service visits. A wiring splice in the IWS-1 well vault was repaired in October and the IWS-1 pump controller was replaced in December. The IWS-1 pump was replaced in January 2009. Post-pump replacement system sampling indicated that the IWS-1 well was operating within historical norms with no PCE removal efficiency issues. Other general maintenance of the system was performed monthly and included greasing of the blower bearings and regularly scheduled blower oil change outs.

10.4 PROGRESS SINCE LAST FIVE-YEAR REVIEW

This is the second five-year review for AOC 50, the first being completed in 2005. An interim Five-Year Remedy Review Report was completed in April 2008. Overall progress towards achievement of the RAOs and protection of human health and the environment is assessed annually with the latest annual assessment provided in the 2009 Annual O&M and Monitoring report (HGL, 2010). The following is a summary of the protectiveness statement and status of recommended follow-up actions and issues from the previous (2005) five-year review.

The following is the protectiveness statement from the 2005 Five-Year Review:

> *"The remedy at AOC 50 is expected to be protective upon completion, and in the interim, exposure pathways that could lead to unacceptable risks are being controlled.*
>
> *A HASP and IDW handling procedures are in place, are sufficient to control risk to on-site workers and the public, and are being properly implemented during groundwater sampling. Human health is currently not at risk at AOC 50 because groundwater at the AOC is not being used for potable use or proposed for potable use.*
>
> *Current remedial action activity consists of operation of the remedy, long-term groundwater monitoring, annual reporting, and five-year site reviews. These components enable continued assessment for compliance with performance standards and reporting of remedial progress."*

The following recommendations were made:

Continue current remedial actions as specified in the ROD. These components enable continued assessment for compliance with remedial goals established in the ROD and reporting

of the remedial progress. Follow performance standards and continue to assess for contaminant migration and remedial duration. Evaluation of the SVE system is ongoing. The ICs should be implemented through deed restrictions in accordance with the RAWP prior to the Operating Properly and Successfully Demonstration.

These recommendations were addressed as follows:
The remedial actions as specified in the ROD were continued throughout the preceding five-year review period. The SVE system was evaluated and shut down permanently in November 2005 due to asymptotic contaminant vapor removal. ICs were implemented in 2005. A Demonstration of Remedial Action Operating Properly and Successfully Report was issued in 2007 and showed that the remedy was working successfully. Contaminant concentrations have been reduced significantly across the site since implementation of the ERD remedy and degradation of primary CVOC contaminants is continuing.

10.5 FIVE-YEAR REVIEW PROCESS

10.5.1 Administrative Components

Development of the third five-year review process for former Fort Devens included the following components that are described in this section:

- Document Review;
- Data Review;
- Site Inspection;
- Interviews; and
- Community Participation.

10.5.2 Document Review

The following documents were reviewed for this five year review:

- Remedial Investigation, prepared by Harding Lawson Associates, January 2000;
- Feasibility Study, prepared by ARCADIS, December 2002;
- Record of Decision prepared by ARCADIS, March 2004;
- Operation and Maintenance and Groundwater Monitoring Report, prepared by ARCADIS, July 2004;
- Operation and Maintenance and Groundwater Monitoring Report, prepared by ARCADIS, September 2004;
- Operation and Maintenance and Groundwater Monitoring Report, prepared by ARCADIS, December 2004;
- Operation and Maintenance and Groundwater Monitoring Report, prepared by ARCADIS, March 2005;

- Operation and Maintenance and Groundwater Monitoring Report, prepared by ARCADIS, July 2005;
- Operation and Maintenance and Groundwater Monitoring Report, prepared by ARCADIS, September 2005;
- Operation and Maintenance and Groundwater Monitoring Report, prepared by ARCADIS, December 2005;
- Operation and Maintenance and Groundwater Monitoring Report, prepared by ARCADIS, March 2006;
- Operation and Maintenance and Groundwater Monitoring Report, prepared by ARCADIS, July 2006;
- Operation and Maintenance and Groundwater Monitoring Report, prepared by ARCADIS, September 2006;
- Operation and Maintenance and Groundwater Monitoring Report, prepared by ARCADIS, December 2006;
- Demonstration of a Remedial Action Operating Properly and Successfully Report, prepared by ARCADIS, February 2007;
- 2004 Operation and Maintenance and Groundwater Monitoring Report, prepared by ARCADIS, March 2007;
- 2005 Operation and Maintenance and Groundwater Monitoring Report, prepared by ARCADIS, July 2007;
- 2006 Operation and Maintenance and Groundwater Monitoring Report, prepared by ARCADIS, September 2007;
- 2007 Operation and Maintenance and Groundwater Monitoring Report, prepared by HGL, 2008;
- AOC 50 Interim Five-Year Remedy Review, prepared by ARCADIS, April 2008;
- Enhanced Reductive Dechlorination Operations and Maintenance Manual Addendum I, prepared by HGL, March 2009;
- 2008 Operation and Maintenance and Groundwater Monitoring Report, prepared by HGL, 2009;
- 2009 Operation and Maintenance and Groundwater Monitoring Report, prepared by HGL, 2010; and
- Data Evaluation Report for the AOC 50 Environmental Remediation Groundwater Samples, April 2010 Groundwater Sampling Event, prepared by HGL, 2010.

10.5.3 Data Review

Analytical data collected during monitoring events performed between January 2005 and April 2010 were evaluated for this five-year review. Data pertaining to the ERD and IWS remedial components are summarized in the following sections.

10.5.3.1 ERD System Operation and Data Review

The ERD system operation includes substrate injections into the 45 ERD injection wells located at AOC 50 (as shown in Figure 10.1) to create and maintain an IRZ that promotes native microbial digestion as a means to treat VOCs. A pilot study to test the effectiveness of the ERD remedy was performed between December 2001 and July 2002 within injection transect 5. Monthly substrate injections (molasses) were initiated in January 2005 and maintained through June 2008. Semiannual substrate injections (ABC®) were initiated in November 2008 with the latest injection performed in June 2010.

The decision to change the substrate from molasses to ABC® was made in an effort to optimize the remedy in place and was based on a review of AOC 50 groundwater sampling results data from December 2001 through June 2008. Although PCE concentrations were reduced at AOC 50, as compared to pre-ERD levels, the sampling results indicated that molasses-driven degradation relatively stalled at the *cis*-1,2-DCE step, with considerably slower advancement to VC within the IRZs. Furthermore, several wells in the target treatment area exhibited elevated DO levels (>2 mg/L) and positive ORP measurements, indicating an aquifer that was not sufficiently reducing and thus, less hospitable to the anaerobic bacterial community. Conversely, the prevalence of elevated methane concentrations within a number of IRZs indicated that methane-producing bacteria (methanogens) were present and potentially outcompeting DHC), leading to the slower degradation of PCE daughter products. Lastly, the frequent (monthly) and highly- to moderately-concentrated molasses injections for several years contributed mobilization of inorganics observed within the IRZs to some degree.

A critical component of the Army's revised ERD approach was the use of ABC® in place of molasses. The ABC® substrate is a mixture of lactates, fatty acids, and a phosphate buffer. The phosphate buffer provides phosphates, which in nature are a limiting micronutrient for bioremediation, and it helps to maintain the aquifer pH in a range best suited for DHC. The lactates and several other water soluble and metabolically-necessary compounds, such as lactic acid, are available for immediate use by native bacterial communities to rapidly initiate the PCE degradation process. Meanwhile, the C_{14} to C_{18} fatty acid chains in ABC® provide a slower release carbon source that help sustain the required level of hydrogen production essential for chlorinated ethene reduction without driving the aquifer into methanogenic conditions.

The ultimate objective of the designed ERD system (molasses- or ABC®-driven) at AOC 50 was to stimulate and support the complete biodegradation of PCE within the source areas and downgradient plume. Progress toward this objective was evaluated based on the January 2005 through January 2009 LTM data and adherence to the aquifer criteria established for maximum PCE degradation. The criteria are summarized below:

- Consistent and adequate TOC concentrations in monitoring wells throughout the treatment areas.
- Proper pH levels to sustain dehalogenating bacteria, where a pH between 5 and 9 is satisfactory, and a pH between 6 and 8 is preferred.
- Reducing conditions established throughout the IRZ at a level that supports reductive dechlorination without favoring methanogenic bacteria.
- A notable decline in parent species (PCE) concentrations and increased production of degradation or daughter products (TCE, *cis*-1,2-DCE, VC, and ethene).
- A subsequent decrease in TCE, *cis*-1,2-DCE, VC, and ethene concentrations in a fully developed IRZ where complete biodegradation is achieved.

As noted, data trends based on the above criteria were used to evaluate the overall success of the ERD system at AOC 50. These trends indicated the extent of enhanced contaminant degradation and included the following observations:

- The PCE concentrations significantly decline over time once a proper IRZ is established.
- Due to the PCE dechlorination mechanism, there is a transient increase in degradation products, such as TCE, *cis*-1,2-DCE and VC.
- As this dechlorination process progresses toward completion, the TCE, *cis*-1,2-DCE and VC concentrations decline and generation of degradation products, such as ethane and methane, increases.
- The total chloroethene molarity of the site eventually declines as innocuous degradation by products become the prominent residual species.

A more detailed discussion of the ERD system adherence and progression by each IRZ area is presented in the following section. Subsequent to this discussion, current data were compared to the initial groundwater dechlorination model developed in the RD. This comparison was meant to ascertain whether the remedy is on target to achieve the remedial goals within the estimated timeframe of 23 years. The latest complete LTM analytical data set is available through 2009; however, April 2010 sampling data are available for a subset of monitoring wells. The April 2010 data is used where available to support trend data.

10.5.3.1.1 Biostimulation and Development of Anaerobic Conditions

A successful ERD process is executed through the development of an anaerobic aquifer and in situ biostimulation of the native bacterial community. As compared to pre-ERD conditions, the change in redox conditions and PCE decrease in the monitoring wells with increases in daughter compounds indicate that biostimulation at AOC 50 is occurring in response to the remedy in place. Furthermore, increased degradation byproduct concentrations in the wells imply that the reducing conditions required for enhanced dechlorination of PCE and TCE are present and that the mechanism is progressing through to the generation of end products.

Analytical and field data collected for all associated monitoring wells since initialization of the ERD technology are presented in Appendix I. To demonstrate successful operation of the ERD remedy, Figures 10.5 through 10.8 exhibit trends for key parameters presented in the Groundwater Analytical Results table in Appendix I for selected wells from each area of concern. The specific parameters in each figure include dissolved iron and arsenic, pH, TOC, methane, and chloroethenes. An abbreviated discussion of the individual criteria for optimum ERD progression is presented below.

TOC Distribution

Implementation of the ERD remedy through regular substrate injections has achieved successful distribution of TOC within the groundwater under all areas of concern: the former drywell and former drum storage areas, and Areas 2, 3, 4, and 5. The readily available organic carbon in the substrate has promoted microbial growth through stimulation of the native community and promoted a strong anaerobic environment within the aquifer. In general, an increased TOC content yields a negative ORP and a decrease in DO content as microbes ferment the organic carbon source; however, this relationship between TOC, ORP, and DO is slightly less defined for some monitoring wells, such as well G6M-02-08X, according to the available data and may be contingent on the mineral and natural organic matter matrix, hydrological heterogeneity, and distance from the injection well.

Permanent Gases and Biostimulation

As shown on Figures10.5 through 10.8, methane concentrations have generally increased with IRZ development in each of the treatment zones. According to the trend lines, methane levels in each area remained low during the initial nine-twelve months of substrate injections and increased significantly once an adequate distribution of approximately 100 mg/L TOC was achieved. For instance, in Area 5 (Figure 10.10) the methane concentration at well MW-3 was relatively low for the first six months (18-3,900 μg/L) and increased to between 17,000-45,000 μg/L within the past five years. Similar trends are observed for the other IRZ areas, and described in detail in the 2009 Annual O&M and Monitoring Report for AOC 50 (HGL, 2010). These data indicate that the reducing conditions required for dechlorination are equally established within the IRZs.

Maintenance of Optimal pH Conditions

The pH levels within and upgradient of the established IRZ boundaries have generally exhibited a slightly acidic nature, fluctuating between 5 and 7 pH since monitoring events began. Although notable outliers have been recorded, such as a pH of 11.97 for well G6M-03-07X in June 2005, these spikes are short-lived and may be random equipment errors; however, the overall pH levels are conducive to dechlorination. As discussed in the 2009 Annual O&M and Monitoring Report (HGL, 2010), such pH differentiation is likely the result of varying carbonic and supplementary acid (e.g., fatty acids, propionic acid) formation from organic carbon fermentation, introduced during the ERD process.

Transient Metals Solubilization

Based on the compiled groundwater monitoring data collected from the beginning of the ERD injection through the April 2010 monitoring period, metals desorption and solubilization,

especially arsenic and manganese is evident within the reducing zones across AOC 50, where the extent of desorption is directly correlated with the TOC and negative ORP of the groundwater environment. The presence of solubilized metals within the site's reducing environment is not an unexpected phenomenon and was anticipated as an element of the selected remedy. Mobilization of soluble inorganics is not expected to be significant beyond the IRZ boundaries and recent monitoring data indicate that dissolved metals are not detected in elevated concentrations within aerobic portions of the aquifer and are generally confined to the CVOC treatment areas.

Arsenic trends for Area 5 provide an illustration of the general behavior expected for wells within and downgradient of other IRZ locations. Elevated arsenic is observed in wells located directly downgradient of the Area 5 IRZ transect, where substrate injections have promoted a strongly reducing environment that favors arsenic desorption and solubilization. Per the spring 2010 monitoring event, the recent arsenic concentration at well G6M-02-11X,was1,050 μg/L and was non-detect in wells G6M-04-05X and G6M-03-09X located within 150 ft downgradient of this well. Well G6M-02-11X had a well developed reducing environment as indicated by an ORP value of -130.5 mV while the two non-detect wells had positive ORP values.

10.5.3.1.2 Enhanced Contaminant Degradation

The primary objective of the ERD system is to stimulate and support the complete reduction of PCE within the source areas and downgradient plume. The following discussion presents trends as related to the enhanced dechlorination activity occurring at each area of concern, beginning with Area 5.

The analytical and field data for monitoring wells at each area of concern are presented in Appendix I and Figures 10.5 through 10.8. Each figure exhibits the progression of the PCE degradation process through the generation and degradation of dechlorination products, as represented by a graph of concentration versus time.

Area 5 (Former Pilot Test Area)

As discussed in the previous section regarding optimum factors for entrenching the ERD process, substrate injections have successfully established a favorable reducing environment within the groundwater under Area 5, which is necessary for complete reduction of PCE. As shown in Figure 10.8 and the Groundwater Analytical Results Table in Appendix I, enhanced dechlorination of PCE and TCE to *cis*-1,2-DCE was observed within the first year of ERD operations. As the Area 5 IRZ continued to develop, specifically at well MW-3 which is immediately downgradient of the ERD transect, *cis*-1,2-DCE became the dominant chlorinated constituent for approximately two years from November 2002 to November 2004. By March 2005, the *cis*-1,2-DCE concentrations began to consistently decline, and the next product in the dechlorination mechanism, VC, became the predominant chlorinated species and has declined from a high of 760 μg/L in August 2005 to 2.5 μg/L in April 2010.

The 2009 and latest 2010 PCE concentrations for all monitored wells in Area 5 ranged between non-detections in wells directly downgradient of the ERD injection transect to 370

μg/L in well G6M-02-05X, which is slightly southwest of the transect. This range of PCE concentrations reflects a consistent decreasing concentration trend relative to the primary CVOC contaminants within the majority of Area 5; however, the G6M-02-05X well located on the western perimeter of the Area 5 transect is showing a marginal reducing environment and a slow degradation of the primary PCE contaminant. The data appears to support that degradation is occurring, albeit slowly, at this location but additional data is required to more thoroughly evaluate this portion of Area 5. Due to the well established reducing environment throughout the majority of Area 5 metals solubilization, primarily arsenic and manganese is prevalent in the formerly PCE contaminated portions of this area. Dissolved metals appear to increase within a year or two of the establishment of persistent reducing conditions then tends to increase to a point where a rough equilibrium is reached and the dissolved metals, primarily arsenic, concentrations vary within a limited range as long as reducing conditions are maintained. There are no clear examples of arsenic concentrations diminishing once elevated within a reducing zone; however, there is no evidence of dissolved arsenic persisting in areas of the aquifer characterized as possessing aerobic conditions. The elevated metals concentrations are likely to persist within the reducing zones until the aquifer is restored to aerobic conditions then quickly precipitate out of solution.

The solubilized metals have reached monitoring wells designated as "sentry" wells, specifically well G6M-03-10X located approximately 300 ft southwest (hydraulically downgradient) of the Area 5 injection transect. The G6M-03-10X well possesses a reducing environment indicating the reducing zone generated by the ERD injections expanded into this area and the original RD estimation of IRZ development underestimated the likely extent of IRZ development. A better definition of "sentry" well would be a well located outside of the developed IRZ in which detections of CVOCs or solubilized metals would indicate contaminant migration and thus the potential for remedy failure if no additional action is taken. Due to the longevity of the ERD system at Area 5, the CVOC and solubilized metals trends can be used as a gauge to assess the progress of contaminant reduction and metals solubilization in the other treatment areas.

Former Drum Storage Area

As exhibited in Figure 10.9, elevated TOC concentrations are present 23 ft downgradient of the Source Area in former drum storage area well G6M-04-10A, and have remained as such since March 2005 along with a low reported DO and negative ORP. Elevated methane concentrations have been observed at this well for over three years. Conversely, the groundwater directly east and approximately 120 ft downgradient of the ERD injection area (wells G6M-94-18X and G6M-04-09X, respectively) depict a less reductive environment and thus, slower PCE degradation rates. However, the overall contaminant concentration trend in this area is showing a decline in CVOC concentrations. As is observed throughout the AOC 50 treatment areas, solubilized metals have appeared within the aquifer where reducing conditions have been established but are not found in aerobic portions of the aquifer. This observation can be applied to the other treatment areas discussed below. As was discussed for the Area 5 ERD evaluation, the elevated solubilized metals are likely to persist as long as reducing conditions are maintained.

Former Drywell Area

Figure 10.10 presents the results of three wells located from 10 to 25 ft downgradient of the former drywell area injection transect. The TOC concentrations are elevated at each of these locations and decline with distance away from the injection wells, 3,400 to 1,200 to 130 mg/L, respectively, in April 2010. Substrate delivery to each of these locations has promoted the development of reducing conditions and the production of chlorinated degradation products. As depicted in well G6M-03-02X (15 ft downgradient), the onset of methane generation was observed approximately 10 months after the first substrate injection, and methane production at this well has generally increased over the past four years. Furthermore, a significant methane concentration (37,000 μg/L) was observed in April 2010 at well G6M-96-13B (25 ft downgradient) where the TOC concentration is lower (Figure 10.10), indicating that reducing conditions have expanded downgradient of the injection transect. Fluctuations in the PCE concentration at well G6M-96-13B have been noted since the substrate injections began and may be the result of upgradient inputs and desorption of PCE from the matrix, followed by rapid dechlorination by the microbial community.

In well G6M-03-02X, *cis*-1,2-DCE currently accounts for most of the total CVOCs and is also prevalent in the well further downgradient. Although the substrate injections increased the rate of progression from parent compounds to daughter products, considerable generation of *cis*-1,2-DCE in all three locations preceded the substrate injections. Furthermore, due to their locations within the Source Area, total CVOC concentrations are still relatively elevated; however, each well location within the former drywell area exhibits characteristics of a well established dechlorination process, and are comparable to trends observed in Area 5. These results indicate that effective ERD is proceeding within this area.

Area 2

The Groundwater Analytical Results table in Appendix I and Figure 10.5 present analytical and field data collected from well G6M-02-01X, which is located approximately 60 ft downgradient of the Area 2 injection transect. Due to the slightly crossgradient location of this well relative to groundwater flow at this location, TOC concentrations have not been consistent. In the spring of 2007, the ERD injection well transect was extended to include well IW-37 (located approximately 60 ft upgradient of well G6M-02-01X) in an effort to expedite treatment in this area. It appears that by March 2008, the organic carbon injections reached well G6M-02-01X, as evidenced by a significant increase in PCE degradation; a corresponding increase in methane and ethene; and a corresponding decline in DO. The PCE concentrations in this well initially showed a rapid decline in historical concentrations with a corresponding increase in daughter products; however, beginning in January 2009, the PCE began an increasing concentration trend with diminished daughter products. The reason for this rise is unknown. One possible explanation may be a rebounding of PCE concentrations after the initial rapid PCE degradation created as a result of a five month gap in carbon injections corresponding to the period when the Army transitioned from molasses to the ABC substrate. The most recent April 2010 data collected at G6M-02-01X show a significant drop in the primary PCE concentration, a drop in the dissolved oxygen concentration and a greater reducing environment as evidenced by a negative ORP relative to the positive ORP detected during the October 2009 event.

Conversely, increasing TOC and permanent gas concentrations at well G6M-97-08B, which is 60 ft directly downgradient of the injection transect, between 2006 and 2008 indicate that injection events are slowly succeeding in delivering electron donor to the downgradient area and reductive conditions are present at this well and CVOC degradation is proceeding; however, the data from this well is only available through the March 2008 sampling event and the site optimization replaced this well with G6M-07-01X located to the west of the injection transect.

Area 3

Results from well G6M-03-07X, located approximately 60 ft downgradient of the Area 3 injection transect, are presented in Figure 10.6. TOC levels combined with the low DO and negative ORP at all three Area 3 wells are adequate to promote reductive dechlorination, PCE concentrations have generally decreased since September 2004. Furthermore, enhanced dechlorination of PCE to *cis*-1,2-DCE was observed in December 2005 for well G6M-03-07X and in September 2007 for well G6M-04-04X. As of the 2009 sampling events, PCE and the corresponding degradation by-products in wells G6M-03-07X and G6M-04-04X were largely degraded. Immediately upgradient of the injection transect, well G6M-04-02X has exhibited a slower PCE degradation rate since the 2004 sampling event; however, increases in daughter product concentrations and declining PCE concentrations indicate that this well is likely receiving diminished CVOCs from the upgradient transect (Area 2) and the ERD process is active in this area as this well is showing a generally reducing environment.

Area 4

Similar to the trends observed in Area 3, the results for well G6M-02-13X, located 60 ft downgradient of the Area 4 injection transect, exhibit a decline in PCE concentration and an increase in degradation byproducts (Figure 10.7). As in the other substrate injection areas, the arrival of elevated TOC concentrations in March 2005 was followed by the onset of greater reducing conditions, where methane levels have been around or well above 10,000 μg/L since December 2005. As demonstrated in Area 3, dechlorination to *cis*-1,2-DCE was observed once adequate TOC was present in the area and methanogenic conditions were achieved. In April 2010, PCE and the corresponding degradation by-products in well G6M-02-13X were either slightly above or below the respective laboratory reporting limits. Such a decline, coupled with the presence of ethene and methane, suggests that the ERD process is well established in this area.

10.5.3.1.3 Contaminant Degradation Rates Consistent with Model

As discussed previously, due to the pilot test in December 2001, ERD progression is the most advanced in Area 5, where regular carbon injections have produced the most mature environment for dechlorination. The quantity of monitoring data available for Area 5 provides an optimal situation to calculate the in situ PCE degradation rate, which can then be compared to the rate predicted by the groundwater model which used MODFLOW (McDonald and Harbaugh, 1988) for groundwater flow simulations and MT3D (Zheng, 1990) for solute transport. This data demonstrates the successful operation of the ERD remedy.

The degradation rates for PCE and total VOCs were calculated from a series of performance monitoring wells located perpendicular to and within 100 ft of the injection wells in Area 5 (including one upgradient). Data from March 2004 and September 2006 were considered in these rate calculations to highlight changes in the ERD zone during this time period. These rates were then compared to the PCE and total VOC half-lives of 25 and 75 days, respectively, as determined by the groundwater model during the RD phase.

As shown on Figure 10.11, the data indicates that within the Area 5 ERD zone, the apparent PCE and total VOC half-lives are approximately 11 and 70 days, respectively. This faster rate for PCE reflects the actual degradation rate in the presence of TOC, whereas the longer degradation rate accounts for the sequential degradation of intermediate compounds, such as *cis*-1,2-DCE and VC. Additionally, each of these half-lives is faster than those predicted by the groundwater model and as compared to historical rates.

Data from 2005 through 2009 indicates that the degradation of both PCE and total VOC within the IRZ is occurring even faster than predicted. The half-lives for PCE and total VOC were 7 and 20 days, respectively. This indicates that dechlorination rates within Area 5 are increasing.

As shown on Figure 10.11, the degradation rates estimated using site data are faster than the rates employed by the groundwater model to determine the remedial timeframe, indicating that remediation should be complete within the estimated time of approximately 23 years. The analysis of site data and determination of these degradation rates support the following conclusions:

1. PCE degradation rates exceed the groundwater model predictions and reveal an increasing degradation trend in Area 5 (the former pilot test area).

2. Degradation rates for PCE by-products (*cis*-1,2-DCE, VC) exceed the model predictions for Area 5.

3. Overall degradation rates of total VOC are sufficient to meet the AOC 50 ROD groundwater restoration time-frames.

10.5.3.2 <u>In-Well Stripping System Operation</u>

The IWS system is located on the USFWS property at the southern end of the plume, downgradient of AOC 50. The system was activated in May of 2004 and consists of two recirculation wells (IWS-1 and IWS-2), that are positioned to intercept the zone of highest CVOC impact in groundwater and treat volatile compounds in situ. The IWS system also creates aerobic conditions in the event that reducing conditions extend beyond the area of the ERD treatment. A provision of the IWS design allows for upgradient injection of reduced iron to encourage the reductive precipitation of solubilized metals to prevent solubilized metals from reaching the IWS system. Conversely, the upgradient injection transects can also be used to inject oxidizing agents to promote metals precipitation under oxidizing conditions once the primary CVOCs have been fully degraded. As of the period of this five-year review,

implementation of the reduced iron injection or oxidant injection has not been performed and is not yet warranted.

The final mechanical testing and start up of the IWS system were completed in May 2004. During system operation between May through December 2004, the groundwater recirculation rate ranged from 10 gpm to 16 gpm per well, and air flow ranged from 85 to 100 cfm per well and these rates have been maintained throughout the IWS operational period. Monitoring of influent and effluent PCE concentrations indicated that removal efficiencies of the IWS system ranged from 88 to 90%.As of December 2009, it was estimated that approximately 60 pounds of PCE have been removed from the groundwater by the IWS system.

During this period of operation, all equipment operated properly and only minor maintenance activities were conducted.

10.5.3.2.1 PCE Mass Removal in In-Well Stripping Area

The removal of PCE mass from the groundwater in the IWS area has been on-going since the initial start-up of the IWS system in May 2004. The rate of PCE mass removal is controlled by the extent of the IWS system capture zone and the PCE concentrations in the groundwater flowing into this capture zone. The IWS system has removed approximately 60 pounds of PCE from groundwater and has significantly lowered the PCE concentrations in the groundwater in the IWS area and at downgradient locations. The two IWS wells operate at a combined flow rate greater than the groundwater flow rate into the IWS capture zone. Therefore, the extracted groundwater is treated for PCE removal with multiple passes through the IWS system. This allows for greater than 90% overall removal efficiency of PCE from the groundwater in the IWS area.

The summary of the operational mass removal data is presented in the Summary of IWS System Operation and Mass Transfer Rates table in Appendix I. Data supports the following conclusions regarding the IWS system:

1. The IWS system removes approximately 90% of PCE mass in groundwater flowing into the IWS capture area as measured from the influent and effluent concentrations.

2. The system has established an effective radius of influence of approximately 45 ft with some variation based on fluctuations in pumping rates and a capture zone width extending approximately 325 ft across at its greatest upgradient extent with an approximate 60 ft downgradient stagnation point.

3. The primary downgradient monitoring wells for the IWS system, wells G6M-04-06X and G6M-04-07X, have shown continued decreases in PCE concentrations, going from a high of 1,100 μg/L (G6M-04-07X) in December 2004 to current levels of 3 μg/L (G6M-04-06X) and 13 μg/L (G6M-04-07X) in April 2010.

10.5.3.2.2 Develop In Situ Aerobic Barrier

The IWS system has been transferring DO into the aquifer to create an aerobic zone as a post-ERD polishing treatment at the down gradient end of the Southwest Plume. The steady state transfer rate of DO is set based on the flow rate of the wells and maximum DO levels that can be obtained with the process. The operational data indicate that the treated effluent from the IWS wells contain DO at the saturation limit (approximately 10 mg/L). The system operational data and the site monitoring data therefore support the following conclusions on the IWS system:

1. The IWS systems pumps at approximately 20-30 gpm (total), a flow rate that is in excess of the groundwater flow into the area.

2. The IWS system delivers sparge air at approximately 80-100 cfm per well and raises DO levels to saturation.

3. The IWS system transfers an estimated 1.4 pounds per day (lbs/day) of oxygen to groundwater, or a total of approximately 2,590 pounds to date.

4. Ferric iron has not impacted operation of the IWS wells.

5. Downgradient wells G6M-04-06X and G6M-04-07X show elevated DO and ORP levels compared to upgradient wells G6M-04-05X and G6M-03-08X.

10.5.4 Site Inspection

A site inspection was performed at AOC 50 by HGL personnel in April and May 2010. Conditions during the site visit were clear and dry and temperatures in the 50s and 60s. Massachusetts State Police and Army Reserve personnel were at the site during the inspections.

The AOC 50 source area is located on the northeastern portion of the site and is bound to the north by Fitchburg Road (Mass Route 2A) and is protected from entry by a perimeter fence line. The source area is less than two acres and includes Building T-3803 (former parachute shop), 3840 (former parachute shakeout tower), 3824 (gazebo), and 3801 (airplane parachute jump simulation building). There is also a decommissioned SVE building east of the simulation building. All buildings at the source area are highly deteriorated and in various states of decay with vegetative overgrowth and timber rot. Building T-3803 is the least deteriorated and still has electrical power to the building and a portion of the building is used for equipment and supply storage for the AOC 50 remediation project. The ERD injection wells and groundwater monitoring wells are in generally good condition but several wells have tilted protective bollards.

The remaining portions of AOC 50 consist of paved areas from the former airfield, landscaped areas, and buildings used by the Army Reserve unit for vehicle maintenance and storage, and administrative offices. The Army Reserve unit is located directly south of the former source

area and uses the former airfield hangars and airfield operations area. The Massachusetts State Police operations are located west of the Army Reserve area and the buildings consist primarily of a permanent main building and several modular buildings. The former runways and taxiways are generally intact and are used primarily for state police driver training and a portion of the former main east-west runway is used for vehicle storage. There are no airfield operations at the site and the former runways are closed to air traffic. The former airfield is typically vacant and the access gate is locked by 6 P.M. each evening.

There was no evidence of recent construction, excavations, well installations, or other intrusive site activities. Access to all ERD injection wells and groundwater monitoring wells is unobstructed and all wells were in good repair. There was no evidence of other site disturbance that might potentially have an impact to the AOC 50 remedy or be in violation of the site LUCs.

10.5.5 Interviews

The following individuals were interviewed as part of the five-year review:

1. Libby Herland, USFWS (April 2010);
2. Henry Woodle, Merrimack Warehouse Realty Co., Inc. (September 2010);
3. Ron Ostrowski, MassDevelopment (April 2010); and
4. Ellen Iorio, USACE (April 2010).

The interviewees indicated that they were not aware of any activities that could interfere with the site remedy and were not aware of any problems with operation of the ERD or IWS systems. Also, the interviewees were not aware of any potential LUC violations at the site. On-site interviews of several site workers, specifically Sgt. Folder of the Army Reserve and Sgt. Lee of the Massachusetts State Police indicated that they were not aware of any site issues that could potentially affect the ongoing remedial operations or potentially violate the site LUCs. The detailed 2010 LUC interviews are included in Appendix J.

10.5.6 Community Participation

Community participation at former Fort Devens Army Installation is detailed in Section 1.3.

10.6 TECHNICAL ASSESSMENT

Question A: Is the remedy functioning as intended by the decision documents?

The remedy is functioning as intended by the ROD and is explained in more detail below.

Remedial Action Performance

As presented in the latest 2009 O&M and Monitoring Report (HGL, 2010), the ERD and IWS treatment systems are operating properly and effectively. Monitoring data confirm that destruction of site COCs is ongoing and that the remedy remains protective of human health and the environment. As presented in Section 10.5.4.1.3, dechlorination rates are consistent

with those predicted in the ROD; therefore, the remedy in place should achieve cleanup objectives within the proposed 23 year timeframe. The generation of mobilized metals is not expected to significantly alter the projected remedy completion timeframe as portions of the plume have already achieved significant CVOC degradation and the Army has reduced or terminated additional ERD injections within those areas. Based on groundwater flow rates and infiltration, those portions of the aquifer which are no longer receiving anthropogenic carbon should see reversion to aerobic conditions within two to three years and a rapid decrease in dissolved arsenic concentrations. Manganese is expected to persist longer due to its solubility at higher ORPs and dependence on factors such as groundwater pH, inorganic carbon, organic carbon, sulfate, chloride and temperature. Observations of existing site data reveal that manganese concentrations are highly variable between sampling events and usually precede the appearance of dissolved arsenic in CVOC impacted wells but is not persistent in un-impacted wells located within the aerobic portions of the aquifer. Manganese concentrations should be monitored closely to determine its reaction to changing geochemical conditions induced by suspension of ERD injections of further monitoring is required to determine trends and rates of precipitation.

System Operations/Operation and Maintenance (Long-Term Groundwater Monitoring)
Groundwater monitoring is being performed in conjunction with the remedial implementation of the ERD and IWS treatment systems. The monitoring results indicate that both the ERD remedy and IWS system are functioning as designed. The primary CVOC contaminant (PCE) is being reduced throughout the ERD treatment area, and increases in secondary contamination of inorganics through metals solubilization is confined to areas of reductive groundwater conditions. The IWS system is efficiently removing dissolved CVOC from impacted groundwater beyond the ERD treatment areas and is acting as an effective downgradient barrier to further VOC and solubilized metals migration. The LTM program is providing the needed data to evaluate remedy effectiveness and to monitor long-term groundwater trends; however, the Army should consider modifying the LTM monitoring network to account for the rapidly diminishing CVOC concentrations and placing additional focus of the solubilized metals.

Opportunities for Optimization
The Army has been proactive in optimizing the ERD remedy by modifying the injection substrate concentrations (molasses) and replacing the molasses substrate with a slower-releasing substrate. The optimization focused on enhancing the degradation of CVOCs within the IRZ and increasing the control of arsenic solubility. Based on monitoring data, the change in ERD substrate and injection timing did not diminish the effectiveness of the ERD remedy. The change in ERD substrate should enhance the reductive dechlorination process by controlling the release of anthropogenic carbon which may moderate the development of secondary inorganic contamination, primarily arsenic and manganese. Changes in the rate of metals solubilization and an eventual decrease in dissolved metals concentrations requires conditions within the IRZ to stabilize and gradually respond to the changes in carbon loading. A gradual lessening of reducing conditions should eventually lead to less metals mobilization while maintaining an environment conducive to CVOC degradation. The reduced injection frequency also lowered the overall cost of the remedy by minimizing the number of injection

events and associated manpower costs. Additional optimization opportunities are realized after each sampling event when LTM data are evaluated for remedy effectiveness. If the data reveal a steady decrease in primary CVOC contaminants and rise in solubilized metals, the Army can choose to skip one or more injections at a particular transect. If the transect CVOC concentrations are significantly diminished, the Army can elect to terminate injections at that transect. These changes are representative of a dynamic treatment approach and should continue to provide opportunities for further treatment optimization as additional monitoring data is collected and analyzed.

Early Indicators of Potential Remedy Failure

Degradation of the primary CVOC contaminants is proceeding and no indicators of potential remedy failure concerning the CVOC contaminants were noted during this review. The wells located on the western ends of Areas 2, 4, and 5 that reveal slowly degrading CVOC concentrations may require additional monitoring to ensure the degradation continues and the location of area transect injection wells remain effective in providing optimal IRZs based on CVOC concentrations. Solubilized metals, particularly arsenic and manganese, prevalent throughout the IRZs in all treatment areas may require more focused monitoring to confirm their attenuation within aerobic portions of the aquifer. If increasing CVOC contaminants and solubilized metals generated within the IRZs are detected and persist within aerobic portions of the aquifer, the remedy, as presently implemented, may require a re-evaluation.

Implementation of ICs and Other Measures

In accordance with the ROD, ICs that prohibit the use of groundwater as a potable source, restrict groundwater pumping and stormwater recharge, limit construction in specific areas, provide access to treatment systems and the monitoring network, protect workers from inhaling vapors from process water and restriction of residential/educational uses in the source area, are currently in effect at AOC 50. As discussed in Section 10.3.1, legal agreements between the Army, MassDevelopment, and USFWS are in place to restrict activities that would interfere with the operation of the remedy, including:

1. The construction of structures;
2. Groundwater withdrawal for any purpose;
3. Stormwater discharge/recharge; and
4. Provide for Army access to the properties during the operation of the remedy to install and maintain monitoring wells and treatment systems.

On behalf of the Army, HGL issues an IC reinforcement letter annually to the property owners impacted by the LUCs at AOC 50 to reinforce the restrictions for the affected areas. Annual interviews and inspections of the site are made following issuance of the letter to confirm continued compliance with IC objectives. The annual LUC compliance monitoring included:

1. Review of documentation and records;
2. Physical on-site inspections; and
3. Interviews with knowledgeable personnel.

The last IC inspection, held in November 2009, is summarized in the 2009 Annual O&M and Monitoring Report (HGL, 2010). In the event of future property transfer, ICs will be stated in full, or by reference, within deed, easements, mortgages, leases, or other instruments of property transfer. These controls will be drafted, implemented and enforced in cooperation with Federal, state, and local governments. These agreements will be maintained as long as groundwater contaminants remain at concentrations above cleanup levels.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?

Changes in toxicology and risk that occurred since remedy selection are described below.

Changes in Standards and To Be Considered

As part of this five-year review, ARARs and TBC guidance for the site presented in the ROD were reviewed. The results of the ARAR/TBC review are discussed further in Section 10.6.2. The MCLs are health-based standards established by the USEPA. The majority of the groundwater cleanup goals are based on these drinking water standards. Changes to the MCLs impact the protectiveness of these cleanup goals. There have been no changes to the COC MCLs since the previous five-year review.

Changes in Exposure Pathways

There are no current complete exposure pathways at the site. There has been no change in exposure pathways since the original risk assessment was performed. The exposure to groundwater through drinking water, industrial water use, and household water use is a concern for future receptors only. The ROD identified potential risk from the following future exposure pathways: potential use of groundwater as the primary drinking water source under residential and industrial land use; inhalation of VOCs migrating from groundwater to indoor air; and use of groundwater as process water by future commercial/industrial workers.

Unacceptable risk from vapor intrusion was identified for residential use in the Source Area only. To eliminate this exposure pathway, an IC was put in place to restrict new building construction and residential/educational uses. ICs are also in place to prohibit the use of site groundwater as drinking water to eliminate the potential exposure pathways. Current site use is in compliance with planned land use restrictions and existing zoning for AOC 50 that prohibits residential use.

AOC 50 hydrogeologic conditions have been adequately characterized and no new contaminants, sources, or routes of exposure have been identified.

Changes in Exposure Assumptions

Standard exposure assumptions were used in the original risk assessment to evaluate the groundwater ingestion pathways. These standard or default values have not changed.

Changes in Toxicology and Other Contaminant Characteristics

Since the completion of the HHRA, the USEPA has issued recent guidance recommending the

use of additional sources of peer-reviewed toxicity values, as well as, updated several toxicity values. A comparison of the original toxicity values used in the HHRA and the current values are presented in a table in Appendix I. While many of the toxicity values have been revised since the HHRA was performed, these revisions would not result in the identification of additional COCs, nor would it change the overall conclusions of the risk assessment. It is worth noting that 1,1-DCE would not be identified as a potential COC based on the current USEPA Regional Screening Levels. Overall, since the cleanup goals presented in the ROD are based on drinking water standards and not risk-based calculated values, changes in toxicity values do not impact the protectiveness of the cleanup goals. Also, the remedy includes the prohibition of groundwater use as drinking water for the duration of the remedy and any changes in toxicity of the COCs do not affect the protectiveness of the remedy.

Below is a summary of the changes in toxicity values for each COC and the potential impact on the risk calculations:

The USEPA's IRIS database lists a range of oral CSF for benzene. Since the risk assessment used a CSF within the current range, risks from exposure to benzene would be higher if the CSF from the high end was used and lower if the CSF from the low end of the range was used. Similarly, a range of IUR values are listed in the IRIS database. As a result, cancer risks from exposure to benzene may be overestimated or underestimated. The current RfD for benzene listed in the IRIS database is slightly higher than the benzene oral RfD used in the risk assessment. Therefore, non-cancer hazards from exposure to benzene may be overestimated.
Both the current chloroform oral CSF and the current recommended RfC are greater than the values used in the HHRA. It would appear that the cancer and non-cancer risks may have been overestimated for chloroform.

USEPA has withdrawn the CSF for 1,1-DCE used in the risk assessment. After further review, it was determined that the data did not warrant development of a CSF. The RfD for 1,1-DCE has been revised to a less potent value than the value used in the risk assessment. Also, an RfC has been included in the IRIS database. Therefore, potential cancer risks from exposure to 1,1-DCE are lower than calculated in the risk assessment but the non-cancer hazards were underestimated since the inhalation pathway was not quantitatively evaluated in the original risk assessment.

The current RfC for dichloromethane is slightly lower than the value used in the risk assessment, indicating this compound is more potent than previously thought. Therefore, the non-cancer hazards associated with dichloromethane may have been underestimated in the HHRA.

An oral RfD and an IUR value are now available for 1,2-dichloropropane. The current oral CSF is slightly lower and the RfC is slightly higher than the values used in the risk assessment. Overall, the calculated potential risk and hazard due to 1,2-dichloropropane may have been underestimated in the original risk assessment. Based on the predicted indoor air concentrations, it is not expected that the inclusion of the IUR would alter the conclusion of the risk assessment.

The toxicity values for PCE and TCE are under review. Following the toxicity hierarchy, the California Environmental Protection Agency's toxicity values for cancer risk have been selected as provisional values. The provisional values are greater than the previous CSFs indicating that they may be more toxic than previously thought. However, these toxicity values have not yet been finalized. In addition, the USEPA has elected not to select any non-cancer toxicity values for TCE believing that the cancer risk considerations will be protective of the non-cancer risks.

The USEPA IRIS database contains revised oral CSF and IUR for VC that are less potent toxicity values than used in the risk assessment. Therefore, the calculated cancer risk from exposure to VC may have been overestimated. In addition, an oral RfD and an RfC have been added to the IRIS database, therefore, the non-cancer hazards from VC exposure were underestimated. VC is a carcinogen that has been identified to also have mutagenic properties. The toxicity of this chemical changes with the age of the receptor, with the greater toxicity being experienced by younger receptors. To account for this varying toxicity over time, ADAF are applied during the risk characterization process. Default values of "10" for age 0 to 2 years and "3" for age 2 to 16 years are suggested. Because these mutagenic ADAFs were not included in the original risk assessment calculations, it is possible that the cancer risks from exposure to VC were underestimated.

Iron was identified as a COC in the ROD because non-cancer hazards from exposure to iron in groundwater exceeded a HI of "1". USEPA Region I has since indicated that they do not support evaluations of risk from exposure to iron because the RfD developed for iron is based on concentrations needed to protect against nutritional deficiency (USEPA, 1996). Based on this, non-cancer health risks would not be calculated for iron, and iron would not be considered a COC. Consequently, this would lower the total site HIs.

The manganese RfD published in the IRIS database includes manganese from all sources, including diet. USEPA Region I supports an oral RfD for manganese of 0.07 mg/kg per day for ingestion of soil, sediment, or food and an oral RfD of 0.024 mg/kg per day for manganese in drinking water. The USEPA also issued a Lifetime Health Advisory of 0.3 mg/L for manganese. This value should be used for infants younger than six months even for an acute exposure of 10 days. The advisory is a TBC value, and an RfC has been included in the IRIS database.

Changes in Risk Assessment Methodology

Several new risk assessment methodologies have been introduced since the original risk assessment was performed in January 2000.

In 2004, the USEPA published a final version of the RAGS Appendix E, which is the updated guidance for the dermal contact evaluation (USEPA, 2004). Current recommendations include updated dermal absorption factors for specific chemicals and updated oral to dermal adjustment factors for RfDs and CSFs. The baseline HHRA results indicated that industrial workers and future residents exposed to groundwater via ingestion and vapor inhalation presented an unacceptable risk to human health. Dermal exposure to groundwater was not

addressed in the original risk assessment. While this may indicate an underestimation of exposure in the original risk assessment, it is not expected that the inclusion of the dermal contact would alter the conclusion of the risk assessment.

The USEPA has identified several carcinogens that act via a mutagenic mode of action, and to account for their early-life exposures, the default ADAFs of "10" for ages 0 to 2 and "3" for ages 2 to 16 have now been incorporated into the risk calculations. This approach is consistent with the 2005 *Guidelines for Carcinogen Risk Assessment and the Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens*. The only groundwater COPC that is considered to be mutagenic for the purposes of this risk assessment methodology is VC. Had the additional mutagenic factors been included in the assessment of VC, the lifetime risk would have been higher due to the additional estimated risk for childhood exposures. While the estimated risk would have been higher, the exclusion of the mutagenic factors did not keep VC from being included in the final COC list as a contributor to site risk.

In January 2009, USEPA introduced RAGS Part F, which updates the approach for determining risk from inhaled chemicals to be consistent with the inhalation dosimetry methodology described in *Methods for Derivation of Inhalation Reference Concentrations and Application of Inhalation Dosimetry* (USEPA, 1994). The new approach revises the equations for estimating inhalation exposure and risk, recommending that when estimating risk via inhalation, the concentration of the chemical in air should be used as the exposure metric (e.g., mg/m^3); rather than inhalation intake of a contaminant in air based on inhalation rates or body weight (e.g., mg/kg per day). Based on the predicted indoor air concentrations, it is not expected that this change in the inhalation calculation would alter the conclusion of the risk assessment.

While numerous methodologies have changed since the original risk assessment was prepared, the potential human health risks discussed in the ROD will be eliminated by the ICs that are in place to prohibit groundwater from being used as drinking water thus maintaining the protectiveness of the current remedy. Therefore, there are no risk assessment methodology changes that affect the protectiveness of the remedy.

Expected Progress Toward Meeting RAOs

As presented in the latest 2009 O&M and Monitoring report (HGL, 2010), the remedy in place at AOC 50 is operating properly and successfully. Continued operation and optimization of the remedial program will ensure that the remedial goals are achieved as designed and the remedy will be complete within the 23 year time period predicted in the ROD.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No other information has been noted that would call into question the protectiveness of the remedy. As detailed by the USEPA, in response to the Final Demonstration of a Remedial Action Operating Properly and Successfully (ARCADIS, 2007), the AOC 50 remedy is in place and functioning in a manner that is expected to adequately protect human health and the

environment when the remedial actions are completed. The generation of secondary contaminants through metals solubilization was anticipated as a result of the selected ERD remedy but the solubilized metals are confined within the reductive treatment areas and are not expected to persist once they encounter the aerobic portions of the aquifer; thus, are not anticipated to create a threat to the protectiveness of the remedy.

10.6.1 Summary of Technical Assessment

The remedy at AOC 50 is functioning as intended and is expected to meet the projected 23 year period to remedy completion. Optimization of the ERD remedy by reducing the frequency of injections from monthly to semiannually and replacing molasses with a slower release substrate has enhanced the effectiveness of the ERD remedy by reducing the constant carbon loading and allowing for a more controlled application of the ERD substrate. The remedy continues to perform effectively at the stated goal of reducing the CVOC contamination at the site. Secondary contamination created by metals solubilization was anticipated as a byproduct of the ERD process but is generally confined to the established IRZs and has not been detected as migrating outside of IRZs. Solubilized metals are anticipated to precipitate out of solution once the primary CVOC are fully degraded and the established reducing zones are allowed to revert to an aerobic state. The IWS system remains effective as a downgradient barrier to CVOC migration. No solubilized metals have been detected at the IWS wells in either the influent or effluent groundwater.

While risk assessment methods have changed since the time of the original risk assessment supporting the ROD for AOC 50, these changes do not affect the protectiveness of the remedy.

10.6.2 Applicable or Relevant and Appropriate Requirements Review

ARARs that were presented in the Final 2004 ROD (ARCADIS, 2004a) are included in Appendix I. Standards and regulations that were current when the ROD was signed in March 2004 have been reviewed for changes that could affect protectiveness of the remedy.

The following ARARs have been modified since the signing of the ROD and were evaluated for their potential impact on remedy effectiveness:

1. 40 CFR 141.11 Subpart B MCLs – updated July 1, 2001. Section 141.11 (a) and (b) were amended at 66 FR 7061 on January 22, 2001, to state the following:

   - ****The analyses and determination of compliance with 0.05 mg/L MCL for arsenic use the requirements of 141.23.*
   - *The MCL for arsenic was 0.05 mg/L for community water systems until January 23, 2006.*

   On January 22, 2001, the USEPA adopted a new standard for arsenic in drinking water at 0.01 mg/L, replacing the old standard of 0.05 mg/L (66 FR 6976). The rule became

effective February 22, 2002. The date by which systems must comply with the new 0.01 mg/L standard was January 23, 2006.

2. 40 CFR 141.15 and 141.16 Subpart B MCLs – updated July 1, 2003. An effective date note (65 FR 76745) removed the sections from the CFR effective December 8, 2003. Sections 141.15 and 141.16 do not appear in 40 CFR 141 updated on July 1, 2004. These two sections addressed MCLs for radium-226, radium-228, gross alpha particle radioactivity, and beta and photon radioactivity, which do not affect the protectiveness of the remedy.

3. 40 CFR 141.51 Subpart F MCL Goals and Maximum Residual Disinfectant Level Goals – updated July 1, 2001. The table was amended in Section 141.51 by adding arsenic with a MCL goal of zero effective January 23, 2006 (66 FR 7063). Until then, no MCL goal applied for arsenic.

4. 310 CMR 22.0 Drinking Water – updated May 24, 2004. The arsenic MCL listed in Section 22.06 is effective for the purpose of compliance with the CFR (outlined above) on January 23, 2006. A perchlorate standard was also promulgated July 28, 2006. Since perchlorate is not a COC for the site, the ARARs are not affected by this change.

5. USEPA RfD and Health Advisories are requirements designated as TBC. These requirements were updated in the USEPA 2009 Edition of the Drinking Water Standards and Health Advisories, dated May 2009.

6. 314 CMR 4.00 Surface Water Standards – updated January 2007. Since these standards were considered during the development of the PRGs for AOC 50, this revision should not affect the protectiveness of the selected remedy.

7. 314 CMR 6.00 Massachusetts Groundwater Quality Standards – rescinded March 20, 2009. Revisions made to 314 CMR 5.00 for a streamlined groundwater discharge permitting process negated the need for this section. As the selected groundwater quality standards for AOC 50 are Federal MCLs and are also presented in 40 CFR 141 Section 11 and 13, the removal of 314 CMR 6.00 from the CMR does not affect the protectiveness of the remedy.

8. 310 CMR 22.00 Massachusetts Drinking Water Standards and Guidelines – updated December 2009. 310 CMR 22.26 was updated regarding microbial communities in groundwater that is also used for public consumption. As bacterial populations are not considered a COC for AOC 50, the protectiveness of the remedy is not affected.

Several other regulations were updated since the ROD, but do not affect the protectiveness of the remedy. These updated regulations include:

1. 40 CFR 262.34 Hazardous Waste Generators, "Accumulation Time" – updated April 22, 2004. There were no revisions that affected the protectiveness of the remedy at AOC 50.

2. 40 CFR 261 Hazardous Wastes – Several sections within this regulation were updated between March 2004 and December 2009. However, none of the revisions affect the protectiveness of the remedy.

3. 310 CMR 10.00 Wetlands Protection – This regulation was updated October 2007 with a streamlined permit application process. There were no revisions that affect the protectiveness of the remedy.

In addition, a search was performed for any newly promulgated standards, which could affect protectiveness at the site. No new ARARs were identified that would affect the protectiveness of the selected remedy.

10.7 ISSUES

There are no areas of non-compliance or deficiencies that have been noted during this review that would make the remedial actions at AOC 50 non-compliant with the ROD, or sufficient to warrant a finding of not protective. This finding is based upon a review of site reports that have been prepared since the signing of the ROD, a review of ARARs triggered by the remedial actions, and the findings from the site monitoring data, inspections, and interviews.

10.8 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

The current remedy is effective at meeting the site's remedial objectives. Therefore, it is recommended that the current remedial actions implemented at AOC 50 be continued.

An additional recommendation that does not affect the remedy's protectiveness but will enhance the site's O&M and LTM monitoring program is that the Army should revise the AOC 50 LTMP. The site conditions have changed since the remedy was implemented and the primary CVOC contaminants have degraded significantly within many portions of the treatment area. The revised monitoring network should place additional focus on areas where metals mobilization is well established and at areas where CVOC degradation is lagging relative to the more degraded areas of the plume. The wells located on the western ends of Areas 2, 4, and 5 that reveal slowly degrading CVOC concentrations may require additional monitoring to ensure the degradation continues and the location of area transect injection wells remain effective in providing optimal IRZs based on CVOC concentrations. Solubilized metals, particularly arsenic and manganese, prevalent throughout the IRZs in all treatment areas may require more focused monitoring to confirm their attenuation within aerobic portions of the aquifer. Proposed revisions to the existing LTM monitoring program will be included in the LTMP revision.

10.9 PROTECTIVENESS STATEMENT

The remedy at AOC 50 is protective of human health and environment. Exposure pathways that could result in unacceptable risks are being controlled. The remedial actions at AOC 50 are expected to allow unrestricted use and unlimited exposure following achievement of groundwater remediation goals.

10.10 NEXT REVIEW

See Section 1.4 for further details.

10.11 REFERENCES

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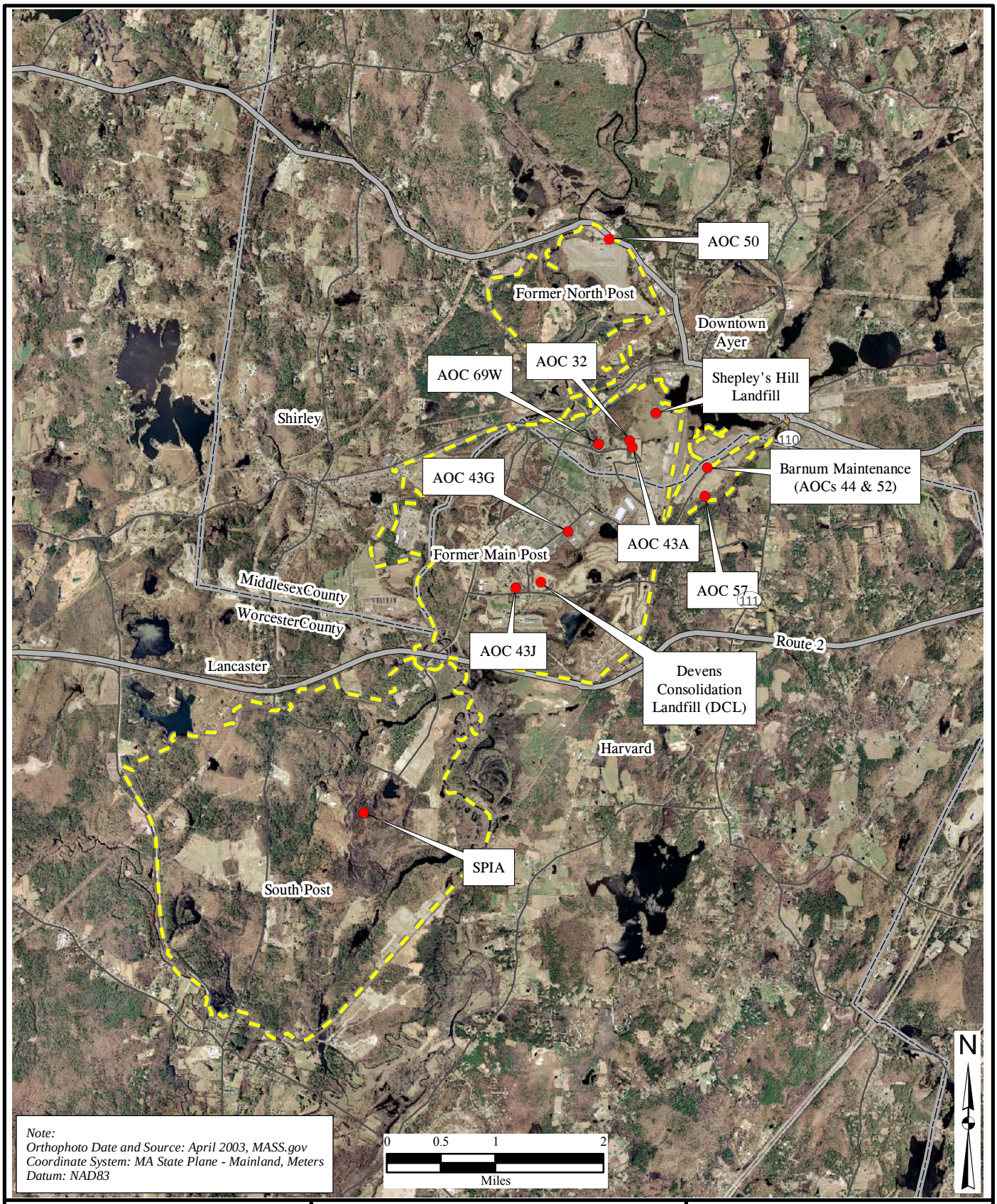
FIGURES



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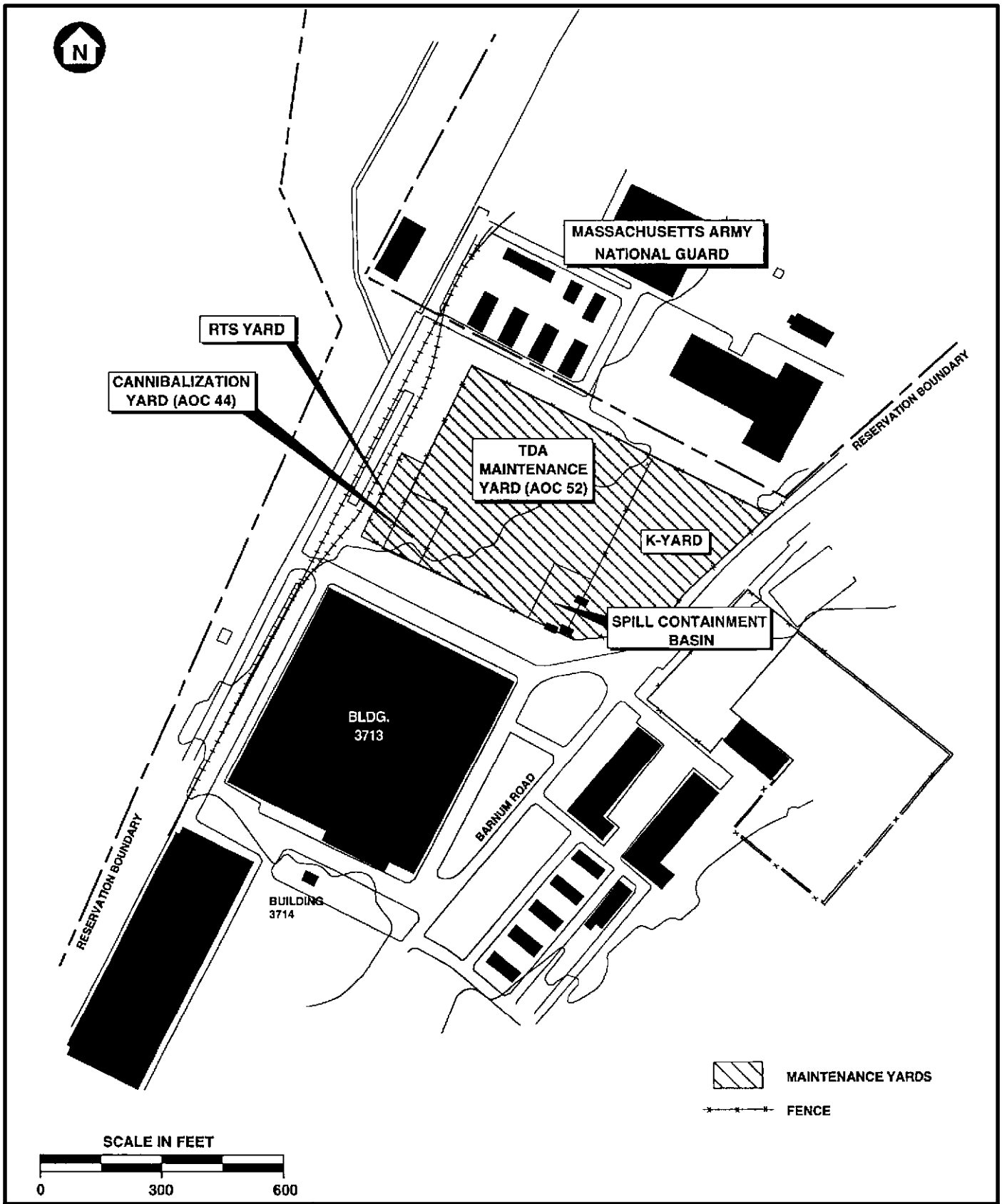
Source: HGL GIS, ESRI, USACE, MASS.Gov

HGL HydroGeoLogic, Inc

Legend

- Former Fort Devens Boundary
- Highway
- Major Road
- County Line
- AOC

Figure ES.1
Site Location Map
Former Fort Devens Army Installation



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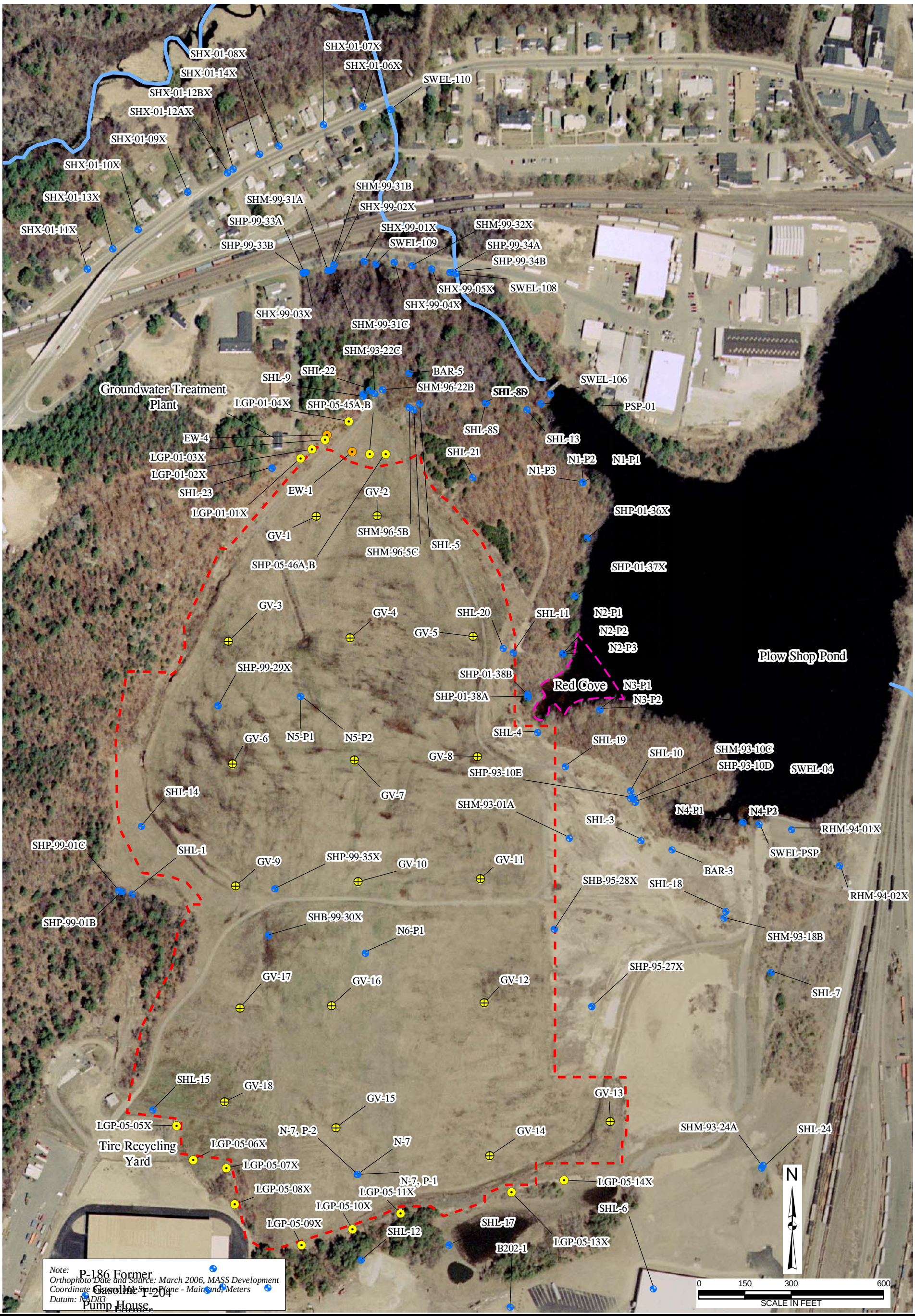
Source: HGL GIS; Harding Lawson Associates, 2000

Figure ES.2
Maintenance Yards



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Revised: 09/17/10 CNL
Map Source: HGL GIS, MASS.GOV, ESRI, USACE

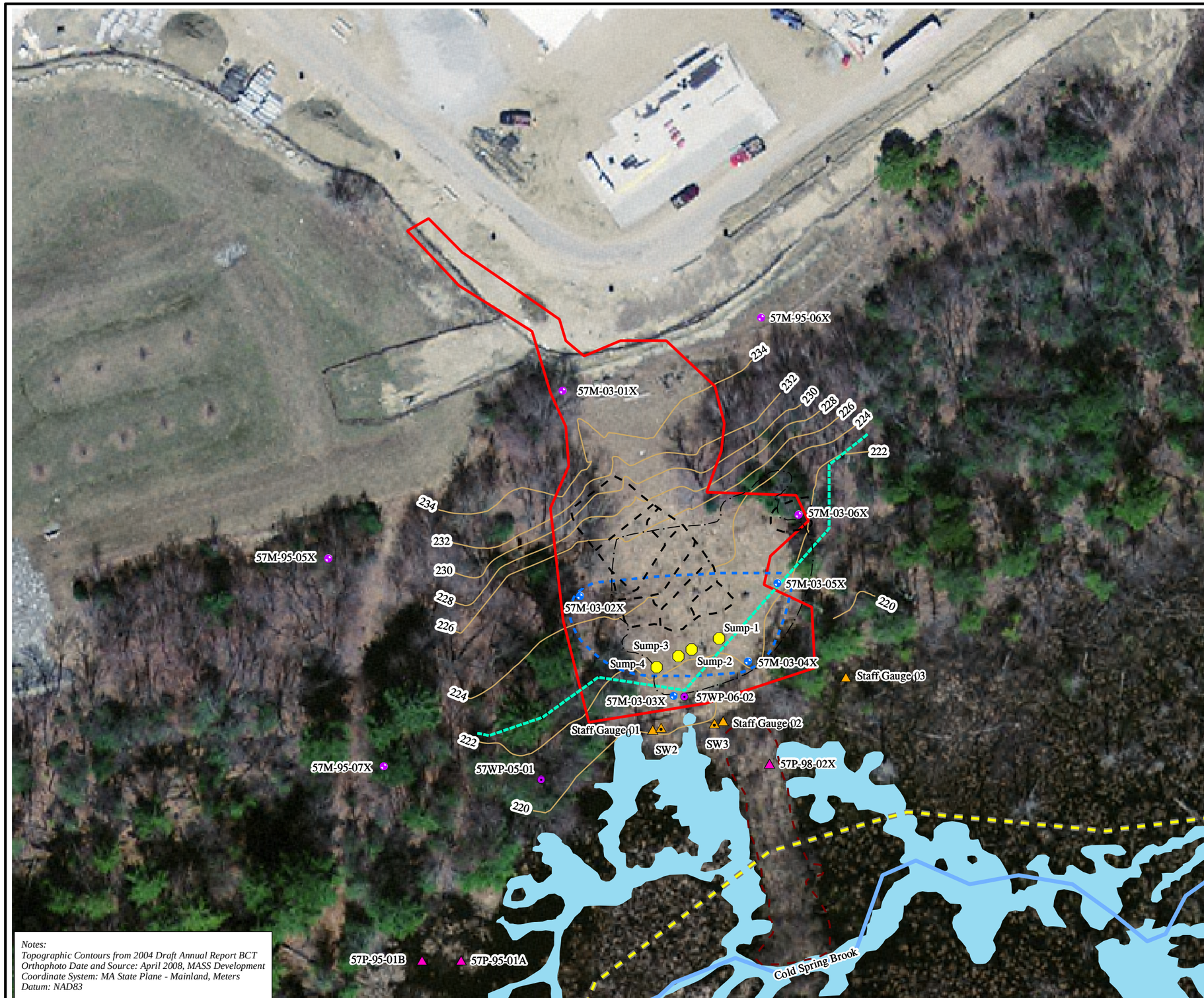
Legend

- Landfill Site Boundary
- Monitoring Well
- Groundwater Extraction Well
- Landfill Gas Vent
- Landfill Gas Probe

Figure ES.3
Site Map
Shepley's Hill Landfill

Figure ES.4a
Site Map
Area of Contamination 57 - Area 2

U.S. Army Corps of Engineers
New England District



Notes:
Topographic Contours from 2004 Draft Annual Report BCT
Orthophoto Date and Source: April 2008, MASS Development
Coordinate System: MA State Plane - Mainland, Meters
Datum: NAD83

Legend

- Former Fort Devens Boundary
- Flagged Wetland Limits
- Final Excavation Limit (2003)
- Limit of Conti Excavation (2002)
- Containment Dam
- Stream
- Topographic Contour
- Area 2 Site Boundary
- Surface Water
- Maximum Historical Extent of Groundwater Contamination in Exceedance of Cleanup Goals (Based on Fall 2003 to Spring 2009 Analytical Data)
- LTM Sample Well
- LTM Well -Ga uge Only
- LTM Well Point - Gauge Only
- Piezometer
- Staff Gauge
- Surface Water Sample Location
- Sumps

N

0 30 60 120
SCALE IN FEET

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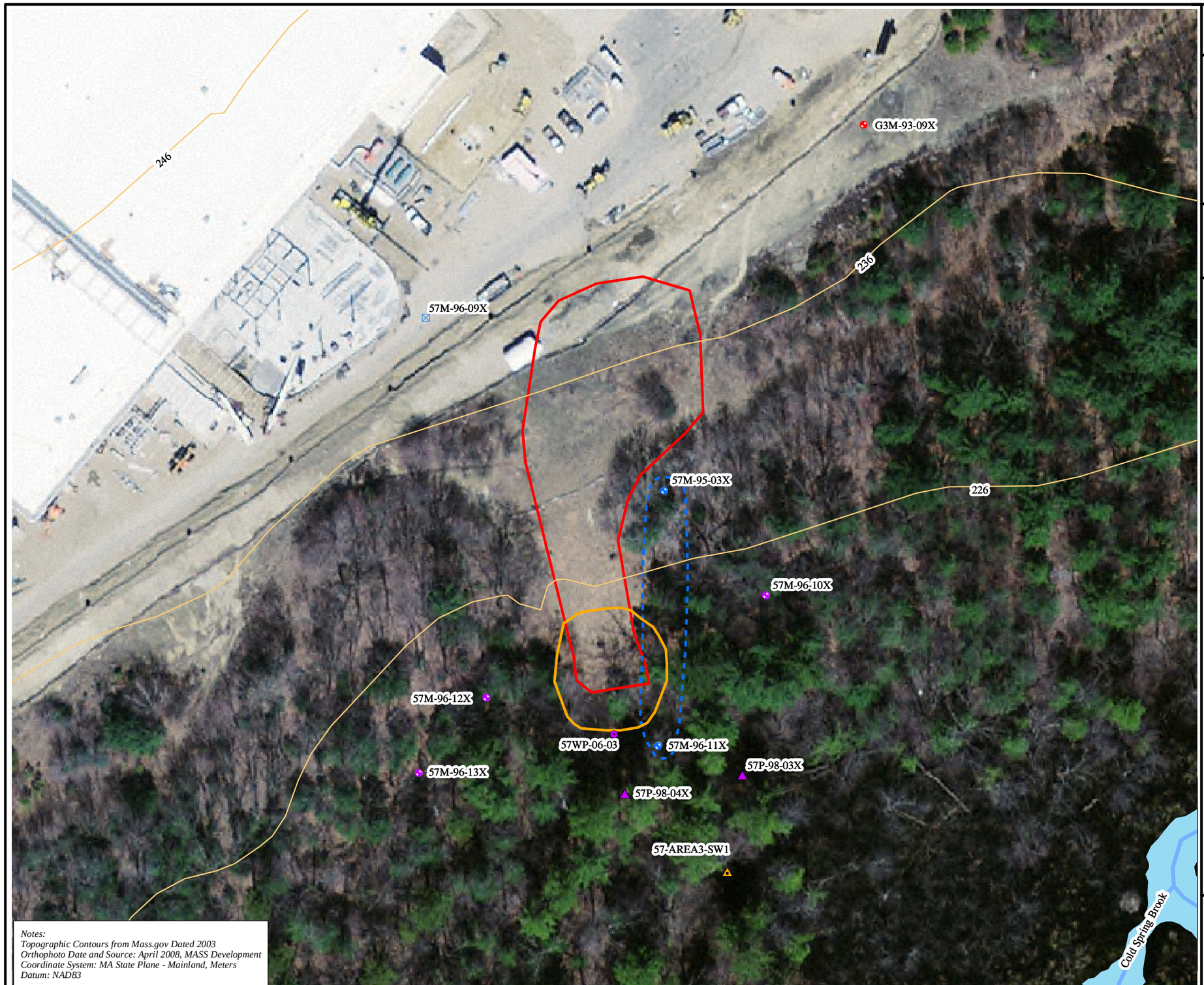
Revised 09/17/10 C NL
Source: HGL GIS, MASS.GOV, ESRI, USACE

HGL HydroGeoLogic, Inc



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Topographic Contours from Mass.gov Dated 2003
Orthophoto Date and Source: April 2008, MASS Development
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Datum: NAD83

HGL—2010 Five-Year Review
Former Fort Devens Army Installation—Devens, MA

Figure ES.4b
Site Map
Area of Contamination 57 - Area 3

U.S. Army Corps of Engineers
New England District

Legend

- Stream
- Topographic Contour
- Area 3 Site Boundary/ 1999 Excavation Area
- Alternate III-2a Estimated Soil Excavation Area (approximate location)
- Surface Water
- Maximum Historical Extent of Groundwater Contamination in Exceedance of Cleanup Goals (Based on Fall 2003 to Spring 2009 Analytical Data)
- Monitoring Well
- LTM Sample Well
- LTM Well -Gauge Only
- LTM Well Point - Gauge Only
- LTM Piezometer -Gauge Only
- Surface Water Sample Location
- Monitoring Well -Paved Over

N

0 30 60 120
SCALE IN FEET

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Revised: 09/17/10 CNL
Source: HGL GIS, MASS.GOV, ESRI, USACE

HGL HydroGeoLogic, Inc

Figure ES.5a
Site Map
Area of Contamination 43G

U.S. Army Corps of Engineers
New England District

Notes:
Topographic Contours from Mass.gov Dated 2003
Orthophoto Date and Source: April 2008, MASS Development
Coordinate System: MA State Plane - Mainland, Meters
Datum: NAD83

Legend

- Topographic Contour
- Location of Former Waste Oil UST
- Location of Former Gasoline USTS
- Maximum Historical Extent of Groundwater Contamination in Exceedance of Cleanup Goals (Based on 1999 to 2009 Analytical Data)
- Monitoring Well
- LTM Sample Well
- LTM Well -Gauge Only
- Piezometer
- Abandoned Monitoring Well

N

0 50 100 200
SCALE IN FEET

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Source: HGL GIS, MASS.GOV, ESRI, USACE

HGL HydroGeoLogic, Inc

Note:
Orthophoto Date and Source: March 2006, MASS Development
Coordinate System: MA State Plane - Mainland, Meters
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HGL—2010 Five-Year Review
Former Fort Devens Army Installation—Devens, MA

Figure ES.5b
Site Map
Area of Contamination 43J

U.S. Army Corps of Engineers
New England District

Legend

- Location of Former Waste Oil UST
- Location of Former Gasoline USTS
- Monitoring Well
- Piezometer

N

0 40 80 160
SCALE IN FEET

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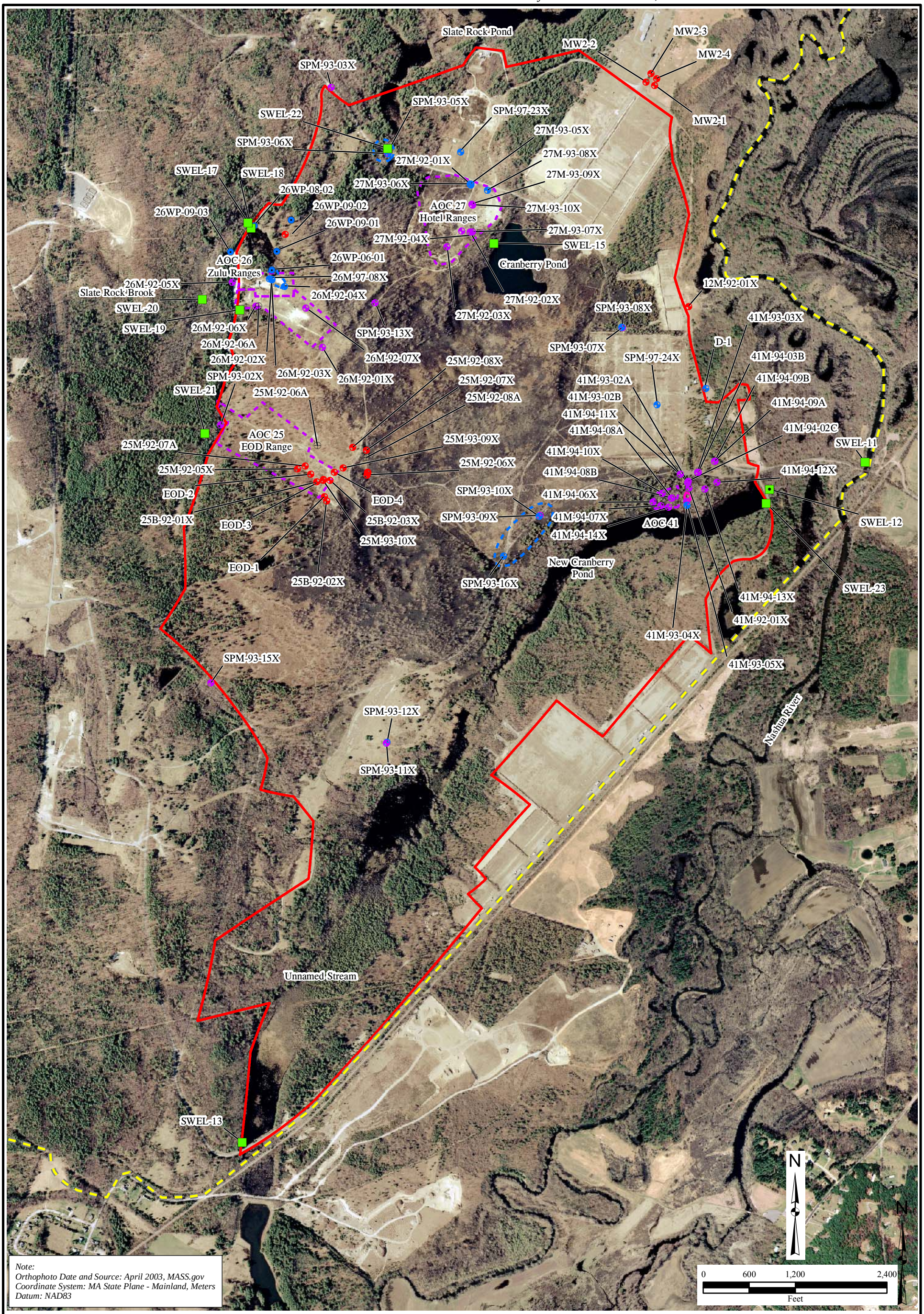
HGL HydroGeoLogic, Inc



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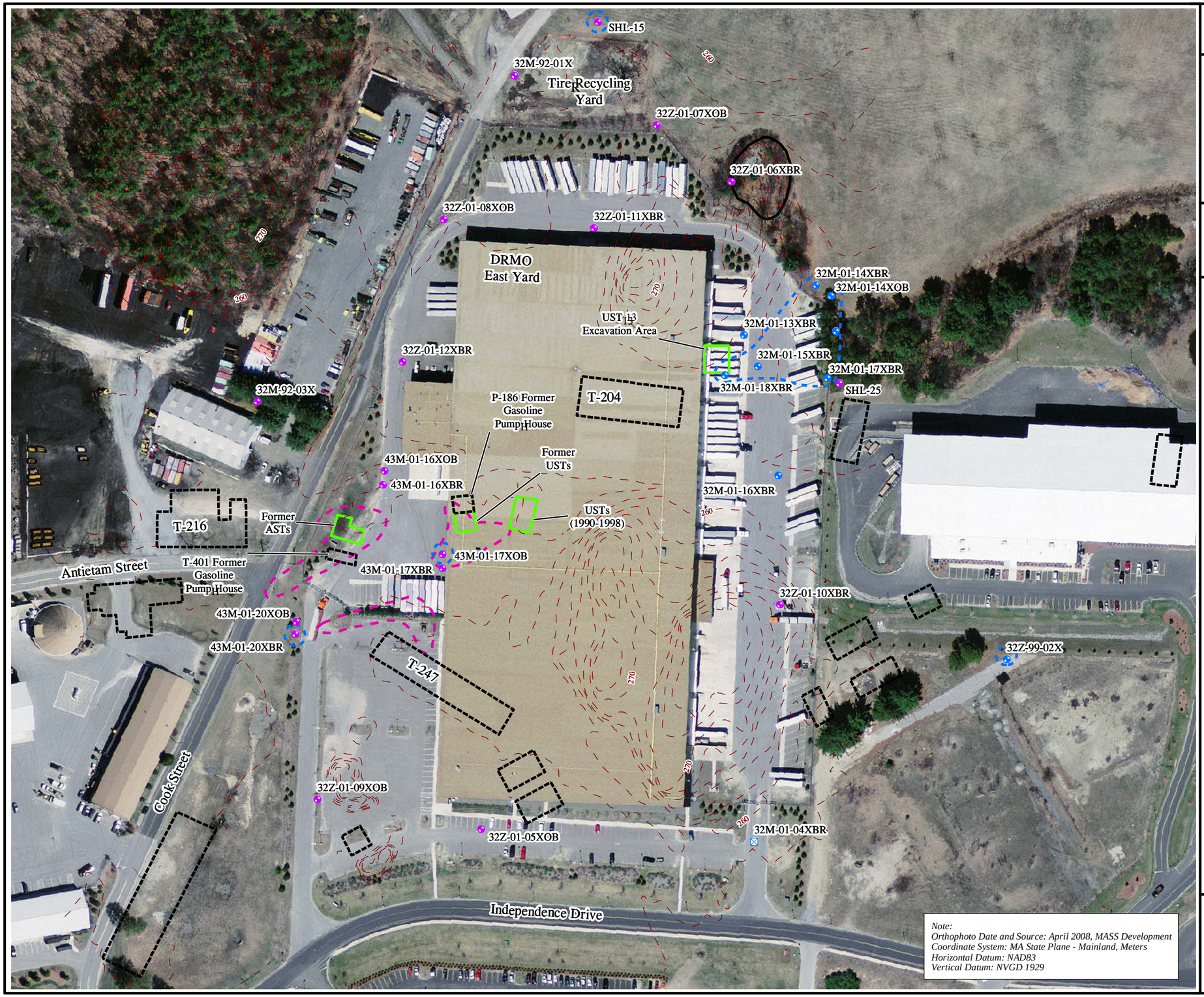
Map Source: HGL GIS, MASS.GOV, ESRI, USACE

Legend

- Former Fort Devens Boundary
- SPIA Boundary
- Landfill Debris
- Maximum Historical Extent of Groundwater Contamination in Exceedance of Groundwater Standards (Based on 1992 to 2009 Analytical Data)
- LTM Sample Well
- LTM Well - Gauge Only
- LTM Sample Well Point
- Abandoned Monitoring Well
- Surface Water Elevation Location
- AOC Boundary

Figure ES.6
Site Map
South Post Impact Area



HGL—2010 Five-Year Review
Former Fort Devens Army Installation—Devens, MA

Figure ES.7
Site Map
Areas of Contamination 32 and 43A

U.S. Army Corps of Engineers
New England District

Legend

- Pre-2000 Topographic Contour
- Former Building
- Underground Storage Tank
- TPHC Soil Contamination
- Remaining Bedrock Outcrop
- Maximum Historical Extent of Groundwater Contamination in Exceedance of Cleanup Goals (Based on April 2002 to October 2009 Analytical Data)
- LTM Sample Well
- LTM Well -Ga uge Only
- Monitoring Well -Pave d Over

N

0 80 160 320
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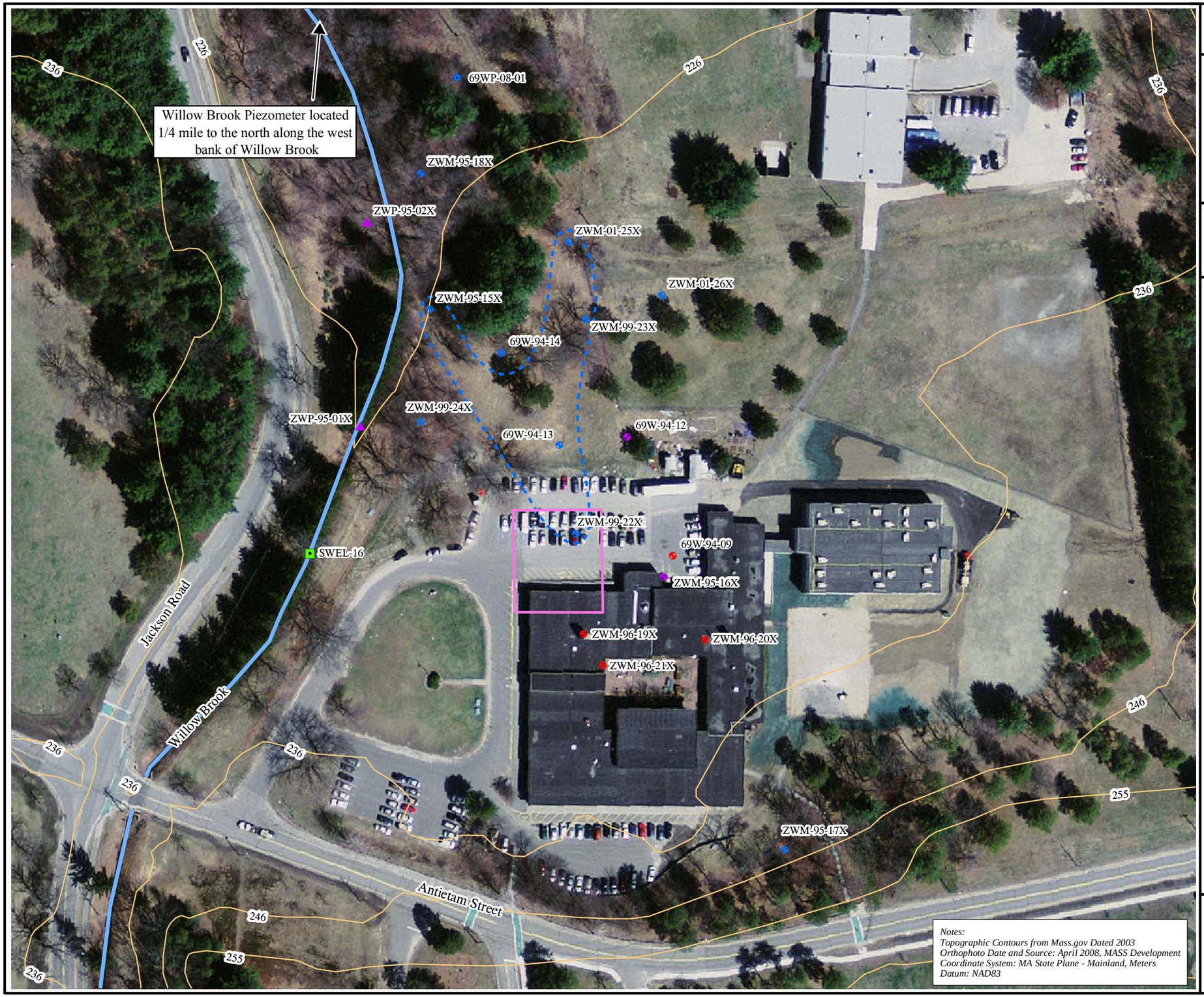

Notes:
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Coordinate System: MA State Plane - Mainland, Meters
Datum: NAD83

HGL—2010 Five-Year Review
Former Fort Devens Army Installation—Devens, MA

Figure ES.8
Site Map
Area of Contamination 69W

U.S. Army Corps of Engineers
New England District

Legend

- Topographic Contour
- Stream
- Excavated Soils Management Area
- Maximum Historical Extent of Groundwater Contamination in Exceedance of Cleanup Goals (Based on 2000 to 2009 Analytical Data)
- Monitoring Well
- LTM Sample Well
- LTM Sample Well Point
- LTM Well -Gauge Only
- LTM Piezometer -Gauge Only
- Surface Water Elevation Location

Note:
Location of 69WP-08-01 is approximate pending survey.

N

0 50 100 200
SCALE IN FEET

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Revised: 09/17/10 C NL
Map Source: HGL GIS, MASS.GOV, ESRI, USACE

HGL HydroGeoLogic, Inc

HGL—2010 Five-Year Review
Former Fort Devens Army Installation—Devens, MA

Figure ES.9
Site Map
Devens Consolidation Landfill

U.S. Army Corps of Engineers
New England District

Legend

- Topographic Contour
- LTM Sample Well
- LTM Well -Ga uge Only
- Gas Vent

Note:
Gas vent locations were approximated based upon the locations displayed in Figure 2 of the Devens Consolidation Landfill 2004 Annual Report.

N

0 60 120 240
SCALE IN FEET

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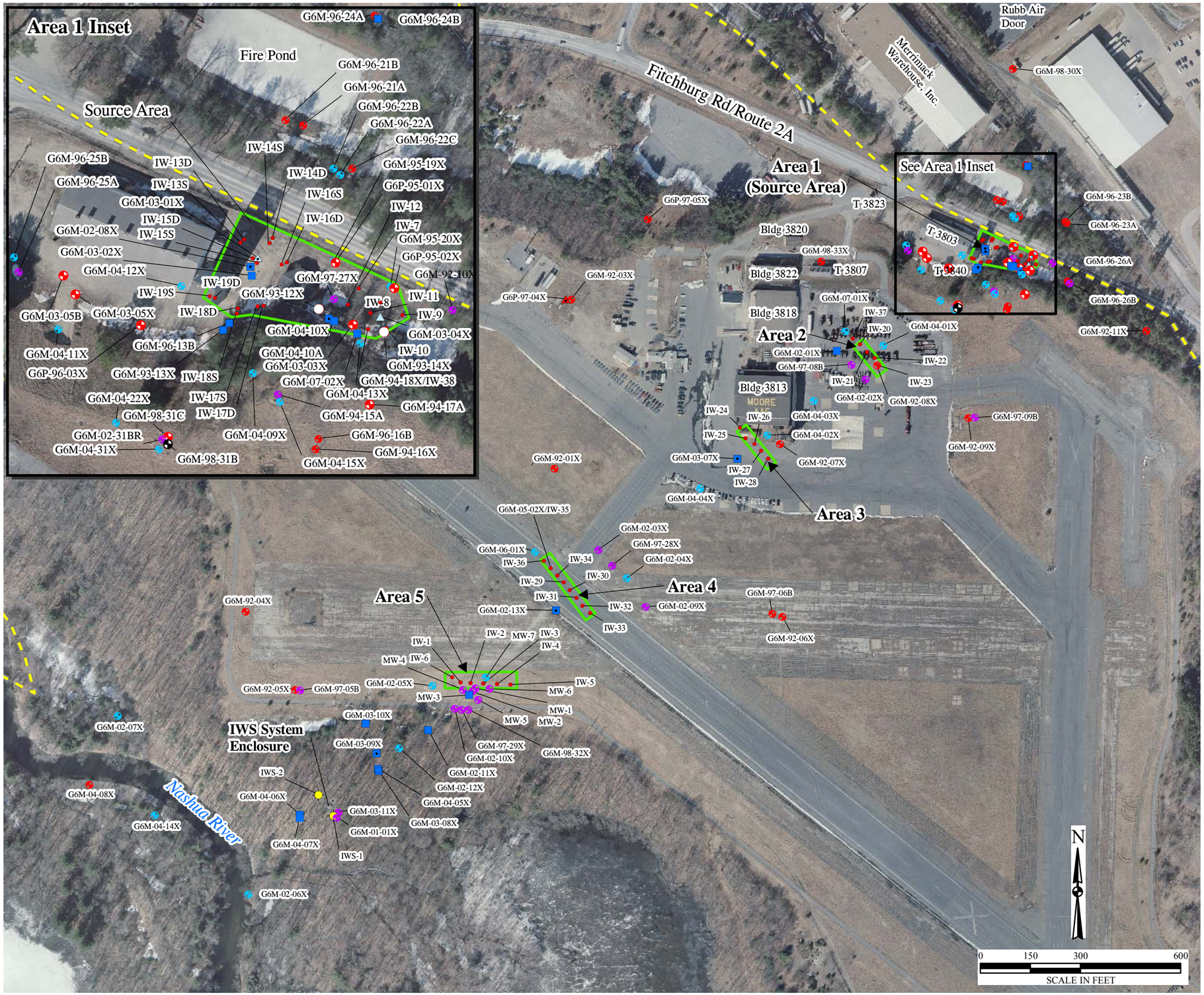
HGL HydroGeoLogic, Inc



HGL—2010 Five-Year Review
Former Fort Devens Army Installation—Devens, MA

Figure ES.10
Site Layout Map
Area of Contamination 50

Army Base Realignment and Closure Division

Legend

- ERD LTM Well (Sampled Semi-annually)
- ERD LTM Well (Sampled Annually)
- LTM Well -Gauge Only
- Monitoring Well
- Destroyed Monitoring Well
- Injection Well
- LTM Well (Sampled Every 3 Years)
- Piezometer
- In-Well Stripping System Well
- Former Fort Devens Boundary
- ERD Injection Well Transect

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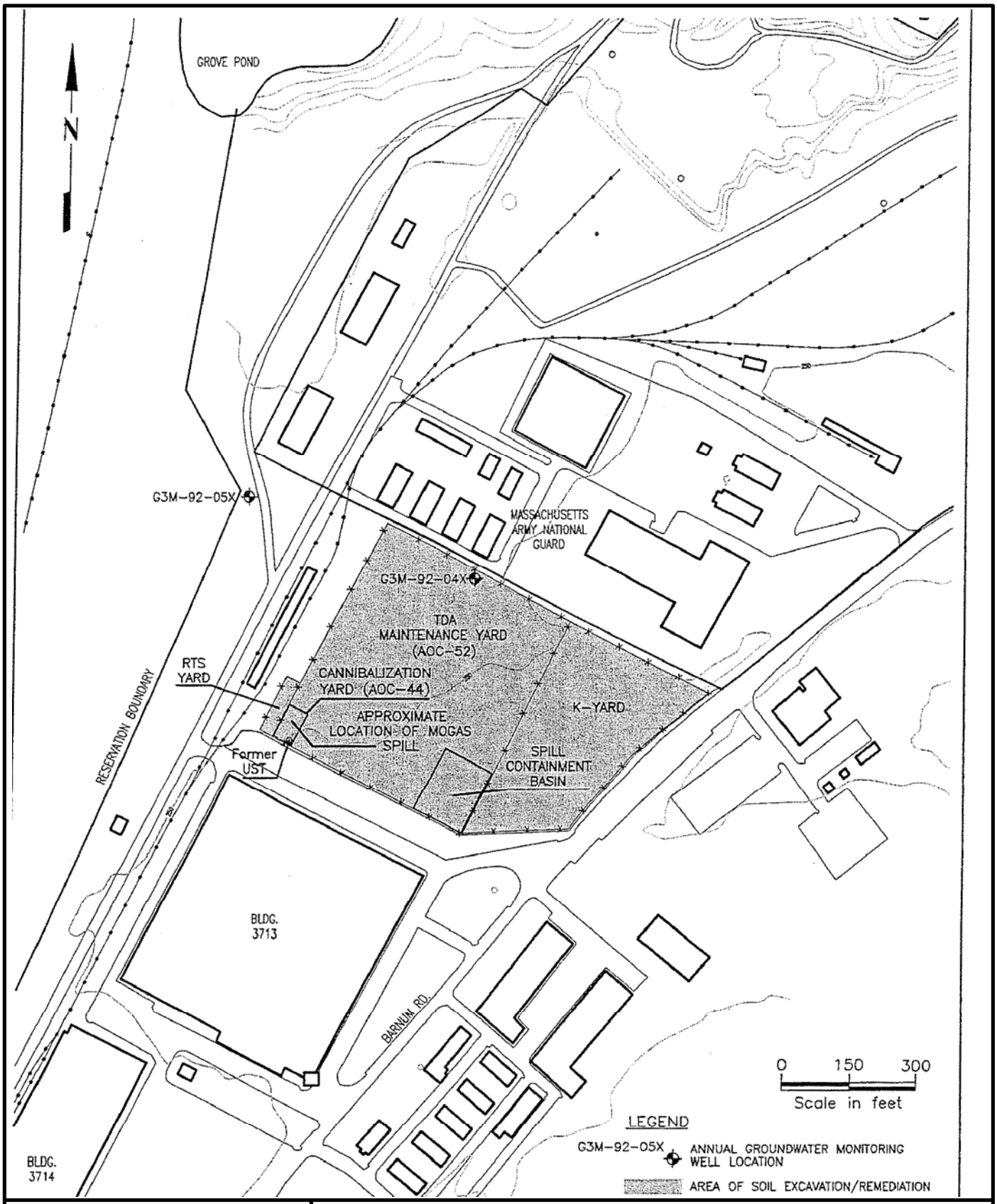
HGL HydroGeoLogic, Inc.



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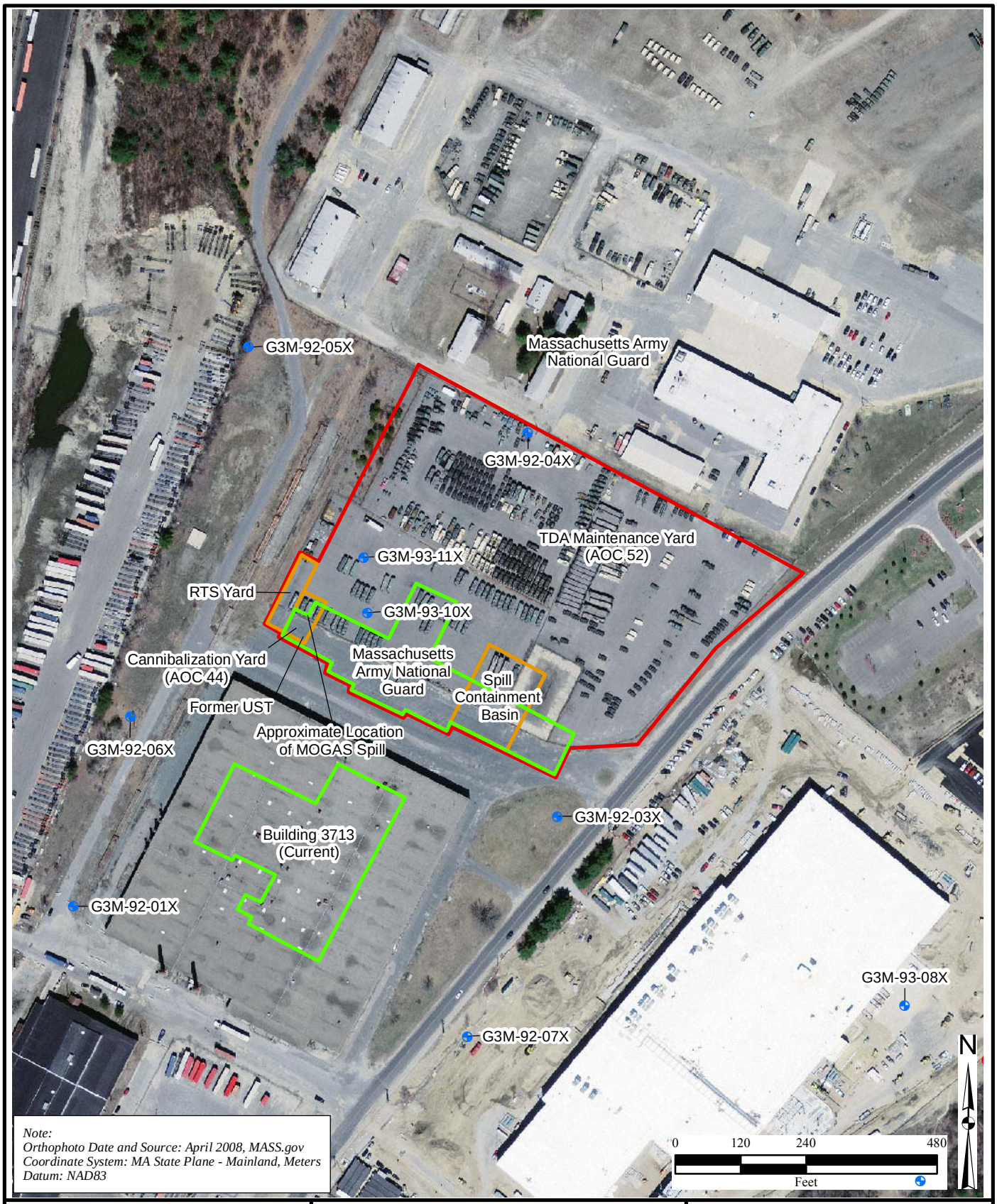
Source: HGL GIS; MACTEC, 2005

Figure 2.1
Areas of Contamination 44 and 52
Barnum Road Maintenance Yards



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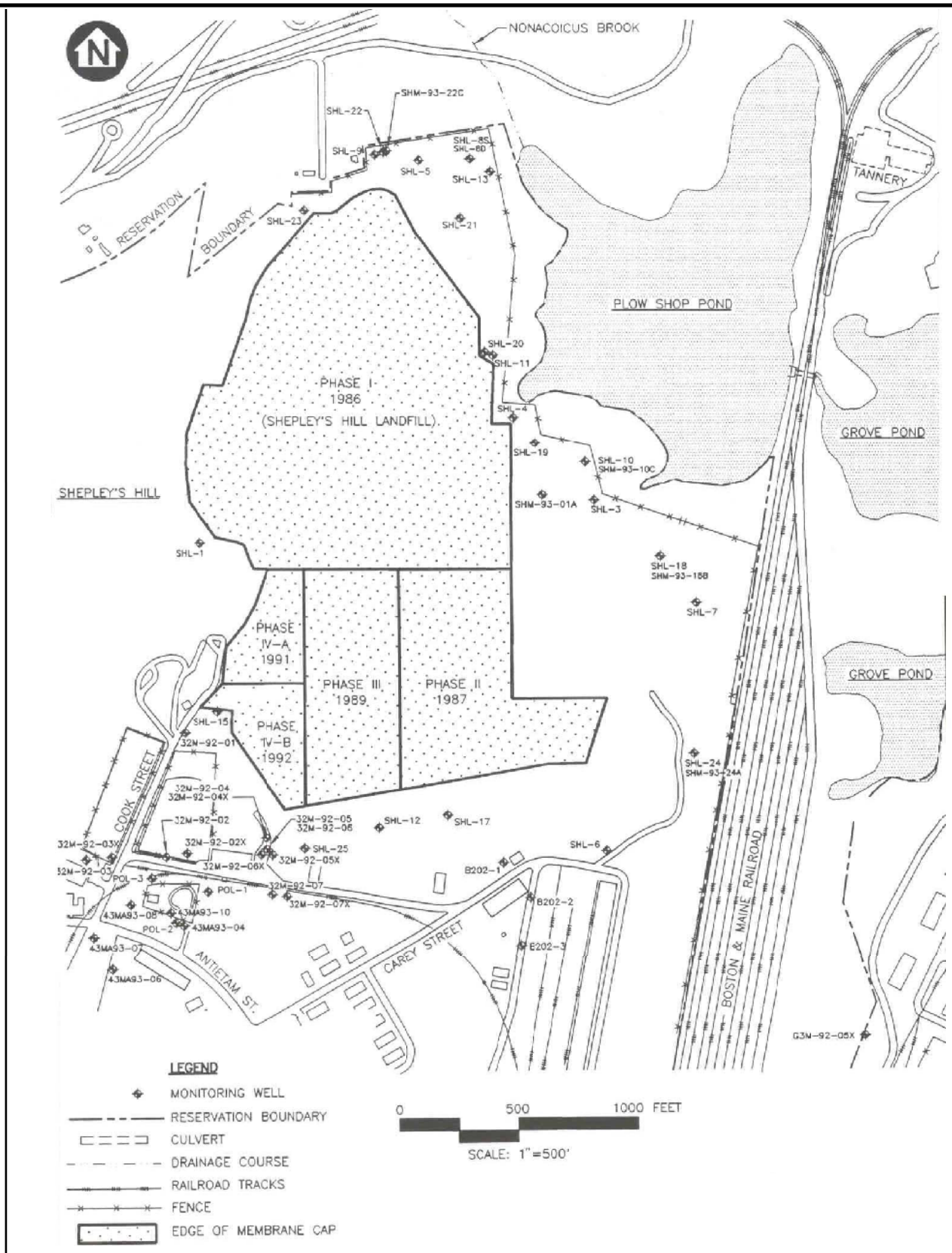
Revised: 09/17/10 CNL
Source: HGL GIS, ESRI, USACE, MASS.Gov

Legend

- LTM Sample Well
- Maintenance Yard Boundary
- Former Yard or Basin
- Existing Building

Figure 2.2
Barnum Road Maintenance Yards



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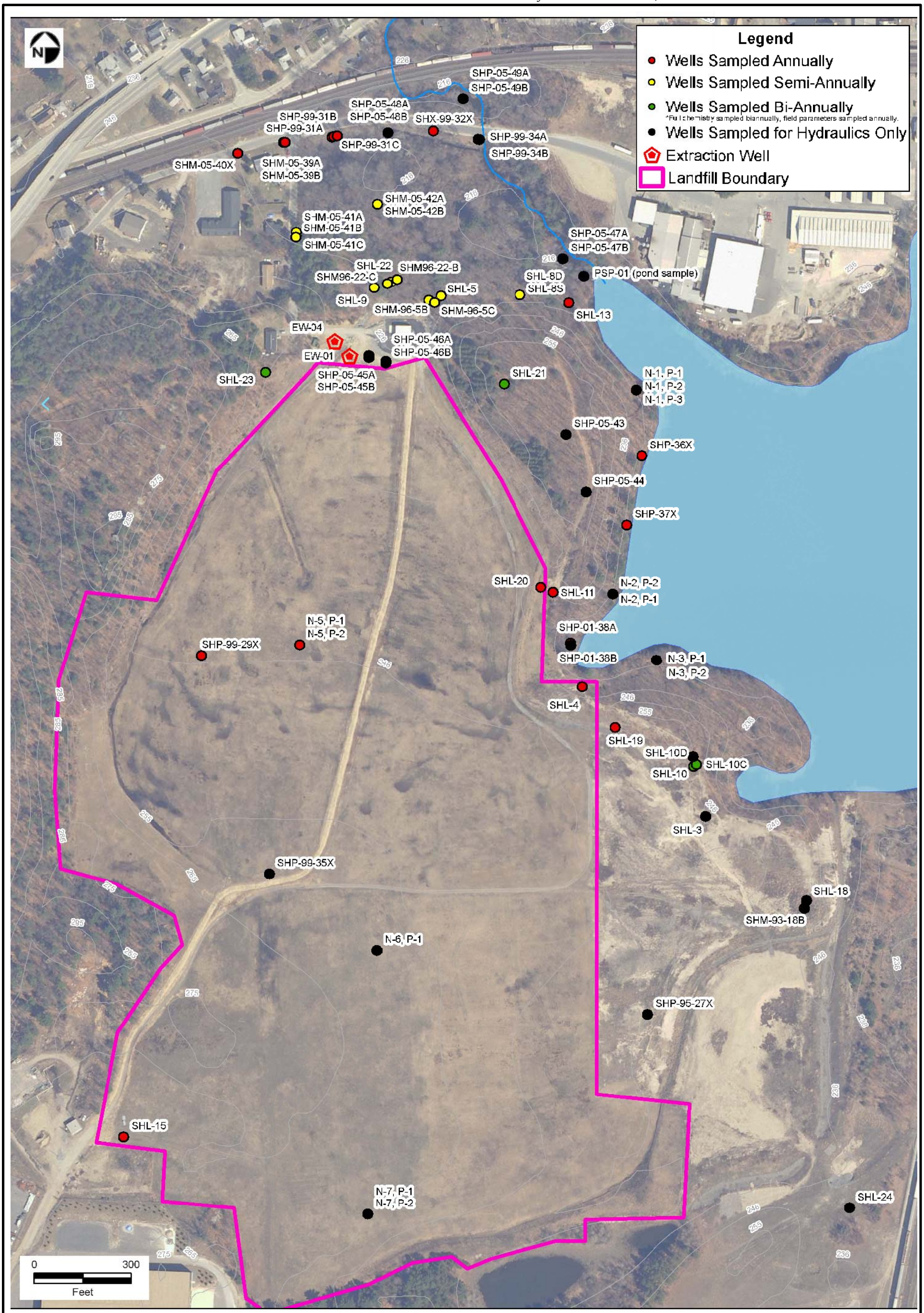
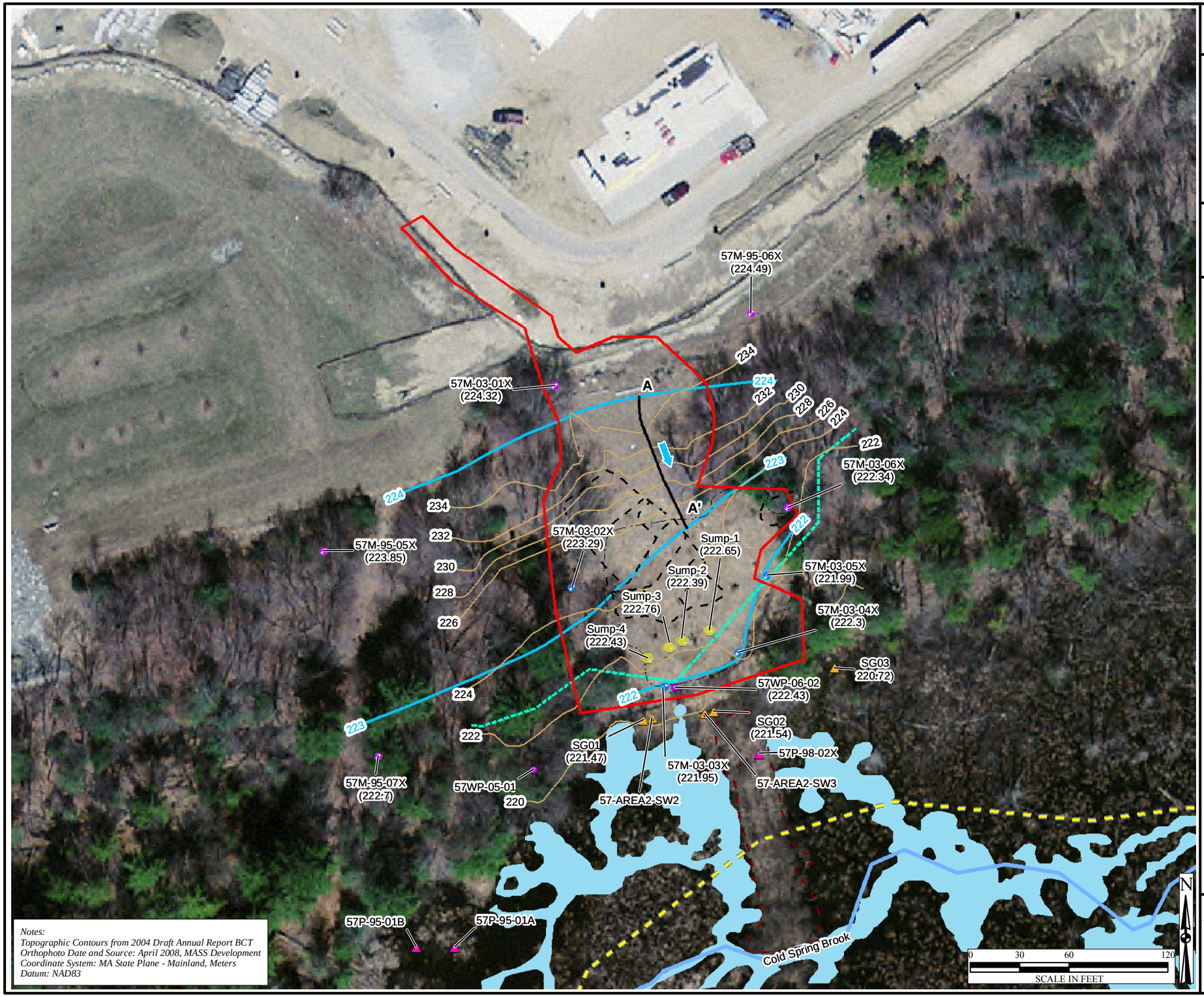
Revised: 06/14/10 CNL
Source: HGL GIS; CH2MHill; USAEC, 1995

Figure 3.1
Site Map
Shepley's Hill Landfill



Filename:X:/OMA010/Ft_Devens/Maps/DO501/2010_5-year_Review/Shepleys_Wells.mxd
Revised: 06/14/10 CNL
Map Source: HGL GIS; ECC, 2010

Figure 3.2
Revised LTMMP Well Network and Sampling Frequency
Shepley's Hill Landfill



Notes:
Topographic Contours from 2004 Draft Annual Report BCT
Orthophoto Date and Source: April 2008, MASS Development
Coordinate System: MA State Plane - Mainland, Meters
Datum: NAD83

HGL—2010 Five-Year Review
Former Fort Devens Army Installation—Devens, MA

Figure 4.1
Interpretive Water Table Elevation
Area of Contamination 57 - Area 2
May 2009

U.S. Army Corps of Engineers
New England District

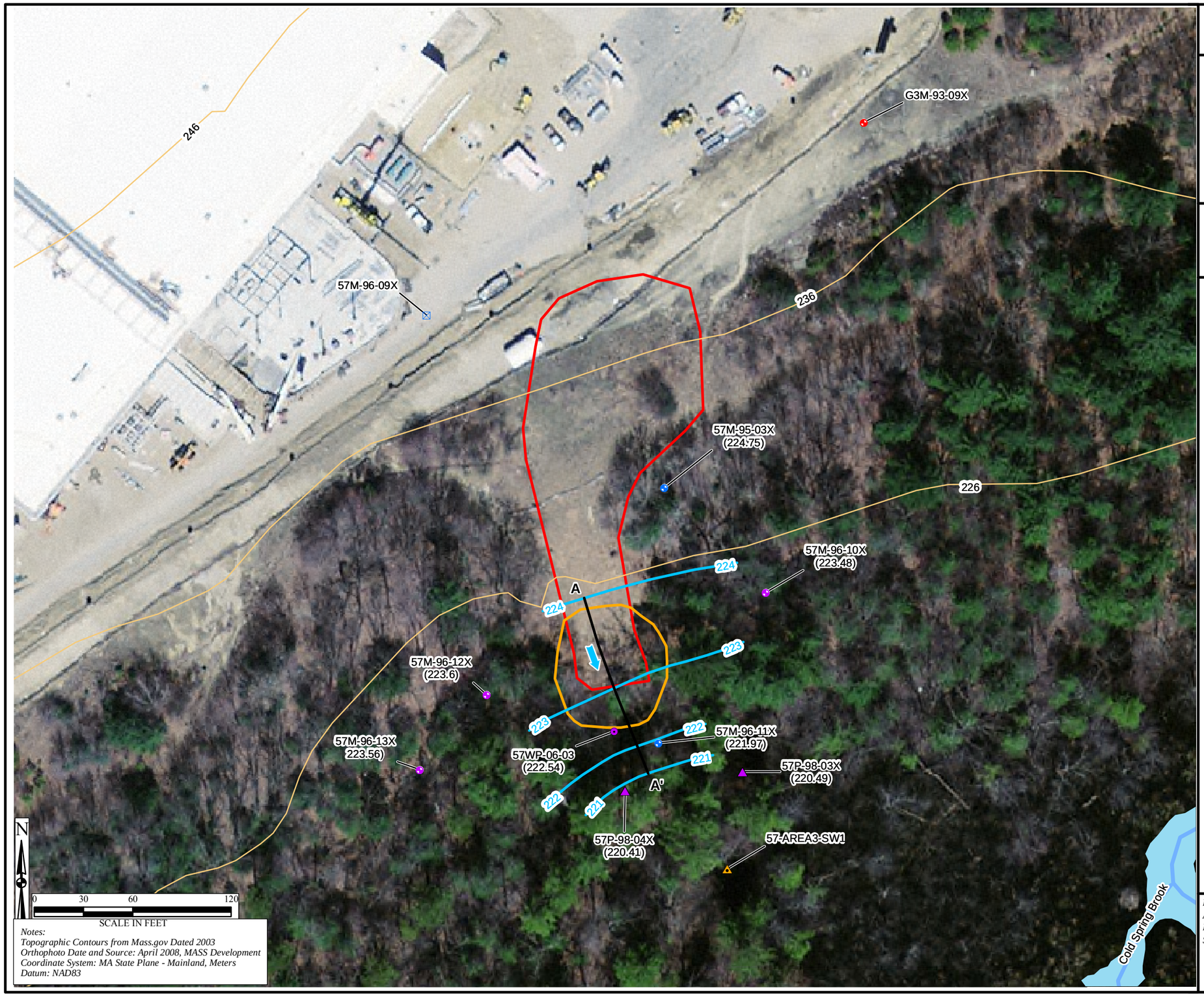
Legend

- Former Fort Devens Boundary
- Flagged Wetland Limits
- Final Excavation Limit (2003)
- Limit of Conti Excavation (2002)
- Containment Dam
- Stream
- 222 — Groundwater Contour (1 ft interval)
- Topographic Contour
- Area 2 Site Boundary
- Surface Water
- LTM Sample Well
- LTM Well -Ga uge Only
- LTM Well Point - Gauge Only
- Piezometer
- Staff Gauge
- Surface Water Sample Location
- Sumps
- 57M-03-06X (222.34) — Well ID (Groundwater Elevation)
- Groundwater Flow Direction

Note: Groundwater Gradient Calculation
A-A'=(224'-223')/86' = 0.012 ft/ft SE

Filename:X:/OMA010/Ft_Devens/Maps/DO501/2010_5-year_Review/AOC_57_Area_2.mxd
Revised: 06/11/10 C NL
Source: HGL GIS, MASS.GOV, ESRI, USACE

HGL HydroGeoLogic, Inc



Notes:
Topographic Contours from Mass.gov Dated 2003
Orthophoto Date and Source: April 2008, MASS Development
Coordinate System: MA State Plane - Mainland, Meters
Datum: NAD83

HGL—2010 Five-Year Review
Former Fort Devens Army Installation—Devens, MA

Figure 4.2
Interpretive Water Table Elevation
Area of Contamination 57 - Area 3
May 2009

U.S. Army Corps of Engineers
New England District

Legend

- Stream
- Topographic Contour
- Area 3 Site Boundary/ 1999 Excavation Area
- Alternate III-2a Estimated Soil Excavation Area (approximate location)
- Surface Water
- 221 Groundwater Contour (1 ft interval)
- Monitoring Well
- LTM Sample Well
- LTM Well -Gauge Only
- LTM Well Point - Gauge Only
- LTM Piezometer -Gauge Only
- Surface Water Sample Location
- Monitoring Well -Paved Over
- 57M-96-11X (221.97) Well ID (Groundwater Elevation)
- Groundwater Flow Direction

Note:
Groundwater Gradient Calculation
A-A'=(224'-221')/113' = 0.027 ft/ft SE

Well 57M-96-09X Buried by Construction

Filename:X:/OMA010/Ft_Devens/Maps/DO501/2010_5-year_Review/AOC_57_Area_3.mxd
Revised: 06/11/10 CNL
Source: HGL GIS, MASS.GOV, ESRI, USACE

HGL HydroGeoLogic, Inc

Figure 4.3
Long-Term Trends
Arsenic
Area of Contamination 57 - Area 2

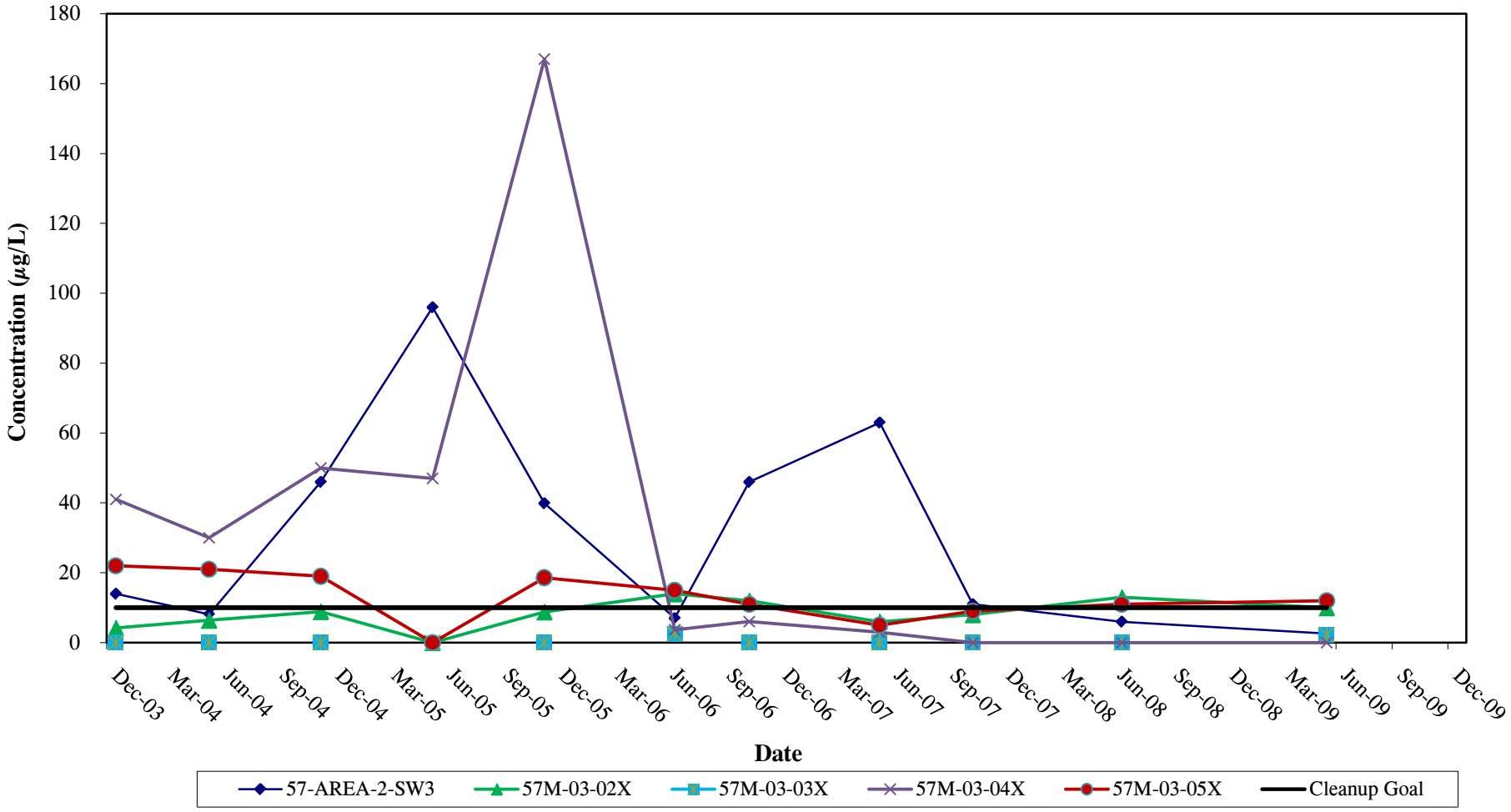


Figure 4.4
Long-Term Trends
Arsenic
Area of Contamination 57 - Area 3

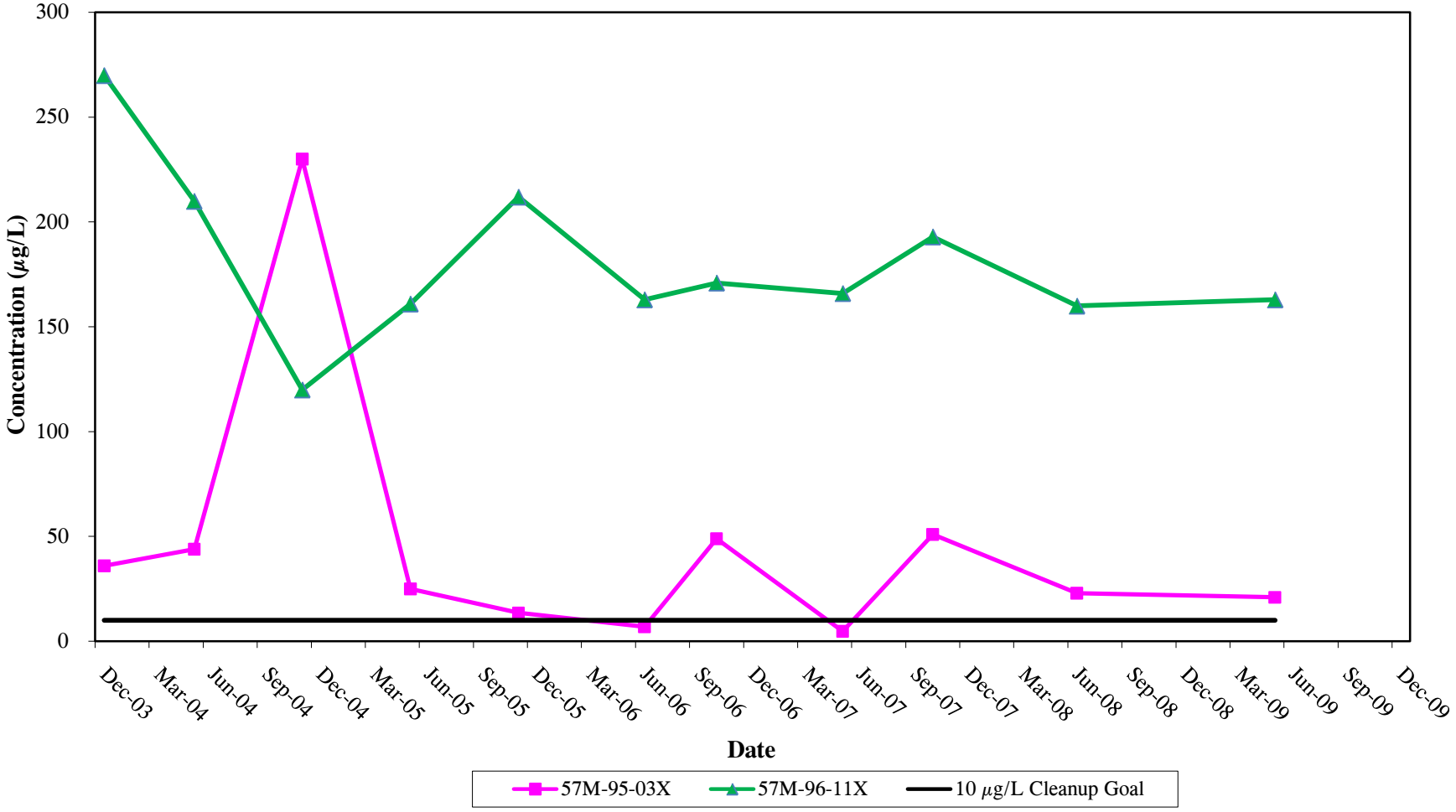


Figure 4.5
Long-Term Trends
Tetrachloroethene
Area of Contamination 57 - Area 2

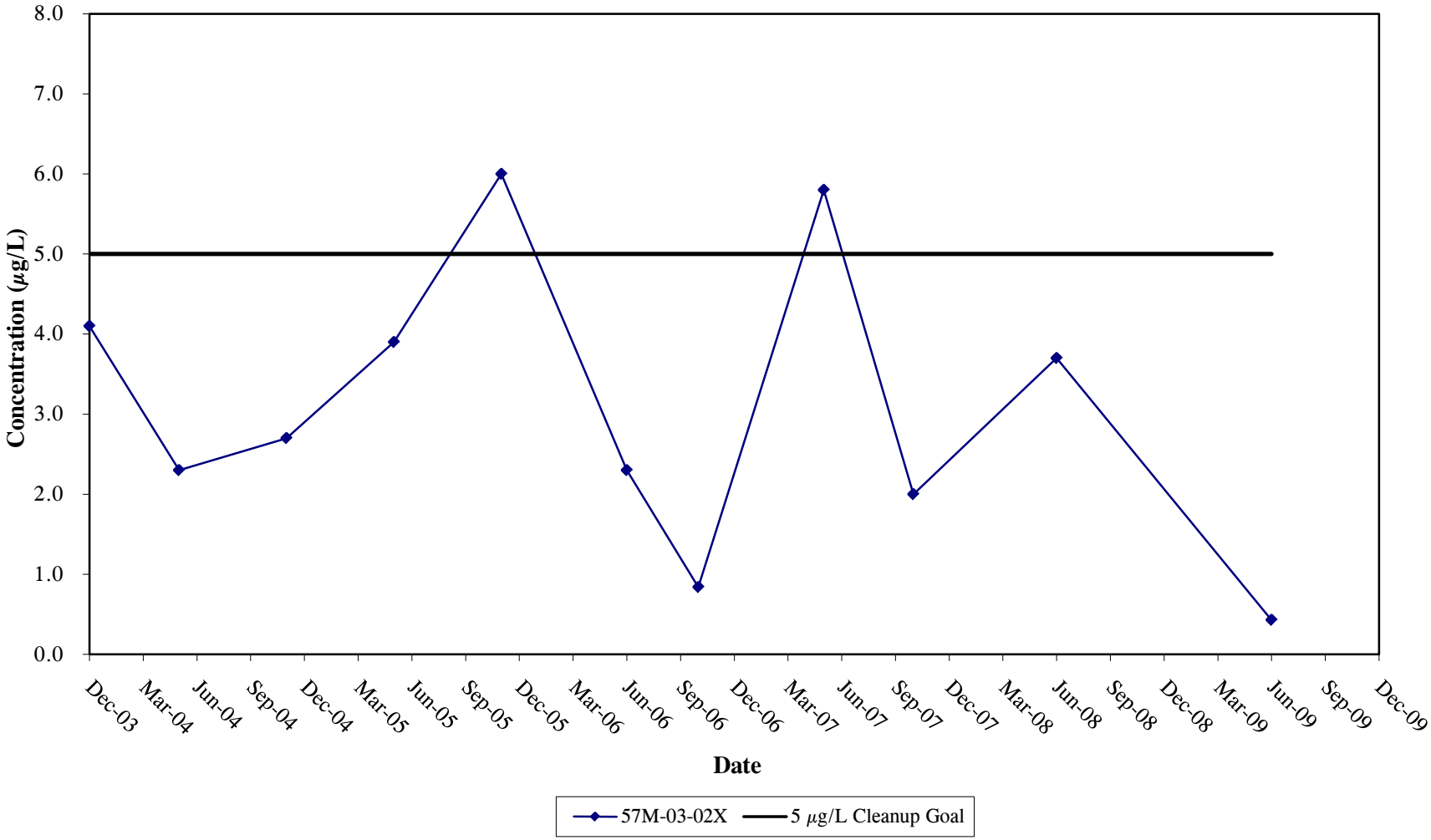


Figure 4.6
Long-Term Trends
Trichloroethene
Area of Contamination 57 - Area 2

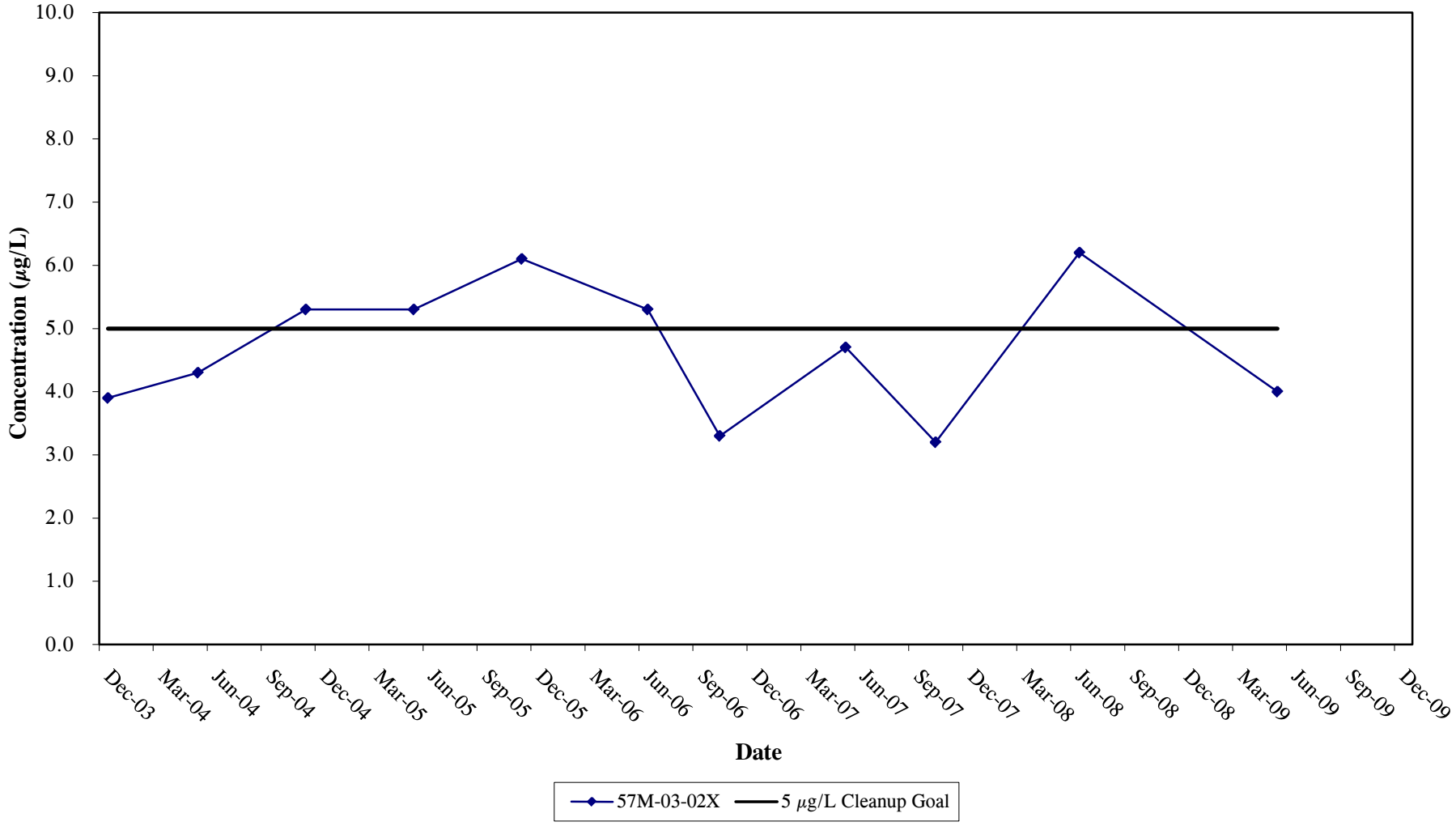


Figure 5.1
Site Map
Area of Contamination 43G

U.S. Army Corps of Engineers
New England District

Notes:
Orthophoto Date and Source: April 2008, MASS Development
Coordinate System: MA State Plane - Mainland, Meters
Datum: NAD83

Legend

- Monitoring Well
- LTM Sample Well
- LTM Well - Gauge Only
- Piezometer
- Abandoned Monitoring Well
- UST Area
- Location of Former Gasoline USTS
- Location of Former Waste Oil UST
- Location of Former Above Ground Waste Oil Storage Tank
- Maximum Historical Extent of Groundwater Contamination in Exceedance of Cleanup Goals (Based on 1999 to 2009 Analytical Data)

N

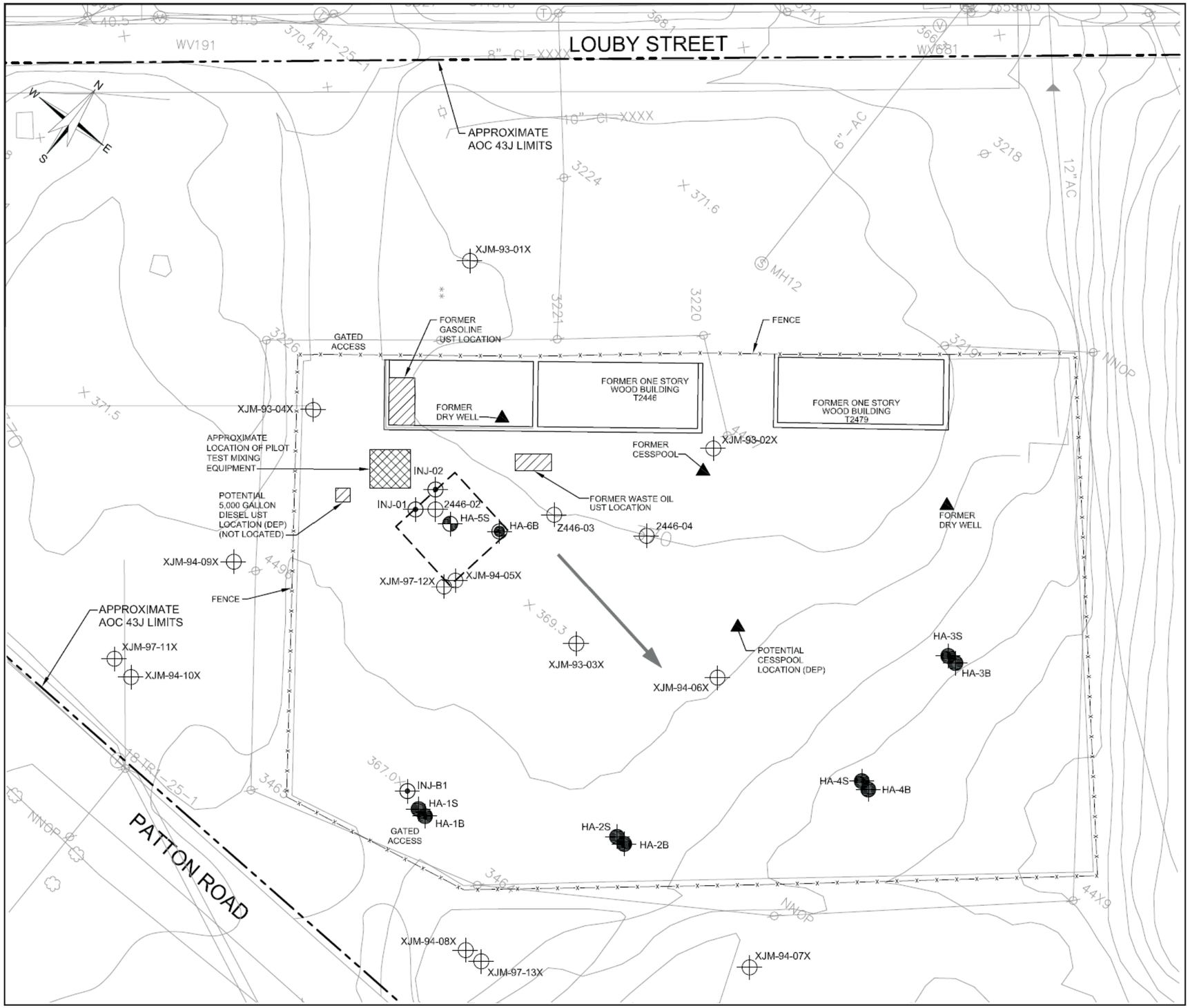
0 60 120 240
SCALE IN FEET

Filename:X:/OMA010/Ft_Devens/Maps/DO501/2010_5-year_review/AOC_43G_USTs.mxd
Revised: 08/27/10 C NL
Source: HGL GIS, MASS.GOV, ESRI, USACE, HLA

HGL HydroGeoLogic, Inc

Figure 5.2
AOC 43J Site Plan/ Pilot Test Layout Plan

U.S. Army Corp of Engineers
New England District



Legend

- HA-6B — DESIGNATION AND PROPOSED LOCATION OF BEDROCK MONITORING WELL
- INJ-01 — DESIGNATION AND PROPOSED LOCATION OF INJECTION WELL
- HA-5S — DESIGNATION AND PROPOSED LOCATION OF OVERBURDEN MONITORING WELL
- HA-1S — DESIGNATION AND LOCATION OF MONITORING WELL INSTALLED BY GEOLOGIC, INC. DURING THE PERIOD 22 DECEMBER 2006 THROUGH 5 JANUARY 2007. WELL INSTALLATION MONITORED BY HALEY & ALDRICH, INC.
- XJM-93-03X — DESIGNATION AND APPROXIMATE LOCATION OF EXISTING GROUNDWATER MONITORING WELL INSTALLED BY OTHERS.
- APPROXIMATE LOCATION OF POTENTIAL FORMER SOURCE AREA INVESTIGATED. "(DEP)" INDICATES LOCATION SUGGESTED BY MADEP FOR INVESTIGATION.
- APPROXIMATE LOCATION OF FORMER UST "(DEP)" INDICATES LOCATION SUGGESTED BY MADEP FOR INVESTIGATION.
- GENERALIZED DIRECTION OF GROUNDWATER FLOW
- APPROXIMATE LOCATION OF PILOT TEST AREA

NOTES:

1. BASE PLAN COMPILED FROM AN ELECTRONIC SITE SURVEY FILE PROVIDED BY MASSDEVELOPMENT, SURVEY REFERENCES MASSACHUSETTS STATE PLANE COORDINATE SYSTEM NAD83 AND NGVD 1929.
2. LOCATIONS OF SUBSURFACE UTILITIES SHOWN ARE APPROXIMATE.
3. LOCATIONS OF FORMER USTs AND POTENTIAL SOURCES ARE APPROXIMATE AND BASED ON REVIEW OF SITE ASSESSMENT DATA.

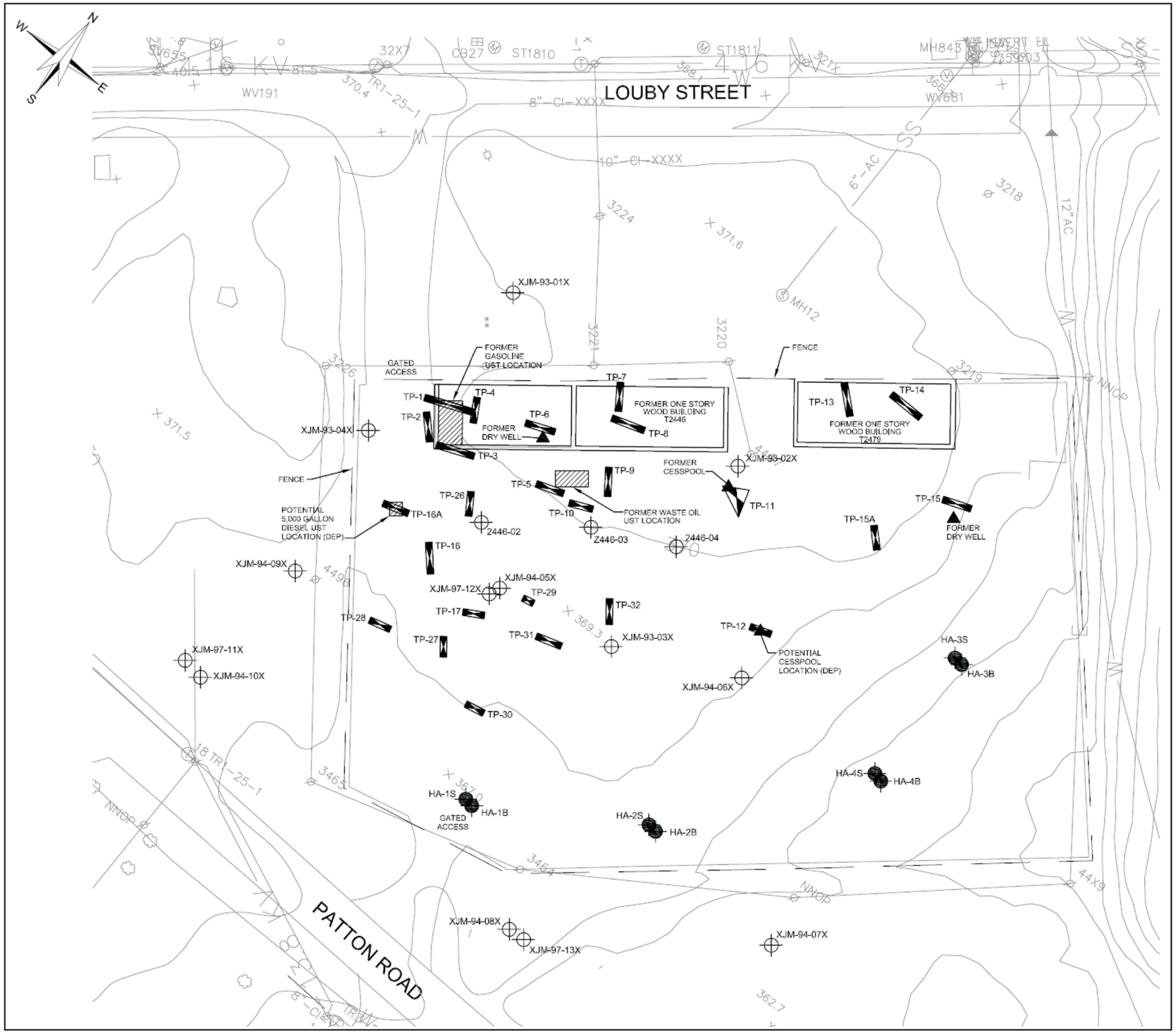
0 50 100
SCALE IN FEET

Filename:X:/OMA010/Ft_Devens/Maps/DO501/ 2010_5-year_review/AOC43J_Site_Plan.cdr
Revised: 08/27/10 CNL
Source: Haley & Aldrich, March 2010

HGL HydroGeoLogic, Inc

Figure 5.3
AOC 43J
Test Pit Location Map

U.S. Army Corp of Engineers
New England District



Legend

HA-1S — DESIGNATION AND LOCATION OF MONITORING WELL INSTALLED BY GEOLOGIC, INC. DURING THE PERIOD 22 DECEMBER 2006 THROUGH 5 JANUARY 2007. WELL INSTALLATION MONITORED BY HALEY & ALDRICH, INC.

XJB-97-11X — DESIGNATION AND APPROXIMATE LOCATION OF EXISTING GROUNDWATER MONITORING WELL INSTALLED BY OTHERS.

TP-1 — DESIGNATION AND APPROXIMATE LOCATION OF TEST PIT COMPLETED BY J. MARCHESE DURING THE PERIOD 10 JULY THROUGH 18 JULY 2006. TEST PITS MONITORED BY HALEY & ALDRICH, INC.

▲ — APPROXIMATE LOCATION OF POTENTIAL FORMER SOURCE AREA INVESTIGATED. "(DEP)" INDICATES LOCATION SUGGESTED BY MADEP FOR INVESTIGATION.

APPROXIMATE LOCATION OF FORMER UST "(DEP)" INDICATES LOCATION SUGGESTED BY MADEP FOR INVESTIGATION.

NOTES:

1. BASE PLAN COMPILED FROM AN ELECTRONIC SITE SURVEY FILE PROVIDED BY MASS DEVELOPMENT. SURVEY REFERENCES MASSACHUSETTS STATE PLANE COORDINATE SYSTEM NAD83 AND NGVD 1929.
2. LOCATIONS OF SUBSURFACE UTILITIES SHOWN ARE APPROXIMATE.
3. LOCATIONS OF FORMER USTs AND POTENTIAL SOURCES ARE APPROXIMATE AND BASED ON REVIEW OF SITE ASSESSMENT DATA.

0 60 120
SCALE IN FEET

Filename:X:/OMA010/Ft_Devens/Maps/DO501/2010_5-year_review/AOC43J_Test_Pits.cdr
Revised: 09/17/10 CNL
Source: Haley & Aldrich, March 2009

HGL HydroGeoLogic, Inc

Figure 5.4
Long-Term Trends
Benzene
Area of Contamination 43G
Wells AAFES-2, XGM-93-02X and XGM-97-12X

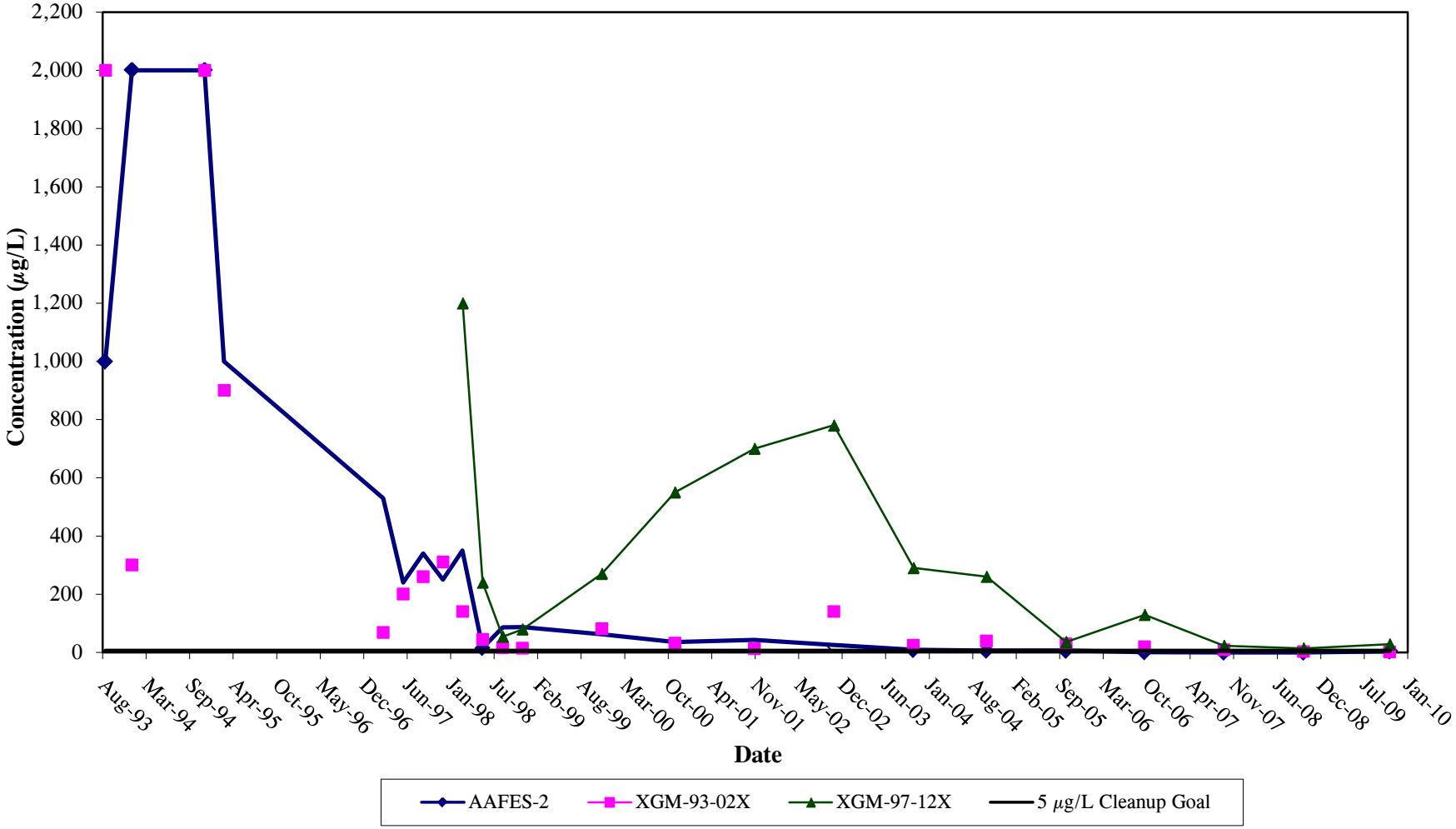


Figure 5.5
Long-Term Trends
VPH C_9-C_{10} Aromatics
Area of Contamination 43G

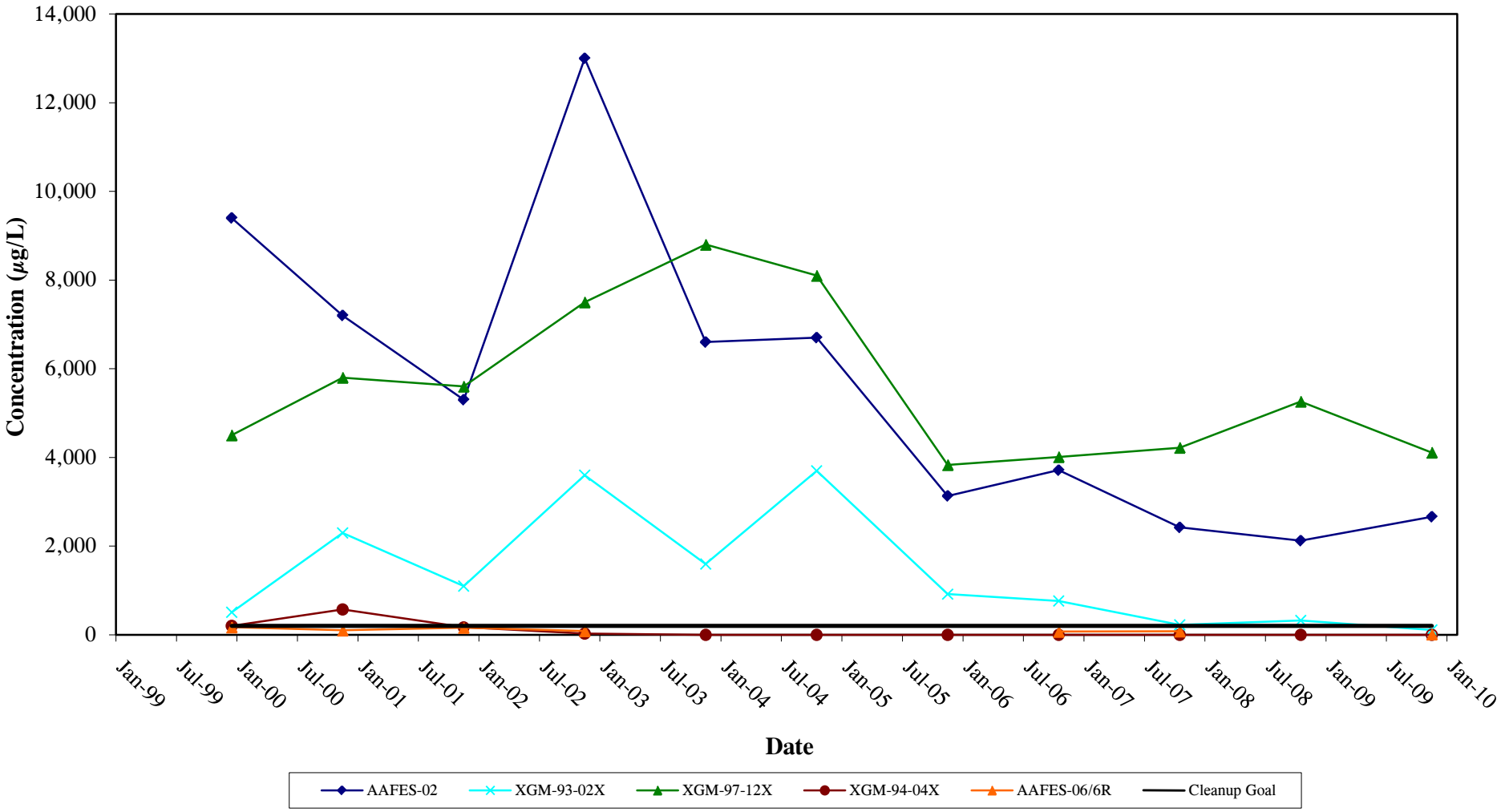
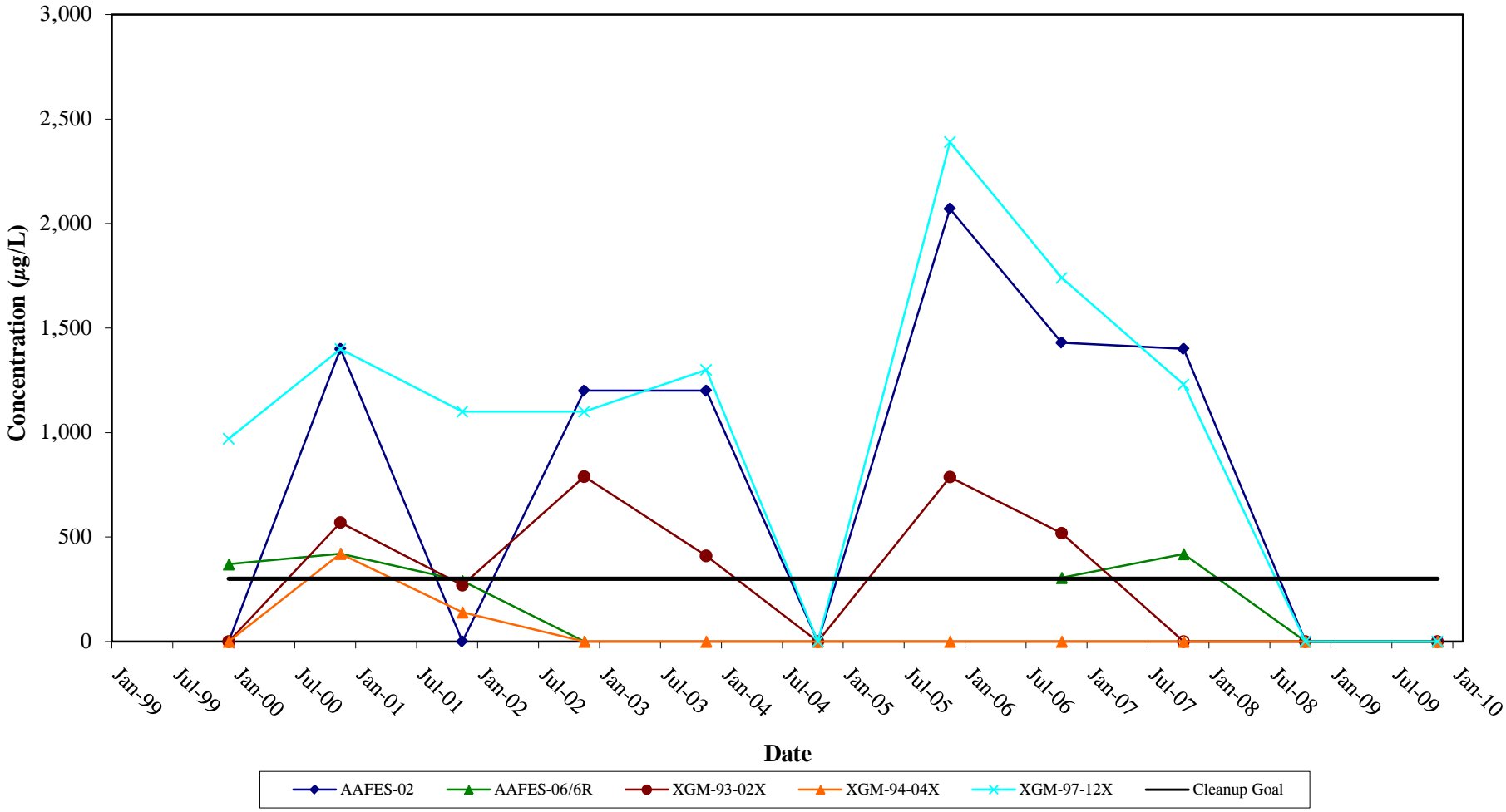


Figure 5.6
Long-Term Trends
VPH C_5-C_8 Aliphatics
Area of Contamination 43G



AAFES-6R was installed in January 2006 to replace abandoned well AAFES-6.

Figure 5.7
Long-Term Trends
VPH C_9-C_{12} Aliphatics
Area of Contamination 43G

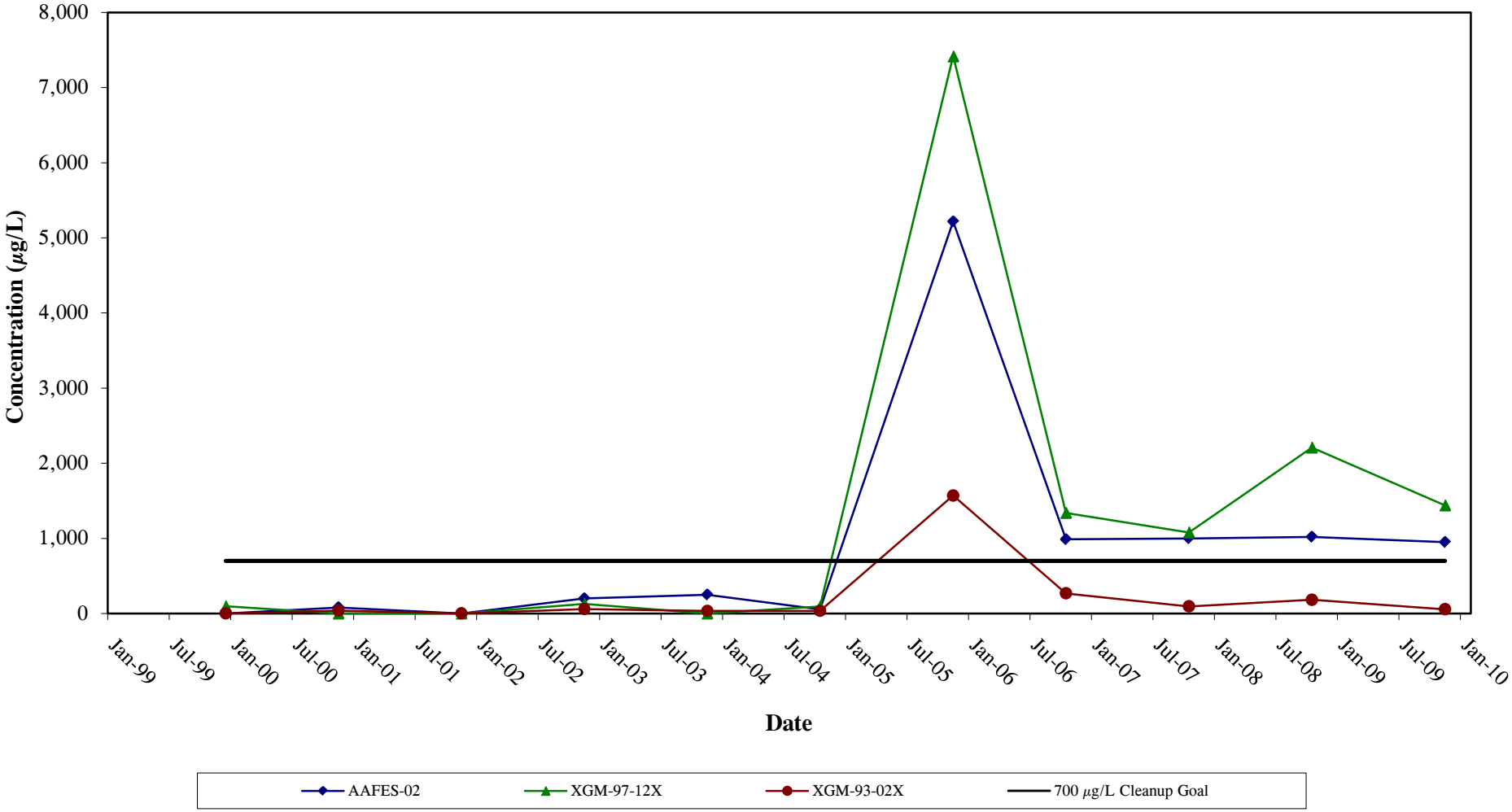
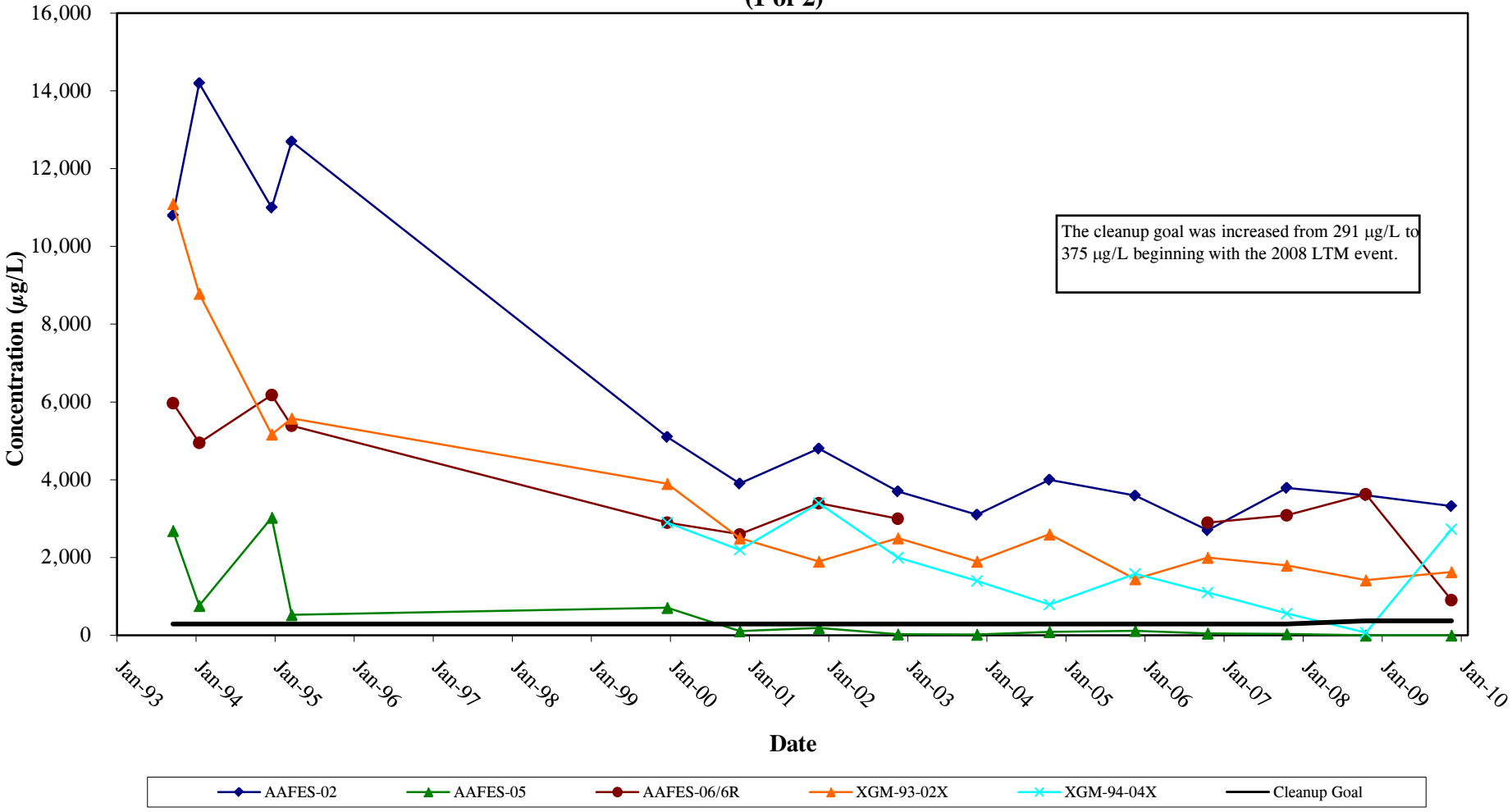


Figure 5.8
Long-Term Trends
Manganese
Area of Contamination 43G
(1 of 2)



AAFES-6R was installed in January 2006 to replace well AAFES-6.

Figure 5.9
Long-Term Trends
Manganese
Area of Contamination 43G
(2 of 2)

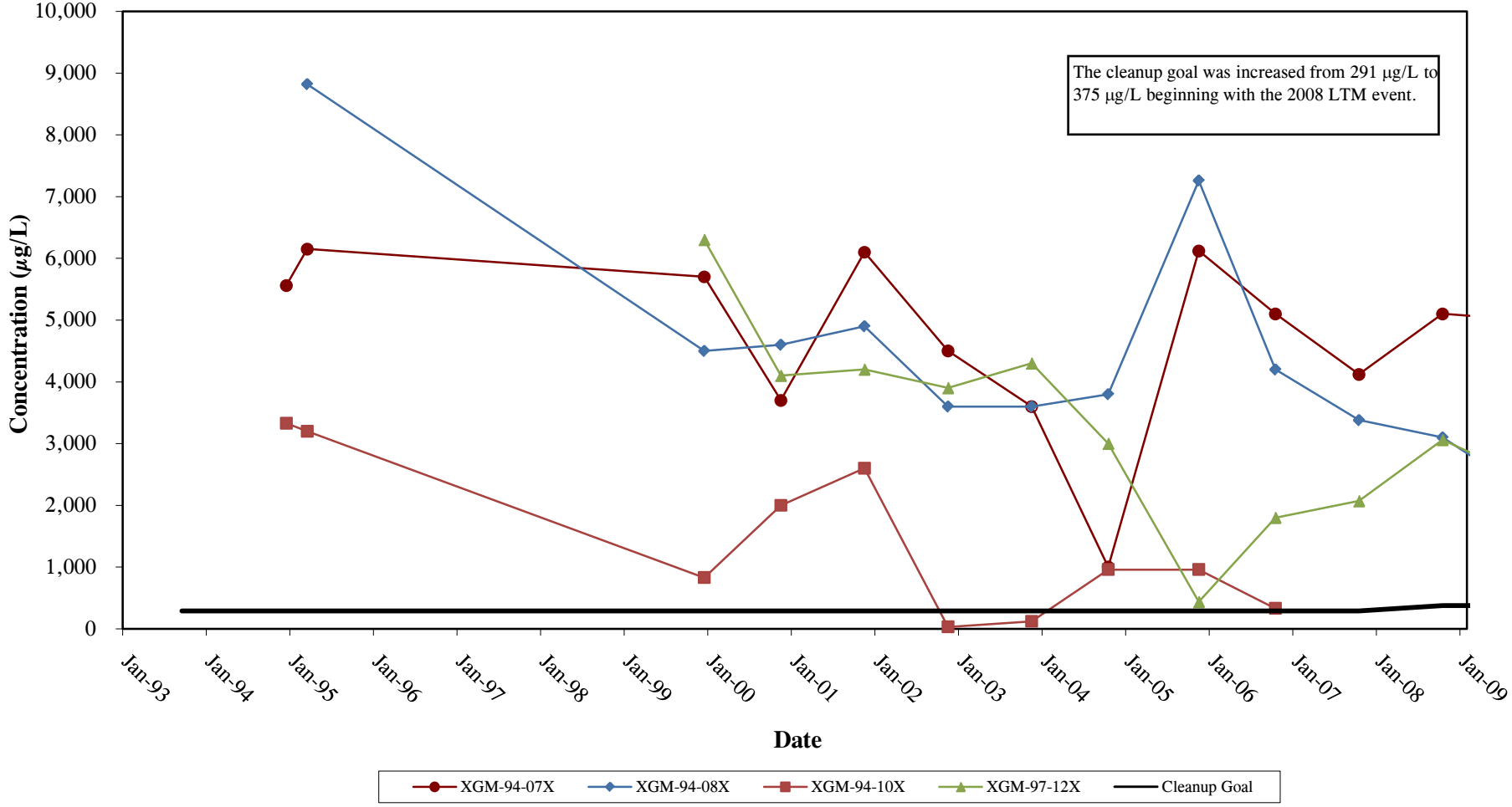


Figure 5.10
Long-Term Trends
Ethylbenzene
Area of Contamination AOC 43J
Wells 2446-01, 2446-03, XJM-94-05X, XJM-97-12X

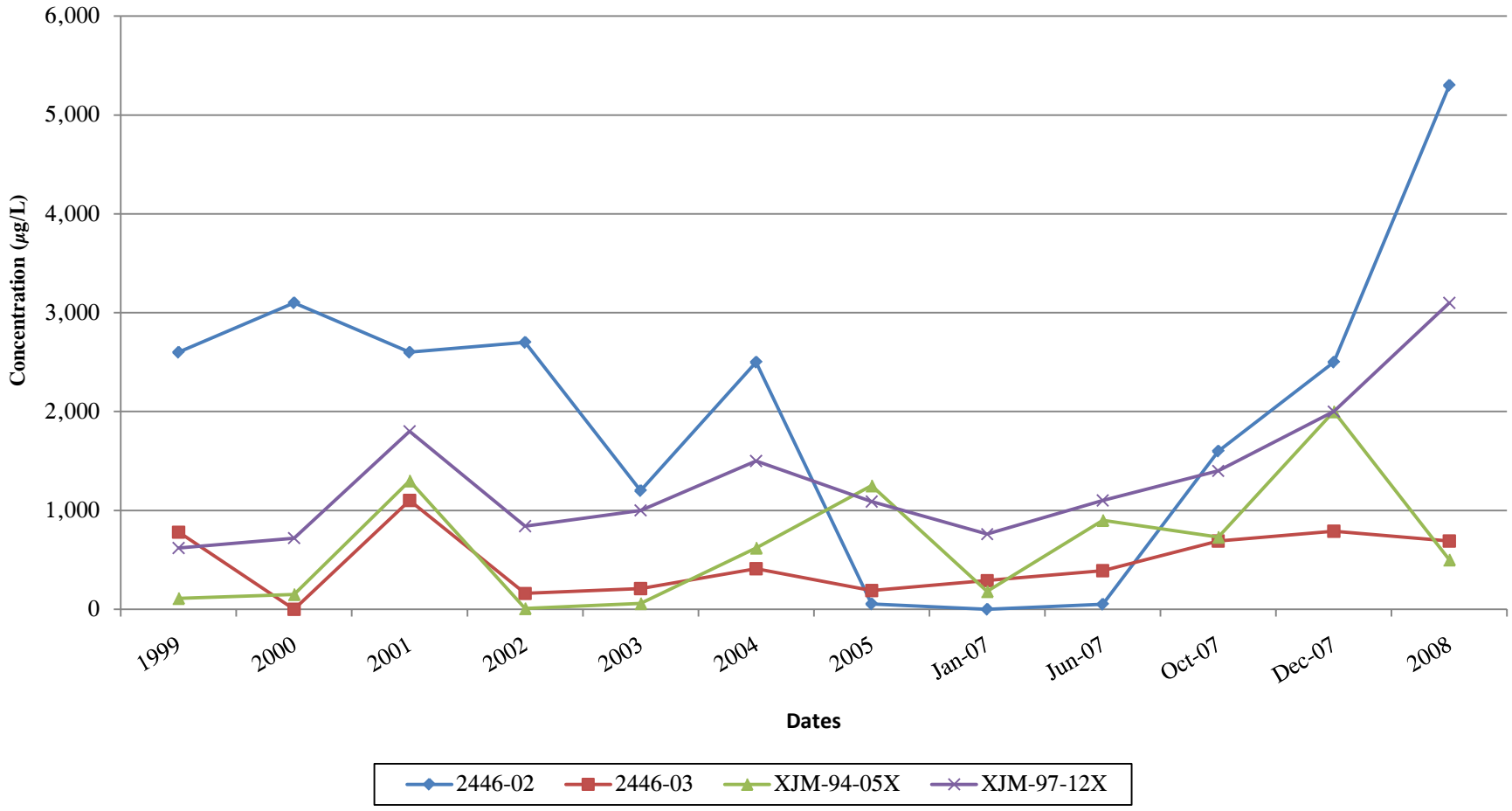


Figure 5.11
Long-Term Trends
C_5-C_8 Aliphatics
Area of Contamination AOC 43J
Wells 2446-01, 2446-03, 2446-04, XJM-94-05X,
XJM-97-11X, XJM-97-12X

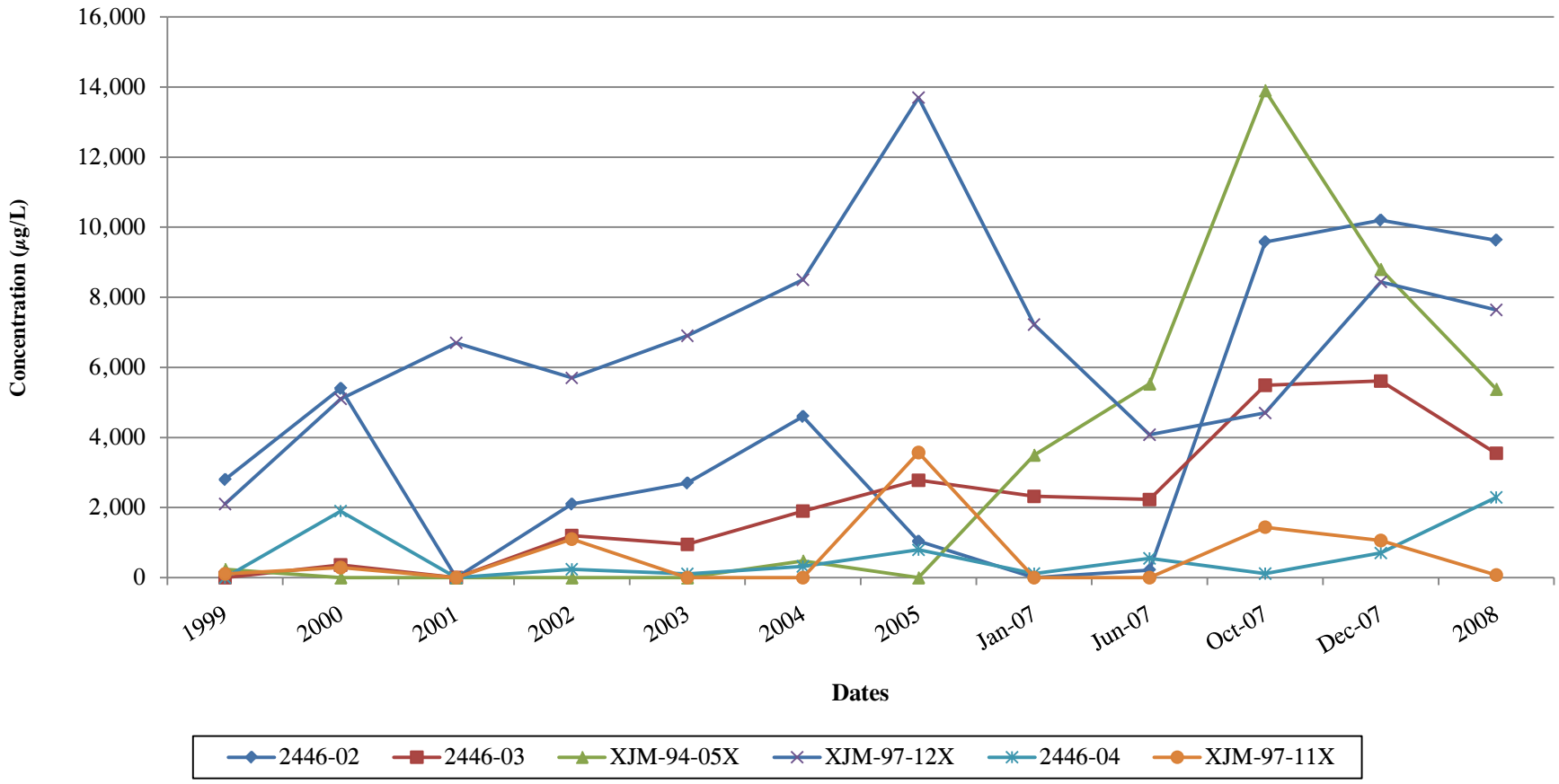


Figure 5.12
Long-Term Trends
C_9-C_{10} Aliphatics
Area of Contamination AOC 43J
Wells 2446-01, 2446-03, 2446-04, XJM-94-05X,
XJM-97-11X, XJM-97-12X

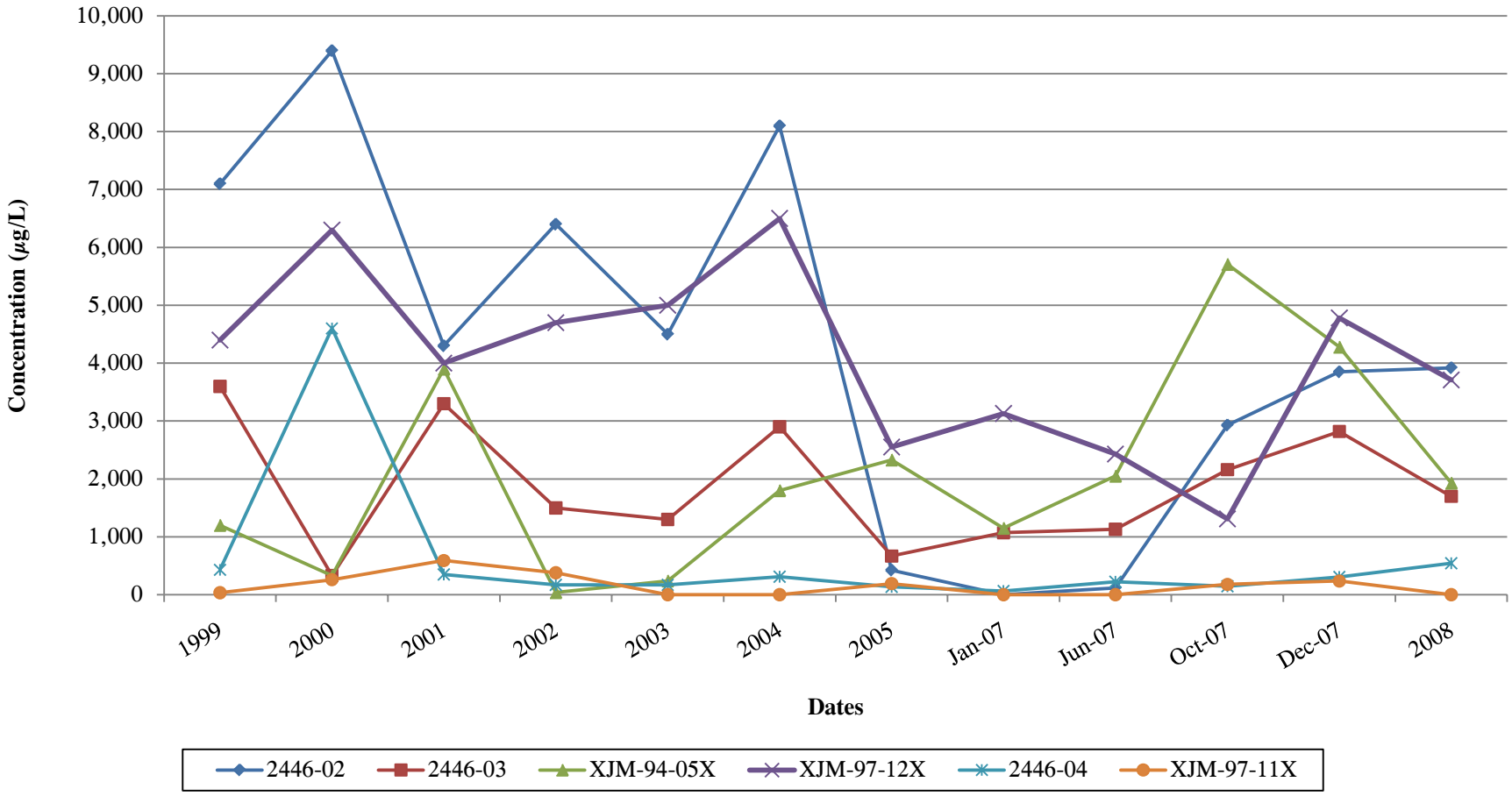


Figure 5.13a
Long Term Trends
Arsenic
Area of Contamination AOC 43J
Wells 2446-02, 2446-03, 2446-04, XJM-97-12X, XJM-93-02X
(1 of 2)

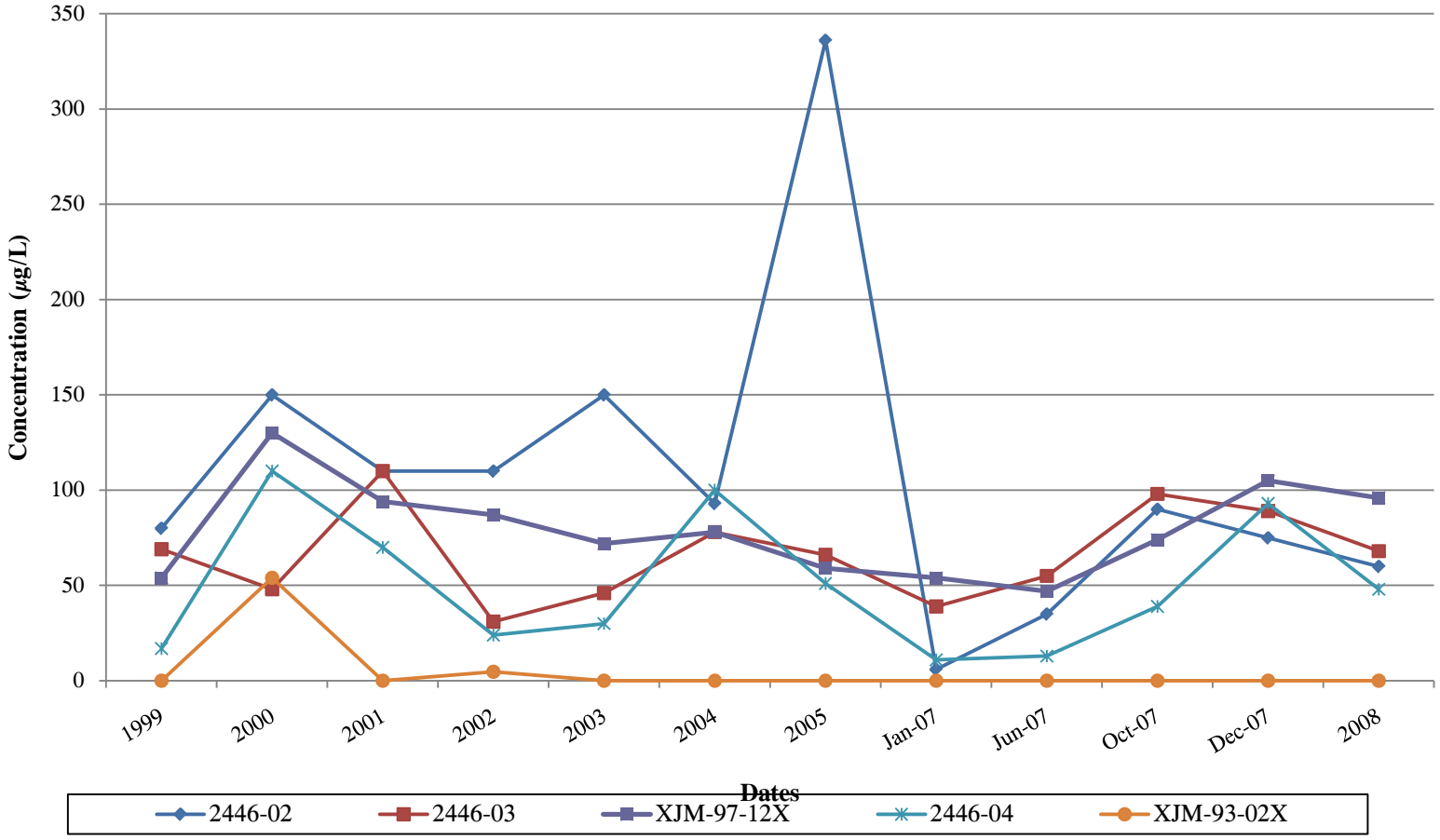


Figure 5.13b
Long Term Trends
Arsenic
Area of Contamination AOC 43J
XJM-94-05X
(2 of 2)

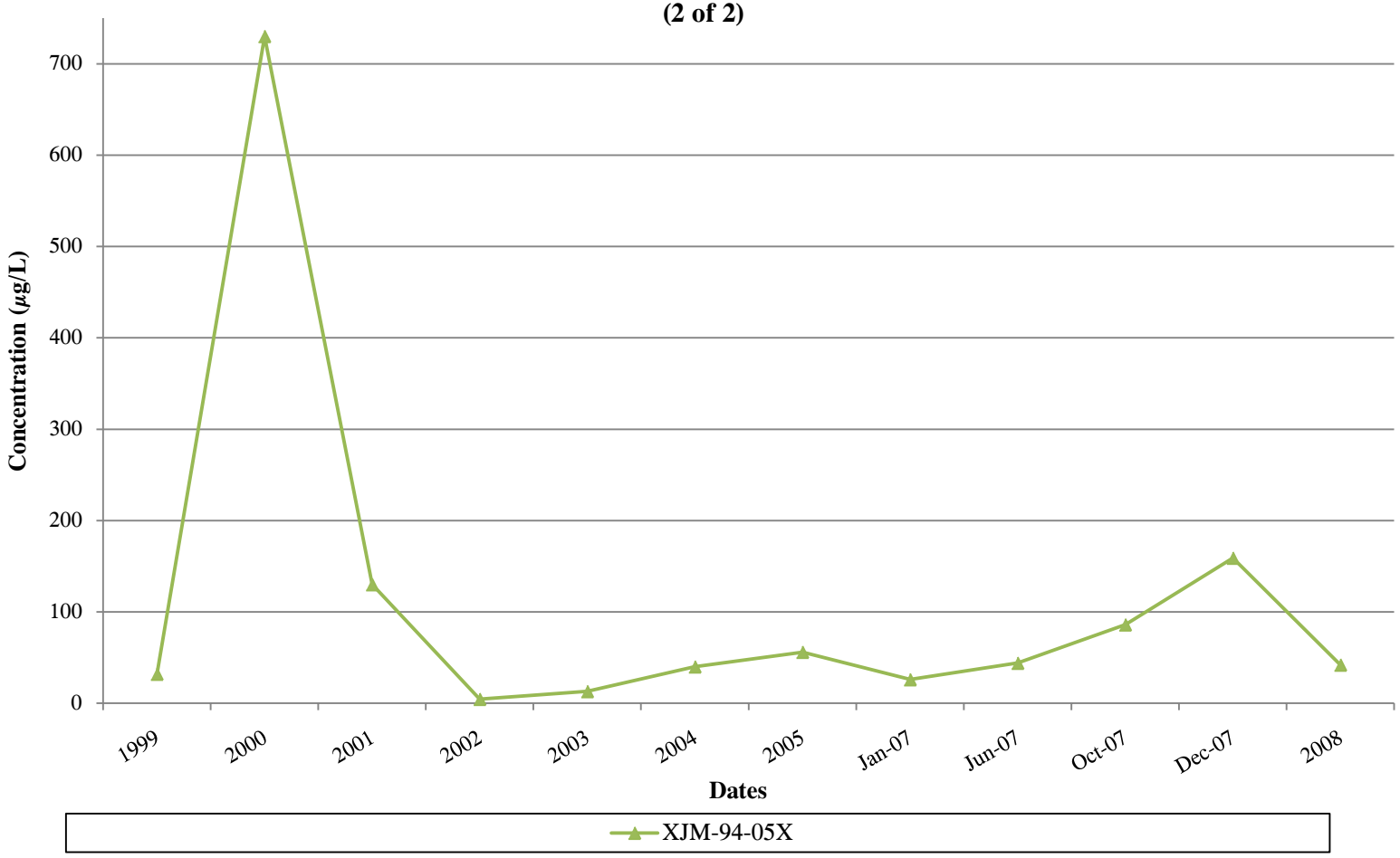


Figure 5.14
Long Term Trends
Iron
Area of Contamination AOC 43J
Wells 2446-02, 2446-03, 2446-04, XJM-94-05X, XJM-97-12X

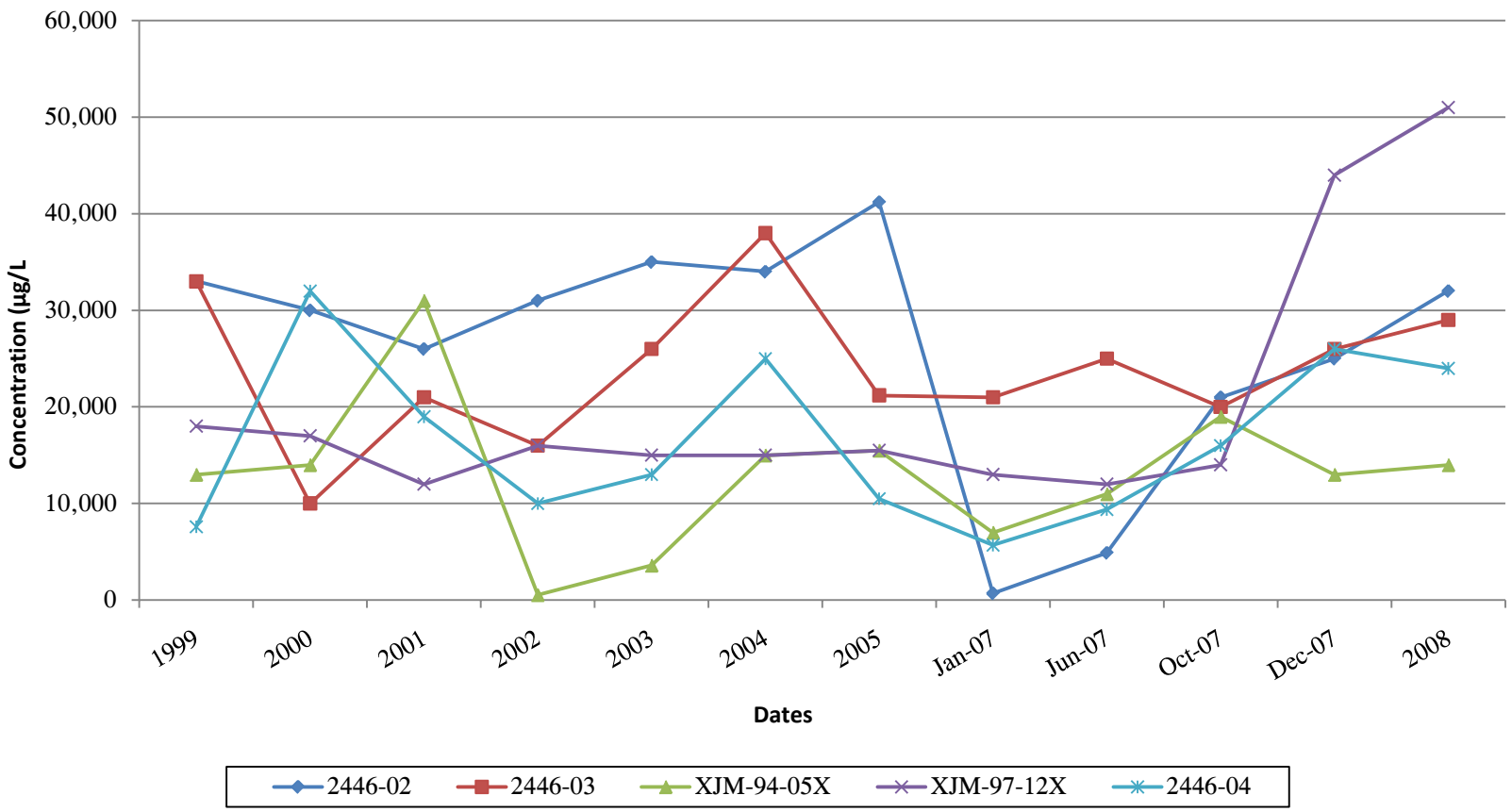
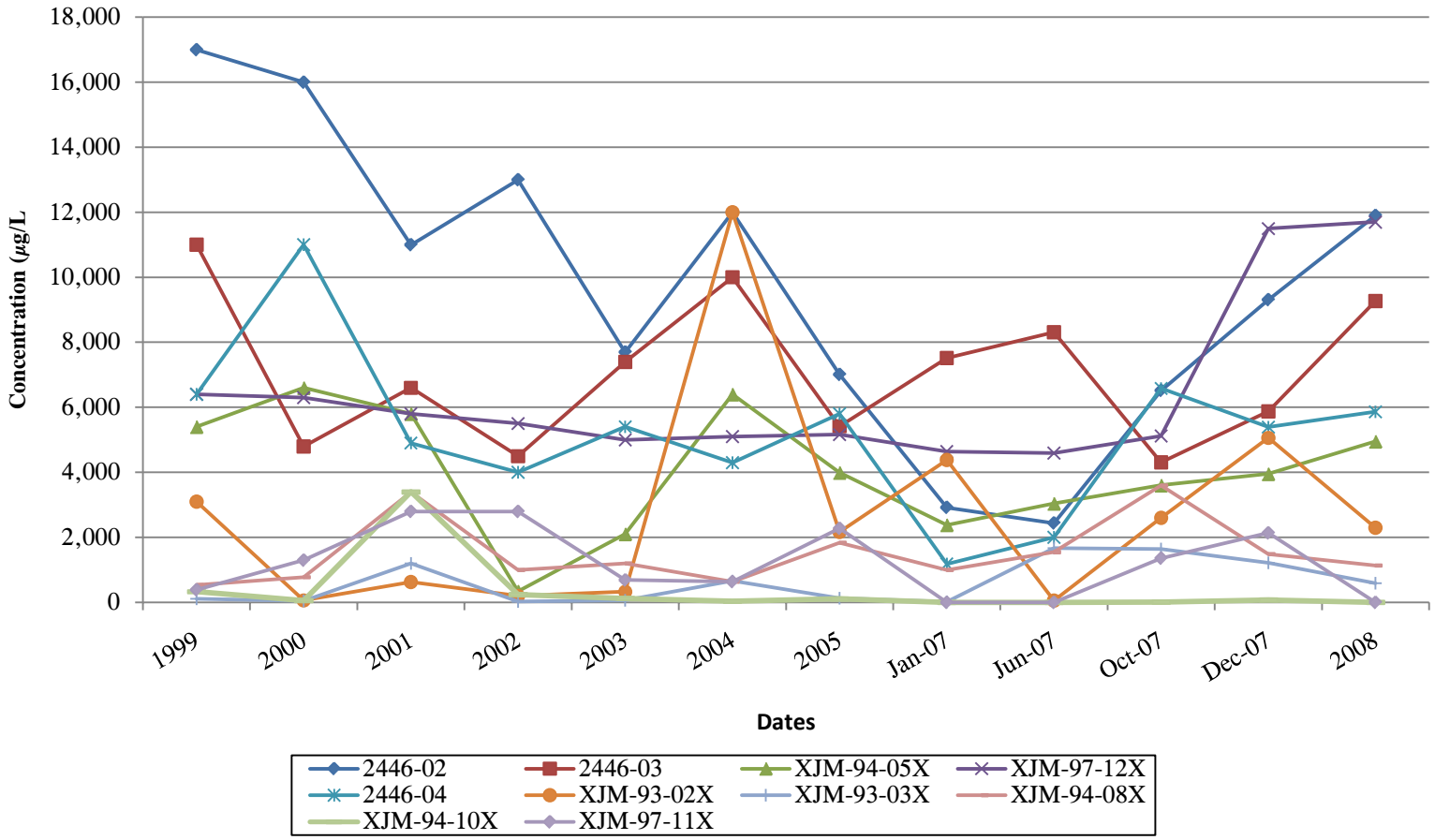
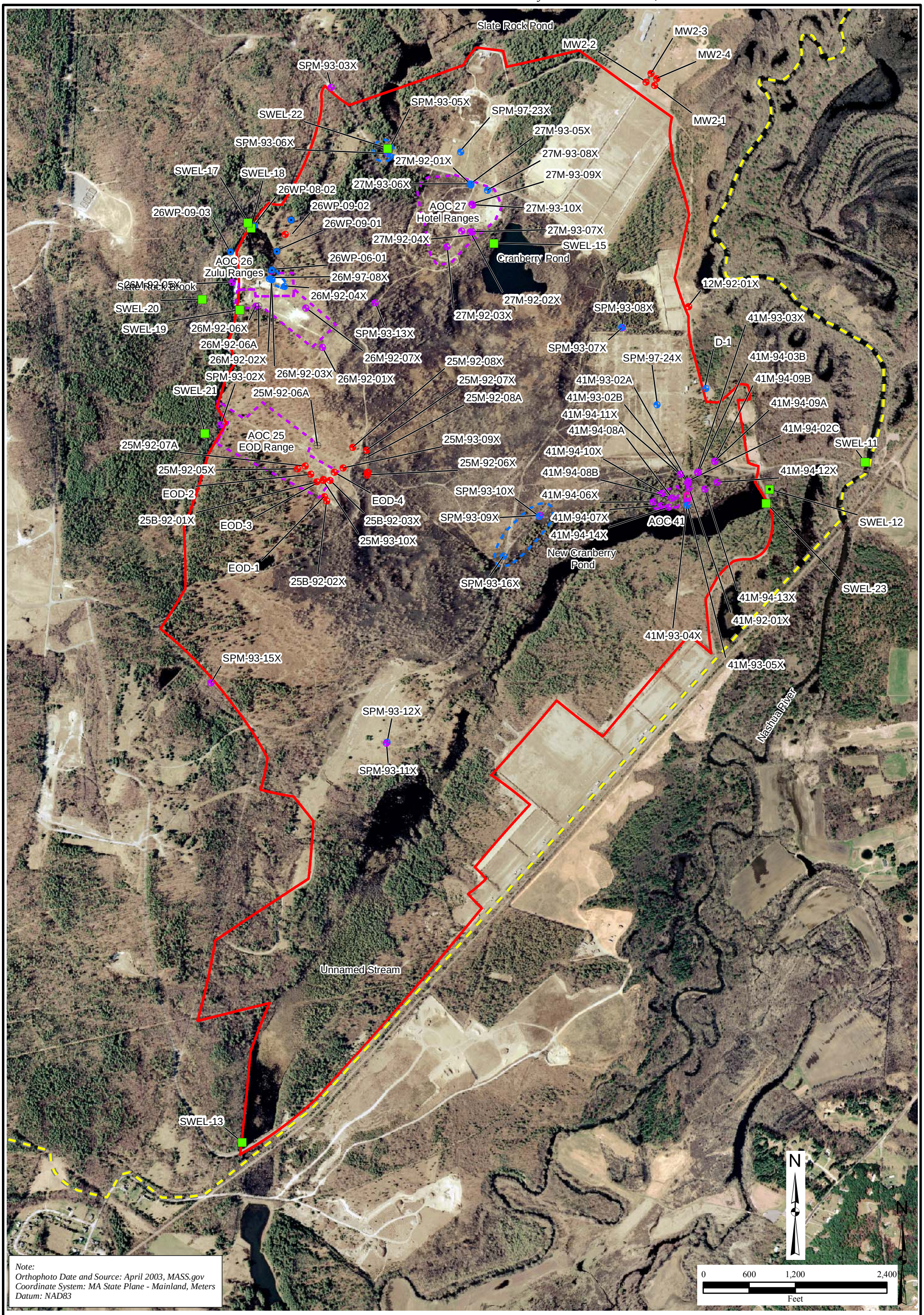


Figure 5.15
Long Term Trends
Manganese
Area of Contamination AOC 43J
Wells 2446-02, 2446-03, 2446-04, XJM-94-05X, XJM-97-12X, XJM-93-02X, XJM-93-03X, XJM-94-08X, XJM-94-10X, XJM-97-11X





Note:
Orthophoto Date and Source: April 2003, MASS.gov
Coordinate System: MA State Plane - Mainland, Meters
Datum: NAD83

Filename:X:/OMA010/Ft_Devens/Maps/DO501/
2010_5-Year_Review/SPIAs_portrait.mxd
Revised: 08/20/10 CNL
Map Source: HGL GIS, MASS.GOV, ESRI, USACE

HGL HydroGeoLogic, Inc

Legend

- Former Fort Devens Boundary
- SPIA Boundary
- Landfill Debris
- Maximum Historical Extent of Groundwater Contamination in Exceedance of Groundwater Standards (Based on 1992 to 2009 Analytical Data)
- LTM Sample Well
- LTM Well - Gauge Only
- LTM Sample Well Point
- Abandoned Monitoring Well
- Surface Water Elevation Location
- AOC Boundary

Figure 6.1
Site Map
South Post Impact Area

Note:
Orthophoto Date and Source: April 2003, MASS.gov
Coordinate System: MA State Plane - Mainland, Meters
Datum: NAD83

HGL—2010 Five-Year Review
Former Fort Devens Army Installation—Devens, MA

Figure 6.2
Site Map
Area of Contamination 25

U.S. Army Corps of Engineers
New England District

Legend

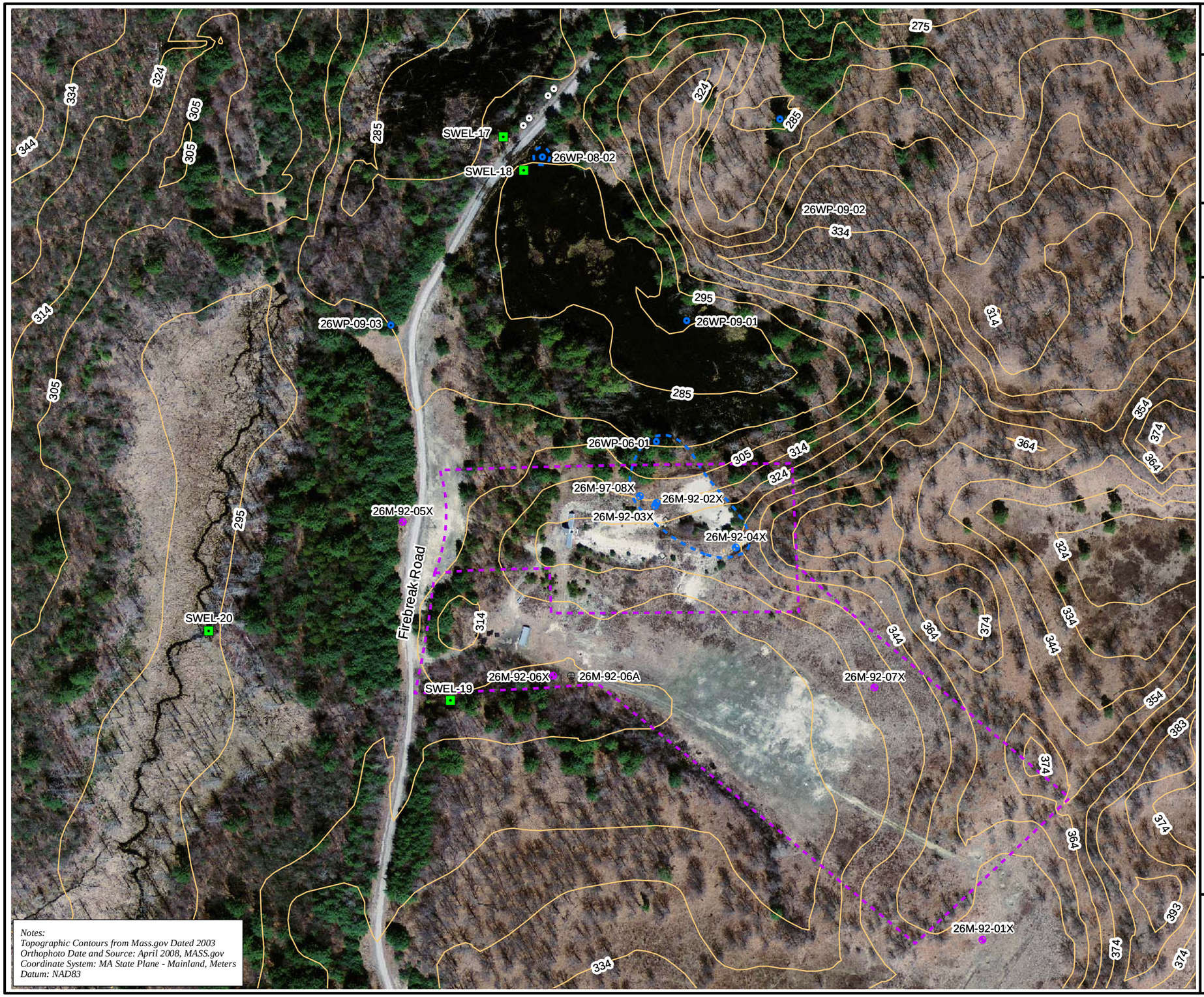
- LTM Sample Well
- LTM Well - Gauge Only
- Abandoned Monitoring Well
- Surface Water Elevation Location
- Site Boundary

N

0 150 300 600
Feet

Filename:X:/OMA010/Ft_Devens/Maps/DO501/
2010_5-year_Review/SPIA_AOC_25.mxd
Revised: 08/20/10 CNL
Source: HGL GIS, MASS.GOV, ESRI, USACE

HGL
HydroGeoLogic, Inc



Notes:
Topographic Contours from Mass.gov Dated 2003
Orthophoto Date and Source: April 2008, MASS.gov
Coordinate System: MA State Plane - Mainland, Meters
Datum: NAD83

HGL—2010 Five-Year Review
Former Fort Devens Army Installation—Devens, MA

Figure 6.3
Site Map
South Post Impact Area
Area of Contamination 26
Zulu Ranges

U.S. Army Corps of Engineers
New England District

Legend

- Topographic Contour
- AOC 26 (Zulu 1 / Zulu 2)
- Maximum Historical Extent of Groundwater Contamination in Exceedance of Groundwater Standards (Based on 1992 to 2009 Analytical Data)
- LTM Sample Well
- LTM Sample Well Point
- LTM Well -pe riodic Gauge Only
- Surface Water Elevation Location
- Abandoned Well Point
- Installation Location
- Shallow Refusal

Note:
Well points require x,y survey.

N

0 100 200 400
SCALE IN FEET

Filename:X:/OMA010/Ft_Devens/Maps/DO501/2010_5-year_Review/SPIA_AOC_26.mxd
Revised: 08/20/10 C NL
Source: HGL GIS, MASS.GOV, ESRI, USACE

HGL HydroGeoLogic, Inc

Figure 6.4
Site Map
South Post Impact Area
Area of Contamination 27
Hotel Range

U.S. Army Corps of Engineers
New England District

Note:
Orthophoto Date and Source: April 2003, MASS.gov
Coordinate System: MA State Plane - Mainland, Meters
Datum: NAD83

Legend

- Site Boundary
- Surface Water
- LTM Sample Well
- LTM Well -Periodic Gauge Only
- Surface Water Elevation Location

N

0 75 150 300
SCALE IN FEET

Filename:X:/OMA010/Ft_Devens/Maps/DO501/2010_5-year_Review/SPIA_AOC_27.mxd
Revised: 08/20/10 CNL
Source: HGL GIS, MASS.GOV, ESRI, USACE

HGL HydroGeoLogic, Inc

Notes:
Topographic Contours from Mass.gov Dated 2003
Orthophoto Date and Source: April 2003, MASS.gov
Coordinate System: MA State Plane - Mainland, Meters
Datum: NAD83

HGL—2010 Five-Year Review
Former Fort Devens Army Installation—Devens, MA

Figure 6.5
Site Map
South Post Impact Area
Area of Contamination 41

U.S. Army Corps of Engineers
New England District

Legend

- Topographic Contour
- Landfill Debris
- Surface Water
- Maximum Historical Extent of Groundwater Contamination in Exceedance of Groundwater Standards (Based on 1992 to 2009 Analytical Data)
- LTM Sample Well
- LTM Well -periodic Gauge Only

N

0 50 100 200
SCALE IN FEET

Filename:X:/OMA010/Ft_Devens/Maps/DO501/2010_5-year_Review/SPIA_AOC_41.mxd
Revised: 08/20/10 CNL
Source: HGL GIS, MASS.GOV, ESRI, USACE

HGL HydroGeoLogic, Inc

Figure 6.6
Long-Term Trends
HMX
South Post Impact Area - Area of Contamination 26

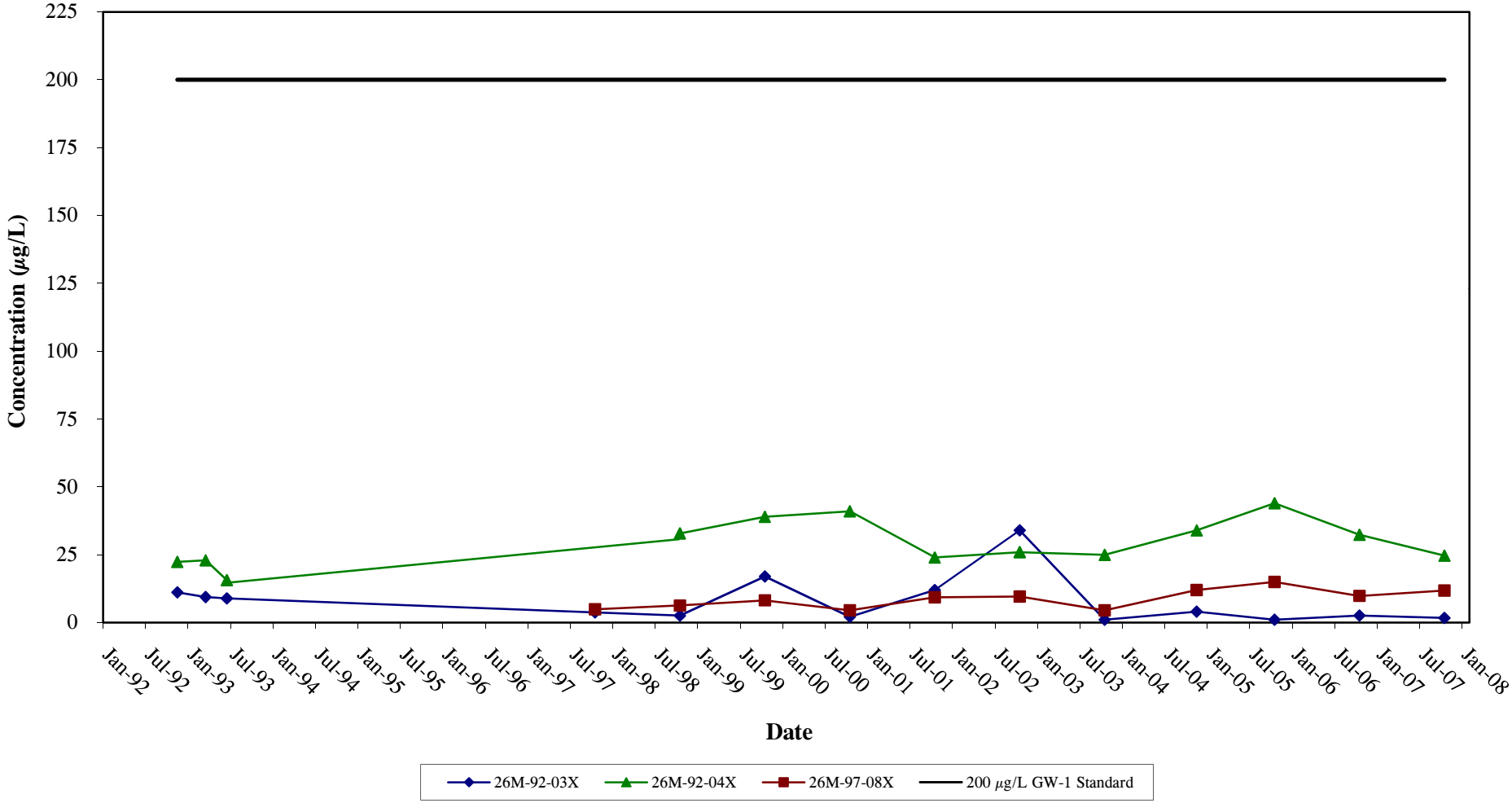


Figure 6.7
Long-Term Trends
HMX
South Post Impact Area - Area of Contamination 27

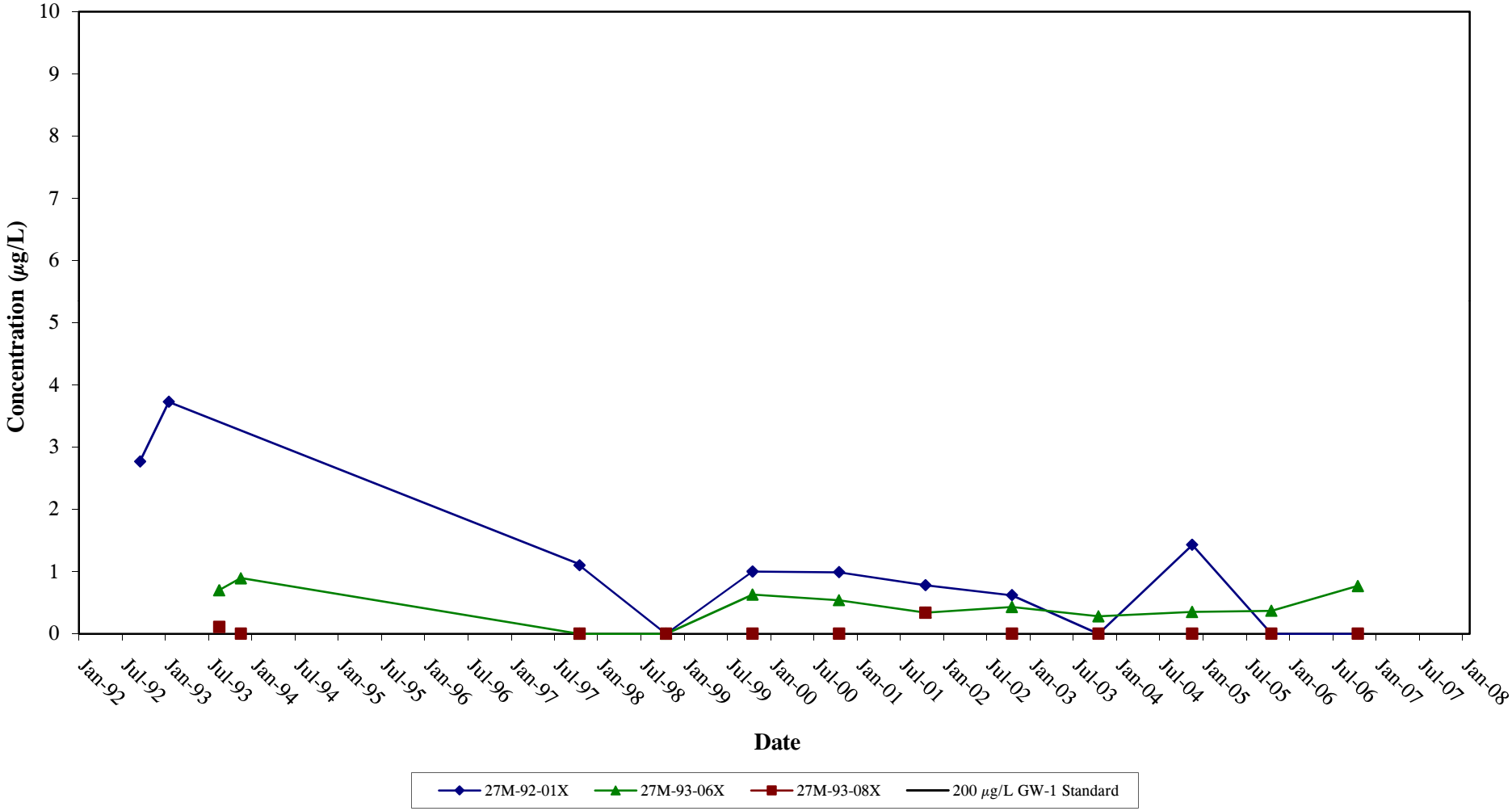


Figure 6.8
Long-Term Trends
RDX
South Post Impact Area - Area of Contamination 26

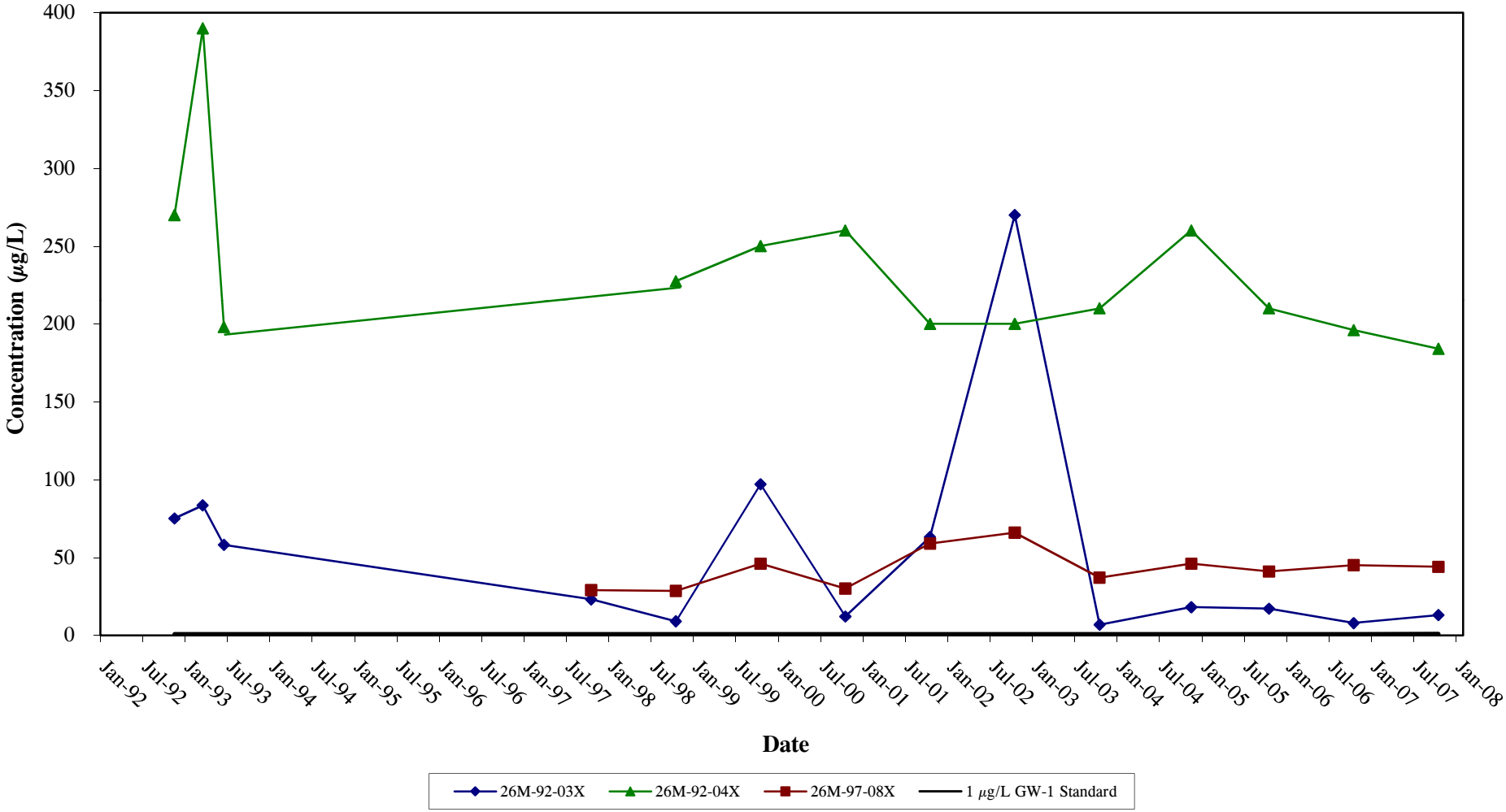


Figure 6.9
Long-Term Trends
RDX
South Post Impact Area - Area of Contamination 27

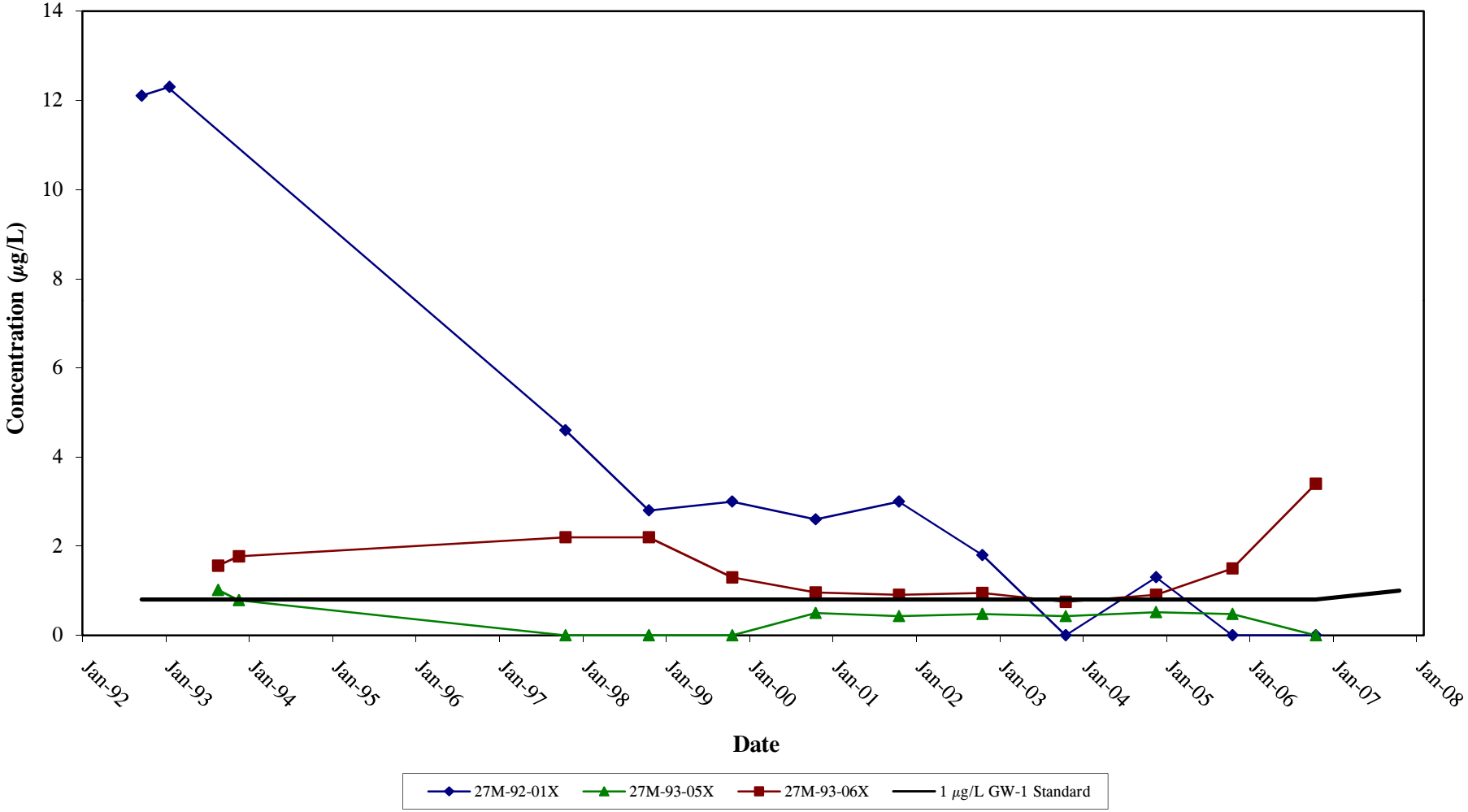


Figure 6.10a
Long-Term Trends
Arsenic
South Post Impact Area - SPM
(1 of 2)

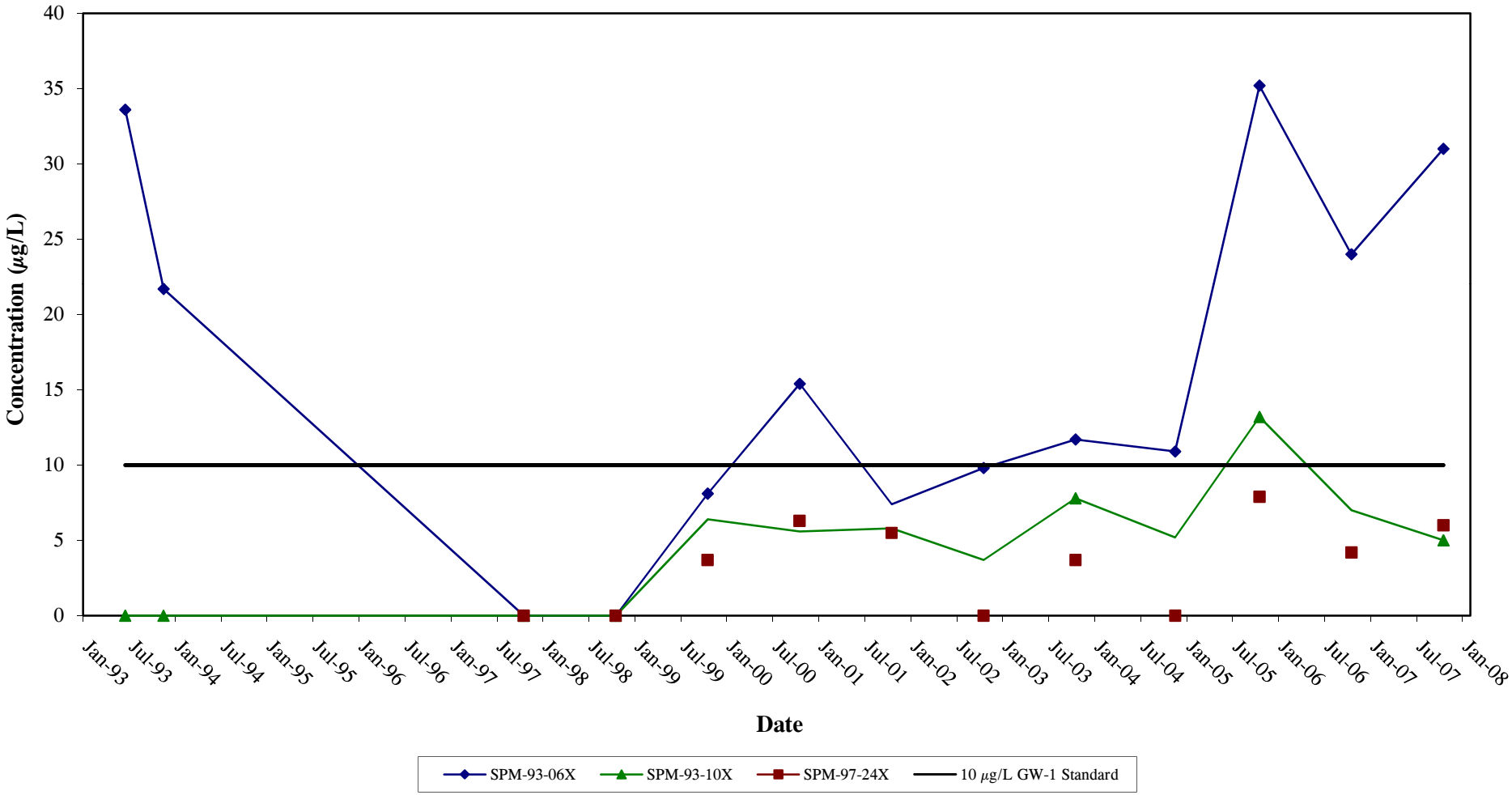


Figure 6.10b
Long-Term Trends
Arsenic
South Post Impact Area - SPM
(2 of 2)

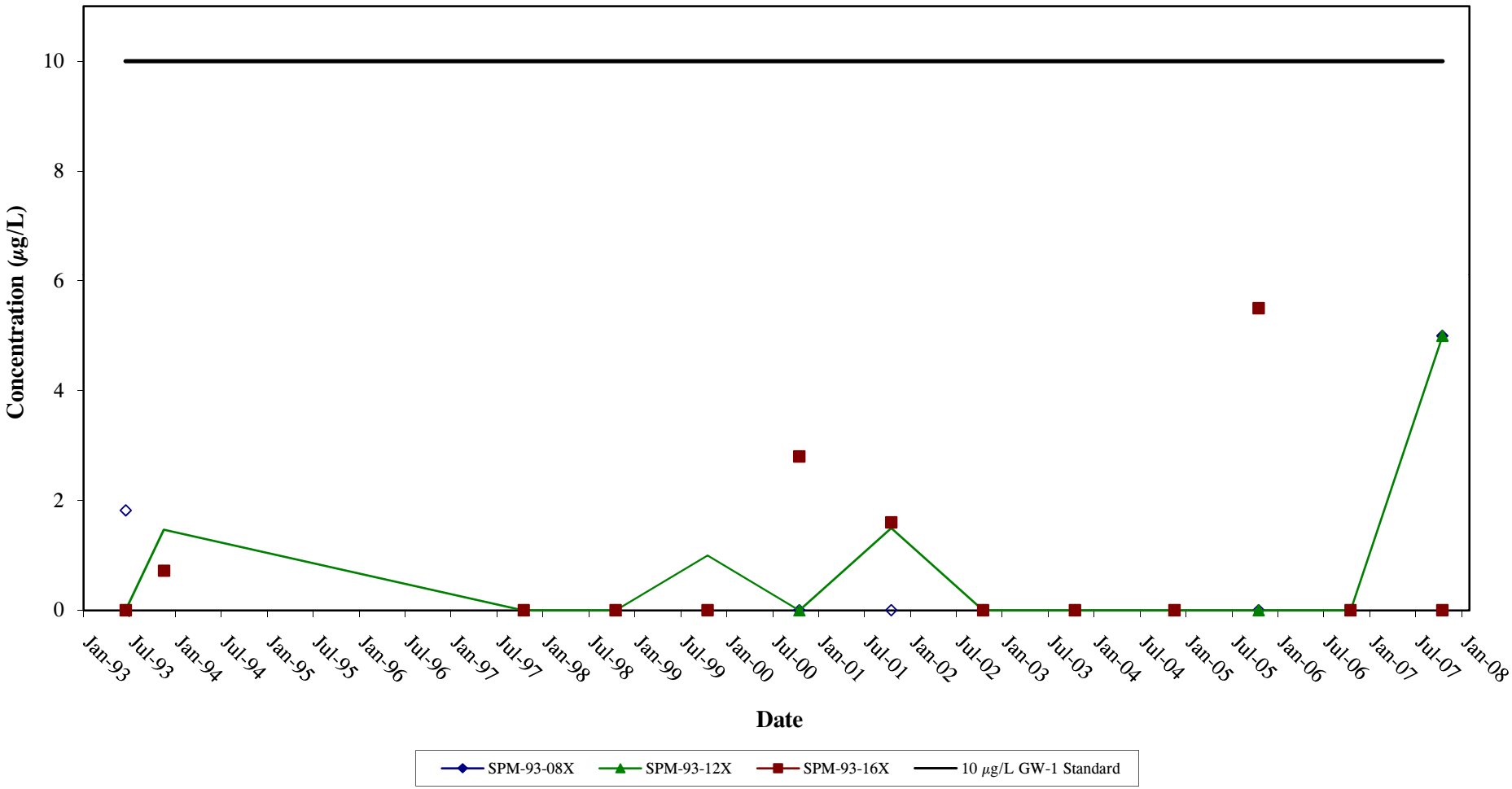
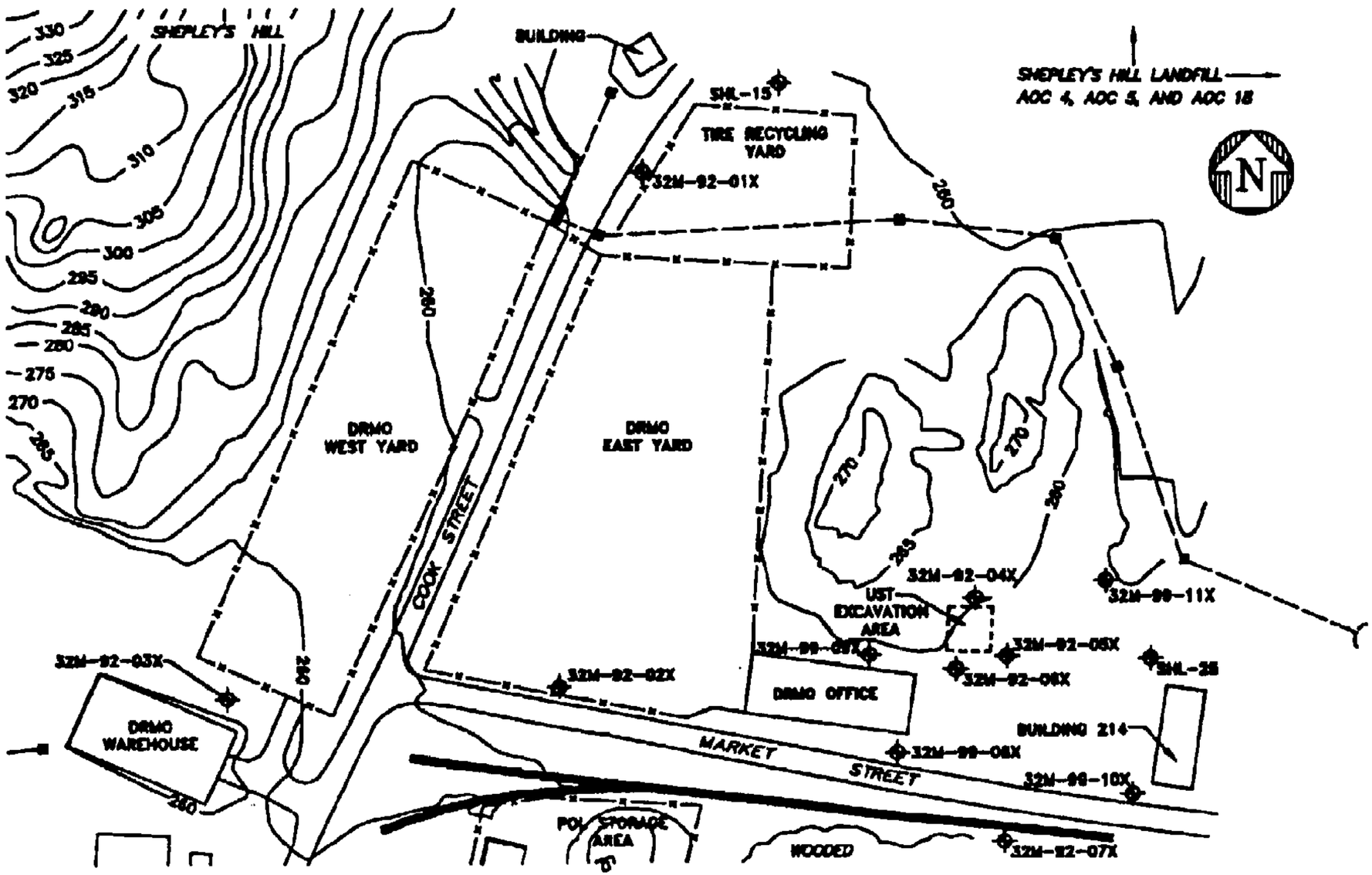


Figure 7.1
Site Map
Area of Contamination 32

U.S. Army Corps of Engineers
New England District



LEGEND

- 265 — TOPOGRAPHIC CONTOUR
- IMPROVED ROAD
- CHAINLINK FENCE
- RAILROAD TRACK
- STORM DRAIN WITH CATCH BASIN

Filename:X:/OMA010/Ft_Devens/Maps/DO501/2010_5-year_Review/AOC-32_HLA.mxd
Revised: 06/14/10 CNL
Source: HGL GIS; Harding Lawson Associates, 2000; Stone & Weber Engineering Corporation, 2000

HGL HydroGeoLogic, Inc

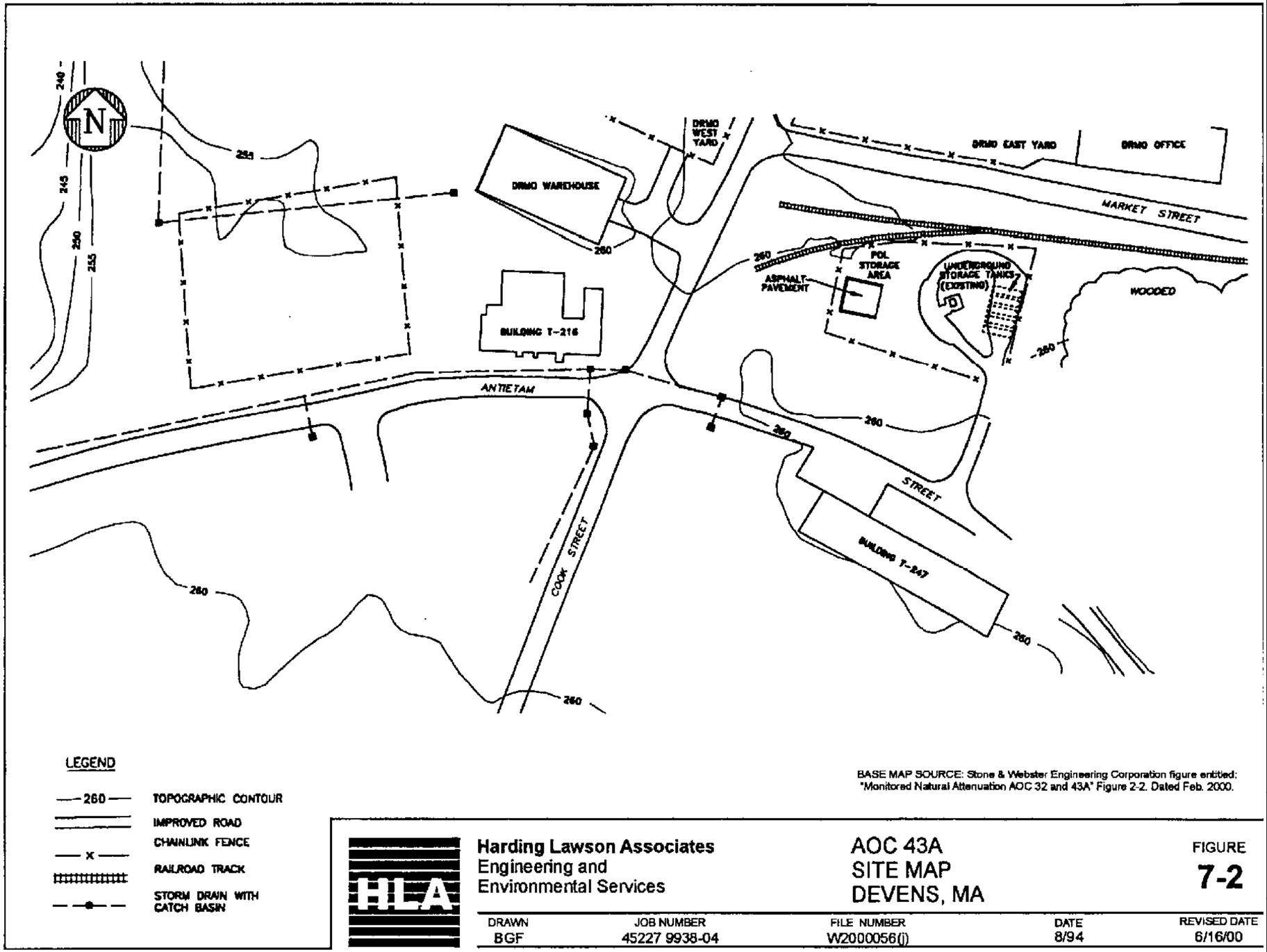


Figure 7.2
Site Map
Area of Contamination 43A

Harding Lawson Associates
Engineering and
Environmental Services

AOC 43A
SITE MAP
DEVENS, MA

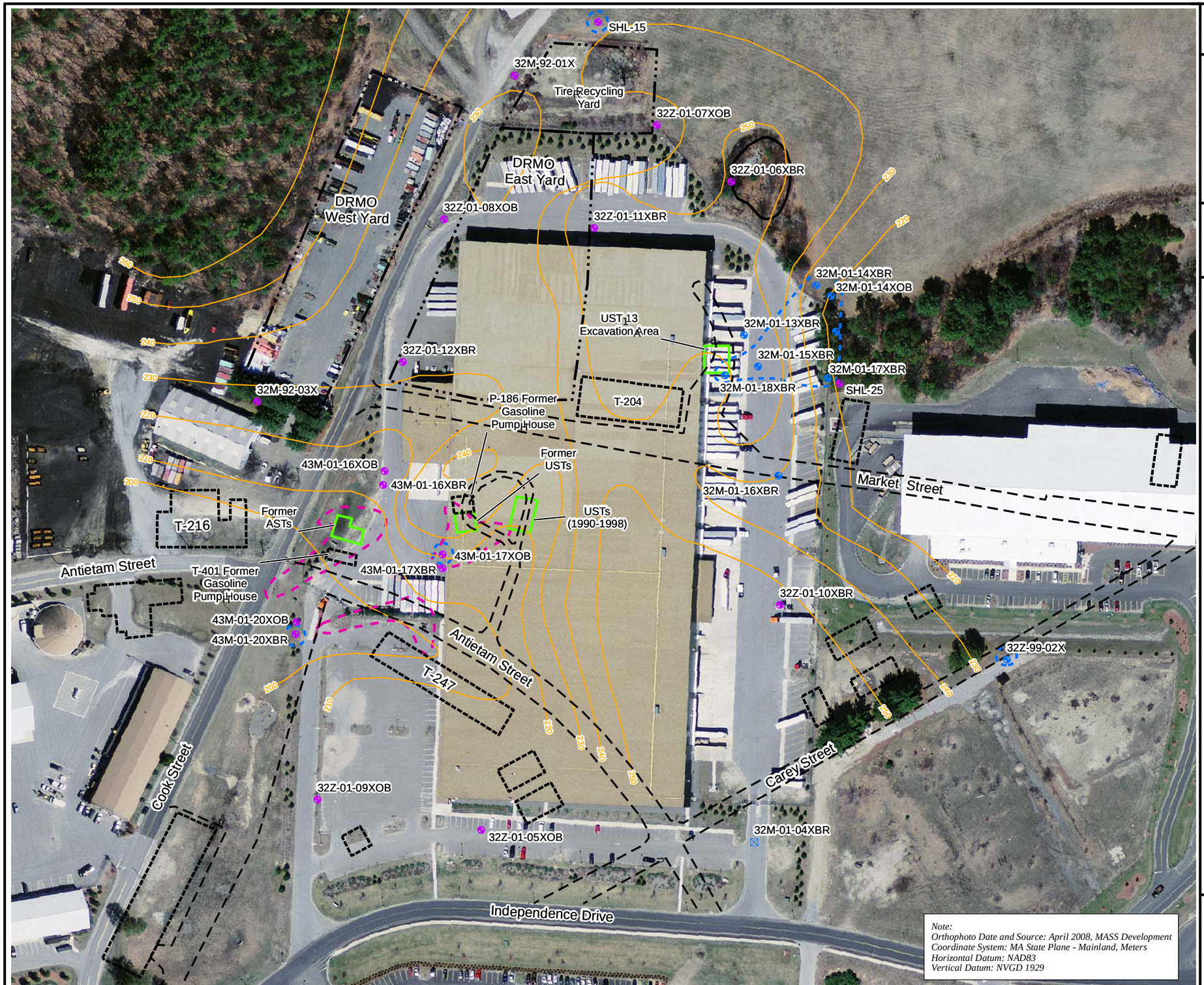
FIGURE
7-2

DRAWN	JOB NUMBER	FILE NUMBER	DATE	REVISED DATE
BGF	45227 9938-04	W2000056(j)	8/94	6/16/00

U.S. Army Corps of Engineers
New England District

Filename:X:/OMA010/Ft_Devens/Maps/DO501/2010_5-year_Review/AOC-43A_HLA.mxd
Revised: 08/16/10 CNL
Source: HGL GIS; Harding Lawson Associates, 2000; Stone & Weber Engineering Corporation, 2000

HGL HydroGeoLogic, Inc



HGL—2010 Five-Year Review
Former Fort Devens Army Installation—Devens, MA

Figure 7.3
Site Map
Areas of Contamination 32 and 43A

U.S. Army Corps of Engineers
New England District

Legend

- LTM Sample Well
- LTM Well -Gauge Only
- Monitoring Well -Paved Over
- Post -Construction Bedrock Contour
- Former Road
- Former Building
- Former Yard
- Underground Storage Tank
- TPHC Soil Contamination
- Remaining Bedrock Outcrop
- Maximum Historical Extent of Groundwater Contamination in Exceedance of Cleanup Goals (Based on April 2002 to October 2009 Analytical Data)

N

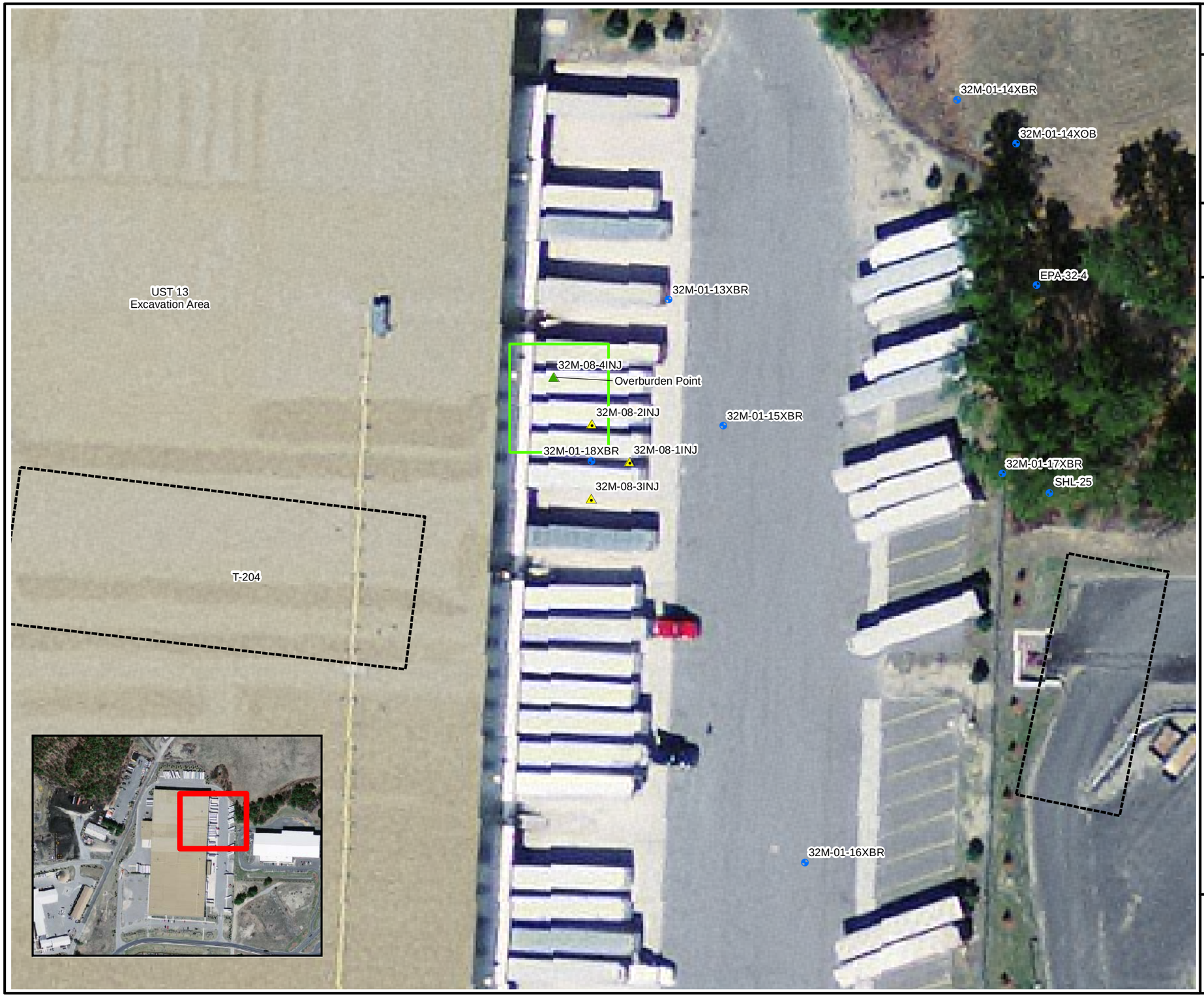
0 80 160 320
SCALE IN FEET

X:/OMA010/Ft_Devens/DO501/Maps/2010_5-year_Review/AOC_43A.mxd
Revised: 08/30/10 CNL
Source: HGL GIS, MASS.GOV, ESRI, USACE

HGL HydroGeoLogic, Inc

Figure 7.4
Areas of Contamination 32 and 43A Persulfate Injection Locations

U.S. Army Corps of Engineers
New England District



Legend

- Monitoring Well
- Injection Well
- Overburden/Bedrock Injection Well
- Former Building
- Former Underground Storage Tank Location

Note:
Orthophoto Date and Source: 2008, USGS
Coordinate System: MA State Plane - Mainland, Meters
Horizontal Datum: NAD83

N

0 20 40 80
SCALE IN FEET

X:/OMA010/Ft_Devens/DO501/Maps/
2010_5-year_Review/Inject_Wells.mxd
Revised: 08/30/10 C NL
Map Source: HGL GIS, MASS.GOV, ESRI, USACE

HGL HydroGeoLogic, Inc

Figure 7.5
Long-Term Trends
Trichloroethene
Areas of Contamination 32 and 43A
Well 32M-01-18XBR

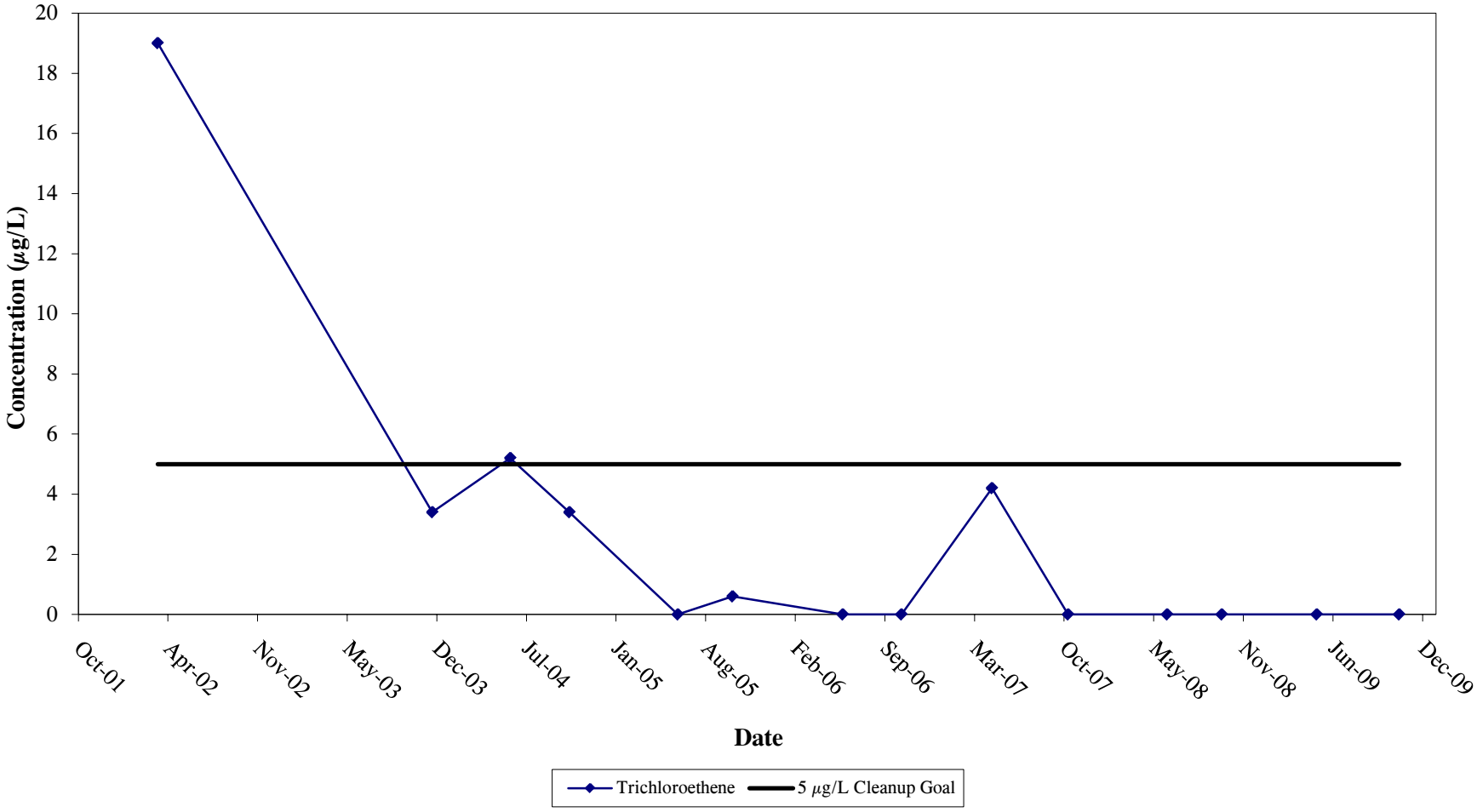


Figure 7.6
Long-Term Trends
1,2-Dichlorobenzene
Areas of Contamination 32 and 43A
Well 32M-01-18XBR

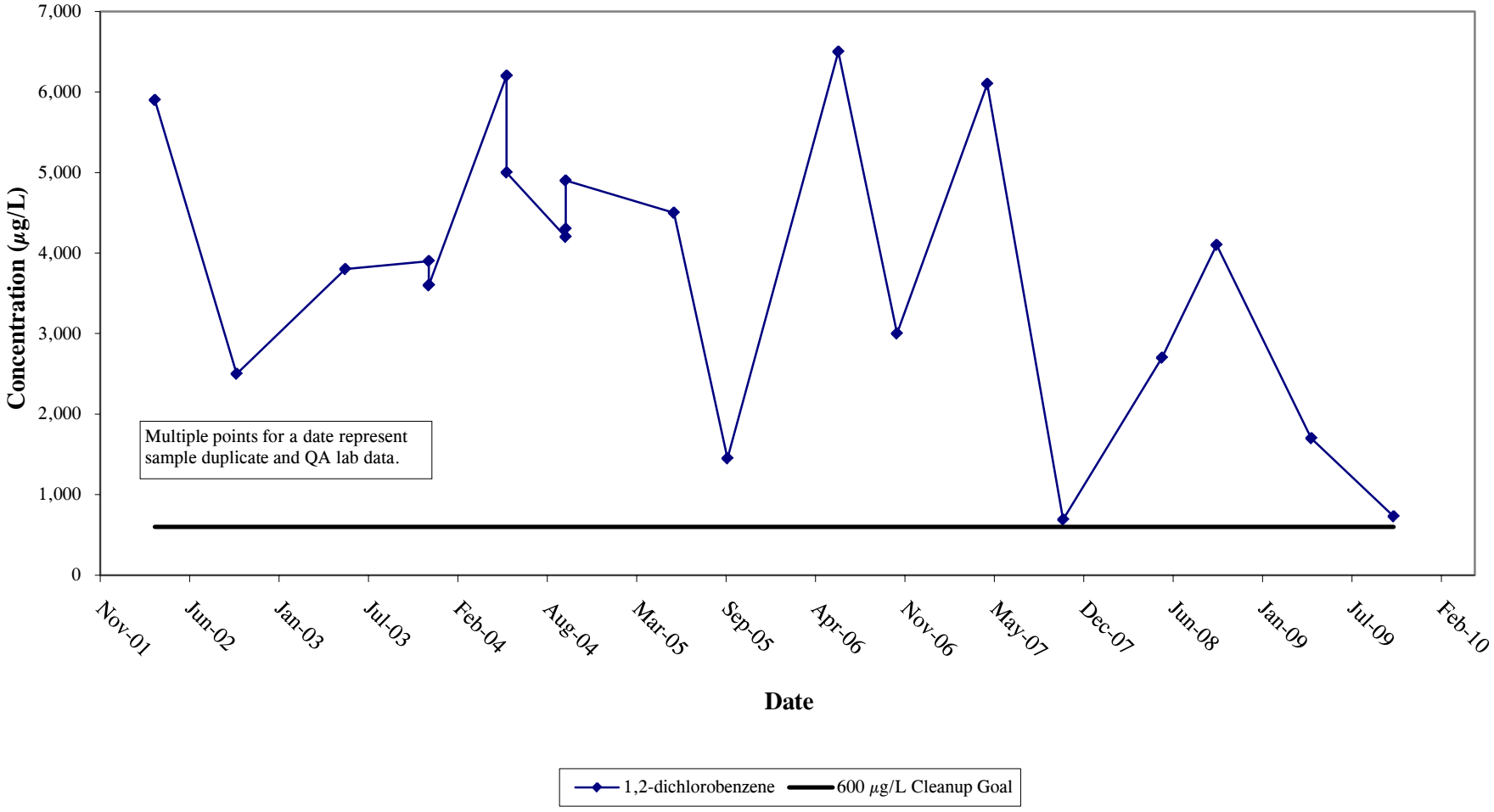


Figure 7.7
Long-Term Trends
1,3-Dichlorobenzene
Areas of Contamination 32 and 43A
Well 32M-01-18XBR

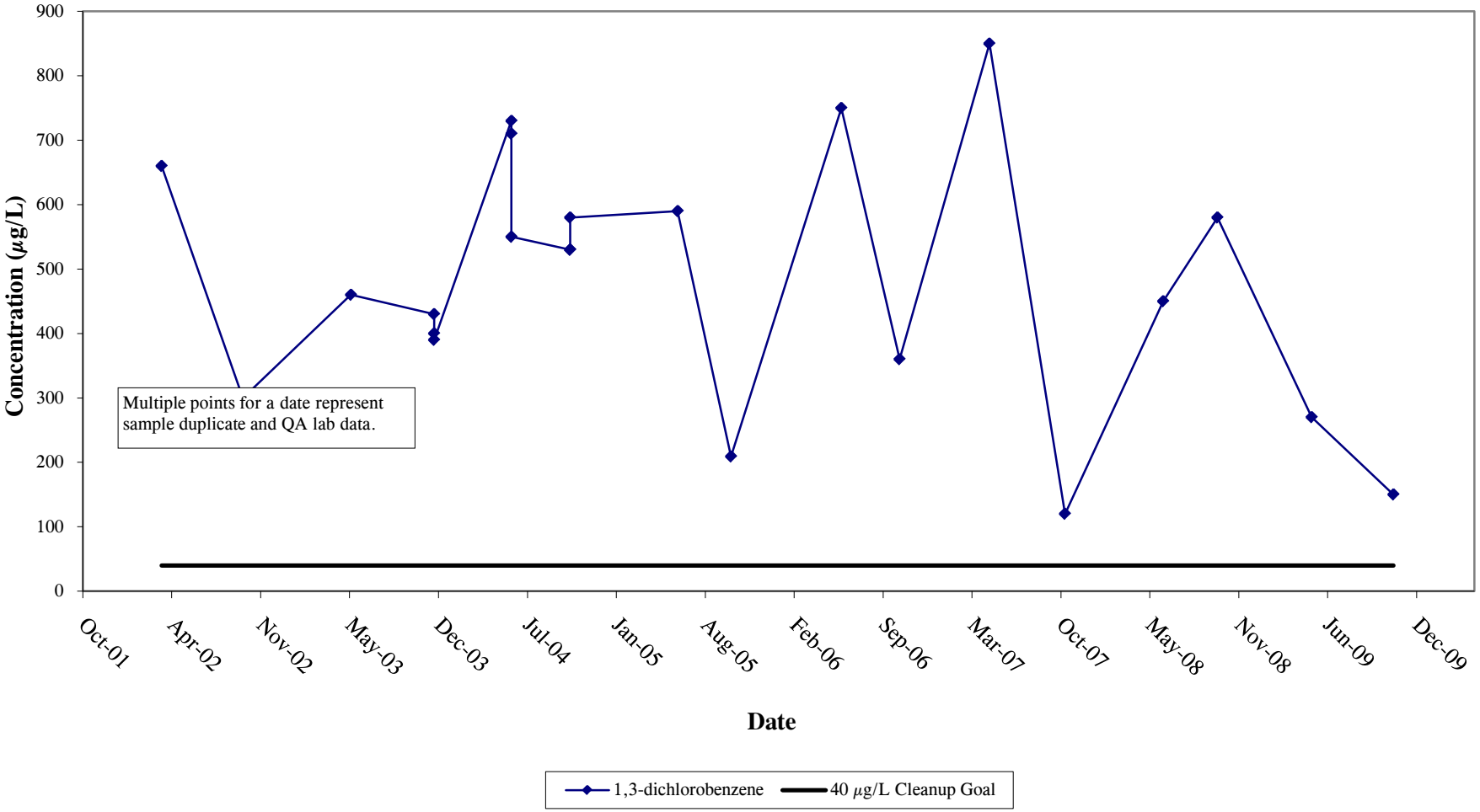


Figure 7.8
Long-Term Trends
1,4-Dichlorobenzene
Areas of Contamination 32 and 43A
Well 32M-01-18XBR

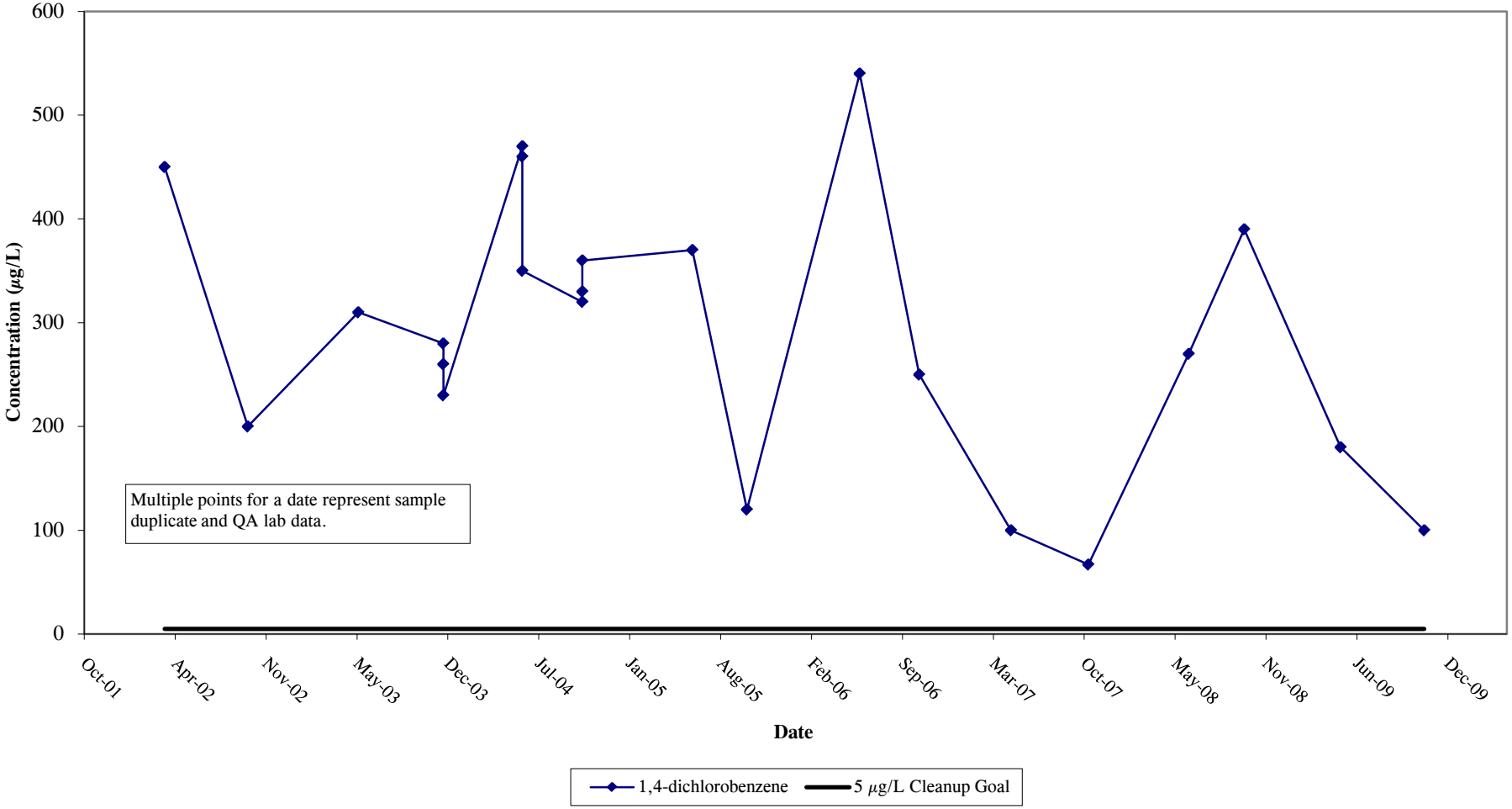


Figure 7.9
Long-Term Trends
Chlorobenzene
Areas of Contamination 32 and 43A
Well 32M-01-18XBR

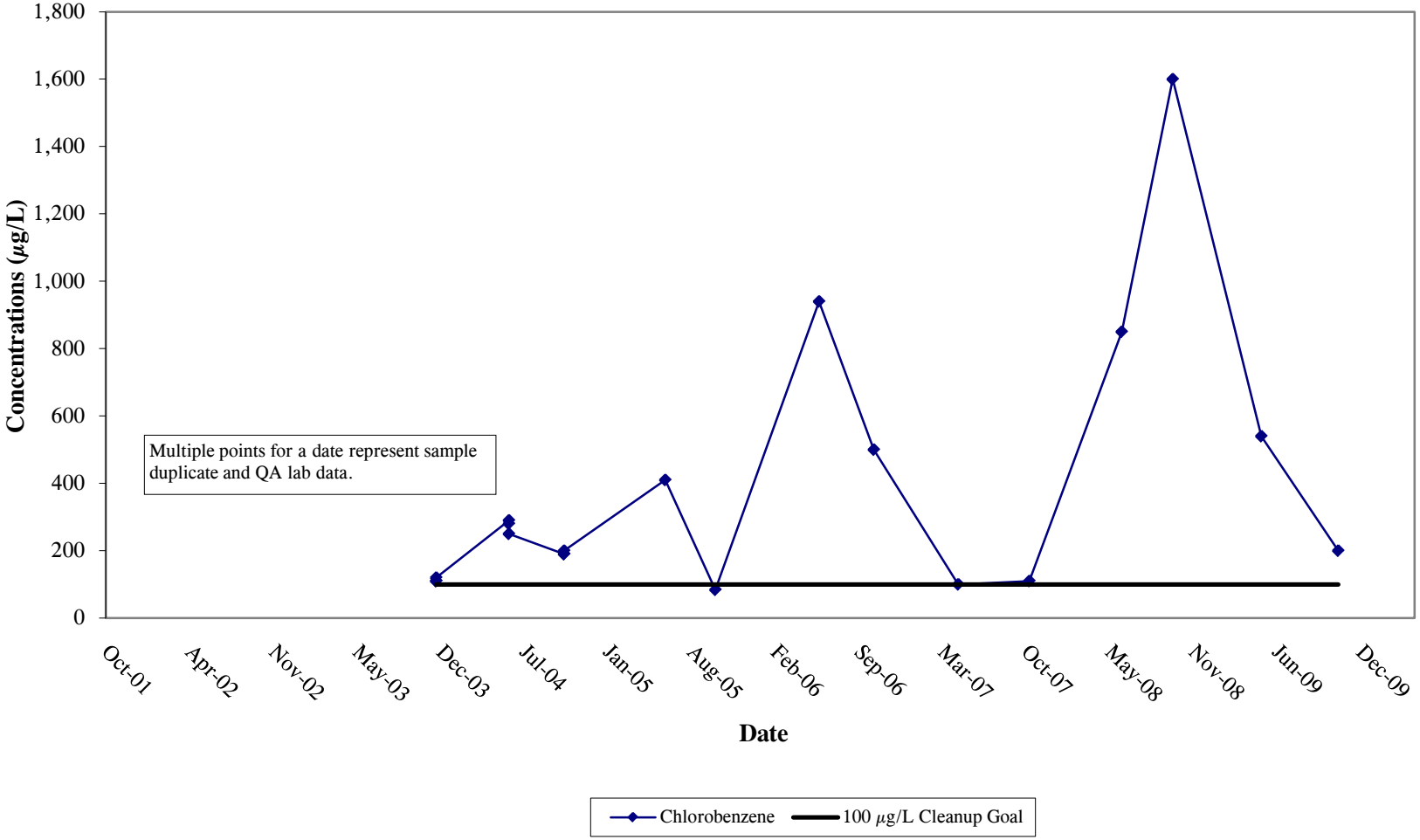


Figure 7.10
Long-Term Trends
C_9-C_{10} Aromatics
Areas of Contamination 32 and 43A
Well 32M-01-18XBR

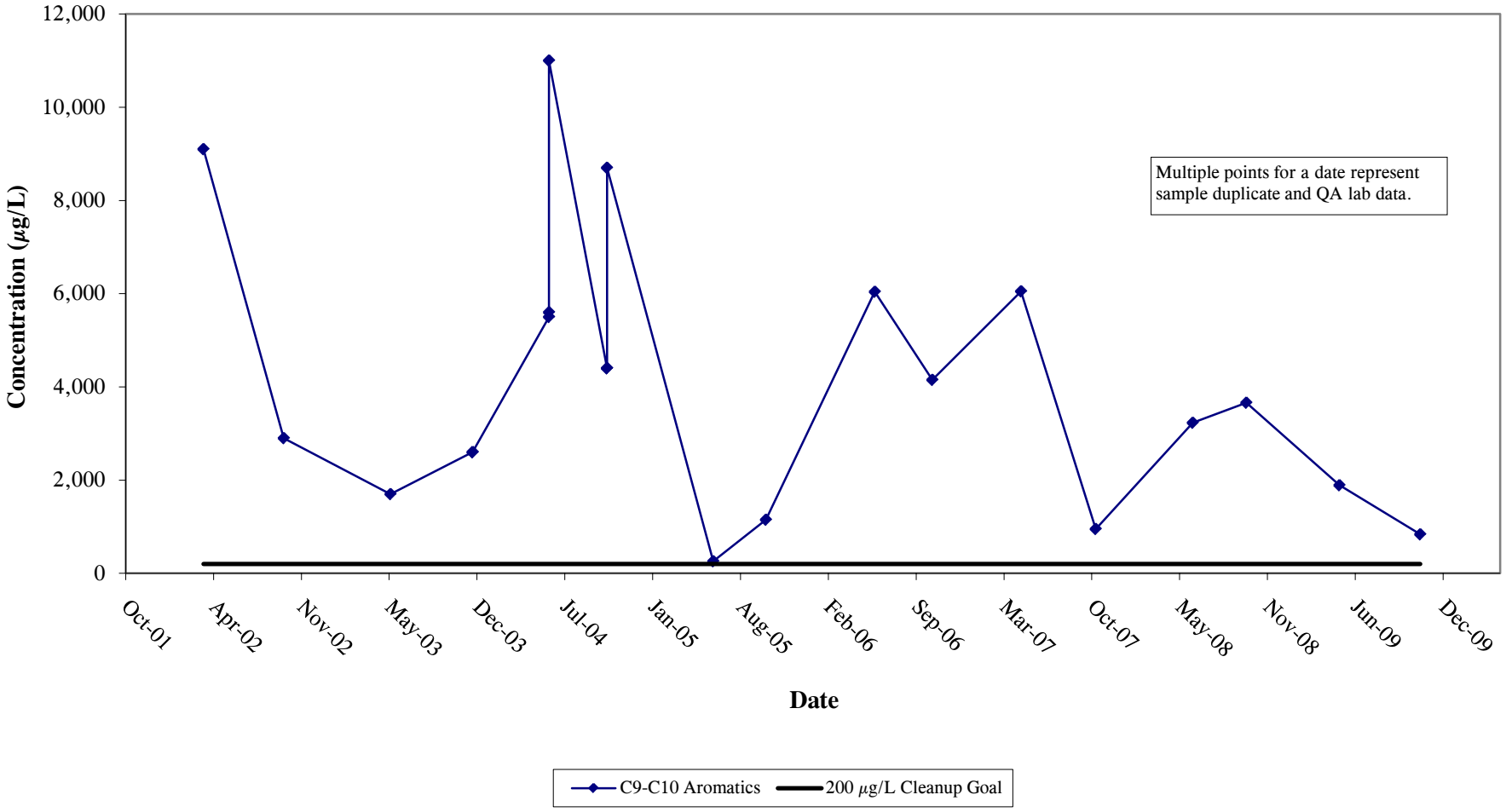
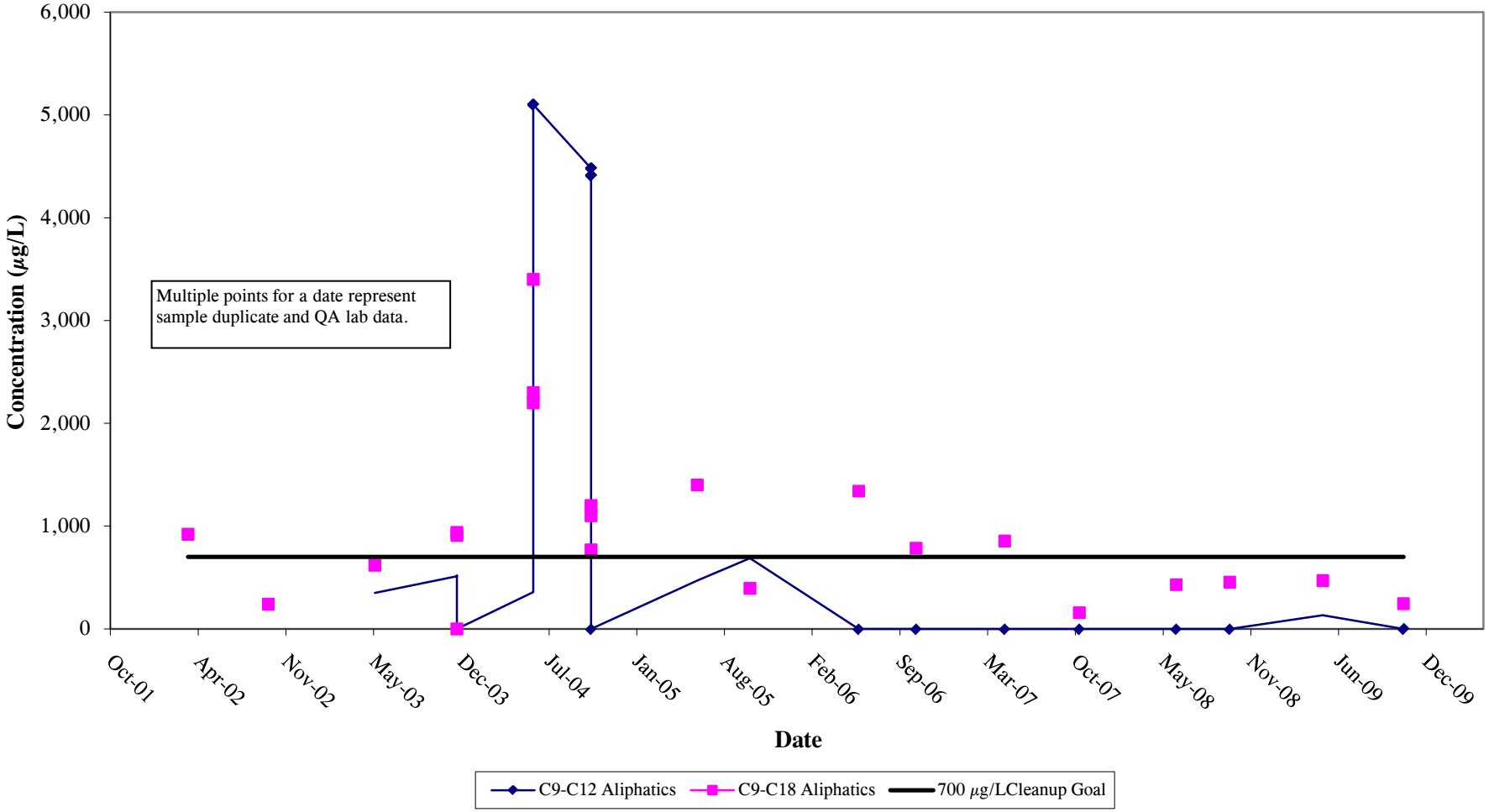


Figure 7.11
Long-Term Trends
C_9-C_{12} and C_9-C_{18} Aliphatics
Areas of Contamination 32 and 43A
Well 32M-01-18XBR



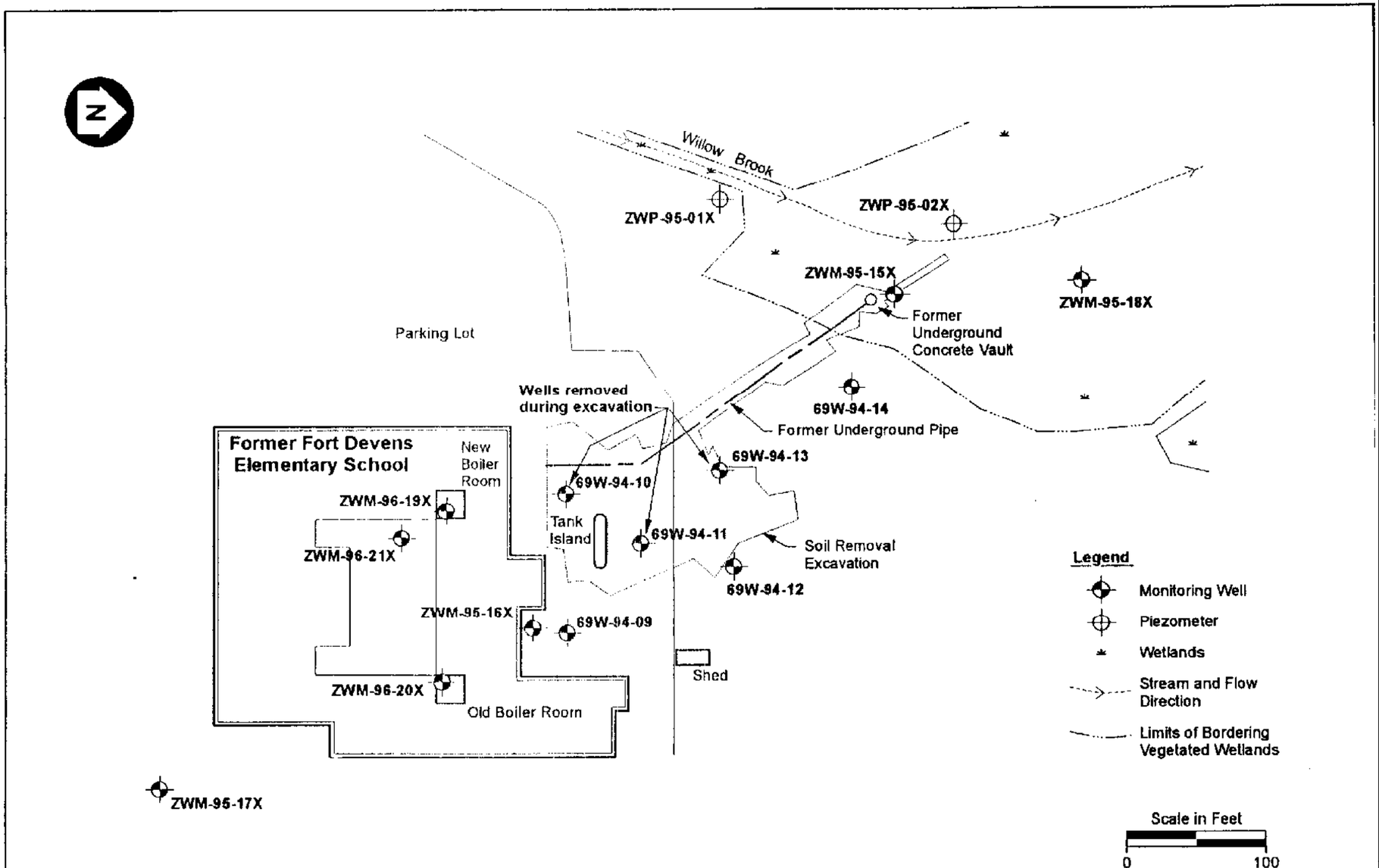


Figure 8.1
Site Map
Area of Contamination 69W

Harding Lawson Associates
Engineering and Environmental Services

Site Plan
AOC 69W Record of Decision
Devens, Massachusetts

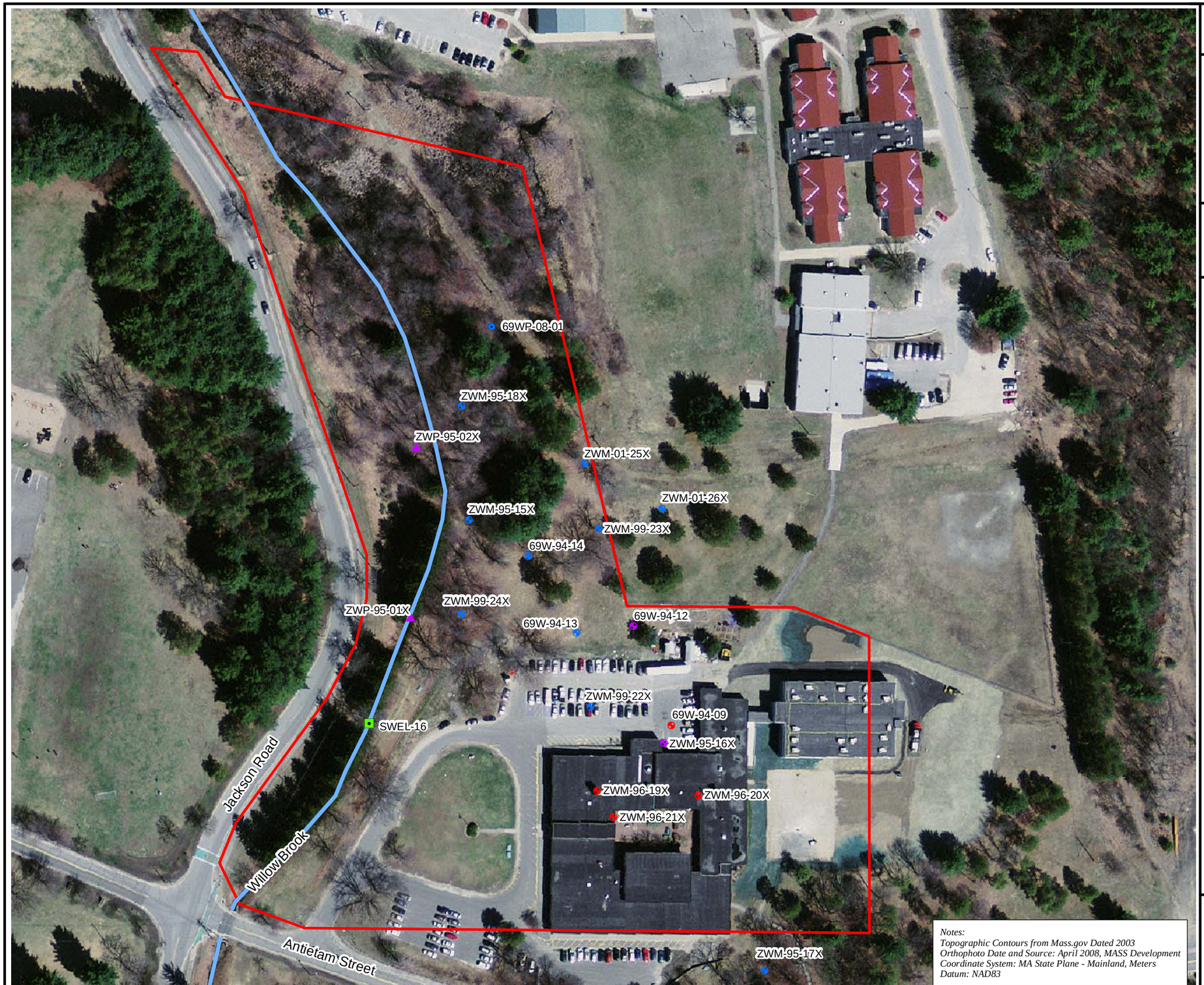
FIGURE 2

DRAWN:	JOB NUMBER:	FILE NUMBER:	APPROVED:	DATE:	REVISED DATE:
jph	45001	W9906003(b)		6/99	

U.S. Army Corps of Engineers
New England District

Filename:X:/OMA010/Ft_Devens/Maps/DO501/2010_5-year_Review/AOC_69W.mxd
Revised: 08/16/10 CNL
Source: HGL GIS; Harding Lawson Associates, 1999

HGL HydroGeoLogic, Inc



Notes:
Topographic Contours from Mass.gov Dated 2003
Orthophoto Date and Source: April 2008, MASS Development
Coordinate System: MA State Plane - Mainland, Meters
Datum: NAD83

HGL—2010 Five-Year Review
Former Fort Devens Army Installation—Devens, MA

Figure 8.2
Parcel Boundary Map
Area of Contamination 69W

U.S. Army Corps of Engineers
New England District

Legend

- Monitoring Well
- LTM Sample Well
- LTM Sample Well Point
- LTM Well -Ga uge Only
- LTM Piezometer -Gauge Only
- Surface Water Elevation Location
- Stream
- Parcel Boundary

Note:
Location of 69WP-08-01 is approximate pending survey.

N

0 60 120 240
SCALE IN FEET

Filename:X:/OMA010/Ft_Devens/Maps/DO501/2010_5-year_Review/AOC_69W_Parcel.mxd
Revised: 08/23/10 C NL
Map Source: HGL GIS, MASS.GOV, ESRI, USACE

HGL HydroGeoLogic, Inc

Figure 8.3
Long-Term Trends
C_{11}-C_{22} Aromatics
Area of Contamination 69W

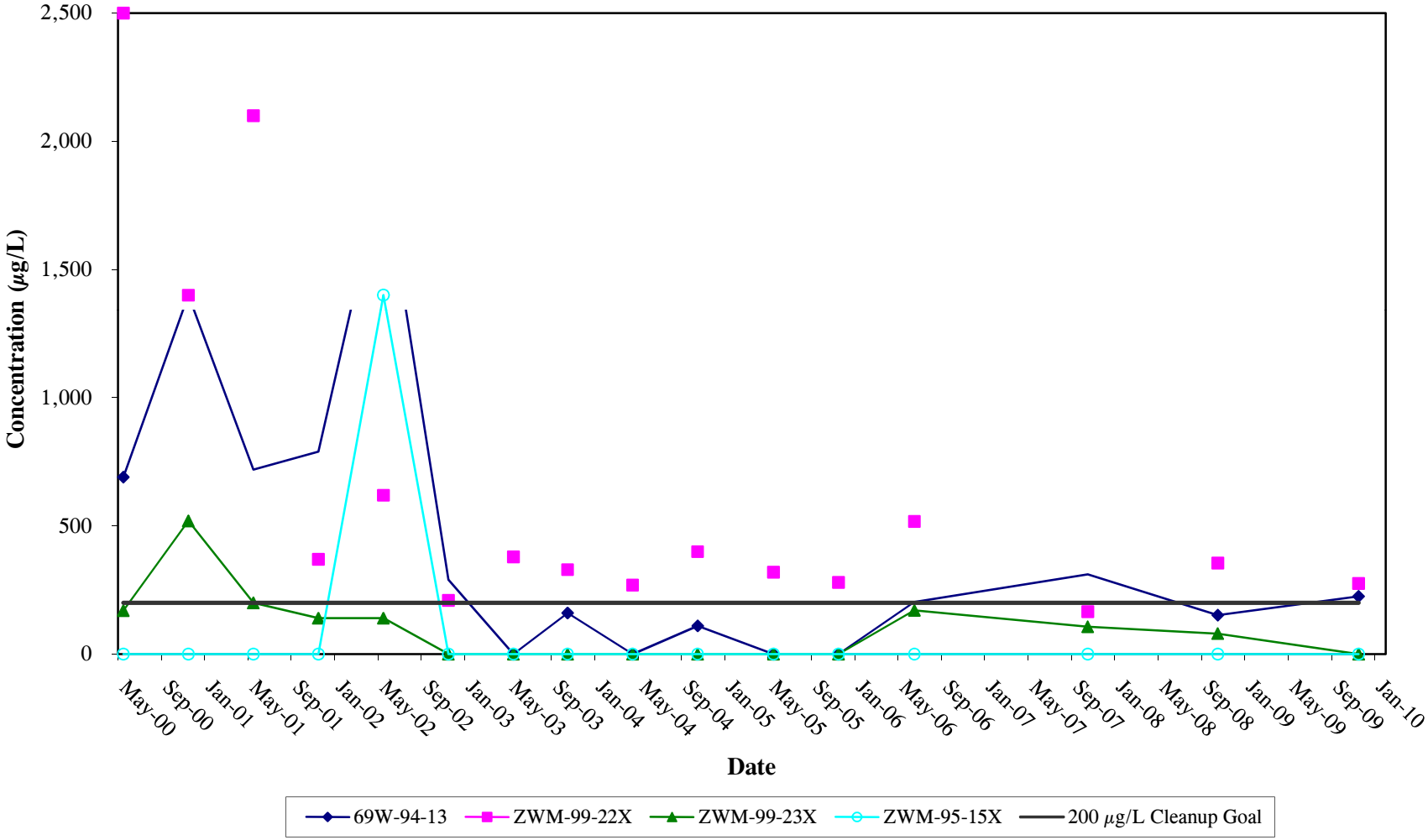


Figure 8.4
Long-Term Trends
C_9-C_{10} Aromatics
Area of Contamination 69W

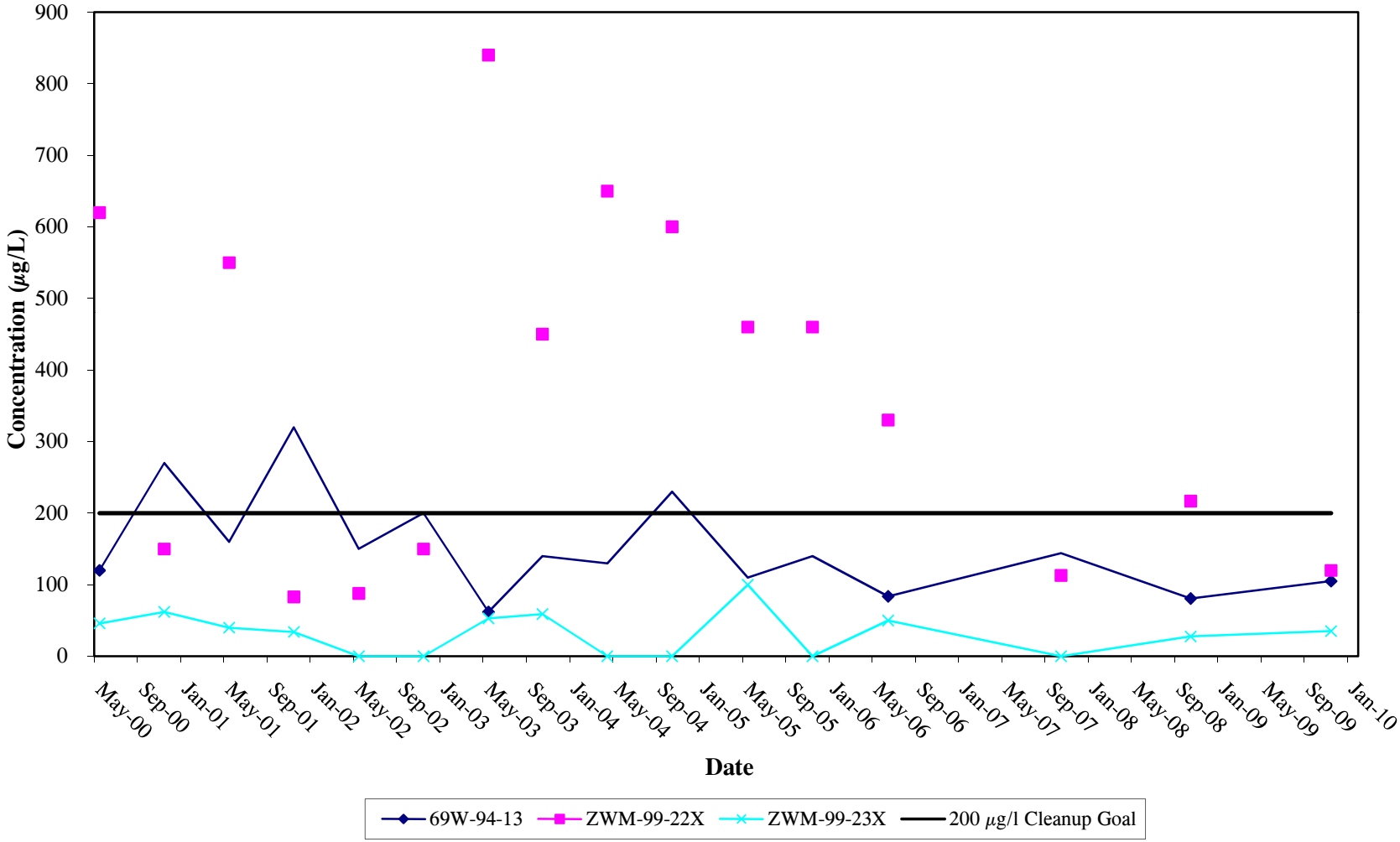


Figure 8.5
Long-Term Trends
Arsenic
Area of Contamination 69W

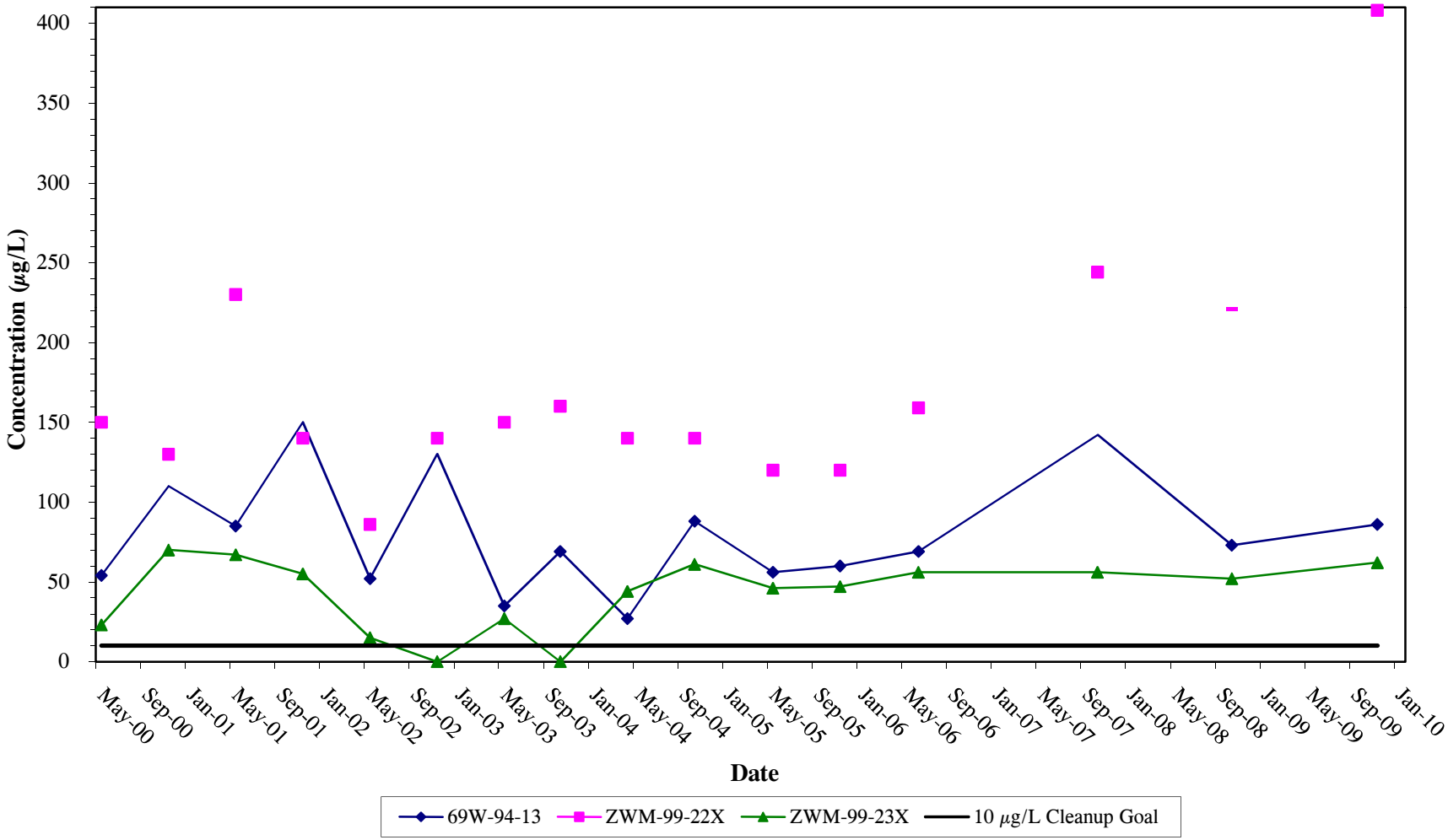
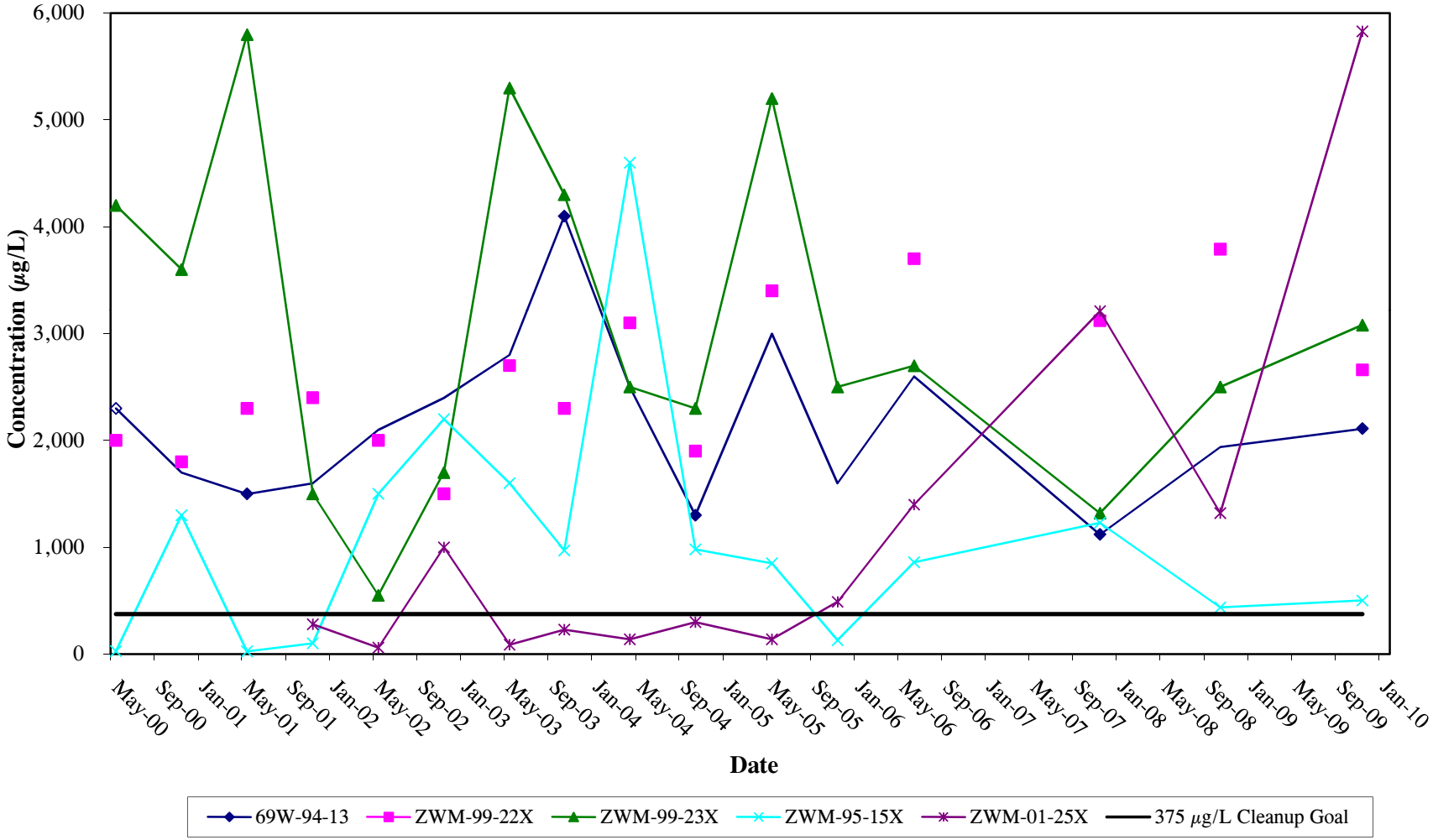
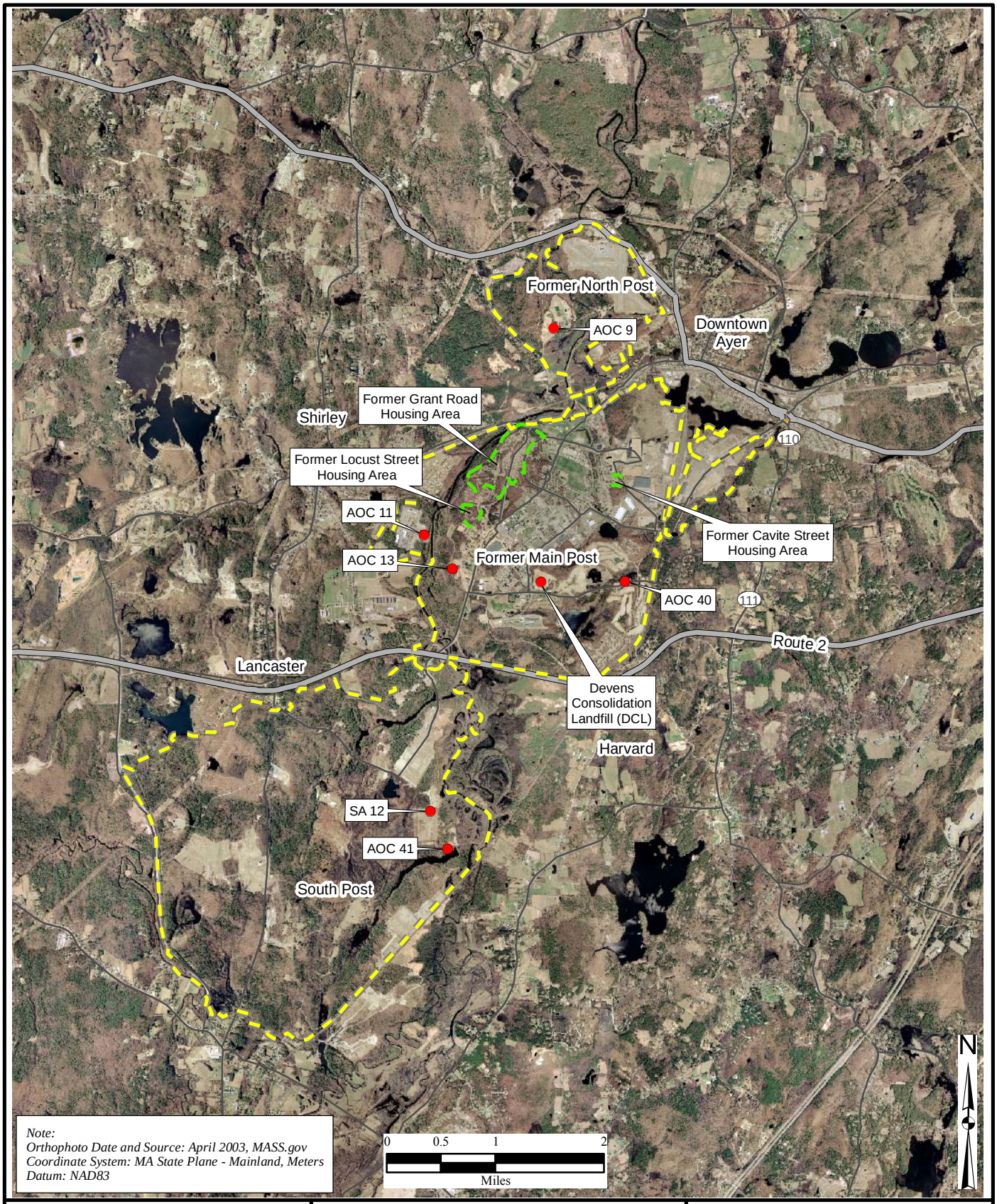


Figure 8.6
Long-Term Trends
Manganese
Area of Contamination 69W





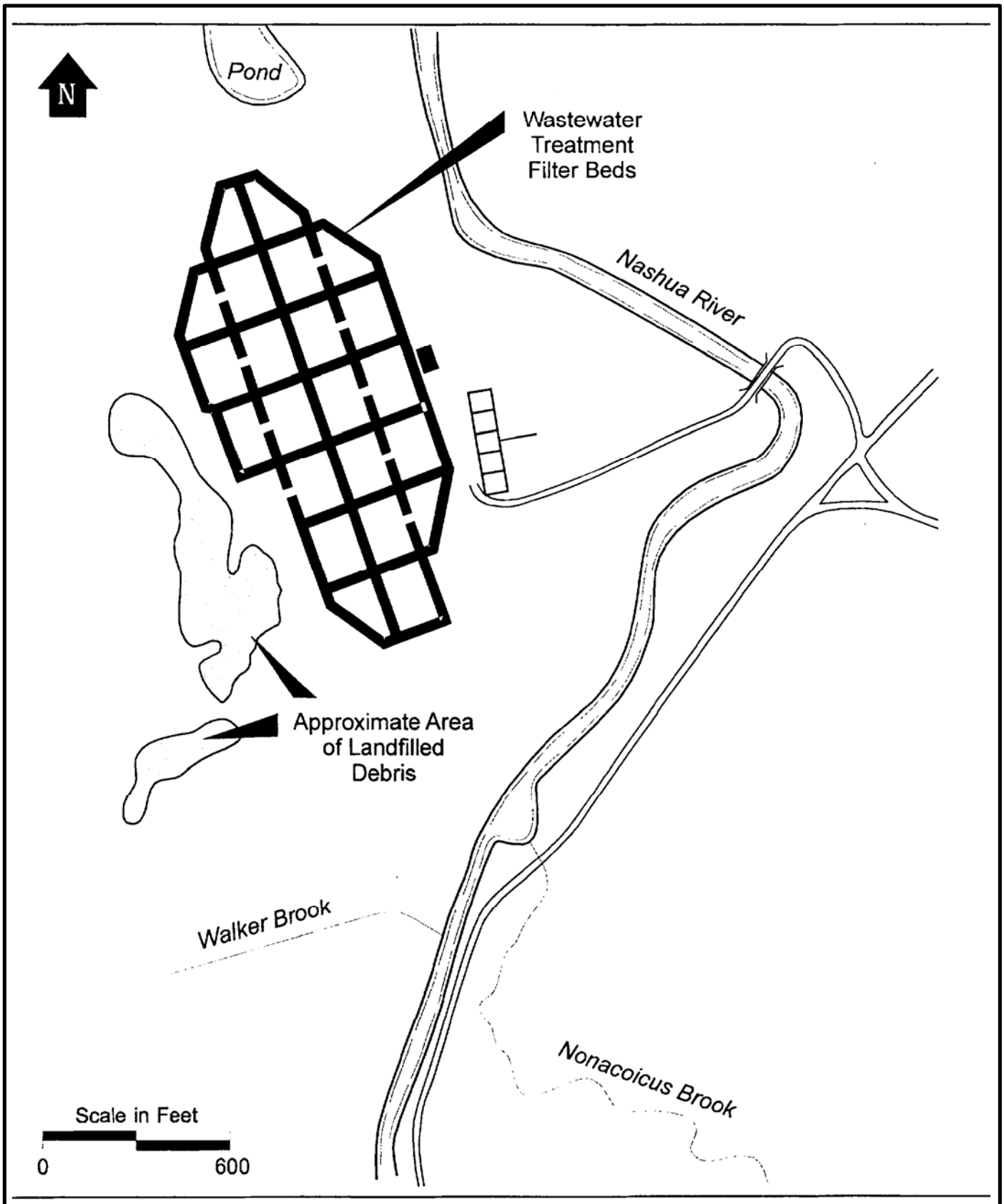
X:/OMA010/Ft_Devens/DO501/Maps/
2010_5-year_Review/DCL_Sites.mxd
Revised: 08/30/10 CNL
Source: HGL GIS, ESRI, USACE, MASS.Gov

HGL HydroGeoLogic, Inc

Legend

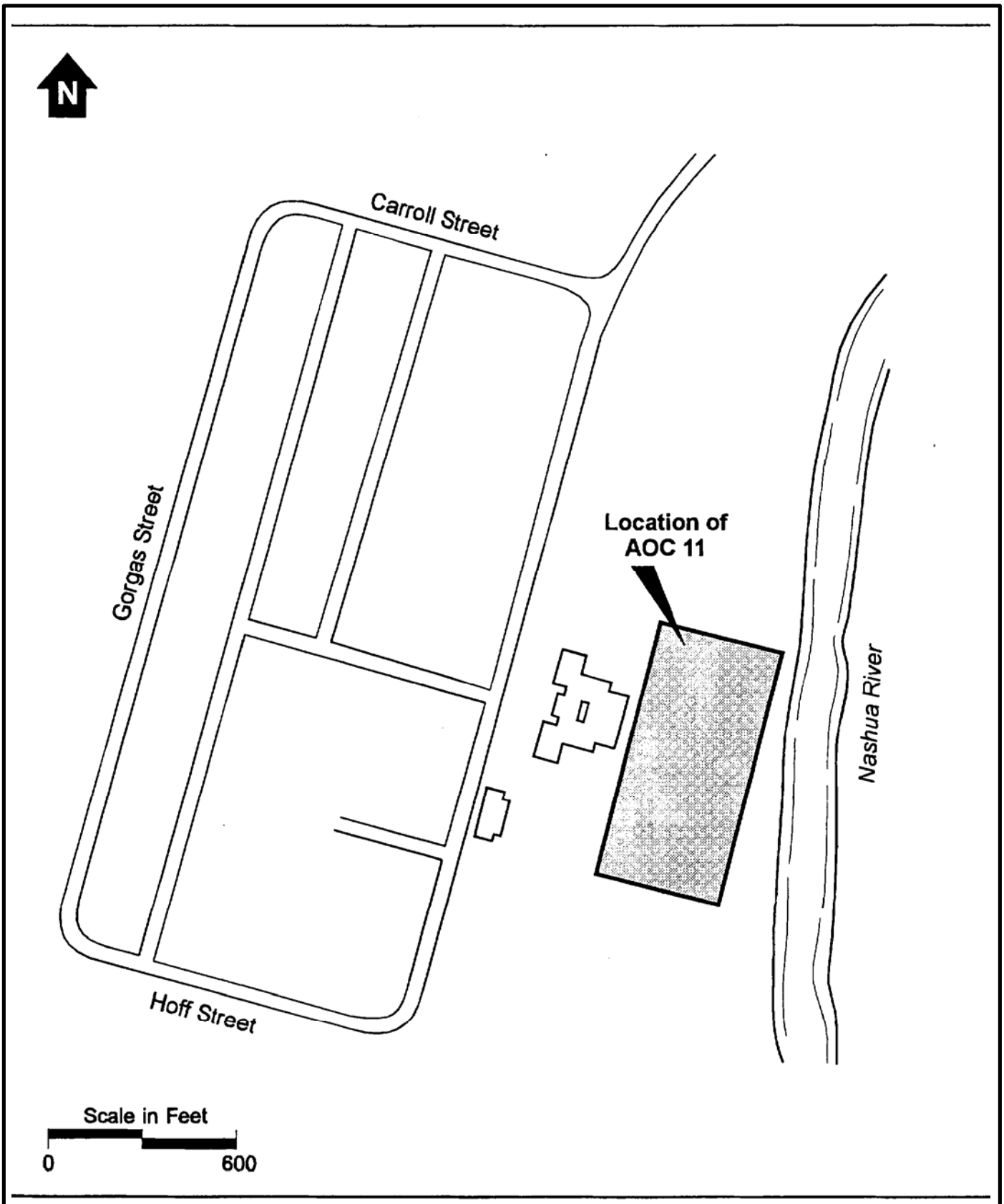
- AOC
- Highway
- Major Road
- County Line
- Former Fort Devens Boundary
- Former Housing Area

Figure 9.1
DCL Site Locations Map



X:/OMA010/Ft_Devens/DO501/Maps/
2010_5-year_Review/AOC_9.mxd
Revised: 08/30/10 CNL
Source: HGL GIS; Harding Lawson Associates, 2000

Figure 9.2
Site Map
Area of Contamination 9



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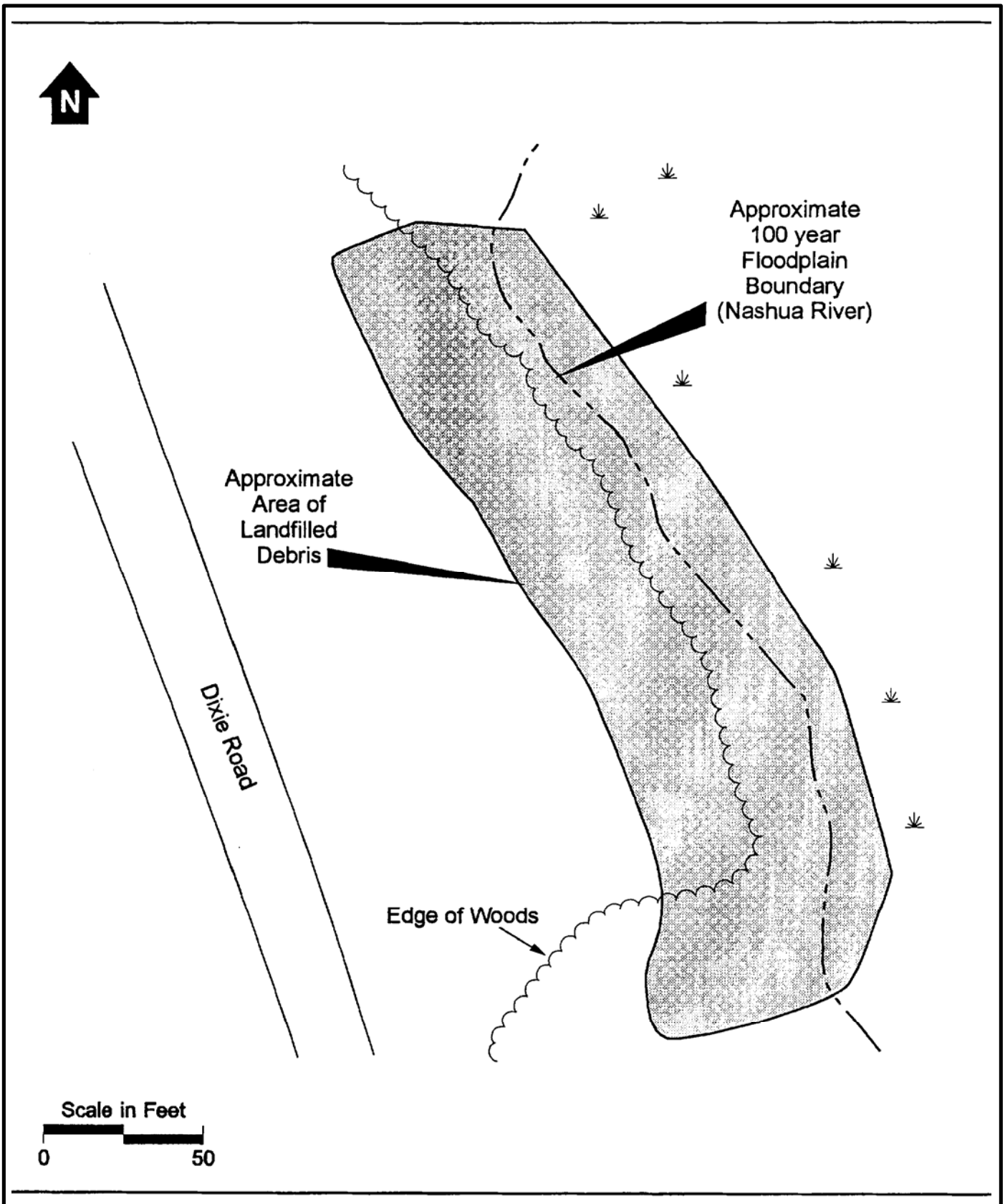
2010_5-year_Review/AOC_9.mxd
Revised: 08/30/10 CNL
Source: HGL GIS; Harding Lawson Associates, 2000

Figure 9.3
Site Map
Area of Contamination 11



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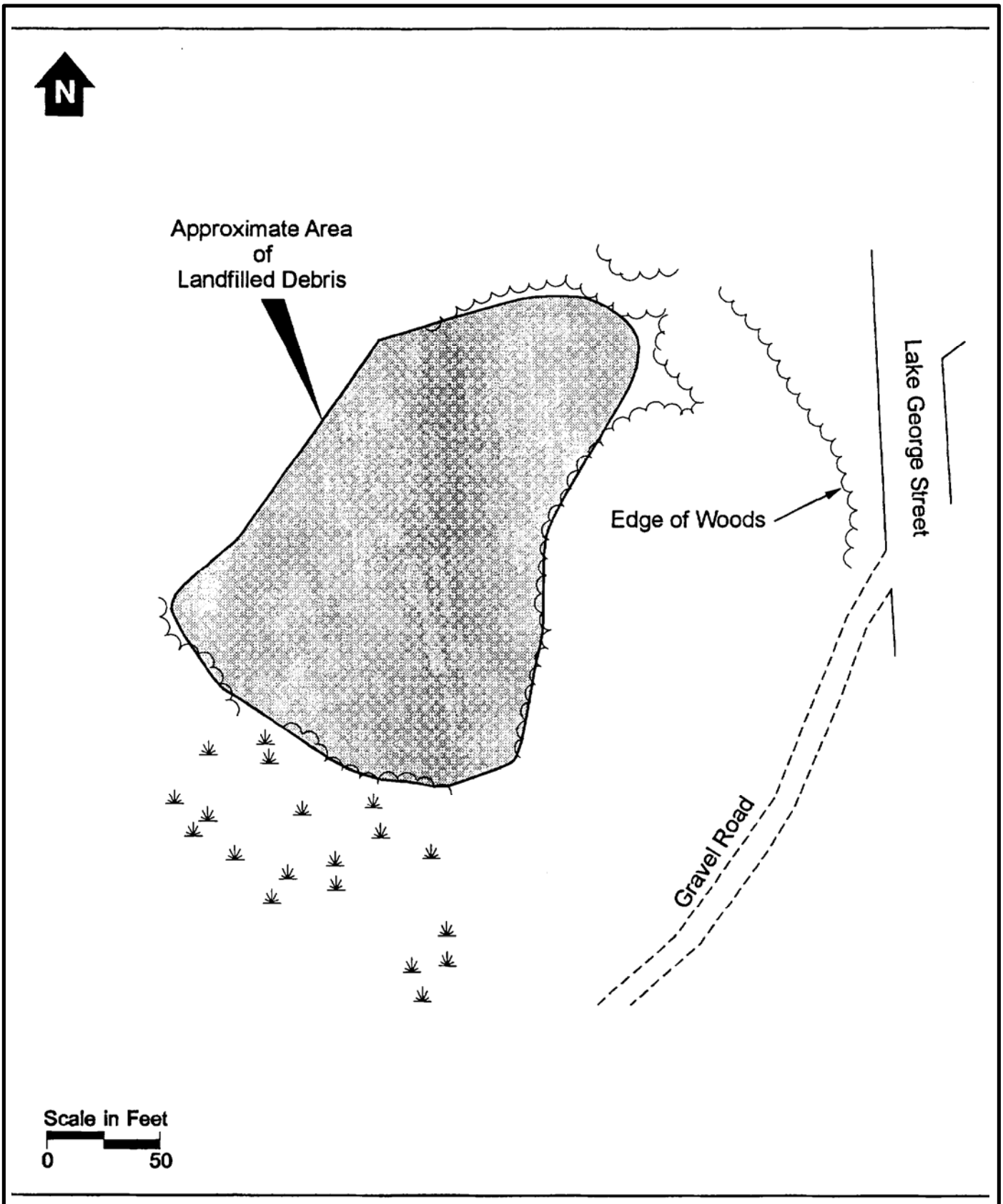
2010_5-year_Review/SA_12.mxd
Revised: 08/30/10 CNL
Source: HGL GIS; Harding Lawson Associates, 2000

Figure 9.4
Site Map
Study Area 12



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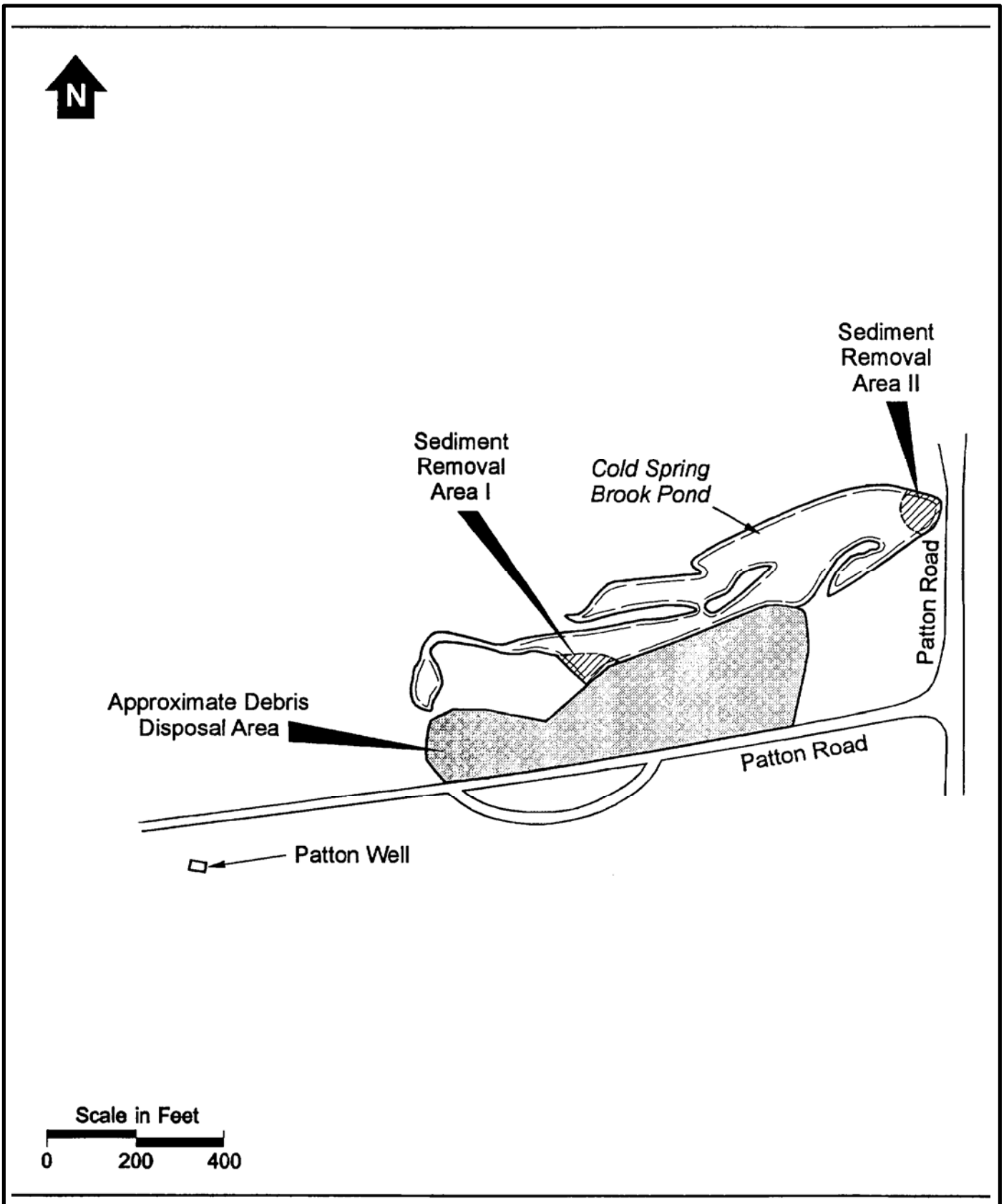
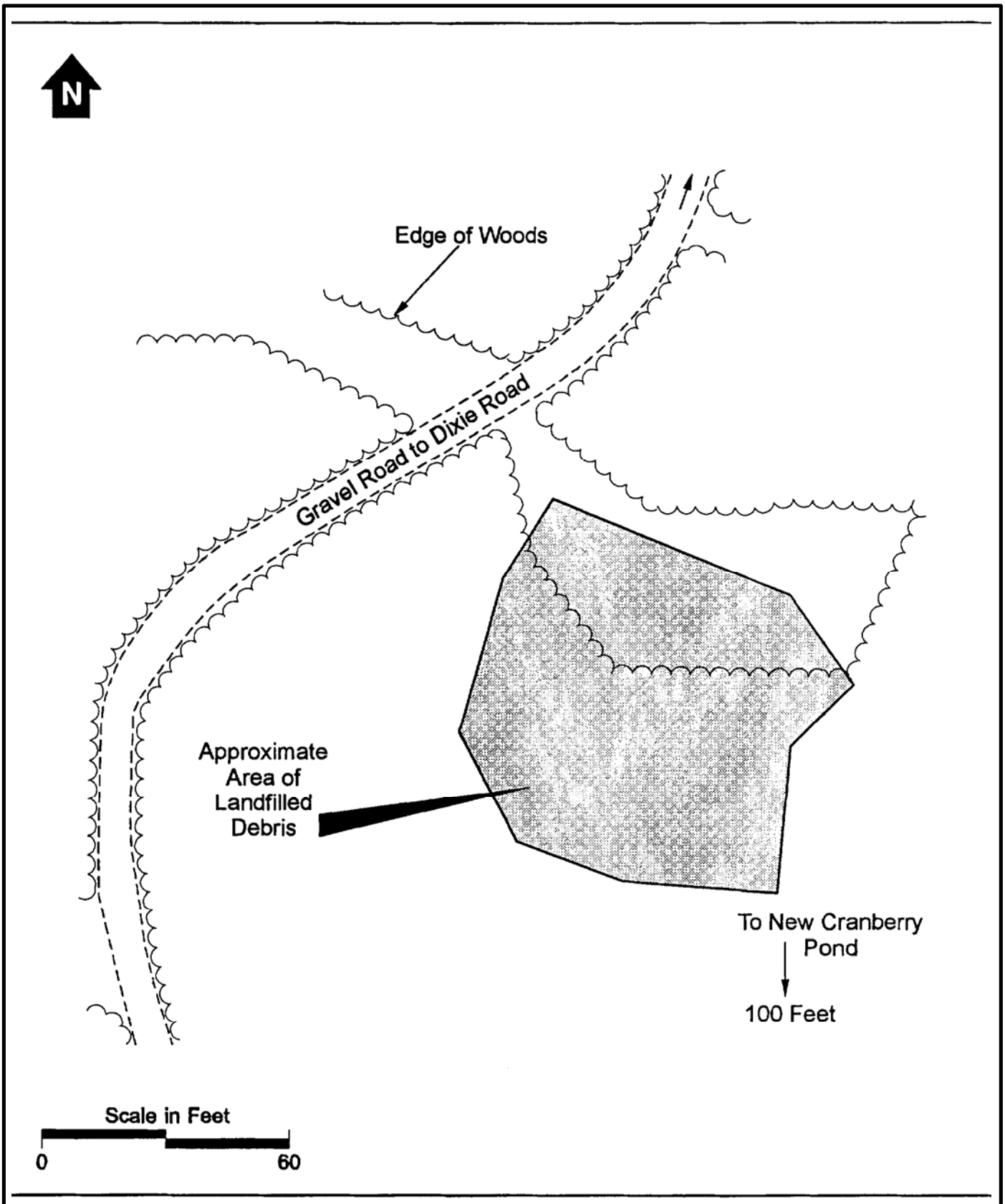
2010_5-year_Review/SA_13.mxd
Revised: 08/30/10 CNL
Source: HGL GIS; Harding Lawson Associates, 2000

Figure 9.5
Site Map
Study Area 13



X:/OMA010/Ft_Devens/DO501/Maps/
2010_5-year_Review/AOC_40.mxd
Revised: 08/30/10 CNL
Source: HGL GIS; Harding Lawson Associates, 2000

Figure 9.6
Site Map
Area of Contamination 40



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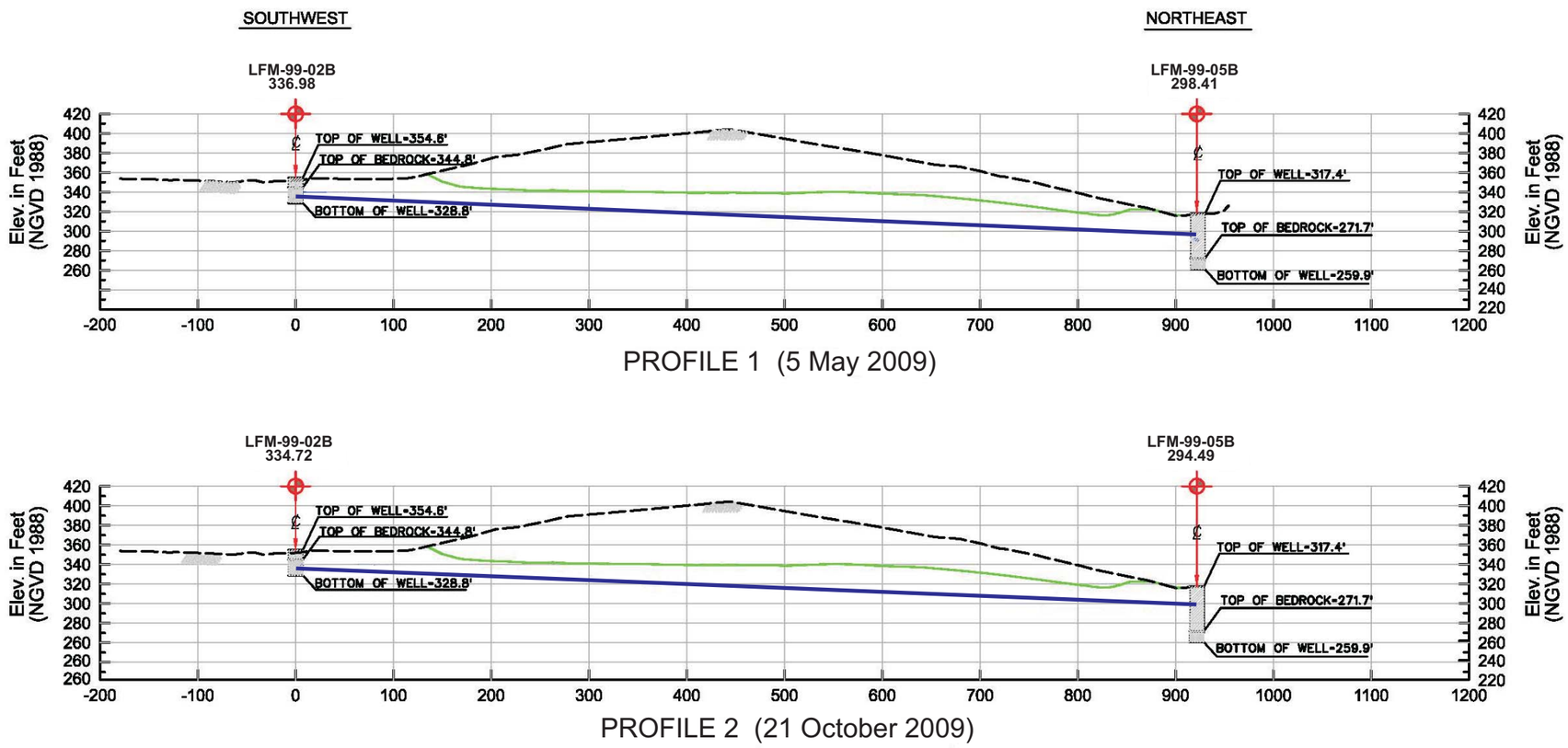
Revised: 08/30/10 CNL
Source: HGL GIS; Harding Lawson Associates, 2000

Figure 9.7
Site Map
Area of Contamination 41

Figure 9.8
Devens Consolidation Landfill Profiles LFM-99-02B to LFM-99-05B

U.S. Army Corp of Engineers
New England District



Legend

- Existing Ground Surface
- Liner
- Water Table Elevation
- Monitoring Well

Notes:
1. Horizontal and vertical scales as shown. No vertical exaggeration.
2. Existing ground surface & liner elevations based on figures from the remedial action closure report by Shaw Environmental, Inc. September 2003.
3. Water table elevation based on contours generated from 5 May and 21 October 2009 measurements.

Filename:X:/OMA010/Ft_Devens/Maps/DO501/2010_5-year_review/DCL_Profiles.cdr
Revised: 08/30/10 CNL
Source: HGL GIS, MASS.GOV, ESRI, USACE

HGL – 2010 Five-Year Review
Former Fort Devens Army Installation — Devens, MA

Figure 9.9
Site Map
Devens Consolidation Landfill

U.S. Army Corps of Engineers
New England District

Legend

- Topographic Contour
- LTM Sample Well
- LTM Well -Ga uge Only
- Gas Vent

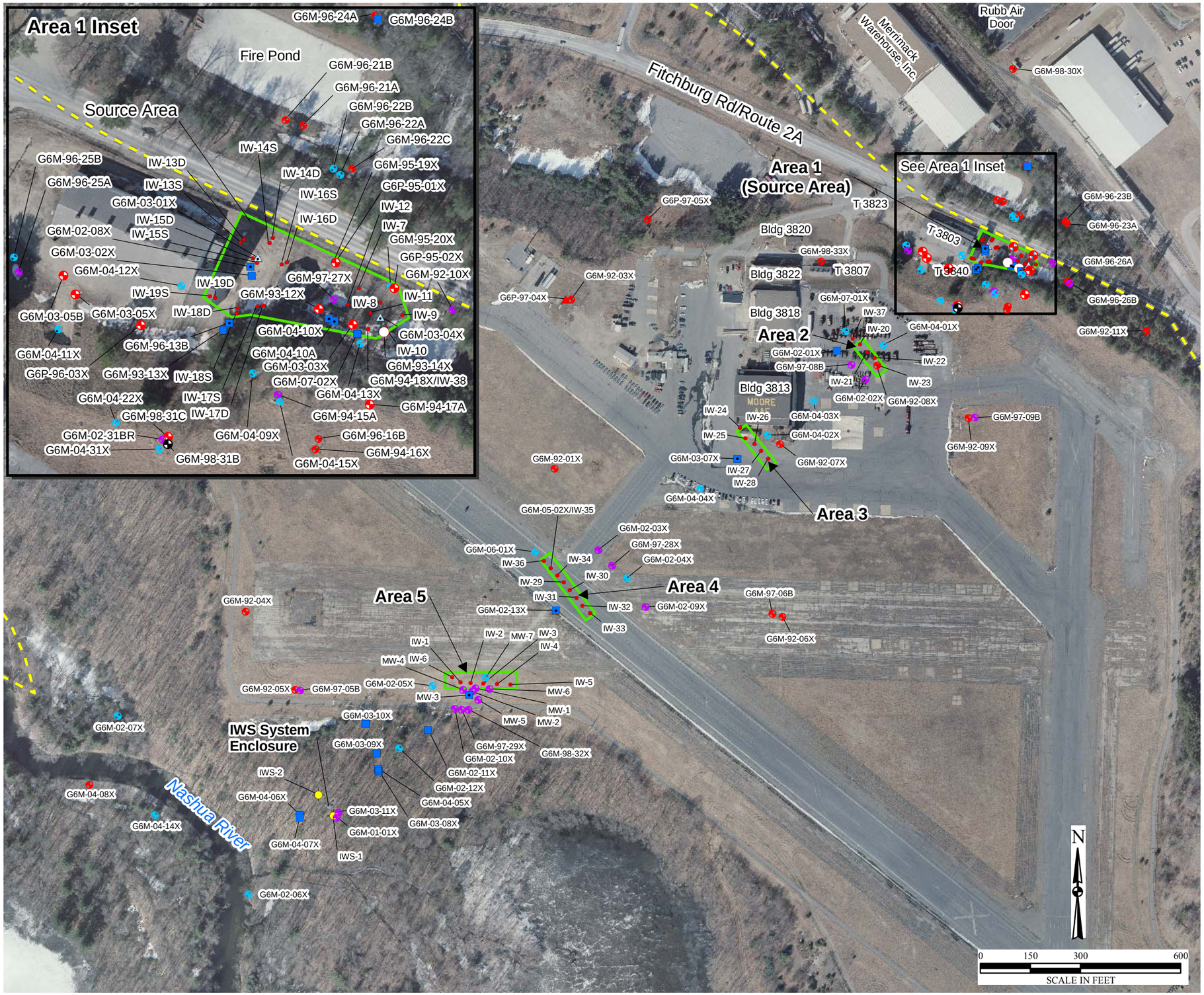
Note:
Gas vent locations were approximated based upon the locations displayed in Figure 2 of the Devens Consolidation Landfill 2004 Annual Report.

N

0 60 120 240
SCALE IN FEET

Filename:X:/OMA010/Ft_Devens/Maps/DO501/2010_5-year_review/DCL.mxd
Revised: 08/30/10 C NL
Source: HGL GIS, MASS.GOV, ESRI, USACE

HGL HydroGeoLogic, Inc



HGL—2010 Five-Year Review
Former Fort Devens Army Installation—Devens, MA

Figure 10.1
Site Layout Map
Area of Contamination 50

Army Base Realignment and Closure Division

Legend

- ERD LTM Well (Sampled Semi-annually)
- ERD LTM Well (Sampled Annually)
- LTM Well -Gauge Only
- Monitoring Well
- Destroyed Monitoring Well
- Injection Well
- LTM Well (Sampled Every 3 Years)
- Piezometer
- In-Well Stripping System Well
- Former Fort Devens Boundary
- ERD Injection Well Transect

X:/OMA010/Ft_Devens/DO501/Maps/
site_layout.mxd
Revised: 09/01/10 C NL
Source: HGL GIS, ESRI, USACE, MASS.Gov

HGL HydroGeoLogic, Inc.

Figure 10.2
Limits of Land-Use Control

Army Base Realignment
and Closure Division

Legend

- Limits of North Plume
- Limits of Source Area
- Limits of Southwest Plume

X:/OMA010/Ft_Devens/DO501/Maps/
LUC.cdr
09/01/10 CNL
Source: ARCADIS 2008 Interim Report; CAD; FD-005.dwg

HGL HydroGeoLogic, Inc

Figure 10.3
Tetrachloroethene Concentration in Groundwater October 2009

Army Base Realignment and Closure Division

Legend

- ERD LTM Well (Sampled Semi-annually)
- ERD LTM Well (Sampled Annually)
- LTM Well - Gauge Only
- Monitoring Well
- Destroyed Monitoring Well
- In-Well Stripping System Well
- LTM Well (Sampled Every 3 Years)
- Piezometer
- Injection Well
- G6M-04-01X 190 — Well Identification and Tetrachloroethene Concentration (µg/L)
- —5— Tetrachloroethene Concentration Contour Line (µg/L)
- Former Fort Devens Boundary
- ERD Injection Well Transect

Notes: Orthophoto Date and Source: April 2006, MASS.gov
Coordinate System: MA State Plane - Mainland, Meters
Datum: NAD83

X:/OMA010/Ft_Devens/DO501/Maps/
PCE_2009-10.mxd
09/01/10 CNL
Source: HGL GIS, ESRI, USACE, MASS.Gov

HGL

HGL—2010 Five-Year Review
Former Fort Devens Army Installation—Devens, MA

Figure 10.4
In-Well Stripping System Layout

Army Base Realignment and Closure Division

Legend

- ERD LTM Well (Sampled Semi-annually)
- ERD LTM Well (Sampled Annually)
- LTM Well - Gauge Only
- Monitoring Well
- Injection Well
- In-Well Stripping System Well
- ERD Injection Well Transect

X:/OMA010/Ft_Devens/DO501/Maps/
IWS_system_layout.mxd
Revised: 09/01/10 CNL
Source: HGL GIS, ESRI, USACE, MASS.Gov

HGL HydroGeoLogic, Inc

Figure 10.5
Area of Contamination 50
Area 2 Monitoring Data
Well G6M-02-01X (60 feet Downgradient)

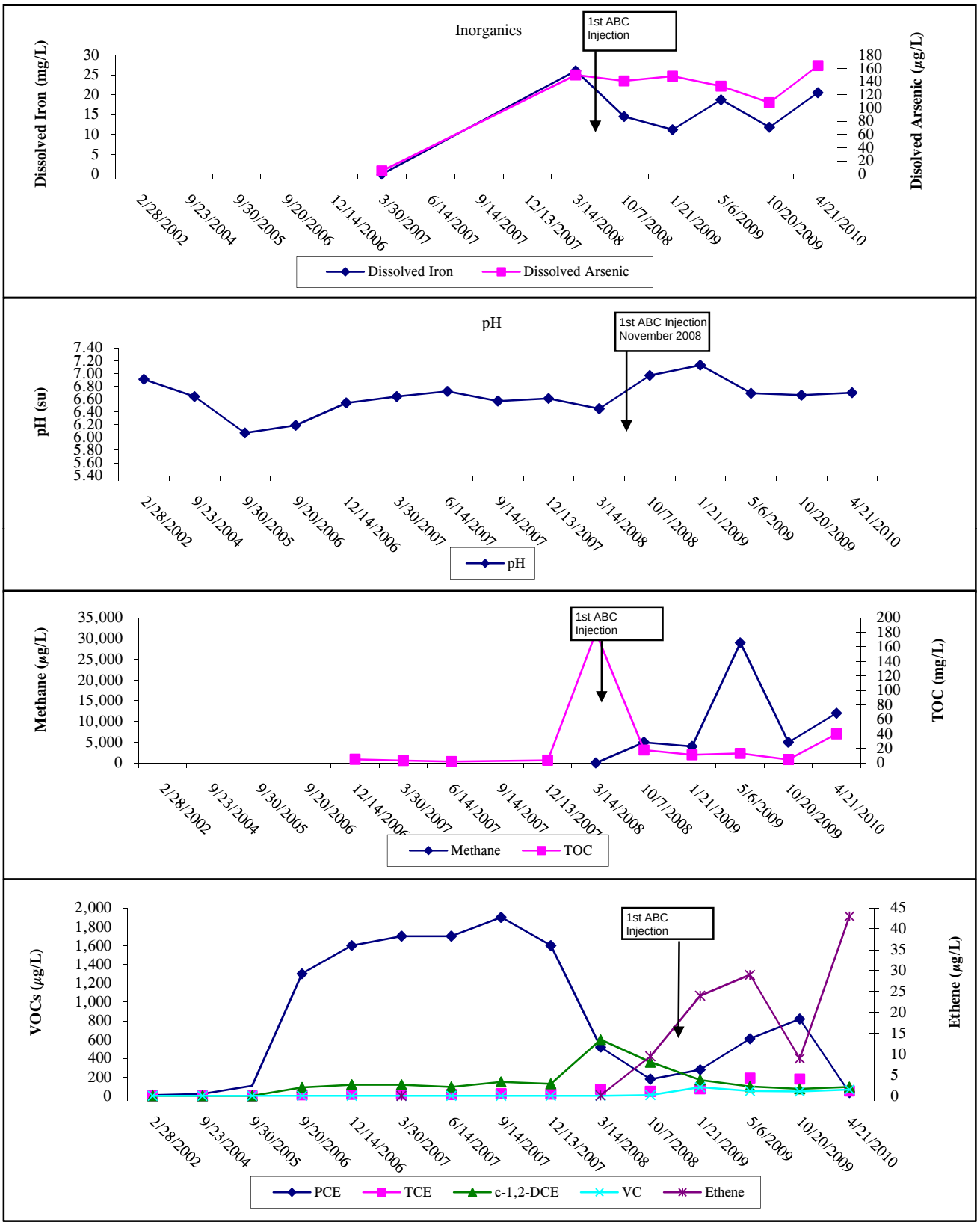


Figure 10.6
Area of Contamination 50
Area 3 Monitoring Data
Well G6M-03-07X (60 feet Downgradient)

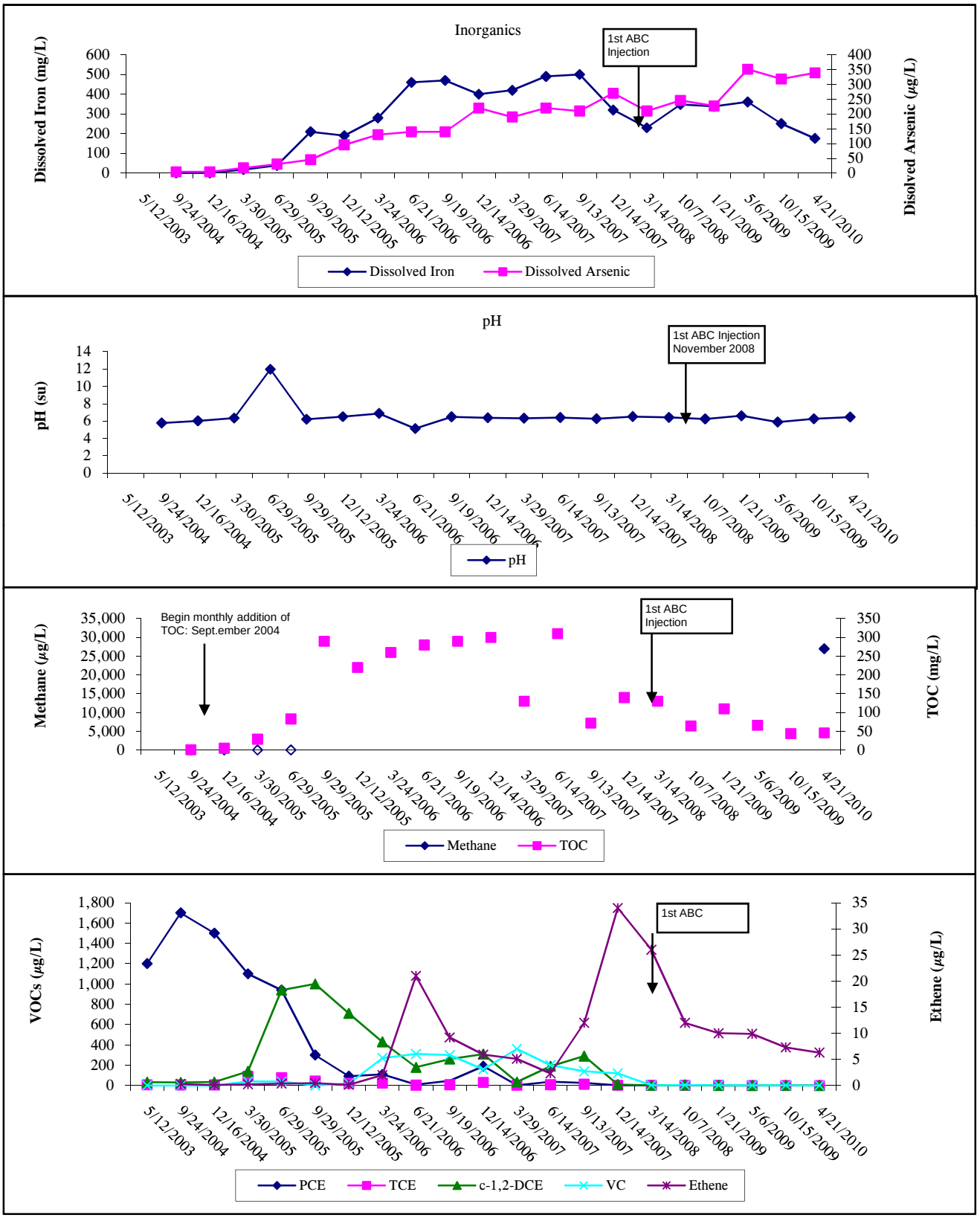


Figure 10.7
Area of Contamination 50
Area 4 Monitoring Data
Well G6M-02-13X (60 feet Downgradient)

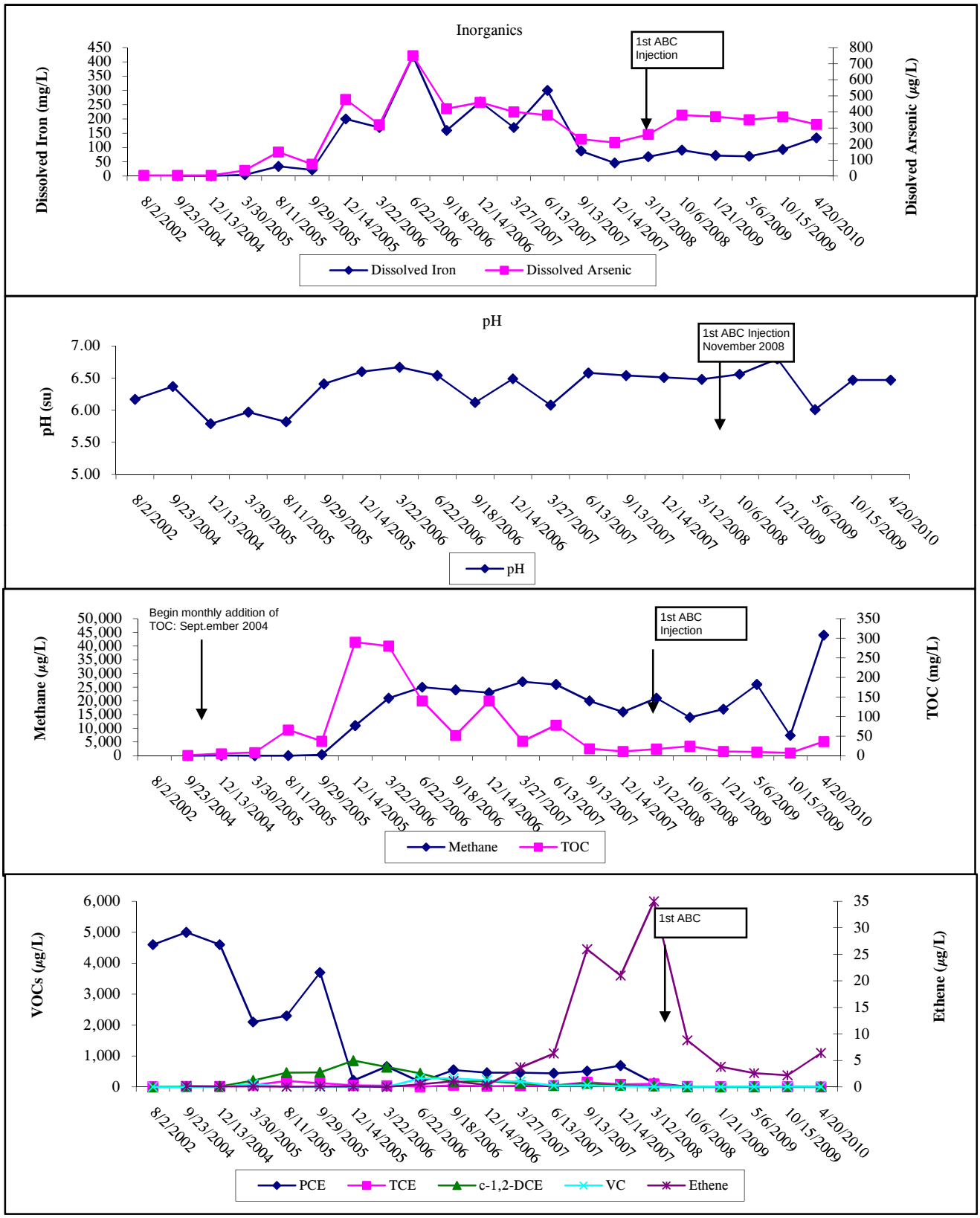


Figure 10.8
Area of Contamination 50
Area 5 Monitoring Data
Well MW-3 (40 feet Downgradient)

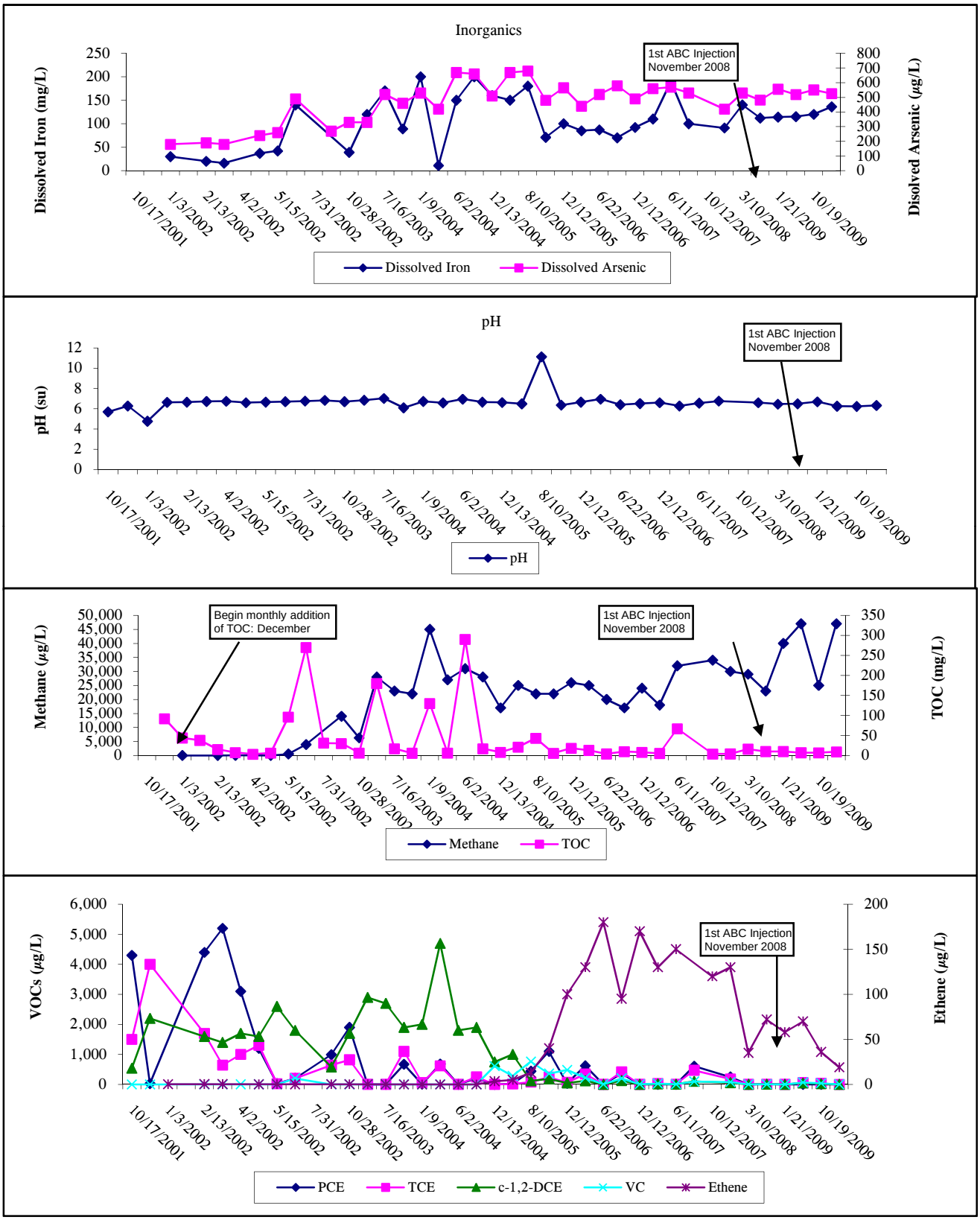


Figure 10.9
Area of Contamination 50
Former Drum Storage Area Monitoring Data
Well G6M-04-10A (23 feet Downgradient)

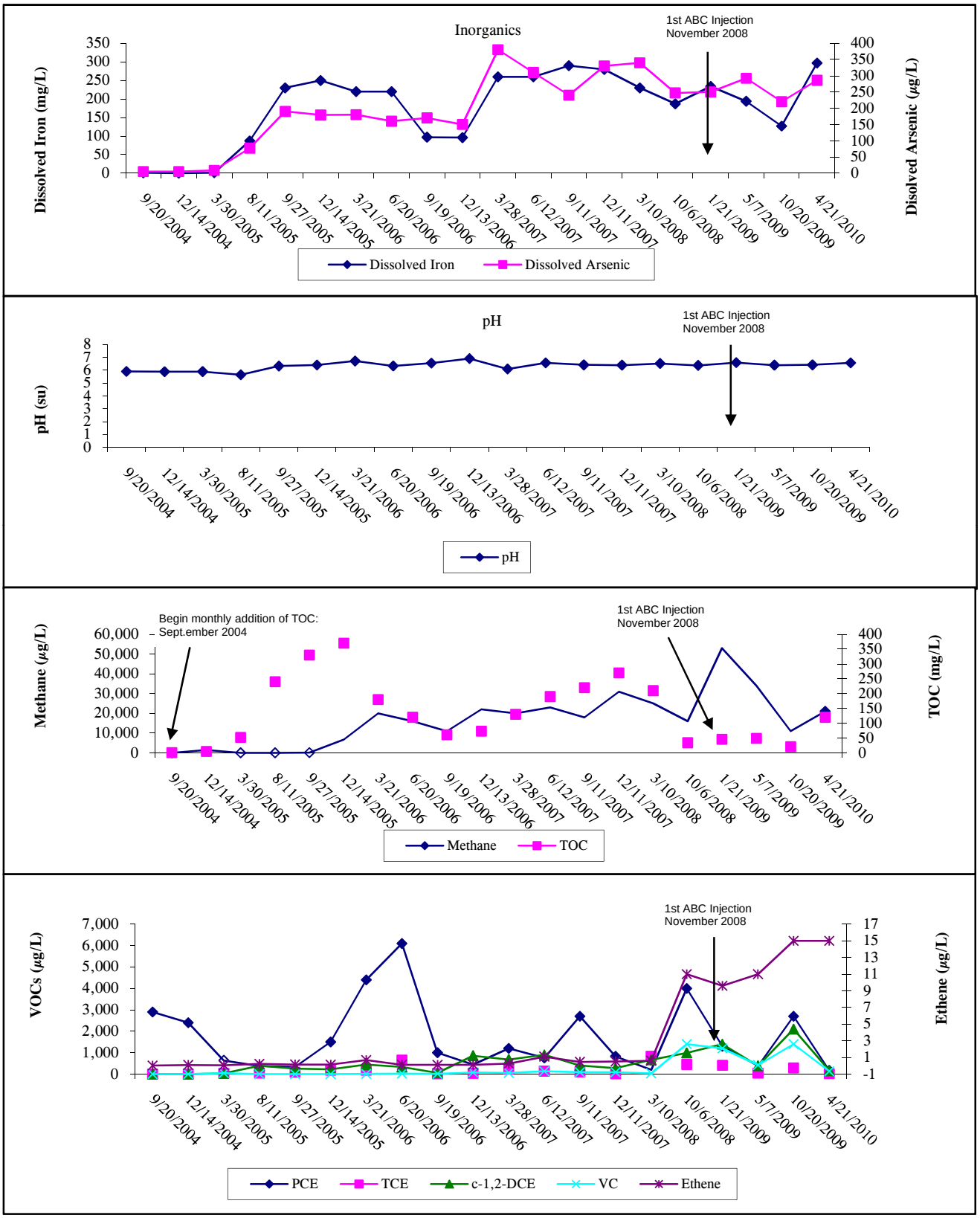
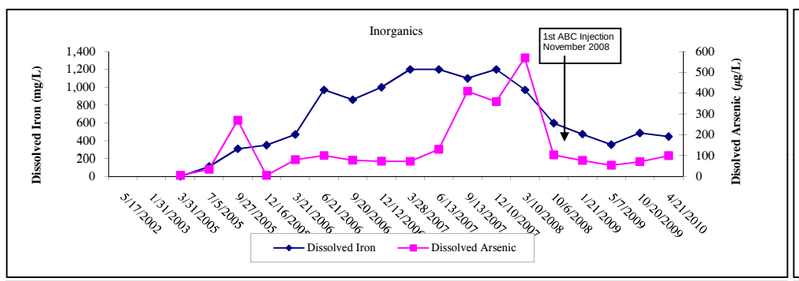
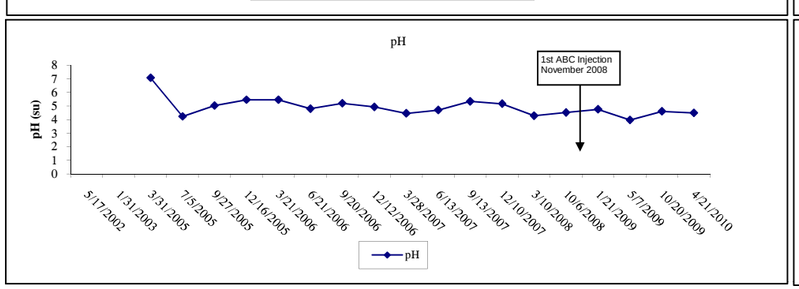
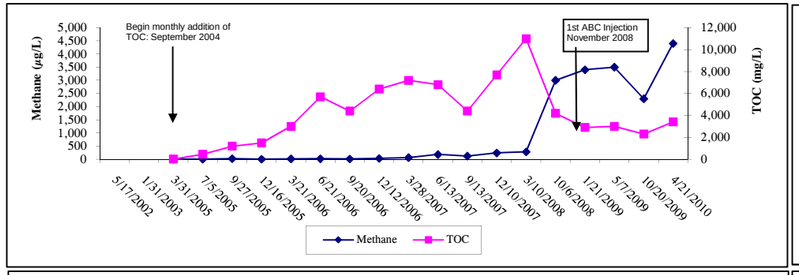


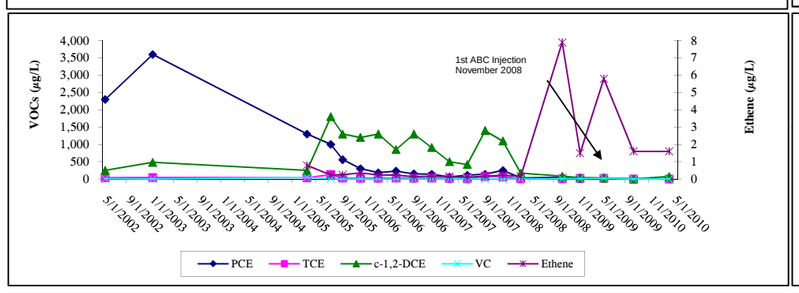
Figure 10.10
Area of Contamination 50
Former Dry Well Area Monitoring Data
Wells G6M-02-08X, G6M-03-02X and G6M-96-13B

G6M-02-08X, 10 feet Downgradient

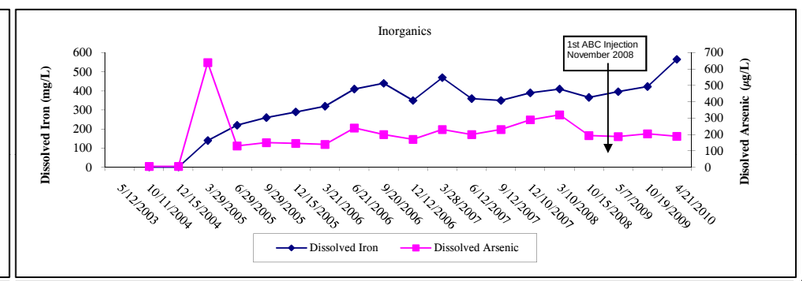


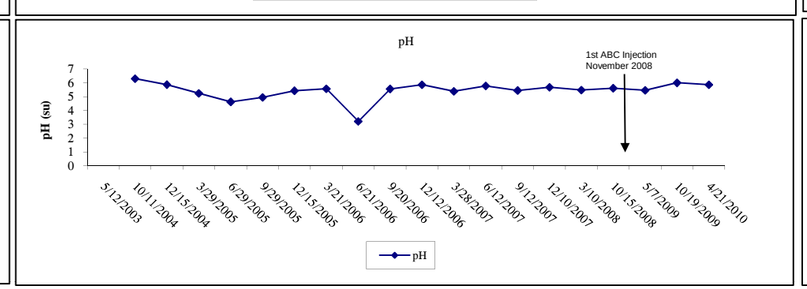


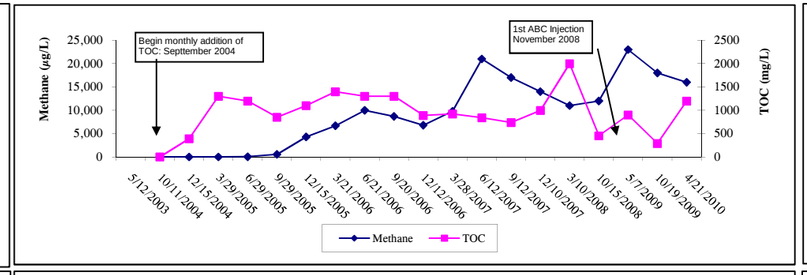


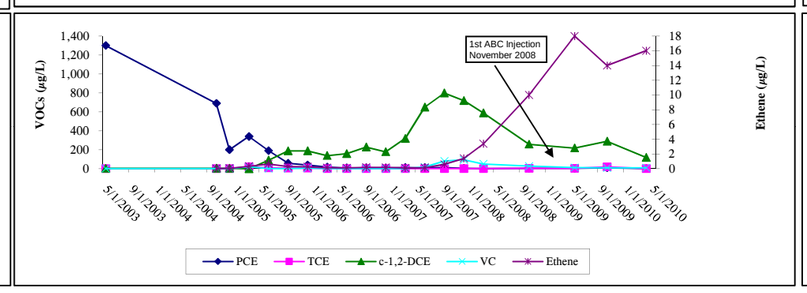


G6M-03-02X, 15 feet Downgradient

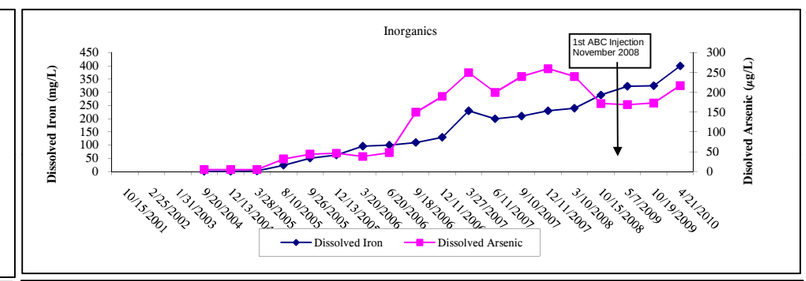


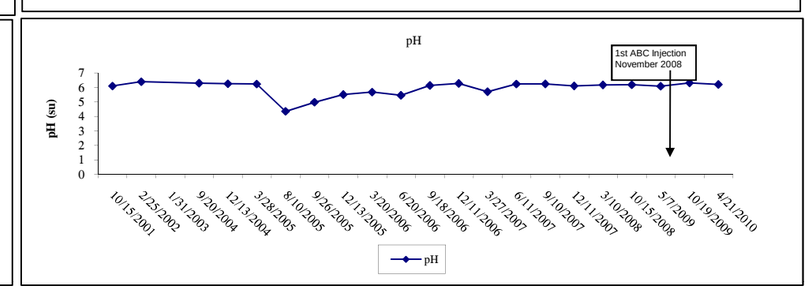


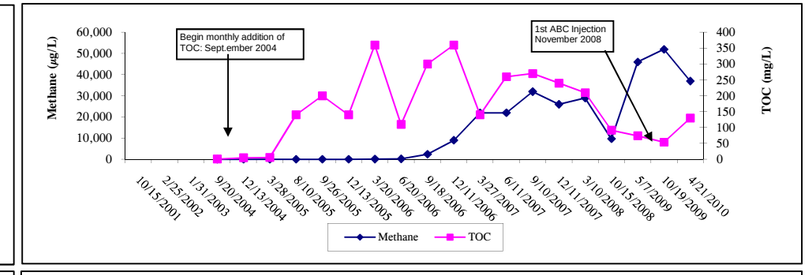


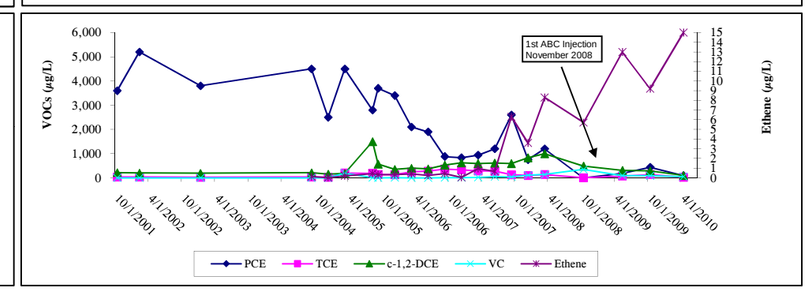


G6M-96-13B, 25 feet Downgradient



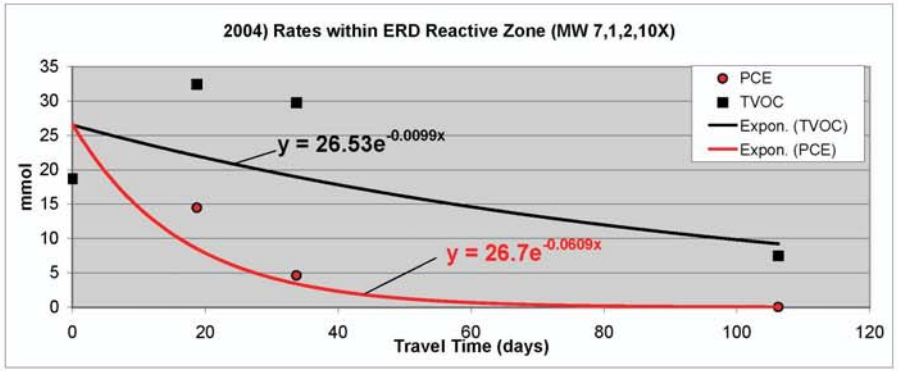


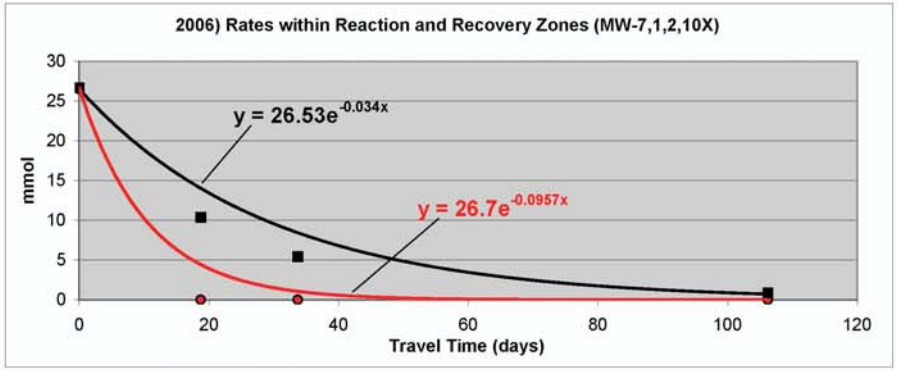


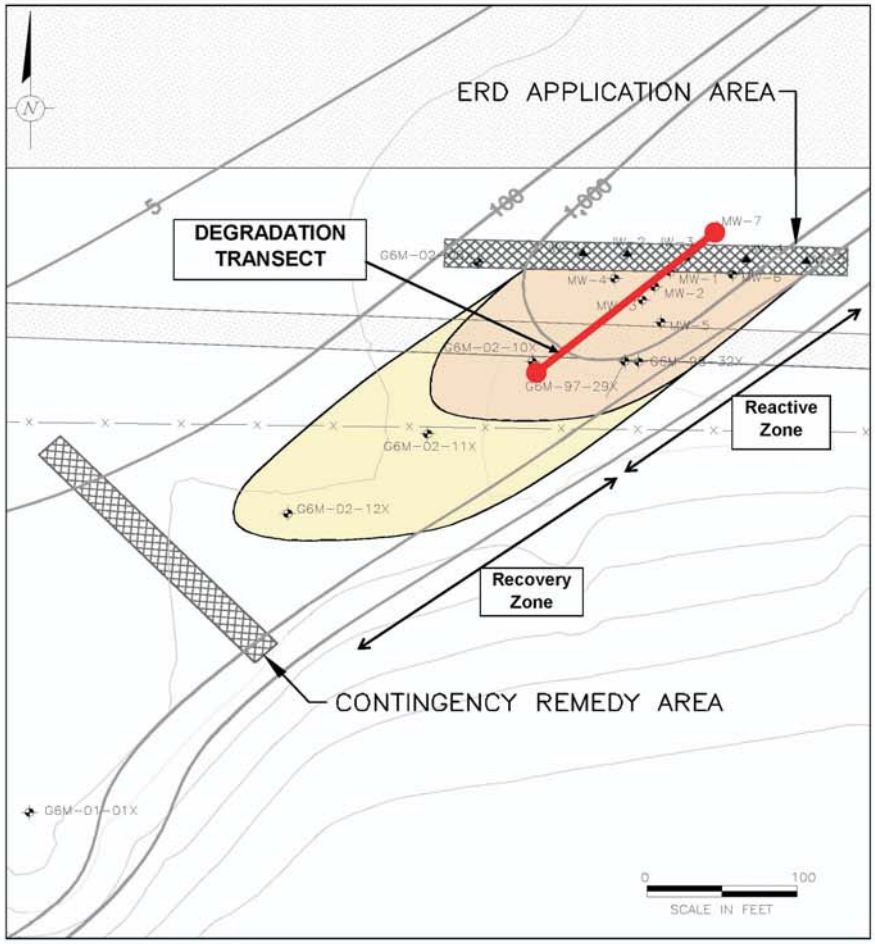


PCE and TVOC ERD Degradation Rates in Area 5 Well Locations

Wells	Transect Length (ft)	Degradation Rate[1] PCE (mmol/day)	Degradation Rate[1] TVOC (mmol/day)	Half Life[2] PCE (day)	Half Life[2] TVOC (day)
Groundwater Model Predictions	--	--	--	25	75
2004) MW-7, MW-1, MW-2, G6M-02-10X	130	0.0609	0.0099	11.4	70.0
2006) MW-7, MW-1, MW-2, G6M-02-10X	130	0.0957	0.0340	7.2	20.4







Notes:

1 Degradation rate is equivalent to the -k variable in the formula attached at right: $C = C_o \times e^{-kt}$

2 Half lives were calculated with the following relationship ($T_{1/2}$): $T_{1/2} = \frac{\ln(C_{1/2})}{-k}$

X:/OMA010/Ft_Devens/DO501/Maps/
GW_Model.cdr
09/01/10 CNL
Source: ARCADIS 2008 Interim Report; Figure 13

HGL HydroGeoLogic, Inc

Figure 10.11
Groundwater Model

VOLUME II

2010
FIVE-YEAR REVIEW REPORT
FOR
FORMER FORT DEVENS ARMY INSTALLATION
DEVENS, MASSACHUSETTS

Prepared For:

U.S. Army Corps of Engineers
New England District

Contract No. W9128F-04-D-0005
Delivery Order 501

and

Army Base Realignment and
Closure Division
U. S. Army Garrison Fort Devens

Contract No. W91ZLK-05-D-0010
Delivery Order 0002

September 2010

VOLUME II

2010
FIVE-YEAR REVIEW REPORT
FOR
FORMER FORT DEVENS ARMY INSTALLATION
DEVENS, MASSACHUSETTS

Prepared for
Former Fort Devens Army Installation
Devens, Massachusetts

Prepared by

HydroGeoLogic, Inc.
Northway 10 Executive Park
313 Ushers Road
Ballston Lake, NY 12019

Approved by;

Date:

September 23, 2010

Robert J. Simeone
BRAC Environmental Coordinator – Devens
Army Base Realignment and Closure Division

September 2010

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APPENDIX A

BARNUM ROAD MAINTENANCE YARDS
(AOCS 44 AND 52)

GROUNDWATER ANALYTICAL RESULTS
(1998-2003)

Table C-1
Ground Water Analytical Results 1998
Relative to Massachusetts Contingency Plan Standards

Sample ID	G3M-92-04X	G3M-92-05X	G3M-92-05XD	*MCP GW-1 Standards*
Date Sampled	5/21/98	5/21/98	5/21/98	
Units	ppb	ppb	ppb	*ppb*
EPH Aliphatics/Aromatics				
C9-C18 Aliphatics	<61	<62	<61	*4,000*
C19-C36 Aliphatics	<61	<62	150	*5,000*
C10-C22 Aromatics	<160	<160	<160	*200*
PAH				
Acenaphthene	<0.2	<0.2	<0.2	*20*
Acenaphthylene	<0.2	<0.2	<0.2	*300*
Anthracene	<0.2	<0.2	<0.2	*2,000*
Benzo (a) anthracene	<0.2	<0.2	<0.2	*1*
Benzo (b) fluoranthene	<0.2	<0.2	<0.2	*1*
Benzo (k) fluoranthene	<0.2	<0.2	<0.2	*1*
Benzo (a) pyrene	<0.2	<0.2	<0.2	*0.2*
Benzo (g,h,i) perylene	<0.2	<0.2	<0.2	*0.5*
Chrysene	<0.2	<0.2	<0.2	*2*
Dibenzo (a,h) anthracene	<0.2	<0.2	<0.2	*0.5*
Fluoranthene	<0.2	<0.2	<0.2	*300*
Flourene	<0.2	<0.2	<0.2	*300*
Indeno (1,2,3-cd) pyrene	<0.2	<0.2	<0.2	*0.5*
2-Methylnaphthalene	<0.2	<0.2	<0.2	*10*
Naphthalene	<0.2	<0.2	<0.2	*20*
Phenanthrene	<0.2	<0.2	<0.2	*300*
Pyrene	<0.2	<0.2	<0.2	*200*
VPH Aliphatics/Aromatics				
C5-C8 Aliphatics	<40	<40	<40	*400*
C9-C12 Aliphatics	<10	<10	<10	*4,000*
C9-C10 Aromatics	<10	<10	<10	*200*
VPH Analytes				
Benzene	<5	<5	<5	*5*
Toluene	<15	<15	<15	*500*
Ethylbenzene	<5	<5	<5	*700*
p/m-Xylenes	<20	<20	<20	*500*
o-Xylene	<10	<10	<10	*500*
Naphthalene	<10	<10	<10	*20*
Methyl-tert-Butyl Ether	<15	<15	<15	*70*
Metals				
Lead	<5	<5	<5	*15*

Table C-2
Ground Water Analytical Results 1999
Relative to Massachusetts Contingency Plan Standards

Sample ID	G3M-92-04X	G3M-92-05X	G3M-92-05XD	*MCP GW-1 Standards*
Date Sampled	6/8/99	6/8/99	6/8/99	
Units	ppb	ppb	ppb	*ppb*
EPH Aliphatics/Aromatics				
C9-C18 Aliphatics	<100	<110	<100	*4,000*
C19-C36 Aliphatics	<100	<110	<100	*5,000*
C10-C22 Aromatics	<100	<110	<100	*200*
PAH				
Acenaphthene	<0.1	<0.11	<0.1	*20*
Acenaphthylene	<0.1	<0.11	<0.1	*300*
Anthracene	<0.1	<0.11	<0.1	*2,000*
Benzo (a) anthracene	<0.1	<0.11	<0.1	*1*
Benzo (b) fluoranthene	<0.1	<0.11	<0.1	*1*
Benzo (k) fluoranthene	<0.1	<0.11	<0.1	*1*
Benzo (a) pyrene	<0.1	<0.11	<0.1	*0.2*
Benzo (g,h,i) perylene	<0.1	<0.11	<0.1	*0.5*
Chrysene	<0.1	<0.11	<0.1	*2*
Dibenzo (a,h) anthracene	<0.1	<0.11	<0.1	*0.5*
Fluoranthene	<0.1	<0.11	<0.1	*300*
Flourene	<0.1	<0.11	<0.1	*300*
Indeno (1,2,3-cd) pyrene	<0.1	<0.11	<0.1	*0.5*
2-Methylnaphthalene	<0.1	<0.11	<0.1	*10*
Naphthalene	<0.1	<0.11	<0.1	*20*
Phenanthrene	<0.1	<0.11	<0.1	*300*
Pyrene	<0.1	<0.11	<0.1	*200*
VPH Aliphatics/Aromatics				
C5-C8 Aliphatics	<100	<100	<100	*400*
C9-C12 Aliphatics	<25	<25	<25	*4,000*
C9-C10 Aromatics	<25	<25	<25	*200*
VPH Analytes				
Benzene	<0.2	<0.2	<0.2	*5*
Toluene	<0.2	<0.2	<0.2	*500*
Ethylbenzene	<0.2	<0.2	<0.2	*700*
p/m-Xylenes	<0.2	<0.2	<0.2	*500*
o-Xylene	<0.2	<0.2	<0.2	*500*
Naphthalene	<0.2	<0.2	<0.2	*20*
Methyl-tert-Butyl Ether	<0.2	<0.2	<0.2	*70*
Metals				
Lead	<5	<5	<5	*15*

Table C-3
Ground Water Analytical Results 2003
Relative to Massachusetts Contingency Plan Standards

Sample ID Date Sampled Units	G3M-92-04X 12/23/03 µg/L	G3M-92-05X 12/23/03 µg/L	G3M-92-05X Duplicate 12/23/03 µg/L	*MCP GW-1 Standards* *µg/L*
EPH Aliphatics/Aromatics				
C9-C18 Aliphatics	0.062 U	0.061 U	0.062 U	*4,000*
C19-C36 Aliphatics	0.083 U	0.082 U	0.082 U	*5,000*
C11-C22 Aromatics	0.18 U	0.17 U	0.17 U	*200*
PAH				
Acenaphthene	0.020 U	0.020 U	0.020 U	*20*
Acenaphthylene	0.020 U	0.020 U	0.020 U	*300*
Anthracene	0.016 J	0.020 U	0.020 U	*2,000*
Benzo (a) anthracene	0.020 U	0.020 U	0.020 U	*1*
Benzo (b) fluoranthene	0.018 J	0.020 U	0.020 U	*1*
Benzo (k) fluoranthene	0.015 J	0.020 U	0.020 U	*1*
Benzo (a) pyrene	0.020 U	0.020 U	0.020 U	*0.2*
Benzo (g,h,i) perylene	0.014 J	0.020 U	0.020 U	*0.5*
Chrysene	0.016 J	0.020 U	0.020 U	*2*
Dibenzo (a,h) anthracene	0.020 U	0.020 U	0.020 U	*0.5*
Fluoranthene	0.024	0.020 U	0.020 U	*300*
Flourene	0.020 U	0.020 U	0.020 U	*300*
Indeno (1,2,3-cd) pyrene	0.013 J	0.020 U	0.020 U	*0.5*
2-Methylnaphthalene	0.020 U	0.020 U	0.020 U	*10*
Naphthalene	0.020 U	0.020 U	0.020 U	*20*
Phenanthrene	0.020 U	0.020 U	0.020 U	*300*
Pyrene	0.021	0.020 U	0.020 U	*200*
VPH Aliphatics/Aromatics				
C5-C8 Aliphatics	40 U	40 U	40 U	*400*
C9-C12 Aliphatics	10 U	10 U	10 U	*4,000*
C9-C10 Aromatics	10 U	10 U	10 U	*200*
VPH Analytes				
Benzene	5.0 U	5.0 U	5.0 U	*5*
Toluene	15 U	15 U	15 U	*500*
Ethylbenzene	5.0 U	5.0 U	5.0 U	*700*
p/m-Xylenes	20 U	20 U	20 U	*500*
o-Xylene	10 U	10 U	10 U	*500*
Naphthalene	10 U	10 U	10 U	*20*
Methyl-tert-Butyl Ether	15 U	15 U	15 U	*70*
Metals				
Lead	1.6 U	1.6 U	1.6 U	*15*

Notes:
U: not detected above method detection limit
J: estimated value

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ARARs

TABLE 19
SYNOPSIS OF FEDERAL AND STATE ARARS
ALTERNATIVE 5: ASPHALT BATCHING SITE/ASPHALT BATCHING HOT SPOT AREAS

AOCS 44 AND 52 SOILS
FORT DEVENS, MASSACHUSETTS

AUTHORITY	LOCATION CHARACTERISTIC AND ARAR TYPE	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARAR
Federal Regulatory Authority	Wetland Location-Specific	National Environmental Policy Act; [40 CFR Part 6]	Applicable	Requires that Federal agencies minimize the degradation, loss, or destruction of wetlands, and preserve and enhance natural and beneficial values of wetlands under Executive Orders 11990 and 11988.	Wetlands adjacent to AOCs 44 and 52 may currently be impacted by surface water runoff via the storm water system. This alternative covers the site with pavement, thus reducing potential off-site runoff of contaminants in surface water from AOCs 44 and 52 soils to the wetlands. The remedy will also be designed and constructed to manage the increased flow from the paved surface in a manner that will minimize impact to adjacent wetlands.
State Regulatory Requirements	Air Action-Specific	Massachusetts Air Pollution Control Regulations; [310 CMR 6.00 - 7.00]	Applicable	Establishes the standards and requirements for air pollution control in the Commonwealth. Specifically, Section 6.04 provides ambient air quality criteria such as particulate matter standards which is pertinent to AOCs 44 and 52 activity. As a minimum, respirable particulate matter (PM_{10}) for treatment and excavation activities must be maintained at an annual mean arithmetic concentration of $50 \mu g/m^3$ and a maximum 24-hour concentration of $150 \mu g/m^3$. Section 7.02 provides emissions limitations from facilities and operations and requires BACT. Additionally, the Massachusetts toxic air pollutant (TAP) control program requirements will be considered in limiting fugitive emissions (VOCs) and total suspended particulates during treatment and excavation activities.	The emissions limits for particulate matter and fugitive emissions will be managed through engineering controls during excavation and treatment activities.
	Soil Action-Specific	Massachusetts Hazardous Waste Management Rules (MHWMR) Identification and Listing of Hazardous Wastes [310 CMR 30.100]	Applicable	Waste oil is a listed as a hazardous waste under this rule and is therefore subject to 310 CMR 30.000 (i.e., the Massachusetts Hazardous Waste Management Rules).	The wastes found at this site were determined not to be characteristic hazardous wastes; however, waste oil is a listed hazardous waste under this rule.

200083

TABLE 6-8 (continued)
SYNOPSIS OF LOCATION-SPECIFIC FEDERAL AND STATE ARARS
ALTERNATIVE 5: ASPHALT BATCHING SITE/ASPHALT BATCHING HOT SPOT AREAS

AOCS 44 AND 52 SOILS
FORT DEVENS, MASSACHUSETTS

AUTHORITY	LOCATION CHARACTERISTIC AND ARAR TYPE	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN ARAR
State Regulatory Requirements	Soil Action-Specific	MHWMR Provisions for Recyclable Materials and for Waste Oil [310 CMR 30.200]	Applicable	This regulation contains procedural and substantive requirements for handling regulated recyclable materials. The substantive requirements include preventing and reporting releases to the environment, proper maintenance of treatment and control systems, and handling of regulated recyclable materials.	Asphalt batching of soil on site will comply with the substantive requirements of this regulation.
	Soil Action-Specific	MHWMR - Waste Piles; [310 CMR 30.640 - 30.649]	Applicable	A waste pile facility must install a liner, provide a leachate collection system, provide a run-on/run-off control system, comply with the groundwater monitoring requirements, perform inspections, and close the facility properly.	These requirements will be addressed in the design of an area for stockpiling of wastes for on-site treatment.
	Ground-water Action-Specific	MHWMR Groundwater Protection; [310 CMR 30.660 - 30.679]	Relevant and Appropriate	Groundwater monitoring should be conducted during and following remedial actions. Concentration limits for the hazardous constituents are specified in 310 CMR 30.667.	Although cleanup of groundwater, if required, will be handled as a separate operable unit, groundwater monitoring will be conducted as a component of the remedy.
	All Chemical-Specific	Standards for Analytical Data for Remedial Response Action [WSC-300-89]	To Be Considered	This policy describes the minimum standards for analytical data submitted to the Department.	All sampling plans will be designed with consideration of the analytical methods provided in this policy.

000063

PHOTO LOG

April 2010
View to the north from the southwest corner of the retention basin.
Looking through fence line, south of Barnum Road, east of Evergreen Solar Facility.

April 2010
View from the southwest corner of retention basin, showing fencing.

X:/OMA010/Ft_Devens/Maps/DO501/2010_5-Year_Review/CDR/barnum_photolog.cdr
06/29/10 CNL

Barnum Road
Photograph Log
2010

April 2010
View to the north of AOC 44 & 52 southwest of former oil water separator.
Taken from the northwest side of Barnum Road.

April 2010
View to the northeast along the northwest side of Barnum Road.
The former oil water separator was previously located to the left of the pine tree.

X:/OMA010/Ft_Devens/Maps/DO501/2010_5-Year_Review/CDR/barnum_photolog.cdr
06/29/10 CNL

Barnum Road
Photograph Log
2010

April 2010
Ongoing construction signage.

April 2010
View to the north form the south side of the retention basin located east of the Evergreen Solar Facility.

X:/OMA010/Ft_Devens/Maps/DO501/2010_5-Year_Review/CDR/barnum_photolog.cdr
06/29/10 CNL

Barnum Road
Photograph Log
2010

April 2010
View to the southwest from the southwest corner of the retention basin.

X:/OMA010/Ft_Devens/Maps/DO501/2010_5-Year_Review/CDR/
barnum_photolog.cdr
06/29/10 CNL

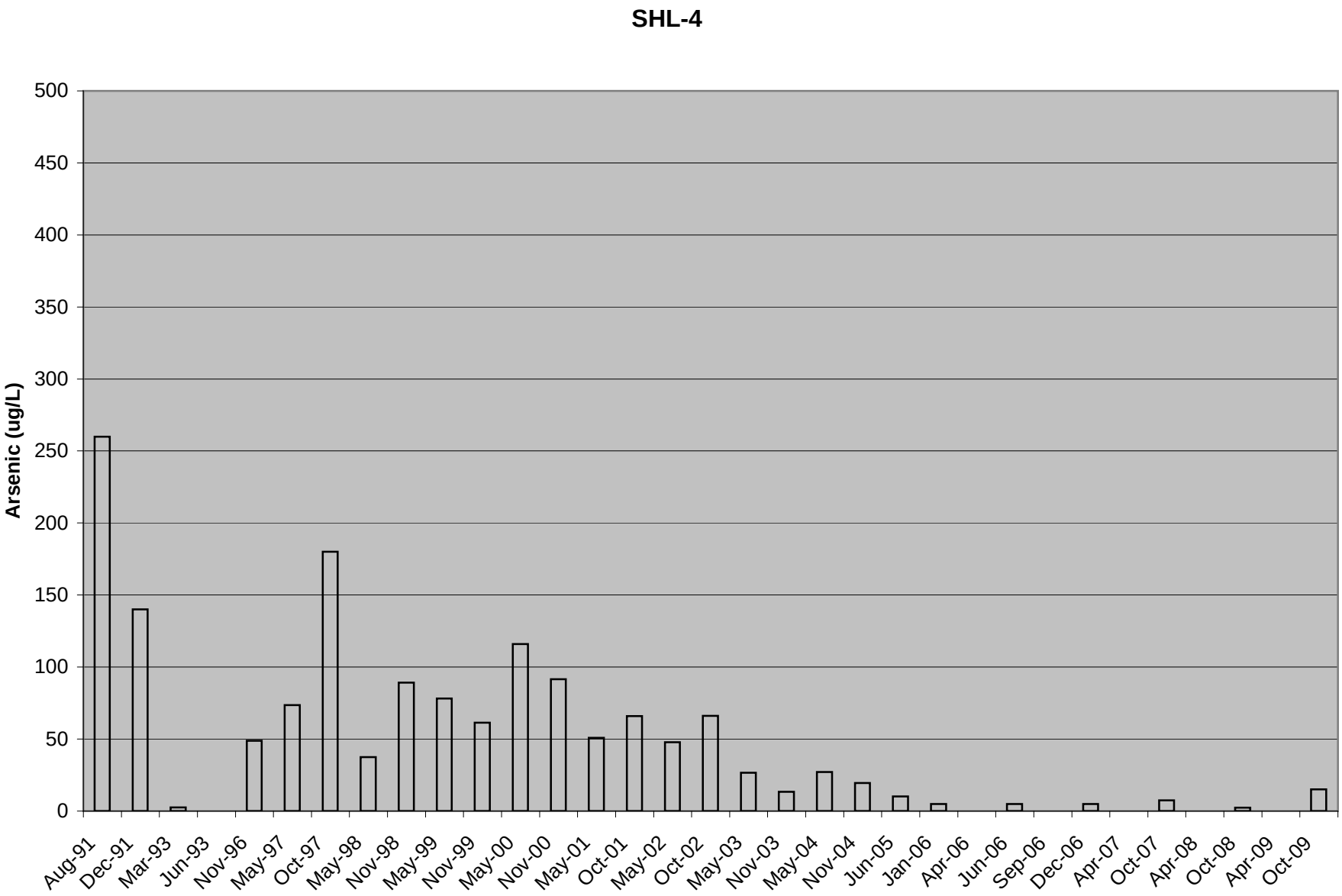
Barnum Road
Photograph Log
2010

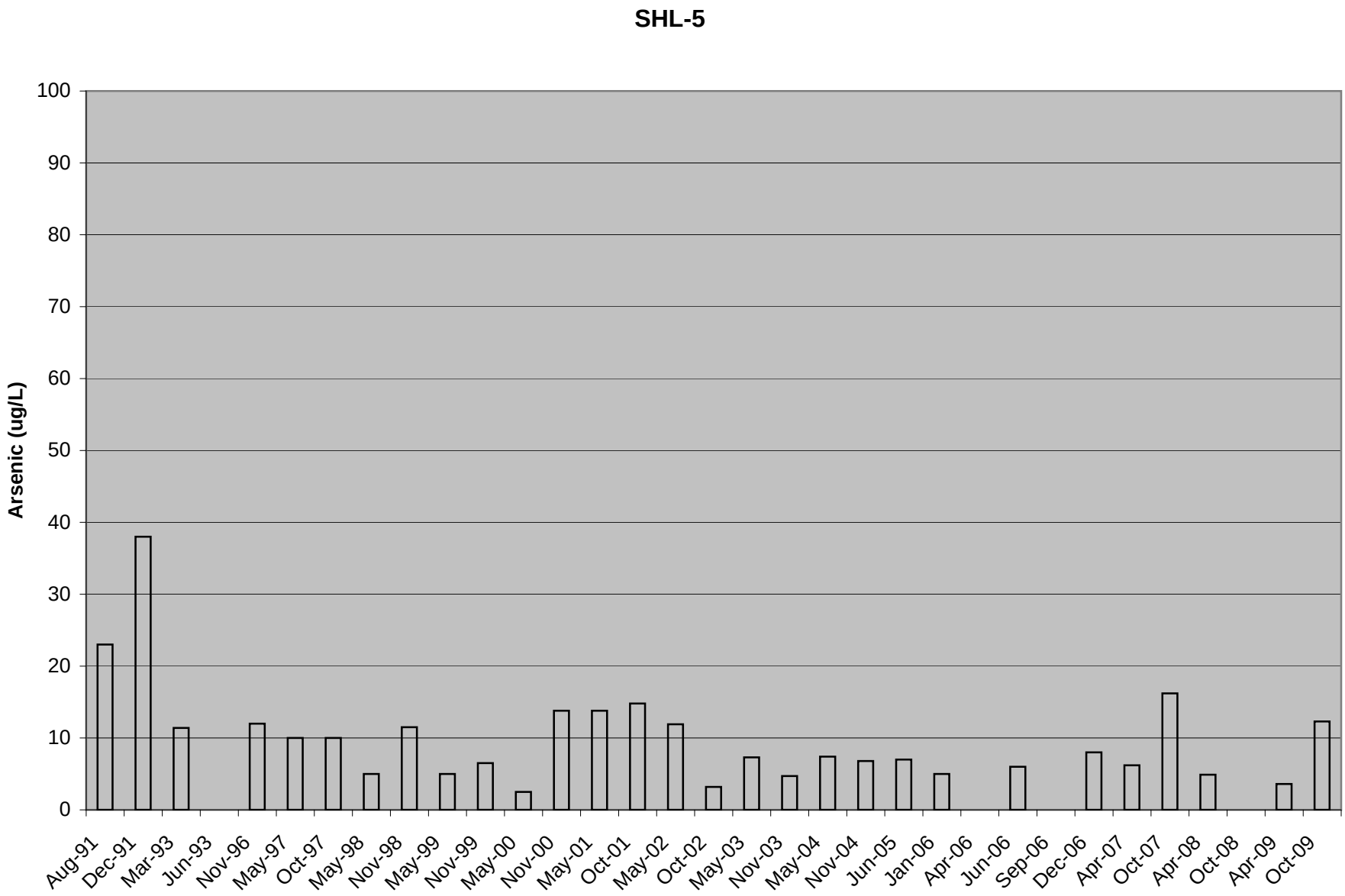
APPENDIX B

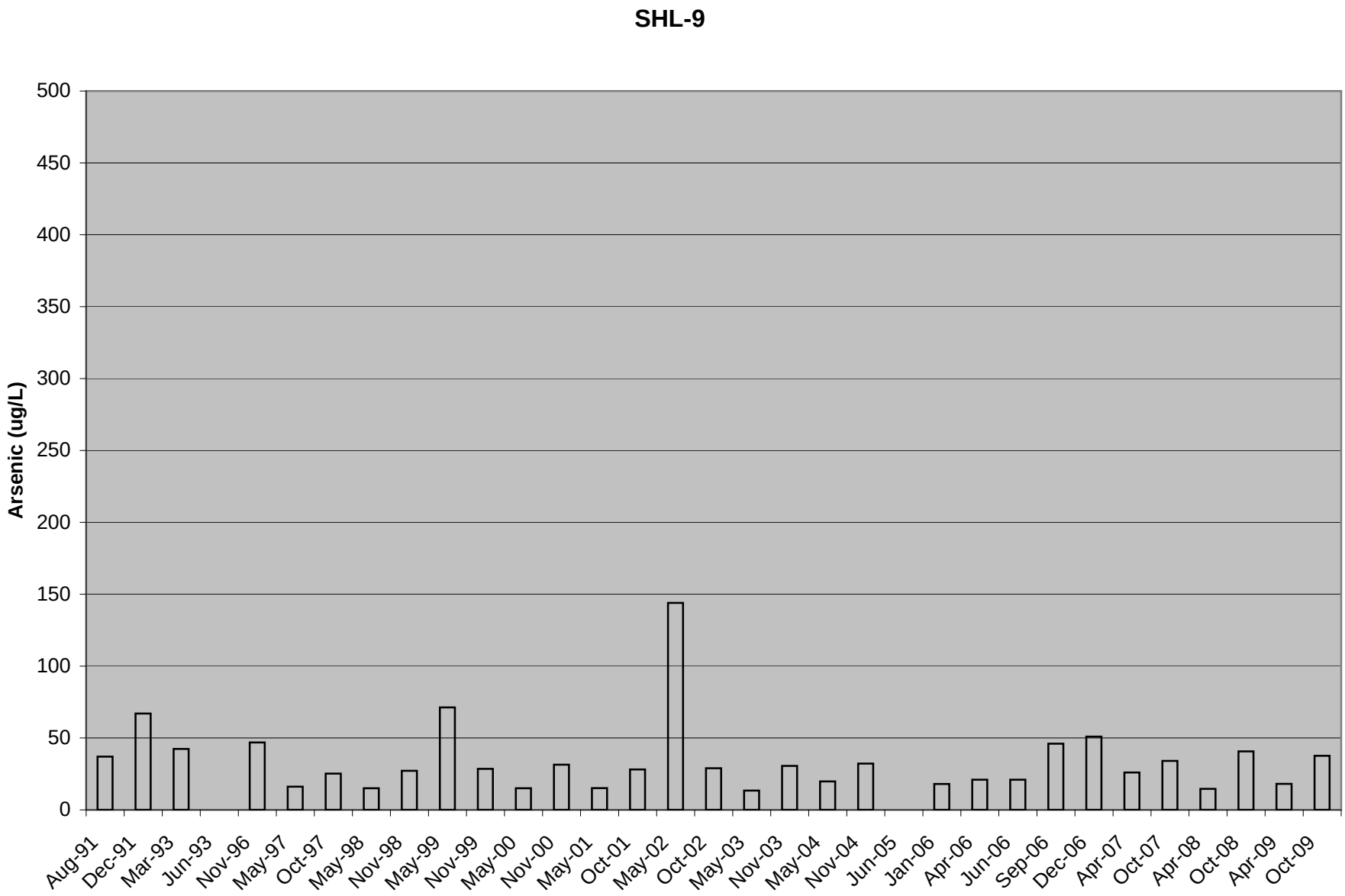
Shepley's Hill Landfill
(AOCs 4, 5, and 18)

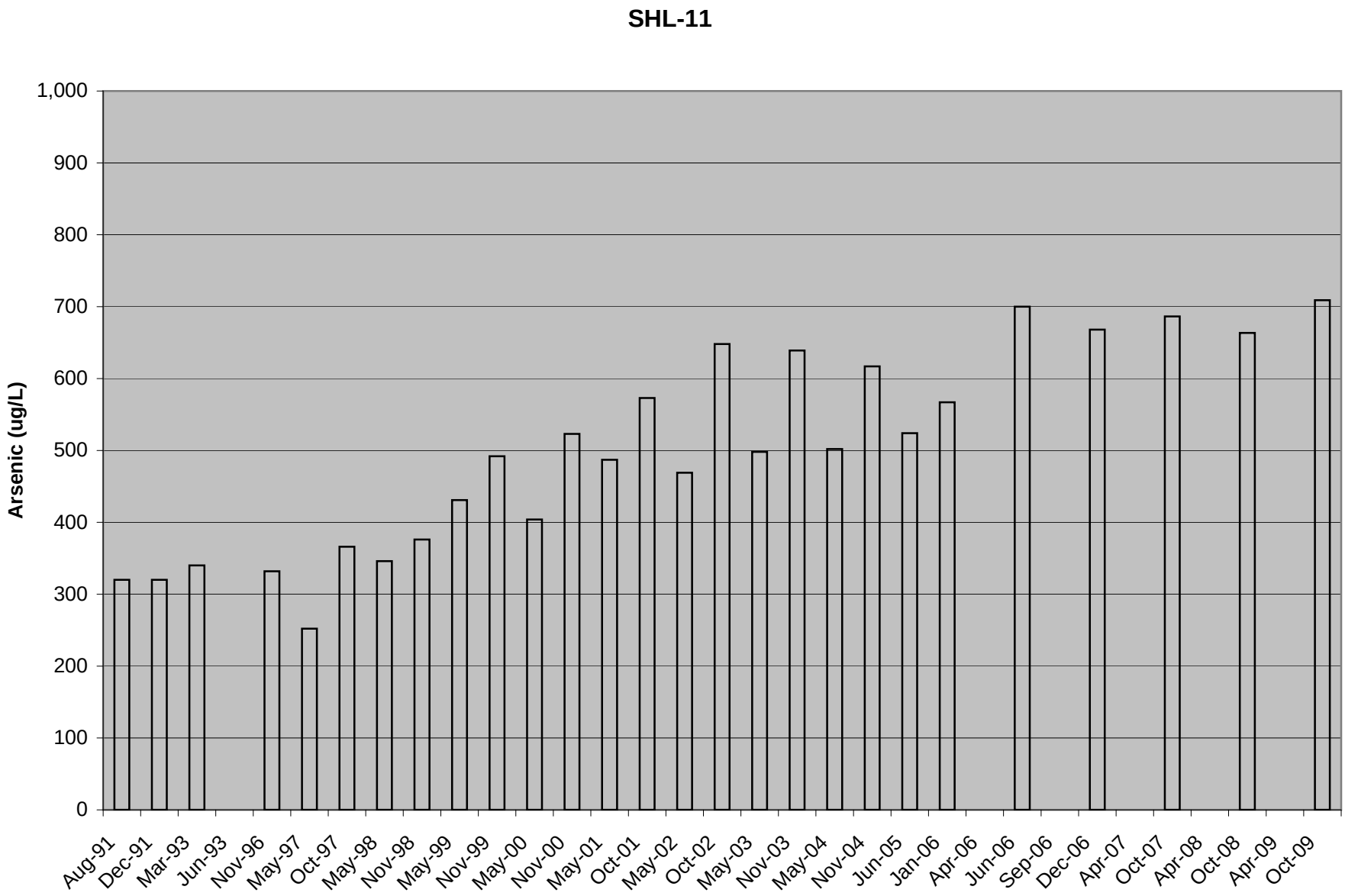
ARSENIC TRENDS
(1991-2009)

Historical Arsenic Trends
1991-2009




SHL-5
Arsenic (ug/L)
100
90
80
70
60
50
40
30
20
10
0
Aug-91
Dec-91
Mar-93
Jun-93
Nov-96
May-97
Oct-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Oct-01
May-02
Oct-02
May-03
Nov-03
May-04
Nov-04
Jun-05
Jan-06
Apr-06
Jun-06
Sep-06
Dec-06
Apr-07
Oct-07
Apr-08
Oct-08
Apr-09
Oct-09


SHL-9
Arsenic (ug/L)
500
450
400
350
300
250
200
150
100
50
0
Aug-91
Dec-91
Mar-93
Jun-93
Nov-96
May-97
Oct-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Oct-01
May-02
Oct-02
May-03
Nov-03
May-04
Nov-04
Jun-05
Jan-06
Apr-06
Jun-06
Sep-06
Dec-06
Apr-07
Oct-07
Apr-08
Oct-08
Apr-09
Oct-09


SHL-11
Arsenic (ug/L)
1,000
900
800
700
600
500
400
300
200
100
0
Aug-91
Dec-91
Mar-93
Jun-93
Nov-96
May-97
Oct-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Oct-01
May-02
Oct-02
May-03
Nov-03
May-04
Nov-04
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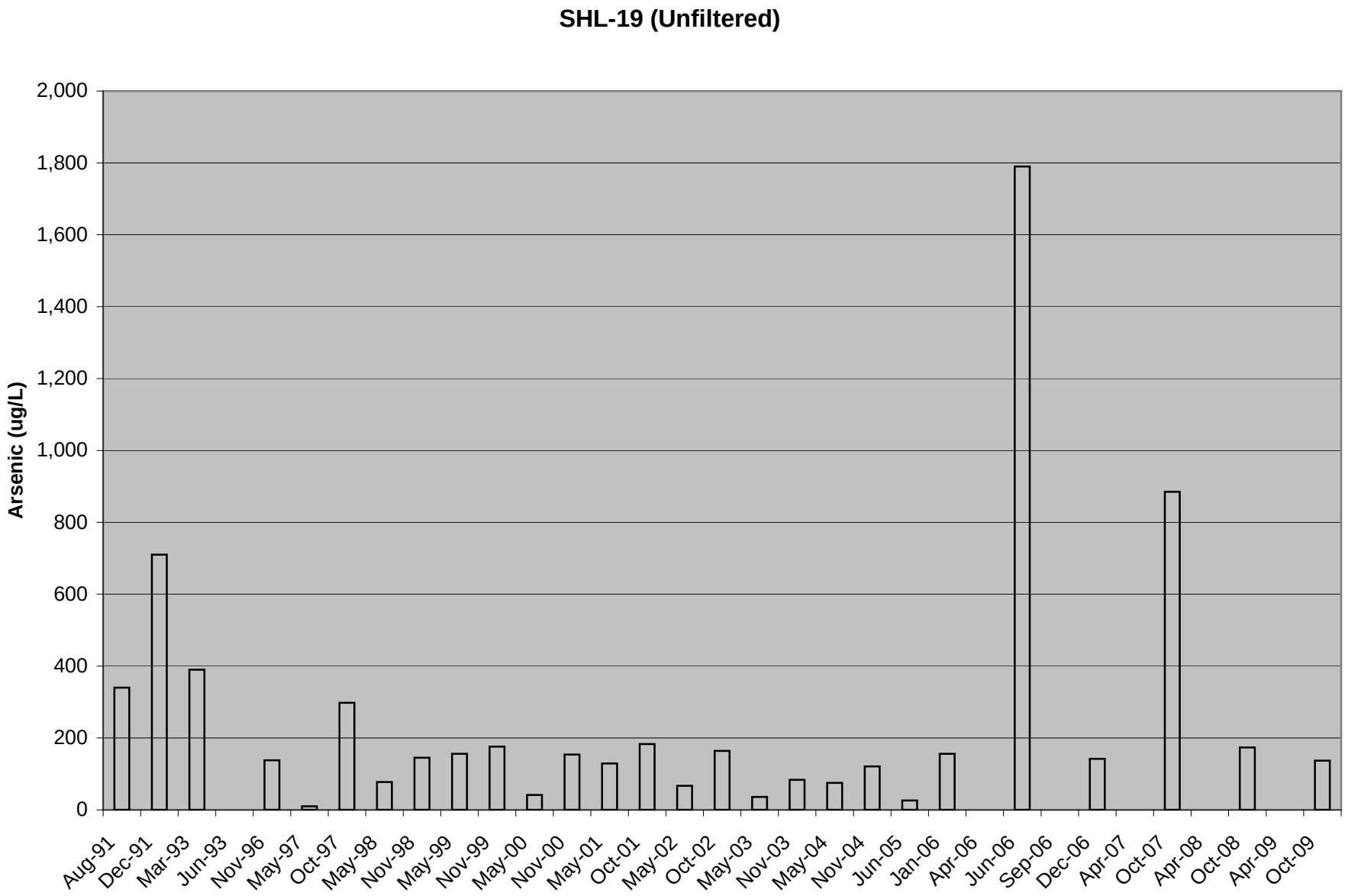
Apr-08
Oct-08
Apr-09
Oct-09


SHL-19 (Unfiltered)
Arsenic (ug/L)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
Aug-91
Dec-91
Mar-93
Jun-93
Nov-96
May-97
Oct-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Oct-01
May-02
Oct-02
May-03
Nov-03
May-04
Nov-04
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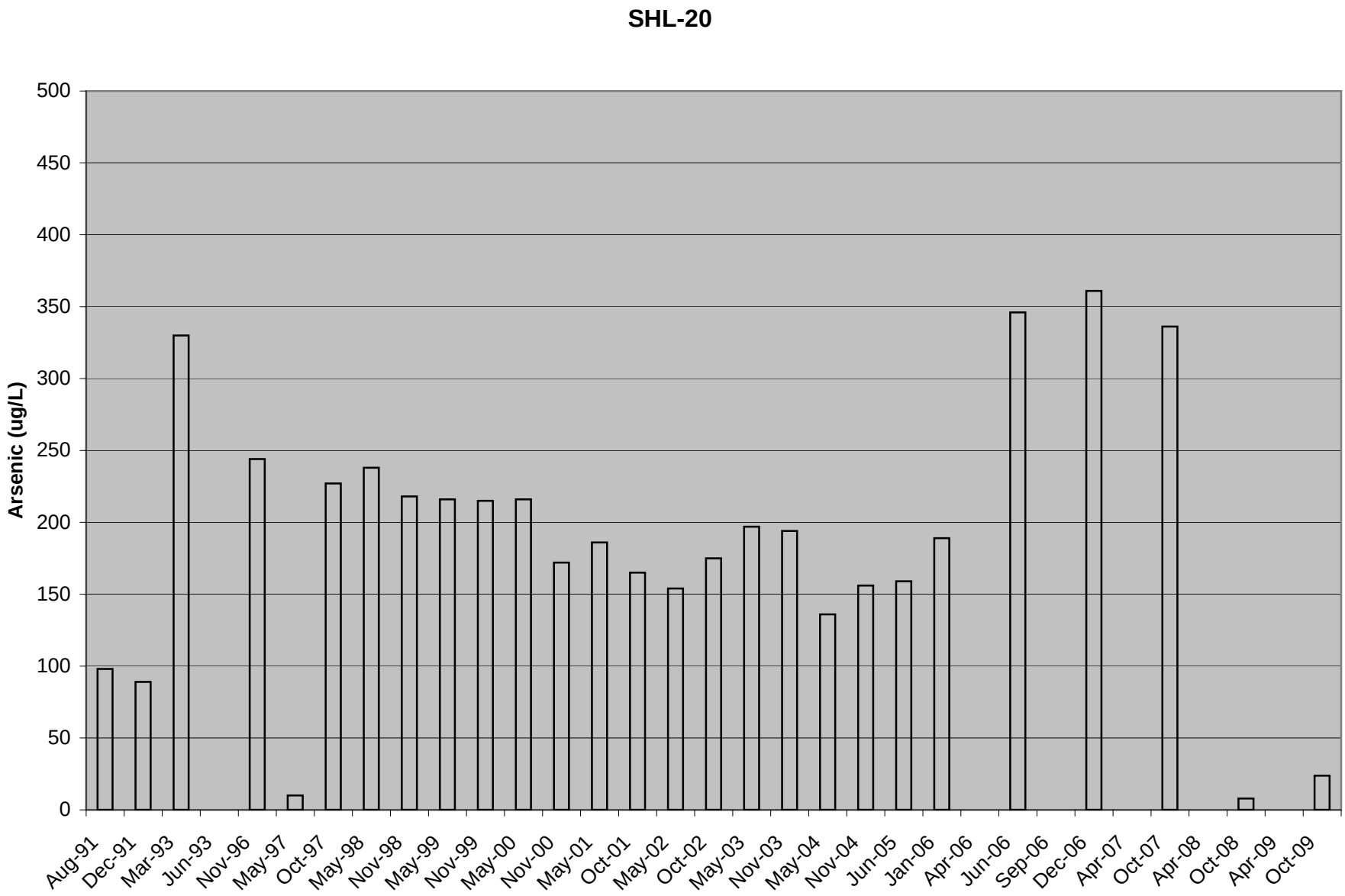
Oct-07
Apr-08
Oct-08
Apr-09
Oct-09


SHL-20
Arsenic (ug/L)
500
450
400
350
300
250
200
150
100
50
0
Aug-91
Dec-91
Mar-93
Jun-93
Nov-96
May-97
Oct-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Oct-01
May-02
Oct-02
May-03
Nov-03
May-04
Nov-04
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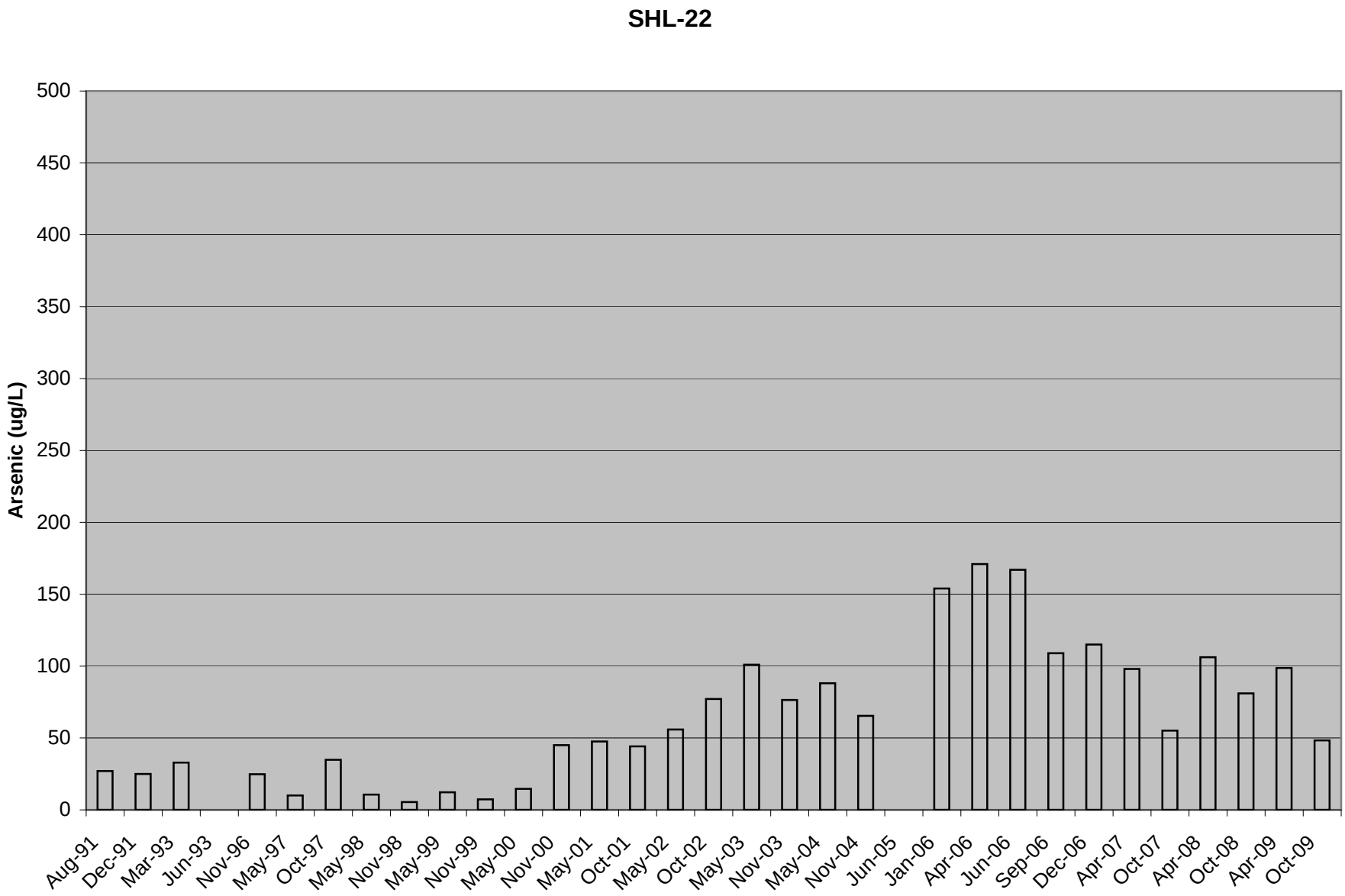
Apr-07
Oct-07
Apr-08
Oct-08
Apr-09
Oct-09


SHL-22
Arsenic (ug/L)
500
450
400
350
300
250
200
150
100
50
0
Aug-91
Dec-91
Mar-93
Jun-93
Nov-96
May-97
Oct-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Oct-01
May-02
Oct-02
May-03
Nov-03
May-04
Nov-04
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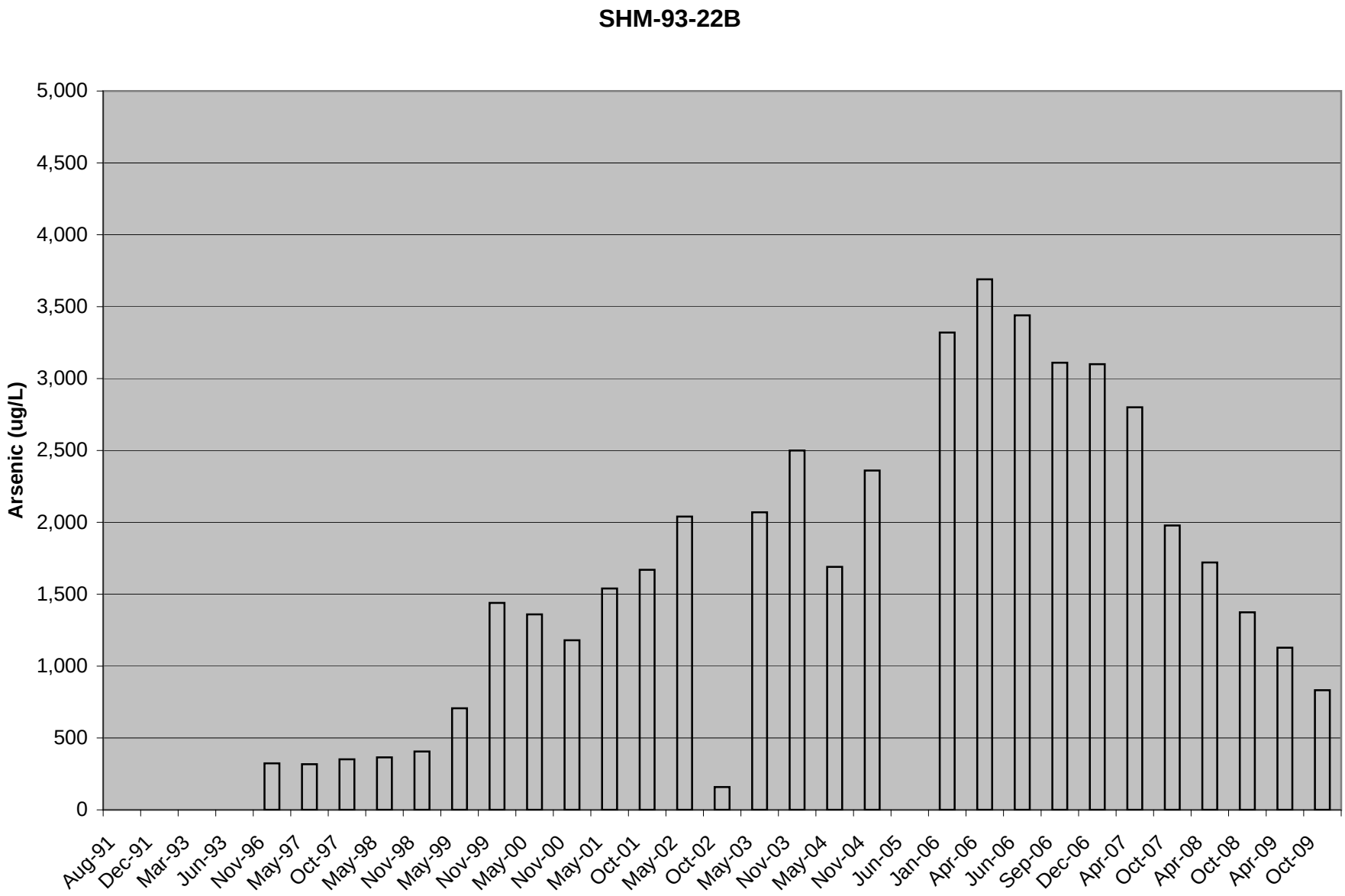
Apr-08
Oct-08
Apr-09
Oct-09


SHM-93-22B
Arsenic (ug/L)
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Aug-91
Dec-91
Mar-93
Jun-93
Nov-96
May-97
Oct-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Oct-01
May-02
Oct-02
May-03
Nov-03
May-04
Nov-04
Jun-05
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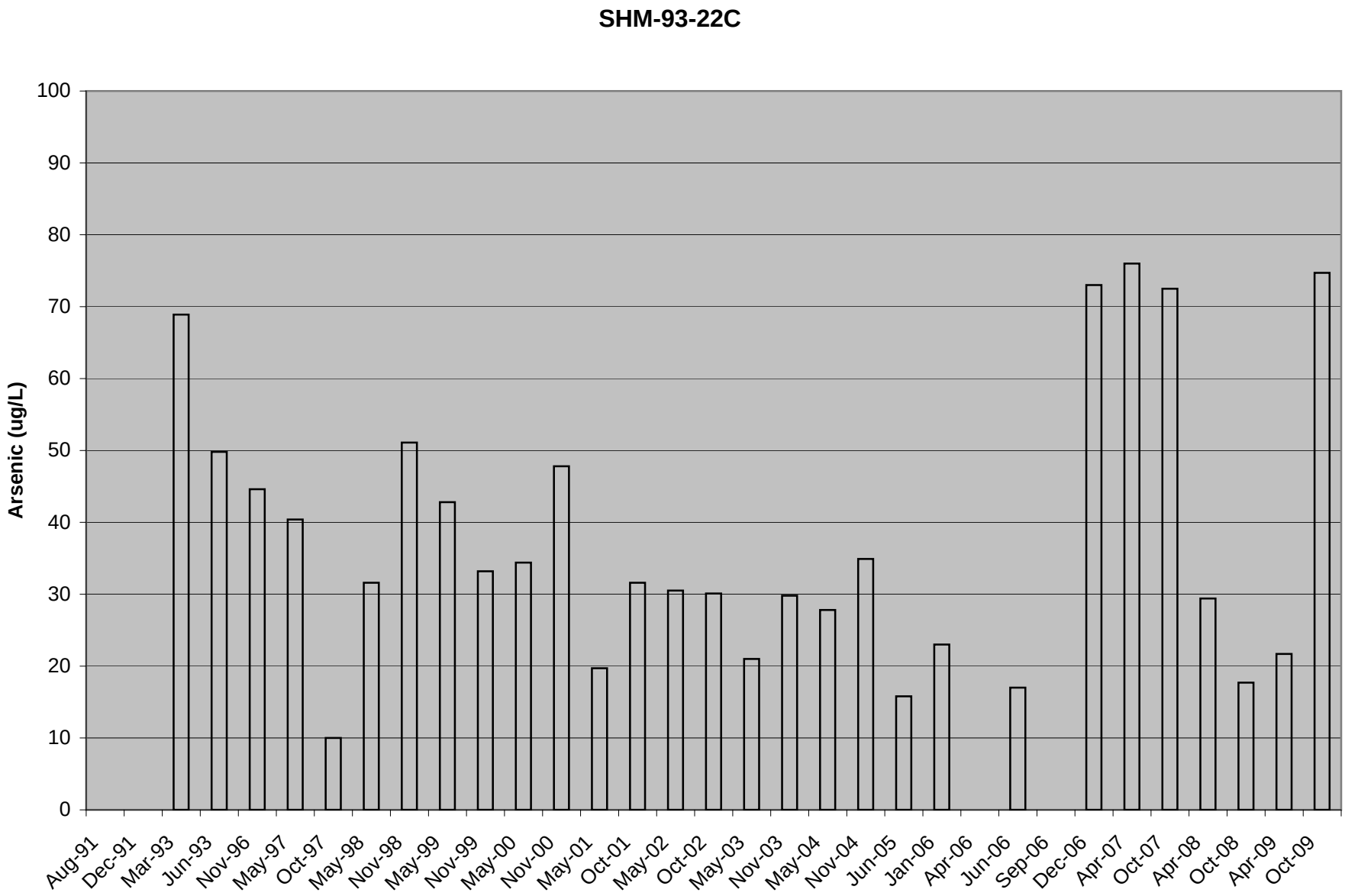
Oct-07
Apr-08
Oct-08
Apr-09
Oct-09


SHM-93-22C
Arsenic (ug/L)
100
90
80
70
60
50
40
30
20
10
0
Aug-91
Dec-91
Mar-93
Jun-93
Nov-96
May-97
Oct-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Oct-01
May-02
Oct-02
May-03
Nov-03
May-04
Nov-04
Jun-05
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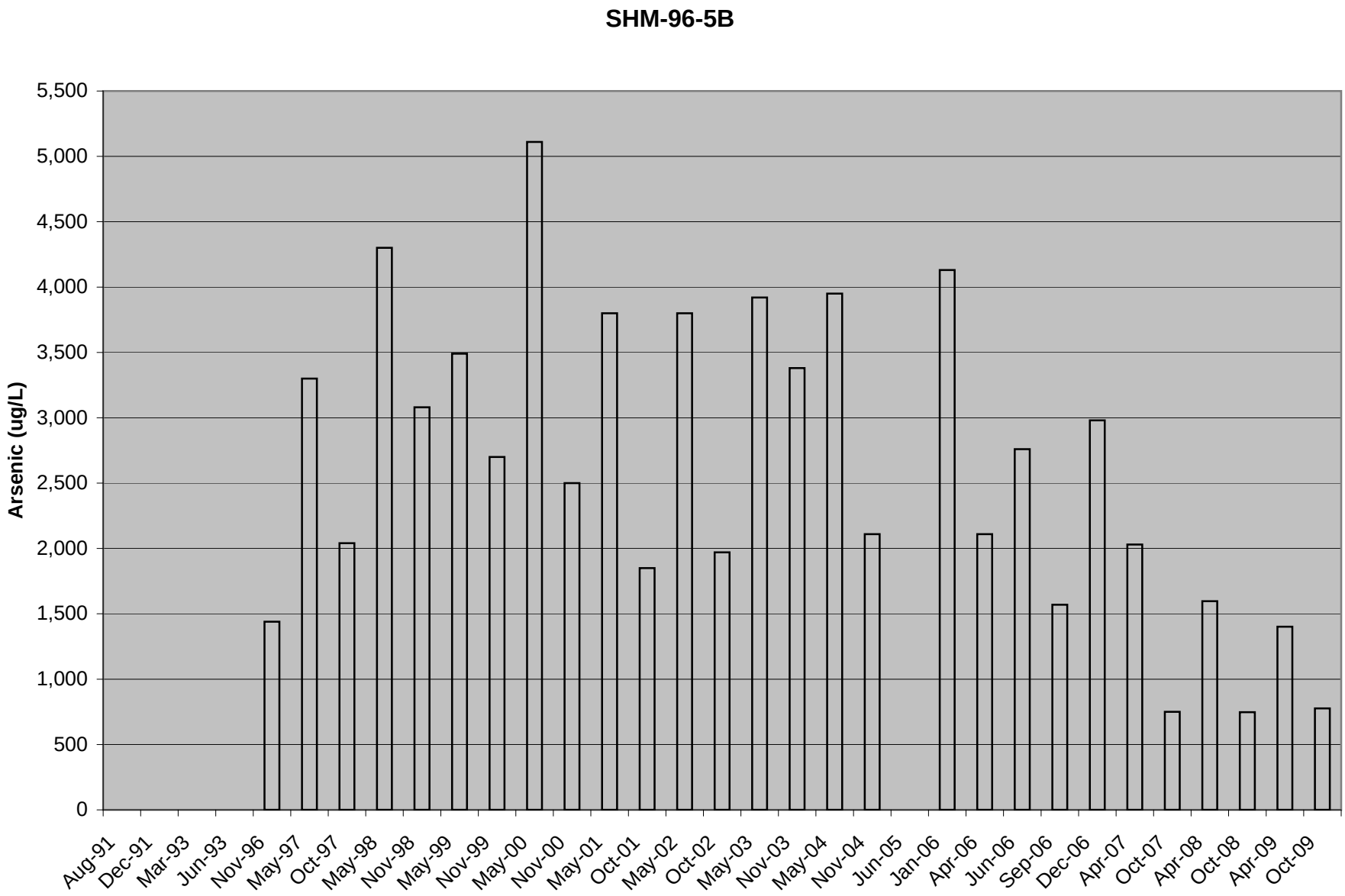
Apr-08
Oct-08
Apr-09
Oct-09


SHM-96-5B
Arsenic (ug/L)
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
Aug-91
Dec-91
Mar-93
Jun-93
Nov-96
May-97
Oct-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Oct-01
May-02
Oct-02
May-03
Nov-03
May-04
Nov-04
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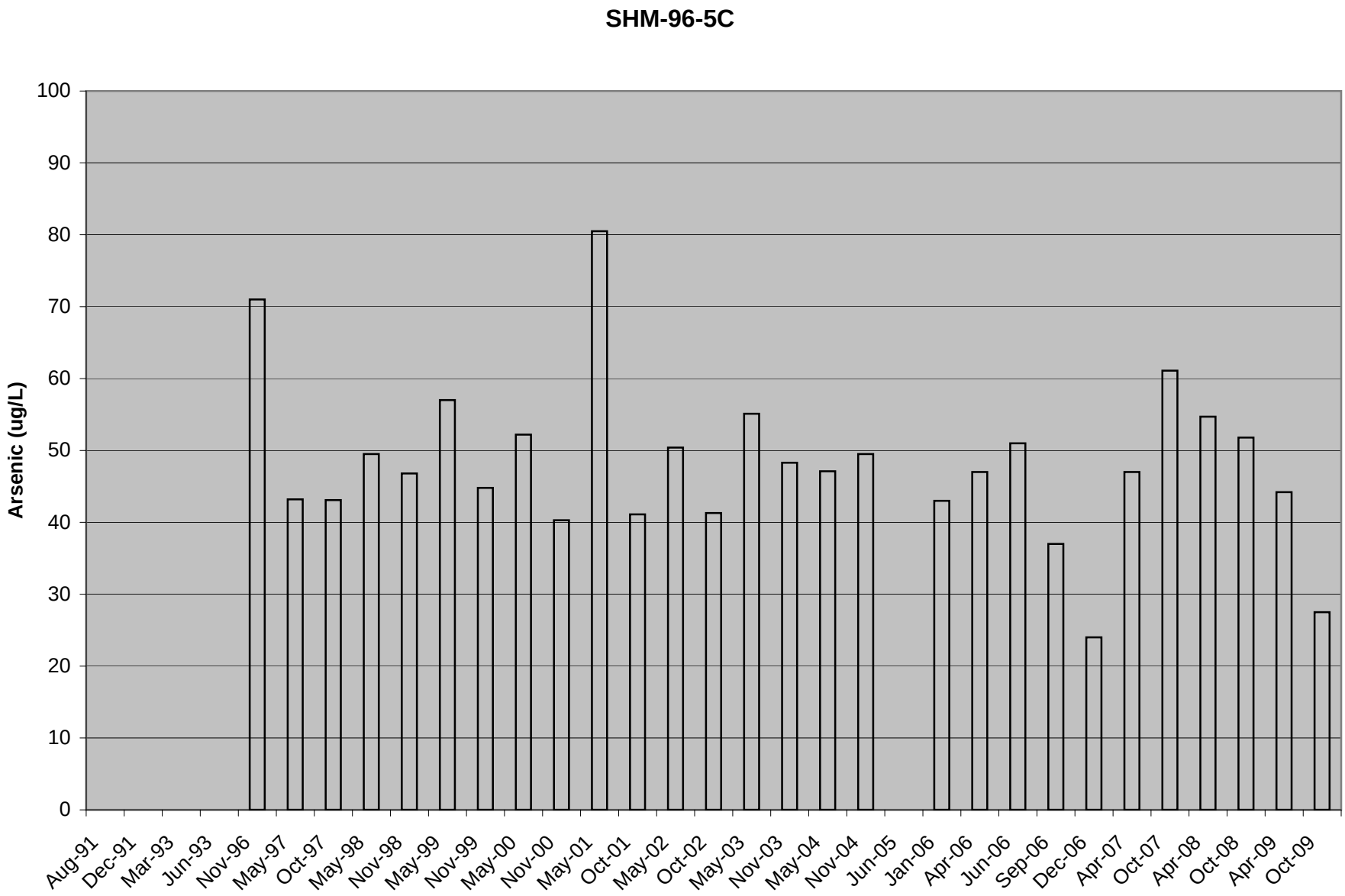
Apr-08
Oct-08
Apr-09
Oct-09


SHM-96-5C
Arsenic (ug/L)
100
90
80
70
60
50
40
30
20
10
0
Aug-91
Dec-91
Mar-93
Jun-93
Nov-96
May-97
Oct-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Oct-01
May-02
Oct-02
May-03
Nov-03
May-04
Nov-04
Jun-05
Jan-06
Apr-06
Jun-06
Sep-06
Dec-06
Apr-07
Oct-07
Apr-08
Oct-08
Apr-09
Oct-09

GROUNDWATER ANALYTICAL RESULTS
(2005-2009)

Key for Tables

General Terms

AP	atmospheric pressure
bgs	below ground surface
BOD_5	biological oxygen demand
BP	barometric pressure
CENAE	U.S. Army Corps of Engineers (USACE), New England District
CGI	combustible gas indicator
CH_4	methane
Co.	Company
CO	carbon monoxide
CO_2	carbon dioxide
DP	Direct push soil gas survey point
ECC	Environmental Chemical Corporation
EPH	extractable petroleum hydrocarbons
ft	feet
GEM	Landtec GEM 500 (instrument)
GP	Temporary gas point at select downgradient monitoring well locations
H_2S	hydrogen sulfide
Hg	mercury
in	inches
ISTMX	Industrial Scientific TMX412 (instrument)
LEL	Lower explosive limit
LGP	Landfill gas well point
lpm	liters per minute
LTMMP	Long-term Monitoring and Maintenance Plan
MCP	Massachusetts Contingency Plan
μg/L	Micrograms per liter
mg/L	Milligrams per liter
μS/cm	Microsiemens per centimeter
NA	Not analyzed
No.	number

NOAA	National Oceanic and Atmospheric Administration
NS	Not sampled
O_2	oxygen
ORP	Oxidation-reduction potential
PID	photoionization detector
ppm	parts per million
ROD	Record of Decision
sec	Second
SHL	Shepley Hill Landfill
T	temperature
V	Landfill gas vent
VOC	volatile organic compounds

Data Qualifiers

J	Estimated detection
U	Not detected (at associated reporting limit)
UJ	Not detected; reporting limit is an estimate
R	Rejected due to serious deficiencies in associated QC. The presence or absence of the analyte cannot be verified.
EJ	Detected result reported at a concentration above the calibrated range of the instrument and is considered an estimate.

Shepley's Hill Landfill
Devens, Massachusetts
(Sheet 1 of 1)

PARAMETERS	Well No. CLEANUP LEVEL (1) µg/L	SHL-11 µg/L	SHL-11-QA µg/L	RPD
VOLATILES (8260B)				
1,1-Dichloroethane	70 (4)	5.0 U	2.0 U	N/A
1,2-Dichlorobenzene	600	5.0 U	2.0 U	N/A
1,2-Dichloroethane	5	5.0 U	5.0 U	N/A
1,2-Dichloroethene (total)	70 (2)	1.4 J	1.2 J	15
1,3-Dichlorobenzene	600 (2)	5.0 U	2.0 U	N/A
1,4-Dichlorobenzene	5	5.0 U	1.6 J	N/A
2-Butanone	-	5.0 U	10 U	N/A
4-Methyl-2-Pentanone	-	5.0 U	10 U	N/A
Acetone	3,000 (4)	5.0 U	10 U	N/A
Benzene	5 (2)	1.5 J	1.4	7
Methyl-t-Butyl Ether	70 (4)	5.0 U	2.0 U	N/A
Xylenes	10,000 (2)	5.0 U	2.0 U	N/A
METALS (6010B or as noted)				
Aluminum	6,870	88 U	480	N/A
Arsenic	50	**524**	**527**	1
Barium	2,000 (2)	78.5 B	67 U	16
Cadmium	5 (2)	0.6 U	5.0 U	N/A
Chromium	100	1.2 U	10.0 U	N/A
Copper	1,300 (3)	6.6 B	4.82 J	31
Iron	9,100	**59400**	**57000**	4
Lead	15	4.8	1.1 J	125
Manganese	1,715	**2380**	**2410**	1
Mercury (7470A)	2 (2)	0.1 U	0.2 U	N/A
Nickel	100	3 U	4.94 J	N/A
Selenium	50 (2)	3.8 U	5.0 U	N/A
Silver	40 (4)	1.8 U	2.36 J	N/A
Sodium	20,000	**21600**	**21100**	2
Zinc	2,000 (4)	5 B	27.4	138
GENERAL CHEMISTRY				
Alkalinity as $CaCO_3$	-	201,000	170,000	17
Biochemical Oxygen Demand	-	1,400	2,000 U	N/A
Chloride	-	23,900	25,000	4
Chemical Oxygen Demand	-	20,000 U	16,000 J	N/A
Cyanide (Total)	200 (2)	10 U	5.0 J	N/A
Hardness as $CaCO_3$	-	127,000	123,000	3
Nitrate as Nitrogen	10,000 (2)	420 U	51 J	N/A
Sulfate	500,000 (2)	880 U	730 J	N/A
Total Dissolved Solids	-	585,000*	380,000	42
Total Suspended Solids	-	33,100	21,000	45
Total Organic Carbon	-	3,600	3,600	0

Notes:

Shaded areas with bold numbers indicate cleanup level exceedance -
B = value within 5 times of the greater amount detected in the equipment or preparation blank samples
B (inorganics)= value below PQL but above IDL
J = estimated value
U = Below laboratory RL
*** = duplicate analysis Relative Percent Difference outside acceptance limits**
N/A = not applicable

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LTMMP - June, 2006 Sampling Event
Shepley's Hill Landfill
Devens, Massachusetts

Analaytical Parameter	Units	MCL or ROD Standard	Sample ID													
			SHL-03	SHL-4	SHL-5	SHM96-5B	SHM96-5C	SHL-9	SHL-10	SHM96-10C	SHL-11	SHL-19	SHL-20	SHL-22	SHM96-22B	SHM93-22C[1]
Alkalinity, Total	mg CaCO3/L		7	43	35	310	370	62	10	180	190	68	250	380	290	72
Solids, Total Dissolved	ug/L		35,000	63,000	28,000	370,000	440,000	89,000	36,000	280,000	270,000	120,000	310,000	450,000	300,000	140,000
Solids, Total Suspended	ug/L		37,000	5,000 U	5,000 U	35,000	120,000	5,000 U	25,000	6,900	59,000	160,000	5,800	5,000 U	94,000	28,000
Cyanide, Total	ug/L	30	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10	5 U	5 U	5 U
Chloride	ug/L		1,000 U	1,400	1,600	21,000	43,000	5,000	1,000 U	20,000	22,000	1,200	23,000	29,000	22,000	13,000
Nitrogen, Nitrate	ug/L		110	100 U	100 U	100 U	110	100 U	180	100 U	180	140	100 U	100 U	100 U	180
Sulfate	ug/L		10,000 U	10,000 U	20,000	10,000 U	10,000 U	10,000 U	10,000 U	22,000	10,000 U	14,000	10,000 U	10,000 U	10,000 U	10,000 U
Chemical Oxygen Demand	ug/L		20,000 U	20,000 U	20,000 U	31,000	95,000	22,000	20,000 U	20,000 U	36,000	20,000 U	20,000 U	20,000 U	31,000	20,000 U
BOD, 5 day	ug/L		2,000 U	2,000 U	2,000 U	2,000 U	5,000	2,000 U	2,000 U	2,000 U	3,500	2,000 U	2,000 U	2,000 U	4,100	2,000 U
Total Organic Carbon	ug/L		500 U	1,300	6,600	4,000	8,600	7,200	500 U	740	3,800	1,400	3,000	3,700	4,900	4,400
Hardness	ug/L		9,700	34,000	40,000	240,000	260,000	66,000	12,000	200,000	130,000	66,000	190,000	32,000	200,000	120,000
			Total Metals by MCP 6000/7000 series													
Aluminum, Total	ug/L	6,870	490	100 U	190	100 U	100 U	100	100 U	100 U	100 U	100 U	100 U	100 U	100 U	120
Arsenic, Total	ug/L	10	5 U	5 U	6	2,760	51	21	5 U	12	700	1,790	346	167	3,440	17
Barium, Total	ug/L	200	10 U	20	10 U	40	60	10	10 U	10 U	70	30	100	10	70	120
Cadmium, Total	ug/L	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chromium, Total	ug/L	100	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Copper, Total	ug/L	10,000	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Iron, Total	ug/L	9,100	640	210	2,900	27,000	89,000	7,500	50 U	50 U	61,000	100,000	6,900	670	67,000	650
Lead, Total	ug/L	15	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Manganese, Total	ug/L	1715	20	400	490	8,500	4,900	380	10 U	40	2,200	2,400	6,700	2,900	2,100	110
Mercury, Total	ug/L	2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel, Total	ug/L	100	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U
Selenium, Total	ug/L	50	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Silver, Total	ug/L	7	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U
Sodium, Total	ug/L	20,000	2,000 U	4,600	2,900	28,000	38,000	2,900	2,000 U	9,000	24,000	2,800	30,000	39,000	29,000	10,000
Zinc, Total	ug/L	900	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	100	50 U	50 U	50 U	50 U
			Volatile Organics by MCP 8260B													
1,1-Dichloroethane	ug/L	70	0.75 U	0.75 U	0.75 U	1	0.92	0.0005 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	1.2	1.2	0.75 U
Benzene	ug/L	5	0.5 U	0.5 U	0.5 U	0.78	1.4	0.5 U	0.5 U	0.5 U	1.5	0.5 U	0.74	0.5 U	1.2	1.5
Chlorobenzene	ug/L	100	0.5 U	0.5 U	0.5 U	0.98	2	0.5 U	0.5 U	0.5 U	0.57	0.5 U	0.5 U	0.56	0.98	0.5 U
Chloroethane	ug/L	1	1 U	1 U	1 U	1.9	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1.8	1.8	1 U
cis-1,2-Dichloroethene	ug/L	70	0.5 U	0.5 U	0.5 U	2.4	2.5	0.5 U	0.5 U	0.5 U	1.7	0.5 U	0.81	2	2.5	0.5 U
Ethyl ether	ug/L	1000	2.5 U	2.5 U	2.5 U	16	17	2.5 U	2.5 U	3.8	16	2.5 U	0.011	18	16	2.5 U
Tetrahydrofuran	ug/L	5000	10 U	10 U	10 U	10 U	150	10 U	10 U	10 U	10 U	10 U	10 U	11	10 U	190
Toluene	ug/L	1000	10 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	10 U	10 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	>100
Field Readings			SHL-03	SHL-4	SHL-5	SHM96-5B	SHM96-5C	SHL-9	SHL-10	SHM96-10C	SHL-11	SHL-19	SHL-20	SHL-22	SHM96-22B	SHM93-22C[1]
pH		n/a	6.6	6.4	5.8	6.57	6.55	6.46	6.8	7.0	6.4	6.2	6.5	6.5	6.53	7.5
Specific Conductivity	(uS/cm)	n/a	0.02	0.07	0.09	0.52	0.77	0.12	0.03	0.36	0.39	0.14	0.39	0.57	0.56	0.51
Dissolved Oxygen	(mg/L)	n/a	11.01	0.14	0.19	0.17	0.15	0.23	10.95	0.63	0.48	0.97	0.25	0.13	0.12	0.13
Oxidation Reduction Potentia	(mV)	n/a	133.1	61.0	36.0	-75.7	-104.8	-37.6	156.9	155.7	-51.7	23.4	-30.2	-52.9	-111.7	-138.4

NOTES: 1. Water table did not stabilize

LTMMP - December, 2006 Sampling Event
Shepley's Hill Landfill
Devens, Massachusetts

Analaytical Parameter	Units	MCL or ROD Standard	Sample ID													
			SHL-3	SHL-4	SHL-5	SHM965-B	SHM96-5C	SHL-9	SHL-10	SHM93-10C	SHL-11	SHL-19	SHL-20	SHL-22	SHM96-22B	SHM93-22C
Alkalinity, Total	mg CaCO3/l		11	62	29	330	370	84	16	190	240	89	250	390	310	330
Solids, Total Dissolved	ug/l		25,000	85,000	81,000	380,000	410,000	160,000	20,000	280,000	290,000	130,000	320,000	470,000	350,000	450,000
Solids, Total Suspended	ug/l		5,900	5,000 U	5,000 U	19,000	19,000	5,000 U	5,000 U	9,300	32,000	22,000	8,700	5,000 U	63,000	20,000
			Anions by Ion Chromatography													
Chloride	ug/l		500 U	5,400	1,000	19,000	39,000	6,000	500 U	22,000	24,000	1,300	25,000	26,000	22,000	42,000
Nitrogen, Nitrate	ug/l		210	410	50 U	230	200	100 U	760	100 U	120	110	100 U	100 U	250	50 U
Sulfate	ug/l		2,600	4,000	5,000	4,700	2,700	8,600	2,400	21,000	1,500	15,000	15,000	5,600	3,500	20,000
Cyanide, Total	ug/l	200	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	120	5 U	9	5 U	5 U	5 U
Chemical Oxygen Demand	ug/l		20,000 U	20,000 U	20,000 U	29,000	31,000	24,000	20,000 U	20,000 U	24,000	20,000 U	20,000	22,000	31,000	20,000 U
BOD, 5 day	ug/l		2,000 U	2,000 U	2,000 R	2,000 R	3,200 J	2,000 R	2,000 R	2,000 U	6,900	2,000 U	2,000 U	2,000 R	4,200 R	2,000 U
Total Organic Carbon	ug/l		500 U	1,400	6,300	3,700	6,300	7,700	500 U	690	3,800	980	2,400	3,400	4,700	2,300
Hardness	ug/l		12,000	55,000	31,000	240,000	260,000	79,000	18,000	190,000	130,000	74,000	190,000	320,000	200,000	330,000
			Total Metals by MCP 6000/7000 series													
Aluminum, Total	ug/l	6,870	100 U	100 U	190	100 U	100 U	100 U	100 U	160	100 U	100 U	100 U	100 U	100 U	100 U
Arsenic, Total	ug/l	10	5 U	5 U	8	2,980	24	51	5 U	10	668	142	361	115	3,100	73
Barium, Total	ug/l	200	10 U	30	10 U	50	64	16	10 U	10 U	79	21	109	12	76	93
Cadmium, Total	ug/l	5	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Chromium, Total	ug/l	100	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Copper, Total	ug/l	10,000	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Iron, Total	ug/l	9,100	50 U	160	2,200	31,000	28,000	11,000	50 U	210	58,000	13,000	7,200	540	74,000	2,700
Lead, Total	ug/l	15	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Manganese	ug/l	1715	10 U	198	372	9,460	5,420	580	10 U	70	2,620	1,320	6,370	3,520	2,070	702
Mercury, Total	ug/l	2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel, Total	ug/l	100	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U
Selenium, Total	ug/l	50	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Silver, Total	ug/l	7	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U
Sodium, Total	ug/l	20,000	2,000 U	4,300	2,000 U	28,000	36,000	3,700	2,000 U	8,900	25,000	2,000 U	29,000	39,000	30,000	24,000
Zinc, Total	ug/l	900	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
			Volatile Organics by MCP 8260B													
1,1-Dichloroethane	ug/l	70	0.75 U	0.75 U	0.75 U	0.88	0.92	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	1.1	1.2	1.5
Benzene	ug/l	5	0.5 U	0.5 U	0.5 U	0.63	0.5 U	0.5 U	0.5 U	0.5 U	1.5	0.5 U	0.5 U	0.5 U	1.1	0.5 U
Chlorobenzene	ug/l	100	0.5 U	0.5 U	0.5 U	0.8	1.7	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.9	0.5 U
cis-1,2-Dichloroethene	ug/l	70	0.5 U	0.5 U	0.5 U	2.1	2.2	0.5 U	0.5 U	0.5 U	1.4	0.5 U	0.68	2	2.3	1.5
Ethyl ether	ug/l		2.5 U	2.7	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	6.1	14	2.5 U	9.7	18	17	20
Methyl tert butyl ether	ug/l	70	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1.1
Tetrahydrofuran	ug/l		10 U	10 U	10 U	10 U	20	10 U	10 U	10 U	10 U	10 U	10 U	37	10 U	10 U
Field Readings			SHL-03	SHL-4	SHL-5	SHM96-5B	SHM96-5C	SHL-9	SHL-10	SHM96-10C	SHL-11	SHL-19	SHL-20	SHL-22	SHM96-22B	SHM93-22C[1]
pH			6.8	5.6	6.3	7.0	6.9	6.8	6.5	7.5	6.4	6.3	6.5	6.9	6.9	7.5
Specific Conductivity	(uS/cm)		0.02	0.20	0.11	0.75	0.96	0.23	0.04	0.43	0.59	0.25	0.53	0.76	0.76	0.75
Dissolved Oxygen	(mg/L)		9.53	--	1.83	1.56	1.74	0.68	9.93	0.43	3.30	0.29	0.28	0.70	0.10	2.50
Oxidation Reduction Potential	(mV)		121.0	74.0	-136.8	-77.4	-81.6	-18.2	175.0	28.0	-74.0	2.0	-38.0	-47.6	-22.6	-162.0

NOTES: 1. Water table did not stabilize

2007 Groundwater Analytical Results

Shepley's Hill Landfill
Devens, Massachusetts

Analaytical Parameter	Units	MCL or ROD Standard	Sample ID														
			N-5, P-1 Oct-2007	N-5, P-2 Oct-2007	SHL-4 Oct-2007	SHL-5 May-2007	SHL-5 Oct-2007	SHL-8D Apr-2007	SHL-8D Oct-2007	SHL-8S Apr-2007	SHL-8S Oct-2007	SHL-9 Apr-2007	SHL-9 Oct-2007	SHL-10 Oct-2007	SHL-11 Oct-2007	SHL-13 Oct-2007	SHL-15 Oct-2007
ALKALINITY, TOTAL (AS CACO3)	ug/l	n/a	280000	600000	130000	28000	39000	42000	55000	17000	17000	63000	84000	20000	230000	18000	60000
CHLORIDE	ug/l	n/a	17000 18000		19000	2600	1000 U	5100	11000	5600	6900	1000 U	3800	1000 U	21000	41000	9900
NITRATE (AS N)	ug/l	n/a	310	250	79 J	100 U	110	590	230	100 U	80 J	690	91 J	280	220	100 U	520
SULFATE	ug/l	n/a	7700 1000	U	3000	1900	1600	6600	6900	800 J	1000 U	11000	5800	2300	4500	5600	19000
TURBIDITY	NTU	n/a	110 320		2.2	1.9	3.2	0.2 U	0.2 U	0.2 U	1.2	14	1	0.2 U	31	0.2 U	1.2
			Total Metals by SW6010/SW6020														
ARSENIC	ug/l	10.00	4856	28.1	7.5	6.2	16.2	3 U	11.8	3 U	22.6	26	34.1	0.59 J	686.5	1.6	42
CALCIUM METAL	ug/l	n/a	69000	140000	35000	8100	9400	13000	18000	3600	3600	22000	26000	5800	34000	6900	21000
IRON	ug/l	9100.00	33000	68000	1800	2400	6300	29 J	22 J	22 J	80	7300	11000	45 J	48000	110	3400
MAGNESIUM	ug/l	n/a	9800	15000	7000	1500	1700	1900	2600	640	660	1500	1700	790	5200	1500	2800
MANGANESE	ug/l	1715.00	6330	374	631	349	362	53	80	29	56	469	515	14	2320	503	570
POTASSIUM	ug/l	n/a	5900	20000	4900	1600 J	1900 J	870 J	970 J	1300 J	1300 J	1900 J	2500	830 J	9500	980 J	4900
SODIUM	ug/l	20000.00	20000	23000	13000	1400 J	1400 J	5600	9100	5600	5900	2800	4100	1200 J	23000	24000	7600
Field Readings	**Units**	**MCL or ROD Standard**	**N-5, P-1 Oct-2007**	**N-5, P-2 Oct-2007**	**SHL-4 Oct-2007**	**SHL-5 May-2007**	**SHL-5 Oct-2007**	**SHL-8D Apr-2007**	**SHL-8D Oct-2007**	**SHL-8S Apr-2007**	**SHL-8S Oct-2007**	**SHL-9 Apr-2007**	**SHL-9 Oct-2007**	**SHL-10 Oct-2007**	**SHL-11 Oct-2007**	**SHL-13 Oct-2007**	**SHL-15 Oct-2007**
pH	pH Units	n/a	5.98	5.75	5.88	5.35	6.01	5.88	5.98	6.06	6.06	6.47	6.21	6.60	6.76	6.1	5.63
SPC	ms/cm	n/a	0.638	1.271	0.24	0.07	0.11	0.171	0.133	0.09	0.059	0.26	0.16	0.07	0.39	0.175	0.158
DO	mg/l	n/a	0.13	0.15	0.15	1.36	0.10	1.9	1.65	2.13	0.69	0.36	0.08	10.30	0.21	0.6	0.24
ORP	Millivolts	n/a	-60	-41	16.40	411.00	8.00	169	138	158	130	-52.00	-62.00	37.00	-91.00	148.3	-2
Temp	DEG C	n/a	11.86	12.03	11.26	10.18	12.84	8.2	10.44	8.18	10.32	6.37	10.14	14.39	11.87	17.18	11.39

Notes: J = Estimated Detect

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Highlighted values exceed MCL or ROD standard

2007 Groundwater Analytical Results

Shepley's Hill Landfill
Devens, Massachusetts

Analaytical Parameter	Units	MCL or ROD Standard	Sample ID													
			SHL-19 Oct-2007	SHL-20 Oct-2007	SHL-21 Apr-2007	SHL-21 Oct-2007	SHL-22 Apr-2007	SHL-22 Oct-2007	SHL-23 Apr-2007	SHL-23 Oct-2007	SHM-05-39A Oct-2007	SHM-05-39B Oct-2007	SHM-05-40X Oct-2007	SHM-05-41A Apr-2007	SHM-05-41A Oct-2007	SHM-05-41B Apr-2007
ALKALINITY, TOTAL (AS CACO3)	ug/l	n/a	88000	250000	20000	14000	380000	370000	3600	2000 U	180000	370000	240000	28000	30000	250000
CHLORIDE	ug/l	n/a	1000 U	21000	1000 U	1000 U	23000	24000	1000 U	1000 U	16000	57000	14000	4600	1000 U	8100
NITRATE (AS N)	ug/l	n/a	140	110	100 U	92 J	100 U	200	410	210	140	210	1100	100 U	100 U	100 U
SULFATE	ug/l	n/a	13000	14000	10000	6600	5500	5700	5900	5900	3300	1900	1800	18000	13000	3300
TURBIDITY	NTU	n/a	470	14	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1.1	190	110	260	0.77	2.7	100
			Total Metals by SW6010/SW6020													
ARSENIC	ug/l	10.00	885.1	336.2	3 U	0.81 J	98	55.1	3 U	0.73 J	241.5	309.4	4445	30	24.9	1990
CALCIUM METAL	ug/l	n/a	24000	66000	7700	5100	97000	100000	2200	2800	29000	99000	50000	8600	8200	42000
IRON	ug/l	9100.00	50000	7200	27 J	40 J	460	370	23 J	210	52000	10000	58000	4000	3400	74000
MAGNESIUM	ug/l	n/a	3800	9300	740	580	13000	13000	200	250	3800	14000	7500	1700	1700	5100
MANGANESE	ug/l	1715.00	2700	6540	1.3 J	4.6 J	3420	4320	13	14	1250	5920	1330	487	356	1440
POTASSIUM	ug/l	n/a	3600	6100	1300 J	1000 J	5900	5400	900 J	990 J	8200	9300	7300	2200 J	1800 J	12000
SODIUM	ug/l	20000.00	4200	28000	2800	2600	34000	34000	1300 J	1000 J	10000	47000	19000	4400	3400	12000
Field Readings	**Units**	**MCL or ROD Standard**	**SHL-19 Oct-2007**	**SHL-20 Oct-2007**	**SHL-21 Apr-2007**	**SHL-21 Oct-2007**	**SHL-22 Apr-2007**	**SHL-22 Oct-2007**	**SHL-23 Apr-2007**	**SHL-23 Oct-2007**	**SHM-05-39A Oct-2007**	**SHM-05-39B Oct-2007**	**SHM-05-40X Oct-2007**	**SHM-05-41A Apr-2007**	**SHM-05-41A Oct-2007**	**SHM-05-41B Apr-2007**
pH	pH Units	n/a	6.00	6.20	5.72	5.66	6.70	6.40	5.35	5.54	6.58	6.85	6.41	NS	7.2	NS
SPC	ms/cm	n/a	0.19	0.42	0.104	0.061	1.11	0.54	0.058	0.044	0.342	0.892	0.473	NS	0.079	NS
DO	mg/l	n/a	0.29	0.12	9.2	9.86	0.19	0.11	11.11	11.03	0.1	0.12	0.12	NS	0.12	NS
ORP	Millivolts	n/a	-43.90	-60.80	179	46	-51.00	-65.00	234	182	5.2	-90	70.4	NS	-12.6	NS
Temp	DEG C	n/a	11.39	11.75	11.76	14.1	7.73	10.75	11.33	11.79	10.88	12.66	11.72	NS	10.22	NS

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2007 Groundwater Analytical Results

Shepley's Hill Landfill
Devens, Massachusetts

Analaytical Parameter	Units	MCL or ROD Standard	Sample ID												
			SHM-05-41B Oct-2007	SHM-05-41C Apr-2007	SHM-05-41C Oct-2007	SHM-05-42A Apr-2007	SHM-05-42A Oct-2007	SHM-05-42B Apr-2007	SHM-05-42B Oct-2007	SHM-93-10C Oct-2007	SHM-93-10D Oct-2007	SHM-93-22C Apr-2007	SHM-93-22C Oct-2007	SHM-96-5B Apr-2007	SHM-96-5B Oct-2007
ALKALINITY, TOTAL (AS CACO3)	ug/l	n/a	340000	340000	340000	14000	16000	350000	460000	180000	84000	310000	280000	330000	320000
CHLORIDE	ug/l	n/a	11000	34000	37000	1000 U	1000 U	30000	44000	23000	26000	42000	45000	18000	21000
NITRATE (AS N)	ug/l	n/a	120	100 U	100 U	100 U	100 U	100 U	100 U	250	70 J	100 U	38 J	100 U	280
SULFATE	ug/l	n/a	1000 U	3600	1000 U	7600	6600	3400	130 J	20000	19000	21000	13000	4300	4500
TURBIDITY	NTU	n/a	170	100	140	1	0.91	110	230	0.91	65	38	21	30	9
			Total Metals by SW6010/SW6020												
ARSENIC	ug/l	10.00	2591	627	684.5	3 U	1.01 J	249	304.4	9.8	10.3	76	72.5	2030	750
CALCIUM METAL	ug/l	n/a	48000	90000	97000	5000	5600	59000	77000	72000	44000	97000	89000	70000	81000
IRON	ug/l	9100.00	100000	18000	18000	120	180	75000	94000	140	1900	2500	1700	22000	5000
MAGNESIUM	ug/l	n/a	6000	12000	13000	1000	1200	9600	12000	4000	1200	15000	15000	11000	12000
MANGANESE	ug/l	1715.00	1770	2960	3260	24	8.1 J	1330	1700	67	24	604	494	9060	11400
POTASSIUM	ug/l	n/a	12000	4500	4200	1700 J	1900 J	20000	20000	5200	5900	5100	4800	10000	9200
SODIUM	ug/l	20000.00	14000	35000	36000	990 J	1000 J	32000	39000	9200	8600	23000	25000	26000	28000
Field Readings	**Units**	**MCL or ROD Standard**	**SHM-05-41B Oct-2007**	**SHM-05-41C Apr-2007**	**SHM-05-41C Oct-2007**	**SHM-05-42A Apr-2007**	**SHM-05-42A Oct-2007**	**SHM-05-42B Apr-2007**	**SHM-05-42B Oct-2007**	**SHM-93-10C Oct-2007**	**SHM-93-10D Oct-2007**	**SHM-93-22C Apr-2007**	**SHM-93-22C Oct-2007**	**SHM-96-5B Apr-2007**	**SHM-96-5B Oct-2007**
pH	pH Units	n/a	6.47	NS	7.46	NS	5.08	NS	6.09	7.46	NS	7.40	6.72	6.47	5.75
SPC	ms/cm	n/a	0.527	NS	0.563	NS	0.046	NS	0.737	0.45	NS	1.05	0.67	0.94	0.69
DO	mg/l	n/a	0.1	NS	0.14	NS	0.09	NS	0.09	0.35	NS	0.20	0.20	0.24	0.13
ORP	Millivolts	n/a	3.5	NS	-28.9	NS	78.6	NS	17.9	19.00	NS	-188.00	-41.00	-82.00	22.00
Temp	DEG C	n/a	10.21	NS	10.17	NS	10.02	NS	10.34	12.47	NS	8.06	12.11	7.52	11.04

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2007 Groundwater Analytical Results

Shepley's Hill Landfill
Devens, Massachusetts

Analaytical Parameter	Units	MCL or ROD Standard	Sample ID											
			SHM-96-5C Apr-2007	SHM-96-5C Oct-2007	SHM-96-22B Apr-2007	SHM-96-22B Oct-2007	SHM-99-31A Oct-2007	SHM-99-31B Oct-2007	SHM-99-31C Oct-2007	SHM-99-32X Oct-2007	SHP-01-36X Oct-2007	SHP-01-37X Oct-2007	SHP-01-38A Oct-2007	SHP-99-29X Oct-2007
ALKALINITY, TOTAL (AS CACO3)	ug/l	n/a	350000	360000	310000	320000	46000	200000	390000	300000		29000	41000	190000	120000
CHLORIDE	ug/l	n/a	37000	32000	26000	20000	19000	16000	34000	35000		44000	49000	32000	1000 U
NITRATE (AS N)	ug/l	n/a	130	130	100 U	180	130	190	120	130		110	120	270	240
SULFATE	ug/l	n/a	4400	2800	5400	3200	6900	2200	1200	3400		7600	1100	12000	4900
TURBIDITY	NTU	n/a	96	180	240	390	2.1	7.6	130		180	0.2 U	0.2 U	35	7
			Total Metals by SW6010/SW6020												
ARSENIC	ug/l	10.00	47	61.1	2800	1978	22.7	85.5	292.1	206.2	16.7	26.6	781.4	2953
CALCIUM METAL	ug/l	n/a	69000	69000	61000	61000	12000	44000	86000	78000	8900	10000	32000	11000
IRON	ug/l	9100.00	56000	60000	78000	55000	12000	28000	44000	60000	6900	8200	37000	44000
MAGNESIUM	ug/l	n/a	8600	11000	11000	10000	800	5100	13000	11000	1700	1600	5400	990
MANGANESE	ug/l	1715.00	3270	3980	1410	3200	798	1210	4050	3480	309	588	848	10400
POTASSIUM	ug/l	n/a	16000	13000	17000	12000	680 J	6800	16000	12000	1500 J	2200 J	12000	530 J
SODIUM	ug/l	20000.00	29000	30000	28000	27000	13000	16000	38000	34000	25000	28000	24000	2600
Field Readings	**Units**	**MCL or ROD Standard**	**SHM-96-5C Apr-2007**	**SHM-96-5C Oct-2007**	**SHM-96-22B Apr-2007**	**SHM-96-22B Oct-2007**	**SHM-99-31A Oct-2007**	**SHM-99-31B Oct-2007**	**SHM-99-31C Oct-2007**	**SHM-99-32X Oct-2007**	**SHP-01-36X Oct-2007**	**SHP-01-37X Oct-2007**	**SHP-01-38A Oct-2007**	**SHP-99-29X Oct-2007**
pH	pH Units	n/a	6.39	5.85	6.63	6.35	5.75	6.15	6.12	6.41	5.85	6.12	6.19	4.82
SPC	ms/cm	n/a	1.16	0.85	1.24	0.51	0.148	0.492	0.626	0.874	0.196	0.218	0.386	0.21
DO	mg/l	n/a	0.13	0.10	0.15	0.11	0.2	0.13	0.1	0.14	0.17	0.12	0.12	0.21
ORP	Millivolts	n/a	-102.00	-54.00	-141.00	-113.00	59.5	-44	30.2	-89	-13	-41.3	-82.9	155.20
Temp	DEG C	n/a	7.63	10.39	7.10	9.84	13.21	10.1	10.53	10.18	17.24	16.73	12.46	12.44

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2008 Groundwater Analytical Results
Shepley's Hill Landfill
Devens, Massachusetts

Analaytical Parameter	Units	MCL or ROD Standard	Sample ID																		
			N-5, P-1 Oct-2008	N-5, P-2 Oct-2008	SHL-10 Oct-2008	SHL-11 Oct-2008	SHL-13 Oct-2008	SHL-15 Oct-2008	SHL-19 Oct-2008	SHL-20 Oct-2008	SHL-21 Apr-2008	SHL-21 Oct-2008	SHL-22 Apr-2008	SHL-22 Oct-2008	SHL-23 Apr-2008	SHL-23 Oct-2008	SHL-4 Oct-2008	SHL-5 Apr-2008	SHL-5 Oct-2008	SHL-8D Apr-2008	SHL-8D Oct-2008
ALKALINITY, TOTAL (AS CACO3)	ug/l		300000	650000	21000	220000	19000	78000	64000	150000	17000	19000 J	370000	370000	2000 U	4000	31000	25000	30000	51000	41000
CHLORIDE	ug/l		22000	15000	1000	15000	47000	1000	2200	21000	2200	1800	24000	21000	1100	1700	2600	1400	530	11000	9600
NITRATE (AS N)	ug/l		100 UJ	500 UJ	520	200 J	100 U	100 UJ	100 U	2400	100	100 UJ	55 J	100 U	360	330	100 U	56 J	100 UJ	270	100 U
SULFATE	ug/l		9200	1000 U	3900	540 J	4600	9900	14000	5900	9500	7100	5100	5600	4500	5100	2800	7600	3400	7300	8000
TURBIDITY	NTU		44	230	0.2 U	150	0.2 U	2.7	70	14	0.2 U	2.5 J	3.2	4.9	0.57	1	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
			Dissolved Metals by SW6010/SW6020																		
ARSENIC	ug/l	10	NS	NS	NS	NS	NS	NS	28	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
CALCIUM METAL	ug/l		NS	NS	NS	NS	NS	NS	17000	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
IRON	ug/l	9100	NS	NS	NS	NS	NS	NS	10000	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MAGNESIUM	ug/l		NS	NS	NS	NS	NS	NS	3100	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MANGANESE	ug/l	1715	NS	NS	NS	NS	NS	NS	2230	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
POTASSIUM	ug/l		NS	NS	NS	NS	NS	NS	3200	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
SODIUM	ug/l	20000	NS	NS	NS	NS	NS	NS	3100	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
			Total Metals by SW6010/SW6020																		
ARSENIC	ug/l	10	1748	26.8	1 UJ	663.5	3.3	75	173.6	7.9	1.1	1 U	106.2	81	0.19 J	1 UJ	2.3	4.1	4.9	0.5 U	1 UJ
CALCIUM METAL	ug/l		79000	140000	7500	34000	6100	26000	17000	42000	6600	6900 J	100000	100000	2000	2500	6500	8900	8600	17000	14000
IRON	ug/l	9100	11000	66000	50	52000	230	2900	18000	1800	50 U	140	630	660	50 U	60	100	1200	1300	50 U	50 U
MAGNESIUM	ug/l		11000	15000	1100	5000	1600	2300	3100	6900	610	640	13000	13000	190	220	1600	1600	1500	2400	1900
MANGANESE	ug/l	1715	5340	396	10 U	2220	314	1100	2160	548	1.3 J	10 U	4700	5210	17	14	21	311	272	1.9 J	10 U
POTASSIUM	ug/l		3500	17000	2500 U	8200	2500 U	3700	3200	7500	820 J	2500 U	6000	4500	640 J	2500 U	1900 J	1300 J	1600 J	840 J	2500 U
SODIUM	ug/l	20000	19000	18000	2000 U	16000	28000	1600 J	2800	23000	1300 J	2800	31000	30000	590 J	1400 J	1300 J	930 J	1300 J	7100	7800

Field Readings	Units	MCL or ROD Standard	N-5, P-1 Oct-2008	N-5, P-2 Oct-2008	SHL-10 Oct-2008	SHL-11 Oct-2008	SHL-13 Oct-2008	SHL-15 Oct-2008	SHL-19 Oct-2008	SHL-20 Oct-2008	SHL-21 Apr-2008	SHL-21 Oct-2008	SHL-22 Apr-2008	SHL-22 Oct-2008	SHL-23 Apr-2008	SHL-23 Oct-2008	SHL-4 Oct-2008	SHL-5 Apr-2008	SHL-5 Oct-2008	SHL-8D Apr-2008	SHL-8D Oct-2008
DO	mg/l	n/a	0.32	0.34	11.33	0.34	0.2	0.13	0.28	0.19	9.67	8.78	0.21	0.15	14.36	12.11	0.91	0.11	0.11	1.57	1.53
ORP	Millivolts	n/a	-69.3	-53.4	95.1	-72.1	48.1	41.3	5.3	90.1	241	127	2	-21	248	184	201.3	73	17.7	233	225.6
pH	pH Units	n/a	6.65	6.04	6.69	6.5	5.45	5.69	6.05	6.44	5.98	6.02	6.69	6.5	5.25	5.94	5.71	3.26	5.57	5.66	5.81
SPC	ms/cm	n/a	0.46	0.993	0.068	0.451	0.147	0.14	0.149	0.301	0.225	0.066	0.767	0.736	0.032	0.041	0.053	0.251	0.098	0.313	0.084
Temp	DEG C	n/a	11.62	7.66	9.57	8.72	14.24	12.9	13.04	12.18	12.46	9.78	7.98	7.41	10.84	8.2	11.8	5.08	11.48	9.64	10.87
TURBIDITY	NTU	n/a	6.01	0	3.09	19.2	0.61	1.4	60.5	13.2	NS	0.91	NS	0	1.42	0.51	1.04	NS	1.65	NS	0.21

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2008 Groundwater Analytical Results
Shepley's Hill Landfill
Devens, Massachusetts

Analaytical Parameter	Units	MCL or ROD Standard	Sample ID															
			SHL-8S Apr-2008	SHL-8S Oct-2008	SHL-9 Apr-2008	SHL-9 Oct-2008	SHM-05-39A Oct-2008	SHM-05-39B Oct-2008	SHM-05-40X Oct-2008	SHM-05-41A Apr-2008	SHM-05-41A Oct-2008	SHM-05-41B Apr-2008	SHM-05-41B Oct-2008	SHM-05-41C Apr-2008	SHM-05-41C Oct-2008	SHM-05-42A Apr-2008	SHM-05-42A Oct-2008	SHM-05-42B Apr-2008
ALKALINITY, TOTAL (AS CACO3)	ug/l		18000	18000	61000	72000	220000	320000	260000	31000	28000	330000	240000	340000	340000	15000	16400	470000
CHLORIDE	ug/l		7000	7400	1600	6100	19000	90000	16000	6700	2100	21000	13000	100000	33000	1300	1200	45000
NITRATE (AS N)	ug/l		150	100 UJ	57 J	100 U	130 J	180	48 J	61 J	65 J	250 J	1000 UJ	94 J	56 J	110	99 J	1000 U
SULFATE	ug/l		1100	1700	7400	7400	3200	3700	2400	11000	7600	1000 U	2900	1800	390 J	7000	6700	2800
TURBIDITY	NTU		0.2 U	0.2 U	3.4	3	140	54	380	1.2	2.6	280	210	170	280	5.2	1.6	280
			Dissolved Metals by SW6010/SW6020															
ARSENIC	ug/l	10	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
CALCIUM METAL	ug/l		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
IRON	ug/l	9100	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MAGNESIUM	ug/l		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MANGANESE	ug/l	1715	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
POTASSIUM	ug/l		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
SODIUM	ug/l	20000	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
			Total Metals by SW6010/SW6020															
ARSENIC	ug/l	10	0.5 U	1 UJ	14.6	40.7	275.6	241.2	4920	26.9	18.7	2349	1910	662.2	789.3	2.5	1 U	266.2
CALCIUM METAL	ug/l		4300	4300	22000	24000	37000	91000	49000	8800	7000	48000	31000	95000	99000	5500	5400	75000
IRON	ug/l	9100	50 U	50 U	3500	11000	60000	4000	65000	3500	1900	100000	68000	16000	19000	590	80	73000
MAGNESIUM	ug/l		770	790	1600	1700	4800	13000	7400	1700	1400	6600	4400	13000	13000	1100	1100	12000
MANGANESE	ug/l	1715	12	14	426	452	1750	5320	1420	396	224	1780	1330	2960	3100	30	7.6 J	2530
POTASSIUM	ug/l		1200 J	2500 U	1800 J	2500	10000	7400	8000	2100 J	2400 J	15000	12000	6700	3400	1600 J	1800 J	20000
SODIUM	ug/l	20000	5200	5900	2000	3200	11000	83000	19000	4400	3400	16000	15000	75000	35000	2000 U	1300 J	36000
Field Readings	**Units**	**MCL or ROD Standard**	**SHL-8S Apr-2008**	**SHL-8S Oct-2008**	**SHL-9 Apr-2008**	**SHL-9 Oct-2008**	**SHM-05-39A Oct-2008**	**SHM-05-39B Oct-2008**	**SHM-05-40X Oct-2008**	**SHM-05-41A Apr-2008**	**SHM-05-41A Oct-2008**	**SHM-05-41B Apr-2008**	**SHM-05-41B Oct-2008**	**SHM-05-41C Apr-2008**	**SHM-05-41C Oct-2008**	**SHM-05-42A Apr-2008**	**SHM-05-42A Oct-2008**	**SHM-05-42B Apr-2008**
DO	mg/l	n/a	2.03	1.07	0.27	1.1	0.2	0.25	0.22	0.55	0.27	0.38	0.12	0.18	0.12	5.36	3.65	0.2
ORP	Millivolts	n/a	158	234.5	-12	-46	-76.1	-70.9	-104.2	35	10.8	-76	-89	-110	-149.5	230	179.6	-59
pH	pH Units	n/a	6.11	5.67	6.48	6.43	6.38	6.86	6.58	6.33	6.73	6.36	5.52	6.9	7.42	5.02	6.1	5.78
SPC	ms/cm	n/a	0.227	0.04	0.159	0.205	0.492	0.879	0.549	0.116	0.052	0.787	0.367	0.986	0.491	0.211	0.033	1.112
Temp	DEG C	n/a	8.85	10.4	7.28	8.85	7.58	9.82	7.91	9.76	10.47	9.77	11.49	9.6	10.81	9.77	10.13	10.06
TURBIDITY	NTU	n/a	NS	0.63	NS	NS	1.19	7.81	14.3	NS	1.96	NS	2.56	NS	4.7	NS	0.64	NS

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2008 Groundwater Analytical Results
Shepley's Hill Landfill
Devens, Massachusetts

Analaytical Parameter	Units	MCL or ROD Standard	Sample ID														
			SHM-05-42B Oct-2008	SHM-93-10C Oct-2008	SHM-93-10D Oct-2008	SHM-93-22C Apr-2008	SHM-93-22C Oct-2008	SHM-96-22B Apr-2008	SHM-96-22B Oct-2008	SHM-96-5B Apr-2008	SHM-96-5B Oct-2008	SHM-96-5C Apr-2008	SHM-96-5C Oct-2008	SHM-99-31A Oct-2008	SHM-99-31B Oct-2008	SHM-99-31C Oct-2008	SHM-99-32X Oct-2008
ALKALINITY, TOTAL (AS CACO3)	ug/l		350000	170000	61000	180000	110000	320000	320000	330000	320000	330000	310000	47000	140000	360000	360000
CHLORIDE	ug/l		33000	24000	26000	25000	13000	29000	18000	22000	19000	28000	21000	16000	9200	32000	37000
NITRATE (AS N)	ug/l		110 J	100 UJ	100 UJ	78 J	290	100 U	1000 UJ	100 U	100 U	500 U	100 UJ	100 U	500 U	40 J	500 U
SULFATE	ug/l		4600	19000	18000	9100	8600	3400	3400	4100	4800	620 J	1700	4300	3800	1800	5600
TURBIDITY	NTU		270	0.8	130	3.9	4.2	400	260	90	12	67	31	0.87	6.2	310	300
			Dissolved Metals by SW6010/SW6020														
ARSENIC	ug/l	10	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
CALCIUM METAL	ug/l		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
IRON	ug/l	9100	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MAGNESIUM	ug/l		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MANGANESE	ug/l	1715	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
POTASSIUM	ug/l		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
SODIUM	ug/l	20000	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
			Total Metals by SW6010/SW6020														
ARSENIC	ug/l	10	256	10.1	23.4	29.4	17.7	1721	1374	1597	747.8	54.7	51.8	16.2	79.5	260.3	203.9
CALCIUM METAL	ug/l		64000	72000	82000	58000	36000	70000	71000	73000	82000	66000	65000	13000	30000	85000	92000
IRON	ug/l	9100	68000	60	17000	1000	640	72000	54000	18000	5300	25000	21000	8400	19000	36000	37000
MAGNESIUM	ug/l		10000	4100	660	8400	5000	12000	11000	12000	13000	8600	8500	880	3200	13000	14000
MANGANESE	ug/l	1715	2410	40	140	335	150	2310	4320	9240	10800	3490	3990	495	890	3880	4200
POTASSIUM	ug/l		15000	4800	5000	4700	4300	14000	9500	10000	8500	14000	11000	2500 U	4600	10000	7000
SODIUM	ug/l	20000	29000	8400	7700	13000	10000	27000	24000	22000	26000	27000	26000	11000	11000	33000	35000
Field Readings	**Units**	**MCL or ROD Standard**	**SHM-05-42B Oct-2008**	**SHM-93-10C Oct-2008**	**SHM-93-10D Oct-2008**	**SHM-93-22C Apr-2008**	**SHM-93-22C Oct-2008**	**SHM-96-22B Apr-2008**	**SHM-96-22B Oct-2008**	**SHM-96-5B Apr-2008**	**SHM-96-5B Oct-2008**	**SHM-96-5C Apr-2008**	**SHM-96-5C Oct-2008**	**SHM-99-31A Oct-2008**	**SHM-99-31B Oct-2008**	**SHM-99-31C Oct-2008**	**SHM-99-32X Oct-2008**
DO	mg/l	n/a	0.13	0.77	0.12	0.35	0.31	0.1	0.21	0.2	0.58	0.12	1.5	0.15	0.9	0.12	0.24
ORP	Millivolts	n/a	-79	-12	-15.7	-142	-96.6	-96	-82.5	-11	6	-21	-57.7	28	-41.2	-90.8	-76.8
pH	pH Units	n/a	6.67	7.27	11.35	7.53	7.87	6.64	6.47	5.52	6.21	5.24	6.21	5.8	6.48	6.59	6.44
SPC	ms/cm	n/a	0.53	0.411	0.312	0.443	0.256	0.859	0.722	0.792	0.709	0.86	0.705	0.159	0.212	0.529	0.713
Temp	DEG C	n/a	10.31	8.67	8.99	8.44	7.75	7.01	7.41	9.78	9.64	9.49	7.51	10.67	10.91	10.79	6.98
TURBIDITY	NTU	n/a	6.35	2.62	82.7	NS	5.16	NS	13	NS	1.02	NS	2.13	1.27	0.46	1.55	8.35

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2008 Groundwater Analytical Results
Shepley's Hill Landfill
Devens, Massachusetts

Analaytical Parameter	Units	MCL or ROD Standard	Sample ID			
			SHP-01-36X Oct-2008	SHP-01-37X Oct-2008	SHP-01-38A Oct-2008	SHP-99-29X Oct-2008
ALKALINITY, TOTAL (AS CACO3)	ug/l		38000	38000	140000 J	100000
CHLORIDE	ug/l		39000	25000	28000	2900
NITRATE (AS N)	ug/l		100 U	100 U	500 UJ	1000 UJ
SULFATE	ug/l		1000 U	3400	16000	5900
TURBIDITY	NTU		0.2 U	0.2 U	33	9.9
			Dissolved Metals by SW6010/SW6020			
ARSENIC	ug/l	10	NS	NS	NS	NS
CALCIUM METAL	ug/l		NS	NS	NS	NS
IRON	ug/l	9100	NS	NS	NS	NS
MAGNESIUM	ug/l		NS	NS	NS	NS
MANGANESE	ug/l	1715	NS	NS	NS	NS
POTASSIUM	ug/l		NS	NS	NS	NS
SODIUM	ug/l	20000	NS	NS	NS	NS
			Total Metals by SW6010/SW6020			
ARSENIC	ug/l	10	27.9	38.1	602.4	2106
CALCIUM METAL	ug/l		9600	7300	28000	9000
IRON	ug/l	9100	5000	6800	26000	40000
MAGNESIUM	ug/l		1800	1400	4300	890
MANGANESE	ug/l	1715	119	310	664	5370
POTASSIUM	ug/l		1800 J	1300 J	9200	2500 U
SODIUM	ug/l	20000	23000	19000	16000	2300
Field Readings	**Units**	**MCL or ROD Standard**	**SHP-01-36X Oct-2008**	**SHP-01-37X Oct-2008**	**SHP-01-38A Oct-2008**	**SHP-99-29X Oct-2008**
DO	mg/l	n/a	0.16	0.12	0.15	0.22
ORP	Millivolts	n/a	-38.7	-54.2	-60.9	14.6
pH	pH Units	n/a	6.37	6.51	6.3	5.3
SPC	ms/cm	n/a	0.219	0.175	0.418	0.226
Temp	DEG C	n/a	17.37	15.59	12.96	11.77
TURBIDITY	NTU	n/a	0.31	0.09	0.04	4.4

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2009 Groundwater Analytical Results
Shepley's Hill Landfill
Devens, Massachusetts

Analaytical Parameter	Units	MCL or ROD Standard	Sample ID														
			N-5, P-1 Oct-2009	N-5, P-2 Oct-2009	SHL-11 Oct-2009	SHL-13 Oct-2009	SHL-15 Oct-2009	SHL-19 Oct-2009	SHL-20 Oct-2009	SHL-21 Apr-2009	SHL-22 Apr-2009	SHL-22 Oct-2009	SHL-23 Apr-2009	SHL-4 Oct-2009	SHL-5 Apr-2009	SHL-5 Oct-2009	SHL-8D Apr 2009
ALKALINITY, TOTAL (AS CACO3)	ug/l		300000	680000	240000	21000	67000	82000	150000	21000	380000	380000	4600	76000	21000	42000	52000
CHLORIDE	ug/l		18000	14000	20000	54000	13000	1800	20000	1700	20000	22000	1200	21000	6900	1100	12000
NITRATE (AS N)	ug/l		120	160	150	100 U	640	80 J	1400	100 U	100 U	100 U	640	39 J	28 J	100	210
SULFATE	ug/l		1000 U	1000 U	3700	5200	17000	14000	7000	8300	5200	6000	4700	1000 U	1400	650 J	6600
TURBIDITY	NTU		59	180	160	0.2 U	0.2 U	36	7.4	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
			Dissolved Metals by SW6010/SW6020														
ARSENIC	ug/l	10	NS	NS	NS	NS	NS	38.8	NS	NS	NS	NS	NS	NS	NS	NS	NS
CALCIUM METAL	ug/l		NS	NS	NS	NS	NS	20000	NS	NS	NS	NS	NS	NS	NS	NS	NS
IRON	ug/l	9100	NS	NS	NS	NS	NS	12000	NS	NS	NS	NS	NS	NS	NS	NS	NS
MAGNESIUM	ug/l		NS	NS	NS	NS	NS	3400	NS	NS	NS	NS	NS	NS	NS	NS	NS
MANGANESE	ug/l	1715	NS	NS	NS	NS	NS	1960	NS	NS	NS	NS	NS	NS	NS	NS	NS
POTASSIUM	ug/l		NS	NS	NS	NS	NS	3000	NS	NS	NS	NS	NS	NS	NS	NS	NS
SODIUM	ug/l	20000	NS	NS	NS	NS	NS	3800	NS	NS	NS	NS	NS	NS	NS	NS	NS
			Total Metals by SW6010/SW6020														
ARSENIC	ug/l	10	4429	30.5	709.1	0.5 U	26.7	136.9	23.8	1.2	98.7	48.3	0.5 U	15.1	3.6	12.3	0.5 U
CALCIUM METAL	ug/l		100 U	150000	34000	8800	25000	20000	39000	8000	98000	110000	2500	26000	8300	11000	18000
IRON	ug/l	9100	50 U	70000	58000	50 U	2600	17000	2600	50 U	400	360	50 U	1700	1300	2700	200
MAGNESIUM	ug/l		9300	14000	4700	1900	3300	3200	5800	820	12000	14000	310	4800	1500	1800	2400
MANGANESE	ug/l	1715	6670	438	2690	358	367	2040	830	10 U	5270	6490 J	10 U	279	281	415	10 U
POTASSIUM	ug/l		5200	16000	8300	2500 U	5200	3100	7500	1000 J	5000	5700 J	2500 U	4200	1300 J	2500 U	980 J
SODIUM	ug/l	20000	2000 U	18000	18000	27000	7600	3300	21000	3500	28000	28000	1600 J	5100	1700 J	3600	8900

Field Readings	Units	MCL or ROD Standard	N-5, P-1 Oct-2009	N-5, P-2 Oct-2009	SHL-11 Oct-2009	SHL-13 Oct-2009	SHL-15 Oct-2009	SHL-19 Oct-2009	SHL-20 Oct-2009	SHL-21 Apr-2009	SHL-22 Apr-2009	SHL-22 Oct-2009	SHL-23 Apr-2009	SHL-4 Oct-2009	SHL-5 Apr-2009	SHL-5 Oct-2009	SHL-8D Apr 2009
DO	mg/l	n/a	0.56	1.58	0.65	2.2	0.64	0.39	0.3	7.54	0.44	0.74	11.74	0.7	0.45	0.9	0.95
ORP	Millivolts	n/a	-82	-66	-85	78	-41	3	67	177	30	-33	248.8	49	44.6	-84	64.4
pH	pH Units	n/a	6.47	6.25	6.37	5.76	5.92	5.92	6.3	5.99	5.7	6.62	5.13	5.59	5.41	5.61	6.02
SPC	ms/cm	n/a	-634	1.289	0.552	0.206	0.22	0.197	0.358	0.071	0.758	0.743	0.024	0.219	0.078	0.09	0.167
Temp	DEG C	n/a	11.63	11.85	12.83	13.63	11.77	12.2	11.95	12.49	9.99	10.38	11.73	12.7	7.55	12.88	10.01
TURBIDITY	NTU	n/a	2.37	2.26	4.47	0	2.4	45	29	0	0.22	1.03	0	0	0.58	1.41	0.18

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2009 Groundwater Analytical Results
Shepley's Hill Landfill
Devens, Massachusetts

Analaytical Parameter	Units	MCL or ROD Standard	Sample ID												
			SHL-8D Oct-2009	SHL-8S Apr 2009	SHL-8S Oct-2009	SHL-9 Apr-2009	SHL-9 Oct-2009	SHM-05-39A Oct-2009	SHM-05-39B Oct-2009	SHM-05-40X Oct-2009	SHM-05-41A Apr-2009	SHM-05-41A Oct-2009	SHM-05-41B Apr-2009	SHM-05-41B Oct-2009	SHM-05-41C Apr-2009
ALKALINITY, TOTAL (AS CACO3)	ug/l		33000	19000	19000	65000	81000	110000	370000	140000	27000	33000	110000	110000	350000
CHLORIDE	ug/l		9500	7000	8400	2200	15000	18000	66000	12000	2600	1700	4300	4400	30000
NITRATE (AS N)	ug/l		100 U	140	100 U	100 U	500 U	30 J	190	130	500 U	110	1000 U	92 J	500 U
SULFATE	ug/l		8400	2100	3100	4100	7400	5000	2700	6300	9600	6000	9100	4400	1000 U
TURBIDITY	NTU		0.2 U	0.2 U	0.2 U	6.8	0.2 U	64	25	110	0.2 U	0.2 U	190	100	270
			Dissolved Metals by SW6010/SW6020												
ARSENIC	ug/l	10	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
CALCIUM METAL	ug/l		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
IRON	ug/l	9100	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MAGNESIUM	ug/l		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MANGANESE	ug/l	1715	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
POTASSIUM	ug/l		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
SODIUM	ug/l	20000	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
			Total Metals by SW6010/SW6020												
ARSENIC	ug/l	10	0.5 U	0.5 U	0.5 U	18.1	37.6	259.5	338.8	3833	22.1	16.3	1497	1464	895.3
CALCIUM METAL	ug/l		13000	5000	5600	20000	30000	22000	110000	30000	7400	9000	16000	16000	89000
IRON	ug/l	9100	50 U	35 J	18 J	5100	11000	32000	5600	37000	2100	2200	36000	36000	18000
MAGNESIUM	ug/l		1800	900	990	1700	2400	2600	17000	4500	1300	1600	2200	2400	11000
MANGANESE	ug/l	1715	5.3 J	10 U	10 J	420	555	914	6770	769	258	270	673	744	2640
POTASSIUM	ug/l		2500 U	1400 J	2500 U	1800 J	2400 J	2500 U	2500 U	2500 U	2200 J	2500 U	8100	2500 U	3600
SODIUM	ug/l	20000	6900	6400	5500	3400	5000	8600	59000	15000	3500	2000	6800	10000	31000
Field Readings	**Units**	**MCL or ROD Standard**	**SHL-8D Oct-2009**	**SHL-8S Apr 2009**	**SHL-8S Oct-2009**	**SHL-9 Apr-2009**	**SHL-9 Oct-2009**	**SHM-05-39A Oct-2009**	**SHM-05-39B Oct-2009**	**SHM-05-40X Oct-2009**	**SHM-05-41A Apr-2009**	**SHM-05-41A Oct-2009**	**SHM-05-41B Apr-2009**	**SHM-05-41B Oct-2009**	**SHM-05-41C Apr-2009**
DO	mg/l	n/a	2.63	2.37	1.45	0.32	0.33	0.46	0.56	0.4	0.71	0.22	0.39	0.59	0.35
ORP	Millivolts	n/a	-17	117.1	41	-3	-98	-99	-83	-108	19	-26	-61.3	-80	-132
pH	pH Units	n/a	6.09	5.98	5.78	5.77	6.51	6.5	6.89	6.72	6.4	6.15	6.47	6.62	6.76
SPC	ms/cm	n/a	0.104	0.072	0.064	0.155	0.238	0.308	0.858	0.391	0.088	0.081	0.316	0.315	0.779
Temp	DEG C	n/a	9.8	9.73	9.9	8.35	10.97	11.11	13.57	10.96	10.01	9.8	9.8	9.84	10.71
TURBIDITY	NTU	n/a	0	0.05	0	3.24	1.11	2.2	15.4	17	0.15	1.61	13.1	8	2.55

Notes: J = Estimated Detect

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Highlighted values exceed MCL or ROD standard

2009 Groundwater Analytical Results
Shepley's Hill Landfill
Devens, Massachusetts

Analaytical Parameter	Units	MCL or ROD Standard	Sample ID												
			SHM-05-41C Oct-2009	SHM-05-42A Apr-2009	SHM-05-42A Oct-2009	SHM-05-42B Apr-2009	SHM-05-42B Oct-2009	SHM-93-22C Apr-2009	SHM-93-22C Oct-2009	SHM-93-22B Apr-2009	SHM-93-22B Oct-2009	SHM-96-5B Apr-2009	SHM-96-5B Oct-2009	SHM-96-5C Apr-2009	SHM-96-5C Oct-2009
ALKALINITY, TOTAL (AS CACO3)	ug/l		350000	15000	17000	340000	310000	110000	190000	350000	340000	330000	320000	260000	290000
CHLORIDE	ug/l		31000	1100	1600	29000	23000	14000	29000	22000	21000	19000	20000	23000	30000
NITRATE (AS N)	ug/l		95 J	100	25 J	200 J	120	100 U	87 J	1000 U	240 J	1100	500 U	140 J	500 U
SULFATE	ug/l		200 J	6600	6500	4100	3900	7900	8200	3100	4500	4100	4600	2600	3400
TURBIDITY	NTU		250	2.1	0.2 U	240	200	2	5.5	310	78	33	0.2 U	20	0.2 U
			Dissolved Metals by SW6010/SW6020												
ARSENIC	ug/l	10	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
CALCIUM METAL	ug/l		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
IRON	ug/l	9100	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MAGNESIUM	ug/l		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MANGANESE	ug/l	1715	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
POTASSIUM	ug/l		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
SODIUM	ug/l	20000	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
			Total Metals by SW6010/SW6020												
ARSENIC	ug/l	10	828.7	2	1 U	255.7	211.4	21.7	74.7	1128	832.3	1401	776.3	44.2	27.5
CALCIUM METAL	ug/l		96000	5600	5800	54000	57000	34000	59000	64000	78000	73000	81000	54000 J	65000
IRON	ug/l	9100	19000	370	50 U	62000	48000	260	940	60000	43000	18000	6500	21000 J	18000
MAGNESIUM	ug/l		13000	1000	1000	8900	8900	4600	9800	9600	13000	11000	13000	6700 J	8500
MANGANESE	ug/l	1715	2960	10 U	10 U	2090	2070	84	286	3580	6460	9810	11100	3250 J	4130
POTASSIUM	ug/l		2500 U	1500 J	1500 J	15000	11000	5200	2500 U	13000	11000	9700	10000	13000 J	14000
SODIUM	ug/l	20000	34000	1600 J	1400 J	25000	24000	12000	21000	24000	24000	23000	25000	24000	25000

Field Readings	Units	MCL or ROD Standard	SHM-05-41C Oct-2009	SHM-05-42A Apr-2009	SHM-05-42A Oct-2009	SHM-05-42B Apr-2009	SHM-05-42B Oct-2009	SHM-93-22C Apr-2009	SHM-93-22C Oct-2009	SHM-96-22B Apr-2009	SHM-96-22B Oct-2009	SHM-96-5B Apr-2009	SHM-96-5B Oct-2009	SHM-96-5C Apr-2009	SHM-96-5C Oct-2009
DO	mg/l	n/a	0.38	6.02	0.18	0.77	1.13	0.63	0.42	0.51	0.87	0.44	1.14	0.73	1.27
ORP	Millivolts	n/a	-130	164	68	-50.6	-77	129	-140	-81	-87	-25.9	-53	-34.1	-45
pH	pH Units	n/a	7.14	5.59	5.42	5.89	6.43	5.65	7.33	5.97	6.54	5.78	6.42	6.06	6.26
SPC	ms/cm	n/a	0.711	0.053	0.05	0.797	0.676	0.276	0.49	0.786	0.73	0.688	0.651	0.636	0.581
Temp	DEG C	n/a	10.09	10.8	9.7	10.69	10.11	11.44	11.3	8.96	9.89	10.22	10.44	9.48	10.9
TURBIDITY	NTU	n/a	3.23	1.63	0	1.72	3	2.24	7.86	16.9	9.21	1.37	3.19	3.01	3

Notes: J = Estimated Detect

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2009 Groundwater Analytical Results
Shepley's Hill Landfill
Devens, Massachusetts

Analaytical Parameter	Units	MCL or ROD Standard	Sample ID							
			SHP-99-31A Oct 2009	SHP-99-31B Oct-2009	SHP-99-31C Oct-2009	SHX-99-32X Oct 2009	SHP-01-36X Oct-2009	SHP-01-37X Oct-2009	SHP-01-38A Oct-2009	SHP-99-29X Oct-2009
ALKALINITY, TOTAL (AS CACO3)	ug/l		38000	100000	320000	360000	26000	51000	160000	73000
CHLORIDE	ug/l		25000	10000	29000	43000	48000	49000	34000	2000
NITRATE (AS N)	ug/l		26 J	38 J	33 J	77 J	38 J	79 J	130	130 J
SULFATE	ug/l		15000	8300	3400	4900	5700	1000 U	13000	6100
TURBIDITY	NTU		1.8	0.2 U	79	61	0.2 U	4.6	53	2
			Dissolved Metals by SW6010/SW6020							
ARSENIC	ug/l	10	NS	NS	NS	NS	NS	NS	NS	NS
CALCIUM METAL	ug/l		NS	NS	NS	NS	NS	NS	NS	NS
IRON	ug/l	9100	NS	NS	NS	NS	NS	NS	NS	NS
MAGNESIUM	ug/l		NS	NS	NS	NS	NS	NS	NS	NS
MANGANESE	ug/l	1715	NS	NS	NS	NS	NS	NS	NS	NS
POTASSIUM	ug/l		NS	NS	NS	NS	NS	NS	NS	NS
SODIUM	ug/l	20000	NS	NS	NS	NS	NS	NS	NS	NS
			Total Metals by SW6010/SW6020							
ARSENIC	ug/l	10	20.4	56.7	223.5	196.8	18.7	35.1	663.7	1686
CALCIUM METAL	ug/l		9900	22000	78000	92000	9800	12000	32000	6200
IRON	ug/l	9100	9600	14000	26000	31000	4600	15000	30000	29000
MAGNESIUM	ug/l		950 J	2600	12000	14000	1600	2500	4100	560
MANGANESE	ug/l	1715	608	676	4020	8010	173	677	781	3690
POTASSIUM	ug/l		2500 U	2500 U	12000	2500 U	1500 J	1800 J	8700	2500 U
SODIUM	ug/l	20000	10000	9000	32000	37000	27000	22000	20000	2000

Field Readings	Units	MCL or ROD Standard	SHM-99-31A Oct-2009	SHM-99-31B Oct-2009	SHM-99-31C Oct-2009	SHM-99-32X Oct-2009	SHP-01-36X Oct-2009	SHP-01-37X Oct-2009	SHP-01-38A Oct-2009	SHP-99-29X Oct-2009
DO	mg/l	n/a	0.8	0.58	0.84	1.17	0.13	0.33	0.16	0.55
ORP	Millivolts	n/a	20	-61	-84	-81	-46	-46	-78	-22
pH	pH Units	n/a	5.73	6.37	6.57	6.55	6.43	6.21	6.25	5.7
SPC	ms/cm	n/a	0.138	0.248	0.728	0.837	0.222	0.254	0.45	0.16
Temp	DEG C	n/a	13.59	10.54	10.6	10.6	14.95	13.46	12.02	11.57
TURBIDITY	NTU	n/a	3	0	3	3	0	2	1.81	2

Notes: J = Estimated Detect

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SITE INSPECTION

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: Shepley's Hill Landfill	**Date of inspection:** 4/29/10
Location and Region: Ayer/Devens, MA	**EPA ID:** MA7210025154
Company leading the five-year review: Hydrogeologic, Inc	**Weather/temperature:** ~60°F, sunny + windy

Remedy Includes: (Check all that apply)

- X Landfill cover/containment
- X Access controls
- Institutional controls
- X Groundwater pump and treatment
- Surface water collection and treatment
- Other _____
- Monitored natural attenuation
- Groundwater containment
- Vertical barrier walls

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Fred Santos (Name) Project Manager (Title) 4/29/10 (Date)
   Interviewed (at site) at office by phone Phone no. _____
   Problems, suggestions; Report attached Design for pump and treat system did not account for necessary O+M visit frequency and had some limitations such as not accounting for idestream flow into microfilter, but system has been operating at design flow rate of 50 gpm for a while now. ECC has made 4 upgrades to system to improve operations.

2. **O&M staff** Dave Reault (Name) O+M Group Manager (Title) 4/29/10 (Date)
   Interviewed (at site) at office by phone Phone no. _____
   Problems, suggestions; Report attached see 1. above

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency Ayer Board of Health
Contact Michelle Carlisle (Name) Administrative Assistant (Title) 6/2/10 (Date) 978-772-8213 (Phone no.)
Problems; suggestions; Report attached Board has concerns regarding the remedy, defer to USEPA, MADEP and Rich Doucette (PACE) regarding arsenic contam for groundwater, surface water and drinking water.

Agency Ayer Fire Dept.
Contact (Name) (Title) 5/2 (Date) 978-772-8231 (Phone no.)
Problems; suggestions; Report attached Defer to Devens Fire Dept.

Agency Devens Fire Dept.
Contact Adams (Name) Deputy Fire Chief (Title) 5/27/10 (Date) 978-772-4600 (Phone no.)
Problems; suggestions; Report attached No problems to date.

Agency Devens State Police
Contact (Name) (Title) 5/27/10 (Date) 978-772-7200 (Phone no.)
Problems; suggestions; Report attached Defer to Devens Fire Dept.

4. **Other interviews** (optional) Report attached.

Ayer Police Dept. Lt. Brian Gill 5/27/10 978-772-8200
No issues/concerns.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

X O&M manual	Readily available	X Up to date	N/A
As-built drawings	Readily available	Up to date	(N/A)
X Maintenance logs	Readily available	X Up to date	N/A

Remarks system data hand written at site and electronic version at office
As builts not available to ECC from previous contractor.

2. **Site-Specific Health and Safety Plan** — X Readily available — X Up to date — N/A
   Contingency plan/emergency response plan — Readily available — Up to date — N/A

Remarks ECC regularly performs Environment Safety + Quality reviews/audits and supplements SOPs as needed.

3. **O&M and OSHA Training Records** — Readily available — X Up to date — N/A

Remarks

4. **Permits and Service Agreements**

Air discharge permit	Readily available	Up to date	(N/A)
X Effluent discharge to POTW	Readily available	X Up to date	N/A
Waste disposal, POTW	Readily available	X Up to date	N/A
Other permits	Readily available	Up to date	N/A

Remarks

5. **Gas Generation Records** — Readily available — X Up to date — N/A

Remarks periodic sampling performed on probes + vents

6. **Settlement Monument Records** — Readily available — Up to date — N/A

Remarks No settlement measurements but subsidence areas corrected as needed - last performed in 2009.

7. **Groundwater Monitoring Records** — Readily available — X Up to date — N/A

Remarks Semi-annual measurement of water levels + gw sample collection. Data submitted to BCT regularly

8. **Leachate Extraction Records** — Readily available — Up to date — (N/A)

Remarks

9. **Discharge Compliance Records**

Air	Readily available	Up to date	(N/A)
Water (effluent)	Readily available	X Up to date	N/A

Remarks Monthly reports to Moss Development; available at ECC office.

10. **Daily Access/Security Logs** — Readily available — X Up to date — N/A

Remarks Security is monitored during site activities; maintained by primary + secondary access gates.

IV. O&M COSTS

1. **O&M Organization**

State in-house — Contractor for State
PRP in-house — Contractor for PRP
Federal Facility in-house — X Contractor for Federal Facility
Other _____

2. **O&M Cost Records**

Readily available — X Up to date (ECC)
X Funding mechanism/agreement in place
Original O&M cost estimate _____ Breakdown attached

Total annual cost by year for review period if available

From (Date)	To (Date)	Total cost	
1/1/05	12/31/05		Breakdown attached
1/1/06	12/31/06		Breakdown attached
1/1/07	12/31/07		X Breakdown attached
1/1/08	12/31/08	511,100	X Breakdown attached
1/1/09	12/31/09	834,500	X Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: Increased O&M labor for pump + treat system due to more frequent site visits; partly due to process flow increase from 25 to 50 gpm.

V. ACCESS AND INSTITUTIONAL CONTROLS X Applicable N/A

A. Fencing

1. **Fencing damaged** X Location shown on site map X Gates secured N/A

Remarks gates are locked unless in use; fence does not surround entire landfill but access limited by hills + woods

B. Other Access Restrictions

1. **Signs and other security measures** Location shown on site map N/A

Remarks _____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented	Yes	(No)	N/A
Site conditions imply ICs not being fully enforced	Yes	(No)	N/A

Type of monitoring (*e.g.*, self-reporting, drive by) drive by at site
Frequency during ECCS O+M work (informally)
Responsible party/agency ECC as O+M contractor (informally)
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date	Yes	No	N/A
Reports are verified by the lead agency	Yes	No	N/A
Specific requirements in deed or decision documents have been met	(Yes)	No	N/A
Violations have been reported	Yes	No	(N/A)

Other problems or suggestions: Report attached
Note: ICs primarily administrative in nature.

2. **Adequacy** X ICs are adequate ICs are inadequate N/A
Remarks

D. General

1. **Vandalism/trespassing** Location shown on site map X No vandalism evident
Remarks

2. **Land use changes on site** N/A
Remarks None evident.

3. **Land use changes off site** (N/A)
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads X Applicable N/A

1. **Roads damaged** Location shown on site map X Roads adequate N/A
Remarks

B. Other Site Conditions

Remarks

VII. LANDFILL COVERS (Applicable) N/A

A. Landfill Surface

1. **Settlement** (Low spots) Location shown on site map X Settlement not evident
   Areal extent _____ Depth _____
   Remarks

2. **Cracks** Location shown on site map X Cracking not evident
   Lengths _____ Widths _____ Depths _____
   Remarks

3. **Erosion** Location shown on site map X Erosion not evident
   Areal extent _____ Depth _____
   Remarks

4. **Holes** Location shown on site map X Holes not evident
   Areal extent _____ Depth _____
   Remarks

5. **Vegetative Cover** (Grass) X Cover properly established No signs of stress
   Trees/Shrubs (indicate size and locations on a diagram)
   Remarks Minor tree/vegetation removal done periodically, including some today

6. **Alternative Cover (armored rock, concrete, etc.)** N/A
   Remarks

7. **Bulges** Location shown on site map X Bulges not evident
   Areal extent _____ Height _____
   Remarks

8. **Wet Areas/Water Damage** X Wet areas/water damage not evident
   - Wet areas — Location shown on site map — Areal extent_____
   - Ponding — Location shown on site map — Areal extent_____
   - Seeps — Location shown on site map — Areal extent_____
   - Soft subgrade — Location shown on site map — Areal extent_____

   Remarks_____

9. **Slope Instability** Slides Location shown on site map X No evidence of slope instability
   Areal extent_____
   Remarks_____

B. Benches Applicable N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** Location shown on site map N/A or okay
   Remarks_____

2. **Bench Breached** Location shown on site map N/A or okay
   Remarks_____

3. **Bench Overtopped** Location shown on site map N/A or okay
   Remarks_____

C. Letdown Channels Applicable N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** Location shown on site map No evidence of settlement
   Areal extent_____ Depth_____
   Remarks_____

2. **Material Degradation** Location shown on site map No evidence of degradation
   Material type_____ Areal extent_____
   Remarks_____

3. **Erosion** Location shown on site map No evidence of erosion
   Areal extent_____ Depth_____
   Remarks_____

4. **Undercutting** Location shown on site map No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ No obstructions
Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
No evidence of excessive growth
Vegetation in channels does not obstruct flow
Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations Applicable N/A

1. **Gas Vents** Active X Passive
NA Properly secured/locked X Functioning X Routinely sampled X Good condition
Evidence of leakage at penetration Needs Maintenance
N/A
Remarks_____

2. **Gas Monitoring Probes**
NA Properly secured/locked X Functioning X Routinely sampled X Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
Properly secured/locked X Functioning X Routinely sampled X Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks One well near center of landfill (but toward south end of landfill) is not locked/secured but within generally restricted area.

4. **Leachate Extraction Wells**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

5. **Settlement Monuments** Located Routinely surveyed N/A
Remarks referenced in ROD but not located during visit.

E. Gas Collection and Treatment Applicable (N/A)

1. **Gas Treatment Facilities**
   Flaring Thermal destruction Collection for reuse
   Good condition Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   Good condition Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   Good condition Needs Maintenance N/A
   Remarks_____

F. Cover Drainage Layer (Applicable) N/A

1. **Outlet Pipes Inspected** X Functioning N/A
   Remarks_____

2. **Outlet Rock Inspected** X Functioning N/A
   Remarks_____

G. Detention/Sedimentation Ponds Applicable (N/A)

1. **Siltation** Areal extent_____ Depth_____ N/A
   Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   Erosion not evident
   Remarks_____

3. **Outlet Works** Functioning N/A
   Remarks_____

4. **Dam** Functioning N/A
   Remarks_____

H. Retaining Walls Applicable (N/A)

1. **Deformations** Location shown on site map Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** Location shown on site map Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge (Applicable) N/A

1. **Siltation** Location shown on site map X Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** Location shown on site map N/A
   X Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** Location shown on site map X Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** X Functioning N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS Applicable (N/A)

1. **Settlement** Location shown on site map Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   Performance not monitored
   Frequency_____ Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES (Applicable) N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines — Applicable N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   X Good condition — All required wells properly operating — Needs Maintenance — N/A
   Remarks

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   X Good condition — Needs Maintenance
   Remarks back wash tank failed once in 07 or 08 - only significant failure issue. replaced tank with thicker - reamed model and also better reinforcels.

3. **Spare Parts and Equipment**
   X Readily available — Good condition — Requires upgrade — Needs to be provided
   Remarks critical components on site. great vendor response time cited for other components.

B. Surface Water Collection Structures, Pumps, and Pipelines — Applicable (N/A)

1. **Collection Structures, Pumps, and Electrical**
   Good condition — Needs Maintenance
   Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition — Needs Maintenance
   Remarks

3. **Spare Parts and Equipment**
   Readily available — Good condition — Requires upgrade — Needs to be provided
   Remarks

C. Treatment System (Applicable) N/A

1. **Treatment Train** (Check components that apply)
   - X Metals removal — Oil/water separation — Bioremediation
   - Air stripping — Carbon adsorbers
   - X Filters microfiltration for arsenic
   - Additive (*e.g.*, chelation agent, flocculent) ____
   - Others ____
   - X Good condition — Needs Maintenance
   - X Sampling ports properly marked and functional
   - X Sampling/maintenance log displayed and up to date
   - X Equipment properly identified
   - Quantity of groundwater treated annually ____
   - Quantity of surface water treated annually ____

   Remarks ____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   - N/A — X Good condition — Needs Maintenance

   Remarks ____

3. **Tanks, Vaults, Storage Vessels**
   - N/A — X Good condition — Proper secondary containment — Needs Maintenance

   Remarks ____

4. **Discharge Structure and Appurtenances**
   - N/A — X Good condition — Needs Maintenance

   Remarks ____

5. **Treatment Building(s)**
   - N/A — X Good condition (esp. roof and doorways) — Needs repair
   - Chemicals and equipment properly stored

   Remarks ____

6. **Monitoring Wells** (pump and treatment remedy)
   - Properly secured/locked — Functioning — Routinely sampled — X Good condition
   - All required wells located — Needs Maintenance — N/A

   Remarks ____

D. Monitoring Data

1. Monitoring Data
   - X Is routinely submitted on time — Is of acceptable quality

2. Monitoring data suggests:
   - X Groundwater plume is effectively contained — Contaminant concentrations are declining

Current system is performing as designed but expansion is planned within a few years.

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
X Properly secured/locked X Functioning X Routinely sampled X Good condition
All required wells located Needs Maintenance N/A
Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.)

The goal of the remedy is to ~~prevent~~ protect human health by preventing exposure to contaminants at levels above MCLs. The landfill cap minimizes future infiltration of precipitation (e.g., recharging landfill waste area) and the groundwater extraction and treatment system is operating per the design. The system reduces off site migration of contaminated groundwater. ICs prevent the use of private groundwater wells within the extent of the off site impacted area and include language for deed restrictions in the event of the transfer of the property.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

No issues with the implementation of O&M activities and their short- and long-term protectiveness. The activities coupled with ICs provide long-term protectiveness. The remedy ~~is~~ will be updated as data gaps are filled. It is expected that the remedy update will take place before the next Five Year Review.

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. There are no early indicators of potential remedy problems such as unexpected cost/scope changes for O&M or high frequency of repairs, etc. Periodic repairs have been performed for the landfill cap and the groundwater extraction and treatment system but the frequency and scope are within expected cost/scope/frequency.

D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. Limited opportunities exist for landfill monitoring and maintenance, but there are opportunities for treatment system optimization. The system run time could be improved by adding more solids handling capacity (ie, another cell off) so one cell off could be in use while the other is cleaned out. The system could be modified to better account for sidestream flow from microfilter backwashing - this would increase the overall system run time by allowing more water to be extracted by the recovery wells. It is noted that the system may be expanded (more recovery wells and expansion to the plant) within the next few years.

LANDFILL GAS MONITORING RESULTS
(2005-2009)

Geotechnical Engineering
Shepley's Hill Landfill

Landfill Gas Monitoring

INSPECTOR: Kullberg/ Michalak TITLE: Civil Engineer DATE: 11/08/05

ORGANIZATION: CENAE-EP WEATHER: Sunny, 55 d F BAROMETER: 29.9 in Hg and rising.

Vent No.	VOC ppm PID	O_2 % GEM 500	H_2S ppm ISTMX	LEL % ISTMX	CO ppm ISTMX	CO_2 % GEM 500	CH4 % GEM 500	Remarks
V-1	0	5.6	0	32	0	10.8	1.7	CGI O2 – 6.9
V-2	0	5.2	0	>100	0	12.8	8.6	CGI O2 – 13.4
V-3	0	2.8	0	>100	0	15.1	9.0	CGI O2 – 3.6
V-4	0	6.4	0	50	0	10.6	4.3	CGI O2 – 12.7
V-5	0	10.4	0	11	0	7.7	1.4	CGI O2 – 17.1
V-6	0	0.4	0	>100	0	18.9	12.5	CGI O2 – 12.9
V-7	0	2.1	0	14	0	12.2	4.4	CGI O2 – 17.6
V-8	0	8.3	0	25	0	8.9	4.2	CGI O2 – 15.8
V-9	0	0	0	>100	0	21.8	26.4	CGI O2 – 9.0
V-10	0	0.6	0	>100	0	14.8	10.3	CGI O2 – 9.3
V-11	0	10.1	0	12	0	6.4	2.2	CGI O2 – 18.4
V-12	0	2.8	0	>100	0	9.4	6.4	CGI O2 – 4.7
V-13	0	20.2	0	25	0	0.5	0.5	CGI O2 – 19.1
V-14	0	20.7	0	6	0	0.2	0.3	CGI O2 – 20.9
V-15	0	20.9	0	0	0	0	0	CGI O2 – 21.0
V-16	0	0	0	>100	2	23.7	20.7	CGI O2 – 0.3
V-17	0	0	0	>100	3	27	32.7	CGI O2 – 0.2
V-18	0	21.0	0	0	0	0	0	CGI O2 – 20.9
LGP-1	0	20.3	0	0	0	0.7	0	CGI O2 – 20.7
LGP-2	0	19.2	0	0	0	2.2	0	CGI O2 – 19.6
LGP-3	0	19.5	0	0	0	1.7	0	CGI O2 – 20.1
LGP-4	0	20.3	0	0	0	0.6	0	CGI O2 – 20.5

CALIBRATION INFORMATION:

Instrument: Thermo Environmental 580B PID 10.6 SN#: 182
Calibrated by: US Environmental Rental Co. 7 November 2005
Calibrated With: 100 ppm isobutylene (R.F. = 1.0)

Instrument: Industrial Scientific TMX412 SN#: 98090009-447
Sampling Pump: Industrial Scientific Sampling Pump SP402 SN#: 9911050-292
Calibrated by: US Environmental Rental Co. 8 November 2005
Calibrated With: 50 ppm CO, 25 H_2S, 50% LEL Methane, 20.9% O_2

Instrument: Landtec GEM 500 Serial#: E-0904
Calibrated by: US Environmental Rental Co. 7 November 2005
Calibrated With: 15% CH_4, 15% CO_2, 20.9% O_2

* Note: Barometric Pressures were obtained from NOAA National weather Service Forecast Office Boston, MA at http://www.erh.noaa.gov/box/stationobs.shtml for the nearest available reporting station at the airport in Fitchburg, MA for the sample date 8 November 2005.

Landfill & Gas Probe Supplemental Inspection

1.0 PURPOSE

Perimeter gas probes were installed (Photo 2) on the southern border of the landfill in December 2005 and were sampled for gas levels on February 16, 2006. This supplemental inspection appendix presents the gas level readings recorded, documents the installation of new perimeter fencing at Shepley's Hill Landfill, and documents some damage to the access roads at SHL which occurred during the recent maintenance contract work.

2.0 FENCING AND ACCESS ROADS

New chain link fencing was installed during recent maintenance work at the landfill. On the south side near the former Web Van warehouse, a section of fencing was constructed at a location of unrestricted access (Photo 3). Two other sections of fencing and gates were added on the south and west sides of Plow Shop Pond where the fence had been rolled back for access (Photos 4 & 5). The fencing appeared to be in excellent condition and will help minimize unauthorized access to the landfill by pedestrians and vehicles.

During the recent maintenance work, the access roads were slightly damaged by rutting and erosion (Photos 1 & 6). The access roads should be regraded, gravel added if necessary, and revegetated on the perimeter.

Geotechnical Engineering
Shepley's Hill Landfill

GAS PROBE READINGS

INSPECTOR: Kullberg/ Michalak TITLE: Civil Engineer DATE: 02/16/06

ORGANIZATION: CENAE-EP WEATHER: Sunny, 55 d F

BAROMETER: 30.1 in Hg @ 1030 BAROMETER: 30.0 in Hg @ 1200

Probe Number	VOC ppm PID	O_2 % GA90	H_2S ppm MG140	LEL % MG140	CO ppm MG140	CO_2 % GA90	CH4 % GA90	Remarks
LGP-5	0.2	20.6	0	0	0	0.3	0	CGI O2 – 20.7
LGP-6	0.7	20.6	0	0	0	0	0	CGI O2 – 21.0
LGP-7	0.2	11.6	0	1	0	3.8	0	CGI O2 –12.4
LGP-8	0.2	11.9	0	2	0	10.7	0	CGI O2 – 13.8
LGP-9	0	12.5	0	2	1	5.9	0	CGI O2 –13.2
LGP-10	0	15.5	0	0	0	7.6	0	CGI O2 – 19.5
LGP-11	0.2	17.8	0	0	0	3.9	0	CGI O2 –18.4
LGP-12	x	x	x	x	x	x	x	Not Installed
LGP-13	0.4	17.0	0	0	0	2.4	0	CGI O2 – 19.2
LGP-14	0.9	8.2	0	0	2	3.2	0	CGI O2 – 9.0

CALIBRATION INFORMATION:

Instrument: Thermo Environmental 580B PID 10.6 SN#: 237
Calibrated by: US Environmental Rental Co. 15 February 2006
Calibrated With: 100 ppm isobutylene (R.F. = 1.0)

Instrument: Industrial Scientific MG 140 SN#: 01044002-134
Sampling Pump: Industrial Scientific Sampling Pump SP402 SN#: 0004373-050
Calibrated by: US Environmental Rental Co. 15 February 2006
Calibrated With: 50 ppm CO, 25 H_2S, 50% LEL Methane, 20.9% O_2

Instrument: Landtec GA90 Serial#: G1457
Calibrated by: US Environmental Rental Co. 15 February 2006
Calibrated With: 15% CH_4, 15% CO_2, 20.9% O_2

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Revision: 2/12/07

2006 LANDFILL GAS MONITORING
SHEPLEY'S HILL LANDFILL
DEVENS, MA

Inspectors: Bakey/ Reault

Date:		**Barometer at Start:**	**End:**	**Time Started:**	**End:**	**Weather**
	10/31/2006	29.99"	29.79"	0710	1400	Partlv Cloudv 40 -65° F
	12/11/2006	30.33"	30.37"	0830	1430	Clear, 30's
	12/14/2006	30.01"	29.94"	0730	1400	Clear, 50's

ID#	VOCs ppm PID	O2 % IR	H2S ppm CGI	% LEL CGI	CO ppm CGI	CO2 % IR	Methane % IR	Remarks
V-1	0.0	6.5	0.0	95.0	4.0	10.9	1.9	12/14/2006 survey
V-2	0.0	5.2	0.0	>100	6.0	15.6	11.5	"
V-3	0.0	6.5	0.0	>100	6.0	18.9	10.9	"
V-4	0.0	10.0	0.0	52.0	2.0	8.8	1.2	"
V-5	0.6	17.9	0.0	2.0	2.0	6.3	2.0	"
V-6	0.0	1.3	0.0	>100	8.0	21.2	14.4	"
V-7	0.0	1.1	0.0	>100	8.0	17.1	6.0	"
V-8	0.0	16.3	0.0	23.0	3.0	11.6	1.2	"
V-9	0.0	6.5	0.0	>100	6.0	23.6	32.0	"
V-10	0.0	8.5	0.0	>100	7.0	17.9	9.6	"
V-11	0.0	10.7	0.0	>100	6.0	7.2	3.3	"
V-12	0.2	21.0	0.0	0.0	0.0	0.1	0.0	"
V-13	0.2	20.1	0.0	0.0	0.0	0.2	0.0	"
V-14	0.1	21.0	0.0	13.0	0.0	0.4	0.1	"
V-15	0.2	21.0	0.0	4.0	0.0	0.4	0.1	"
V-16	0.0	20.1	0.0	1.0	0.0	1.1	0.2	"
V-17	0.0	9.2	0.0	>100	5.0	16.5	17.4	"
V-18	0.0	21.0	0.0	0.0	0.0	0.2	0.0	"
LGP-01-01X	0.0	20.9	0.0	0.0	0.0	0.0	0.0	12/11/2006 survey
LGP-01-02X	0.0	20.4	0.0	0.0	1.0	1.2	0.0	"
LGP-01-03X	0.0	20.6	0.0	0.0	0.0	1.7	0.0	"
LGP-01-04X	1.5	20.6	0.0	0.0	0.0	0.5	0.0	"
LGP-05-05X	0.0	20.3	0.0	0.0	0.0	1.5	0.0	"
LGP-05-06X	0.0	18.2	0.0	0.0	1.0	2.8	0.0	"
LGP-05-07X	0.3	17.3	0.0	0.0	1.0	4.1	0.0	"
LGP-05-08X	0.0	10.4	0.0	0.0	4.0	12.3	0.0	"
LGP-05-09X	0.1	11.0	0.0	1.0	4.0	8.8	0.0	"
LGP-05-10X	0.3	12.6	0.0	2.0	4.0	10.4	0.0	"
LGP-05-11X	2.2	6.9	0.0	2.0	3.0	15.0	0.0	"
LGP-05-12X	--	--	--	--	--	--	--	not installed
LGP-05-13X	0.2	18.5	0.0	0.0	0.0	3.2	0.0	12/11/2006 survey
LGP-05-14X	0.4	8.9	0.0	0.0	3.0	5.1	0.0	"
DP-1	0.0	20.3	0.0	0.0	0.0	0.4	0.0	10/31/2006 temporary soil gas survey
DP-2	0.0	20.7	0.0	0.0	0.0	0.6	0.0	"
DP-3	0.0	21.1	0.0	0.0	0.0	0.6	0.0	"
DP-4	0.0	20.5	0.0	0.0	0.0	0.7	0.0	"
DP-5	0.0	20.9	0.0	0.0	0.0	0.7	0.0	"
DP-6	0.0	19.7	0.0	0.0	0.0	0.5	0.0	"
DP-7	0.0	17.8	0.0	0.0	0.0	2.2	0.0	"
DP-8	0.0	21.1	0.0	0.0	0.0	0.3	0.0	"
DP-9	0.0	21.0	0.0	0.0	0.0	0.3	0.0	"
DP-10	0.0	20.7	0.0	0.0	0.0	0.5	0.0	"
SHM-99-31-GP	0.0	20.6	0.0	0.0	0.0	0.4	0.0	12/11/2006 temporary soil gas survey
SHP-99-32X-GP	0.3	20.6	0.0	0.0	0.0	0.5	0.0	"
SHP-05-39-GP	0.0	20.0	0.0	0.0	3.0	1.2	0.0	"
SHP-05-40X-GP	0.1	20.2	0.0	0.0	0.0	1.2	0.0	"
SHP-05-41GP	4.6	20.6	0.0	0.0	2.0	0.4	0.0	"
SHP-05-42-GP	--	--	--	--	--	--	--	Not sampled due to standing water

Equipment and Calibration Information

Instrument: Thermo Environmental 580B PID 10.6 (Pine ID#6416);Calibrated by Pine Env. 10/31/06 w/ 100 ppm isobutylene (Lot #100 Iso 88410).
Thermo Environmental 580B PID 10.2 (S.N. 242); Calibrated by T. Bakey 12/11/06 and D. Reault 12/14/2006 w/ 100 ppm isobutylene (Lot #90295).

Instrument: Industrial Scientific TMX 412 (Pine ID# 6416); Calib'd by T. Bakey 10/31/06 w/ Cal Gas (Lot# 84993A) 50 ppm CO, 50% LEL, 20.9% O2, 25 ppm H2S.
Industrial Scientific TMX 412 (S.N. 9809009-444); Calib'd by T. Bakey 12/11/06 and D. Reault 12/14/2006 w/ US Env. Cal Gas (Lot# 004266) 50 ppm CO, 50% LEL, 20.9% O2, 25 ppm H2S.

Instrument: GEM 2000 (S.N. GM07991105); Calib'd by Pine Env. on 10/27/06 with 35 ppm CO2, 50ppm CH4, and 20.9 % O2 (Lot #1).
GEM 500 (S.N. E0985); Calibrated by US Env. on 12/11/06 with 35 ppm CO2, 50ppm CH4, and 20.9 % O2; Calibrated by D. Reault on 12/14/06 with 35 ppm CO2, 50ppm CH4, and 20.9 % O2.

NOTES:

V= Landfill gas vent
LGP= Landfill gas well point
DP = Direct push soil gas survey point
GP= Temporary gas point at select downgradient monitoring well locations

Barometric pressures were obtained from http://www.widespread.com for Ayer, MA
Unless otherwise indicated, LEL readings from the GEM 2000 and TMX 412 were the same. If two readings given, the first reading represents the GEM 2000 and the second reading represents the TMX 412 reading.

' DWH ______________ **,QVSHFWRU** &RP HDX &RNLQRV **7LWOH** ______________

2 UJDQL]DWLRQ (&& **: HDWKHU** SDUWO FORXG\ **%DURP HWHU** DP SP

RYHUFDVW DP SP

9HQW1 R	**92 & SSP 3,'**	**2 ,5**	**+ 6 SSP &* ,**	**/ (/ &* ,**	**&2 SSP &* ,**	**&2 ,5**	**&+ ,5**	**5 HP DUNV**
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&RRN6W 0 DQKRO H * : 73 GLVFKDUJH								

&DOLEUDWRQ ,QIRUP DWRQ

,QVWUXP HQW * (0 / DQGXMF * (0
&DOLEUDWRQ E\ * HRII &RNLQRV
&DOLEUDWRQ Z LWK &2 &+ SSP + 6 SSP &2 &+ / (/ 2

,QVWUXP HQW 3(3KRWR9 DF 3,' (') 1
&DOLEUDWRQ E\ ' DYLG &RP HDX
&DOLEUDWRQ Z LWK SSP ,VREX\WOHQH

,QVWUXP HQW * LOODQ * LOOLU DLUSXP S
&DOLEUDWRQ E\ 8 6 (QYLURQP HQWDO
&DOLEUDWRQ Z LWK

1 RWHV

2007 Landfill Gas Monitoring

6KHSOHI &RXQW\ &DOLIRUQLD

/*3 6DPSOLQJ ' DWD

' DWH &RPSDQ\ V %3 # # : HDWKHU %3 # #) LHOG 7HDP) UHG 6DQGRV ' DYH 5HDXOW%RE 6LPRQH $UP\ %5$&

	,QWHUQDO 5HDGLQJV									3RWW3XUJH 5HDGLQJV						
: HOO	92&SSP 3,'	2	+6SSP	/(/	&2SSP	&2	&+	3XUJH 5DWH &SP	3XUJH 7LPH VHF	92&SSP 3,'	2	+6SSP	/(/	&2SSP	&2	&+
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Gas Monitoring Data

VENT	DATE	AP	T (^{0}F)	VOC ppm PID	O_2 % GEM 500	H_2S ppm ISTMX	% LEL ISTMX	CO ppm ISTMX	CO_2 % GEM 500	CH_4 % GEM 500
GV-1 (PH1)	11/19/1996	30.5	32	0.0	21.4	0.0	0.0	0.0	0.0	0.0
	10/29/1997	29.9	45	1.0	17.8	0.0	4.0	5.0	1.7	0.2
	10/26/1998	30.2	45	0.0	21.0	0.0	0.0	0.0	0.0	0.0
	12/01/1999	30.0	25	0.0	2.0	3.0	100.0	0.0	13.4	3.5
	12/07/1999	29.6	45	0.0	19.7	0.0	0.0	0.0	0.8	0.0
	10/30/2000	29.7	45	0.0	8.3	0.0	0.0	0.0	9.5	1.0
	12/05/2001	29.9	65	0.0	20.8	0.0	0.0	0.0	0.0	0.0
	11/05/2002	29.9	50	0.0	18.3	0.0	0.0	0.0	1.2	0.0
	11/17/2003	30.1	45	0.0	21.0	0.0	0.0	0.0	0.0	0.0
	11/16/2004	30.0	45	0.0	16.9	0.0	0.0	0.0	3.1	0.0
	11/08/2005	29.9	55	0.0	5.6	0.0	32.0	0.0	10.8	1.7
	12/14/2006	30.0	55.0	0.0	6.5	0.0	95.0	4.0	10.9	1.9
	10/23/2007	29.5	74	0.0	14.5	0.0	0.0	0.0	4.7	0.0
	09/30/2008	29.6	61	0.7	21.9	0.0	0.0	0.0	0.0	0.0
GV-2 (PH1)	11/19/1996	30.5	32	0.0	21.5	0.0	0.0	0.0	0.0	0.0
	10/29/1997	29.9	45	0.0	20.1	0.0	0.0	2.0	0.2	0.0
	10/26/1998	30.2	45	0.0	21.0	0.0	0.0	0.0	0.0	0.0
	12/01/1999	30.0	25	0.0	2.8	0.0	100.0	0.0	14.0	7.4
	12/07/1999	29.6	45	0.0	7.2	0.0	100.0	0.6	10.9	8.4
	10/30/2000	29.7	45	0.0	21.0	0.0	0.0	0.0	2.6	1.3
	12/05/2001	29.9	65	0.0	15.2	0.0	93.0	0.0	4.7	2.4
	11/05/2002	29.9	50	0.0	18.1	0.0	75.0	0.0	1.3	1.4
	11/17/2003	30.1	45	0.0	20.8	0.0	75.0	0.0	0.0	0.0
	11/16/2004	30.0	45	0.0	2.9	0.0	100.0	0.0	15.4	11.0
	11/08/2005	29.9	55	0.0	5.2	0.0	100.0	0.0	12.8	8.6
	12/14/2006	30.0	55.0	0.0	5.2	0.0	100.0	6.0	15.6	11.5
	10/23/2007	29.5	74	0.0	11.2	0.0	60.0	13.0	6.4	3.0
	09/30/2008	29.6	61	0.7	21.8	0.0	0.0	0.0	0.0	0.0
GV-3 (PH1)	11/19/1996	30.5	32	0.0	21.3	0.0	0.0	0.0	0.0	0.0
	10/29/1997	29.9	45	1.0	14.3	0.0	20.0	1.0	3.8	0.9
	10/26/1998	30.2	45	0.0	21.0	0.0	0.0	0.0	0.0	0.0
	12/01/1999	30.0	25	0.0	0.9	0.0	100.0	0.0	18.9	14.6
	12/07/1999	29.6	45	0.0	21.0	0.0	0.1	0.0	0.0	0.0
	10/30/2000	29.7	45	0.0	11.5	0.0	7.0	0.0	7.9	5.8
	12/05/2001	29.9	65	0.0	10.3	0.0	100.0	0.0	8.3	6.3
	11/05/2002	29.9	50	0.0	10.7	0.0	100.0	0.0	5.7	3.4
	11/17/2003	30.1	45	0.0	20.6	0.0	0.0	0.0	0.0	0.0
	11/16/2004	30.0	45	0.0	8.9	0.0	100.0	0.0	10.3	7.6
	11/08/2005	29.9	55	0.0	2.8	0.0	100.0	0.0	15.1	9.0
	12/14/2006	30.0	55.0	0.0	6.5	0.0	100.0	6.0	18.9	10.9
	10/23/2007	29.5	74	0.0	8.2	0.0	94.0	0.0	8.3	4.7
	09/30/2008	29.6	61	0.0	21.7	0.0	0.0	0.0	0.0	0.0

Gas Monitoring Data

VENT	DATE	AP	T (^{0}F)	VOC ppm PID	O_2 % GEM 500	H_2S ppm ISTMX	% LEL ISTMX	CO ppm ISTMX	CO_2 % GEM 500	CH_4 % GEM 500
GV-4(PH1)	11/19/1996	30.5	32	0.0	21.3	0.0	2.0	0.0	0.0	0.0
	10/29/1997	29.9	45	0.0	12.3	0.0	50.0	3.0	5.3	2.4
	10/26/1998	30.2	45	0.0	21.0	0.0	0.0	0.0	0.0	0.0
	12/01/1999	30.0	25	0.0	1.4	0.0	100.0	0.0	16.2	9.3
	12/07/1999	29.6	45	0.0	16.2	0.0	3.0	0.0	4.1	2.0
	10/30/2000	29.7	45	0.0	17.4	0.0	0.0	0.0	1.7	0.5
	12/05/2001	29.9	65	0.0	14.5	0.0	61.0	0.0	4.4	1.3
	11/05/2002	29.9	50	0.0	14.1	0.0	100.0	0.0	4.0	0.9
	11/17/2003	30.1	45	0.0	20.7	0.0	0.0	0.0	0.0	0.0
	11/16/2004	30.0	45	0.0	8.0	0.0	100.0	0.0	9.5	3.0
	11/08/2005	29.9	55	0.0	6.4	0.0	50.0	0.0	10.6	4.3
	12/14/2006	30.0	55.0	0.0	10.0	0.0	52.0	2.0	8.8	1.2
	10/23/2007	29.5	74	0.0	14.9	0.0	39.0	8.0	4.8	1.9
	09/30/2008	29.6	61	0.0	21.9	0.0	0.0	0.0	0.0	0.0
GV-5 (PH1)	11/19/1996	30.5	32	0.0	21.4	0.0	0.0	0.0	0.0	0.0
	10/29/1997	29.9	45	0.2	19.2	0.0	0.0	1.0	0.7	0.0
	10/26/1998	30.2	45	0.0	21.0	0.0	0.0	0.0	0.0	0.0
	12/01/1999	30.0	25	0.0	6.8	0.0	72.0	2.5	7.6	2.6
	12/07/1999	29.6	45	0.0	21.0	0.0	0.0	0.0	0.0	0.0
	10/30/2000	29.7	45	0.0	16.3	0.0	0.0	0.0	2.4	0.0
	12/05/2001	29.9	65	0.0	15.3	0.0	5.0	0.0	3.6	0.1
	11/05/2002	29.9	50	0.0	18.8	0.0	0.0	0.0	0.8	0.0
	11/17/2003	30.1	45	0.0	20.8	0.0	0.0	0.0	0.0	0.0
	11/16/2004	30.0	45	0.0	11.7	0.0	33.0	0.0	7.0	0.7
	11/08/2005	29.9	55	0.0	10.4	0.0	11.0	0.0	7.7	1.4
	12/14/2006	30.0	55.0	0.6	17.9	0.0	2.0	2.0	6.3	2.0
	10/23/2007	29.5	74	0.0	18.2	0.0	0.0	4.0	1.8	0.0
	09/30/2008	29.6	61	0.3	21.8	0.0	0.0	0.0	0.0	0.0
GV-6 (PH1)	11/19/1996	30.5	32	0.0	21.4	0.0	0.0	0.0	0.0	0.0
	10/29/1997	29.9	45	0.0	17.2	0.0	8.0	1.0	1.7	0.4
	10/26/1998	30.2	45	0.0	21.0	0.0	0.0	0.0	0.0	0.0
	12/01/1999	30.0	25	0.0	1.4	0.0	100.0	0.0	16.2	10.8
	12/07/1999	29.6	45	0.0	21.0	0.0	0.5	0.0	0.0	0.0
	10/30/2000	29.7	45	0.4	11.6	0.0	4.0	0.0	7.2	3.1
	12/05/2001	29.9	65	0.0	14.8	0.0	37.0	0.0	3.9	0.7
	11/05/2002	29.9	50	0.0	15.4	0.0	100.0	0.0	3.4	2.8
	11/17/2003	30.1	45	0.0	20.4	0.0	1.0	0.0	0.0	0.0
	11/16/2004	30.0	45	0.0	11.6	0.0	78.0	0.0	6.8	2.2
	11/08/2005	29.9	55	0.0	0.4	0.0	100.0	0.0	18.9	12.5
	12/14/2006	30.0	55.0	0.0	1.3	0.0	100.0	8.0	21.2	14.4
	10/23/2007	29.5	74	0.0	15.3	0.0	53.0	0.0	3.9	2.7
	09/30/2008	29.6	61	0.0	21.8	0.0	0.0	0.0	0.0	0.0

Gas Monitoring Data

VENT	DATE	AP	T (^{0}F)	VOC ppm PID	O_2 % GEM 500	H_2S ppm ISTMX	% LEL ISTMX	CO ppm ISTMX	CO_2 % GEM 500	CH_4 % GEM 500
GV-7(PH1)	11/19/1996	30.5	32	0.0	21.4	0.0	0.0	0.0	0.0	0.0
	10/29/1997	29.9	45	0.0	20.3	0.0	0.0	1.0	0.1	0.0
	10/26/1998	30.2	45	0.0	21.1	0.0	0.0	0.0	0.0	0.0
	12/01/1999	30.0	25	0.0	3.8	0.0	54.0	0.0	9.1	0.8
	12/07/1999	29.6	45	0.0	21.0	0.0	0.0	0.0	0.0	0.0
	10/30/2000	29.7	45	0.0	18.1	0.0	0.0	0.0	1.0	0.0
	12/05/2001	29.9	65	0.0	16.4	0.0	31.0	0.0	2.4	0.7
	11/05/2002	29.9	50	0.0	18.0	0.0	16.0	0.0	0.8	0.2
	11/17/2003	30.1	45	0.0	20.4	0.0	1.0	0.0	0.0	0.0
	11/16/2004	30.0	45	0.0	7.9	0.0	19.0	0.0	8.2	1.3
	11/08/2005	29.9	55	0.0	2.1	0.0	14.0	0.0	12.2	4.4
	12/14/2006	30.0	55.0	0.0	1.1	0.0	100.0	8.0	17.1	6.0
	10/23/2007	29.5	74	0.0	19.6	0.0	0.0	6.0	0.7	0.0
	09/30/2008	29.6	61	0.0	21.8	0.0	0.0	0.0	0.0	0.0
GV-8 (PH1)	11/19/1996	30.5	32	0.0	21.2	0.0	2.0	0.0	0.1	0.1
	10/29/1997	29.9	45	0.0	18.7	0.0	4.0	1.0	1.0	0.2
	10/26/1998	30.2	45	0.0	21.0	0.0	0.0	0.0	0.0	0.0
	12/01/1999	30.0	25	0.0	4.8	0.0	100.0	1.0	9.6	2.2
	12/07/1999	29.6	45	0.0	12.7	0.0	0.0	0.0	6.1	0.0
	10/30/2000	29.7	45	0.0	19.3	0.0	0.0	0.0	0.1	0.0
	12/05/2001	29.9	65	0.0	14.8	0.0	50.0	0.0	4.2	1.3
	11/05/2002	29.9	50	0.0	16.1	0.0	40.0	0.0	2.4	0.6
	11/17/2003	30.1	45	0.0	19.7	0.0	0.0	0.0	0.2	0.0
	11/16/2004	30.0	45	0.0	7.5	0.0	31.0	0.0	9.6	0.9
	11/08/2005	29.9	55	0.0	8.3	0.0	25.0	0.0	8.9	4.2
	12/14/2006	30.0	55.0	0.0	16.3	0.0	23.0	3.0	11.6	1.2
	10/23/2007	29.5	74	0.0	16.9	0.0	0.0	6.0	2.1	0.0
	09/30/2008	29.6	61	0.0	21.8	0.0	0.0	0.0	0.0	0.0
GV-9 (PH1)	11/19/1996	30.5	32	0.0	21.2	0.0	1.0	0.0	0.0	0.1
	10/29/1997	29.9	45	0.0	19.7	0.0	6.0	1.0	0.4	0.3
	10/26/1998	30.2	45	0.0	21.1	0.0	0.0	0.0	0.0	0.0
	12/01/1999	30.0	25	0.0	0.3	0.0	100.0	1.0	23.2	26.6
	12/07/1999	29.6	45	0.0	20.2	0.0	0.5	0.0	0.6	0.5
	10/30/2000	29.7	45	0.0	19.0	0.0	0.0	0.0	0.2	0.0
	12/05/2001	29.9	65	0.0	6.7	0.0	100.0	0.0	10.2	9.2
	11/05/2002	29.9	50	0.0	7.2	0.0	100.0	0.0	14.7	19.8
	11/17/2003	30.1	45	0.0	11.5	0.0	100.0	1.0	9.9	15.0
	11/16/2004	30.0	45	0.0	4.1	0.0	100.0	0.0	18.6	23.9
	11/08/2005	29.9	55	0.0	0.0	0.0	100.0	0.0	21.8	26.4
	12/14/2006	30.0	55.0	0.0	6.5	0.0	100.0	6.0	23.6	32.0
	10/23/2007	29.5	74	0.0	5.9	0.0	100.0	15.0	15.7	21.7
	09/30/2008	29.6	61	0.0	21.8	0.0	0.0	0.0	0.0	0.0

Gas Monitoring Data

VENT	DATE	AP	T (^{0}F)	VOC ppm PID	O_2 % GEM 500	H_2S ppm ISTMX	% LEL ISTMX	CO ppm ISTMX	CO_2 % GEM 500	CH_4 % GEM 500
GV-10 (PH1)	11/19/1996	30.5	32	0.0	21.2	0.0	0.0	0.0	0.0	0.0
	10/29/1997	29.9	45	0.2	19.5	0.0	0.0	1.0	0.2	0.0
	10/26/1998	30.2	45	0.0	21.1	0.0	0.0	0.0	0.0	0.0
	12/01/1999	30.0	25	0.0	0.5	0.0	100.0	2.0	17.7	7.0
	12/07/1999	29.6	45	0.0	20.9	0.0	0.1	0.0	0.2	0.0
	10/30/2000	29.7	45	0.0	19.1	0.0	0.0	0.0	0.2	0.0
	12/05/2001	29.9	65	0.0	13.8	0.0	55.0	0.0	4.1	1.4
	11/05/2002	29.9	50	0.0	17.8	0.0	9.0	0.0	0.6	0.0
	11/17/2003	30.1	45	0.4	20.3	0.0	2.0	0.0	0.0	0.0
	11/16/2004	30.0	45	0.0	0.3	0.0	100.0	4.0	17.6	6.5
	11/08/2005	29.9	55	0.0	0.6	0.0	100.0	0.0	14.8	10.3
	12/14/2006	30.0	55.0	0.0	8.5	0.0	100.0	7.0	17.9	9.6
	10/23/2007	29.5	74	0.0	19.8	0.0	0.0	6.0	0.5	0.0
	09/30/2008	29.6	61	0.0	21.8	0.0	0.0	0.0	0.0	0.0
GV-11(PH1)	11/19/1996	30.5	32	0.0	21.3	0.0	0.0	0.0	0.0	0.0
	10/29/1997	29.9	45	0.0	20.1	0.0	0.0	1.0	0.1	0.0
	10/26/1998	30.2	45	0.0	21.0	0.0	0.0	0.0	0.0	0.0
	12/01/1999	30.0	25	0.0	3.9	0.0	100.0	0.0	9.7	7.3
	12/07/1999	29.6	45	0.0	21.0	0.0	0.0	0.0	0.0	0.0
	10/30/2000	29.7	45	0.0	19.3	0.0	0.0	0.0	0.1	0.0
	12/05/2001	29.9	65	0.0	14.7	0.0	69.0	0.0	3.4	2.5
	11/05/2002	29.9	50	0.0	16.3	0.0	62.0	0.0	1.5	1.0
	11/17/2003	30.1	45	0.0	19.0	0.0	5.0	0.0	0.5	0.0
	11/16/2004	30.0	45	0.0	8.4	0.0	100.0	0.0	7.4	4.2
	11/08/2005	29.9	55	0.0	10.1	0.0	12.0	0.0	6.4	2.2
	12/14/2006	30.0	55.0	0.0	10.7	0.0	100.0	6.0	7.2	3.3
	10/23/2007	29.5	74	0.0	12.5	0.0	60.0	16.0	3.8	3.1
	09/30/2008	29.6	61	0.0	21.9	0.0	0.0	0.0	0.0	0.0
GV-12(PH2)	11/19/1996	30.5	32	0.0	21.2	0.0	0.0	0.0	0.0	0.0
	10/29/1997	29.9	45	0.0	20.5	0.0	0.0	1.0	0.0	0.0
	10/26/1998	30.2	45	0.0	21.0	0.0	0.0	0.0	0.0	0.0
	12/01/1999	30.0	25	0.0	2.1	0.0	100.0	0.0	14.5	10.5
	12/07/1999	29.6	45	0.0	20.6	0.0	0.0	0.0	0.6	0.0
	10/30/2000	29.7	45	0.0	4.9	0.0	20.0	0.0	8.2	2.7
	12/05/2001	29.9	65	0.0	1.2	0.0	100.0	4.0	13.6	8.0
	11/05/2002	29.9	50	0.0	20.5	0.0	0.0	0.0	0.0	0.0
	11/17/2003	30.1	45	0.0	19.8	0.0	0.0	0.0	0.0	0.0
	11/16/2004	30.0	45	0.0	20.6	0.0	46.0	0.0	0.8	0.5
	11/08/2005	29.9	55	0.0	2.8	0.0	100.0	0.0	9.4	6.4
	12/14/2006	30.0	55.0	0.2	21.0	0.0	0.0	0.0	0.1	0.0
	10/23/2007	29.5	74	0.0	20.2	0.0	0.0	6.0	0.5	0.0
	09/30/2008	29.6	61	0.0	13.1	0.0	0.0	0.0	4.3	0.0

Gas Monitoring Data

VENT	DATE	AP	T (^{0}F)	VOC ppm PID	O_2 % GEM 500	H_2S ppm ISTMX	% LEL ISTMX	CO ppm ISTMX	CO_2 % GEM 500	CH_4 % GEM 500
GV-13 (PH2)	11/19/1996	30.5	32	0.0	21.2	0.0	0.0	0.0	0.0	0.0
	10/29/1997	29.9	45	0.0	17.9	0.0	66.0	1.0	2.0	1.6
	10/26/1998	30.2	45	0.0	21.0	0.0	0.0	0.0	0.0	0.0
	12/01/1999	30.0	25	0.0	2.3	0.0	100.0	0.0	14.0	18.5
	12/07/1999	29.6	45	0.0	14.7	0.0	100.0	0.0	4.6	6.6
	11/01/2000	29.8	55	0.0	0.1	0.0	100.0	0.0	14.5	19.1
	12/05/2001	29.9	65	0.0	4.3	0.0	100.0	1.0	10.1	11.3
	11/05/2002	29.9	50	0.0	9.3	0.0	100.0	0.0	6.3	4.9
	11/17/2003	30.1	45	0.0	19.2	0.0	2.0	0.0	0.3	0.0
	11/16/2004	30.0	45	0.0	21.2	0.0	75.0	0.0	0.1	0.2
	11/08/2005	29.9	55	0.0	20.2	0.0	25.0	0.0	0.5	0.5
	12/14/2006	30.0	55.0	0.2	20.1	0.0	0.0	0.0	0.2	0.0
	10/23/2007	29.5	74	0.0	0.2	0.0	100.0	0.0	13.1	14.7
	09/30/2008	29.6	61	0.0	5.2	0.0	>100	0.0	1.0	13.9
GV-14 (PH2)	11/19/1996	30.5	32	0.0	21.2	0.0	0.0	0.0	0.0	0.0
	10/29/1997	29.9	45	0.0	20.4	0.0	0.0	1.0	0.0	0.0
	10/26/1998	30.2	45	0.0	21.2	0.0	0.0	0.0	0.0	0.0
	12/01/1999	30.0	25	0.0	1.7	2.0	100.0	0.0	22.2	34.1
	12/06/1999	29.7	45	0.0	17.0	0.0	100.0	0.0	5.2	8.0
	11/01/2000	29.8	55	0.0	0.0	0.0	100.0	0.0	26.6	41.0
	12/05/2001	29.9	65	0.0	1.6	0.0	100.0	2.0	22.2	33.1
	11/05/2002	29.9	50	0.0	2.2	0.0	100.0	0.0	15.7	18.6
	11/17/2003	30.1	45	0.0	5.8	0.0	57.0	0.0	7.8	3.8
	11/16/2004	30.0	45	0.0	4.4	0.0	100.0	13.0	19.9	33.5
	11/08/2005	29.9	55	0.0	20.7	0.0	6.0	0.0	0.2	0.3
	12/14/2006	30.0	55.0	0.1	21.0	0.0	13.0	0.0	0.4	0.1
	10/23/2007	29.5	74	0.0	0.2	0.0	100.0	8.0	23.1	33.6
	09/30/2008	29.6	61	0.0	1.5	0.0	>100	0.0	20.0	26.8
GV-15 (PH3)	11/19/1996	30.5	32	0.0	20.1	0.0	11.0	0.0	0.6	0.4
	10/29/1997	29.9	45	0.0	13.4	0.0	46.0	1.0	4.2	2.2
	10/26/1998	30.2	45	0.0	21.6	0.0	0.0	0.0	0.0	0.0
	12/01/1999	30.0	25	0.0	2.1	0.0	100.0	0.0	22.5	23.7
	12/06/1999	29.7	45	0.0	20.2	0.0	0.4	0.0	0.7	0.6
	11/01/2000	29.8	55	0.0	0.1	0.0	100.0	0.0	26.6	27.7
	12/05/2001	29.9	65	0.0	0.3	0.0	100.0	0.0	22.9	23.4
	11/05/2002	29.9	50	0.0	4.2	0.0	100.0	0.0	12.2	10.6
	11/17/2003	30.1	45	0.0	8.2	0.0	74.0	0.0	7.4	5.1
	11/16/2004	30.0	45	0.0	0.0	0.0	100.0	11.0	26.1	32.4
	11/08/2005	29.9	55	0.0	20.9	0.0	0.0	0.0	0.0	0.0
	12/14/2006	30.0	55.0	0.2	21.0	0.0	4.0	0.0	0.4	0.1
	10/23/2007	29.5	74	0.0	0.1	0.0	100.0	12.0	27.4	24.9
	09/30/2008	29.6	61	0.0	3.9	0.0	>100	0.0	15.1	11.3

Gas Monitoring Data

VENT	DATE	AP	T (^{0}F)	VOC ppm PID	O_2 % GEM 500	H_2S ppm ISTMX	% LEL ISTMX	CO ppm ISTMX	CO_2 % GEM 500	CH_4 % GEM 500
GV-16 (PH3)	11/19/1996	30.5	32	0.0	21.1	0.0	1.0	0.0	0.0	0.0
	10/29/1997	29.9	45	0.2	18.0	0.0	2.0	1.0	1.0	0.0
	10/26/1998	30.2	45	0.0	21.0	0.0	0.0	0.0	0.0	0.0
	12/01/1999	30.0	25	0.0	1.8	0.0	100.0	0.0	19.2	13.0
	12/06/1999	29.7	45	0.0	20.9	0.0	0.0	0.0	0.0	0.0
	11/01/2000	29.8	55	30.0	0.5	0.0	68.0	0.0	21.8	14.6
	12/05/2001	29.9	65	0.0	0.4	0.0	68.0	1.0	19.7	12.5
	11/05/2002	29.9	50	0.0	20.7	0.0	0.0	0.0	0.0	0.0
	11/17/2003	30.1	45	0.0	15.0	0.0	29.0	0.0	2.3	1.0
	11/16/2004	30.0	45	0.0	0.1	0.0	100.0	10.0	24.6	22.6
	11/08/2005	29.9	55	0.0	0.0	0.0	100.0	2.0	23.7	20.7
	12/14/2006	30.0	55.0	0.0	20.1	0.0	1.0	0.0	1.1	0.2
	10/23/2007	29.5	74	0.0	0.1	1.0	100.0	11.0	25.3	15.1
	09/30/2008	29.6	61	0.0	3.8	0.0	96.0	0.0	16.7	4.8
GV-17 (PH4A)	11/19/1996	30.5	32	0.0	21.0	0.0	2.0	0.0	0.2	0.1
	10/29/1997	29.9	45	0.0	16.1	0.0	8.0	1.0	2.5	0.5
	10/26/1998	30.2	45	0.0	21.0	0.0	0.0	0.0	0.0	0.0
	12/01/1999	30.0	25	0.0	1.7	3.0	100.0	0.0	25.0	26.2
	12/06/1999	29.7	45	0.0	20.2	0.0	0.0	0.0	0.0	0.0
	11/01/2000	29.8	55	40.0	0.1	0.0	100.0	0.0	29.2	32.0
	12/05/2001	29.9	65	0.0	2.2	0.0	100.0	3.0	19.6	17.1
	11/05/2002	29.9	50	0.0	14.9	0.0	17.0	0.0	3.0	0.5
	11/17/2003	30.1	45	0.4	14.8	0.0	7.0	0.0	2.1	0.4
	11/16/2004	30.0	45	0.0	0.0	0.0	100.0	10.0	27.6	37.5
	11/08/2005	29.9	55	0.0	0.0	0.0	100.0	3.0	27.0	32.7
	12/14/2006	30.0	55.0	0.0	9.2	0.0	100.0	5.0	16.5	17.4
	10/23/2007	29.5	74	0.0	16.2	0.0	100.0	0.0	15.2	22.1
	09/30/2008	29.6	61	0.0	21.0	0.0	26.0	0.0	1.0	1.3
GV-18 (PH4B)	11/19/1996	30.5	32	0.0	21.2	0.0	2.0	0.0	0.1	0.2
	10/29/1997	29.9	45	0.0	18.6	0.0	50.0	0.0	2.4	2.7
	10/26/1998	30.2	45	0.0	21.1	0.0	0.0	0.0	0.0	0.0
	12/01/1999	30.0	25	0.0	1.7	0.0	100.0	0.0	25.7	32.8
	12/06/1999	29.7	45	0.0	0.0	0.0	100.0	0.0	35.8	45.5
	11/01/2000	29.8	55	0.0	0.2	0.0	100.0	0.0	30.0	39.5
	12/05/2001	29.9	65	0.0	3.7	0.0	100.0	0.0	21.7	29.1
	11/05/2002	29.9	50	0.0	3.2	0.0	100.0	0.0	19.0	23.5
	11/17/2003	30.1	45	0.0	19.5	0.0	2.0	0.0	0.4	0.3
	11/16/2004	30.0	45	0.0	21.2	0.0	0.0	0.0	0.0	0.0
	11/08/2005	29.9	55	0.0	21.0	0.0	0.0	0.0	0.0	0.0
	12/14/2006	30.0	55.0	0.0	21.0	0.0	0.0	0.0	0.2	0.0
	10/23/2007	29.5	74	0.0	0.1	0.0	100.0	7.0	28.6	37.1
	09/30/2008	29.6	61	0.0	18.2	0.0	24.0	1.0	1.7	1.1

Gas Monitoring Data

VENT	DATE	AP	T (^{0}F)	VOC ppm PID	O_2 % GEM 500	H_2S ppm ISTMX	% LEL ISTMX	CO ppm ISTMX	CO_2 % GEM 500	CH_4 % GEM 500
LGP-01-01X	12/05/2001	29.9	65.0	0.0	20.9	0.0	0.0	0.0	0.0	0.0
	11/05/2002	29.9	50.0	0.0	20.2	0.0	0.0	0.0	0.2	0.0
	11/17/2003	30.1	45.0	0.8	20.0	0.0	0.0	0.0	0.3	0.0
	11/16/2004	30.0	45.0	0.0	20.6	0.0	0.0	0.0	0.4	0.0
	11/08/2005	29.9	55.0	0.0	20.3	0.0	0.0	0.0	0.7	0.0
	12/11/2006	30.4	35.0	0.0	20.9	0.0	0.0	0.0	0.0	0.0
	10/23/2007	29.5	74	0.0	20.4	0.0	0.0	0.0	0.7	0.0
	03/18/2008	30.4	50.0	0.0	20.9	0.0	0.0	0.0	0.1	0.0
	09/29/2008	29.7	70	0	19.2	0	0	5	1.4	0
LGP-01-02X	12/05/2001	29.9	65.0	0.0	20.3	0.0	0.0	0.0	0.8	0.0
	11/05/2002	29.9	50.0	0.0	19.3	0.0	0.0	0.0	1.4	0.0
	11/17/2003	30.1	45.0	0.9	18.8	0.0	0.0	0.0	1.7	0.0
	11/16/2004	30.0	45.0	0.0	20.0	0.0	0.0	0.0	1.7	0.0
	11/08/2005	29.9	55.0	0.0	19.2	0.0	0.0	0.0	2.2	0.0
	12/11/2006	30.4	35.0	0.0	20.4	0.0	0.0	1.0	1.2	0.0
	10/23/2007	29.5	74	0.0	19.7	0.0	0.0	0.0	1.5	0.0
	03/18/2008	30.4	50.0	0.0	20.2	0.0	0.0	0.0	0.6	0.0
	09/29/2008	29.7	70	0.0	17.6	0.0	0.0	0.0	2.9	0.0
LGP-01-03X	12/05/2001	29.9	65.0	0.0	20.7	0.0	0.0	0.0	0.3	0.0
	11/05/2002	29.9	50.0	0.0	20.2	0.0	0.0	0.0	0.6	0.0
	11/17/2003	30.1	45.0	0.9	19.6	0.0	0.0	0.0	0.8	0.0
	11/16/2004	30.0	45.0	0.0	21.3	0.0	0.0	0.0	0.0	0.0
	11/08/2005	29.9	55.0	0.0	19.5	0.0	0.0	0.0	1.7	0.0
	12/11/2006	30.4	35.0	0.0	20.6	0.0	0.0	0.0	1.7	0.0
	10/23/2007	29.5	74	0.0	19.5	0.0	0.0	0.0	1.4	0.0
	03/18/2008	30.4	50.0	0.0	20.5	0.0	0.0	0.0	0.4	0.0
	09/29/2008	29.7	70	0.0	18.7	0.0	0.0	2.0	1.5	0.0
LGP-01-04X	12/05/2001	29.9	65.0	0.0	20.8	0.0	0.0	0.0	0.1	0.0
	11/05/2002	29.9	50.0	0.0	20.2	0.0	0.0	0.0	0.2	0.0
	11/17/2003	30.1	45.0	0.9	19.9	0.0	0.0	0.0	0.4	0.0
	11/16/2004	30.0	45.0	0.0	21.3	0.0	0.0	0.0	0.0	0.0
	11/08/2005	29.9	55.0	0.0	20.3	0.0	0.0	0.0	0.6	0.0
	12/11/2006	30.4	35.0	1.5	20.6	0.0	0.0	0.0	0.5	0.0
	10/23/2007	29.5	74	0.0	20.2	0.0	0.0	0.0	0.6	0.0
	03/18/2008	30.4	50.0	0.0	20.4	0.0	0.0	0.0	0.1	0.1
	09/29/2008	29.7	70	0.0	19.6	0.0	0.0	3.0	0.8	0.0
LGP-05-05X	12/11/2006	30.4	35.0	0.0	20.3	0.0	0.0	0.0	1.5	0.0
	10/23/2007	29.5	74	0.0	14.8	0.0	0.0	0.0	6.3	0.0
	03/18/2008	30.4	50.0	0.0	21.0	0.0	1.0	0.0	0.5	0.1
	09/29/2008	29.7	70	0.0	0.0	0.0	>100	0.0	37.7	35.7
	10/12/2008	30.4	75		17.8		0.0	3.0		0.0
	10/16/2008	29.7	65		20.9		0.0	2.6		0.0
	11/05/2008	30.2	65		3.0		0.0		15.2	0.0
	11/07/2008	29.9	65		0.6		>100		24.8	15.8

Gas Monitoring Data

VENT	DATE	AP	T (^{0}F)	VOC ppm PID	O_2 % GEM 500	H_2S ppm ISTMX	% LEL ISTMX	CO ppm ISTMX	CO_2 % GEM 500	CH_4 % GEM 500
LGP-05-06X	12/11/2006	30.4	35.0	0.0	18.2	0.0	0.0	1.0	2.8	0.0
	10/23/2007	29.5	74	0.0	15.4	0.0	0.0	0.0	5.3	0.0
	03/18/2008	30.4	50.0	17.2	0.0	0.0	0.0	0.0	1.2	0.0
	09/29/2008	29.7	70	0.0	2.6	0.0	0.0	9.0	7.6	0.0
LGP-05-07X	12/11/2006	30.4	35.0	0.3	17.3	0.0	0.0	1.0	4.1	0.0
	10/23/2007	29.5	74	0.0	16.6	0.0	0.0	0.0	6.3	0.0
	03/18/2008	30.4	50.0	17.8	0.0	0.0	0.0	0.0	2.1	0.0
	09/29/2008	29.7	70	0.0	20.1	0.0	0.0	0.0	0.1	0.0
LGP-05-08X	12/11/2006	30.4	35.0	0.0	10.4	0.0	0.0	4.0	12.3	0.0
	10/23/2007	29.5	74	0.0	5.3	0.0	0.0	0.0	16.0	0.0
	03/18/2008	30.4	50.0	0.0	15.7	1.0	0.0	0.0	6.7	0.0
	09/29/2008	29.7	70	0.0	4.2	0.0	10.0	0.0	7.4	0.6
LGP-05-09X	12/11/2006	30.4	35.0	0.1	11.0	0.0	1.0	4.0	8.8	0.0
	10/23/2007	29.5	74	0.0	13.5	0.0	0.0	0.0	8.8	0.0
	03/18/2008	30.4	50.0	0.0	15.6	0.0	1.0	0.0	4.8	0.1
	09/29/2008	29.7	70	0.0	0.0	0.0	>100	0.0	18.1	18.9
	10/12/2008	30.4	75		14.4		0.0	6.7		0.0
	10/16/2008	29.7	65		8.4		>100	10.6		8.6
	11/05/2008	30.2	65		6.4		0.0		10.3	0.0
	11/07/2008	29.9	65		0.1		>100		13.6	6.7
LGP-05-10X	12/11/2006	30.4	35.0	0.3	12.6	0.0	2.0	4.0	10.4	0.0
	10/23/2007	29.5	74	0.0	0.1	1.0	>100	0.0	22.5	5.8
	03/18/2008	30.4	50.0	0.0	18.1	0.0	1.0	0.0	5.5	0.1
	09/29/2008	29.7	70	0.0	0.0	0.0	>100	0.0	19.9	10.1
	10/12/2008	30.4	75		14.2		0.0	7.2		0.0
	10/16/2008	29.7	65		5.8		>100	16.7		14.7
	11/05/2008	30.2	65		2.2		0.0		13.2	0.0
	11/07/2008	29.9	65		0.6		>100		18.8	10.3
LGP-05-11X	12/11/2006	30.4	35.0	2.2	6.9	0.0	2.0	3.0	15.0	0.0
	10/23/2007	29.5	74	0.0	5.3	0.0	>100	0.0	17.7	5.9
	03/18/2008	30.4	50.0	0.0	20.9	0.0	0.0	0.0	1.2	0.0
	09/29/2008	29.7	70	0.0	1.0	0.0	0.0	8.0	7.1	0.0
LGP-05-13X	12/11/2006	30.4	35.0	0.2	18.5	0.0	0.0	0.0	3.2	0.0
	10/23/2007	29.5	74	0.0	2.9	0.0	88.0	0.0	14.5	4.4
	03/18/2008	30.4	50.0	0.0	18.9	0.0	1.0	0.0	2.9	0.1
	09/29/2008	29.7	70	0.0	1.5	0.0	35.0	0.0	13.8	1.7
	10/12/2008	30.4	75		17.5		0.0	3.5		0.0
	10/16/2008	29.7	65		20.6		0.0	0.0		0.0
	11/05/2008	30.2	65		6.0		0.0		8.6	0.0
	11/07/2008	29.9	65		0.6		39.0		13.0	1.9

Gas Monitoring Data

VENT	DATE	AP	T (^{0}F)	VOC ppm PID	O_2 % GEM 500	H_2S ppm ISTMX	% LEL ISTMX	CO ppm ISTMX	CO_2 % GEM 500	CH_4 % GEM 500
LGP-05-14X	12/11/2006	30.4	35.0	0.4	8.9	0.0	0.0	3.0	5.1	0.0
	10/23/2007	29.5	74	0.0	19.5	0.0	37.0	8.0	5.3	0.1
	03/18/2008	30.4	50.0	0.0	13.7	0.0	1.0	0.0	1.3	0.1
	09/29/2008	29.7	70	0.0	16.2	0.0	23.0	0.0	2.1	1.1
	10/12/2008	30.4	75		9.2		25.0	5.6		1.2
	10/16/2008	29.7	65		11.6		>100	5.0		7.1
	11/05/2008	30.2	65		7.4		18.0		7.3	0.1
	11/07/2008	29.9	65		3.4		>100		9.0	5.1

Typical Landfill Gases

Component	Percent by Volume
NMOCs	0.01 to 0.6
O_2	0.1 to 1.0
Sulfides	0 to 1.0
CO	0 to 0.2
CO_2	40 to 60
CH_4	45 to 60

SHEPLEY'S HILL LANDFILL GAS

TECHNICAL MEMORANDUM

TO: ROBERT SIMEONE

FROM: FRED SANTOS, WILLARD MURRAY

SUBJECT: DEVENS SHEPLEY'S HILL LANDFILL GAS EVALUATION OF THE SOUTHERN PERIMETER

DATE: 11/12/08

CC: FILE (CORRESPONDENCE LOG# 5404.006.COR.011), PAUL HUNT

Purpose:

Review recent landfill gas probe measurements related to high and /low barometric pressure and determine extent of potential gas migration.

Summary Results of Recent Sampling Data at Landfill Gas Probes:

ECC has reviewed both the results of recent sampling of landfill gas probes on the southern end of the Shepley's Hill Landfill and the April 2008 Draft report entitled "Gas Trend Report, Shepley's Hill Landfill, Ayer, Massachusetts, by the US Army Corps of Engineers, New England District. This review has revealed the following:

1. On 9/29/08 gas results along the southern edge of the landfill at LGP-5, LGP-9 and LGP-10 showed >100% LEL and LGP-13 showed 35% LEL; weather was cloudy and temperature was in the 70s and barometric pressure was 29.6 inches of mercury.
2. On 10/12/08 gas results along the southern edge of the landfill at these same LGPs showed 0 % LEL; weather was clear with temperature in the 70s and barometric pressure was 30.1 inches of mercury.
3. On 10/16/08 gas results along the southern edge of the landfill at LGP-9, LGP-10 and LGP-14 showed >100% LEL; weather was cloudy with temperature in the 60s and barometric pressure was 29.8 inches of mercury. Storm drains and manholes near the southern perimeter of the landfill and Cook Street were checked for landfill gas during this sampling episode. Gas results showed zero methane and LEL in the manhole/storm drains.
4. On 11/5/08 gas results along the southern edge of the landfill were once again at 0% LEL except for a reading of 18% LEL at LGP-14; weather was overcast with temperature in the 60s but the barometric pressure was high at 30.1 inches of mercury.
5. On 11/7/08 gas results along the southern edge of the landfill at LGP-5, LGP-9, LGP-10 and LGP-14 showed >100% LEL and LGP-13 showed 39% LEL; weather was overcast with slight rain and barometric pressure at 29.9 inches of mercury; on this sampling episode drive probes were placed at distances of 10 to

25 feet out from the above LGPs to see if migration has occurred to greater distances from the landfill edge; at locations adjacent to LGP-5, LGP-9 and LGP-10 for sample depths of 3 ft and 6 ft the %LEL was zero, furthermore, at locations

LGP-13 and LGP-14 at sample depth of 3 ft the %LEL was zero and water was encountered at a depth of 5 to 6 ft.

6. Prior to the September 2008 detection of excessive %LEL readings, the LGPs have detected little or no methane gas since installation at the northern or southern perimeter of the landfill, as reported in the April 2008 Gas Trend Report by the US Army Corps of Engineers.

It can clearly be seen that when the weather is clear and/or barometric pressure is high, there is no significant landfill gas migration outside the landfill cap. However, when the weather is cloudy and overcast and barometric pressure is relatively low, landfill gas tends to migrate laterally outside the landfill cap along the southern end of the landfill in the vicinity of LGP-5, LGP-9, LGP-10, LGP-13 and LGP-14. The distance migrated is small, less than 10 to 25 feet from the edge of the landfill cap during these periods of low barometric pressure. When high barometric pressure returns the landfill gas is apparently pushed back beneath the landfill cap.

Conclusions Regarding Landfill Gas Migration:

The observed high %LEL gas levels measured recently in landfill gas probes along the southern edge of the Shepley's Hill Landfill cap are transient events and only persist for a short time while a low barometric pressure system resides over the landfill. Furthermore, during this time of low pressure the distance gas migrates away from the edge of the landfill is very small, less than 10 to 25 feet. When the inclement weather and its associated low pressure are replaced by clear weather and relatively high atmospheric pressure, the landfill gas probes show that %LEL values return to zero or to very low values.

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2009 Landfill Gas Monitoring
Shepley Hill LF

Date: 05/28/2009 Weather: Cloudy, mist, 50's Field Team: Dave Reault & Matt Stetson

		Initial Readings										Post Purge Readings							
Time	Well	VOC ppm PID	O2 %	H2S ppm	LEL %	CO ppm	CO2 %	CH4 %	Riser Length (ft of 1")	Purge Rate (lpm)	Purge Time (sec)	VOC ppm PID	O2 %	H2S ppm	LEL %	CO ppm	CO2 %	CH4 %	BP (inches)
930	LGP-01-04X	0	21.0	0	0	0	0.8	0	9	2	83	0	20.4	0	0	0	0.8	0	29.75
940	LGW-09-04X	58	20.4	0	0	0	0.7	0	13	2	120	3.2	21.1	0	0	0	0	0	29.75
950	LGP-01-03X	1.5	20.9	0	0	0	0.7	0	9	2	83	0	21.1	0	0	0	0	0	29.75
1000	LGW-09-03X	>300	21.1	0	0	0	0.3	0	18	2	167	9.2	21.2	0	0	0	0	0	29.75
1010	LGP-01-02X	0	20.6	0	0	0	1.7	0	9	2	83	0	20.6	0	0	0	0.8	0	29.75
1020	LGW-09-02X	161	21.1	0	0	0	1.7	0	22	2	204	2.9	20.4	0	0	0	1.6	0	29.75
1030	LGP-01-01X	0	21.4	0	1	0	0	0	9	2	83	0	21.2	0	0	0	0.4	0	29.75
1040	LGW-09-01XA	164	21.1	0	0	0	0.5	0	17	2	157	4.2	21.1	0	0	0	0.6	0	29.75
1050	LGW-09-01XB	184	21.3	0	0	0	0.3	0	28	2	259	22	21.3	0	0	0	0.6	0	29.75
1150	LGP-05-05X	0	11.1	0	29	0	9.7	1.5	10	2	93	0	2.3	0	48	2	17.6	2.3	29.72
1200	LGW-09-05X	0	19.8	0	8	0	1.4	0.4	18	2	167	0	2.7	0	>100	0	16.7	5.6	29.72
1210	LGP-05-06X	0	18.1	0	1	0	2.9	0	10	2	93	0	17.4	0	0	0	3.6	0	29.72
1220	LGW-09-06X	145	13.6	0	0	0	5.3	0	13	2	120	18	13.6	0	0	0	5.8	0	29.72
1230	LGP-05-08X	4.6	16.7	0	3	0	4.8	0.1	10	2	93	1.8	3.9	0	3	0	17.2	0.1	29.72
1240	LGW-09-08X	62	10.4	0	19	0	9.7	0.9	20	2	185	6.5	5.7	0	45	0	15.2	2	29.72
1250	LGP-05-07X	3.8	12.9	0	21	0	6	1	7	2	65	5.7	5.5	0	1	0	12.7	0.1	29.72
1300	LGP-05-09X	2.6	12.7	0	3	0	7.7	0.1	10	2	93	2.4	2.7	0	2	0	12.4	0.1	29.72
1310	LGW-09-09X	27	8.0	0	16	0	10.3	0.8	20	2	185	3.9	2.2	0	22	0	13	1.1	29.72
1320	LGP-05-10X	0	11.8	0	40	0	9.1	2	10	2	93	0	5.4	0	81	0	15.9	4	29.72
1330	LGW-09-10X	1.5	16.3	0	43	0	5.7	2.1	16	2	148	2.3	2.9	0	>100	0	18.6	7.7	29.72
1340	LGP-05-11X	0	13.1	0	32	0	7.6	1.5	9	2	83	0	13.2	0	20	0	11.6	1	29.72
1350	LGW-09-11X	13.9	12.0	0	66	0	10.1	3.3	15	2	139	1.7	3.2	0	>100	0	17.7	8	29.72
1400	LGP-05-13X	1.4	16.9	0	0	0	3.9	0	6	2	56	4	12.4	0	0	0	7.3	0	29.72
1410	LGP-05-14X	3.6	19.8	0	3	0	1.4	0.1	10	2	93	2.8	8	0	17	0	7.1	0.8	29.72
1420	LGW-09-15X	6.7	17.0	0	0	0	1.8	0	12	2	111	1.1	15.2	0	0	0	4.9	0	29.72

*** ECC also monitored catch basins and the swale culvert at the southern perimeter of the landfill for LEL and methane. Levels were at zero. No LEL or methane was detected.**
**** ECC will install temporary soil gas probes tomorrow (Friday, May 29th) to monitor gas migration if landfill gas levels remain high.**

Gas Well ID	Depth to Groundwater (ft)	Screened Interval (ft)	Screen Length (ft)	End of Boring (ft)
LGW-09-14X	4.28	2-12	10	13

2009 Landfill Gas Monitoring
Shepley Hill LF

Date: 05/30/2009 Weather: Clear, breezy, 60's Field Team: Dave Reault

		Initial Readings										Post Purge Readings							
Time	Well	VOC ppm PID	O2 %	H2S ppm	LEL %	CO ppm	CO2 %	CH4 %	Riser Length (ft of 1")	Purge Rate (lpm)	Purge Time (sec)	VOC ppm PID	O2 %	H2S ppm	LEL %	CO ppm	CO2 %	CH4 %	BP (inches)
1400	LGP-05-05X				>100			11.2	10	2	93				>100			19.6	29.39
1410	LGP-09-05X				>100			21.3	18	2	167				>100			25.6	29.39
1420	LGP-09-08X				>100			5.1	20	2	185				>100			5.4	29.39
1430	LGP-05-10X				>100			7.8	10	2	93				>100			14.4	29.39
1440	LGP-09-10X				>100			9.8	16	2	148				>100			15.6	29.39
1450	LGP-09-11X				>100			12.5	15	2	139				>100			17.4	29.39

*** ECC also monitored catch basins and the swale culvert at the southern perimeter of the landfill for LEL and methane. Levels were at zero. No LEL or methane was detected.**

2009 Landfill Gas Monitoring
Shepley Hill LF

Date: 05/31/2009 Weather: Clear, breezy, 60's Field Team: Dave Reault

		Initial Readings										Post Purge Readings							
Time	Well	VOC ppm PID	O2 %	H2S ppm	LEL %	CO ppm	CO2 %	CH4 %	Riser Length (ft of 1")	Purge Rate (lpm)	Purge Time (sec)	VOC ppm PID	O2 %	H2S ppm	LEL %	CO ppm	CO2 %	CH4 %	BP (inches)
1220	LGP-05-05X				>100			16.5	10	2	93				>100			13.5	29.44
1230	LGP-09-05X				>100			21.7	18	2	167				>100			22.2	29.44
1240	LGP-09-08X				>100			5.1	20	2	185				91			4.5	29.44
1250	LGP-05-10X				>100			5.1	10	2	93				>100			12	29.44
1300	LGP-09-10X				>100			5.2	16	2	148				>100			14.3	29.44
1310	LGP-09-11X				>100			15.8	15	2	139				>100			15.6	29.44

*** ECC also monitored catch basins and the swale culvert at the southern perimeter of the landfill for LEL and methane. Levels were at zero. No LEL or methane was detected.**

2009 Landfill Gas Monitoring
Shepley Hill LF

Date: 06/01/2009 Weather: Clear sky, breezy, 50's Field Team: Dave Reault

		Initial Readings										Post Purge Readings							
Time	Well	VOC ppm PID	O2 %	H2S ppm	LEL %	CO ppm	CO2 %	CH4 %	Riser Length (ft of 1")	Purge Rate (lpm)	Purge Time (sec)	VOC ppm PID	O2 %	H2S ppm	LEL %	CO ppm	CO2 %	CH4 %	BP (inches)
930	LGP-05-05X				>100			8.1	10	2	93				0			0	29.89
940	LGP-09-05X				>100			7.8	18	2	167				0			0	29.89
950	LGP-09-08X				78			3.9	20	2	185				0			0	29.89
1000	LGP-05-10X				35			1.8	10	2	93				0			0	29.89
1010	LGP-09-10X				9			0.4	16	2	148				0			0	29.89
1020	LGP-09-11X				29			1.4	15	2	139				18			0.6	29.89

*** ECC also monitored catch basins and the swale culvert at the southern perimeter of the landfill for LEL and methane. Levels were at zero. No LEL or methane was detected.**
**** ECC did not install temporary soil gas probes today due to the rising barometric pressure that caused the landfill gas to retreat back into the landfill.**

2009 Landfill Gas Monitoring
Shepley Hill LF

Date: 07/17/2009 Weather: Partly cloudy, 75 Field Team: Dave Reault, Dave Comeau

		Initial Readings									Post Purge Readings							
Time	Well	VOC ppm PID	O2 %	H2S ppm	LEL %	CO ppm	CO2 %	CH4 %	Purge Rate (lpm)	Purge Time (sec)	VOC ppm PID	O2 %	H2S ppm	LEL %	CO ppm	CO2 %	CH4 %	BP
0840	01-04X	0	19.5	0	0	0	1.3	0	2	83	0	19.3	0	0	0	1.4	0	29.48
0847	09-04X	3	19.3	0	0	0	1.3	0	2	120	0	19.2	0	0	0	1.4	0	29.48
0853	01-03X	0	19.2	0	0	0	1.9	0	2	83	0	19.1	0	0	0	1.9	0	29.48
0858	09-03X	13	19.2	0	0	0	1.6	0	2	167	3	19	0	0	0	1.7	0	29.48
0904	01-02X	5	18.4	0	0	0	2.8	0	2	83	1	18	0	0	0	2.8	0	29.48
0908	09-02X	7	17.8	0	0	1	3	0	2	204	2	18	0	0	0	2.5	0	29.48
0914	01-01X	0	19.6	0	0	1	0.7	0	2	83	1	20.1	0	0	1	0.2	0	29.48
0919	09-01XA	7	19.7	0	0	2	0.7	0	2	157	2	19.7	0	0	1	0.7	0	29.48
0923	09-01XB	17	19.8	0	0	3	0.7	0	2	259	3	19.9	0	0	4	0.7	0	29.48
0950	05-05X	0	2.5	0	>100	4	25.6	22.4	2	93	0	0.4	0	>100	2	31.6	29.1	29.48
0957	09-05X	0	1.1	0	>100	3	27.9	25.9	2	167	0	0.5	0	>100	2	32.4	33.1	29.48
1005	05-06X	3	13.6	0	0	1	4.9	0	2	93	2	11.1	0	0	0	6.8	0	29.48
1011	09-06X	11	2.3	0	0	0	10.8	0	2	120	3	20.2	0	0	2	0	0	29.48
1029	05-08X	0	11.3	0	66	1	10.5	3.3	2	93	0	1.2	0	>100	1	23.1	7.2	29.48
1035	09-08X	0	0.5	0	>100	3	21.6	7.7	2	185	0	0.3	0	>100	5	22.9	9.8	29.48
1020	05-07X	0	7.7	0	>100	2	11.7	7	2	65	1	5.9	0	9	1	14.7	0.4	29.48
1045	05-09X	0	3.8	0	>100	3	12.4	5.8	2	93	0	0.4	0	>100	2	15.3	8.4	29.48
1050	09-09X	0	0.4	0	>100	3	16.4	7	2	185	0	0.4	0	>100	3	16.9	8.2	29.48
1101	05-10X	0	9.2	0	>100	3	13.8	11	2	93	0	3.4	0	>100	2	19.5	13.9	29.48
1105	09-10X	0	11.2	0	>100	1	13.2	10.8	2	148	0	1	11	>100	1	26.2	24.9	29.48
1110	05-11X	0	10.2	1	>100	2	11.1	9.6	2	83	1	3.4	1	44	1	19.8	2.2	29.48
1115	09-11X	0	1	1	>100	2	22.8	22.6	2	139	0	0.5	2	>100	1	24.3	27.3	29.48
1121	05-13X	3	12.9	0	10	0	6.7	0.5	2	56	3	6.1	0	1	0	12.3	0	29.48
1128	05-14X	2	17.7	0	9	0	1.8	0.4	2	93	0	7.4	0	78	0	7.5	3.9	29.48
1137	09-15X	3	15.9	0	1	0	2.8	0	2	111	2	9.7	0	0	0	8	0	29.48

Gas Well ID	Depth to Groundwater (ft)	Screened Interval (ft)	Screen Length (ft)	End of Boring (ft)
LGW-09-14X	5.56	2-12	10	13

*** ECC also monitored catch basins and the swale culvert at the southern perimeter of the landfill for LEL and methane. Levels were at zero. No LEL or methane was detected.**
**** ECC was unable to install temporary soil gas probes this quarterly event due to equipment damage and incorrect replacement equipment being shipped to the site. Barometric pressure increased to a high level by the time the correct equipment was shipped to the site.**

2009 Landfill Gas Monitoring
Shepley Hill LF

Date: 07/20/2009 Weather: Clear, 80's Field Team: Dave Reault

		Initial Readings									Post Purge Readings							
Time	**Well**	**VOC ppm PID**	**O2 %**	**H2S ppm**	**LEL %**	**CO ppm**	**CO2 %**	**CH4 %**	**Purge Rate (lpm)**	**Purge Time (sec)**	**VOC ppm PID**	**O2 %**	**H2S ppm**	**LEL %**	**CO ppm**	**CO2 %**	**CH4 %**	**BP**
0940	05-05X		8.4	0	>100	1	20.7	12.3	2	93		14.6	0	0	0	7	0	29.86
0948	09-05X		5.7	0	>100	0	25.1	18.6	2	167		9.5	0	5	0	12.2	0.2	29.86
0956	05-08X		18.3	0	4	0	2.3	0.2	2	93		11.2	0	0	0	12.5	0	29.86
1000	09-08X		2.3	0	>100	1	21.6	5.5	2	185		5.5	0	2	0	18	0.1	29.86
1008	05-09X		8.2	0	57	1	11.2	2.8	2	93		5.7	0	0	0	14.7	0	29.86
1012	09-09X		15.2	0	0	0	3.5	0	2	185		14	0	0	0	4.3	0	29.86
1020	05-10X		18.6	0	18	0	3.2	0.9	2	93		9.2	0	0	0	9.9	0	29.86
1025	09-10X		20.1	0	4	0	1	0.2	2	148		0.8	6	>100	0	24.1	5.4	29.86
1032	05-11X		15.4	0	25	0	7.8	1.2	2	83		15.2	0	18	0	8.2	0.9	29.86
1036	09-11X		7.2	0	>100	0	23.3	24.5	2	139		6.9	0	>100	0	22.2	10.6	29.86
1047	05-14X		20.4	0	0	0	0.3	0	2	93		7.7	0	51	0	8.1	2.5	29.86

2009 Landfill Gas Monitoring
Shepley Hill LF

Date: 07/22/2009 Weather: Cloudy, 70's Field Team: Fred Santos

		Initial Readings									Post Purge Readings							
Time	**Well**	**VOC ppm PID**	**O2 %**	**H2S ppm**	**LEL %**	**CO ppm**	**CO2 %**	**CH4 %**	**Purge Rate (lpm)**	**Purge Time (sec)**	**VOC ppm PID**	**O2 %**	**H2S ppm**	**LEL %**	**CO ppm**	**CO2 %**	**CH4 %**	**BP**
1000	09-10X				0			0	2	148				0			0	30.18
1015	09-11X				0			0	2	139				0			0	30.18
1030	05-14X				0			0	2	93				0			0	30.18

2009 Landfill Gas Monitoring
Shepley Hill LF

Date: 11/30/2009 Weather: Cloudy, rainy, 50's, BP = 29.29 @ 0900. Field Team: Dave Reault, Bill Bearce

		Initial Readings									Post Purge Readings							
Time	Well	VOC ppm PID	O2 %	H2S ppm	LEL %	CO ppm	CO2 %	CH4 %	Purge Rate (lpm)	Purge Time (sec)	VOC ppm PID	O2 %	H2S ppm	LEL %	CO ppm	CO2 %	CH4 %	BP (GEM 2000)
925	05-05X	0	15.5	0	>100		9.1	7.6	2	93	0	0	0	>100		18.6	9.1	29.29
930	09-05X	0	4.5	0	>100		19	16.8	2	167	0	0.2	0	>100		25.1	23.2	29.29
950	05-06X	0	13.4	0	23		3	1.1	2	93	0	11.5	0	2		4.5	0.1	29.29
956	09-06X	0	6.8	0	9		7.1	0.4	2	120	0	16.4	0	6		1	0.1	29.29
1005	05-07X	0	14.1	0	4		4.4	0.2	2	65	0	1.2	0	>100	1	23.1	7.2	29.29
1011	05-08X	0	12.7	0	10		7.5	0.5	2	93	0	0.3	0	>100	5	22.9	9.8	29.29
1016	09-08X	0	3.2	0	>100		15.7	5.8	2	185	1	5.9	0	9	1	14.7	0.4	29.29
1022	05-09X	0	8.3	0	74		8.3	3.6	2	93	0	0.4	0	>100	2	15.3	8.4	29.29
1028	09-09X	0	2	0	>100		13.4	5.1	2	185	0	0.4	0	>100	3	16.9	8.2	29.29
1036	05-10X	0	15.3	0	18		5	0.9	2	93	0	3.4	0	>100	2	19.5	13.9	29.29
1040	09-10X	0	2.7	0	>100		16.5	9.6	2	148	0	1	11	>100	1	26.2	24.9	29.29
1045	05-11X	0	14.4	0	22		5.4	1.1	2	83	1	3.4	1	44	1	19.8	2.2	29.29
1050	09-11X	0	0.4	0	>100		13.9	7.5	2	139	0	0.5	2	>100	1	24.3	27.3	29.29
1055	05-13X	0	13.5	0	0		4.1	0	2	56	0	20.9	0	0		0	0	29.29
1059	05-14X	0	13.4	0	91		6.6	4.6	2	93	0	0.4	0	84		6.7	4.2	29.29
1107	09-15X	0	17	0	0		3.4	0	2	111	0	13.5	0	0		6.7	0	29.29

Gas Well ID	Depth to Groundwater (ft)	Screened Interval (ft)	Screen Length (ft)	End of Boring (ft)
LGW-09-14X	6.76	2-12	10	13

*** ECC also monitored catch basins and the swale culvert at the southern perimeter of the landfill for LEL and methane. Levels were at zero. No LEL or methane was detected.**

2009 Landfill Gas Monitoring
Shepley Hill LF

Date: 11/30/2009 Weather: Cloudy, rainy, 50's, BP = 29.24 @ 0900. Field Team: Dave Reault, Bill Bearce

		3' depth									6' depth							
Time	Well/Distance	VOC ppm PID	O2 %	H2S ppm	LEL %	CO ppm	CO2 %	CH4 %	Purge Rate (lpm)	Purge Time (sec)	VOC ppm PID	O2 %	H2S ppm	LEL %	CO ppm	CO2 %	CH4 %	BP (GEM 2000)
1137	*05X @ 0'	0	6.4	0	89		12.3	4.4	N/A	N/A	0	0.4	0	>100		22	17	29.23
1145	05X @ 10'	0	16.3	0	0		4.5	0	N/A	N/A	0	11.6	0	1		8.6	0	29.23
1210	08X @ 10'	0	18	0	0		3	0	N/A	N/A	0	19	0	0		2.2	0	29.24
1225	09X @10'	0	19.2	0	0		2	0	N/A	N/A	0	18.3	0	0		2.6	0	29.24
1235	10X @ 10'	0	14.1	0	0		1.1	0	N/A	N/A	0	19.3	0	0		2.5	0	29.24
1245	11X @ 10'	0	18.2	0	0		2.6	0	N/A	N/A	Below water table, not sampled.							29.24
1255	14X @ 10'	0	19.5	0	0		1.3	0	N/A	N/A	Below water table, not sampled.							29.24

* ECC performed an equipment check of the manual soil gas probe to ensure it is working properly. The soil gas was checked at an LGP with elevated methane levels (LGP-05X) .

Manual soil gas probe samples were collected 10 feet away from the LGPs (except for the equipment check sample which was at 0' away from LGP-05X).

2009 Landfill Gas Monitoring
Shepley Hill LF

Date: 11/30/2009 Weather: Cloudy, rainy, 50's, BP = 29.24 @ 0900. Field Team: Dave Reault, Bill Bearce

		Initial Readings									Post Purge Readings							
Time	**Vent**	**VOC ppm PID**	**O2 %**	**H2S ppm**	**LEL %**	**CO ppm**	**CO2 ppm**	**CH4 %**	**Purge Rate (lpm)**	**Purge Time (min)**	**VOC ppm PID**	**O2 %**	**H2S ppm**	**LEL %**	**CO ppm**	**CO2 %**	**CH4 %**	**BP (GEM 2000)**
1255	13	0	20.9	0	5	0	0.1	0.2	5	6	0	12.3	0	>100	0	5	6.6	29.24
1305	14	0	20.3	0	20	0	1	1	5	6	0	9.5	0	>100	0	10.3	17.7	29.24
1315	15	0	20.9	0	0	0	0	0	5	10	0	20.8	0	6	0	0.4	0.3	29.24
1338	18	0	21.1	0	1	0	0	0.1	5	10	0	18.4	0	94	0	3.3	4.7	29.24
1400	17	0	21.2	0	2	0	0	0.1	5	10	0	21.1	0	2	0	0.1	0.1	29.24
1415	16	0	21.2	0	2	0	0	0.1	5	10	0	20.3	0	8	0	0.9	0.4	29.24
1435	12	0	21.1	0	1	0	0	0.1	5	6	0	20.7	0	1	0	1.2	0	29.24

2009 Landfill Gas Monitoring
Shepley Hill LF

Date: 12/01/2009 Weather: Cloudy, 40s Field Team: Dave Reault

		Initial Readings									Post Purge Readings							
Time	Well	VOC ppm PID	O2 %	H2S ppm	LEL %	CO ppm	CO2 %	CH4 %	Purge Rate (lpm)	Purge Time (sec)	VOC ppm PID	O2 %	H2S ppm	LEL %	CO ppm	CO2 %	CH4 %	BP (GEM 2000)
1020	09-04X	0	20.1	0	0	0	0.7	0	2	120	0	20.2	0	0	0	0.7	0	29.63
1025	01-04X	0	20.3	0	0	0	0.5	0	2	83	0	20.4	0	0	0	0.5	0	29.63
1030	01-03X	0	20.1	0	0	0	1.2	0	2	83	0	20.1	0	0	0	1.2	0	29.63
1033	09-03X	0	19.9	0	0	0	1.7	0	2	167	0	19.9	0	0	0	1.8	0	29.63
1039	01-02X	0	19.8	0	0	0	1.8	0	2	83	0	19.9	0	0	0	1.9	0	29.63
1043	09-02X	0	20	0	0	0	2.1	0	2	204	0	19.7	0	0	0	2.1	0	29.63
1047	01-01X	0	20.7	0	0	0	0.5	0	2	83	0	20.7	0	0	0	0.6	0	29.63
1050	09-01X-A	0	20.6	0	1	0	0.8	0	2	157	0	20.7	0	0	0	0.9	0	29.63
1055	09-01X-B	0	20.7	0	0	0	1	0	2	259	0	20.7	0	0	0	1.1	0	29.63

2009 Landfill Gas Monitoring
Shepley Hill LF

Date: 12/01/2009 Weather: Cloudy, 40s. Field Team: Dave Reault

		Initial Readings									Post Purge Readings							
Time	Vent	VOC ppm PID	O2 %	H2S ppm	LEL %	CO ppm	CO2 ppm	CH4 %	Purge Rate (lpm)	Purge Time (min)	VOC ppm PID	O2 %	H2S ppm	LEL %	CO ppm	CO2 %	CH4 %	BP (GEM 2000)
1114	1	0	20	0	0	0	1.1	0	5	6	0	20.1	0	2	0	1	0.1	29.63
1125	2	0	20.9	0	0	0	0	0	5	6	0	20.9	0	1	0	0	0.1	29.63
1138	4	0	20.9	0	0	0	0	0	5	6	0	20.9	0	0	0	0	0	29.63
1150	3	0	20.9	0	0	0	0	0	5	6	0	20.9	0	0	0	0	0	29.63
1205	6	0	20.9	0	0	0	0.1	0	5	6	0	20.9	0	0	0	0.1	0	29.63
1218	9	0	20.9	0	2	0	0.2	0.1	5	6	0	19.8	0	36	0	1.4	1.8	29.63
1230	10	0	20.9	0	0	0	0.1	0	5	6	0	20.9	0	0	0	0.1	0	29.63
1240	11	0	20.9	0	2	0	0.5	0.1	5	6	0	20.7	0	2	0	0.5	0.1	29.63
1445	5	0	20.9	0	0	0	0.1	0	5	6	0	20.9	0	0	0	0.1	0	29.64
1456	8	0	20.9	0	0	0	0	0	5	6	0	20.9	0	0	0	0	0	29.64
1506	7	0	20.9	0	0	0	0	0	5	6	0	20.9	0	0	0	0	0	29.64

2009 Landfill Gas Monitoring
Shepley Hill LF

Date: 12/02/2009 Weather: Clear, sunny, 50s Field Team: Dave Reault

		Initial Readings									Post Purge Readings							
Time	Well	VOC ppm PID	O2 %	H2S ppm	LEL %	CO ppm	CO2 ppm	CH4 %	Purge Rate (lpm)	Purge Time (sec)	VOC ppm PID	O2 %	H2S ppm	LEL %	CO ppm	CO2 %	CH4 %	BP (GEM 2000)
1140	05-05X		11.9		57		9.9	2.8	2	93		20		0		1.2	0	29.86
1145	09-05X		10		>100		15	10	2	167		9.3		0		11.8	0	29.86
1151	05-08X		17.9		3		1.4	0.1	2	93		14.2		0		8.6	0	29.86
1156	09-08X		10.2		75		14.9	3.7	2	185		2.6		23		17.3	0.9	29.86
1203	09-09X		7.6		48		12	2.4	2	185		3		11		14.6	0.5	29.86
1212	05-10X		18.7		8		3.1	0.4	2	93		16.4		0		5.2	0	29.86
1216	09-10X		19.3		2		3.1	0.1	2	148		11.7		2		10.3	0.1	29.86
1221	05-11X		19.7		5		3.6	0.2	2	83		13.3		2		7.7	0.1	29.86
1225	09-11X		12		91		13	4.5	2	139		9.2		0		11.6	0	29.86
1233	05-14X		17.7		11		3.7	0.6	2	93		9		0		6.7	0	29.86

SHEPLEY'S HILL LANDFILL PERIMETER GAS

TECHNICAL MEMORANDUM

TO: ROBERT SIMEONE

FROM: FRED SANTOS, WILLARD MURRAY

SUBJECT: SHEPLEY'S HILL LANDFILL SUPPLEMENTAL PERIMETER GAS MONITORING

DATE: 6/22/2009

CC: FILE (CORRESPONDENCE LOG# 5404.006.COR.024)

Purpose:

Review recent (May 28 to June 1) landfill gas measurements in both newly installed gas monitoring wells and existing gas monitoring probes; and assess the relationship of gas concentrations to barometric pressure and compare with measurements made during the Fall of 2008.

Summary Results of Recent Sampling Data at Landfill Gas Probes and Wells:

During the period from 05/18/2009 to 05/21/2009 thirteen (13) new gas wells were installed at the northern and southern ends of the Shepley's Hill Landfill to supplement the existing landfill gas probes. The new wells (see Figure 1) are typically paired with the existing probes but have been installed at deeper elevations so as to allow monitoring of the full thickness of the unsaturated zone between the water table and the existing gas probes. One of the new gas wells (LGW-09-15X) was installed as a single monitoring location at the southeast corner of the landfill. The new wells (see Table 1) were typically completed with the bottom of the well screen positioned 1-foot below the observed water table to account for seasonal variations. At LGW-09-14X the well screen was set to straddle the water table with several feet of screen below as well as above the water table to confirm the water table elevation and to assess water table fluctuations at this location.

Screen lengths from gas wells LGW-09-5X and LGW-09-8X were modified from the *Final Supplemental Landfill Gas Monitoring Well Work Plan* during drilling activities due to conditions observed in the field that warranted the changes. LGW-09-5X was proposed to include a 14' screen but was reduced to 7.5' screen due to bedrock refusal. Bedrock was located at 15' bgs during two failed attempts to drill past that depth. LGW-09-8X was proposed to include an 18' screen scheduled to be split between two gas wells inside the borehole (10' screen well and 8' screen well). During the drilling of LGW-09-8X, the water table was observed at 18' bgs. Therefore end of boring was located at 20' bgs and a 12'screen was installed in a single gas well. A second gas well was not installed in the borehole since the screen length was now less than 15'.

Gas monitoring performed during the quarterly monitoring episode on May 28 yielded the results shown in Table 2. As prescribed in the Revised Long Term Monitoring and

Maintenance Plan prepared in May 2007, several of the monitoring probes/wells which exceeded 25% LEL (LGP-05-05X, LGW-09-05X, LGW-09-08X, LGP-05-10X, LGW-09-10X, and LGW-09-11X) were subjected to continued daily monitoring for %LEL and CH_4 through June 1. Those subsequent daily monitoring results are shown in Tables 3, 4 and 5. The gas concentrations are also plotted along with the barometric pressure on Figures 2 and 3. It should be noted that there were no exceedances of the 25% LEL trigger level at the northern perimeter, only along the southern perimeter.

The results plotted on Figures 2 and 3 show that as barometric pressure decreases, the landfill gas concentrations increase; and when the barometric pressure increases, the landfill gas concentrations decrease. In fact there is a mirror image between the plots of CH_4 and barometric pressure shown on Figure 2. The plots of %LEL and barometric pressure show similar results. These results confirm the findings from the Fall 2008 measurements summarized in a memo dated 11/12/2008, and the following is a quote from that memo:

> *"It can clearly be seen that when the weather is clear and/or barometric pressure is high, there is no significant landfill gas migration outside the landfill cap. However, when the weather is cloudy and overcast and barometric pressure is relatively low, landfill gas tends to migrate laterally outside the landfill cap along the southern end of the landfill in the vicinity of LGP-5, LGP-9, LGP-10, LGP-13 and LGP-14. The distance migrated is small, less than 25 feet from the edge of the landfill cap during these periods of low barometric pressure. When high barometric pressure returns, the landfill gas is apparently pushed back beneath the landfill cap".*

The groundwater elevation in LGW-09-14X confirms that the water table is near the ground surface (depth to water at LGW-09-14X was 6.68 ft) at the southern end of the landfill near the storm detention ponds, and the standing water in those ponds reflects the water table elevation. Therefore the detention ponds are a barrier for gas migration to the south. No %LEL and CH_4 detections at LGW-09-15X indicate that gas is not migrating east of the detention ponds.

Temporary drive point soil gas probes were to be installed on Friday May 29, the day following the start of the quarterly sampling event to assess the distance of gas migration away from the perimeter gas monitoring locations. They were not installed due to the rainy weather and postponed to Monday June 01. By Monday morning June 01, landfill gas levels decreased in all monitoring locations to non-detect levels (except for 39% LEL at LGW-09-11X) as the barometric pressure continued to rise. Therefore temporary drive point installation was unable to take place and was postponed until the next quarterly sampling event. It should be noted that such temporary points for assessing gas migration distance were installed during the Fall 2008 monitoring and the results showed that the lateral distance away from the landfill perimeter that detectable gas had migrated was less than 25 feet.

Also, as was done during the Fall 2008 monitoring, storm drains and manholes near the southern perimeter of the landfill and Cook Street were checked for landfill gas, as was the culvert outlet that drains the parking lots south of the landfill into the detention ponds. Again these results showed no detectable gas levels.

Conclusions Regarding Landfill Gas Migration:

The observed high %LEL and CH_4 gas levels, measured during the May 28 quarterly monitoring event, in landfill gas probes and wells along the southern edge of the Shepley's Hill Landfill cap are transient events and only persist for a short time while a low barometric pressure system resides over the landfill – in this case the transient event lasted for 3 days. When the barometric pressure increased from 29.44 inches Hg on May 31 to 29.89 inches Hg on June 1, the %LEL and CH_4 levels decreased drastically in all monitoring locations (to non-detectable levels in all but one location) .

Assessment of the perimeter landfill gas in both the southern and northern boundary areas will continue on a quarterly basis. The next sampling events are scheduled to take place in July 2009, October 2009 and January 2010.

LANDFILL INSPECTION CHECKLIST
(2005-2009)

Geotechnical Engineering
Shepley's Hill Landfill

DATE: 8 November 2005
INSPECTOR: Kullberg/Michalak

LANDFILL ATTRIBUTE	OBSERVATIONS	RECOMMENDATIONS	SAT/ UNSAT
Cover Surface	1. Vegetative cover is generally satisfactory except as noted in the comments that follow. Various species growing; mowed to about 8 inches height (see Photo 6).	1. See specific comments under the sections that follow.	SAT
	2. There are several areas where settlement has occurred.	2. A Comprehensive Site Assessment (CSA) is being conducted to address this condition.	SAT
	3. Trees were removed in the fall of 2002 & 2004 in the vicinity of GV-13, the southern perimeter, and the eastern perimeter, and have not reestablished.	3. Monitor for tree growth in future	SAT
	4. A utility berm was constructed through the middle of the landfill in 2004. It provides utility service to a newly constructed pumping station at the northeastern corner of the landfill.	4.Observe effect on drainage patterns in the vicinity of the utility berm during future inspections. This may be investigated as part of the ongoing CSA.	NA
	5. Several areas on the landfill have sustained damage by trespassing vehicles, and in some cases damage by lawn mowing equipment (Photo 3).	5. Damaged areas should be repaired as soon as possible.	UNSAT
Vegetative Growth	1. In the vicinity of gas vents 8, 11 and 12, the perimeter of the cap has some areas of sparse/eroded vegetation. The soil in the bare areas is mostly sand and is eroded in some areas. The area should be graded to fill in the eroded areas and topsoil should be placed to a depth of 6 inches over the sand to allow grass to grow. The grass cover should extend at least twenty feet beyond the limits of the cap.	1. This area should be reseeded, with hay or straw placed on the surface, to prevent further erosion. This area to be considered as part of the CSA.	UNSAT
Landfill Gas Vent Wells	1. The gas vents are in good condition. All screens and pipes are in functional condition. All of the non-galvanized vents are showing signs of rusting and corrosion. These include all gas vents except for V-12 through V-15.	1. All of the nongalvanized vents should be scraped, cleaned and painted.	SAT

Geotechnical Engineering
Shepley's Hill Landfill

LANDFILL ATTRIBUTE	OBSERVATIONS	RECOMMENDATIONS	SAT/ UNSAT
Drainage Swales	1. Most of the drainage swale on the south side is being invaded by vegetation/wetland species. There are also intermittent zones of standing water indicating a lack of proper channel slope and drainage. 2. In the south east side drainage swale, in the vicinity of gas vent #13 and continuing downstream to the rip rap - lined channel, the drainage swale is overgrown with vegetation and wetland species. It appears to be heavily silted in and has a large area of standing water. There is an earth and vegetation obstruction just upstream of the new rock section preventing the drainage of water and turning the channel into a pond.	1. The swale should be cleared of vegetation, accumulated sediment, and debris. The swale should then be regraded to promote adequate drainage. 2. The swale should be cleared of vegetation, accumulated sediment, and debris. The swale should then be regraded to promote adequate drainage.	UNSAT UNSAT
Culverts	1. The concrete drainage structure at the terminus of the catch basin and underground conduit system on the southwest side is overgrown with vegetation and is silting in. Standing water is present and wetland species are becoming established as well.	1. The structure and channel immediately downstream should be cleaned out and the channel regraded as required to properly drain.	UNSAT
Catch Basins	1. Catch Basin #2 near the entrance to the site has a broken surface grate. 2. Catch Basin #3 near the entrance to the site is not set at grade. The rim of the basin is about six to eight inches higher than the surrounding ground.	1. The surface grate should be replaced. 2. The rim of this catch basin should be lowered to meet the surrounding grade.	UNSAT UNSAT

Geotechnical Engineering
Shepley's Hill Landfill

Settlement	1. It appears that many areas of the landfill may be settling. The extent and its effect on the function of the landfill is unknown	1 A Comprehensive Site Assessment is underway to address this condition.	SAT
Erosion	1. No substantial erosion observed.		SAT
Access Roads	1. The access roads on the site are in good condition.	1. There are no problems on access roads which warrant repair at this time.	SAT
Security Fencing	1. The perimeter chain-link security fence is in poor condition. Fence sections and gates are missing and unrestricted access to the site is available at many locations. Some damage to the cap by off-road vehicles (trucks, ATV's, dirt bikes, etc.) using the turfed cap areas was observed.	1. The security fence should be repaired/replaced and extended. This work is currently planned under the maintenance work underway at the landfill.	UNSAT
Wetland Encroachment	1. Wetland encroachment is taking place at several locations, but is not happening on a wide scale. Overall, the areas of encroachment are small. These locations have been noted in above comments.	1. Wetland encroachment should be eliminated by simple mowing in some areas, and by regrading channels in other areas. The above comments address the actions to take at specific locations. A CSA is underway to address this concern at the landfill.	UNSAT

Immediate Action Required: The following problem areas, from among those mentioned in the comments above, are the most critical and should be addressed before the next inspection;

(1) Repair and replace the security fence and gates as required to control access to the site;
(2) Repair damage to cap caused by trespassers and lawn mowing equipment.

SAT – Satisfactory
UNSAT- Unsatisfactory
NA – Not Applicable

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Shepley's Hill Landfill Devens, Massachusetts

Date: October 31, 2006
Inpsector: Tim Bakey/ Dave Reault

LANDFILL ATTRIBUTE	OBSERVATIONS	RECOMMENDATIONS	SAT/ UNSAT
Cover Surface	1. Vegetative cover is generally satisfactory except as noted in the comments that follow. Various species growing; mowed to about four inches height (See Photo 5). 2. There are several areas where settlement has occurred. 3. Trees were removed in the fall of 2002 and 2004 in the vicinity of GV-13, the southern perimeter, and the eastern perimeter, and have not reestablished. 4. A utility berm was constructed through the middle of the landfill in 2004. It provides utility service to the pumping station at the northeastern corner of the landfill. An access path was built over the utility berm in the fall of 2006 in the middle of the landfill, near GV-9. 5. Several areas on the landfill have sustained damage by trespassing vehicles and lawn mowing equipment.	1. See specific comments under the sections that follow. 2. A Comprehensive Site Assessment (CSA) is being conducted to address this condition. 3. Monitor for tree growth in future. 4. Observe effects on drainage patterns in the vicinity of the utility berm during future inspections. This may be investigated as part of the ongoing CSA. 5. Damaged areas should be repaired as soon as possible.	SAT SAT SAT NA UNSAT

LANDFILL ATTRIBUTE	OBSERVATIONS	RECOMMENDATIONS	SAT/ UNSAT
Vegetative Growth	1. In the vicinity of gas vents 8, 11, and 12, the perimeter of the cap has some areas of sparse/eroded vegetation. The soil in the bare areas is mostly sand and is eroded in some areas. The areas should be graded to fill in the eroded areas and topsoil should be placed to a depth of six inches over the sand to allow grass to grow. The grass cover should extend at least twenty feet beyond the limits of the cap.	1. These areas should be reseeded, with hay or straw placed on the surface, to prevent further erosion. These areas should be addressed as part of the CSA.	UNSAT
Landfill Gas Vent Wells	1. The gas vents are in good condition. All screens and pipes are in functional condition. All of the non-galvanized vents are showing signs of rusting and corrosion. These include all gas vents except for GV-12 through GV-15.	1. All of the non-galvanized vents should be scraped, cleaned and painted.	SAT
Drainage Swales	1. Most of the drainage swale on the south side is being invaded by vegetation/wetland species. There are also intermittent zones of standing water, indicating a lack of proper channel slope and drainage. 2. In the south-east side drainage swale, in the vicinity of GV-13 and continuing downstream to the rip rap lined channel, the drainage swale is overgrown with vegetation and wetlands species. It appears to be heavily silted in and has a large area of standing water. There is an earth and vegetation obstruction just upstream of the new rock section preventing the drainage of water and turning the cannel into a pond 3. Vegetation growing in rip rap lined channel located in the northern side (under Sculley Road access road).	1. The swale should be cleared of vegetation, accumulated sediment, and debris. The swale should then be regraded to promote adequate drainage. 2. The swale should be cleared of vegetation, accumulated sediment, and debris. The swale should then be regraded to promote adequate drainage. 3. The swale should be cleared of vegetation.	UNSAT UNSAT UNSAT

LANDFILL ATTRIBUTE	OBSERVATIONS	RECOMMENDATIONS	SAT/ UNSAT
Culverts	1. The concrete drainage structure at the terminus of the catch basin and underground conduit system on the southwest side is overgrown with vegetation and is silting in. Standing water is present and wetland species are becoming established as well.	1. The structure and channel immediately downstream should be cleaned out and the channel regraded as required to properly drain.	UNSAT
Catch Basins	1. Catch Basin #2 near the entrance to the site has a broken surface grate. 2. Catch Basin #3 near the entrance to the site is not set at grade. The rim of the basin is about six to eight inches higher than the surrounding ground.	1. The surface grate should be replaced. 2. The rim of this catch basin should be lowered to meet the surrounding grade.	UNSAT UNSAT
Settlement	1. It appears that many areas of the landfill may be settling. The extent and its effect on the function of the landfill is unknown.	1. A CSA is underway to address this condition.	SAT
Erosion	1. No substantial erosion observed.		SAT
Access Roads	1. The access roads on the landfill road are generally in good condition. A new dense grade surface was applied to the landfill road starting from the Cook Street entrance and terminating in the middle of the landfill in the vicinity of GV-11. 2. Some small ruts and standing water was observed along the landfill road from about GV-11 to the entrance of the pumping station. Moderate erosion of the landfill road has occurred at the entrance of the pumping station.	1. None 2.	SAT UNSAT

LANDFILL ATTRIBUTE	OBSERVATIONS	RECOMMENDATIONS	SAT/ UNSAT
Security/ Fencing	1. Repairs have been made to the perimeter fencing. Fence sections and gates have been replaced; however, many of the gates remain unlocked, allowing unrestricted access.	1. Secure gates with chains and padlocks.	UNSAT
Wetland Encroachment	1. Wetland encroachment is taking place at several locations, but is not happening on a wide scale. Overall, the areas of encroachment are small. Theses locations have been noted in above comments.	1. Wetland encroachment should be eliminated by simple mowing in some areas, and by regarding channels in other areas. The above comments address the action to take at specific locations. A CSA is underway to address this concern at the landfill.	UNSAT

Immediate Action Required: The following problem areas, from among those mentioned in the comments above, are the most critical and should be addressed before the next inspection:

1. Secure gates with locks to control access to the site.
2. Repair damage to cover surface caused by trespassers and lawn moving equipment.

NOTES:
SAT = satisfactory
UNSAT = unsatisfactory
NA = not applicable

2007 Landfill Maintenance Checklist
Shepley's Hill Landfill Devens, Massachusetts

Date: October 9, 2007
Inspectors: Dave Reault / Willard Murray, Ph.D., P.E.

LANDFILL ATTRIBUTE	OBSERVATIONS	RECOMMENDATIONS	SAT/UNSAT
Cover Surface	1. Vegetative cover is generally satisfactory except as noted in the comments that follow. Various species growing; mowed to about four inches height in October 2007.	1. See specific comments under the sections that follow.	SAT
	2. There are several areas where settlement has occurred.	2. A Supplemental Groundwater and Landfill Cap Assessment (AMEC, ongoing) is being conducted to address this condition.	SAT
	3. No tree or shrub growth was observed on the landfill surface. Small shrubs/sapling growth was observed in riprap drainage areas along the northern perimeter	3. Monitor for tree growth in future. Remove shrub/sapling growth as necessary.	SAT
	4. A utility berm was constructed through the middle of the landfill in 2004. It provides utility service to the pumping station at the northeastern corner of the landfill. An access path was built over the utility berm in the fall of 2006 in the middle of the landfill, near GV-9. No adverse effects from this construction were observed.	4. Continued observation of effects on drainage patterns in the vicinity of the utility berm during future inspections.	SAT
	5. Several areas on the landfill which have historically exhibited poor drainage have sustained minor rutting damage, either from trespassing vehicles or lawn mowing equipment. The areas retain water for a considerable time after rain effects or melt offs, indicating that the rutting has not compromised the cap integrity.	5. Affected area should be filled/regraded, damaged areas should be repaired as soon as possible.	UNSAT

2007 Landfill Maintenance Checklist
Shepley's Hill Landfill Devens, Massachusetts

LANDFILL ATTRIBUTE	OBSERVATIONS REC	OMMENDATIONS	SAT/UNSAT
Vegetative Growth	1. In the vicinity of gas vents 8, 11, and 12, the perimeter of the cap has some areas of sparse/eroded vegetation. The soil in the bare areas is mostly sand and is eroded in some areas. The areas should be graded to fill in the eroded areas and topsoil should be placed to a depth of six inches over the sand to allow grass to grow. The grass cover should extend at least twenty feet beyond the limits of the cap.	1. These areas should be reseeded, with hay or straw placed on the surface, to prevent further erosion.	UNSAT
Landfill Gas Vents and Monitoring Wells	1. The gas vents are in good condition. All screens and pipes are in functional condition. All of the non-galvanized vents are showing signs of rusting and corrosion. These include all gas vents except for GV-12 through GV-15. 2. Monitoring wells and piezometers are all in good condition with no damage observed. However, many monitoring wells and peizometers where without locks or the locks had been intentionally cut.	1. All of the non-galvanized vents should be scraped, cleaned and painted. 2. The involvement of several different agencies has resulted in padlocks being intentionally cut to gain access for sampling or gauging. All monitoring wells and piezometers should be equipped with keyed-alike padlocks with keys issued to necessary personnel.	SAT UNSAT

2007 Landfill Maintenance Checklist
Shepley's Hill Landfill Devens, Massachusetts

LANDFILL ATTRIBUTE	OBSERVATIONS REC	OMMENDATIONS	SAT/UNSAT
Drainage Swales	1. Some of the drainage swale on the south side is exhibiting growth of vegetation/wetland species. There are also intermittent zones of standing water, indicating a lack of proper channel slope and drainage.	1. The swale should be cleared of vegetation, accumulated sediment, and debris. The swale should then be regraded to promote adequate drainage.	UNSAT
	2. In the south-east side drainage swale, in the vicinity of GV-13 and continuing downstream to the rip rap lined channel, the drainage swale is exhibiting growth of vegetation and wetlands species, and appears to be heavily silted in some areas. A silt fence along the newly constructed rail line south of the landfill exhibited several significant failures (see photos) which may have contributed to silt buildup in the drainage swale.	2. The swale should be cleared of vegetation, accumulated sediment, and debris. The swale should then be regraded to promote adequate drainage. The silt fence should be repaired or the area otherwise loamed/seeded to prevent erosion.	UNSAT
	3. Vegetation growing in rip rap lined channel located in the northern side (under Sculley Road access road).	3. The swale should be cleared of vegetation.	UNSAT
Culverts	1. The concrete drainage structure at the terminus of the catch basin and underground conduit system on the southwest side is overgrown with vegetation and is silting in. Standing water is present and wetland species are becoming established as well.	1. The structure and channel immediately downstream should be cleaned out and the channel regraded as required to properly drain.	UNSAT

2007 Landfill Maintenance Checklist
Shepley's Hill Landfill Devens, Massachusetts

LANDFILL ATTRIBUTE	OBSERVATIONS REC	OMMENDATIONS	SAT/UNSAT
Catch Basins	1. Catch Basin #2 near the entrance to the site has a broken surface grate. 2. Catch Basin #3 near the entrance to the site is not set to grade. The rim of the basin is about six to eight inches higher than the surrounding ground.	1. The surface grate should be replaced. 2. The rim of this catch basin should be lowered to meet the surrounding grade.	UNSAT UNSAT
Settlement	1. It appears that many areas of the landfill may be settling. The extent and its effect on the function of the landfill is unknown. The settled areas maintain pooled water for significant times after rainfall, indicated the integrity of the cap has not been compromised.	1. A Supplemental Groundwater and Landfill Cap Assessment (AMEC, ongoing) is underway to address this condition.	SAT
Erosion	1. No substantial erosion observed.	1. None	SAT
Access Roads	1. The access roads on the landfill road are generally in good condition. 2. The access road entrance to the treatment plant had experience severe erosion and rutting. The damage was repaired in May 2007 with the addition of riprap. Repairs have not exhibited further damage.	1. None 2. None	SAT SAT
Security/Fencing	1. Perimeter fencing is damage and non-existent along much of the western boundary of the landfill (wooded area along Shepley Hill). Existing fence gates are not locked.	1. Secure existing gates with chains and padlocks. Extend perimeter fence around the entire landfill boundary.	UNSAT

2007 Landfill Maintenance Checklist
Shepley's Hill Landfill Devens, Massachusetts

LANDFILL ATTRIBUTE	OBSERVATIONS REC	OMMENDATIONS	SAT/UNSAT
Wetland Encroachment	1. Wetland encroachment is taking place at several locations, but is not happening on a wide scale. Overall, the areas of encroachment are small. Theses locations have been noted in above comments.	1. Wetland encroachment should be eliminated by simple mowing in some areas, and by regrading channels in other areas. The above comments address the action to take at specific locations.	UNSAT

Immediate Action Required: The following problem areas, from among those mentioned in the comments above, are the most critical and should be addressed before the next inspection:
1. Secure gates with locks to control access to the site.
2. Repair damage to cover surface caused by trespassers and lawn moving equipment.
3. Install keyed-alike padlocks on all monitoring wells and piezometers and issue keys as necessary.

NOTES:
SAT = satisfactory
UNSAT = unsatisfactory
NA = not applicable

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2008 Landfill Maintenance Checklist
Shepley's Hill Landfill Devens, Massachusetts

Date: December 29, 2008
Inspectors: Fred Santos/Dave Reault /Willard Murray, Ph.D., P.E.

LANDFILL ATTRIBUTE	OBSERVATIONS REC	OMMENDATIONS	SAT/UNSAT
Cover Surface	1. The vegetation covering the majority of the landfill is adequate; a small area on the east edge has sparse vegetation due to a lack of topsoil but no significant erosion was observed in this area; mowed to about four inches height in September 2008.	1. See specific comments under the sections that follow.	SAT
	2. The areas noted in the 2007 report where settlement has occurred were being filled and graded to conform to the slope of the surrounding landfill surface during this inspection. As reported in the *Draft* Supplemental Groundwater and Landfill Cap Assessment for Long-Term Monitoring and Maintenance (AMEC, 2008): "Depressions due to subsidence create standing water and additional hydraulic pressure on the geomembrane, and repairs to eliminate these were underway as of December 2008."	2. Monitor after completion of current repairs.	SAT
	3. No tree or shrub growth was observed on the landfill surface, but was observed in riprap drainage areas along the southern perimeter and in northern swale – the small tree growth was removed in December.	3. Monitor for tree growth in future. Remove shrub/sapling growth as necessary.	SAT
	4. A utility berm was constructed through the middle of the landfill in 2004. It provides utility service to the pumping station at the northeastern corner of the landfill. An access path was built over the utility berm in the fall of 2006 in the middle of the landfill, near GV-9. No adverse effects from this construction were observed.	4. Continue observation of effects on drainage patterns in the vicinity of the utility berm during future inspections.	SAT

2008 Landfill Maintenance Checklist
Shepley's Hill Landfill Devens, Massachusetts

LANDFILL ATTRIBUTE	OBSERVATIONS REC	OMMENDATIONS	SAT/UNSAT
Vegetative Growth	1. The previously reported sparse/eroded vegetation in the vicinity of gas vents 8, 11, and 12 appears to have been naturally revegetated and no erosion features are apparent. The area near SHL-4 has sparse vegetation cover, but no significant erosion.	1. Continuing observation of this area to detect any erosion or development of sparse vegetation cover should conducted annually. The area around SHL-4 should be revegetated.	SAT UNSAT
Landfill Gas Vents and Monitoring Wells	1. The gas vents are in good condition. All screens and pipes are in functional condition. All of the non-galvanized vents are showing signs of rusting and corrosion. These include all gas vents except for GV-12 through GV-15. 2. Monitoring wells and piezometers are all in good condition with no damage observed. All monitoring wells and piezometers have been equipped with keyed-alike padlocks with keys issued to necessary personnel.	1. Touch-up work on the non-galvanized vents should be conducted including scraping, cleaning and painting. 2. None	SAT SAT
Drainage Swales	1. Some of the drainage swale on the south side is exhibiting growth of vegetation/wetland species. 2. In the south-east side drainage swale, in the vicinity of GV-13 and continuing downstream to the rip rap lined channel, the drainage swale appears to have accumulations of silt in some areas. 3. Vegetation growing in rip rap lined channel located in the northern side (under Sculley Road access road).	1. The swale should be cleared of vegetation, accumulated sediment, and debris. 2. The swale will be surveyed after snow melt in 2009 to determine the amount of silt removal needed to maintain a continuous slope of the channel bottom. 3. The swale should be cleared of vegetation.	UNSAT UNSAT UNSAT

2008 Landfill Maintenance Checklist
Shepley's Hill Landfill Devens, Massachusetts

LANDFILL ATTRIBUTE	OBSERVATIONS REC	OMMENDATIONS	SAT/UNSAT
Culverts	1. The concrete drainage structure at the terminus of the catch basin and underground conduit system south of the landfill is overgrown with vegetation and is silting in. Standing water is present and wetland species are becoming established as well.	1. This catch basin and drainage system were constructed specifically for runoff from the commercial buildings and parking lots south of the landfill, and are therefore not the responsibility of the Army.	SAT
Catch Basins	1. Catch Basin #2 near the entrance to the site has a broken surface grate. 2. Catch Basin #3 near the entrance to the site is not set to grade. The rim of the basin is about six to eight inches higher than the surrounding ground.	1. The surface grate should be replaced, however this is outside the landfill boundary and does not affect landfill cap integrity. 2. The rim of this catch basin should be lowered to meet the surrounding grade, however this is outside the landfill boundary and does not affect landfill cap integrity.	SAT SAT
Settlement	1. Repairs to eliminate depressions caused by settlement were underway as of December 2008.	1. An inspection of these areas should be conducted in 2009 to verify satisfactory repair.	SAT
Erosion	1. No substantial erosion observed.	1. None	SAT
Access Roads	1. The access roads on the landfill road are generally in good condition.	1. None	SAT
Security/Fencing	1. Perimeter fencing is damage and non-existent along much of the western boundary of the landfill (wooded area along Shepley's Hill). However, no roads have open access to the landfill. Existing fence gates across roads that access the landfill are secured with chains and padlocks.	1. None	SAT

2008 Landfill Maintenance Checklist
Shepley's Hill Landfill Devens, Massachusetts

LANDFILL ATTRIBUTE	OBSERVATIONS REC	OMMENDATIONS	SAT/UNSAT
Wetland Encroachment	1. Wetland encroachment is taking place at several locations, but is not happening on a wide scale. Overall, the areas of encroachment are small.	1. Wetland encroachment should be controlled by simple mowing in some areas, and by clearing channels in other areas.	UNSAT
Immediate Action Required: The following problem areas, from among those mentioned in the comments above, are the most critical and should be addressed before the next inspection: 1. Wetland encroachment should be stopped by mowing and clearing as needed. 2. Vegetation in rip rap lined channels and southern swale should be removed.			
NOTES: SAT = satisfactory UNSAT = unsatisfactory			

2009 Landfill Maintenance Checklist
Shepley's Hill Landfill Devens, Massachusetts

Date: November 4, 2009
Inspectors: Fred Santos/Willard Murray, Ph.D., P.E.

LANDFILL ATTRIBUTE	OBSERVATIONS	RECOMMENDATIONS	SAT/UNSAT
Cover Surface	1. The vegetation covering the majority of the landfill is adequate; mowed to about four inches height in October-November 2009.	1. See specific comments under the sections that follow.	SAT
	2. The areas noted in the 2008 report where settlement has occurred have been filled and graded to conform to the slope of the surrounding landfill surface in 2009 and the areas are fully vegetated as of this inspection.	2. Repairs have successfully eliminated the depressions. Continue monitoring for settlement that creates depressions.	SAT
	3. No tree or shrub growth was observed on the landfill surface, and previously reported growth in riprap drainage areas has been removed.	3. Monitor for tree growth in future. Remove shrub/sapling growth as necessary.	SAT
	4. A utility berm was constructed through the middle of the landfill in 2004. It provides utility service to the pumping station at the northeastern corner of the landfill. An access path was built over the utility berm in the fall of 2006 in the middle of the landfill, near GV-9. No adverse effects from this construction were observed.	4. Continue observation of effects on drainage patterns in the vicinity of the utility berm during future inspections.	SAT

2009 Landfill Maintenance Checklist
Shepley's Hill Landfill Devens, Massachusetts

LANDFILL ATTRIBUTE	OBSERVATIONS REC	OMMENDATIONS	SAT/UNSAT
Vegetative Growth	1. The area near SHL-4 has sparse vegetation cover, but no significant erosion. A steep ground surface slope extends from the access road down to the small cove of Plow Shop Pond which exhibits a few old shallow erosion features, however much of the ground surface is covered with a growth of moss over the very sandy soils. It would appear that the sandy surface soils have a high value of permeability such that most rainfall infiltrates rather than becoming surface runoff thus preventing significant erosion.	1. Continuing observation of this area to detect any erosion should be conducted annually. Although the area around SHL-4 is sparsely vegetated, there does not appear to be current erosion of the sandy soils and revegetation is not warranted at this time. Several small trees were removed in 2009 from this area near SHL-4.	SAT
Landfill Gas Vents and Monitoring Wells	1. The gas vents are in good condition and all of the non-galvanized vents have recently been scraped and painted a bright yellow. All screens and pipes are in functional condition. 2. Monitoring wells and piezometers are all in good condition with no damage observed. All monitoring wells and piezometers have been equipped with keyed-alike padlocks with keys issued to necessary personnel.	1. None 2. None	SAT SAT

2009 Landfill Maintenance Checklist
Shepley's Hill Landfill Devens, Massachusetts

LANDFILL ATTRIBUTE	OBSERVATIONS REC	OMMENDATIONS	SAT/UNSAT
Drainage Swales	1. Some of the drainage swale on the south side is exhibiting growth of vegetation/wetland species. All trees that were growing in the swale have been removed, however the wetland species growth remains. The existence of wetland species growth has created areas along the swale that retain water, however this does not compromise the function of the landfill cap as the standing water is restricted to the edge of the landfill.	1. The swale should be monitored for expanded growth of wetland species, and small trees that appear should be removed.	SAT
	2. In the south-east side drainage swale, in the vicinity of GV-13 and continuing downstream to the rip-rap lined channel, the drainage swale appears to have minor accumulations of silt and standing water in some areas, however after surveying the swale it has been observed that this is part of the wetland species growth and does not inhibit the function of the swale. In fact the wetland species growth in the swale areas tends to slow the velocity of storm water and hence it has become a natural retardant to erosive forces.	2. None	SAT
	3. Vegetation has been removed that was growing in rip rap lined channel located in the northern side (under Sculley Road access road).	3. None	SAT
Culverts	1. The concrete drainage structure at the terminus of the catch basin and underground conduit system south of the landfill is overgrown with vegetation and is silting in. Standing water is present and wetland species are becoming established as well.	1. This catch basin and drainage system were constructed specifically for runoff from the commercial buildings and parking lots south of the landfill, and are therefore not the responsibility of the Army.	SAT

2009 Landfill Maintenance Checklist
Shepley's Hill Landfill Devens, Massachusetts

LANDFILL ATTRIBUTE	OBSERVATIONS REC	OMMENDATIONS	SAT/UNSAT
Catch Basins	1. Catch Basin #2 near the entrance to the site has a broken surface grate. 2. Catch Basin #3 near the entrance to the site is not set to grade. The rim of the basin is about six to eight inches higher than the surrounding ground.	1. The surface grate should be replaced; however this is outside the landfill boundary and does not affect landfill cap integrity. 2. The rim of this catch basin should be lowered to meet the surrounding grade; however this is outside the landfill boundary and does not affect landfill cap integrity.	SAT SAT
Settlement	1. Repairs to eliminate depressions caused by settlement have been completed and there are no remaining large areas that hold standing water after rain storms.	1. None	SAT
Erosion	1. No erosion observed.	1. None	SAT
Access Roads	1. The access roads on the landfill road are generally in very good condition.	1. None	SAT
Security/Fencing	1. Perimeter fencing is damaged and non-existent along much of the western boundary of the landfill (wooded area along Shepley's Hill). However, no roads have open access to the landfill. Existing fence gates across roads that access the landfill are secured with chains and padlocks. A security fence surrounds the arsenic treatment plant.	1. None	SAT

2009 Landfill Maintenance Checklist
Shepley's Hill Landfill Devens, Massachusetts

LANDFILL ATTRIBUTE	OBSERVATIONS REC	OMMENDATIONS	SAT/UNSAT
Wetland Encroachment	1. Wetland encroachment is taking place at several locations, but is not happening on a wide scale. Overall, the areas of encroachment are small.	1. Continued monitoring of wetland encroachment should be conducted and simple mowing in some areas close to the existing growth will prevent the development of a potential wetland problem.	SAT
Immediate Action Required: None			
NOTES: SAT = satisfactory UNSAT = unsatisfactory			

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TABLE 8
SUMMARY OF COVER SYSTEM PERFORMANCE STANDARDS

RECORD OF DECISION
SHEPLEY'S HILL LANDFILL OPERABLE UNIT
FORT DEVENS, MA

MASSACHUSETTS SOLID WASTE REGULATIONS 310 CMR 19.000	RCRA SUBTITLE C 40 CFR 264	RCRA SUBTITLE D 40 CFR 258	MASSACHUSETTS HAZARDOUS WASTE REGULATIONS 310 CMR 30.000	HOW COMPLIANCE IS ACHIEVED BY EXISTING COVER
Minimize percolation of water into landfill.	Minimize migration of liquids through landfill.	Minimize infiltration through landfill.	Minimize migration of liquids through landfill.	Geomembrane installations such as the existing one at Shepley's Hill Landfill have a permeability of 10 E -7 centimeters per second or less that minimizes infiltration and migration of liquid into landfilled waste. Sloped surface promotes runoff and minimizes infiltration. Vegetation promotes evapotranspiration.
	Have a permeability less than or equal to bottom liner or subsoils.	Have a permeability less than or equal to bottom liner or subsoils or less than 10 E-5 centimeters per second, whichever is less.	Have a permeability less than or equal to bottom liner.	Existing geomembrane permeability is less than that of sands underlying landfill. There is no bottom liner.
Promote drainage of precipitation.	Promote drainage and minimize erosion.		Promote drainage and minimize erosion of cover.	The existing cover is sloped to promote drainage and vegetated to prevent erosion.
Minimize erosion of final cover.		Minimize erosion of final cover.		The existing cover is sloped and vegetated to minimize erosion.
	Function with minimum maintenance.		Function with minimum maintenance.	The existing cover was constructed in a manner to minimize maintenance. Monitoring and maintenance of cover systems to maintain integrity is normal practice.
Facilitate gas venting.				The existing collection piping and riser system facilitate gas venting. Analysis of gas samples from vents confirms that they function.

(continued)

TABLE 8
SUMMARY OF COVER SYSTEM PERFORMANCE STANDARDS

RECORD OF DECISION
SHEPLEY'S HILL LANDFILL OPERABLE UNIT
FORT DEVENS, MA

MASSACHUSETTS SOLID WASTE REGULATIONS 310 CMR 19.000	RCRA SUBTITLE C 40 CFR 264	RCRA SUBTITLE D 40 CFR 258	MASSACHUSETTS HAZARDOUS WASTE REGULATIONS 310 CMR 30.000	HOW COMPLIANCE IS ACHIEVED BY EXISTING COVER
Minimize percolation of water into landfill.	Minimize migration of liquids through landfill.	Minimize infiltration through landfill.	Minimize migration of liquids through landfill.	Geomembrane installations such as the existing one at Shepley's Hill Landfill have a permeability of 10 E -7 centimeters per second or less that minimizes infiltration and migration of liquid into landfilled waste. Sloped surface promotes runoff and minimizes infiltration. Vegetation promotes evapotranspiration.
Accommodate settling and subsidence to continue to meet performance standards.	Accommodate settling and subsidence to maintain cover integrity.		Accommodate settling and subsidence to maintain cover integrity.	Landfill materials were compacted and graded during construction of the existing cap to accommodate settling. Maintenance actions are possible to maintain cover integrity if or when settling occurs.
Ensure isolate of wastes from environment.				The existing cover isolates wastes from potential terrestrial receptors by covering them with soil and lowers groundwater to elevations interpreted to be below waste.

TABLE 9
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE SHL-2: LIMITED ACTION

RECORD OF DECISION
SHEPLEY'S HILL LANDFILL OPERABLE UNIT
FORT DEVENS, MA

AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority	Floodplains	Floodplain Management Executive Order No. 11988, [40 CFR Part 6, App. A]	Applicable	Requires federal agencies to evaluate the potential adverse effects associated with direct and indirect development of a floodplain. Alternatives that involve modification/construction within a floodplain may not be selected unless a determination is made that no practicable alternative exists. If no practicable alternative exists, potential harm must be minimized and action taken to restore and preserve the natural and beneficial values of the floodplain.	To the extent that any activity associated with this alternative takes place in the floodplain, the activity will be altered to comply with the law.
	Wetlands	Protection of Wetlands Executive Order No. 11990	Applicable	Under this Order, federal agencies are required to minimize the destruction, loss, or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands. If remediation is required within wetland areas, and no practical alternative exists, potential harm must be minimized and action taken to restore natural and beneficial values.	To the extent that any activity associated with this alternative takes place in wetlands, the activity will be altered to comply with the law.

(continued)

TABLE 9
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE SHL-2: LIMITED ACTION

RECORD OF DECISION
SHEPLEY'S HILL LANDFILL OPERABLE UNIT
FORT DEVENS, MA

AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
	Surface Waters Endangered Species	Fish and Wildlife Coordination Act [16 USC 661 et seq.; 40 CFR Part 302]	Applicable	Actions which affect species/habitat require consultation with U.S. Department of the Interior, U.S. Fish and Wildlife Service, and National Marine Fisheries Service, and/or state agencies, as appropriate, to ensure that proposed actions do not jeopardize the continued existence of the species or adversely modify or destroy critical habitat. The effects of water-related projects on fish and wildlife resources must be considered. Action must be taken to prevent, mitigate, or compensate for project-related damages or losses to fish and wildlife resources. Consultation with the responsible agency is also strongly recommended for on-site actions. Under 40 CFR Part 300.38, these requirements apply to all response activities under the NCP.	No off-site remedial actions performed for this alternative. On-site actions would be minimal and would include agency consultation prior to implementation.
	Endangered Species	Endangered Species Act [16 USC 1531 et seq.; 50 CFR Part 402]	Applicable	This act requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or modification of their habitat.	To minimize impact, landfill cover maintenance would be performed after nesting areas of the Grasshopper Sparrow have been identified.

(continued)

TABLE 9
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE SHL-2: LIMITED ACTION

RECORD OF DECISION
SHEPLEY'S HILL LANDFILL OPERABLE UNIT
FORT DEVENS, MA

AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
State Regulatory Authority	Floodplains Wetlands	Massachusetts Wetland Protection Act and Regulations [MGL c. 131 s. 40; 310 CMR 10.00]	Applicable	Wetlands and land subject to flooding are protected under this Act and these regulations. Activities that will remove, dredge, fill, or alter protected areas (defined as areas within the 100-year floodplain) are subject to regulation and must file a Notice of Intent with the municipal conservation commission and obtain a Final Order of Conditions before proceeding with the activity. A Determination of Applicability or Notice of Intent must be filed for activities such as excavation within a 100 foot buffer zone. The regulations specifically prohibit loss of over 5,000 square feet of bordering vegetated wetland. Loss may be permitted with replication of any lost area within two growing seasons.	If remedial activities alter more than 5,000 square feet of protected area, the affected area will be restored within two growing seasons.
	Endangered Species	Massachusetts Endangered Species Act and implementing regulations [MGL c. 131A, s. 1 et seq.; 321 CMR 8.00]	Applicable	Actions must be conducted in a manner which minimizes the impact to Massachusetts listed endangered species and species listed by the Massachusetts Natural Heritage Program.	To minimize impacts, landfill cover maintenance would be performed after nesting areas of the Grasshopper Sparrow have been identified.

(continued)

TABLE 9
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE SHL-2: LIMITED ACTION

RECORD OF DECISION
SHEPLEY'S HILL LANDFILL OPERABLE UNIT
FORT DEVENS, MA

AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
	Area of Critical Environmental Concern	Areas of Critical Environmental Concern [301 CMR 12.00]	Relevant and Appropriate	An Area of Critical Environmental Concern is of regional, state, or national importance or contains significant ecological systems with critical inter-relationships among a number-of-components. An eligible area must contain features from four or more of the following groups: (1) fishery habitats; (2) coastal feature; (3) estuarine wetland; (4) inland wetland; (5) inland surface water; (6) water supply area (i.e., aquifer recharge area); (7) natural hazard area (i.e., floodplain); (8) agricultural area; (9) historical/archeological resources; (10) habitat resource (i.e., for endangered wildlife; or (11) special use areas.	Activities must be controlled to minimize impacts to nesting areas of the Grasshopper Sparrow.

(continued)

TABLE 9
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE SHL-2: LIMITED ACTION

RECORD OF DECISION
SHEPLEY'S HILL LANDFILL OPERABLE UNIT
FORT DEVENS, MA

AUTHORITY	CHEMICAL MEDIUM	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority	Groundwater	Safe Drinking Water Act, National Primary Drinking Water Standards, MCLs [40 CFR Parts 141.11 - 141.16 and 141.50-191.51]	Relevant and Appropriate	The National Primary Drinking Water Regulation establishes MCLs and non-zero Maximum Contaminant Level Goals for several common organic and inorganic contaminants. These MCLs specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques.	MCLs will be used to evaluate the performance of this alternative. If MCLs are exceeded, the remedy will be re-evaluated.
State Regulatory Authority	Surface water	Massachusetts Surface Water Quality Standards [314 CMR 4.00]	Applicable	Massachusetts Surface Water Quality Standards designate the most sensitive uses for which surface waters of the Commonwealth are to be enhanced, maintained and protected and designate minimum water quality criteria for sustaining the designated uses. Surface waters at Fort Devens are classified as Class B. Surface waters assigned to this class are designated as habitat for fish, other aquatic life and wildlife, and for primary and secondary contact recreation.	Discharges associated with remedial actions will be controlled/monitored to ensure that surface waters meet standards.

(continued)

TABLE 9
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE SHL-2: LIMITED ACTION

RECORD OF DECISION
SHEPLEY'S HILL LANDFILL OPERABLE UNIT
FORT DEVENS, MA

AUTHORITY	CHEMICAL MEDIUM	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
	Groundwater	Massachusetts Groundwater Quality Standards [314 CMR 6.00]	Applicable	Massachusetts Groundwater Quality Standards designate and assign uses for which groundwaters of the Commonwealth shall be maintained and protected and set forth water quality criteria necessary to maintain the designated uses. Groundwater at Fort Devens is classified as Class I. Groundwaters assigned to this class are fresh groundwaters designated as a source of potable water supply.	MCLs will be used to evaluate the performance of this alternative. If MCLs are exceeded, the remedy will be re-evaluated.
	Groundwater	Massachusetts Drinking Water Standards and Guidelines [310 CMR 22.00]	Relevant and Appropriate	The Massachusetts Drinking Water Standards and Guidelines list MMCLs which apply to water delivered to any user of a public water supply system as defined in 310 CMR 22.00. Private residential wells are not subject to the requirements of 310 CMR 22.00; however, the standards are often used to evaluate private residential contamination especially in CERCLA activities.	MMCLs will be used to evaluate the performance of this alternative. If MMCLs are exceeded, the remedy will be re-evaluated.

(continued)

TABLE 9
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE SHL-2: LIMITED ACTION

RECORD OF DECISION
SHEPLEY'S HILL LANDFILL OPERABLE UNIT
FORT DEVENS, MA

AUTHORITY	CHEMICAL MEDIUM	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
	Air	Massachusetts Ambient Air Quality Standards [310 CMR 6.00]	Relevant and Appropriate	Regulations specify primary and secondary ambient air quality standards to protect public health and welfare for certain pollutants	Ambient Air Quality Standards will be used to evaluate the performance of this alternative. If standards are exceeded, the remedy will be re-evaluated.
	Air	Massachusetts Air Pollution Control Regulations [310 CMR 7.00]	Relevant and Appropriate	Regulations pertain to the prevention of emissions in excess of Massachusetts or national ambient air quality standards or in excess of emission limitations in those regulations.	Ambient Air Quality Standards will be used to evaluate the performance of this alternative. If standards are exceeded, the remedy will be re-evaluated.

(continued)

TABLE 9
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE SHL-2: LIMITED ACTION

RECORD OF DECISION
SHEPLEY'S HILL LANDFILL OPERABLE UNIT
FORT DEVENS, MA

AUTHORITY	ACTION	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority	Solid waste landfill construction, operation, closure, and post-closure	Resource Conservation and Recovery Act (RCRA) [Subtitle D, 40 CFR 258]	Relevant and Appropriate	RCRA Subtitle D regulates the generation, transport, storage, treatment, and disposal of solid wastes. Regulations at 40 CFR 258 govern preparedness and prevention, closure, and post-closure at municipal solid waste landfills.	Performance of this alternative will be evaluated to determine compliance with the substantive requirements of federal solid waste regulations. If the substantive requirements are not met at the appropriate time, the remedy will be re-evaluated.
	Hazardous waste landfill construction, operation, closure, and post-closure	Resource Conservation and Recovery Act (RCRA) [Subtitle C, 40 CFR 260,264]	Relevant and Appropriate	RCRA Subtitle C regulates the generation, transport, storage, treatment, and disposal of hazardous wastes. Regulations at 40 CFR 264 govern preparedness and prevention, closure, and post-closure at landfills.	Performance of this alternative will be evaluated to determine compliance with the substantive requirements of federal hazardous waste regulations. If the substantive requirements are not met at the appropriate time, the remedy will be re-evaluated.
State Regulatory Authority	Solid waste landfill construction, operation, closure, and post-closure.	Massachusetts Solid Waste Management Regulations [310 CMR 19.000]	Applicable	These regulations outline the requirements for construction, operation, closure, and post-closure at solid waste management facilities in the Commonwealth of Massachusetts.	This alternative includes components to meet closure and post-closure requirements at Shepley's Hill Landfill.

(continued)

TABLE 9
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE SHL-2: LIMITED ACTION

RECORD OF DECISION
SHEPLEY'S HILL LANDFILL OPERABLE UNIT
FORT DEVENS, MA

AUTHORITY	ACTION	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
	Hazardous waste landfill construction, operation, closure, and post-closure	Massachusetts Hazardous Waste Regulations [310 CMR 30.00]	Relevant and Appropriate	Regulates handling, storage, treatment, disposal, and record keeping at hazardous waste facilities.	Performance of this alternative will be evaluated to determine compliance with the substantive requirements of Massachusetts hazardous waste regulations. If the substantive requirements are not met at the appropriate time, the remedy will be re-evaluated.

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PHOTO LOG

April 2010
View southeast from the entrance road toward the landfill.

April 2010
View south of the landfill towards the groundwater treatment system building.

X:/OMA010/Ft_Devens/Maps/DO501/2010_5-Year_Review/CDR/
shepleys_photolog.cdr
07/07/10 CNL

Shepley's Landfill
Photograph Log
2010

April 2010
View of the western façade of the pump station.

April 2010
Interior view of the pump station mechanical equipment.

X:/OMA010/Ft_Devens/Maps/DO501/2010_5-Year_Review/CDR/shepleys_photolog.cdr
07/07/10 CNL

Shepley's Landfill
Photograph Log
2010

April 2010
Overall view south of the landfill from the groundwater treatment system building.

April 2010
View southwest of the landfill from the GV-2.

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shepleys_photolog.cdr
07/07/10 CNL

Shepley's Landfill
Photograph Log
2010

April 2010
Looking southwest from GV-8.

April 2010
View west from the eastern side of the landfill (next to Plow Shop Pond).

X:/OMA010/Ft_Devens/Maps/DO501/2010_5-Year_Review/CDR/
shepleys_photolog.cdr
07/07/10 CNL

Shepley's Landfill
Photograph Log
2010

April 2010
View north from GV-10 toward the groundwater treatment system building.

April 2010
View south from GV-11 toward catch basin.

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shepleys_photolog.cdr
07/07/10 CNL

Shepley's Landfill
Photograph Log
2010

April 2010
Looking south beyond landfill, toward adjacent commercial property.

April 2010
View north along the southwestern portion of the toe-drain.

X:/OMA010/Ft_Devens/Maps/DO501/2010_5-Year_Review/CDR/
shepleys_photolog.cdr
07/07/10 CNL

Shepley's Landfill
Photograph Log
2010

APPENDIX C

AOC 57

GROUNDWATER ANALYTICAL RESULTS
(2005-2009)

Key for Tables

General Terms

AOC	Area of Contamination
COC	contaminants of concern
COD	chemical oxygen demand
CMR	Code of Massachusetts Regulations
DTW	depth to water
EOD	explosive ordnance disposal
EPH	extractable petroleum hydrocarbons
ft	feet
ID	identification
LTM	long-term monitoring
MADEP	Massachusetts Department of Environmental Protection; indicates MADEP-derived analytical methods (MADEP, 2004a and 2004b)
MCL	maximum contaminant level
MCP	Massachusetts Contingency Plan
μg/L	Micrograms per liter
mg/L	Milligrams per liter
μS/cm	Microsiemens per centimeter
msl	mean sea level
mV	Millivolts
NC	Not collected
ND	Not detected
NS	No standard established
NTU	Nephelometric turbidity units
ORP	Oxidation-reduction potential
PCB	polychlorinated biphenyls
PQL	Practical Quantitation Limit
QAPP	Quality Assurance Project Plan
RI	Remedial Investigation
ROD	Record of Decision

SW(number)	Analytical method from the SW-846 method series (EPA, 2005)
VOC	volatile organic compounds

Result Indicators (Laboratory Results Only)

Bold Text	Indicates a detected result above a background level.
Bold Text	Indicates a detected result above the associated site cleanup goal or GW-1 Standard.
Bold Text	Indicates a detected result above USEPA Water Quality Criteria.
Bold Text	Indicates a detected result above GW-3 Standard.

Data Qualifiers

J	Estimated detection
U	Not detected (at associated reporting limit)
UJ	Not detected; reporting limit is an estimate

2005 Groundwater, Surface and Sump Water Analytical Results
Area of Contamination 57 - Areas 2 and 3
November 2005

Method	Analyte	Units	Groundwater Standard[1]	Background[2]	57M-03-01X	57M-03-02X	57M-03-03X	57M-03-04X	57M-03-05X	57M-03-06X	57M-95-03X	57M-96-11X	57M-96-11X Duplicate	WP-01	57-AREA 2-SW2
VOCs - SW8260B	1,1,1,2-Tetrachloroethane	µg/L	5	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	1,1,1-Trichloroethane	µg/L	200	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	1,1,2,2-Tetrachloroethane	µg/L	2	—	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	0.5 U
VOCs - SW8260B	1,1,2-Trichloroethane	µg/L	5	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	1,1-Dichloroethane	µg/L	70	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	1,1-Dichloroethene	µg/L	7	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	1,1-Dichloropropene	µg/L	0.5	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	1,2,3-Trichlorobenzene	µg/L	NS	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	1,2,3-Trichloropropane	µg/L	1,000	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	1,2,4-Trichlorobenzene	µg/L	70	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	1,2,4-Trimethylbenzene	µg/L	10,000	—	1.0 U	1.0 U	1.0 U	1.0 U	4.0	1.0 U	27.8	4.2	4.0	NA	1.0 U
VOCs - SW8260B	1,2-Dibromo-3-chloropropane	µg/L	100	—	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	NA	5.0 U
VOCs - SW8260B	1,2-Dibromoethane	µg/L	0.02	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	1,2-Dichlorobenzene	µg/L	600	—	1.0 U	1.0 U	1.0 U	0.6 J	1.0 U	1.0 U	1.4	3.3	3.3	NA	1.0 U
VOCs - SW8260B	1,2-Dichloroethane	µg/L	5	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	1,2-Dichloropropane	µg/L	3	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	1,3,5-Trimethylbenzene	µg/L	100	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	9.2	0.4 J	1.0 U	NA	1.0 U
VOCs - SW8260B	1,3-Dichlorobenzene	µg/L	40	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	1,3-Dichloropropane	µg/L	5,000	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	1,4-Dichlorobenzene	µg/L	5 (ROD)	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.8 J	1.4	1.4	NA	1.0 U
VOCs - SW8260B	1-Chlorohexane	µg/L	NS	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	2,2-Dichloropropane	µg/L	NS	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	2-Butanone	µg/L	400	—	25.0 U	25.0 UJ	25.0 U	25.0 U	25.0 UJ	25.0 UJ	25.0 UJ	25.0 UJ	25.0 UJ	NA	25.0 UJ
VOCs - SW8260B	2-Chlorotoluene	µg/L	1,000	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	2-Hexanone	µg/L	1,000	—	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	NA	10.0 U
VOCs - SW8260B	4-Chlorotoluene	µg/L	NS	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	4-Isopropyltoluene	µg/L	1,000	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.8	1.0 U	1.1	NA	1.0 U
VOCs - SW8260B	4-Methyl-2-pentanone	µg/L	350	—	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	NA	10.0 U
VOCs - SW8260B	Acetone	µg/L	3,000	—	25.0 U	25.0 UJ	25.0 U	25.0 U	25.0 UJ	25.0 U	25.0 UJ	25.0 UJ	25.0 UJ	NA	25.0 UJ
VOCs - SW8260B	Benzene	µg/L	5	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	Bromobenzene	µg/L	1,000	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	Bromochloromethane	µg/L	NS	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	Bromodichloromethane	µg/L	3	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	Bromoform	µg/L	4	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	Bromomethane	µg/L	2	—	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	NA	2.0 U
VOCs - SW8260B	Carbon disulfide	µg/L	1,000	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	Carbon tetrachloride	µg/L	2	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	Chlorobenzene	µg/L	100	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.8 J	0.8 J	NA	1.0 U
VOCs - SW8260B	Chloroethane	µg/L	1,000	—	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	NA	2.0 U
VOCs - SW8260B	Chloroform	µg/L	5	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	Chloromethane	µg/L	1,000	—	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	NA	2.0 UJ
VOCs - SW8260B	cis-1,2-Dichloroethene	µg/L	70	—	1.0 U	2.2	0.4 J	0.9 J	1.6	1.0 U	1.0 U	2.2	2.2	NA	1.0 U
VOCs - SW8260B	cis-1,3-Dichloropropene	µg/L	0.5	—	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	0.5 U

[1] From the MCP GW1 Standards (310 CMR 40 Subpart P) unless identified as from the ROD.
[2] From the RI.
[3] Meter malfunction suspected due to erroneous value.

2005 Groundwater, Surface and Sump Water Analytical Results
Area of Contamination 57 - Areas 2 and 3
November 2005

Method	Analyte	Units	Groundwater Standard[1]	Background[2]	57M-03-01X	57M-03-02X	57M-03-03X	57M-03-04X	57M-03-05X	57M-03-06X	57M-95-03X	57M-96-11X	57M-96-11X Duplicate	WP-01	57-AREA 2-SW2
VOCs - SW8260B	Dibromochloromethane	µg/L	2	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	Dibromomethane	µg/L	5,000	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	Dichlorodifluoromethane	µg/L	10,000	—	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	NA	2.0 UJ
VOCs - SW8260B	Ethylbenzene	µg/L	700	—	1.0 U	1.0 U	1.0 U	1.0 U	27.5	1.0 U	5.0	3.3	3.2	NA	1.0 U
VOCs - SW8260B	Hexachlorobutadiene	µg/L	0.6	—	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 UJ	0.6 U	0.6 U	0.6 U	NA	0.6 U
VOCs - SW8260B	Isopropylbenzene	µg/L	10,000	—	1.0 U	1.0 U	1.0 U	1.0 U	0.4 J	1.0 U	1.2	0.8 J	0.8 J	NA	1.0 U
VOCs - SW8260B	m,p-Xylene	µg/L	NS	—	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	12.5	1.3 J	1.3 J	NA	2.0 U
VOCs - SW8260B	Methyl tert-butyl ether	µg/L	70	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	Methylene chloride	µg/L	5	—	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	NA	5.0 U
VOCs - SW8260B	Naphthalene	µg/L	140	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.7	2.7	2.7	NA	1.0 U
VOCs - SW8260B	n-Butylbenzene	µg/L	NS	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	n-Propylbenzene	µg/L	1,000	—	1.0 U	1.0 U	1.0 U	1.0 U	0.9 J	1.0 U	2.3	1.8	1.8	NA	1.0 U
VOCs - SW8260B	o-Xylene	µg/L	NS	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	9.2	0.8 J	0.8 J	NA	1.0 U
VOCs - SW8260B	sec-Butylbenzene	µg/L	NS	—	1.0 U	1.0 U	1.0 U	1.6	0.7 J	1.0 U	0.8 J	0.4 J	0.5 J	NA	1.0 U
VOCs - SW8260B	Styrene	µg/L	100	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	tert-Butylbenzene	µg/L	1,000	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	Tetrachloroethene	µg/L	5 (ROD)	—	1.0 U	**6.0**	1.6	1.0 U	1.0 U	1.0 U	1.0 U	0.2 J	1.0 U	NA	1.0 U
VOCs - SW8260B	Tetrahydrofuran	µg/L	5,000	—	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	NA	5.0 U
VOCs - SW8260B	Toluene	µg/L	1,000	—	1.0 U	1.0 U	1.0 U	1.0 U	6.7	1.0 U	2.6	0.9 J	0.8 J	NA	1.0 U
VOCs - SW8260B	trans-1,2-Dichloroethene	µg/L	90	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
VOCs - SW8260B	trans-1,3-Dichloropropene	µg/L	0.5	—	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	0.5 U
VOCs - SW8260B	Trichloroethene	µg/L	5	—	1.0 U	**6.1**	0.8 J	1.0 U	1.0 U	1.0 U	1.0 U	1.3	1.3	NA	1.0 U
VOCs - SW8260B	Trichlorofluoromethane	µg/L	10,000	—	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	0.5 J	1.0 U	2.0 U	2.0 U	NA	2.0 U
VOCs - SW8260B	Vinyl acetate	µg/L	10,000	—	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	NA	5.0 U
VOCs - SW8260B	Vinyl chloride	µg/L	2	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	NA	1.0 U
EPH - MADEP	C_{11}-C_{22} Aromatics	µg/L	200	—	150 U	150 U	174 U	150 U	150 U	150 U	NA	NA	NA	NA	153 U
PCBs - SW8082	Aroclor 1016	µg/L	0.5	—	0.10 U	0.10 U	0.10 U	0.11 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	NA	0.10 U
PCBs - SW8082	Aroclor 1221	µg/L	0.5	—	0.10 U	0.10 U	0.10 U	0.11 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	NA	0.10 U
PCBs - SW8082	Aroclor 1232	µg/L	0.5	—	0.10 U	0.10 U	0.10 U	0.11 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	NA	0.10 U
PCBs - SW8082	Aroclor 1242	µg/L	0.5	—	0.10 U	0.10 U	0.10 U	0.11 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	NA	0.10 U
PCBs - SW8082	Aroclor 1248	µg/L	0.5	—	0.10 U	0.10 U	0.10 U	0.11 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	NA	0.10 U
PCBs - SW8082	Aroclor 1254	µg/L	0.5	—	0.10 U	0.10 U	0.10 U	0.11 U	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	NA	0.10 U
PCBs - SW8082	Aroclor 1260	µg/L	0.5	—	0.10 U	0.10 U	0.10 U	0.11 U	0.10 U	0.10 U	0.08 J	0.10 U	0.10 U	NA	0.10 U
Metals - SW6010E	Arsenic, total	µg/L	10	10.5	2.5 U	8.8	2.5 U	**167**	**18.6**	2.5 U	**13.6**	**212**	**215**	2.5 U	2.5U
Metals - SW6010E	Cadmium, total	µg/L	5	4.01	2 U	2U	2 U	2U	2U	2 U	2	2U	2U	2 U	2U
Lead - SW7421	Lead, total	µg/L	15	4.25	2.5 U	3.3 J	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 J	2.5 U	2.5 U	2.5 U
Field Parameter	ORP	mV	NS	—	302.4	-42.8	297.4	303.2	-114	354.6	-41.3	-92.4	NA	NA	NA
Field Parameter	Dissolved oxygen	mg/L	NS	—	9.01	0.3	-1.13[3]	-0.45[3]	-0.19[3]	4.78	1.3	0.44	NA	NA	NA

[1] From the MCP GW1 Standards (310 CMR 40 Subpart P) unless identified as from the ROD.
[2] From the RI.
[3] Meter malfunction suspected due to erroneous value.

2005 Groundwater, Surface and Sump Water Analytical Results
Area of Contamination 57 - Areas 2 and 3
November 2005

Method	Analyte	Units	Groundwater Standard[1]	Background[2]	57-AREA 2-SW3	57-AREA 3-SW1	SUMP 1	SUMP 2	SUMP 3	SUMP 4
VOCs - SW8260B	1,1,1,2-Tetrachloroethane	µg/L	5	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	1,1,1-Trichloroethane	µg/L	200	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	1,1,2,2-Tetrachloroethane	µg/L	2	—	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - SW8260B	1,1,2-Trichloroethane	µg/L	5	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	1,1-Dichloroethane	µg/L	70	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	1,1-Dichloroethene	µg/L	7	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	1,1-Dichloropropene	µg/L	0.5	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	1,2,3-Trichlorobenzene	µg/L	NS	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	1,2,3-Trichloropropane	µg/L	1,000	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	1,2,4-Trichlorobenzene	µg/L	70	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	1,2,4-Trimethylbenzene	µg/L	10,000	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	1,2-Dibromo-3-chloropropane	µg/L	100	—	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
VOCs - SW8260B	1,2-Dibromoethane	µg/L	0.02	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	1,2-Dichlorobenzene	µg/L	600	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	1,2-Dichloroethane	µg/L	5	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	1,2-Dichloropropane	µg/L	3	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	1,3,5-Trimethylbenzene	µg/L	100	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	1,3-Dichlorobenzene	µg/L	40	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	1,3-Dichloropropane	µg/L	5,000	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	1,4-Dichlorobenzene	µg/L	5 (ROD)	—	1.0 U	1.0 U	0.4 J	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	1-Chlorohexane	µg/L	NS	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	2,2-Dichloropropane	µg/L	NS	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	2-Butanone	µg/L	400	—	25.0 UJ	25.0 UJ	25.0 U	25.0 U	25.0 U	25.0 U
VOCs - SW8260B	2-Chlorotoluene	µg/L	1,000	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	2-Hexanone	µg/L	1,000	—	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
VOCs - SW8260B	4-Chlorotoluene	µg/L	NS	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	4-Isopropyltoluene	µg/L	1,000	—	1.0 U	0.6 J	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	4-Methyl-2-pentanone	µg/L	350	—	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
VOCs - SW8260B	Acetone	µg/L	3,000	—	25.0 UJ	25.0 UJ	25.0 U	25.0 U	25.0 U	25.0 U
VOCs - SW8260B	Benzene	µg/L	5	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	Bromobenzene	µg/L	1,000	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	Bromochloromethane	µg/L	NS	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	Bromodichloromethane	µg/L	3	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	Bromoform	µg/L	4	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	Bromomethane	µg/L	2	—	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
VOCs - SW8260B	Carbon disulfide	µg/L	1,000	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	Carbon tetrachloride	µg/L	2	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	Chlorobenzene	µg/L	100	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	Chloroethane	µg/L	1,000	—	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
VOCs - SW8260B	Chloroform	µg/L	5	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	Chloromethane	µg/L	1,000	—	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ
VOCs - SW8260B	cis-1,2-Dichloroethene	µg/L	70	—	1.1	1.0 U	1.0	2.1	0.7 J	2.6
VOCs - SW8260B	cis-1,3-Dichloropropene	µg/L	0.5	—	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

[1] From the MCP GW1 Standards (310 CMR 40 Subpart P) unless identified as from the ROD.
[2] From the RI.
[3] Meter malfunction suspected due to erroneous value.

2005 Groundwater, Surface and Sump Water Analytical Results
Area of Contamination 57 - Areas 2 and 3
November 2005

Method	Analyte	Units	Groundwater Standard[1]	Background[2]	57-AREA 2-SW3	57-AREA 3-SW1	SUMP 1	SUMP 2	SUMP 3	SUMP 4
VOCs - SW8260B	Dibromochloromethane	µg/L	2	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	Dibromomethane	µg/L	5,000	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	Dichlorodifluoromethane	µg/L	10,000	—	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ	2.0 UJ
VOCs - SW8260B	Ethylbenzene	µg/L	700	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	Hexachlorobutadiene	µg/L	0.6	—	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
VOCs - SW8260B	Isopropylbenzene	µg/L	10,000	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	m,p-Xylene	µg/L	NS	—	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
VOCs - SW8260B	Methyl tert-butyl ether	µg/L	70	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	Methylene chloride	µg/L	5	—	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
VOCs - SW8260B	Naphthalene	µg/L	140	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	n-Butylbenzene	µg/L	NS	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	n-Propylbenzene	µg/L	1,000	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	o-Xylene	µg/L	NS	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	sec-Butylbenzene	µg/L	NS	—	1.0 U	1.0 U	0.4 J	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	Styrene	µg/L	100	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	tert-Butylbenzene	µg/L	1,000	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	Tetrachloroethene	µg/L	5 (ROD)	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.6
VOCs - SW8260B	Tetrahydrofuran	µg/L	5,000	—	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
VOCs - SW8260B	Toluene	µg/L	1,000	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	trans-1,2-Dichloroethene	µg/L	90	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	trans-1,3-Dichloropropene	µg/L	0.5	—	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - SW8260B	Trichloroethene	µg/L	5	—	1.0 U	1.0 U	0.8 J	1.3	1.0 U	1.7
VOCs - SW8260B	Trichlorofluoromethane	µg/L	10,000	—	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
VOCs - SW8260B	Vinyl acetate	µg/L	10,000	—	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
VOCs - SW8260B	Vinyl chloride	µg/L	2	—	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
EPH - MADEP	C_{11}-C_{22} Aromatics	µg/L	200	—	150 U	NA	172	**251**	150 U	150 U
PCBs - SW8082	Aroclor 1016	µg/L	0.5	—	0.10 U	0.11 U	0.10 U	0.10 U	0.10 U	0.10 U
PCBs - SW8082	Aroclor 1221	µg/L	0.5	—	0.10 U	0.11 U	0.10 U	0.10 U	0.10 U	0.10 U
PCBs - SW8082	Aroclor 1232	µg/L	0.5	—	0.10 U	0.11 U	0.10 U	0.10 U	0.10 U	0.10 U
PCBs - SW8082	Aroclor 1242	µg/L	0.5	—	0.10 U	0.11 U	0.10 U	0.10 U	0.10 U	0.10 U
PCBs - SW8082	Aroclor 1248	µg/L	0.5	—	0.10 U	0.11 U	0.10 U	0.10 U	0.10 U	0.10 U
PCBs - SW8082	Aroclor 1254	µg/L	0.5	—	0.10 U	0.11 U	0.10 U	0.10 U	0.10 U	0.10 U
PCBs - SW8082	Aroclor 1260	µg/L	0.5	—	0.10 U	0.11 U	0.10 U	0.10 U	0.10 U	0.10 U
Metals - SW6010E	Arsenic, total	µg/L	10	10.5	**39.9**	5.2	**36.1**	**36.2**	**16.8**	**24.8**
Metals - SW6010E	Cadmium, total	µg/L	5	4.01	2U	2U	2U	2U	2U	2U
Lead - SW7421	Lead, total	µg/L	15	4.25	3.3 J	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Field Parameter	ORP	mV	NS	—	NA	NA	NA	NA	NA	NA
Field Parameter	Dissolved oxygen	mg/L	NS	—	NA	NA	NA	NA	NA	NA

[1] From the MCP GW1 Standards (310 CMR 40 Subpart P) unless identified as from the ROD.
[2] From the RI.
[3] Meter malfunction suspected due to erroneous value.

2006 Groundwater, Surface and Sump Water Analytical Results
Area of Contamination 57 - Areas 2 and 3
June 2006

Method	Analyte	Units	Cleanup Goal[1]	Background[2]	57M-03-01X	57M-03-02X	57M-03-03X	57M-03-04X	57M-03-05X	57M-03-05X Duplicate	57M-03-06X	SUMP-1	SUMP-2	SUMP-3
Metals - 6010B	Arsenic, Total	µg/L	10	10.5	5 U	**14**	2.5 J	3.7 J	**15**	NC	3.4 J	**25**	**38**	**21**
Metals - 6010B	Cadmium, Total	µg/L	5	4.01	5 U	5 U	5 U	5 U	5 U	NC	5 U	5 U	5 U	5 U
Metals - 6010B	Iron, Total	µg/L	NS	9,100	50 U	**24,000**	50 U	80	3,100	NC	550	1,500	5,600	2,800
Metals - 6010B	Lead, Total	µg/L	15	4.25	10 U	10 U	10 U	**10**	10 U	NC	10 U	1.4 J	2.2 J	1.5 J
Metals - 6010B	Manganese, Total	µg/L	NS	291	9 J	**2,400**	240	**840**	**760**	NC	30	**1,600**	**2,600**	**1,500**
Metals - 6010B	Arsenic, Dissolved	µg/L	10	10.5	5 U	**14**	5 U	4.1 U	**14**	NC	5 U	**25**	**33**	**21**
Metals - 6010B	Cadmium, Dissolved	µg/L	5	4.01	5 U	5 U	5 U	5 U	5 U	NC	5 U	5 U	5 U	5 U
Metals - 6010B	Iron, Dissolved	µg/L	NS	9,100	50 U	**24,000**	59 U	50 U	2,900	NC	50 U	1,600	5,300	2,600
Metals - 6010B	Lead, Dissolved	µg/L	15	4.25	10 U	10 U	10 U	10 U	10 U	NC	10 U	10 U	10 U	10 U
Metals - 6010B	Manganese, Dissolved	µg/L	NS	291	9 J	**2,500**	230	**860**	**750**	NC	20	**1,600**	**2,500**	**1,500**
VOCs - 8260B	1,1,1,2-Tetrachloroethane	µg/L	5	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	1,1,1-Trichloroethane	µg/L	200	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	1,1,2,2-Tetrachloroethane	µg/L	2	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	1,1,2-Trichloroethane	µg/L	5	NS	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	NC	0.75 U	0.75 U	0.75 U	0.75 U
VOCs - 8260B	1,1-Dichloroethane	µg/L	70	NS	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	NC	0.75 U	0.75 U	0.75 U	0.75 U
VOCs - 8260B	1,1-Dichloroethene	µg/L	7	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	1,1-Dichloropropene	µg/L	0.5	NS	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,2,3-Trichlorobenzene	µg/L	NS	NS	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,2,3-Trichloropropane	µg/L	1,000	NS	5 U	5 U	5 U	5 U	5 U	NC	5 U	5 U	5 U	5 U
VOCs - 8260B	1,2,4-Trichlorobenzene	µg/L	70	NS	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,2,4-Trimethylbenzene	µg/L	10,000	NS	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,2-Dibromo-3-chloropropane	µg/L	100	NS	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,2-Dibromoethane	µg/L	0.02	NS	2 U	2 U	2 U	2 U	2 U	NC	2 U	2 U	2 U	2 U
VOCs - 8260B	1,2-Dichlorobenzene	µg/L	600	NS	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,2-Dichloroethane	µg/L	0.5	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	1,2-Dichloropropane	µg/L	3	NS	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	NC	1.8 U	1.8 U	1.8 U	1.8 U
VOCs - 8260B	1,3,5-Trimethylbenzene	µg/L	100	NS	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,3-Dichlorobenzene	µg/L	40	NS	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,3-Dichloropropane	µg/L	5,000	NS	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,4-Dichlorobenzene	µg/L	5 (ROD)	NS	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	2,2-Dichloropropane	µg/L	NS	NS	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	2-Butanone	µg/L	400	NS	5 U	5 U	5 U	5 U	5 U	NC	5 U	5 U	5 U	5 U
VOCs - 8260B	2-Hexanone	µg/L	1,000	NS	5 U	5 U	5 U	5 U	5 U	NC	5 U	5 U	5 U	5 U
VOCs - 8260B	4-Methyl-2-pentanone	µg/L	350	NS	5 U	5 U	5 U	5 U	5 U	NC	5 U	5 U	5 U	5 U
VOCs - 8260B	4-Isopropyltoluene	µg/L	1,000	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Acetone	µg/L	3,000	NS	5 U	5 U	5 U	5 U	5 U	NC	5 U	5 U	5 U	5 U
VOCs - 8260B	Benzene	µg/L	5	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Bromobenzene	µg/L	1,000	NS	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	Bromochloromethane	µg/L	NS	NS	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	Bromodichloromethane	µg/L	3	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Bromoform	µg/L	4	NS	2 U	2 U	2 U	2 U	2 U	NC	2 U	2 U	2 U	2 U
VOCs - 8260B	Bromomethane	µg/L	2	NS	1 U	1 U	1 U	1 U	1 U	NC	1 U	1 U	1 U	1 U
VOCs - 8260B	Carbon disulfide	µg/L	1,000	NS	5 U	5 U	5 U	5 U	5 U	NC	5 U	5 U	5 U	5 U
VOCs - 8260B	Carbon tetrachloride	µg/L	2	NS	0.5 U	0.5 U	0.5 U	0.5	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Chlorobenzene	µg/L	100	NS	0.5 U	0.5 U	0.5 U	0.5	0.5 U	NC	0.5 U	0.17 J	0.24 J	0.12 J
VOCs - 8260B	Chloroethane	µg/L	1,000	NS	100 U	1 U	1	1 U	1 U	NC	1 U	1 U	1 U	1 U

2006 Groundwater, Surface and Sump Water Analytical Results
Area of Contamination 57 - Areas 2 and 3
June 2006

Method	Analyte	Units	Cleanup Goal[1]	Background[2]	57M-03-01X	57M-03-02X	57M-03-03X	57M-03-04X	57M-03-05X	57M-03-05X Duplicate	57M-03-06X	SUMP-1	SUMP-2	SUMP-3
VOCs - 8260B	Chloroform	µg/L	5	NS	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	NC	0.75 U	0.75 U	0.75 U	0.75 U
VOCs - 8260B	Chloromethane	µg/L	1,000	NS	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	cis-1,2-Dichloroethene	µg/L	70	NS	0.5 U	7.7	0.39 J	0.5 U	0.51	NC	0.5 U	0.2 J	0.4 J	0.5 U
VOCs - 8260B	cis-1,3-Dichloropropene	µg/L	0.5	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Dibromochloromethane	µg/L	2	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Dibromomethane	µg/L	5,000	NS	5 U	5 U	5 U	5 U	5 U	NC	5 U	5 U	5 U	5 U
VOCs - 8260B	Dichlorodifluoromethane	µg/L	10,000	NS	5 U	5 U	5 U	5 U	5 U	NC	5 U	5 U	5 U	5 U
VOCs - 8260B	Ethylbenzene	µg/L	700	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Hexachlorobutadiene	µg/L	0.6	NS	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	NC	0.6 U	0.6 U	0.6 U	0.6 U
VOCs - 8260B	Isopropylbenzene	µg/L	10,000	NS	0.5 U	0.5 U	0.28 J	0.5 U	0.5 U	NC	0.5 U	0.5 U	0.16 J	0.5 U
VOCs - 8260B	Methyl tert butyl ether	µg/L	70	NS	1 U	1 U	1 U	1 U	1 U	NC	1 U	1 U	1 U	1 U
VOCs - 8260B	Methylene chloride	µg/L	5	NS	5 U	5 U	5 U	5 U	5 U	NC	5 U	5 U	5 U	5 U
VOCs - 8260B	n-Butylbenzene	µg/L	NS	NS	0.5 U	0.5 U	0.31 J	0.5 U	0.13 J	NC	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	n-Propylbenzene	µg/L	1,000	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.17 J	NC	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Naphthalene	µg/L	140	NS	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	o-Chlorotoluene	µg/L	1,000	NS	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	o-Xylene	µg/L	NS	NS	100 U	1 U	1 U	1 U	1 U	NC	1 U	1 U	1 U	1 U
VOCs - 8260B	m,p-Xylene	µg/L	NS	NS	100 U	1 U	1 U	1 U	1 U	NC	1 U	1 U	1 U	1 U
VOCs - 8260B	Total xylenes	µg/L	10,000	NS	100 U	1 U	1 U	1 U	1 U	NC	1 U	1 U	1 U	1 U
VOCs - 8260B	p-Chlorotoluene	µg/L	1,000	NS	2.5 U	2.5 U	2.5 U	2.5 U	2.5	NC	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	sec-Butylbenzene	µg/L	NS	NS	0.5 U	0.5 U	2.7	0.14 J	0.32 J	NC	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Styrene	µg/L	100	NS	1 U	1 U	1 U	1 U	1 U	NC	1 U	1 U	1 U	1 U
VOCs - 8260B	tert-Butylbenzene	µg/L	1,000	NS	2.5 U	2.5 U	0.68 J	2.5 U	2.5 U	NC	2.5 U	2.5 U	0.19 J	2.5 U
VOCs - 8260B	Tetrachloroethene	µg/L	5 (ROD)	NS	0.22 J	2.3	0.9	0.67	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Toluene	µg/L	1,000	NS	0.75 U	0.14 J	0.75 U	0.75 U	0.75 U	NC	0.75 U	0.75 U	0.75 U	0.75 U
VOCs - 8260B	trans-1,2-Dichloroethene	µg/L	90	NS	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	NC	0.75 U	0.75 U	0.75 U	0.75 U
VOCs - 8260B	trans-1,3-Dichloropropene	µg/L	0.5	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Trichloroethene	µg/L	5	NS	0.5 U	**5.3**	0.7	0.17 J	0.19 J	NC	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Trichlorofluoromethane	µg/L	10,000	NS	2.5 U	2.5 U	2.5 U	0.39 J	0.25 U	NC	0.29 J	2.5 U	2.5 U	2.5 U
VOCs - 8260B	Vinyl chloride	µg/L	2	NS	1 U	1 U	1 U	1 U	1 U	NC	1 U	1 U	1 U	1 U
PCBs - 8082	Aroclor 1016	µg/L	0.5	NS	0.25 U	0.263 U	0.287 U	0.269 U	0.25 U	NC	0.284 U	0.26 U	0.263 U	0.269 U
PCBs - 8083	Aroclor 1221	µg/L	0.5	NS	0.25 U	0.263 U	0.287 U	0.269 U	0.25 U	NC	0.284 U	0.26 U	0.263 U	0.269 U
PCBs - 8084	Aroclor 1232	µg/L	0.5	NS	0.25 U	0.263 U	0.287 U	0.269 U	0.25 U	NC	0.284 U	0.26 U	0.263 U	0.269 U
PCBs - 8085	Aroclor 1242	µg/L	0.5	NS	0.25 U	0.263 U	0.287 U	0.269 U	0.25 U	NC	0.284 U	0.26 U	0.263 U	0.269 U
PCBs - 8086	Aroclor 1248	µg/L	0.5	NS	0.25 U	0.263 U	0.287 U	0.269 U	0.25 U	NC	0.284 U	0.26 U	0.263 U	0.269 U
PCBs - 8087	Aroclor 1254	µg/L	0.5	NS	0.25 U	0.263 U	0.287 U	0.269 U	0.25 U	NC	0.284 U	0.26 U	0.263 U	0.269 U
PCBs - 8088	Aroclor 1260	µg/L	0.5	NS	0.25 U	0.263 U	0.287 U	0.269 U	0.25 U	NC	0.284 U	0.26 U	0.263 U	0.269 U
EPH (MADEP)	2-Methylnaphthalene	µg/L	10	NS	0.426 U	0.444 U	0.435 U	0.462 U	0.44 U	0.421 U	0.426 U	0.412 U	0.417 U	0.444 U
EPH (MADEP)	Acenaphthene	µg/L	20	NS	0.426 U	0.444 U	0.435 U	0.462 U	0.44 U	0.426 U	0.426 U	0.412 U	0.417 U	0.444 U
EPH (MADEP)	Acenaphthylene	µg/L	300	NS	0.426 U	0.444 U	0.435 U	0.462 U	0.44 U	0.426 U	0.426 U	0.412 U	0.417 U	0.444 U
EPH (MADEP)	Anthracene	µg/L	2,000	NS	0.426 U	0.444 U	0.435 U	0.462 U	0.44 U	0.426 U	0.426 U	0.412 U	0.417 U	0.444 U
EPH (MADEP)	Benzo(a)anthracene	µg/L	1	NS	0.426 U	0.444 U	0.435 U	0.462 U	0.44 U	0.426 U	0.426 U	0.412 U	0.417 U	0.444 U
EPH (MADEP)	Benzo(a)pyrene	µg/L	0.2	NS	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.0002	0.2 U	0.2 U	0.2 U	0.2 U
EPH (MADEP)	Benzo(b)fluoranthene	µg/L	1	NS	0.426 U	0.444 U	0.435 U	0.462 U	0.44 U	0.426 U	0.426 U	0.412 U	0.417 U	0.444 U
EPH (MADEP)	Benzo(ghi)perylene	µg/L	300	NS	0.426 U	0.444 U	0.435 U	0.462 U	0.44 U	0.426 U	0.426 U	0.412 U	0.417 U	0.444 U
EPH (MADEP)	Benzo(k)fluoranthene	µg/L	1	NS	0.426 U	0.444 U	0.435 U	0.462 U	0.44 U	0.426 U	0.426 U	0.412 U	0.417 U	0.444 U

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Method	Analyte	Units	Cleanup Goal[1]	Background[2]	57M-03-01X	57M-03-02X	57M-03-03X	57M-03-04X	57M-03-05X	57M-03-05X Duplicate	57M-03-06X	SUMP-1	SUMP-2	SUMP-3
EPH (MADEP)	C11-C22 Aromatics (Unadjusted)	µg/L	200	NS	106 U	111 U	109 U	106 U	110 U	105 U	106 U	103 U	104 U	111 U
EPH (MADEP)	C11-C22 Aromatics, Adjusted	µg/L	200	NS	106 U	111 U	109 U	106 U	110 U	105 U	106 U	103 U	104 U	111 U
EPH (MADEP)	Chrysene	µg/L	2	NS	0.426 U	0.444 U	0.435 U	0.462 U	0.44 U	0.426 U	0.426 U	0.412 U	0.417 U	0.444 U
EPH (MADEP)	Dibenzo(a,h)anthracene	µg/L	0.5	NS	0.426 U	0.444 U	0.435 U	0.462 U	0.44 U	0.426 U	0.426 U	0.412 U	0.417 U	0.444 U
EPH (MADEP)	Fluoranthene	µg/L	90	NS	0.426 U	0.444 U	0.435 U	0.462 U	0.44 U	0.426 U	0.426 U	0.412 U	0.417 U	0.444 U
EPH (MADEP)	Fluorene	µg/L	300	NS	0.426 U	0.444 U	0.435 U	0.462 U	0.44 U	0.426 U	0.426 U	0.412 U	0.417 U	0.444 U
EPH (MADEP)	Indeno(1,2,3-cd)Pyrene	µg/L	0.5	NS	0.426 U	0.444 U	0.435 U	0.462 U	0.44 U	0.426 U	0.426 U	0.412 U	0.417 U	0.444 U
EPH (MADEP)	Naphthalene	µg/L	140	NS	0.426 U	0.444 U	0.435 U	0.462 U	0.44 U	0.426 U	0.426 U	0.412 U	0.417 U	0.444 U
EPH (MADEP)	Phenanthrene	µg/L	50	NS	0.426 U	0.444 U	0.435 U	0.462 U	0.44 U	0.426 U	0.426 U	0.412 U	0.417 U	0.444 U
EPH (MADEP)	Pyrene	µg/L	20	NS	0.426 U	0.444 U	0.435 U	0.462 U	0.44 U	0.426 U	0.426 U	0.412 U	0.417 U	0.444 U
Field Parameter	ORP	mV	NS	NS	459.1	-81.1	35.1	241.5	-30.2	NA	209.9	-77.3	-118.9	-52.5
Field Parameter	Dissolved Oxygen	mg/L	NS	NS	8.96	0.26	0.63	1.85	0.7	NA	4.24	0.53	1.16	0.6
Field Parameter	Turbidity	NTU	NS	NS	0.70	3.6	0.20	NA	1.80	2.3	1.8	NM	NM	NM

Notes:

[1] From the MCP GW1 Standards (310 CMR 40 Subpart P) unless identified as from the ROD.

[2] From the RI.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

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Method	Analyte	Units	Cleanup Goal[1]	Background[2]	SUMP-4	57WP-05-01	57-AREA2-SW2	57-AREA2-SW2 Duplicate	57-AREA2-SW3	57-AREA3-SW1	57M-95-03X	57M-96-09X	57M-96-11X	57M-96-11X Duplicate
Metals - 6010B	Arsenic, Total	µg/L	10	10.5	**23**	3 J	4.2 J	2.9 J	7	34 J	7	5 U	**163**	**163**
Metals - 6010B	Cadmium, Total	µg/L	5	4.01	5 U	NC	5 U	5 U	5 U	5 U	2 J	5 U	5 U	5 U
Metals - 6010B	Iron, Total	µg/L	NS	9,100	1,800	NC	1,100	1,200	740	600	370	34 J	**51,000**	**51,000**
Metals - 6010B	Lead, Total	µg/L	15	4.25	2.1 J	NC	1.8 J	2.2 J	2.8 J	2.3 J	10 U	10 U	10 U	10 U
Metals - 6010B	Manganese, Total	µg/L	NS	291	**630**	NC	**570**	**640**	280	**470**	50	8 J	**2,600**	**2,600**
Metals - 6010B	Arsenic, Dissolved	µg/L	10	10.5	**11**	3 U	3.2 J	2.9 J	4.3 J	5 U	6	5 U	**162**	**162**
Metals - 6010B	Cadmium, Dissolved	µg/L	5	4.01	5 U	NC	5 U	5 U	5 U	5 U	5 U	0.8 J	5 U	5 U
Metals - 6010B	Iron, Dissolved	µg/L	NS	9,100	770	NC	970	930	310	440	240	50 U	**52,000**	**52,000**
Metals - 6010B	Lead, Dissolved	µg/L	15	4.25	10 U	NC	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Metals - 6010B	Manganese, Dissolved	µg/L	NS	291	**660**	NC	**770**	**740**	290	**500**	60	7 J	**2,600**	**2,600**
VOCs - 8260B	1,1,1,2-Tetrachloroethane	µg/L	5	NS	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	1,1,1-Trichloroethane	µg/L	200	NS	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	1,1,2,2-Tetrachloroethane	µg/L	2	NS	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	1,1,2-Trichloroethane	µg/L	5	NS	0.75 U	NC	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
VOCs - 8260B	1,1-Dichloroethane	µg/L	70	NS	0.75 U	NC	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
VOCs - 8260B	1,1-Dichloroethene	µg/L	7	NS	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	1,1-Dichloropropene	µg/L	0.5	NS	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,2,3-Trichlorobenzene	µg/L	NS	NS	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,2,3-Trichloropropane	µg/L	1,000	NS	5 U	NC	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
VOCs - 8260B	1,2,4-Trichlorobenzene	µg/L	70	NS	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,2,4-Trimethylbenzene	µg/L	10,000	NS	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U	53	2.5 U	7.9	7.3
VOCs - 8260B	1,2-Dibromo-3-chloropropane	µg/L	100	NS	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,2-Dibromoethane	µg/L	0.02	NS	2 U	NC	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
VOCs - 8260B	1,2-Dichlorobenzene	µg/L	600	NS	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U	2.4 J	2.5 U	9.7	9.3
VOCs - 8260B	1,2-Dichloroethane	µg/L	0.5	NS	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	1,2-Dichloropropane	µg/L	3	NS	1.8 U	NC	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U
VOCs - 8260B	1,3,5-Trimethylbenzene	µg/L	100	NS	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U	22	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,3-Dichlorobenzene	µg/L	40	NS	2.5 U	NC	0.2 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,3-Dichloropropane	µg/L	5,000	NS	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,4-Dichlorobenzene	µg/L	5 (ROD)	NS	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U	1.4 J	2.5 U	3.7	3.5
VOCs - 8260B	2,2-Dichloropropane	µg/L	NS	NS	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	2-Butanone	µg/L	400	NS	5 U	NC	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
VOCs - 8260B	2-Hexanone	µg/L	1,000	NS	5 U	NC	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
VOCs - 8260B	4-Methyl-2-pentanone	µg/L	350	NS	5 U	NC	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
VOCs - 8260B	4-Isopropyltoluene	µg/L	1,000	NS	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U	2	0.5 U	0.16 J	0.12 J
VOCs - 8260B	Acetone	µg/L	3,000	NS	5 U	NC	2.6 U	5 U	5 U	5 U	12 U	5 U	5 U	5 U
VOCs - 8260B	Benzene	µg/L	5	NS	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Bromobenzene	µg/L	1,000	NS	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	Bromochloromethane	µg/L	NS	NS	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	Bromodichloromethane	µg/L	3	NS	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Bromoform	µg/L	4	NS	2 U	NC	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
VOCs - 8260B	Bromomethane	µg/L	2	NS	1 U	NC	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
VOCs - 8260B	Carbon disulfide	µg/L	1,000	NS	5 U	NC	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
VOCs - 8260B	Carbon tetrachloride	µg/L	2	NS	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Chlorobenzene	µg/L	100	NS	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.58	0.57
VOCs - 8260B	Chloroethane	µg/L	1,000	NS	1 U	NC	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U

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Method	Analyte	Units	Cleanup Goal[1]	Background[2]	SUMP-4	57WP-05-01	57-AREA2-SW2	57-AREA2-SW2 Duplicate	57-AREA2-SW3	57-AREA3-SW1	57M-95-03X	57M-96-09X	57M-96-11X	57M-96-11X Duplicate
VOCs - 8260B	Chloroform	µg/L	5	NS	0.75 U	NC	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
VOCs - 8260B	Chloromethane	µg/L	1,000	NS	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	cis-1,2-Dichloroethene	µg/L	70	NS	0.5 U	NC	0.3 J	0.16 J	0.25 J	0.5 U	0.35 J	0.5 U	3.7	3.7
VOCs - 8260B	cis-1,3-Dichloropropene	µg/L	0.5	NS	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Dibromochloromethane	µg/L	2	NS	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Dibromomethane	µg/L	5,000	NS	5 U	NC	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
VOCs - 8260B	Dichlorodifluoromethane	µg/L	10,000	NS	5 U	NC	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
VOCs - 8260B	Ethylbenzene	µg/L	700	NS	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U	5.9	0.5 U	14	14
VOCs - 8260B	Hexachlorobutadiene	µg/L	0.6	NS	0.6 U	NC	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
VOCs - 8260B	Isopropylbenzene	µg/L	10,000	NS	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U	1.8	0.5 U	2.7	2.6
VOCs - 8260B	Methyl tert butyl ether	µg/L	70	NS	1 U	NC	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
VOCs - 8260B	Methylene chloride	µg/L	5	NS	5 U	NC	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
VOCs - 8260B	n-Butylbenzene	µg/L	NS	NS	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U	1	0.5 U	1.2	1
VOCs - 8260B	n-Propylbenzene	µg/L	1,000	NS	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U	3.8	0.5 U	5.8	5.5
VOCs - 8260B	Naphthalene	µg/L	140	NS	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U	4.4	2.5 U	9.6	9.4
VOCs - 8260B	o-Chlorotoluene	µg/L	1,000	NS	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	o-Xylene	µg/L	NS	NS	1 U	NC	1 U	1 U	1 U	1 U	13	1 U	0.47 J	0.45 J
VOCs - 8260B	m,p-Xylene	µg/L	NS	NS	1 U	NC	1 U	1 U	1 U	1 U	17	1 U	3	2.9
VOCs - 8260B	Total xylenes	µg/L	10,000	NS	1 U	NC	1 U	1 U	1 U	1 U	30	1 U	3.47	3.35
VOCs - 8260B	p-Chlorotoluene	µg/L	1,000	NS	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	sec-Butylbenzene	µg/L	NS	NS	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U	1	0.5 U	1.2	1.2
VOCs - 8260B	Styrene	µg/L	100	NS	1 U	NC	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
VOCs - 8260B	tert-Butylbenzene	µg/L	1,000	NS	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	0.47 J	0.47 J
VOCs - 8260B	Tetrachloroethene	µg/L	5 (ROD)	NS	0.5 U	NC	0.81	0.66	3.1 J	0.5 U	0.44 J	0.22 J	1.1	1
VOCs - 8260B	Toluene	µg/L	1,000	NS	0.75 U	NC	0.75 U	0.75 U	0.75 U	0.75 U	1.2	0.75 U	0.26 J	0.26 J
VOCs - 8260B	trans-1,2-Dichloroethene	µg/L	90	NS	0.75 U	NC	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
VOCs - 8260B	trans-1,3-Dichloropropene	µg/L	0.5	NS	0.5 U	NC	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Trichloroethene	µg/L	5	NS	0.5 U	NC	0.14 J	0.5 U	0.14 J	0.5 U	0.5 U	0.5 U	2.2	2.3
VOCs - 8260B	Trichlorofluoromethane	µg/L	10,000	NS	2.5 U	NC	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	Vinyl chloride	µg/L	2	NS	1 U	NC	1 U	1 U	1 U	1 U	1	1 U	1 U	1 U
PCBs - 8082	Aroclor 1016	µg/L	0.5	NS	0.255 U	NC	0.275 U	0.272 U	0.269 U	0.266 U	0.258 U	0.25 U	0.284 U	0.263 U
PCBs - 8083	Aroclor 1221	µg/L	0.5	NS	0.255 U	NC	0.275 U	0.272 U	0.269 U	0.266 U	0.258 U	0.25 U	0.284 U	0.263 U
PCBs - 8084	Aroclor 1232	µg/L	0.5	NS	0.255 U	NC	0.275 U	0.272 U	0.269 U	0.266 U	0.258 U	0.25 U	0.284 U	0.263 U
PCBs - 8085	Aroclor 1242	µg/L	0.5	NS	0.255 U	NC	0.275 U	0.272 U	0.269 U	0.266 U	0.258 U	0.25 U	0.284 U	0.263 U
PCBs - 8086	Aroclor 1248	µg/L	0.5	NS	0.255 U	NC	0.275 U	0.272 U	0.269 U	0.266 U	0.258 U	0.25 U	0.284 U	0.263 U
PCBs - 8087	Aroclor 1254	µg/L	0.5	NS	0.255 U	NC	0.275 U	0.272 U	0.269 U	0.266 U	0.258 U	0.25 U	0.284 U	0.263 U
PCBs - 8088	Aroclor 1260	µg/L	0.5	NS	0.255 U	NC	0.275 U	0.272 U	0.269 U	0.266 U	0.258 U	0.25 U	0.284 U	0.263 U
EPH (MADEP)	2-Methylnaphthalene	µg/L	10	NS	0.412 U	NC	0.426 U	0.43 U	0.421 U	NC	NC	NC	NC	NC
EPH (MADEP)	Acenaphthene	µg/L	20	NS	0.412 U	NC	0.426 U	0.43 U	0.421 U	NC	NC	NC	NC	NC
EPH (MADEP)	Acenaphthylene	µg/L	300	NS	0.412 U	NC	0.426 U	0.43 U	0.421 U	NC	NC	NC	NC	NC
EPH (MADEP)	Anthracene	µg/L	2,000	NS	0.412 U	NC	0.426 U	0.43 U	0.421 U	NC	NC	NC	NC	NC
EPH (MADEP)	Benzo(a)anthracene	µg/L	1	NS	0.412 U	NC	0.426 U	0.43 U	0.421 U	NC	NC	NC	NC	NC
EPH (MADEP)	Benzo(a)pyrene	µg/L	0.2	NS	0.2 U	NC	0.2 U	0.43 U	0.2 U	NC	NC	NC	NC	NC
EPH (MADEP)	Benzo(b)fluoranthene	µg/L	1	NS	0.412 U	NC	0.426 U	0.43 U	0.421 U	NC	NC	NC	NC	NC
EPH (MADEP)	Benzo(ghi)perylene	µg/L	300	NS	0.412 U	NC	0.426 U	0.43 U	0.421 U	NC	NC	NC	NC	NC
EPH (MADEP)	Benzo(k)fluoranthene	µg/L	1	NS	0.412 U	NC	0.426 U	0.43 U	0.421 U	NC	NC	NC	NC	NC

2006 Groundwater, Surface and Sump Water Analytical Results
Area of Contamination 57 - Areas 2 and 3
June 2006

Method	Analyte	Units	Cleanup Goal[1]	Background[2]	SUMP-4	57WP-05-01	57-AREA2-SW2	57-AREA2-SW2 Duplicate	57-AREA2-SW3	57-AREA3-SW1	57M-95-03X	57M-96-09X	57M-96-11X	57M-96-11X Duplicate
EPH (MADEP)	C11-C22 Aromatics (Unadjusted)	µg/L	200	NS	103 U	NC	106 U	108 U	0.105 U	NC	NC	NC	NC	NC
EPH (MADEP)	C11-C22 Aromatics, Adjusted	µg/L	200	NS	103 U	NC	106 U	108 U	0.105 U	NC	NC	NC	NC	NC
EPH (MADEP)	Chrysene	µg/L	2	NS	0.412 U	NC	0.426 U	0.43 U	0.421 U	NC	NC	NC	NC	NC
EPH (MADEP)	Dibenzo(a,h)anthracene	µg/L	0.5	NS	0.412 U	NC	0.426 U	0.43 U	0.421 U	NC	NC	NC	NC	NC
EPH (MADEP)	Fluoranthene	µg/L	90	NS	0.412 U	NC	0.426 U	0.43 U	0.421 U	NC	NC	NC	NC	NC
EPH (MADEP)	Fluorene	µg/L	300	NS	0.412 U	NC	0.426 U	0.43 U	0.421 U	NC	NC	NC	NC	NC
EPH (MADEP)	Indeno(1,2,3-cd)Pyrene	µg/L	0.5	NS	0.412 U	NC	0.426 U	0.43 U	0.421 U	NC	NC	NC	NC	NC
EPH (MADEP)	Naphthalene	µg/L	140	NS	0.412 U	NC	0.426 U	0.43 U	0.421 U	NC	NC	NC	NC	NC
EPH (MADEP)	Phenanthrene	µg/L	50	NS	0.412 U	NC	0.426 U	0.43 U	0.421 U	NC	NC	NC	NC	NC
EPH (MADEP)	Pyrene	µg/L	20	NS	0.412 U	NC	0.426 U	0.43 U	0.421 U	NC	NC	NC	NC	NC
Field Parameter	ORP	mV	NS	NS	-16.5	57.7	70.5	NA	2.2	70.8	-41.1	17.5	-95.8	NA
Field Parameter	Dissolved Oxygen	mg/L	NS	NS	1.61	2.82	7.28	NA	6.22	3.72	0.98	9.50	0.14	NA
Field Parameter	Turbidity	NTU	NS	NS	NM	3.1	NM	NM	NM	NM	1.95	1.4	8.0	NA

Notes:

[1] From the MCP GW1 Standards (310 CMR 40 Subpart P) unless identified as from the ROD.

[2] From the RI.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

2006 Groundwater, Surface and Sump Water Analytical Results
Area of Contamination 57 - Areas 2 and 3
October 2006

Method	Analyte	Units	Cleanup Goal[1]	Background[2]	57M-03-01X	57M-03-02X	57M-03-03X	57M-03-03X Duplicate	57M-03-04X	57M-03-05X	57M-03-06X
Metals - 6010B	Arsenic, Total	µg/L	10	10.5	5 U	**13**	5 U	NA	6	**11**	5 U
Metals - 6010B	Cadmium, Total	µg/L	5	4.01	5 U	5 U	5 U	NA	5 U	5 U	5 U
Metals - 6010B	Iron, Total	µg/L	NS	9,100	50 U	**28,000**	50 U	NA	150	2,100	50 U
Metals - 6010B	Lead, Total	µg/L	15	4.25	10 U	10 U	10 U	NA	10 U	10 U	10 U
Metals - 6010B	Manganese, Total	µg/L	NS	291	10 U	**2,200**	90	NA	**1,400**	**1,100**	20 U
PCBs - 8082	Aroclor 1016	µg/L	0.5	NS	0.25 U	0.25 U	0.263 U	NA	0.25 U	0.278 U	0.258 U
PCBs - 8082	Aroclor 1221	µg/L	0.5	NS	0.25 U	0.25 U	0.263 U	NA	0.25 U	0.278 U	0.258 U
PCBs - 8082	Aroclor 1232	µg/L	0.5	NS	0.25 U	0.25 U	0.263 U	NA	0.25 U	0.278 U	0.258 U
PCBs - 8082	Aroclor 1242	µg/L	0.5	NS	0.25 U	0.25 U	0.263 U	NA	0.25 U	0.278 U	0.258 U
PCBs - 8082	Aroclor 1248	µg/L	0.5	NS	0.25 U	0.25 U	0.263 U	NA	0.25 U	0.278 U	0.258 U
PCBs - 8082	Aroclor 1254	µg/L	0.5	NS	0.25 U	0.25 U	0.263 U	NA	0.25 U	0.278 U	0.258 U
PCBs - 8082	Aroclor 1260	µg/L	0.5	NS	0.25 U	0.25 U	0.263 U	NA	0.25 U	0.278 U	0.258 U
VOCs - 8260B	1,1,1,2-Tetrachloroethane	µg/L	5	NS	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
VOCs - 8260B	1,1,1-Trichloroethane	µg/L	200	NS	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
VOCs - 8260B	1,1,2,2-Tetrachloroethane	µg/L	2	NS	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
VOCs - 8260B	1,1,2-Trichloroethane	µg/L	5	NS	0.75 U	0.75 U	0.75 U	NA	0.75 U	0.75 U	0.75 U
VOCs - 8260B	1,1-Dichloroethane	µg/L	70	NS	0.75 U	0.75 U	0.75 U	NA	0.75 U	0.75 U	0.75 U
VOCs - 8260B	1,1-Dichloroethene	µg/L	7	NS	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
VOCs - 8260B	1,1-Dichloropropene	µg/L	0.5	NS	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,2,3-Trichlorobenzene	µg/L	NS	NS	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,2,3-Trichloropropane	µg/L	1,000	NS	5 U	5 U	5 U	NA	5 U	5 U	5 U
VOCs - 8260B	1,2,4-Trichlorobenzene	µg/L	70	NS	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,2,4-Trimethylbenzene	µg/L	10,000	NS	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,2-Dibromo-3-chloropropane	µg/L	100	NS	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,2-Dibromoethane	µg/L	0.02	NS	2 U	2 U	2 U	NA	2 U	2 U	2 U
VOCs - 8260B	1,2-Dichlorobenzene	µg/L	600	NS	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,2-Dichloroethane	µg/L	5	NS	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
VOCs - 8260B	1,2-Dichloropropane	µg/L	3	NS	1.8 U	1.8 U	1.8 U	NA	1.8 U	1.8 U	1.8 U
VOCs - 8260B	1,3,5-Trimethylbenzene	µg/L	100	NS	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,3-Dichlorobenzene	µg/L	40	NS	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,3-Dichloropropane	µg/L	5,000	NS	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,4-Dichlorobenzene	µg/L	5 (ROD)	NS	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U	2.5 U
VOCs - 8260B	2,2-Dichloropropane	µg/L	NS	NS	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U	2.5 U
VOCs - 8260B	2-Butanone	µg/L	400	NS	5 U	5 U	5 U	NA	5 U	5 U	5 U
VOCs - 8260B	2-Chlorotoluene	µg/L	1,000	NS	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U	2.5 U
VOCs - 8260B	2-Hexanone	µg/L	1,000	NS	5 U	5 U	5 U	NA	5 U	5 U	5 U
VOCs - 8260B	4-Chlorotoluene	µg/L	NS	NS	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U	2.5 U
VOCs - 8260B	4-Isopropyltoluene	µg/L	1,000	NS	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
VOCs - 8260B	4-Methyl-2-pentanone	µg/L	350	NS	5 U	5 U	5 U	NA	5 U	5 U	5 U
VOCs - 8260B	Acetone	µg/L	3,000	NS	5 U	29	11 U	NA	46	10 U	39
VOCs - 8260B	Benzene	µg/L	5	NS	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Bromobenzene	µg/L	1,000	NS	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U	2.5 U
VOCs - 8260B	Bromochloromethane	µg/L	NS	NS	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U	2.5 U
VOCs - 8260B	Bromodichloromethane	µg/L	3	NS	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Bromoform	µg/L	4	NS	2 U	2 U	2 U	NA	2 U	2 U	2 U
VOCs - 8260B	Bromomethane	µg/L	2	NS	1 U	1 U	1 U	NA	1 U	1 U	1 U

2006 Groundwater, Surface and Sump Water Analytical Results
Area of Contamination 57 - Areas 2 and 3
October 2006

Method	Analyte	Units	Cleanup Goal[1]	Background[2]	57M-03-01X	57M-03-02X	57M-03-03X	57M-03-03X Duplicate	57M-03-04X	57M-03-05X	57M-03-06X
VOCs - 8260B	Carbon disulfide	µg/L	1,000	NS	5 U	5 U	5 U	NA	5 U	5 U	5 U
VOCs - 8260B	Carbon tetrachloride	µg/L	2	NS	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Chlorobenzene	µg/L	100	NS	0.5 U	0.5 U	0.5 U	NA	0.2 J	0.5 U	0.5 U
VOCs - 8260B	Chloroethane	µg/L	1,000	NS	1 U	1 U	1 U	NA	1 U	1 U	1 U
VOCs - 8260B	Chloroform	µg/L	5	NS	0.75 U	0.75 U	0.75 U	NA	0.75 U	0.75 U	0.75 U
VOCs - 8260B	Chloromethane	µg/L	1,000	NS	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U	2.5 U
VOCs - 8260B	cis-1,2-Dichloroethene	µg/L	70	NS	0.5 U	9.2	0.13 J	NA	0.5 U	0.5 U	0.5 U
VOCs - 8260B	cis-1,3-Dichloropropene	µg/L	0.5	NS	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Dibromochloromethane	µg/L	2	NS	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Dibromomethane	µg/L	5,000	NS	5 U	5 U	5 U	NA	5 U	5 U	5 U
VOCs - 8260B	Dichlorodifluoromethane	µg/L	10,000	NS	5 U	5 U	5 U	NA	5 U	5 U	5 U
VOCs - 8260B	Ethylbenzene	µg/L	700	NS	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Hexachlorobutadiene	µg/L	0.6	NS	1 U	1 U	1 U	NA	1 U	1 U	1 U
VOCs - 8260B	Isopropylbenzene	µg/L	10,000	NS	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
VOCs - 8260B	m,p-Xylene	µg/L	NS	NS	1 U	1 U	1 U	NA	1 U	1 U	1 U
VOCs - 8260B	o-Xylene	µg/L	NS	NS	1 U	1 U	1 U	NA	1 U	1 U	1 U
VOCs - 8260B	Total xylenes	µg/L	10,000	NS	1 U	1 U	1 U	NA	1 U	1 U	1 U
VOCs - 8260B	Methyl tert-butyl ether	µg/L	70	NS	1 U	1 U	1 U	NA	1 U	1 U	1 U
VOCs - 8260B	Methylene chloride	µg/L	5	NS	5 U	5 U	5 U	NA	5 U	5 U	5 U
VOCs - 8260B	Naphthalene	µg/L	140	NS	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U	2.5 U
VOCs - 8260B	n-Butylbenzene	µg/L	NS	NS	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
VOCs - 8260B	n-Propylbenzene	µg/L	1,000	NS	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
VOCs - 8260B	sec-Butylbenzene	µg/L	NS	NS	0.5 U	0.5 U	0.74	NA	0.14 J	0.5 U	0.5 U
VOCs - 8260B	Styrene	µg/L	100	NS	1 U	1 U	1 U	NA	1 U	1 U	1 U
VOCs - 8260B	tert-Butylbenzene	µg/L	1,000	NS	2.5 U	2.5 U	0.31 J	NA	2.5 U	2.5 U	2.5 U
VOCs - 8260B	Tetrachloroethene	µg/L	5 (ROD)	NS	0.5 U	0.84	1.2	NA	0.2 J	0.5 U	0.5 U
VOCs - 8260B	Toluene	µg/L	1,000	NS	0.75 U	0.75 U	0.75 U	NA	0.75 U	0.75 U	0.75 U
VOCs - 8260B	trans-1,2-Dichloroethene	µg/L	90	NS	0.75 U	0.21 J	0.75 U	NA	0.75 U	0.75 U	0.75 U
VOCs - 8260B	trans-1,3-Dichloropropene	µg/L	0.5	NS	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Trichloroethene	µg/L	5	NS	0.5 U	3.3	0.37 J	NA	0.18 J	0.5 U	0.5 U
VOCs - 8260B	Trichlorofluoromethane	µg/L	10,000	NS	0.58 J	2.5 U	2.5 U	NA	2.5 U	2.5 U	2.5 U
VOCs - 8260B	Vinyl chloride	µg/L	2	NS	1 U	0.43 J	1 U	NA	1 U	1 U	1 U
EPH (MADEP)	2-Methylnaphthalene	µg/L	10	NS	0.44 U	0.426 U	0.421 U	0.417 U	0.426 U	0.426 U	0.4 U
EPH (MADEP)	Acenaphthene	µg/L	20	NS	0.44 U	0.426 U	0.421 U	0.417 U	0.426 U	0.426 U	0.4 U
EPH (MADEP)	Acenaphthylene	µg/L	300	NS	0.44 U	0.426 U	0.421 U	0.417 U	0.426 U	0.426 U	0.4 U
EPH (MADEP)	Anthracene	µg/L	2,000	NS	0.44 U	0.426 U	0.421 U	0.417 U	0.426 U	0.426 U	0.4 U
EPH (MADEP)	Benzo(a)anthracene	µg/L	1	NS	0.44 U	0.426 U	0.421 U	0.417 U	0.426 U	0.426 U	0.4 U
EPH (MADEP)	Benzo(a)pyrene	µg/L	0.2	NS	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
EPH (MADEP)	Benzo(b)fluoranthene	µg/L	1	NS	0.44 U	0.426 U	0.421 U	0.417 U	0.426 U	0.426 U	0.4 U
EPH (MADEP)	Benzo(g,h,i)perylene	µg/L	300	NS	0.171 J	0.426 U	0.421 U	0.417 U	0.426 U	0.426 U	0.4 U
EPH (MADEP)	Benzo(k)fluoranthene	µg/L	1	NS	0.44 U	0.426 U	0.421 U	0.417 U	0.426 U	0.426 U	0.4 U
EPH (MADEP)	C11-C22 Aromatics (Adjusted)	µg/L	200	NS	110 U	106 U	105 U	104 U	106 U	106 U	100 U
EPH (MADEP)	C11-C22 Aromatics (Unadjusted)	µg/L	200	NS	110 U	106 U	105 U	104 U	106 U	106 U	100 U
EPH (MADEP)	Chrysene	µg/L	2	NS	0.44 U	0.426 U	0.421 U	0.417 U	0.426 U	0.426 U	0.4 U
EPH (MADEP)	Dibenzo(a,h)anthracene	µg/L	0.5	NS	0.144 J	0.426 U	0.421 U	0.417 U	0.426 U	0.426 U	0.4 U
EPH (MADEP)	Fluoranthene	µg/L	90	NS	0.44 U	0.426 U	0.421 U	0.417 U	0.426 U	0.426 U	0.4 U

2006 Groundwater, Surface and Sump Water Analytical Results
Area of Contamination 57 - Areas 2 and 3
October 2006

Method	Analyte	Units	Cleanup Goal[1]	Background[2]	57M-03-01X	57M-03-02X	57M-03-03X	57M-03-03X Duplicate	57M-03-04X	57M-03-05X	57M-03-06X
EPH (MADEP)	Fluorene	µg/L	300	NS	0.44 U	0.426 U	0.421 U	0.417 U	0.426 U	0.426 U	0.4 U
EPH (MADEP)	Indeno(1,2,3-cd)pyrene	µg/L	0.5	NS	0.168 J	0.426 U	0.421 U	0.417 U	0.426 U	0.426 U	0.4 U
EPH (MADEP)	Naphthalene	µg/L	140	NS	0.44 U	0.426 U	0.421 U	0.417 U	0.426 U	0.426 U	0.4 U
EPH (MADEP)	Phenanthrene	µg/L	50	NS	0.44 U	0.426 U	0.421 U	0.417 U	0.426 U	0.426 U	0.4 U
EPH (MADEP)	Pyrene	µg/L	20	NS	0.44 U	0.426 U	0.421 U	0.417 U	0.426 U	0.426 U	0.4 U
Field Parameter	ORP	mV	NS	NS	267.8	19.8	258.7	NA	158.2	51.7	288.3
Field Parameter	Dissolved Oxygen	mg/L	NS	NS	7.72	0.42	0.40	NA	0.30	0.19	4.00
Field Parameter	Turbidity	NTU	NS	NS	0.0	3.98	0.16	NA	1.00	1.3	0.25

Notes:
[1] From the MCP GW1 Standards (310 CMR 40 Subpart P) unless identified as from the ROD.
[2] From the RI.
All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

2006 Groundwater, Surface and Sump Water Analytical Results
Area of Contamination 57 - Areas 2 and 3
October 2006

Method	Analyte	Units	Cleanup Goal[1]	Background[2]	SUMP-1	SUMP-2	SUMP-3	SUMP-4	57WP-05-01	57-AREA2-SW2	57-AREA2-SW2 Duplicate
Metals - 6010B	Arsenic, Total	µg/L	10	10.5	9	**17**	**20**	**37**	5 U	5 U	5 U
Metals - 6010B	Cadmium, Total	µg/L	5	4.01	5 U	5 U	5 U	5 U	NA	5 U	5 U
Metals - 6010B	Iron, Total	µg/L	NS	9,100	100 U	1,400	2,900	4,800	NA	480	600
Metals - 6010B	Lead, Total	µg/L	15	4.25	10 U	10 U	10 U	10 U	NA	1.9 J	10 U
Metals - 6010B	Manganese, Total	µg/L	NS	291	**600**	**1,600**	**1,700**	**2,400**	NA	90	80
PCBs - 8082	Aroclor 1016	µg/L	0.5	NS	0.266 U	0.272 U	0.287 U	0.278 U	NA	0.258 U	0.272 U
PCBs - 8082	Aroclor 1221	µg/L	0.5	NS	0.266 U	0.272 U	0.287 U	0.278 U	NA	0.258 U	0.272 U
PCBs - 8082	Aroclor 1232	µg/L	0.5	NS	0.266 U	0.272 U	0.287 U	0.278 U	NA	0.258 U	0.272 U
PCBs - 8082	Aroclor 1242	µg/L	0.5	NS	0.266 U	0.272 U	0.287 U	0.278 U	NA	0.258 U	0.272 U
PCBs - 8082	Aroclor 1248	µg/L	0.5	NS	0.266 U	0.272 U	0.287 U	0.278 U	NA	0.258 U	0.272 U
PCBs - 8082	Aroclor 1254	µg/L	0.5	NS	0.266 U	0.272 U	0.287 U	0.278 U	NA	0.258 U	0.272 U
PCBs - 8082	Aroclor 1260	µg/L	0.5	NS	0.266 U	0.272 U	0.287 U	0.278 U	NA	0.258 U	0.272 U
VOCs - 8260B	1,1,1,2-Tetrachloroethane	µg/L	5	NS	0.5 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U
VOCs - 8260B	1,1,1-Trichloroethane	µg/L	200	NS	0.5 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U
VOCs - 8260B	1,1,2,2-Tetrachloroethane	µg/L	2	NS	0.5 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U
VOCs - 8260B	1,1,2-Trichloroethane	µg/L	5	NS	0.75 U	0.75 U	0.75 U	0.75 U	NA	0.75 U	0.75 U
VOCs - 8260B	1,1-Dichloroethane	µg/L	70	NS	0.75 U	0.75 U	0.75 U	0.75 U	NA	0.75 U	0.75 U
VOCs - 8260B	1,1-Dichloroethene	µg/L	7	NS	0.5 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U
VOCs - 8260B	1,1-Dichloropropene	µg/L	0.5	NS	2.5 U	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U
VOCs - 8260B	1,2,3-Trichlorobenzene	µg/L	NS	NS	2.5 U	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U
VOCs - 8260B	1,2,3-Trichloropropane	µg/L	1,000	NS	5 U	5 U	5 U	5 U	NA	5 U	5 U
VOCs - 8260B	1,2,4-Trichlorobenzene	µg/L	70	NS	2.5 U	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U
VOCs - 8260B	1,2,4-Trimethylbenzene	µg/L	10,000	NS	2.5 U	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U
VOCs - 8260B	1,2-Dibromo-3-chloropropane	µg/L	100	NS	2.5 U	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U
VOCs - 8260B	1,2-Dibromoethane	µg/L	0.02	NS	2 U	2 U	2 U	2 U	NA	2 U	2 U
VOCs - 8260B	1,2-Dichlorobenzene	µg/L	600	NS	2.5 U	0.2 J	2.5 U	2.5 U	NA	2.5 U	2.5 U
VOCs - 8260B	1,2-Dichloroethane	µg/L	5	NS	0.5 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U
VOCs - 8260B	1,2-Dichloropropane	µg/L	3	NS	1.8 U	1.8 U	1.8 U	1.8 U	NA	1.8 U	1.8 U
VOCs - 8260B	1,3,5-Trimethylbenzene	µg/L	100	NS	2.5 U	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U
VOCs - 8260B	1,3-Dichlorobenzene	µg/L	40	NS	2.5 U	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U
VOCs - 8260B	1,3-Dichloropropane	µg/L	5,000	NS	2.5 U	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U
VOCs - 8260B	1,4-Dichlorobenzene	µg/L	5 (ROD)	NS	2.5 U	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U
VOCs - 8260B	2,2-Dichloropropane	µg/L	NS	NS	2.5 U	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U
VOCs - 8260B	2-Butanone	µg/L	400	NS	5 U	5 U	5 U	5 U	NA	5 U	5 U
VOCs - 8260B	2-Chlorotoluene	µg/L	1,000	NS	2.5 U	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U
VOCs - 8260B	2-Hexanone	µg/L	1,000	NS	5 U	5 U	5 U	5 U	NA	5 U	5 U
VOCs - 8260B	4-Chlorotoluene	µg/L	NS	NS	2.5 U	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U
VOCs - 8260B	4-Isopropyltoluene	µg/L	1,000	NS	0.5 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U
VOCs - 8260B	4-Methyl-2-pentanone	µg/L	350	NS	5 U	5 U	5 U	5 U	NA	5 U	5 U
VOCs - 8260B	Acetone	µg/L	3,000	NS	5 U	5 U	5 U	5 U	NA	5 U	5 U
VOCs - 8260B	Benzene	µg/L	5	NS	0.5 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U
VOCs - 8260B	Bromobenzene	µg/L	1,000	NS	2.5 U	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U
VOCs - 8260B	Bromochloromethane	µg/L	NS	NS	2.5 U	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U
VOCs - 8260B	Bromodichloromethane	µg/L	3	NS	0.5 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U
VOCs - 8260B	Bromoform	µg/L	4	NS	2 U	2 U	2 U	2 U	NA	2 U	2 U
VOCs - 8260B	Bromomethane	µg/L	2	NS	1 U	1 U	1 U	1 U	NA	1 U	1 U

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Method	Analyte	Units	Cleanup Goal[1]	Background[2]	SUMP-1	SUMP-2	SUMP-3	SUMP-4	57WP-05-01	57-AREA2-SW2	57-AREA2-SW2 Duplicate
VOCs - 8260B	Carbon disulfide	µg/L	1,000	NS	5 U	5 U	5 U	5 U	NA	5 U	5 U
VOCs - 8260B	Carbon tetrachloride	µg/L	2	NS	0.5 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U
VOCs - 8260B	Chlorobenzene	µg/L	100	NS	0.5 U	0.26 J	0.5 U	0.5 U	NA	0.5 U	0.5 U
VOCs - 8260B	Chloroethane	µg/L	1,000	NS	1 U	1 U	1 U	1 U	NA	1 U	1 U
VOCs - 8260B	Chloroform	µg/L	5	NS	0.75 U	0.75 U	0.75 U	0.75 U	NA	0.75 U	0.75 U
VOCs - 8260B	Chloromethane	µg/L	1,000	NS	2.5 U	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U
VOCs - 8260B	cis-1,2-Dichloroethene	µg/L	70	NS	0.5 U	0.8	0.62	1.5	NA	0.5 U	0.5 U
VOCs - 8260B	cis-1,3-Dichloropropene	µg/L	0.5	NS	0.5 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U
VOCs - 8260B	Dibromochloromethane	µg/L	2	NS	0.5 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U
VOCs - 8260B	Dibromomethane	µg/L	5,000	NS	5 U	5 U	5 U	5 U	NA	5 U	5 U
VOCs - 8260B	Dichlorodifluoromethane	µg/L	10,000	NS	5 U	5 U	5 U	5 U	NA	5 U	5 U
VOCs - 8260B	Ethylbenzene	µg/L	700	NS	0.5 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U
VOCs - 8260B	Hexachlorobutadiene	µg/L	0.6	NS	1 U	1 U	1 U	1 U	NA	1 U	1 U
VOCs - 8260B	Isopropylbenzene	µg/L	10,000	NS	0.5 U	0.11 J	0.5 U	0.5 U	NA	0.5 U	0.5 U
VOCs - 8260B	m,p-Xylene	µg/L	NS	NS	1 U	1 U	1 U	1 U	NA	1 U	1 U
VOCs - 8260B	o-Xylene	µg/L	NS	NS	1 U	1 U	1 U	1 U	NA	1 U	1 U
VOCs - 8260B	Total xylenes	µg/L	10,000	NS	1 U	1 U	1 U	1 U	NA	1 U	1 U
VOCs - 8260B	Methyl tert-butyl ether	µg/L	70	NS	1 U	1 U	1 U	1 U	NA	1 U	1 U
VOCs - 8260B	Methylene chloride	µg/L	5	NS	5 U	5 U	5 U	5 U	NA	5 U	5 U
VOCs - 8260B	Naphthalene	µg/L	140	NS	2.5 U	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U
VOCs - 8260B	n-Butylbenzene	µg/L	NS	NS	0.5 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U
VOCs - 8260B	n-Propylbenzene	µg/L	1,000	NS	0.5 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U
VOCs - 8260B	sec-Butylbenzene	µg/L	NS	NS	0.5 U	0.17 J	0.5 U	0.22 J	NA	0.5 U	0.5 U
VOCs - 8260B	Styrene	µg/L	100	NS	1 U	1 U	1 U	1 U	NA	1 U	1 U
VOCs - 8260B	tert-Butylbenzene	µg/L	1,000	NS	2.5 U	2.5 U	2.5 U	2.5 U	NA	2.5 U	2.5 U
VOCs - 8260B	Tetrachloroethene	µg/L	5 (ROD)	NS	0.5 U	0.5 U	0.5 U	0.5 U	NA	1.5	1.4
VOCs - 8260B	Toluene	µg/L	1,000	NS	0.75 U	0.75 U	0.75 U	0.75 U	NA	0.75 U	0.75 U
VOCs - 8260B	trans-1,2-Dichloroethene	µg/L	90	NS	0.75 U	0.75 U	0.75 U	0.75 U	NA	0.75 U	0.75 U
VOCs - 8260B	trans-1,3-Dichloropropene	µg/L	0.5	NS	0.5 U	0.5 U	0.5 U	0.5 U	NA	0.5 U	0.5 U
VOCs - 8260B	Trichloroethene	µg/L	5	NS	0.5 U	0.5 U	0.5 U	0.24 J	NA	0.18 J	0.5 U
VOCs - 8260B	Trichlorofluoromethane	µg/L	10,000	NS	2.5 U	2.5 U	2.5 U	2.5 U	NA	0.34 J	0.28 J
VOCs - 8260B	Vinyl chloride	µg/L	2	NS	1 U	1 U	1 U	1 U	NA	1 U	1 U
EPH (MADEP)	2-Methylnaphthalene	µg/L	10	NS	0.426 U	0.426 U	0.426 U	0.421 U	NA	0.435 U	0.404 U
EPH (MADEP)	Acenaphthene	µg/L	20	NS	0.426 U	0.426 U	0.426 U	0.421 U	NA	0.435 U	0.404 U
EPH (MADEP)	Acenaphthylene	µg/L	300	NS	0.426 U	0.426 U	0.426 U	0.421 U	NA	0.435 U	0.404 U
EPH (MADEP)	Anthracene	µg/L	2,000	NS	0.426 U	0.426 U	0.426 U	0.421 U	NA	0.435 U	0.404 U
EPH (MADEP)	Benzo(a)anthracene	µg/L	1	NS	0.426 U	0.426 U	0.426 U	0.421 U	NA	0.435 U	0.404 U
EPH (MADEP)	Benzo(a)pyrene	µg/L	0.2	NS	0.2 U	0.2 U	0.2 U	0.2 U	NA	0.2 U	0.2 U
EPH (MADEP)	Benzo(b)fluoranthene	µg/L	1	NS	0.426 U	0.426 U	0.426 U	0.421 U	NA	0.435 U	0.404 U
EPH (MADEP)	Benzo(g,h,i)perylene	µg/L	300	NS	0.426 U	0.426 U	0.426 U	0.421 U	NA	0.435 U	0.404 U
EPH (MADEP)	Benzo(k)fluoranthene	µg/L	1	NS	0.426 U	0.426 U	0.426 U	0.421 U	NA	0.435 U	0.404 U
EPH (MADEP)	C11-C22 Aromatics (Adjusted)	µg/L	200	NS	106 U	106 U	106 U	105 U	NA	109 U	101 U
EPH (MADEP)	C11-C22 Aromatics (Unadjusted)	µg/L	200	NS	106 U	106 U	106 U	105 U	NA	109 U	101 U
EPH (MADEP)	Chrysene	µg/L	2	NS	0.426 U	0.426 U	0.426 U	0.421 U	NA	0.435 U	0.404 U
EPH (MADEP)	Dibenzo(a,h)anthracene	µg/L	0.5	NS	0.426 U	0.426 U	0.426 U	0.421 U	NA	0.435 U	0.404 U
EPH (MADEP)	Fluoranthene	µg/L	90	NS	0.426 U	0.426 U	0.426 U	0.421 U	NA	0.435 U	0.404 U

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Method	Analyte	Units	Cleanup Goal[1]	Background[2]	SUMP-1	SUMP-2	SUMP-3	SUMP-4	57WP-05-01	57-AREA2-SW2	57-AREA2-SW2 Duplicate
EPH (MADEP)	Fluorene	µg/L	300	NS	0.426 U	0.426 U	0.426 U	0.421 U	NA	0.435 U	0.404 U
EPH (MADEP)	Indeno(1,2,3-cd)pyrene	µg/L	0.5	NS	0.426 U	0.426 U	0.426 U	0.421 U	NA	0.435 U	0.404 U
EPH (MADEP)	Naphthalene	µg/L	140	NS	0.426 U	0.426 U	0.426 U	0.421 U	NA	0.435 U	0.404 U
EPH (MADEP)	Phenanthrene	µg/L	50	NS	0.426 U	0.426 U	0.426 U	0.421 U	NA	0.435 U	0.404 U
EPH (MADEP)	Pyrene	µg/L	20	NS	0.426 U	0.426 U	0.426 U	0.421 U	NA	0.435 U	0.404 U
Field Parameter	ORP	mV	NS	NS	26	30.3	81.4	45.1	-0.2	149.8	NA
Field Parameter	Dissolved Oxygen	mg/L	NS	NS	2.31	1.05	1.21	1.10	0.73	3.36	NA
Field Parameter	Turbidity	NTU	NS	NS	2.56	13.8	16.0	23.8	0.51	16.2	NM

Notes:
[1] From the MCP GW1 Standards (310 CMR 40 Subpart P) unless identified as from the ROD.
[2] From the RI.
All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

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Method	Analyte	Units	Cleanup Goal[1]	Background[2]	57-AREA2-SW3	57-AREA3-SW1	57M-95-03X	57M-96-09X	57M-96-11X	57M-96-11X Duplicate
Metals - 6010B	Arsenic, Total	µg/L	10	10.5	**46**	6	**49**	5 U	**171**	**174**
Metals - 6010B	Cadmium, Total	µg/L	5	4.01	5 U	5 U	5 U	5 U	5 U	5 U
Metals - 6010B	Iron, Total	µg/L	NS	9,100	8,300	4,500	3,400	50 U	**41,000**	**42,000**
Metals - 6010B	Lead, Total	µg/L	15	4.25	10 U	10 U	10 U	10 U	10 U	10 U
Metals - 6010B	Manganese, Total	µg/L	NS	291	**1,300**	**910**	170	10 U	**2,200**	**2,300**
PCBs - 8082	Aroclor 1016	µg/L	0.5	NS	0.278 U	0.26 U	0.263 U	0.26 U	0.275 U	0.272 U
PCBs - 8082	Aroclor 1221	µg/L	0.5	NS	0.278 U	0.26 U	0.263 U	0.26 U	0.275 U	0.272 U
PCBs - 8082	Aroclor 1232	µg/L	0.5	NS	0.278 U	0.26 U	0.263 U	0.26 U	0.275 U	0.272 U
PCBs - 8082	Aroclor 1242	µg/L	0.5	NS	0.278 U	0.26 U	0.263 U	0.26 U	0.275 U	0.272 U
PCBs - 8082	Aroclor 1248	µg/L	0.5	NS	0.278 U	0.26 U	0.263 U	0.26 U	0.275 U	0.272 U
PCBs - 8082	Aroclor 1254	µg/L	0.5	NS	0.278 U	0.26 U	0.263 U	0.26 U	0.275 U	0.272 U
PCBs - 8082	Aroclor 1260	µg/L	0.5	NS	0.278 U	0.26 U	0.263 U	0.26 U	0.275 U	0.272 U
VOCs - 8260B	1,1,1,2-Tetrachloroethane	µg/L	5	NS	0.5 U	0.5 U	2 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	1,1,1-Trichloroethane	µg/L	200	NS	0.5 U	0.5 U	2 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	1,1,2,2-Tetrachloroethane	µg/L	2	NS	0.5 U	0.5 U	2 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	1,1,2-Trichloroethane	µg/L	5	NS	0.75 U	0.75 U	3 U	0.75 U	0.75 U	0.75 U
VOCs - 8260B	1,1-Dichloroethane	µg/L	70	NS	0.75 U	0.75 U	3 U	0.75 U	0.75 U	0.75 U
VOCs - 8260B	1,1-Dichloroethene	µg/L	7	NS	0.5 U	0.5 U	2 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	1,1-Dichloropropene	µg/L	0.5	NS	2.5 U	2.5 U	10 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,2,3-Trichlorobenzene	µg/L	NS	NS	2.5 U	2.5 U	10 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,2,3-Trichloropropane	µg/L	1,000	NS	5 U	5 U	20 U	5 U	5 U	5 U
VOCs - 8260B	1,2,4-Trichlorobenzene	µg/L	70	NS	2.5 U	2.5 U	10 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,2,4-Trimethylbenzene	µg/L	10,000	NS	2.5 U	2.5 U	230	2.5 U	3.5	3.3
VOCs - 8260B	1,2-Dibromo-3-chloropropane	µg/L	100	NS	2.5 U	2.5 U	10 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,2-Dibromoethane	µg/L	0.02	NS	2 U	2 U	8 U	2 U	2 U	2 U
VOCs - 8260B	1,2-Dichlorobenzene	µg/L	600	NS	0.71 J	2.5 U	8.1 J	2.5 U	5.5	5.2
VOCs - 8260B	1,2-Dichloroethane	µg/L	5	NS	0.5 U	0.5 U	2 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	1,2-Dichloropropane	µg/L	3	NS	1.8 U	1.8 U	7 U	1.8 U	1.8 U	1.8 U
VOCs - 8260B	1,3,5-Trimethylbenzene	µg/L	100	NS	2.5 U	2.5 U	90	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,3-Dichlorobenzene	µg/L	40	NS	2.5 U	2.5 U	10 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,3-Dichloropropane	µg/L	5,000	NS	2.5 U	2.5 U	10 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	1,4-Dichlorobenzene	µg/L	5 (ROD)	NS	2.5 U	2.5 U	4.5 J	2.5 U	2.4 J	2.3 J
VOCs - 8260B	2,2-Dichloropropane	µg/L	NS	NS	2.5 U	2.5 U	10 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	2-Butanone	µg/L	400	NS	5 U	5 U	20 U	5 U	5 U	5 U
VOCs - 8260B	2-Chlorotoluene	µg/L	1,000	NS	2.5 U	2.5 U	10 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	2-Hexanone	µg/L	1,000	NS	5 U	5 U	20 U	5 U	5 U	5 U
VOCs - 8260B	4-Chlorotoluene	µg/L	NS	NS	2.5 U	2.5 U	10 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	4-Isopropyltoluene	µg/L	1,000	NS	0.5 U	0.45 J	5.7	0.5 U	0.5 U	0.5 U
VOCs - 8260B	4-Methyl-2-pentanone	µg/L	350	NS	5 U	5 U	20 U	5 U	5 U	5 U
VOCs - 8260B	Acetone	µg/L	3,000	NS	5 U	6.6 U	20 U	5 U	5 U	5 U
VOCs - 8260B	Benzene	µg/L	5	NS	0.5 U	0.5 U	2 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Bromobenzene	µg/L	1,000	NS	2.5 U	2.5 U	10 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	Bromochloromethane	µg/L	NS	NS	2.5 U	2.5 U	10 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	Bromodichloromethane	µg/L	3	NS	0.5 U	0.5 U	2 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Bromoform	µg/L	4	NS	2 U	2 U	8 U	2 U	2 U	2 U
VOCs - 8260B	Bromomethane	µg/L	2	NS	1 U	1 U	4 U	1 U	1 U	1 U

2006 Groundwater, Surface and Sump Water Analytical Results
Area of Contamination 57 - Areas 2 and 3
October 2006

Method	Analyte	Units	Cleanup Goal[1]	Background[2]	57-AREA2-SW3	57-AREA3-SW1	57M-95-03X	57M-96-09X	57M-96-11X	57M-96-11X Duplicate
VOCs - 8260B	Carbon disulfide	µg/L	1,000	NS	5 U	5 U	20 U	5 U	5 U	5 U
VOCs - 8260B	Carbon tetrachloride	µg/L	2	NS	0.5 U	0.5 U	2 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Chlorobenzene	µg/L	100	NS	0.28 J	0.14 J	2 U	0.5 U	0.17 J	0.16 J
VOCs - 8260B	Chloroethane	µg/L	1,000	NS	1 U	1 U	4 U	1 U	1 U	1 U
VOCs - 8260B	Chloroform	µg/L	5	NS	0.75 U	0.75 U	3 U	0.75 U	0.75 U	0.75 U
VOCs - 8260B	Chloromethane	µg/L	1,000	NS	2.5 U	2.5 U	10 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	cis-1,2-Dichloroethene	µg/L	70	NS	1.1	0.5 U	0.81 J	0.5 U	4	3.9
VOCs - 8260B	cis-1,3-Dichloropropene	µg/L	0.5	NS	0.5 U	0.5 U	2 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Dibromochloromethane	µg/L	2	NS	0.5 U	0.5 U	2 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Dibromomethane	µg/L	5,000	NS	5 U	5 U	20 U	5 U	5 U	5 U
VOCs - 8260B	Dichlorodifluoromethane	µg/L	10,000	NS	5 U	5 U	20 U	5 U	5 U	5 U
VOCs - 8260B	Ethylbenzene	µg/L	700	NS	0.5 U	0.5 U	26	0.5 U	9.7	8.3
VOCs - 8260B	Hexachlorobutadiene	µg/L	0.6	NS	1 U	1 U	4 U	1 U	1 U	1 U
VOCs - 8260B	Isopropylbenzene	µg/L	10,000	NS	0.18 J	0.1 J	8	0.5 U	1.8	1.8
VOCs - 8260B	m,p-Xylene	µg/L	NS	NS	1 U	1 U	55	1 U	3.4	2.9
VOCs - 8260B	o-Xylene	µg/L	NS	NS	1 U	1 U	54	1 U	1 U	1 U
VOCs - 8260B	Total xylenes	µg/L	10,000	NS	1 U	1 U	109	1 U	3.4	2.9
VOCs - 8260B	Methyl tert-butyl ether	µg/L	70	NS	1 U	1 U	4 U	1 U	1 U	1 U
VOCs - 8260B	Methylene chloride	µg/L	5	NS	5 U	5 U	20 U	5 U	5 U	5 U
VOCs - 8260B	Naphthalene	µg/L	140	NS	2.5 U	2.5 U	16	2.5 U	4.8	4.6
VOCs - 8260B	n-Butylbenzene	µg/L	NS	NS	0.5 U	0.5 U	2 U	0.5 U	0.74	0.58 U
VOCs - 8260B	n-Propylbenzene	µg/L	1,000	NS	0.5 U	0.5 U	14	0.5 U	3.8	3.3
VOCs - 8260B	sec-Butylbenzene	µg/L	NS	NS	0.36 J	0.5 U	2.6	0.5 U	0.74	0.68
VOCs - 8260B	Styrene	µg/L	100	NS	1 U	1 U	4 U	1 U	1 U	1 U
VOCs - 8260B	tert-Butylbenzene	µg/L	1,000	NS	0.17 J	2.5 U	10 U	2.5 U	0.32 J	0.29 J
VOCs - 8260B	Tetrachloroethene	µg/L	5 (ROD)	NS	0.39 J	0.5 U	1.6 J	0.19 J	0.45 J	0.45 J
VOCs - 8260B	Toluene	µg/L	1,000	NS	0.75 U	0.13 J	7.6	0.75 U	0.75 U	0.75 U
VOCs - 8260B	trans-1,2-Dichloroethene	µg/L	90	NS	0.24 J	0.75 U	3 U	0.75 U	0.75 U	0.75 U
VOCs - 8260B	trans-1,3-Dichloropropene	µg/L	0.5	NS	0.5 U	0.5 U	2 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Trichloroethene	µg/L	5	NS	0.57	0.5 U	2 U	0.5 U	1.3	1.3
VOCs - 8260B	Trichlorofluoromethane	µg/L	10,000	NS	2.5 U	2.5 U	10 U	2.5 U	2.5 U	2.5 U
VOCs - 8260B	Vinyl chloride	µg/L	2	NS	0.37 J	1 U	4 U	1 U	1 U	1 U
EPH (MADEP)	2-Methylnaphthalene	µg/L	10	NS	0.421 U	NA	NA	NA	NA	NA
EPH (MADEP)	Acenaphthene	µg/L	20	NS	0.421 U	NA	NA	NA	NA	NA
EPH (MADEP)	Acenaphthylene	µg/L	300	NS	0.421 U	NA	NA	NA	NA	NA
EPH (MADEP)	Anthracene	µg/L	2,000	NS	0.421 U	NA	NA	NA	NA	NA
EPH (MADEP)	Benzo(a)anthracene	µg/L	1	NS	0.421 U	NA	NA	NA	NA	NA
EPH (MADEP)	Benzo(a)pyrene	µg/L	0.2	NS	0.2 U	NA	NA	NA	NA	NA
EPH (MADEP)	Benzo(b)fluoranthene	µg/L	1	NS	0.421 U	NA	NA	NA	NA	NA
EPH (MADEP)	Benzo(g,h,i)perylene	µg/L	300	NS	0.421 U	NA	NA	NA	NA	NA
EPH (MADEP)	Benzo(k)fluoranthene	µg/L	1	NS	0.421 U	NA	NA	NA	NA	NA
EPH (MADEP)	C11-C22 Aromatics (Adjusted)	µg/L	200	NS	105 U	NA	NA	NA	NA	NA
EPH (MADEP)	C11-C22 Aromatics (Unadjusted)	µg/L	200	NS	105 U	NA	NA	NA	NA	NA
EPH (MADEP)	Chrysene	µg/L	2	NS	0.421 U	NA	NA	NA	NA	NA
EPH (MADEP)	Dibenzo(a,h)anthracene	µg/L	0.5	NS	0.421 U	NA	NA	NA	NA	NA
EPH (MADEP)	Fluoranthene	µg/L	90	NS	0.421 U	NA	NA	NA	NA	NA

2006 Groundwater, Surface and Sump Water Analytical Results
Area of Contamination 57 - Areas 2 and 3
October 2006

Method	Analyte	Units	Cleanup Goal[1]	Background[2]	57-AREA2-SW3	57-AREA3-SW1	57M-95-03X	57M-96-09X	57M-96-11X	57M-96-11X Duplicate
EPH (MADEP)	Fluorene	µg/L	300	NS	0.421 U	NA	NA	NA	NA	NA
EPH (MADEP)	Indeno(1,2,3-cd)pyrene	µg/L	0.5	NS	0.421 U	NA	NA	NA	NA	NA
EPH (MADEP)	Naphthalene	µg/L	140	NS	0.421 U	NA	NA	NA	NA	NA
EPH (MADEP)	Phenanthrene	µg/L	50	NS	0.421 U	NA	NA	NA	NA	NA
EPH (MADEP)	Pyrene	µg/L	20	NS	0.421 U	NA	NA	NA	NA	NA
Field Parameter	ORP	mV	NS	NS	33.1	10.1	-85.2	303.8	-100	NA
Field Parameter	Dissolved Oxygen	mg/L	NS	NS	9.56	3.44	3.11	8.56	0.34	NA
Field Parameter	Turbidity	NTU	NS	NS	4.0	45	1.1	0.0	8.1	NA

Notes:
[1] From the MCP GW1 Standards (310 CMR 40 Subpart P) unless identified as from the ROD.
[2] From the RI.
All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

2007 Surface Water Analytical Results
Area of Contamination 57 - Areas 2 and 3
May 2007 and October 2007

				May 2007 LTM Event								October 2007 LTM Event							
Method	**Analyte**	**Units**	**USEPA Water Quality Criteria ***	**57-AREA2-SW2**	**Qual**	**57-AREA2-SW2 Duplicate**	**Qual**	**57-AREA2-SW3**	**Qual**	**57-AREA3-SW1**	**Qual**	**57-AREA2-SW2**	**Qual**	**57-AREA2-SW2 Duplicate**	**Qual**	**57-AREA2-SW3**	**Qual**	**57-AREA3-SW1**	**Qual**
Metals - SW6010B	Arsenic, Total	µg/L	150	7		5		63		2.7	J	5.0	U	2.4	J	11		9	
Metals - SW6010B	Cadmium, Total[1]	µg/L	0.25	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
Metals - SW6010B	Iron, Total	µg/L	1,000	***3,900***		***3,800***		***4,500***		520		***1,200***		***1,400***		***1,100***		***7,100***	
Metals - SW6010B	Lead, Total[2]	µg/L	2.5	***12***		***11***		***12***		1.8	J	10.0	U	10.0	U	10.0	U	***14***	
Metals - SW6010B	Manganese, Total	µg/L	NS	336		354		494		45		114		111		321		949	
VOCs - 8260B	1,4-Dichlorobenzene	µg/L	NS	2.5	U	2.5	U	2.5	U	0.21	J	2.5	U	2.5	UJ	2.5	U	2.5	UJ
VOCs - 8260B	Chlorobenzene	µg/L	NS	0.5	U	0.5	U	0.5	U	0.14	J	0.5	U	0.5	UJ	0.5	U	0.5	UJ
VOCs - 8260B	Cis-1,2-Dichloroethene	µg/L	NS	0.5	U	0.5	U	0.9		0.5	U	0.5	U	0.28	J	0.21	J	0.5	UJ
VOCs - 8260B	Tetrachloroethene	µg/L	NS	2		2		0.55		0.5	U	0.5	UJ	0.74	J	0.5	U	0.5	UJ
VOCs - 8260B	Trichloroethene	µg/L	NS	0.32	J	0.32	J	0.43	J	0.5	U	0.5	U	0.21	J	0.5	U	0.5	UJ
VOCs - 8260B	Trichlorofluoromethane	µg/L	NS	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	UJ	2.5	U	2.5	UJ
VOCs - 8260B	Vinyl Chloride	µg/L	NS	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	UJ	1.0	U	1.0	UJ
PCBs - 8082	Aroclor 1016[3]	µg/L	0.014	0.255	U	0.266	U	0.263	U	0.255	U	0.255	U	0.255	U	0.252	U	0.252	U
PCBs - 8082	Aroclor 1221[3]	µg/L	0.014	0.255	U	0.266	U	0.263	U	0.255	U	0.255	U	0.255	U	0.252	U	0.252	U
PCBs - 8082	Aroclor 1232[3]	µg/L	0.014	0.255	U	0.266	U	0.263	U	0.255	U	0.255	U	0.255	U	0.252	U	0.252	U
PCBs - 8082	Aroclor 1242[3]	µg/L	0.014	0.255	U	0.266	U	0.263	U	0.255	U	0.255	U	0.255	U	0.252	U	0.252	U
PCBs - 8082	Aroclor 1248[3]	µg/L	0.014	0.255	U	0.266	U	0.263	U	0.255	U	0.255	U	0.255	U	0.252	U	0.252	U
PCBs - 8082	Aroclor 1254[3]	µg/L	0.014	0.255	U	0.266	U	0.263	U	0.255	U	0.255	U	0.255	U	0.252	U	0.252	U
PCBs - 8082	Aroclor 1260[3]	µg/L	0.014	***0.0749***	J	***0.0855***	J	***0.0777***	J	0.255	U	0.255	U	0.255	U	0.252	U	0.3	U
EPH (MADEP)	C11-C22 Aromatics (Unadjusted)	µg/L	NS	108	U	103	U	104	U	NA		100	U	100	U	100	U	102	U
Field Parameters	ORP	mV	NS	114.7		NA		101.9		-21.7		3.7		NA		-1.1		44.9	
Field Parameters	Dissolved Oxygen	mg/L	NS	12.80		NA		8.15		3.84		11.17		NA		11.83		13.63	
Field Parameters	Turbidity	NTU	NS	80.0		NA		55.0		11.0		4.02		NA		4.24		24.1	

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

* = Criterion Continuous Concentration

[1] Reporting limit not meeting USEPA water quality criteria. USEPA water quality criteria cadmium value is below QAPP MDL and PQL.

[2] Reporting limit not meeting USEPA water quality criteria during October 2007 LTM event but is compliant with QAPP.

[3] Reporting limit not meeting USEPA water quality criteria but is compliant with QAPP.

Water Quality Criteria published by USEPA pursuant to Section 304(a) of the Clean Water Act and provide guidance for states and tribes to use in adopting water quality standards.

For Contaminants of Concern (COCs) without Water Quality Criteria a qualitative comparison will be made between the detected concentrations in groundwater and COC concentrations in surface water to determine if groundwater discharge is impacting surface water.

2007 Groundwater and Sump Water Analytical Results
Area of Contamination 57 - Areas 2 and 3
October 2007

Method	Analyte	Units	Cleanup Goal[1]	GW-3 Groundwater Standard	Background[2]	57M-03-01X	Qual	57M-03-02X	Qual	57M-03-03X	Qual	57M-03-04X	Qual	57M-03-05X	Qual	57M-03-06X	Qual	SUMP1	Qual
Metals - SW6010B	Arsenic, Total	µg/L	10	900	10.5	5.0	U	8.0		5.0	U	5.0	U	9		5.0	U	7	
Metals - SW6010B	Cadmium, Total[3]	µg/L	5 (ROD)	4	4.01	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U
Metals - SW6010B	Iron, Total	µg/L	NS	NS	9,100	50.0	U	7,200		50.0	U	50.0	U	1,400		50.0	U	320	
Metals - SW6010B	Lead, Total[3]	µg/L	15	10	4.25	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U
Metals - SW6010B	Manganese, Total	µg/L	NS	NS	291	7.9	J	**1,070**		116		**474**		**1,380**		14		**544**	
VOCs - 8260B	1,4-Dichlorobenzene	µg/L	5 (ROD)	8,000	NS	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U	2.5	U
VOCs - 8260B	Chlorobenzene	µg/L	100	1,000	NS	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
VOCs - 8260B	Cis-1,2-Dichloroethene	µg/L	70	50,000	NS	0.5	U	4.6		0.33	J	0.5	U	0.25	J	0.5	U	0.5	U
VOCs - 8260B	Tetrachloroethene	µg/L	5 (ROD)	30,000	NS	0.5	U	1.5		2.1		0.23	J	0.5	U	0.5	U	0.5	U
VOCs - 8260B	Trichloroethene	µg/L	5	5,000	NS	0.5	U	3.2		0.63		0.5	U	0.5	U	0.5	U	0.5	U
VOCs - 8260B	Vinyl Chloride	µg/L	2	50,000	NS	1.0	U	0.42	J	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
PCBs - 8082	Aroclor 1016	µg/L	0.5	10[4]	NS	0.263	U	0.255	U	0.263	U	0.263	U	0.26	U	0.26	U	0.252	U
PCBs - 8082	Aroclor 1221	µg/L	0.5	10[4]	NS	0.263	U	0.255	U	0.263	U	0.263	U	0.26	U	0.26	U	0.252	U
PCBs - 8082	Aroclor 1232	µg/L	0.5	10[4]	NS	0.263	U	0.255	U	0.263	U	0.263	U	0.26	U	0.26	U	0.252	U
PCBs - 8082	Aroclor 1242	µg/L	0.5	10[4]	NS	0.263	U	0.255	U	0.263	U	0.263	U	0.26	U	0.26	U	0.252	U
PCBs - 8082	Aroclor 1248	µg/L	0.5	10[4]	NS	0.263	U	0.255	U	0.263	U	0.263	U	0.26	U	0.26	U	0.252	U
PCBs - 8082	Aroclor 1254	µg/L	0.5	10[4]	NS	0.263	U	0.255	U	0.263	U	0.263	U	0.26	U	0.26	U	0.252	U
PCBs - 8082	Aroclor 1260	µg/L	0.5	10[4]	NS	0.263	U	0.255	U	0.263	U	0.263	U	0.26	U	0.26	U	0.252	U
EPH (MADEP)	C11-C22 Aromatics (Unadjusted)	µg/L	200	5,000[4]	NS	111	U	100	U	104	U	106	U	101	U	100	U	100	U
Field Parameter	ORP	mV	NS	NS	NS	127.5		-4.8		115.9		64.6		-90.6		172.4		-48.5	
Field Parameter	Dissolved Oxygen	mg/L	NS	NS	NS	5.53		0.45		0.74		0.44		0.18		5.38		11.46	
Field Parameter	Turbidity	NTU	NS	NS	NS	0.00		3.9		0.80		0.15		0.10		0.71		NC	

Notes:

[1] From the MCP "GW-1" Standards (310 CMR 40 Subpart P) unless identified as from the ROD.

[2] From the RI.

[3] Reporting limit above background.

[4] Revised GW-3 standard effective February 14, 2008.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

2007 Groundwater and Sump Water Analytical Results
Area of Contamination 57 - Areas 2 and 3
October 2007

Method	Analyte	Units	Cleanup Goal[1]	GW-3 Groundwater Standard	Background[2]	SUMP2	Qual	SUMP3	Qual	SUMP4	Qual	57WP-05-01	Qual	57M-95-03X	Qual	57M-96-09X	Qual	57M-96-11X	Qual	57M-96-11X 57M-DUP2	Qual
Metals - SW6010B	Arsenic, Total	µg/L	10	900	10.5	**28**		**14**		**62**		5.0	U	**51**		5.0	U	**193**		**195**	
Metals - SW6010B	Cadmium, Total[3]	µg/L	5 (ROD)	4	4.01	5.0	U	5.0	U	5.0	U	NA		5.0	U	5.0	U	5.0	U	5.0	U
Metals - SW6010B	Iron, Total	µg/L	NS	NS	9,100	2,500		1,700		8,400		NA		4,100		50.0	U	**39,000**		**39,000**	
Metals - SW6010B	Lead, Total[3]	µg/L	15	10	4.25	10.0	U	10.0	U	10.0	U	NA		10.0	U	10.0	U	10.0	U	10.0	U
Metals - SW6010B	Manganese, Total	µg/L	NS	NS	291	**1,750**		**2,530**		**3,170**		NA		278		6.6	J	**1,960**		**1,950**	
VOCs - 8260B	1,4-Dichlorobenzene	µg/L	5 (ROD)	8,000	NS	0.22	J	2.5	UJ	2.5	UJ	NA		**13**		2.5	UJ	1.6	J	1.6	J
VOCs - 8260B	Chlorobenzene	µg/L	100	1,000	NS	0.28	J	0.5	UJ	0.5	UJ	NA		0.5	U	0.5	UJ	0.5	UJ	0.5	UJ
VOCs - 8260B	Cis-1,2-Dichloroethene	µg/L	70	50,000	NS	0.62		0.97	J	1.9	J	NA		8.1		0.5	UJ	3	J	3.2	J
VOCs - 8260B	Tetrachloroethene	µg/L	5 (ROD)	30,000	NS	0.5	U	0.5	UJ	0.5	UJ	NA		2.7		0.18	J	0.26	J	0.25	J
VOCs - 8260B	Trichloroethene	µg/L	5	5,000	NS	0.5	U	0.5	UJ	0.51	J	NA		0.74		0.5	UJ	1	J	1	J
VOCs - 8260B	Vinyl Chloride	µg/L	2	50,000	NS	1.0	U	1.0	UJ	1.0	UJ	NA		1.0	U	1.0	UJ	1.0	UJ	1.0	UJ
PCBs - 8082	Aroclor 1016	µg/L	0.5	10^4	NS	0.25	U	0.255	U	0.252	U	NA		0.269	U	0.26	U	0.266	U	0.26	U
PCBs - 8082	Aroclor 1221	µg/L	0.5	10^4	NS	0.25	U	0.255	U	0.252	U	NA		0.269	U	0.26	U	0.266	U	0.26	U
PCBs - 8082	Aroclor 1232	µg/L	0.5	10^4	NS	0.25	U	0.255	U	0.252	U	NA		0.269	U	0.26	U	0.266	U	0.26	U
PCBs - 8082	Aroclor 1242	µg/L	0.5	10^4	NS	0.25	U	0.255	U	0.252	U	NA		0.269	U	0.26	U	0.266	U	0.26	U
PCBs - 8082	Aroclor 1248	µg/L	0.5	10^4	NS	0.25	U	0.255	U	0.252	U	NA		0.269	U	0.26	U	0.266	U	0.26	U
PCBs - 8082	Aroclor 1254	µg/L	0.5	10^4	NS	0.25	U	0.255	U	0.252	U	NA		0.269	U	0.26	U	0.266	U	0.26	U
PCBs - 8082	Aroclor 1260	µg/L	0.5	10^4	NS	0.25	U	0.255	U	0.252	U	NA		0.269	U	0.26	U	0.266	U	0.26	U
EPH (MADEP)	C11-C22 Aromatics (Unadjusted)	µg/L	200	5,000[4]	NS	100	U	100	U	100	U	NA		NA		NA		NA		NA	
Field Parameter	ORP	mV	NS	NS	NS	-74.2		-78.8		-72.9		-93.8		-188.1		163.8		-175.8		NA	
Field Parameter	Dissolved Oxygen	mg/L	NS	NS	NS	1.53		1.56		1.45		1.29		1.15		9.99		0.48		NA	
Field Parameter	Turbidity	NTU	NS	NS	NS	23.3		13.0		65.0		0.0		0.0		0.0		10.0		NA	

Notes:

[1] From the MCP "GW-1" Standards (310 CMR 40 Subpart P) unless identified as from the ROD.

[2] From the RI.

[3] Reporting limit above background.

[4] Revised GW-3 standard effective February 14, 2008.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

2008 Groundwater Analytical Results
Area of Contamination 57 - Areas 2 and 3
June 2008

						AREA 2												AREA 3					
Method	**Analyte**	**Units**	**Cleanup Goal[1]**	**GW-3 Groundwater Standard**	**Background[2]**	**57M-03-01X**	**Qual**	**57M-03-02X**	**Qual**	**57M-03-02X Duplicate**	**Qual**	**57M-03-03X**	**Qual**	**57M-03-04X**	**Qual**	**57M-03-05X**	**Qual**	**57M-95-03X**	**Qual**	**57M-96-11X**	**Qual**	**57M-96-11X Duplicate**	**Qual**
Metals - SW6010B	Arsenic, Total	µg/L	10	900	10.5	NA		**13**		NA		5.0	U	5.0	U	**11**		**23**		**160**		**159**	
Metals - SW6010B	Iron, Total	µg/L	NS	NS	9,100	NA		**11,000**		NA		50.0	U	5.0	U	4,900		1,900		**37,000**		**37,000**	
Metals - SW6010B	Manganese, Total	µg/L	NS	NS	291	NA		**1,130**		NA		130		239		**2,380**		77		**2,400**		**2,410**	
VOCs - 8260B	1,4-Dichlorobenzene	µg/L	5 (ROD)	8,000	NS	NA		2.5	U	NA		2.5	U	2.5	U	2.5	U	0.93	J	**5.1**		5.0	
VOCs - 8260B	*cis* -1,2-Dichloroethene	µg/L	70	50,000	NS	NA		5.3		NA		0.5	U	0.27	J	0.5	U	0.97		6.2		6.2	
VOCs - 8260B	Chlorobenzene	µg/L	100	1,000	NS	NA		0.5	U	NA		0.5	UJ	0.50	U	0.5	U	0.50	U	0.50	U	0.50	U
VOCs - 8260B	Tetrachloroethene	µg/L	5 (ROD)	30,000	NS	NA		3.7		NA		0.66		0.27	J	0.5	U	0.61		0.82		0.81	
VOCs - 8260B	Trichloroethene	µg/L	5	5,000	NS	NA		**6.2**		NA		0.23	J	0.50	U	0.5	U	0.5	U	2.3		2.3	
VOCs - 8260B	Vinyl Chloride	µg/L	2	50,000	NS	NA		1.0	U	NA		1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
EPH (MADEP)	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000[3]	NS	NA		103	U	105	U	106	U	103	U	108	U	NA		NA		NA	
Field Parameter	ORP	mV	NS	NS	NS	237.0		-29.1		NA		119.6		145.5		35.8		-189		-61.1		NA	
Field Parameter	Dissolved Oxygen	mg/L	NS	NS	NS	9.17		0.83		NA		1.10		0.34		0.25		0.67		0.62		NA	
Field Parameter	Turbidity	NTU	NS	NS	NS	0.00		2.0		NA		0.00		0.97		4.38		1.3		2.61		NA	

Notes:

[1] From the MCP "GW-1" Standards (310 CMR 40 Subpart P) unless identified as from the ROD.

[2] From the RI.

[3] Revised GW-3 standard effective February 14, 2008.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

2008 Surface Water Analytical Results
Area of Contamination 57 - Areas 2 and 3
June 2008

Method	Analyte	Units	USEPA Water Quality Criteria *	57-AREA2-SW2	Qual	57-AREA2-SW2 Duplicate	Qual	57-AREA2-SW3	Qual	57-AREA3-SW1	Qual
Metals - SW6010B	Arsenic, Total	µg/L	150	6.0		8.0		6.0		11	
Metals - SW6010B	Iron, Total	µg/L	1,000	*2,600*	*J*	*2,100*	*J*	*1,500*		*6,800*	
Metals - SW6010B	Manganese, Total	µg/L	NS	248		230		266		1,850	
VOCs - 8260B	1,4-Dichlorobenzene	µg/L	NS	2.5	U	2.5	U	2.5	U	2.5	U
VOCs - 8260B	*cis* -1,2-Dichloroethene	µg/L	NS	0.5	U	0.5	U	0.5	U	0.5	U
VOCs - 8260B	Chlorobenzene	µg/L	NS	0.5	U	0.5	U	0.5	U	0.5	U
VOCs - 8260B	Tetrachloroethene	µg/L	NS	0.5	U	0.5	U	0.5	U	0.5	U
VOCs - 8260B	Trichloroethene	µg/L	NS	0.5	U	0.5	U	0.5	U	0.5	U
VOCs - 8260B	Vinyl Chloride	µg/L	NS	1.0	U	1.0	U	1.0	U	1.0	U
EPH (MADEP)	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	NS	112	U	105	U	108	U	NA	
Field Parameters	ORP	mV	NS	102.9		NA		105.9		-15.6	
Field Parameters	Dissolved Oxygen	mg/L	NS	6.12		NA		8.26		6.84	
Field Parameters	Turbidity	NTU	NS	15.0		NA		16.0		20.0	

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

* = Criterion Continuous Concentration

Water Quality Criteria published by USEPA pursuant to Section 304(a) of the Clean Water Act and provide guidance for states and tribes to use in adopting water quality standards.

For Contaminants of Concern (COCs) without Water Quality Criteria a qualitative comparison will be made between the detected concentrations in groundwater and COC concentrations in surface water to determine if groundwater discharge is impacting surface water.

2009 Groundwater Analytical Results
Area of Contamination 57 - Areas 2 and 3
May 2009

						AREA 2									
Groundwater Analytical Results	**Analyte**	**Units**	**Cleanup Goal[1]**	**GW-3 Groundwater Standard[3]**	**Background[2]**	**57M-03-02X**	**Qual**	**57M-03-02X Duplicate**	**Qual**	**57M-03-03X**	**Qual**	**57M-03-04X**	**Qual**	**57M-03-05X**	**Qual**
Metals (SW6010B)	Arsenic, Total	µg/L	10	900	10.5	**10**		NA		2.3	J	5.0	U	**12**	
	Iron, Total	µg/L	NS	NS	9,100	**30,000**		NA		50.0	U	50.0	U	740	
	Manganese, Total	µg/L	NS	NS	291	**2,870**		NA		44		**880**		**437**	
VOCs (8260B)	1,4-Dichlorobenzene	µg/L	5 (ROD)	8,000	NS	2.5	U	NA		2.5	U	2.5	U	2.5	U
	cis -1,2-Dichloroethene	µg/L	70	50,000	NS	8.8		NA		0.5	U	0.20	J	0.79	
	Chlorobenzene	µg/L	100	1,000	NS	0.5	U	NA		0.5	U	0.50	U	0.5	U
	Tetrachloroethene	µg/L	5 (ROD)	30,000	NS	0.43	J	NA		0.18	J	0.41	J	0.5	U
	Trichloroethene	µg/L	5	5,000	NS	4.0		NA		0.5	U	0.18	J	0.18	J
	Vinyl Chloride	µg/L	2	50,000	NS	1.0	U	NA		1.0	U	1.0	U	1.0	U
EPH (MADEP)	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	NS	102	U	102	U	100	U	102	U	100	U
Field Parameter	Temperature, initial	°C	NS	NS	NS	10.2		NA		12.5		11.6		13.3	
	Temperature, final	°C	NS	NS	NS	10.3		NA		11.0		10.5		10.2	
	ORP	mV	NS	NS	NS	-25.1		NA		134.8		115.4		120.1	
	pH	standard units	NS	NS	NS	5.99		NA		5.57		6.0		5.45	
	Specific Conductance	µS/cm	NS	NS	NS	142		NA		518		309.0		252	
	Dissolved Oxygen	mg/L	NS	NS	NS	0.21		NA		6.10		1.49		0.37	
	Turbidity	NTU	NS	NS	NS	4.08		NA		0.9		2.0		4.0	

Notes:

[1] From the MCP "GW-1" Standards (310 CMR 40 Subpart P) unless identified as from the ROD.

[2] From the RI.

[3] GW-3 standard effective June 26, 2009 ·

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

2009 Groundwater Analytical Results
Area of Contamination 57 - Areas 2 and 3
May 2009

						AREA 3					
Groundwater Analytical Results	**Analyte**	**Units**	**Cleanup Goal[1]**	**GW-3 Groundwater Standard[3]**	**Background[2]**	**57M-95-03X**	**Qual**	**57M-96-11X**	**Qual**	**57M-96-11X Duplicate**	**Qual**
Metals (SW6010B)	Arsenic, Total	µg/L	10	900	10.5	**21**		**163**		**168**	
	Iron, Total	µg/L	NS	NS	9,100	2,400		**43,000**		**44,000**	
	Manganese, Total	µg/L	NS	NS	291	134		**3,190**		**3,330**	
VOCs (8260B)	1,4-Dichlorobenzene	µg/L	5 (ROD)	8,000	NS	2.40	J	**7.5**		**7.6**	
	cis -1,2-Dichloroethene	µg/L	70	50,000	NS	1.70		6.1		6.1	
	Chlorobenzene	µg/L	100	1,000	NS	0.50	U	0.50	U	0.50	U
	Tetrachloroethene	µg/L	5 (ROD)	30,000	NS	0.67		0.91		0.93	
	Trichloroethene	µg/L	5	5,000	NS	0.5	U	2.9		2.8	
	Vinyl Chloride	µg/L	2	50,000	NS	1.0	U	1.0	U	1.0	U
EPH (MADEP)	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	NS	NA		NA		NA	
Field Parameter	Temperature, initial	°C	NS	NS	NS	9.49		10.77		NA	
	Temperature, final	°C	NS	NS	NS	9.14		11.32		NA	
	ORP	mV	NS	NS	NS	-63.4		-51.7		NA	
	pH	standard units	NS	NS	NS	6.45		5.76		NA	
	Specific Conductance	µS/cm	NS	NS	NS	214		240		NA	
	Dissolved Oxygen	mg/L	NS	NS	NS	0.17		0.20		NA	
	Turbidity	NTU	NS	NS	NS	1.95		0.26		NA	

Notes:

[1] From the MCP "GW-1" Standards (310 CMR 40 Subpart P) unless identified as from the ROD.

[2] From the RI.

[3] GW-3 standard effective June 26, 2009 ·

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Groundwater Analytical Results
Area of Contamination 57 - Surface Water
May 2009

Method	Analyte	USEPA Water Quality Criteria*	Unit	57-AREA2-SW2		57-AREA2-SW2 Duplicate		57-AREA2-SW3		57-AREA3-SW1	
				Result	Qual	Result	Qual	Result	Qual	Result	Qual
METALS - 6010B	ARSENIC, DISSOLVED	150	µg/l	5	U	5	U	2.6	J	5	U
	IRON, DISSOLVED	1,000	µg/l	770		690		760		250	
	MANGANESE,	NS	µg/l	632		612		498		478	
VOCS - 8260B	1,4-DICHLOROETHENE	NS	µg/l	2.5	U	2.5	U	2.5	U	0.24	J
	TETRACHLOROETHENE	NS	µg/l	0.23	J	0.24	J	0.5	U	0.5	U
EPH (MADEP)	C_{11}-C_{22} AROMATICS (UNADJUSTED)	NS	µg/l	104	U	104	U	100	U	NA	
Field Parameter	Dissolved Oxygen	NS	mg/L	7.92				7.55		4.70	
	ORP	NS	mV	60.9				45.9		28.3	
	pH	NS	Standard units	5.92				5.48		6.09	
	Specific Conductance	NS	µS/cm	334				290		111	
	Turbidity	NS	NTU	NA				NA		NA	
	Temperature, final	NS	°C	19.35				20.40		19.33	

Notes

1,200 = water quality criteria exceedance

NS = No Standard

Results for contaminants of concern and related VOCs (such as trichloroethene and cis-1,2-dichloroethene) not present in table were non-detect.

* = Criterion Continuous Concentration

Water Quality Criteria published by USEPA pursuant to Section 304(a) of the Clean Water Act and provide guidance for states and tribes to use in adopting water quality standards. For contaminants of concern without Water Quality Criteria a qualitative comparison between the detected concentrations in groundwater will be compared to contaminant of concern concentrations in surface water to determine if groundwater discharge is impacting surface water.

ARARS

TABLE 14
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE II-3

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal	Floodplains	Floodplain Management Executive Order 11988 [40 CFR Part 6, Appendix A]	Applicable	Requires federal agencies to evaluate the potential adverse effects associated with direct and indirect development of a floodplain. Alternatives that involve modification/construction within a floodplain may not be selected unless a determination is made that no practicable alternative exists. If no practicable alternative exists, potential harm must be minimized and action taken to restore and preserve the natural and beneficial values of the floodplain.	Contaminated soil removal will be designed to minimize alteration/destruction of the floodplain area. If this alternative is chosen, floodplains affected by Remedial Investigation will be restored to original elevations.
	Wetlands	Protection of Wetlands Executive Order 11990 [40 CFR Part 6, Appendix A]	Applicable	Under this Order, federal agencies are required to minimize the destruction, loss, or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands. If remediation is required within wetland areas, and no practical alternative exists, potential harm must be minimized and action taken to restore natural and beneficial values.	Contaminated soil removal will be designed to minimize alteration/destruction of the wetlands. If this alternative is chosen, the wetlands will be restored.
	Wetlands, Aquatic Ecosystem	Clean Water Act, Dredge or Fill Requirements Section 404 [40 CFR Part 230]	Relevant and Appropriate	Section 404 of the CWA regulates the discharge of dredged or fill materials to U.S. waters, including wetlands. Filling wetlands would be considered a	The removal of soil will be designed for eventual restoration. A Massachusetts PGP (granted by USACE) is typically required prior to excavating/restoring

TABLE 14 (continued)
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE II-3

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
				discharge of fill materials. Guidelines for Specification of Disposal Sites for Dredged or Fill material at 40 CFR Part 230, promulgated under CWA Section 404(b)(1), maintain that no discharge of dredged or fill material will be permitted if there is a practical alternative that would have less effect on the aquatic ecosystem. If adverse impacts are unavoidable, action must be taken to restore, or create alternative wetlands.	any sediment. The substantive portions of the permit would potentially be required.
	Surface Waters. Endangered Species. Migratory Species	Fish and Wildlife Coordination Act [16 USC 661 et seq.]	Relevant and Appropriate	Actions that affect species/habitat require consultation with USDOI, USFWS, NMFS, and/or state agencies, as appropriate, to ensure that proposed actions do not jeopardize the continued existence of the species or adversely modify or destroy critical habitat. The effects of water-related projects on fish and wildlife resources must be considered. Action must be taken to prevent, mitigate, or compensate for project-related damages or losses to fish and wildlife resources. Consultation with the responsible agency is also strongly recommended for on-site actions. Under 40 CFR Part 300.38, these	To the extent necessary, actions will be taken to develop measures to prevent, mitigate, or compensate for project related impacts to habitat and wildlife. The USFWS, acting as a review agency for the USEPA, will be kept informed of proposed Remedial Investigations.

TABLE 14 (continued)
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE II-3

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
				requirements apply to all response activities under the NCP.	
	Endangered Species	Endangered Species Act [50 CFR Parts 17.11-17.12]	Relevant and Appropriate	This act requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or modification of their habitat.	According to the RI report, no endangered federally-listed species have been identified within one mile of the AOC 57. However, protection of endangered species and their habitat will be considered as part of the design and excavation activities.
	Atlantic Flyway, Wetlands, Surface Waters	Migratory Bird Treaty Act [16 USC 703 et seq.]	Relevant and Appropriate	The Migratory Bird Treaty Act protects migratory birds, their nests, and eggs. A depredation permit is required to take, possess, or transport migratory birds or disturb their nests, eggs, or young.	Remedial Investigations will be performed to protect migratory birds, their nests, and eggs.
State	Floodplains, Wetlands, Surface Waters	Massachusetts Wetland Protection Regulations [310 CMR 10.00]	Applicable	These regulations include standards on dredging, filling, altering, or polluting inland wetlands and protected areas (defined as areas within the 100-year floodplain). A NOI must be filed with the municipal conservation commission and a Final Order of Conditions obtained before proceeding with the activity. A Determination of Applicability or NOI must be filed for activities such as excavation within a 100 foot buffer zone. The regulations specifically prohibit loss of over 5,000	All work to be performed within wetlands and the 100 foot buffer zone will be in accordance with the substantive requirements of these regulations.

TABLE 14 (continued)
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE II-3

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
				square feet of bordering vegetated wetland. Loss may be permitted with replication of any lost area within two growing seasons.	
	Endangered Species	Massachusetts Endangered Species Regulations [321 CMR 8.00]	Applicable	Actions must be conducted in a manner that minimizes the impact to Massachusetts-listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Heritage Program.	The RI report identified several state-listed rare, threatened, or endangered species occurring within one mile of AOC 57. The protection of state listed endangered species will be considered during the design and implementation of this alternative.

Notes:

AOC = Area of contamination
ARAR = Area of Contamination
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
CWA = Clean Water Act
USDOI = U.S. Department of the Interior
USFWS = U.S. Fish and Wildlife Service
NCP = National Contingency Plan
NMFS = National Maine Fisheries Service
NOI = Notice of Intent
PGP = Programatic General Permit
RI = Remedial Investigation
USACE = U.S. Army Corps of Engineers
USEPA = U.S. Environmental Protection Agency
USC = United States Code

TABLE 15
SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS FOR ALTERNATIVE II-3

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	CHEMICAL MEDIUM	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal	Groundwater	Safe Drinking Water Act, National Primary Drinking Water Regulations, MCLs and MCLGs [40 CFR Parts 141.60 - 141.63 and 141.50 - 141.52]	Relevant and Appropriate	The National Primary Drinking Water Regulations establish MCLs and MCLGs for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques. MCLGs specify the maximum concentration at which no known or anticipated adverse effect on humans will occur. MCLGs are non-enforceable health based goals set equal to or lower than MCLs.	The MCLs for arsenic and PCE will likely be met through natural attenuation processes. Monitoring would be performed to measure changes in contaminant concentrations or migration; therefore attainment of groundwater ARARs would eventually be confirmed at the two locations (57M-95-04A and 57P-98-02X), where MCL exceedances were detected.
State	Groundwater	Massachusetts Groundwater Quality Standards [314 CMR 6.00]	Relevant and Appropriate	These standards designate and assign uses for which groundwaters of the Commonwealth shall be maintained and protected, and set forth water quality criteria necessary to maintain the designated uses. Groundwater at Fort Devens is classified as Class I, fresh groundwaters designated as a source of potable water supply.	314 CMR 6.00 would be met by achieving MMCLs for arsenic and PCE. The MMCLs for arsenic and PCE will likely be met through natural attenuation processes. Monitoring would be performed to measure changes in contaminant concentrations or migration; therefore attainment of groundwater MMCLs would eventually be confirmed at the two locations (57M-95-04A and 57P-98-02X).
	Groundwater	Massachusetts Drinking	Relevant and	These regulations list MMCLs which	As previously stated, Devens

TABLE 15 (continued)
SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS FOR ALTERNATIVE II-3

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	CHEMICAL MEDIUM	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
		Water Regulations [310 CMR 22.00]	Appropriate	apply to drinking water distributed through a public water system.	groundwater is classified as Class1, and designated as a source of potable water supply. AOC 57 is currently not within a Zone I or II/Interim Wellhead Protection Area. An AUL would be established at Area 2 until the environmental monitoring program indicates that MMCLs have been achieved for at least three years.

Notes:

AOC = Area of contamination
ARARs = Applicable or Relevant and Appropriate Requirements
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Rules
MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
MMCL = Massachusetts Maximum Contaminant Level
PCE = Tetrachloroethylene

TABLE 16
SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE II-3

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	ACTION	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal	Control of surface water runoff. Direct discharge to surface water	Clean Water Act NPDES Permit Program [40 CFR 122.125]	Relevant and Appropriate	The NPDES permit program specifies the permissible concentration or level of contaminants in the discharge from any point source, including surface runoff, to waters of the United States.	Construction activities will be controlled to meet USEPA discharge requirements. Water collected from dewatering and stockpile activities will be collected and treated offsite or discharged to the Devens WWTP. Any on-site runoff discharges (though none expected) will meet the substantive requirements of these regulations.
	Discharge to Devens Treatment Plant	CWA, General Pretreatment Program (40 CFR Part 403)	Applicable	Discharge of nondomestic wastewater to WWTP must comply with the general prohibitions of this regulation, as well as categorical standards, and local pretreatment standards.	Discharge to Devens WWTP would be sampled to evaluate compliance with pre-treatment standards.
	Groundwater	USEPA OSWER Publication 9345.3-03FS, January 1992	To Be Considered	Management of IDW must ensure protection of human health and the environment.	IDW produced from well sampling will comply with ARARs.
	RCRA - Identification and Listing of Hazardous Wastes	Toxicity Characteristics (40 CFR 261.24)	Applicable	Defines those wastes that are subject to regulations as hazardous wastes under 40 CFR Parts 124 and 264.	Soil/sediment analytical results will be evaluated against the criteria and definitions of hazardous waste. The criteria and definition of hazardous waste will be referred to and utilized in development of the Remedial

TABLE 16 (continued)
SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE II-3

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	ACTION	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
					Investigation.
	Disposal of soil that contains hazardous waste	RCRA, Land Disposal Restrictions (40 CFR 268)	Applicable	Land disposal of RCRA hazardous wastes without specified treatment is restricted. LDRs require that such wastes must be treated either by a treatment technology or to a specific concentration prior to disposal in a RCRA Subtitle C permitted facility.	Waste materials from Area 2 will be evaluated to determine whether the waste is subject to LDRs. If so, the materials will be treated in accordance with LDRs prior to disposal at an off-base facility.
	Management of PCB-contaminated soil	TSCA (40 CFR Part 761 Subpart G) PCB Spill Cleanup Policy	To be considered	This policy governs the cleanup of PCB spills occurring after May 4, 1987. Because this policy is not a regulation and only applies to recent spills (reported within 24hours of occurrence), these requirements are not applicable, but will be considered.	This policy would only be considered during the development of Remedial Investigation for areas with expected detected PCBs at concentrations greater than or equal to 50 ppm. The highest concentration of PCBs in soil was detected during the RI at 12 ppm.
	Management of PCB-contaminated soil	TSCA (40 CFR Part 761 Subpart D) Storage and Disposal	Relevant and Appropriate	This regulation governs the storage and final disposal of PCBs. The regulation also specifies procedures to be followed in decontaminating containers and moveable equipment used in storage areas. Section 761.61 pertains to PCB remediation wastes and provides self-implementing on-site cleanup and disposal requirements. Per Section 761.61, the self-implementing cleanup provisions are not binding for cleanups	Section 761.61 cleanup levels for low and high occupancy areas are ≤ 1 ppm, respectively. RI calculated RBCs for Aroclor – 1260 are more conservative and will be used as PRGs at AOC 57. Off-site storage, disposal and decontamination requirements specified in this regulation will be applied for soil or sediment containing PCBs.

TABLE 16 (continued)
SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE II-3

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	ACTION	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
				conducted under CERCLA.	
State	Hazardous Waste	Hazardous Waste Management Systems; (RCRA 40 CFR 260)	Relevant and Appropriate	USEPA procedures for making information available to the public; rules for claims of business confidentially.	Does not address cleanup requirements. However, these procedures will be followed when dealing with hazardous waste.
	Hazardous Waste	Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities (RCRA 40 CFR 264)	Relevant and Appropriate	Define requirements for RCRA facility operations and management including impoundments, waste piles, land treatment, landfills, incinerators, storage, closure and post closure.	Operations, management and safety requirements in effect for all portions of remedial process, if hazardous waste is being handled.
	Hazardous Waste	RCRA 40 CFR Part 262, Standards Applicable to Generators of Hazardous Waste	Relevant and Appropriate	These regulations establish standards for generators of hazardous waste. RCRA Subtitle C established standards applicable to treatment, storage, and disposal of hazardous waste and closure of hazardous waste facilities.	Sediments will be tested to determine whether they contain characteristic hazardous waste. If so, management of the hazardous waste would comply with substantive requirements of these regulations.
	Hazardous Waste	Massachusetts Hazardous Waste Management Rules; 310 CMR 30.000	Relevant and Appropriate	These rules set forth Massachusetts definitions and criteria for establishing whether waste materials are hazardous and subject to associated hazardous waste regulations.	These regulations supplement RCRA requirements. Those criteria and definitions more stringent than RCRA take precedence over federal requirements.
	Activities that potentially affect surface water quality	Massachusetts Water Quality Certification and Certification for Dredging [314 CMR 9.00]	Relevant and Appropriate	A Massachusetts Division of Water Pollution Control Water Quality Certification is required pursuant to 314 CMR 9.00 for dredging-related	Excavation and filling activities will meet the substantive criteria and standards of these regulations. Remedial activities will be designed to

TABLE 16 (continued)
SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE II-3

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	ACTION	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
				activities in waters (including wetlands) within the Commonwealth which require federal licenses or permits and which are subject to state water quality certification.	attain and maintain Massachusetts Water Quality Standards in affected waters.
	Activities that affect ambient air quality	Massachusetts Air Pollution Control Regulations [310 CMR 7.00]	Applicable	These regulations pertain to the prevention of emissions in excess of Massachusetts ambient air quality standards.	Remedial activities will be conducted to meet the standards for Visible Emissions (310 CMR 7.06); Dust, Odor, Construction and Demolition (310 CMR 7.09); Noise (310 CMR 7.10); and Volatile Organic Compounds (310 CMR 7.18).

Notes:
ARARs = Applicable or Relevant and Appropriate Requirements
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
CWA = Clean Water Act
IDW = Investigation derived waste
LDR = Land Disposal Restrictions
NPDES = National Pollutant Discharge Elimination System
RCBs = Risk-based concentrations
RCRA = Resource Conservation and Recovery Act
RI = Remedial Investigation
TSCA = Toxic Substances Control Act
PCB = Polychlorinated biphenyls
PRGs = preliminary remediation goals
USEPA = U.S. Environmental Protection Agency
WWTP = Wastewater Treatment Plant

TABLE 17
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE III-2A

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal	Floodplains	Floodplain Management Executive Order 11988 [40 CFR Part 6, Appendix A]	Applicable	Requires federal agencies to evaluate the potential adverse effects associated with direct and indirect development of a floodplain. Alternatives that involve modification/construction within a floodplain may not be selected unless a determination is made that no practicable alternative exists. If no practicable alternative exists, potential harm must be minimized and action taken to restore and preserve the natural and beneficial values of the floodplain.	Contaminated soil removal will be designed to minimize alteration/destruction of the floodplain area. If this alternative is chosen, floodplains affected by Remedial Investigation will be restored to original elevations.
	Wetlands	Protection of Wetlands Executive Order 11990 [40 CFR Part 6, Appendix A]	Applicable	Under this Order, federal agencies are required to minimize the destruction, loss, or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands. If remediation is required within wetland areas, and no practical alternative exists, potential harm must be minimized and action taken to restore natural and beneficial values.	Contaminated soil removal will be designed to minimize alteration/destruction of the wetlands. If this alternative is chosen, the wetlands will be restored.
	Wetlands, Aquatic Ecosystem	Clean Water Act, Dredge or Fill Requirements Section 404	Relevant and Appropriate	Section 404 of the Clean Water Act (CWA) regulates the discharge of dredged or fill materials to U.S.	The removal of soil will be designed for eventual restoration. A Massachusetts PGP (granted by USACE) is typically

TABLE 17 (continued)
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE III-2A

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
		[40 CFR Part 230]		waters, including wetlands. Filling wetlands would be considered a discharge of fill materials. Guidelines for Specification of Disposal Sites for Dredged or Fill material at 40 CFR Part 230, promulgated under CWA Section 404(b)(1), maintain that no discharge of dredged or fill material will be permitted if there is a practical alternative that would have less effect on the aquatic ecosystem. If adverse impacts are unavoidable, action must be taken to restore, or create alternative wetlands.	required prior to excavating/restoring any sediment. The substantive portions of the permit would potentially be required.
	Surface Waters. Endangered Species. Migratory Species	Fish and Wildlife Coordination Act [16 USC 661 et seq.]	Relevant and Appropriate	Actions that affect species/habitat require consultation with USDOI, USFWS, NMFS, and/or state agencies, as appropriate, to ensure that proposed actions do not jeopardize the continued existence of the species or adversely modify or destroy critical habitat. The effects of water-related projects on fish and wildlife resources must be considered. Action must be taken to prevent, mitigate, or compensate for project-related damages or losses to fish and wildlife resources.	To the extent necessary, actions will be taken to develop measures to prevent, mitigate, or compensate for project related impacts to habitat and wildlife. The USFWS, acting as a review agency for the USEPA, will be kept informed of proposed Remedial Investigations.

TABLE 17 (continued)
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE III-2A

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
				Consultation with the responsible agency is also strongly recommended for on-site actions. Under 40 CFR Part 300.38, these requirements apply to all response activities under the NCP.	
	Endangered Species	Endangered Species Act [50 CFR Parts 17.11-17.12]	Relevant and Appropriate	This act requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or modification of their habitat.	According to the RI report, no endangered federally-listed species have been identified within one mile of the AOC 57. However, protection of endangered species and their habitat will be considered as part of the design and excavation activities.
	Atlantic Flyway, Wetlands, Surface Waters	Migratory Bird Treaty Act [16 USC 703 et seq.]	Relevant and Appropriate	The Migratory Bird Treaty Act protects migratory birds, their nests, and eggs. A depredation permit is required to take, possess, or transport migratory birds or disturb their nests, eggs, or young.	Remedial Investigations will be performed to protect migratory birds, their nests, and eggs.
State	Floodplains, Wetlands, Surface Waters	Massachusetts Wetland Protection Regulations [310 CMR 10.00]	Applicable	These regulations include standards on dredging, filling, altering, or polluting inland wetlands and protected areas (defined as areas within the 100-year flood plain). A NOI must be filed with the municipal conservation commission and a Final Order of	All work to be performed within wetlands and the 100-foot buffer zone will be in accordance with the substantive requirements of these regulations.

TABLE 17 (continued)
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE III-2A

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	LOCATION CHARACTERISTIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
				Conditions obtained before proceeding with the activity. A Determination of Applicability or NOI must be filed for activities such as excavation within a 100-foot buffer zone. The regulations specifically prohibit loss of over 5,000 square feet of bordering vegetated wetland. Loss may be permitted with replication of any lost area within two growing seasons.	
	Endangered Species	Massachusetts Endangered Species Regulations [321 CMR 8.00]	Applicable	Actions must be conducted in a manner that minimizes the impact to Massachusetts-listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Heritage Program.	The RI report identified several state-listed rare, threatened, or endangered species occurring within one mile of AOC 57. The protection of state listed endangered species will be considered during the design and implementation of this alternative.

Notes:

AOC = Area of contamination
ARAR = Area of Contamination
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
CWA = Clean Water Act
USDOI = U.S. Department of the Interior
USFWS= U.S. Fish and Wildlife Service
NCP = National Contingency Plan
NMFS = National Maine Fisheries Service

TABLE 17 (continued)
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE III-2A

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

NOI	=	Notice of Intent
PGP	=	Programatic General Permit
RI	=	Remedial Investigation
USACE	=	U.S. Army Corps of Engineers
USEPA	=	U.S. Environmental Protection Agency
USC	=	United States Code

TABLE 18
SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS FOR ALTERNATIVES III-2A

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	CHEMICAL MEDIUM	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal	Groundwater	Safe Drinking Water Act, National Primary Drinking Water Regulations, MCLs and MCLGs [40 CFR Parts 141.60 - 141.63 and 141.50 - 141.52]	Relevant and Appropriate	The National Primary Drinking Water Regulations establish Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques. MCLGs specify the maximum concentration at which no known or anticipated adverse effect on humans will occur. MCLGs are non-enforceable health based goals set equal to or lower than MCLs.	The MCLs for arsenic, cadmium, tetrachloroethebne (PCE), and 1,4-dichlorobenzene will likely be met through natural attenuation processes. Monitoring would be performed to measure changes in contaminant concentrations or migration; therefore attainment of groundwater ARARs would eventually be confirmed at the two locations (57M-95-03X and 57M-96-11X), where MCL exceedances were detected.
State	Groundwater	Massachusetts Groundwater Quality Standards [314 CMR 6.00]	Relevant and Appropriate	These standards designate and assign uses for which groundwaters of the commonwealth shall be maintained and protected, and set forth water quality criteria necessary to maintain the designated uses. Groundwater at Fort Devens is classified as Class I, fresh groundwaters designated as a	314 CMR 6.00 would be met by achieving MMCLs for arsenic, cadmium, PCE, and 1,4-dichlorobenzene. The MMCLs will likely be met through natural attenuation processes. Monitoring would be performed to measure changes in contaminant concentrations or

TABLE 18 (continued)
SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS FOR ALTERNATIVE III-2A

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	CHEMICAL MEDIUM	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
				source of potable water supply.	migration; therefore attainment of groundwater MMCLs would eventually be confirmed at the two locations (57M-95-03X and 57M-96-11X).
	Groundwater	Massachusetts Drinking Water Regulations [310 CMR 22.00]	Relevant and Appropriate	These regulations list Massachusetts MCLs applicable to drinking water distributed through a public water system.	As previously stated, Devens groundwater is classified as Class I, and designated as a source of potable water supply. AOC 57 is currently not within a Zone I or II/Interim Wellhead Protection Area. An AUL would be established at Area 3 until the environmental monitoring program indicates that MMCLs have been achieved for at least three years.

Notes:
AOCs = Area of Contamination
ARARs = Applicable or Relevant and Appropriate Requirements
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Rules
MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
MMCL = Massachusetts Maximum Contaminant Level

TABLE 19
SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE III-2A

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	ACTION	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal	Control of surface water runoff. Direct discharge to surface water	Clean Water Act NPDES Permit Program [40 CFR 122.125]	Relevant and Appropriate	The National Pollutant Discharge Elimination System (NPDES) permit program specifies the permissible concentration or level of contaminants in the discharge from any point source, including surface runoff, to waters of the United States.	Construction activities will be controlled to meet USEPA discharge requirements. Water collected from dewatering and stockpile activities will be collected and treated offsite or discharged to Devens WWTP. Any on-site runoff discharges (though none expected) will meet the substantive requirements of these regulations.
	Discharge to Devens Treatment Plant	CWA, General Pretreatment Program (40 CFR Part 403)	Applicable	Discharge of nondomestic wastewater to WWTP must comply with the general prohibitions of this regulation, as well as categorical standards, and local pretreatment standards.	Discharge to Devens WWTP would be sampled to evaluate compliance with pre-treatment standards.
	Groundwater	USEPA OSWER Publicaton 9345.3-03FS, January 1992	To Be Considered	Management of IDW must ensure protection of human health and the environment.	IDW produced from well sampling will comply with ARARs.
	RCRA – Identification and Listing of Hazardous Wastes	Toxicity Characteristics (40 CFR 261.24)	Applicable	Defines those wastes that are subject to regulations as hazardous wastes under 40 CFR Parts 124 and 264.	Soil/sediment analytical results will be evaluated against the criteria and definitions of hazardous waste. The criteria and definition of hazardous waste will be referred to and utilized in development of the remedial action.
	Disposal of soil	RCRA, Land Disposal	Applicable	Land disposal of RCRA hazardous	Waste materials from Area 3 will be

TABLE 19 (continued)
SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE III-2A

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	ACTION	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
	that contains hazardous waste	Restrictions (40 CFR 268)		wastes without specified treatment is restricted. LDRs require that such wastes must be treated either by a treatment technology or to a specific concentration prior to disposal in a RCRA Subtitle C permitted facility.	evaluated to determine whether the waste is subject to LDRs. If so, the materials will not be disposed of on base but will be treated in accordance with LDRs prior to disposal at an off-base facility.
	Hazardous Waste	Hazardous Waste Management Systems; (RCRA 40 CFR 260)	Relevant and Appropriate	USEPA procedures for making information available to the public; rules for claims of business confidentially.	Does not address cleanup requirements. However, these procedures will be followed when dealing with hazardous waste.
	Hazardous Waste	Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities (RCRA 40 CFR 264)	Relevant and Appropriate	Define requirements for RCRA facility operations and management including impoundments, wastepiles, land treatment, landfills, incinerators, storage, closure and post closure.	Operations, management and safety requirements in effect for all portions of remedial process, if hazardous waste is being handled.
	Hazardous Waste	RCRA 40 CFR Part 262, Standards Applicable to Generators of Hazardous Waste	Relevant and Appropriate	RCRA Subtitle C established standards applicable to treatment, storage, and disposal of hazardous waste and closure of hazardous waste facilities.	Sediments will be tested to determine whether they contain characteristic hazardous waste. If so, treatment on-site would comply with substantive requirements of these regulations.
State	Hazardous Waste	Massachusetts Hazardous Waste Management Rules; 310 CMR 30.000	Relevant and Appropriate	These rules set forth Massachusetts definitions and criteria for establishing whether waste materials are hazardous and subject to associated hazardous waste regulations.	These regulations supplement RCRA requirements. Those criteria and definitions more stringent than RCRA take precedence over federal requirements.

TABLE 19 (continued)
SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE III-2A

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

REGULATORY AUTHORITY	ACTION	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
	Activities that potentially affect surface water quality	Massachusetts Water Quality Certification and Certification for Dredging [314 CMR 9.00]	Relevant and Appropriate	A Massachusetts Division of Water Pollution Control Water Quality Certification is required pursuant to 314 CMR 9.00 for dredging-related activities in waters (including wetlands) within the Commonwealth which require federal licenses or permits and which are subject to state water quality certification.	Excavation and filling activities will meet the substantive criteria and standards of these regulations. Remedial activities will be designed to attain and maintain Massachusetts Water Quality Standards in affected waters.
	Activities that affect ambient air quality	Massachusetts Air Pollution Control Regulations [310 CMR 7.00]	Applicable	These regulations pertain to the prevention of emissions in excess of Massachusetts ambient air quality standards.	Remedial activities will be conducted to meet the standards for Visible Emissions (310 CMR 7.06); Dust, Odor, Construction and Demolition (310 CMR 7.09); Noise (310 CMR 7.10); and Volatile Organic Compounds (310 CMR 7.18).

Notes:

ARARs = Applicable or Relevant and Appropriate Requirements
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
CWA = Clean Water Act
IDW = Investigation-derived waste
LDR = Land Disposal Restrictions
NPDES = National Pollutant Discharge Elimination System
PCB = Polychlorinated biphenyls
PRGs = preliminary remediation goals

TABLE 19 (continued)
SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE III-2A

AOC 57 RECORD OF DECISION
DEVENS RFTA, DEVENS, MASSACHUSETTS

RBCs	=	Risk-based concentrations
RCRA	=	Resource Conservation and Recovery Act
RI	=	Remedial Investigation
TSCA	=	Toxic Substances Control Act
USEPA	=	U.S. Environmental Protection Agency
WWTP	=	Wastewater Treatment Plant

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PHOTO LOG

April 2010
View to the southeast from the northwest side of Barnum Road.
The southwest corner of the Evergreen Solar Panel facility is noted in the background.

April 2010
Well 57M-95-06X, located in the northeast corner of Area 2 is noted in this photo.

X:/OMA010/Ft_Devens/Maps/DO501/2010_5-Year_Review/CDR/
AOC_57_photolog.cdr
06/29/10 CNL

AOC 57
Photograph Log
2010

April 2010
View to the southwest along a walking path northeast of Area 2,
along the southern boundary line of the Evergreen Solar Panel facility.

April 2010
View to the southeast from the northwest side of Barnum Road.

X:/OMA010/Ft_Devens/Maps/DO501/2010_5-Year_Review/CDR/
AOC_57_photolog.cdr
06/29/10 CNL

AOC 57
Photograph Log
2010

April 2010
View to the southeast from the north main entrance to Evergreen Solar Panel facility.

April 2010
View to the northeast along the walking path.

X:/OMA010/Ft_Devens/Maps/DO501/2010_5-Year_Review/CDR/
AOC_57_photolog.cdr
06/29/10 CNL

AOC 57
Photograph Log
2010

April 2010
View to the south at Area 2. The sumps are shown in the foreground, beyond the brush line.

April 2010
View to the south at Area 3.
Well 57M-95-03X is depicted in the left hand portion of the photo among the overgrown brush.

X:/OMA010/Ft_Devens/Maps/DO501/2010_5-Year_Review/CDR/AOC_57_photolog.cdr
06/29/10 CNL

AOC 57
Photograph Log
2010

APPENDIX D

AOCS 43G AND J

GROUNDWATER ANALYTICAL RESULTS
(2005-2009)

Key for Tables

General Terms

AOC	Area of Contamination
bgs	below ground surface
BOD_5	biological oxygen demand
CMR	Code of Massachusetts Regulations
EPH	extractable petroleum hydrocarbons
MADEP	Massachusetts Department of Environmental Protection; indicates MADEP-derived analytical methods (MADEP, 2004a and 2004b)
MCP	Massachusetts Contingency Plan
μg/L	Micrograms per liter
mg/L	Milligrams per liter
μS/cm	Microsiemens per centimeter
mV	Millivolts
NC	Not collected
NS	No standard established
NTU	Nephelometric turbidity units
ORP	Oxidation-reduction potential
PCB	polychlorinated biphenyls
ROD	Record of Decision

Result Indicators (Laboratory Results Only)

Bold Text	Indicates a detected result above a background level.
Bold Text	Indicates a detected result above the associated site cleanup goal or GW-1 Standard.
Bold Text	Indicates a detected result above USEPA Water Quality Criteria.
Bold Text	Indicates a detected result above GW-3 Standard.

Data Qualifiers

J	Estimated detection
U	Not detected (at associated reporting limit)
UJ	Not detected; reporting limit is an estimate

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AOC 43G

2005 Groundwater Analytical Results
Area of Contamination 43G - October 2005

Method	Analyte	Units	Groundwater Standard[1]	Background[2]	AAFES-2	AAFES-5	AAFES-6	XGM-93-02X	XGM-94-04X	XGM-94-07X	XGM-94-08X	XGM-94-10X	XGM-97-12X	XGM-97-12X Duplicate
VPH - MADEP	Benzene	µg/L	5	—	**6.1**	1.5 U	NC	**29**	1.5 U	1.5 U	1.5 U	1.5 U	**35.6**	**35.7**
VPH - MADEP	Toluene	µg/L	1,000	—	9.8	5.0 U	NC	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	53.4	53.4
VPH - MADEP	Ethylbenzene	µg/L	700	—	121	5.0 U	NC	104	5.0 U	5.0 U	5.0 U	5.0 U	35.6	35.8
VPH - MADEP	m,p-Xylene	µg/L	NS	—	168	10 U	NC	80.8	10 U	10 U	10 U	10 U	1,600	1,580
VPH - MADEP	o-Xylene	µg/L	NS	—	46.4	5.0 U	NC	6.6	5.0 U	5.0 U	5.0 U	5.0 U	842	836
VPH - MADEP	Total Xylenes	µg/L	10,000	—	214	10 U	NC	87	10 U	10 U	10 U	10 U	2,442	2,416
VPH - MADEP	C5 - C8 Aliphatics	µg/L	400	—	**2,070**	158 U	NC	**788**	158 U	158 U	158 U	158 U	**2,370**	**2,390**
VPH - MADEP	C9 - C12 Aliphatics	µg/L	4,000	—	**5,220**	220 U	NC	1,570	220 U	220 U	220 U	220 U	**7,310**	**7,420**
VPH - MADEP	C9 - C10 Aromatics	µg/L	200	—	**3,130**	100 U	NC	**918**	100 U	100 U	100 U	100 U	**3,810**	**3,830**
Metals - SW6010B	Iron, total	µg/L	9,100 [2]	9,100	**21,900**	916	NC	**11,500**	205	1,610	4,520	120	**20,100 J**	**47,400 J**
Metals - SW6010B	Manganese, total	µg/L	291 (ROD)	291	**3,590**	118	NC	**1,450**	**1,580**	**6,120**	**7,260**	**960**	**437**	**427**
Metals - SW6010B	Nickel, total	µg/L	100	34.3	10 U	10 U	NC	10 U	10 U	18.5	17.6	6.8 J	10 U	16.9 J
Field Parameter	ORP	mV	NS	—	-150.5	130.1	NC	-162.2	-98.3	74.5	-115.8	-23.3	-80.2	NC
Field Parameter	Dissolved oxygen	mg/L	NS	—	0.47	2.22	NC	25.83	16.85	0.54	17.65	14.73	0.30	NC

[1] From the MCP GW1 Standards (310 CMR 40 Subpart P) unless identified as from the ROD.

[2] From the RI.

2006 Groundwater Analytical Results
Area of Contamination 43G
October 2006

Method	Analyte	Units	Cleanup Goal[1]	Background[2]	AAFES-2	AAFES-5	AAFES-6R	XGM-93-02X	XGM-94-04X	XGM-94-07X	XGM-94-08X	XGM-94-10X	XGM-97-12X	XGM-97-12X Duplicate
VPH - MADEP	Benzene	µg/L	5	NS	1.3 J	2 U	0.516 J	**18.5**	2 U	0.775 J	2 U	0.278 J	**129**	**138**
VPH - MADEP	Toluene	µg/L	1,000	NS	5.59 J	2 U	0.526 J	1.81 J	2 U	2 U	2 U	0.28 J	239	248
VPH - MADEP	Ethylbenzene	µg/L	700	NS	56.8	2 U	2 U	75.8	2 U	2 U	2 U	2 U	227	235
VPH - MADEP	m,p-Xylene	µg/L	NS	NS	60.8	2 U	2 U	13	2 U	2 U	2 U	2 U	980	1,000
VPH - MADEP	o-Xylene	µg/L	NS	NS	21.3	2 U	2 U	2 U	2 U	2 U	2 U	2 U	343	351
VPH - MADEP	Total Xylenes[3]	µg/L	10,000	NS	82.1	2 U	2 U	2 U	2 U	2 U	2 U	2 U	1,323	1,351
VPH - MADEP	C5 - C8 Aliphatics, Adjusted	µg/L	400	NS	**1,430**	50 U	305	**519**	50 U	113	125	50 U	**1,740**	**1,790**
VPH - MADEP	C5 - C8 Aliphatics, Unadjusted	µg/L	400	NS	**1,430**	50 U	305	**551**	50 U	113	125	50 U	**2,110**	**2,180**
VPH - MADEP	C9 - C12 Aliphatics, Adjusted	µg/L	4,000	NS	987	50 U	50 U	268	50 U	50 U	50 U	50 U	1,340	1,480
VPH - MADEP	C9 - C12 Aliphatics, Unadjusted	µg/L	4,000	NS	**4,840**	50 U	111	1,120	50 U	50 U	50 U	50 U	**6,900**	**7,150**
VPH - MADEP	C9 - C10 Aromatics	µg/L	200	NS	**3,710**	50 U	71.1	**766**	50 U	50 U	50 U	50 U	**4,010**	**4,080**
Metals - SW6010B	Total Iron	µg/L	9,100	9,100	**12,000**	120	**11,000**	**13,000**	50 U	1,400	6,100	170	**18,000**	**19,000**
Metals - SW6010B	Total Manganese	µg/L	291	291	**2,700**	50	**2,900**	**2,000**	**1,100**	**5,100**	**4,200**	**330**	**1,800**	**1,900**
Metals - SW6010B	Total Nickel	µg/L	100	34.3	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U
Metals - SW6010B	Dissolved Iron	µg/L	9,100	9,100	**11,000**	50 U	**11,000**	**13,000**	50 U	840	3,800	50 U	**17,000**	**17,000**
Metals - SW6010B	Dissolved Manganese	µg/L	291	291	**2,700**	10 U	**3,000**	**2,000**	**1,200**	**5,100**	**4,200**	40 U	**1,800**	**1,800**
Metals - SW6010B	Dissolved Nickel	µg/L	100	34.3	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U
SM2320 B	Alkalinity (mg $CaCO_3$/L)	mg/L	NS	NS	140	32 U	110	160	160	120	120	140	160	160
Field Parameter	ORP	mV	NS	NS	-108.9	259	-76.1	-116.6	-76.4	11.9	-137.7	181.7	-111.1	NA
Field Parameter	Dissolved oxygen	mg/L	NS	NS	0.6	5.76	0.3	0.2	0.4	0.4	0.5	1.8	0.2	NA
Field Parameter	Turbidity	NTU	NS	NS	1.27	2.03	0.00	2.3	1.3	2.61	23	3.1	0.57	NA

Notes:
[1] Cleanup values as developed in the ROD (unless otherwise noted).
[2] From the RI
[3] Total Xylenes = m,p-Xylene + o-Xylene
All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

2007 Groundwater Analytical Results
Area of Contamination 43G
October 2007

Method	Analyte	Units	Cleanup Goal[1]	GW-3 Groundwater Standard	Background[2]	AAFES-2[4]	Qual	AAFES-5	Qual	AAFES-6R	Qual	XGM-93-02X[5]	Qual	XGM-94-04X	Qual	XGM-94-07X	Qual	XGM-94-08X	Qual	XGM-97-12X	Qual	XGM-97-12X Duplicate	Qual
VPH - MADEP	Benzene	µg/L	5	10,000	NS	40.0	U	2.0	U	0.369	J	**8.81**		2.0	U	2.0	U	2.0	U	**22.8**		**16.7**	
VPH - MADEP	Toluene	µg/L	1,000[7]	40,000[6]	NS	40.0	U	2.0	U	0.519	J	0.78	J	2.0	U	2.0	U	2.0	U	15.9	J	12.3	J
VPH - MADEP	Ethylbenzene	µg/L	700	5,000[6]	NS	59.3		2.0	U	2.0	U	19.2		2.0	U	2.0	U	2.0	U	107	J	80.1	J
VPH - MADEP	m,p-Xylenes	µg/L	NS	NS	NS	83.5		2.0	U	2.0	U	1.44	J	2.0	U	2.0	U	2.0	U	264	J	197	J
VPH - MADEP	o-Xylene	µg/L	NS	NS	NS	15.3	J	2.0	U	2.0	U	2	U	2.0	U	2.0	U	2.0	U	61.6		49.9	
VPH - MADEP	Total Xylenes[3]	µg/L	10,000	5,000[6]	NS	98.8	J	2.0	U	2.0	U	1.44	J	2.0	U	2.0	U	2.0	U	325.6	J	246.9	J
VPH - MADEP	C5 - C8 Aliphatics, Adjusted	µg/L	300[6,7]	50,000[6]	NS	**1,400**	J	50.0	U	419	U	241	U	50.0	U	119	U	104	U	**1,230**	J	**1,250**	J
VPH - MADEP	C9 - C12 Aliphatics, Adjusted	µg/L	700[6,7]	50,000[6]	NS	**1,000**		50.0	U	50.0	U	93.9		50.0	U	50.0	U	50.0	U	**1,080**		**1,050**	
VPH - MADEP	C9 - C10 Aromatics	µg/L	200[6,7]	50,000[6]	NS	**2,420**		50.0	U	78.5		**228**		50.0	U	50.0	U	50.0	U	**4,220**	J	**3,070**	J
Metals - SW6010B	Total Iron	µg/L	9,100	NS	9,100	**20,000**		120	U	**11,000**		5,800		50.0	U	4,500		4,600		**22,000**		**22,000**	
Metals - SW6010B	Total Manganese	µg/L	291	NS	291	**3,790**		34		**3,090**		**1,800**		**559**		**4,120**		**3,380**		**2,070**		**2,060**	
SM2320 B	Alkalinity (mg $CaCO_3$/L)	mg/L	NS	NS	NS	120		62		130		160		180		94		120		150		150	
Field Parameter	ORP	mV	NS	NS	NS	-185.2		54.3		-143.3		-165.7		1.0		-110.6		-93.6		-187.7		NA	
Field Parameter	Dissolved oxygen	mg/L	NS	NS	NS	0.26		3.10		2.68		3.35		0.74		0.55		5.47		5.28		NA	
Field Parameter	Turbidity	NTU	NS	NS	NS	0.59		2.5		0.32		4.4		0.21		4.6		21.0		1.4		NA	

Notes:
[1] Cleanup values as developed in the ROD (unless otherwise noted).
[2] From the RI
[3] Total Xylenes = m,p-Xylene + o-Xylene
[4] Reporting limit for benzene higher than cleanup goal.
[5] Reporting limit for VPH C9-C12 Aliphatics higher than revised GW-1 standard effective February 14, 2008.
[6] Revised GW-1 or GW-3 standard effective February 14, 2008.
[7] Cleanup goal is based on the respective GW-1 standards.
All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

2008 Groundwater Analytical Results
Area of Contamination 43G
June 2008

Method	Analyte	Units	Cleanup Goal[1]	GW-3 Groundwater Standard	AAFES-7	Qual	XGM-94-06X	Qual
Metals - SW6010B	Manganese, Dissolved	µg/L	375	NS	29		7.7	J
Metals - SW6010B	Manganese, Total	µg/L	375	NS	106		**793**	
Field Parameter	ORP	mV	NS	NS	201.8		95.7	
Field Parameter	Dissolved Oxygen	mg/L	NS	NS	4.51		6.63	
Field Parameter	Turbidity	NTU	NS	NS	3.9		4.50	

Notes:

[1] Cleanup goal is based upon the lower of the revised site-specific cleanup goal.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

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2008 Groundwater Analytical Results
Area of Contamination 43G
October 2008

Method	Analyte	Units	Cleanup Goal[1]	GW-3 Groundwater Standard	Background[2]	AAFES-2	Qual	AAFES-5	Qual	AAFES-6R	Qual	AAFES-7	Qual	XGM-93-02X	Qual	XGM-94-04X	Qual	XGM-94-07X	Qual	XGM-94-08X	Qual	XGM-97-12X	Qual	XGM-97-12X Duplicate	Qual
Metals - SW6010B	Iron, Total	µg/L	9,100	NS	9,100	**18,000**		80	U	6,500		NA		**11,000**		50	U	**9,300**		2,200		**25,000**		**25,000**	
Metals - SW6010B	Manganese, Dissolved	µg/L	375	NS	291	NA		NA		NA		16	U	NA		NA		NA		NA		NA		NA	
Metals - SW6010B	Manganese, Total	µg/L	375	NS	291	**3,600**		10	U	**3,630**		20	U	**1,420**		68		**5,100**		**3,100**		**3,060**		**3,080**	
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)[5]	µg/L	300[3,4]	50,000[3]	NS	1,330	U	50.0	U	177	U	NA		311	U	50.0	U	157	U	73.6	U	1,250	U	1,250	U
VPH (MADEP)	C_9-C_{10} Aromatics	µg/L	200	50,000[3]	NS	**2,120**		50.0	U	50.0	U	NA		**325**		50.0	U	45.1	J	50.0	U	**5,260**		**4,570**	
VPH (MADEP)	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[3,4]	50,000[3]	NS	**1,020**		50.0	U	50.0	U	NA		182		50.0	U	89.8	U	50.0	U	**2,210**		**2,310**	
VPH (MADEP)	Benzene[6]	µg/L	5	10,000	NS	20.0	U	2.0	U	0.83	J	NA		2.61		2.00	U	1.17	J	2.00	U	**13.7**	J	**18.9**	J
VPH (MADEP)	Ethylbenzene	µg/L	700	5,000[3]	NS	38.6		2.0	U	0.329	J	NA		13.6		2.00	U	2.00	U	2.00	U	256		233	
VPH (MADEP)	*m,p* -Xylenes	µg/L	NS	NS	NS	46.2		2.0	U	2.0	U	NA		2.0	U	2.00	U	2.00	U	2.00	U	599		547	
VPH (MADEP)	*o* -Xylene	µg/L	NS	NS	NS	20.0	U	2.0	U	2.0	U	NA		2.0	U	2.00	U	2.00	U	2.00	U	223		210	
VPH (MADEP)	Total Xylenes	µg/L	10,000	5,000[3]	NS	46.2		2.0	U	2.0	U	NA		2.0	U	2.00	U	2.00	U	2.00	U	822		757	
VPH (MADEP)	Toluene	µg/L	1,000[4]	40,000[3]	NS	4.17	J	2.0	U	2.0	U	NA		1.16	J	2.00	U	0.466	J	2.00	U	11.4	J	15.4	J
Alkalinity - 2320B	Alkalinity, Total (as $CaCO_3$)	mg/L	NS	NS	NS	140		55		120		NA		160		140		98		110		150		150	
Field Parameter	ORP	mV	NS	NS	NS	1.0		246.6		53.9		222.9		-14.3		153.4		25.4		68.9		-52.0		NA	
Field Parameter	Dissolved Oxygen	mg/L	NS	NS	NS	0.59		2.83		1.00		6.39		0.60		0.80		0.24		0.16		1.09		NA	
Field Parameter	Turbidity	NTU	NS	NS	NS	2.00		4.07		4.42		1.80		3.0		2.50		25.5		19.9		1.6		NA	

Notes:

[1] Cleanup value as developed in the ROD (unless otherwise noted).

[2] From the RI.

[3] Revised GW-1 or GW-3 standard effective February 14, 2008.

[4] Cleanup goal is based on the respective GW-1 standards.

[5] Results for wells AAFES-2, XGM-93-02X and XGM-97-12X were non-detections above the cleanup goal.

[6] Result for well AAFES-2 was a non-detection above the cleanup goal.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Groundwater Analytical Results
Area of Contamination 43G
November 2009

Method	Analyte	Units	Cleanup Goal[1,4]	GW-3 Groundwater Standard[3]	Background[2]	AAFES-2	Qual	AAFES-5	Qual	AAFES-6R	Qual	AAFES-7	Qual	XGM-93-02X	Qual	XGM-94-04X	Qual
Metals SW6010B	Iron, Total	µg/L	9,100	NS	9,100	**16,000**		60	U	4,300		NA		8500		1800	
	Manganese, Total	µg/L	375	NS	291	**3,320**		10	U	**907**		81		**1630**		**2730**	
VPH (MADEP)	C5-C8 ALIPHATICS (Adjusted)	µg/L	300[3,4]	50,000	NS	730	U	50	U	56	U	NA		132	U	50	U
	C9-C10 AROMATICS	µg/L	200	50,000	NS	**2,660**		50	U	11.3	J	NA		110		50	U
	C9-C12 ALIPHATICS (Adjusted)	µg/L	700[3,4]	50,000	NS	**950**		50	U	19.5	J	NA		55.5		50	U
	BENZENE	µg/L	5	10,000	NS	3.93	J	2	U	0.44	J	NA		0.997	J	2	U
	ETHYLBENZENE	µg/L	700	5,000	NS	40.0		2	U	2	U	NA		3.5		2	U
	m,p-XYLENE	µg/L	NS	NS	NS	40.2	J	2	U	2	U	NA		2	U	2	U
	O-XYLENE	µg/L	NS	NS	NS	8.59	J	2	U	2	U	NA		0.23	J	2	U
	Total Xylenes	µg/L	10,000	5,000	NS	48.79	J	2	U	2	U	NA		0.23	J	2	U
	TOLUENE	1,000	1,000[4]	40,000	NS	4.67	J	2	U	2	U	NA		0.5	J	2	U
Alkalinity 2320B	Alkalinity, Total (as $CaCO_3$)	mg/L	NS	NS	NS	130	NA	31		100		NA		130		150	
Field Parameter	Temperature, Initial	NS	° Celsius	NS	NS	13.08		13.06		12.87		10.8		12.89		13.39	
	Temperature, Final	NS	° Celsius	NS	NS	12.95		13.83		13.16		10.69		17.82		13.53	
	pH	NS	Std units	NS	NS	6.95		5.8		6.63		6.47		6.7		6.74	
	Specific Conductance	NS	µS/cm	NS	NS	880		1138		9.79		606		979		785	
	ORP[5]	mV	NS	NS	NS	-123.8		14.9		6.9		130		-19.2		139.8	
	Dissolved Oxygen	mg/L	NS	NS	NS	2.5		6.77		2.15		9.35		0.44		3.91	
	Turbidity	NTU	NS	NS	NS	0.44		5		8		1.74		5		18.5	

Notes:

[1] Cleanup value as developed in the ROD (unless otherwise noted).

[2] From the RI.

[3] GW-3 standard effective June 26, 2009

[4] Cleanup goal is based on the respective GW-1 standards.

[5] The ORP value was not corrected to SHE.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Groundwater Analytical Results
Area of Contamination 43G
November 2009

Method	Analyte	Units	Cleanup Goal[1,4]	GW-3 Groundwater Standard[3]	Background[2]	XGM-94-07X	Qual	XGM-94-08X	Qual	XGM-97-12X	Qual	XGM-97-12X Duplicate	Qual
Metals SW6010B	Iron, Total	µg/L	9,100	NS	9,100	8,800		1,300		**25,000**		**27,000**	
	Manganese, Total	µg/L	375	NS	291	**4,990**		**2,150**	J	**2,390**		**2,490**	
VPH (MADEP)	C5-C8 ALIPHATICS (Adjusted)	µg/L	300[3,4]	50,000	NS	151	U	50	U	1,000	U	1,000	U
	C9-C10 AROMATICS	µg/L	200	50,000	NS	76.4		50	U	**4,110**		**4,050**	
	C9-C12 ALIPHATICS (Adjusted)	µg/L	700[3,4]	50,000	NS	89.1		6.19	J	**1,440**		**1,450**	
	BENZENE	µg/L	5	10,000	NS	1.61	J	2	U	**27.9**	J	**27.4**	J
	ETHYLBENZENE	µg/L	700	5,000	NS	0.732	U	2	U	90.2		88.1	
	m,p-XYLENE	µg/L	NS	NS	NS	2	U	2	U	153		145	
	O-XYLENE	µg/L	NS	NS	NS	2	U	2	U	56.7		53	
	Total Xylenes	µg/L	10,000	5,000	NS	2	U	2	U	209.7		198	
	TOLUENE	1,000	1,000[4]	40,000	NS	0.711	J	2	U	16.9	J	5.3	J
Alkalinity 2320B	Alkalinity, Total (as $CaCO_3$)	mg/L	NS	NS	NS	98		110		170		170	
Field Parameter	Temperature, Initial	NS	° Celsius	NS	NS	13.63		12.78		13.54		NA	
	Temperature, Final	NS	° Celsius	NS	NS	13.73		12.87		13.84		NA	
	pH	NS	Std units	NS	NS	6.63		6.78		6.67		NA	
	Specific Conductance	NS	µS/cm	NS	NS	960		826		1143		NA	
	ORP[5]	mV	NS	NS	NS	-3.4		122		-34.3		NA	
	Dissolved Oxygen	mg/L	NS	NS	NS	2.2		2.08		0.21		NA	
	Turbidity	NTU	NS	NS	NS	5		14.6		5.92		NA	

Notes:

[1] Cleanup value as developed in the ROD (unless otherwise noted).

[2] From the RI.

[3] GW-3 standard effective June 26, 2009

[4] Cleanup goal is based on the respective GW-1 standards.

[5] The ORP

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

AOC 43J

Groundwater Analytical Results
Area of Contamination 43J
October 2005

Method	Analyte	Units	Groundwater Standard[1]	Background[2]	2446-02	2446-02 Duplicate	2446-03	2446-04	XJM-93-02X	XJM-93-03X	XJM-94-05X	XJM-94-06X	XJM-94-08X	XJM-94-10X	XJM-97-11X	XJM-97-12X	XJM-97-13X
VPH - MADEP	Benzene	µg/L	5	—	1.5 U	1.5 U	1.5 U	1.5	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	3.9	3.9	1.5 U
VPH - MADEP	Toluene	µg/L	1,000	—	5.0 U	5.0 U	10.6	5.0 U	5.0 U	5.0 U	38.1	5.0 U	5.0 U	5.0 U	14.4	237	5.0 U
VPH - MADEP	Ethylbenzene	µg/L	700	—	54.2	53.6	190	5.0 U	5.0 U	5.0 U	**1,250**	5.0 U	5.0 U	5.0 U	5.0 U	**1,090**	5.0 U
VPH - MADEP	m,p-Xylene	µg/L	NS	—	39.3	38	71.2	10.0 U	10.0 U	10.0 U	1,730	10.0 U	10.0 U	10.0 U	10.0 U	1,430	10.0 U
VPH - MADEP	o-Xylene	µg/L	NS	—	5.0 U	5.0 U	40.6	5.0 U	5.0 U	5.0 U	61.7	5.0 U	5.0 U	5.0 U	15.7	56.3	5.0 U
VPH - MADEP	Total Xylenes	µg/L	10,000	—	39.3	38	112	10.0 U	10.0 U	10.0 U	1,791.7	10.0 U	10.0 U	10.0 U	15.7	1,486.3	10.0 U
VPH - MADEP	C_5 - C_8 Aliphatics	µg/L	400	—	**1,040**	**990**	**2,780**	**793**	158 U	158 U	**7,780**	158 U	158 U	158 U	**3,570**	**13,700**	158 U
VPH - MADEP	C_9 - C_{12} Aliphatics	µg/L	4,000	—	802	769	1320	255	220 U	220 U	**5,430**	220 UJ	220 U	220 U	398	**5,470**	220 U
VPH - MADEP	C_9 - C_{10} Aromatics	µg/L	200	—	**424**	**419**	**668**	137	100 U	100 U	**2,330**	100 U	100 U	100 U	192	**2,550**	100 U
Metals - SW6010B	Arsenic, total	µg/L	10	10.5	**336**	**317**	**66**	**51**	2.5 U	2.5 U	**55.6**	2.5 U	2.8	2.5	2.5 U	**59.4**	2.5 U
Metals - SW6010B	Iron, total	µg/L	9,100 [2]	9,100	**41,200**	**42,000**	**21,200**	**10,500**	417	293	**15,500**	164	567	462	128	**15,500**	60
Metals - SW6010B	Manganese, total	µg/L	291 (ROD)	291	**7,010 J-**	**7,220 J-**	**5,420**	**5,800**	**2,170**	129	**3,990**	72.9	**1,840**	106	**2,280**	**5,650**	14
Field Parameter	ORP	µg/L	NS	NS	-76.4	NA	-89.8	-33.2	-45.2	-35.9	-97.3	-18.1	-41.1	81.1	77.8	-98.6	52.9
Field Parameter	Dissolved Oxygen	µg/L	NS	NS	0.47	NA	14.58	1.08	11.56	4.83	10.23	7.13	1.13	1.11	0.74	0.88	1.9

[1] From the MCP GW1 Standards (310 CMR 40 Subpart P) unless identified as from the ROD.

[2] From the RI.

2007 GROUNDWATER ANALYTICAL DATA
ANNUAL MONITORING EVENT
AOC 43J
DEVENS, MASSACHUSETTS
FILE NO: 10884-072

							Equipment Blanks			Duplicate				
LOCATION	**ROD Established**			**2446-02**			**2446-02E**	**2446-02E**				**2446-03**		
SAMPLING DATE	**Clean-up Goals**	1/16/2007	6/6/2007	10/4/2007	12/20/2007	12/9/2008	1/16/2007	6/6/2007	1/16/2007	1/16/2007	6/6/2007	10/4/2007	12/20/2007	12/8/2008
LAB SAMPLE ID	**(ug/L)** [4.]	L0700748-05	L0708099-08	L0714720-02	L0718933-04	L0818014-03	L0700748-06	L0708099-09	L0700748-03	L0700748-04	L0708099-07	L0714720-01	L0718933-03	L0817968-04
UNIT SCREENED				overburden			-	-				overburden		
Volatile Organics by MCP 8260B (ug/L)														
Benzene	5	ND(0.25)	ND(0.25)	**10**	**11**	ND(50)	ND(0.25)			ND(2.5)	ND(1.25)	ND(1.25)	ND (1.25)	ND(1.25)
Carbon tetrachloride	NA	ND(0.25)	ND(0.25)	ND(0.25)	ND (5)	ND(50)	ND(0.25)	ND(0.25)	ND(2.5)	ND(2.5)	ND(1.25)	ND(1.25)	ND (1.25)	ND(1.25)
Ethylbenzene	700	ND(0.25)	51	**1600**	**2500**	**5300**	ND(0.25)	ND(0.25)	290	270	390	690	**790**	690
Toluene	1000	ND(0.375)	11	400	550	810	ND(0.375)	ND(0.375)	ND(3.75)	ND(3.75)	7.8	28	26	11
o-Xylene	NA	ND(0.5)	34	1200	1400	3600	ND(0.5)	ND(0.5)	33	32	42	130	160	62
p/m-Xylene	NA	ND(0.5)	82	2600	3800	9000	ND(0.5)	ND(0.5)	86	83	120	270	340	210
Total Xylenes	10000	ND(0.5)	116	3800	5200	**12600**	ND(0.5)	ND(0.5)	115	115	162	400	500	272
Total BTEX	NA	ND(0.5)	178	5810	8261	18710	ND(0.5)	ND(0.5)	405	385	559.8	1118	1316	973
Volatile Petroleum Hydrocarbons (ug/L)														
C5-C8 Aliphatics, Adjusted	400	ND(25)	216	**9580**	**10200**	**9630**	-	-	**2320**	**2800**	**2230**	**5490**	**5610**	**3550**
C5-C8 Aliphatics, Unadjusted	NA	ND(25)	227	10100	10700	9960	-	-	2320	2800	2230	5520	5640	3550
C9-C10 Aromatics	200	ND(25)	116	**2930**	**3850**	**3920**	-	-	**1070**	**1140**	**1130**	**2160**	**2820**	**1700**
C9-C12 Aliphatics, Adjusted	4000	ND(25)	62.4	2840	3090	3950	-	-	328	303	431	911	928	801
C9-C12 Aliphatics, Unadjusted	NA	ND(25)	330	12300	14000	14700	-	-	1800	1900	1940	4160	5060	3150
Total VPHs		ND	662	24810	28050	28250	-	-	5190	5840	5300	11810	13490	8400
Dissolved Metals by MCP 6000/7000 series (ug/L)														
Arsenic, Dissolved	10	6	**35**	**90**	**75**	**60**	-	-	**39**	**39**	**55**	**98**	**89**	**68**
Iron, Dissolved	9100	710	4900	**21000**	**25000**	**32000**	-	-	**21000**	**21000**	**25000**	**20000**	**26000**	**29000**
Manganese, Dissolved	291	**2920**	**2440**	**6520**	**9310**	**11900**	-	-	**7520**	**7570**	**8310**	**4310**	**5880**	**9270**
Methane (ug/L)	NA	1.3	16.4	1100	1090	1080	-	-	641	785	492	3200	2640	2950
Nitrogen, Nitrate (ug/L)	NA	130	130	130	ND (250)	ND(500)	-	-	120	120	130	120	ND (250)	ND(500)
Nitrogen, Nitrite (ug/L)	NA	-	-	ND(50)	ND (50)	100			-	-	-	ND(50)	ND (50)	60
Sulfate (ug/L)	NA	22000	25000	ND(5000)	ND (5000)	ND(5000)	-	-	ND(5000)	ND(5000)	ND(5000)	ND(5000)	ND (5000)	ND(5000)
Total Organic Carbon (ug/L)	NA	-	-	-	-	-	-	-	-	-	4800	-	-	-
Field Parameters														
Conductivity (umhos/cm)	NA	115	138	352	375	848	-	-	237	-	244	356	542	555
Temperature (° Celsius)	NA	9.14	17.37	20.54	14.43	14.11			12.61	-	14.82	20.97	14.37	14.34
Dissolved Oxygen (mg/L)	NA	0.14	0.33	0.27	0.34	0.20	-	-	0.05	-	0.38	0.32	0.55	0.15
Oxidation Reduction Potential (ORP) (mV)	NA	31.1	42.3	-172.2	-192.8	-107.9	-	-	-12.2	-	-103.8	-144.2	-163	-117.8
pH	NA	5.3	5.83	6.45	6.65	6.34	-	-	6.0	-	6.71	6.34	6.56	6.45
Ferrous Iron (mg/L)	NA	0.83	4.3	-	-	3.8	-	-	2.28	-	8.6	-	-	2.8
Turbidity (NTU)	NA	-	-	-	-	1.71	-	-	-	-	-	-	-	1.07

Notes and Abbreviations:
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2007 GROUNDWATER ANALYTICAL DATA
ANNUAL MONITORING EVENT
AOC 43J
DEVENS, MASSACHUSETTS
FILE NO: 10884-072

LOCATION	ROD Established			Duplicate				Equipment Blank	Equipment Blank
				2446-04				EB-1	EB-2
SAMPLING DATE	Clean-up Goals	1/15/2007	6/6/2007	6/6/2007	12/19/2007	10/3/2007	12/5/2008	12/5/2008	12/11/2008
LAB SAMPLE ID	(ug/L) [4.]	L0700693-07	L0708099-02	L0708099-03	L0718845-03	L0714597-02	L0817904-05	L0817904-06	L0818237-06
UNIT SCREENED				overburden					
Volatile Organics by MCP 8260B (ug/L)									
Benzene	5	0.96	**6.9**	**6.2**	1.1	3	4.7	ND(0.25)	ND(0.25)
Carbon tetrachloride	NA	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)
Ethylbenzene	700	1.7	7.8	7.4	ND (0.25)	ND(0.25)	74	ND(0.25)	ND(0.25)
Toluene	1000	ND(0.375)	11	9.8	ND (0.375)	1.4	8.8	2.9	ND(0.375)
o-Xylene	NA	ND(0.5)	7.1	6.6	ND (0.5)	1.9	33	ND(0.5)	ND(0.5)
p/m-Xylene	NA	ND(0.5)	36	34	ND (0.5)	3.4	63	1.3	ND(0.5)
Total Xylenes	10000	ND(0.5)	43.1	40.6	ND (0.5)	5.3	96	1.3	-
Total BTEX	NA	2.66	68.8	64	1.1	9.7	183.5	4.2	-
Volatile Petroleum Hydrocarbons (ug/L)									
C5-C8 Aliphatics, Adjusted	400	114	**550**	**599**	117	**704**	**2290**	-	-
C5-C8 Aliphatics, Unadjusted	NA	114	563	613	117	712	2290	-	-
C9-C10 Aromatics	200	65.4	**224**	**242**	146	**307**	**543**	-	-
C9-C12 Aliphatics, Adjusted	4000	ND(25)	81.3	99.5	ND (25)	133	ND(125)	-	-
C9-C12 Aliphatics, Unadjusted	NA	101	343	380	177	443	919	-	-
Total VPHs		280.4	1117	841	440	1454	2833	-	-
Dissolved Metals by MCP 6000/7000 series (ug/L)									
Arsenic, Dissolved	10	**11**	**13**	**12**	**39**	**93**	**48**	-	-
Iron, Dissolved	9100	5700	**9400**	9000	**16000**	**26000**	**24000**	-	-
Manganese, Dissolved	291	**1180**	**2000**	**1960**	**6580**	**5390**	**5860**	-	-
Methane (ug/L)	NA	-	-	-	-	-	1600	-	-
Nitrogen, Nitrate (ug/L)	NA	190	440	440	ND (50)	130	ND(500)	-	-
Nitrogen, Nitrite (ug/L)	NA	-	-	-	ND (10)	ND(50)	80	-	-
Sulfate (ug/L)	NA	ND(5000)	ND(5000)	ND(5000)	ND (5000)	ND(5000)	ND(5000)	-	-
Total Organic Carbon (ug/L)	NA	-	-	-	-	-	-	-	-
Field Parameters									
Conductivity (umhos/cm)	NA	182	197	-	321	403	454	-	-
Temperature (° Celsius)	NA	8.60	14.86	-	14.98	21.03	15.51	-	-
Dissolved Oxygen (mg/L)	NA	1	1.47	-	0.93	0.46	2.07	-	-
Oxidation Reduction Potential (ORP) (mV)	NA	40.9	-21.1	-	-42.1	-172.8	-166.6	-	-
pH	NA	5.4	6.14	-	6.36	6.33	6.51	-	-
Ferrous Iron (mg/L)	NA	3.3	5.5	-	-	-	1.9	-	-
Turbidity (NTU)	NA	-	-	-	-	-	2.93	-	-

Notes and Abbreviations:
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2007 GROUNDWATER ANALYTICAL DATA
ANNUAL MONITORING EVENT
AOC 43J
DEVENS, MASSACHUSETTS
FILE NO: 10884-072

LOCATION	ROD Established			HA-1B					HA-1S		
SAMPLING DATE	Clean-up Goals	1/15/2007	6/5/2007	10/2/2007	12/17/2007	12/11/2008	1/15/2007	6/5/2007	10/2/2007	12/18/2007	12/10/2008
LAB SAMPLE ID	(ug/L) [4.]	L0700693-02	L0708103-03	L0714486-03	L0718708-03	L0818237-05	L0700693-01	L0708103-04	L0714486-05	L0718825-04	L0818149-02
UNIT SCREENED				bedrock					overburden		
Volatile Organics by MCP 8260B (ug/L)											
Benzene	5	**24**	**15**	**68**	**69**	ND(25)	**22**	**18**	**43**	**51**	**12**
Carbon tetrachloride	NA	ND(5)	ND(0.5)	ND(0.5)	ND (25)	ND(25)	ND(5)	ND(1.25)	ND(1.25)	ND (1.25)	ND(1.25)
Ethylbenzene	700	410	390	**940**	**1100**	360	350	370	660	**770**	380
Toluene	1000	170	200	330	300	100	100	120	73	190	20
o-Xylene	NA	64	110	75	ND (50)	ND(50)	39	62	24	50	13
p/m-Xylene	NA	510	490	940	1000	390	350	360	360	670	240
Total Xylenes	10000	574	600	1015	1000	390	389	422	384	720	253
Total BTEX	NA	1178	1205	2353	2469	850	861	930	1160	1731	665
Volatile Petroleum Hydrocarbons (ug/L)											
C5-C8 Aliphatics, Adjusted	400	**8410**	**4060**	**11400**	**10500**	**4120**	**7520**	**3690**	**8210**	**6580**	**4360**
C5-C8 Aliphatics, Unadjusted	NA	8610	4210	11800	10800	4190	7660	3800	8310	6800	4360
C9-C10 Aromatics	200	**1660**	**1270**	**2340**	**2650**	**1110**	**1360**	**1090**	**1270**	**1820**	**1010**
C9-C12 Aliphatics, Adjusted	4000	580	599	1320	ND (500)	617	486	448	697	ND (250)	587
C9-C12 Aliphatics, Unadjusted	NA	3180	2620	5690	5650	2230	2620	2120	2820	3700	2020
Total VPHs		10070	5330	13740	18800	7460	11500	6900	12300	12100	7390
Dissolved Metals by MCP 6000/7000 series (ug/L)											
Arsenic, Dissolved	10	**18**	**16**	**54**	**44**	7	**39**	**25**	**42**	**40**	**39**
Iron, Dissolved	9100	**11000**	**10000**	**19000**	**19000**	**11000**	8800	8000	**10000**	**12000**	**12000**
Manganese, Dissolved	291	**6250**	**5620**	**9800**	**9960**	**5240**	**11700**	**9450**	**12900**	**14400**	**11400**
Methane (ug/L)	NA	856	313	1870	2680	540	914	388	1530	2060	1030
Nitrogen, Nitrate (ug/L)	NA	ND(50)	110	ND(50)	ND (50)	ND(250)	ND(50)	110	ND(50)	ND (25)	ND(50)
Nitrogen, Nitrite (ug/L)	NA	-	-	ND(50)	ND (50)	ND(25)	-	-	ND(50)	ND (25)	ND(25)
Sulfate (ug/L)	NA	ND(5000)	ND(5000)	ND(5000)	ND (5000)	ND(5000)	ND(5000)	ND(5000)	ND(5000)	ND (2500)	ND(5000)
Total Organic Carbon (ug/L)	NA	-	5400	-	-	-	-	5200	-	-	-
Field Parameters											
Conductivity (umhos/cm)	NA	180	157	357	749	188	230	187	331	417	782
Temperature (° Celsius)	NA	13.60	14.09	16.01	14.26	13.79	12.20	13.94	17.99	14.60	14.74
Dissolved Oxygen (mg/L)	NA	0.04	0.21	1.34	0.98	0.16	0.07	0.33	0.33	0.5	3.52
Oxidation Reduction Potential (ORP) (mV)	NA	-27.6	-183.2	-148.4	-339.9	-142.8	-15.8	-110.8	-156.3	-105.4	-192.0
pH	NA	5.7	6.71	7.03	7.15	6.34	5.8	6.84	6.81	7.02	6.65
Ferrous Iron (mg/L)	NA	3.3	6.4	-	-	4	3.3	5	-	-	0.9
Turbidity (NTU)	NA	-	-	-	-	0.84	-	-	-	-	12.1

Notes and Abbreviations:
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2007 GROUNDWATER ANALYTICAL DATA
ANNUAL MONITORING EVENT
AOC 43J
DEVENS, MASSACHUSETTS
FILE NO: 10884-072

LOCATION	ROD Established			HA-2B					HA-2S		
SAMPLING DATE	Clean-up Goals	1/12/2007	6/5/2007	9/26/2007	12/12/2007	12/11/2008	1/12/2007	6/4/2007	10/2/2007	12/18/2007	12/8/2008
LAB SAMPLE ID	(ug/L) [4.]	L0700612-03	L0708103-02	L0714164-01	L0718446-01	L0818237-03	L0700612-04	L0708046-03	L0714486-04	L0718825-03	L0817968-05
UNIT SCREENED				bedrock					overburden		
Volatile Organics by MCP 8260B (ug/L)											
Benzene	5	3.1	1.2	**7.9**	**13**	**5.3**	0.5	0.73	ND(0.25)	ND (0.25)	1.7
Carbon tetrachloride	NA	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)
Ethylbenzene	700	ND(0.25)	ND(0.25)	ND(0.25)	0.88	ND(0.25)	ND(0.25)	8.8	ND(0.25)	ND (0.25)	ND(0.25)
Toluene	1000	ND(0.375)	ND(0.375)	3	1	ND(0.375)	ND(0.375)	ND(0.375)	ND(0.375)	ND (0.375)	ND(0.375)
o-Xylene	NA	ND(0.5)	ND(0.5)	1.6	ND (0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	ND(0.5)
p/m-Xylene	NA	ND(0.5)	ND(0.5)	5.7	2.7	1.2	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	ND(0.5)
Total Xylenes	10000	ND(0.5)	ND(0.5)	7.3	2.7	1.2	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	-
Total BTEX	NA	3.1	1.2	18.2	17.58	6.5	0.5	9.53	ND(0.5)	ND(0.5)	1.7
Volatile Petroleum Hydrocarbons (ug/L)											
C5-C8 Aliphatics, Adjusted	400	ND(25)	ND(25)	**590**	240	288	55.1	251	ND(25)	58.1	362
C5-C8 Aliphatics, Unadjusted	NA	ND(25)	ND(25)	598	250	291	55.1	251	ND(25)	58.1	362
C9-C10 Aromatics	200	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	ND(25)	68.3	ND(25)	52.6	84.8
C9-C12 Aliphatics, Adjusted	4000	ND(25)	ND(25)	66.9	50.8	ND(25)	57.9	ND(25)	72.4	ND (25)	56.9
C9-C12 Aliphatics, Unadjusted	NA	ND(25)	ND(25)	72.7	50.8	ND(25)	57.9	110	72.4	72.9	142
Total VPHs		ND	ND	662.7	290.8	288	113	429.3	72.4	183.6	588.8
Dissolved Metals by MCP 6000/7000 series (ug/L)											
Arsenic, Dissolved	10	ND(2.5)	ND(2.5)	ND(2.5)	ND (2.5)	ND(2.5)	5	ND(2.5)	7	ND (2.5)	7
Iron, Dissolved	9100	ND(25)	230	120	ND (25)	ND(25)	ND(25)	130	480	ND (25)	380
Manganese, Dissolved	291	216	**619**	**381**	**302**	210	**963**	**1460**	**1740**	**820**	1690
Methane (ug/L)	NA	-	-	-	-	256	-	-	-	-	380
Nitrogen, Nitrate (ug/L)	NA	ND(50)	ND(50)	ND(50)	ND (50)	ND(50)	ND(50)	ND(50)	ND(50)	ND (50)	140
Nitrogen, Nitrite (ug/L)	NA	-	-	ND(50)	ND (50)	ND(25)	-	-	ND(50)	ND (10)	80
Sulfate (ug/L)	NA	ND(5000)	ND(5000)	ND(5000)	ND (5000)	ND(5000)	12000	ND(5000)	ND(5000)	ND (5000)	ND(5000)
Total Organic Carbon (ug/L)	NA	-	-	-	-	-	-	-	-	-	-
Field Parameters											
Conductivity (umhos/cm)	NA	324	310	295	487	430.000	312	305	513	476	782*
Temperature (° Celsius)	NA	13.68	14.30	17.18	13.75	11.71	11.70	13.18	18.50	11.76	12.00*
Dissolved Oxygen (mg/L)	NA	0.08	0.34	0.42	6.06	2.65	0.09	0.53	5.2	3.82	2.96*
Oxidation Reduction Potential (ORP) (mV)	NA	-84	-158	-154.1	-14.9	-132.7	-57.4	-69	-50	-72.6	-82.8*
pH	NA	6.6	7.56	7.31	8.47	7.22	6.3	7.25	7	7.53	4.15*
Ferrous Iron (mg/L)	NA	0.11	-	-	-	ND	0.02	-	-	-	-
Turbidity (NTU)	NA	-	-	-	-	7.75	-	-	-	-	18.8*

Notes and Abbreviations:
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2007 GROUNDWATER ANALYTICAL DATA
ANNUAL MONITORING EVENT
AOC 43J
DEVENS, MASSACHUSETTS
FILE NO: 10884-072

		Trip Blanks							Equipment Blank					
LOCATION	**ROD Established**	**HA-301**	**HA-301**			**HA-3B**			**HA-3BE**			**HA-3S**		
SAMPLING DATE	**Clean-up Goals**	1/15/2007	6/6/2007	1/11/2007	6/1/2007	10/1/2007	12/17/2007	12/10/2008	6/1/2007	1/11/2007	6/4/2007	10/2/2007	12/18/2007	12/5/2008
LAB SAMPLE ID	**(ug/L)** [4.]	L0700693-06	L0708099-10	L0700557-06	L0707938-05	L0714410-03	L0718708-01	L0818149-04	L0707938-06	L0700557-05	L0708046-01	L0714486-02	L0718825-01	L0817904-07
UNIT SCREENED		-	-			bedrock			-			overburden		
Volatile Organics by MCP 8260B (ug/L)														
Benzene	5	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)
Carbon tetrachloride	NA	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)
Ethylbenzene	700	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)
Toluene	1000	ND(0.375)	ND(0.375)	ND(0.375)	ND(0.375)	ND(0.375)	1.8	ND(0.375)	ND(0.375)	ND(0.375)	ND(0.375)	ND(0.375)	ND (0.375)	ND(0.375)
o-Xylene	NA	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	ND(0.5)
p/m-Xylene	NA	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	ND(0.5)
Total Xylenes	10000	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	-	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	-
Total BTEX	NA	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	1.8	-	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	-
Volatile Petroleum Hydrocarbons (ug/L)														
C5-C8 Aliphatics, Adjusted	400	-	-	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	-	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)
C5-C8 Aliphatics, Unadjusted	NA	-	-	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	-	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)
C9-C10 Aromatics	200	-	-	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	-	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)
C9-C12 Aliphatics, Adjusted	4000	-	-	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	-	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)
C9-C12 Aliphatics, Unadjusted	NA	-	-	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	-	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)
Total VPHs		-	-	ND	ND	ND	ND	ND	-	ND	ND	ND	ND	ND
Dissolved Metals by MCP 6000/7000 series (ug/L)														
Arsenic, Dissolved	10	-	-	ND(2.5)	ND(2.5)	ND(2.5)	ND (2.5)	ND(2.5)	-	ND(2.5)	ND(2.5)	ND(2.5)	ND (2.5)	ND(2.5)
Iron, Dissolved	9100	-	-	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	-	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)
Manganese, Dissolved	291	-	-	55	20	13	11	ND(5)	-	281	45	204	14	ND(5)
Methane (ug/L)	NA	-	-	0.373	ND(0.15)	0.45	0.382	0.589	-	1.11	0.353	0.57	0.646	1.61
Nitrogen, Nitrate (ug/L)	NA	-	-	ND(50)	110	ND(50)	ND (50)	230	-	ND(50)	360	310	330	860
Nitrogen, Nitrite (ug/L)	NA	-	-	-	-	ND(50)	ND (50)	ND(25)		-	-	ND(50)	ND (10)	ND(25)
Sulfate (ug/L)	NA	-	-	10000	ND(5000)	ND(5000)	ND (5000)	ND(5000)	-	13000	11000	21000	16000	17000
Total Organic Carbon (ug/L)	NA	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Parameters														
Conductivity (umhos/cm)	NA	-	-	285	269	247	415	774	-	132	141	549	560	554
Temperature (° Celsius)	NA	-	-	13.46	17.13	15.97	13.51	13.79		12.36	14.28	20.80	14.81	14.09
Dissolved Oxygen (mg/L)	NA	-	-	0.06	0.36	0.36	2.88	3.99	-	1.13	5.39	1.86	NA	2.21
Oxidation Reduction Potential (ORP) (mV)	NA	-	-	-48	-164.5	-165.1	-152.7	-148.0	-	-36.8	127	87	-176.7	94.5
pH	NA	-	-	7.4	7.97	8.17	8.28	7.60	-	6.7	6.29	7.02	7.67	6.85
Ferrous Iron (mg/L)	NA	-	-	0.0	-	-	-	-	-	0.0	-	-	-	ND
Turbidity (NTU)	NA	-	-	-	-	-	-	7.98	-	-	-	-	-	13.12

Notes and Abbreviations:
Refer to the end of this table for Notes and Abbreviations.

2007 GROUNDWATER ANALYTICAL DATA
ANNUAL MONITORING EVENT
AOC 43J
DEVENS, MASSACHUSETTS
FILE NO: 10884-072

LOCATION	ROD Established			HA-4B					HA-4S		
SAMPLING DATE	Clean-up Goals	1/12/2007	6/5/2007	10/2/2007	12/18/2007	12/11/2008	1/12/2007	6/4/2007	10/2/2007	12/19/2007	12/8/2008
LAB SAMPLE ID	(ug/L) [4.]	L0700612-01	L0708103-01	L0714486-01	L0718825-02	L0818237-04	L0700612-02	L0708046-02	L0714486-06	L0718845-01	L0817968-06
UNIT SCREENED				bedrock					overburden		
Volatile Organics by MCP 8260B (ug/L)											
Benzene	5	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)	ND(0.25)	ND(0.25)	1.9	ND (0.25)	ND(0.25)
Carbon tetrachloride	NA	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)
Ethylbenzene	700	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	1.1	ND(0.25)
Toluene	1000	ND(0.375)	ND(0.375)	ND(0.375)	3.5	ND(0.375)	ND(0.375)	ND(0.375)	ND(0.375)	ND (0.375)	ND(0.375)
o-Xylene	NA	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	ND(0.5)
p/m-Xylene	NA	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	1	ND(0.5)
Total Xylenes	10000	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	-	ND(0.5)	ND(0.5)	ND(0.5)	1	-
Total BTEX	NA	ND(0.5)	ND(0.5)	ND(0.5)	3.5	-	ND(0.5)	ND(0.5)	1.9	2.1	-
Volatile Petroleum Hydrocarbons (ug/L)											
C5-C8 Aliphatics, Adjusted	400	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)
C5-C8 Aliphatics, Unadjusted	NA	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)
C9-C10 Aromatics	200	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)
C9-C12 Aliphatics, Adjusted	4000	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)
C9-C12 Aliphatics, Unadjusted	NA	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)
Total VPHs		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dissolved Metals by MCP 6000/7000 series (ug/L)											
Arsenic, Dissolved	10	ND(2.5)	7	6	7	6	ND(2.5)	6	**14**	ND (2.5)	ND(5)
Iron, Dissolved	9100	ND(25)	200	ND(25)	ND (25)	ND(25)	ND(25)	640	780	ND (25)	ND(25)
Manganese, Dissolved	291	168	260	71	199	54	**695**	**4130**	**1030**	**403**	20
Methane (ug/L)	NA	-	-	-	-	8.85	-	-	-	-	1.24
Nitrogen, Nitrate (ug/L)	NA	ND(50)	ND(50)	ND(50)	ND (50)	110	100	ND(50)	ND(50)	120	340
Nitrogen, Nitrite (ug/L)	NA	-	-	ND(50)	ND (50)	ND(25)	-	-	ND(50)	ND (50)	ND(25)
Sulfate (ug/L)	NA	25000	18000	ND(5000)	19000	ND(5000)	31000	16000	39000	40000	36000
Total Organic Carbon (ug/L)	NA	-	-	-	-	-	-	-	-	-	-
Field Parameters											
Conductivity (umhos/cm)	NA	348	336	368	481	367	#REF!	272	625	472	868*
Temperature (° Celsius)	NA	14.36	16.56	15.45	10.29	12.81	12.90	14.54	20.80	12.97	13.91*
Dissolved Oxygen (mg/L)	NA	0.07	0.74	2.3	NA	4.53	1.29	0.69	1.3	2.66	6.28*
Oxidation Reduction Potential (ORP) (mV)	NA	-60.9	-100.1	278.3	-183.4	-14.7	-31.3	-144	-140	-38.6	39.6*
pH	NA	6.2	7.68	7.78	7.87	7.68	6.3	7.01	7.46	7.26	4.15*
Ferrous Iron (mg/L)	NA	0.0	-	-	-	ND	NA	-	-	-	-
Turbidity (NTU)	NA	-	-	-	-	33.6	-	-	-	-	108*

Notes and Abbreviations:
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2007 GROUNDWATER ANALYTICAL DATA
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AOC 43J
DEVENS, MASSACHUSETTS
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LOCATION	ROD Established	TRIP BLANKS				XJM-93-01X				
SAMPLING DATE	Clean-up Goals	12/12/2007	12/14/2007	12/2/2008	12/3/2008	1/10/2007	5/31/2007	9/27/2007	12/12/2007	12/8/2008
LAB SAMPLE ID	(ug/L) [4.]	L0718446-03	L0718643-07	L0818237-07	L0817904-08	L0700476-01	L0707912-01	L0714221-01	L0718446-02	L0817968-02
UNIT SCREENED		-	-	-	-			overburden/bedrock		
Volatile Organics by MCP 8260B (ug/L)										
Benzene	5	ND (0.25)	ND (0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)
Carbon tetrachloride	NA	ND (0.25)	ND (0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)
Ethylbenzene	700	ND (0.25)	ND (0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)
Toluene	1000	ND (0.375)	ND (0.375)	ND(0.375)	ND(0.375)	ND(0.375)	ND(0.375)	ND(0.375)	ND (0.375)	ND(0.375)
o-Xylene	NA	ND (0.5)	ND (0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	ND(0.5)
p/m-Xylene	NA	ND (0.5)	ND (0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	ND(0.5)
Total Xylenes	10000	ND (0.5)	ND (0.5)	-	-	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	-
Total BTEX	NA	ND(0.5)	ND(0.5)	-	-	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	-
Volatile Petroleum Hydrocarbons (ug/L)										
C5-C8 Aliphatics, Adjusted	400	ND (25)	ND (25)	-	-	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)
C5-C8 Aliphatics, Unadjusted	NA	ND (25)	ND (25)	-	-	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)
C9-C10 Aromatics	200	ND (25)	ND (25)	-	-	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)
C9-C12 Aliphatics, Adjusted	4000	ND (25)	ND (25)	-	-	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)
C9-C12 Aliphatics, Unadjusted	NA	ND (25)	ND (25)	-	-	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)
Total VPHs		ND	ND	-	-	ND	ND	ND	ND	ND
Dissolved Metals by MCP 6000/7000 series (ug/L)										
Arsenic, Dissolved	10	-	-	-	-	ND(2.5)	ND(2.5)	ND(2.5)	ND (2.5)	ND(2.5)
Iron, Dissolved	9100	-	-	-	-	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)
Manganese, Dissolved	291	-	-	-	-	ND(5)	ND(5)	**1090**	ND (5)	ND(5)
Methane (ug/L)	NA	-	-	-	-	-	-	-	-	0.483
Nitrogen, Nitrate (ug/L)	NA	-	-	-	-	ND(50)	100	120	300	130
Nitrogen, Nitrite (ug/L)	NA	-	-	-	-	-	-	ND(50)	ND (50)	ND(25)
Sulfate (ug/L)	NA	-	-	-	-	ND(5000)	ND(5000)	ND(5000)	ND (5000)	ND(5000)
Total Organic Carbon (ug/L)	NA	-	-	-	-	-	-	-	-	-
Field Parameters										
Conductivity (umhos/cm)	NA	-	-	-	-	166	137	285	316	214
Temperature (° Celsius)	NA	-	-	-	-	10.08	12.19	19.14	12.70	10.76
Dissolved Oxygen (mg/L)	NA	-	-	-	-	0.77	5.07	3.25	0.19	3.89
Oxidation Reduction Potential (ORP) (mV)	NA	-	-	-	-	179.2	71.1	-41.7	52.7	125.6
pH	NA	-	-	-	-	5.9	6.49	6.45	7.55	6.40
Ferrous Iron (mg/L)	NA	-	-	-	-	0.01	-	-	-	ND
Turbidity (NTU)	NA	-	-	-	-	-	-	-	-	0.97

Notes and Abbreviations:
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LOCATION	ROD Established		Duplicate	XJM-93-02X					XJM-93-03X			
SAMPLING DATE	Clean-up Goals	1/15/2007	1/15/2007	6/6/2007	10/3/2007	12/19/2007	12/5/2008	1/15/2007	6/6/2007	10/3/2007	12/19/2007	12/8/2008
LAB SAMPLE ID	(ug/L) [4.]	L0700693-03	L0700693-04	L0708099-01	L0714597-01	L0718845-02	L0817904-02	L0700693-08	L0708099-04	L0714597-06	L0718845-04	L0817968-01
UNIT SCREENED				overburden						overburden		
Volatile Organics by MCP 8260B (ug/L)												
Benzene	5	ND(0.25)	ND(0.25)	ND(0.25)	1.6	ND (0.25)	ND(0.25)	ND(0.25)	0.58	0.65	ND (0.25)	ND(0.25)
Carbon tetrachloride	NA	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)
Ethylbenzene	700	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)	ND(0.25)	2.3	1.4	ND (0.25)	ND(0.25)
Toluene	1000	ND(0.375)	ND(0.375)	ND(0.375)	ND(0.375)	ND (0.375)	ND(0.375)	ND(0.375)	ND(0.375)	ND(0.25)	ND (0.375)	ND(0.375)
o-Xylene	NA	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	ND(0.5)
p/m-Xylene	NA	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	ND(0.5)
Total Xylenes	10000	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	-	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	-
Total BTEX	NA	ND(0.5)	ND(0.5)	ND(0.5)	1.6	ND(0.5)	-	ND(0.5)	2.88	2.05	ND(0.5)	-
Volatile Petroleum Hydrocarbons (ug/L)												
C5-C8 Aliphatics, Adjusted	400	ND(25)	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	ND(25)	209	340	137	57.4
C5-C8 Aliphatics, Unadjusted	NA	ND(25)	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	ND(25)	209	343	137	57.4
C9-C10 Aromatics	200	ND(25)	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	ND(25)	67.9	124	74.4	ND(25)
C9-C12 Aliphatics, Adjusted	4000	ND(25)	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	ND(25)	ND(25)	53.8	ND (25)	ND(25)
C9-C12 Aliphatics, Unadjusted	NA	ND(25)	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	ND(25)	96.1	177	106	ND(25)
Total VPHs		ND	ND	ND	ND	ND	ND	ND	373	641	317.4	57.4
Dissolved Metals by MCP 6000/7000 series (ug/L)												
Arsenic, Dissolved	10	ND(2.5)	ND(2.5)	ND(2.5)	ND(2.5)	ND (2.5)	ND(2.5)	ND(2.5)	7	**21**	**16**	ND(2.5)
Iron, Dissolved	9100	210	220	ND(25)	220	940	ND(25)	ND(25)	530	2500	1600	890
Manganese, Dissolved	291	**4380**	**4240**	56	**2600**	**5060**	**2300**	18	**1670**	**1640**	**1220**	**593**
Methane (ug/L)	NA	18.4	21.7	0.558	170	241	4.34	-	-	-	-	35.4
Nitrogen, Nitrate (ug/L)	NA	ND(50)	ND(50)	130	ND(50)	ND (50)	610	160	300	ND(50)	ND (50)	1400
Nitrogen, Nitrite (ug/L)	NA	-	-	-	ND(50)	ND (10)	ND(25)	-	-	ND(50)	ND (10)	ND(25)
Sulfate (ug/L)	NA	18000	18000	20000	27000	15000	21000	ND(5000)	ND(5000)	ND(5000)	ND (5000)	ND(5000)
Total Organic Carbon (ug/L)	NA	-	-	-	-	-	-	-	-	-	-	-
Field Parameters												
Conductivity (umhos/cm)	NA	218	-	148	354	267	378	106	297	417	377	669
Temperature (° Celsius)	NA	11.50	-	13.09	17.90	13.49	15.08	11.80	15.35	20.60	14.36	13.14
Dissolved Oxygen (mg/L)	NA	0.6	-	5.38	3.7	2.03	3.67	1.21	0.67	4.34	1.59	2.86
Oxidation Reduction Potential (ORP) (mV)	NA	51.6	-	90.9	138	16.1	62.7	50.6	-69.5	-120	-51.4	57.5
pH	NA	5.2	-	6.06	6.02	6.07	6.00	5.5	6.87	6.48	6.87	6.10
Ferrous Iron (mg/L)	NA	0.0	-	0	-	-	0.5	0.35	-	-	-	1.5
Turbidity (NTU)	NA	-	-	-	-	-	4.32	-	-	-	-	4.82

Notes and Abbreviations:
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DEVENS, MASSACHUSETTS
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LOCATION	ROD Established			XJM-93-04X					XJM-94-05X		
SAMPLING DATE	Clean-up Goals	1/10/2007	5/31/2007	9/28/2007	12/14/2007	12/10/2008	1/16/2007	6/6/2007	10/3/2007	12/20/2007	12/9/2008
LAB SAMPLE ID	(ug/L) [4.]	L0700476-02	L0707912-02	L0714319-01	L0718643-03	L0818149-01	L0700748-02	L0708099-06	L0714597-05	L0718933-02	L0818014-01
UNIT SCREENED				bedrock					overburden		
Volatile Organics by MCP 8260B (ug/L)											
Benzene	5	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)	**5.5**	**10**	**5.4**	ND (5)	12
Carbon tetrachloride	NA	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)	ND(2.5)	ND(0.25)	ND(0.25)	ND (5)	ND(5)
Ethylbenzene	700	ND(0.25)	ND(0.25)	ND(0.25)	0.94	ND(0.25)	180	**900**	**730**	**2000**	500
Toluene	1000	ND(0.375)	ND(0.375)	ND(0.375)	ND (0.375)	ND(0.375)	55	200	69	150	68
o-Xylene	NA	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	ND(0.5)	14	120	47	78	20
p/m-Xylene	NA	ND(0.5)	ND(0.5)	ND(0.5)	1.4	ND(0.5)	340	870	680	1800	490
Total Xylenes	10000	ND(0.5)	ND(0.5)	ND(0.5)	1.4	-	354	990	727	1878	510
Total BTEX	NA	ND(0.5)	ND(0.5)	ND(0.5)	2.34	-	594.5	2100	1531.4	4028	1090
Volatile Petroleum Hydrocarbons (ug/L)											
C5-C8 Aliphatics, Adjusted	400	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	**3500**	**5530**	**13900**	**8800**	**5380**
C5-C8 Aliphatics, Unadjusted	NA	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	3560	5690	14100	8950	5450
C9-C10 Aromatics	200	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	**1150**	**2050**	**5710**	**4280**	**1930**
C9-C12 Aliphatics, Adjusted	4000	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	362	847	2730	1940	ND(625)
C9-C12 Aliphatics, Unadjusted	NA	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	2040	4280	13000	10000	4000
Total VPHs		ND	ND	ND	ND	ND	3560	5690	14100	8950	7310
Dissolved Metals by MCP 6000/7000 series (ug/L)											
Arsenic, Dissolved	10	ND(2.5)	**10**	ND(2.5)	ND (5)	ND(2.5)	**26**	**44**	**86**	**159**	**42**
Iron, Dissolved	9100	ND(25)	2200	400	110	ND(25)	7000	**11000**	**19000**	**13000**	**14000**
Manganese, Dissolved	291	ND(5)	**1020**	132	115	43	**2380**	**3040**	**3600**	**3950**	**4950**
Methane (ug/L)	NA	-	-	-	-	0.78	-	-	-	-	1240
Nitrogen, Nitrate (ug/L)	NA	280	830	1600	590	430	ND(50)	220	ND(50)	220	ND(500)
Nitrogen, Nitrite (ug/L)	NA	-	-	ND(50)	ND (50)	ND(25)	-	-	ND(50)	ND (50)	70
Sulfate (ug/L)	NA	ND(5000)	19000	160000	20000	ND(5000)	ND(5000)	ND(5000)	ND(5000)	ND (5000)	ND(5000)
Total Organic Carbon (ug/L)	NA	-	-	-	-	-	-	7400	-	-	-
Field Parameters											
Conductivity (umhos/cm)	NA	75	129	411	2827	333	184	257	348	402	624
Temperature (° Celsius)	NA	7.54	13.80	17.70	9.07	10.62	11.69	14.84	20.00	16.29	13.89
Dissolved Oxygen (mg/L)	NA	1.11	0.4	4.16	6.48	3.72	0.06	0.24	NA	0.67	0.48
Oxidation Reduction Potential (ORP) (mV)	NA	152.3	-51.7	18.2	101.7	61.6	-9.4	-123.9	-139	-162.1	-119.2
pH	NA	6.4	6.64	6.93	8.68	6.55	5.9	6.78	6.15	6.76	6.44
Ferrous Iron (mg/L)	NA	0.12	-	-	-	ND	6.85	6.1	-	-	4.5
Turbidity (NTU)	NA	-	-	-	-	1.01**	-	-	-	-	4.98

Notes and Abbreviations:
Refer to the end of this table for Notes and Abbreviations.

2007 GROUNDWATER ANALYTICAL DATA
ANNUAL MONITORING EVENT
AOC 43J
DEVENS, MASSACHUSETTS
FILE NO: 10884-072

LOCATION	ROD Established	XJM-94-07X					XJM-94-08X					Duplicate
SAMPLING DATE	Clean-up Goals	1/11/2007	6/1/2007	10/1/2007	12/17/2007	12/8/2008	1/11/2007	6/1/2007	10/1/2007	12/14/2007	12/5/2008	12/5/2008
LAB SAMPLE ID	(ug/L) [4.]	L0700557-04	L0707938-04	L0714410-04	L0718708-02	L0817968-03	L0700557-02	L0707938-02	L0714410-01	L0718643-05	L0817904-03	L0817904-04
UNIT SCREENED				overburden					overburden			
Volatile Organics by MCP 8260B (ug/L)												
Benzene	5	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)	ND(0.25)
Carbon tetrachloride	NA	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)	ND(0.25)
Ethylbenzene	700	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)	ND(0.25)
Toluene	1000	ND(0.375)	ND(0.375)	ND(0.375)	ND (0.375)	ND(0.375)	ND(0.375)	ND(0.375)	ND(0.375)	0.97	ND(0.375)	ND(0.375)
o-Xylene	NA	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	ND(0.5)	ND(0.5)
p/m-Xylene	NA	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	ND(0.5)	ND(0.5)
Total Xylenes	10000	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	-	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	-	-
Total BTEX	NA	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	-	ND(0.5)	ND(0.5)	ND(0.5)	0.97	-	-
Volatile Petroleum Hydrocarbons (ug/L)												
C5-C8 Aliphatics, Adjusted	400	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	ND(25)
C5-C8 Aliphatics, Unadjusted	NA	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	ND(25)
C9-C10 Aromatics	200	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	ND(25)
C9-C12 Aliphatics, Adjusted	4000	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	ND(25)
C9-C12 Aliphatics, Unadjusted	NA	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	ND(25)
Total VPHs		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dissolved Metals by MCP 6000/7000 series (ug/L)												
Arsenic, Dissolved	10	ND(2.5)	ND(2.5)	ND(2.5)	ND (2.5)	ND(2.5)	ND(2.5)	ND(2.5)	ND(2.5)	ND (5)	ND(2.5)	-
Iron, Dissolved	9100	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	ND(25)	50	470	270	ND(25)	-
Manganese, Dissolved	291	ND(5)	ND(5)	ND(5)	17	13	**1000**	**1550**	**3600**	**1490**	**1140**	-
Methane (ug/L)	NA	ND(0.15)	0.327	0.32	0.502	1.57	-	-	-	-	144	-
Nitrogen, Nitrate (ug/L)	NA	ND(50)	ND(50)	ND(50)	ND (50)	140	ND(50)	ND(50)	ND(50)	ND (50)	ND(50)	-
Nitrogen, Nitrite (ug/L)	NA	-	-	ND(50)	ND (50)	ND(25)	-	-	ND(50)	ND (50)	ND(25)	-
Sulfate (ug/L)	NA	ND(5000)	ND(5000)	ND(5000)	ND (5000)	ND(5000)	ND(5000)	ND(5000)	ND(5000)	ND (5000)	ND(5000)	-
Total Organic Carbon (ug/L)	NA	-	-	-	-	-	-	-	-	-	-	-
Field Parameters												
Conductivity (umhos/cm)	NA	84	61	170	199	287	296	275	388	501	292	-
Temperature (° Celsius)	NA	8.78	12.97	15.31	10.10	10.80	10.53	12.36	14.88	11.68	12.38	-
Dissolved Oxygen (mg/L)	NA	0.76	4.91	2.44	2.93	5.22	0.11	0.41	1.46	0.46	2.69	-
Oxidation Reduction Potential (ORP) (mV)	NA	-67	50.9	89.1	17.8	60.5	-138	-54.1	-68.2	-102	58.8	-
pH	NA	6.2	6.07	6.28	6.65	3.19	6.9	7.22	6.78	8.03	6.38	-
Ferrous Iron (mg/L)	NA	0.07	-	-	-	-	0.0	-	-	-	ND	-
Turbidity (NTU)	NA	-	-	-	-	4.69	-	-	-	-	1.98	-

Notes and Abbreviations:
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2007 GROUNDWATER ANALYTICAL DATA
ANNUAL MONITORING EVENT
AOC 43J
DEVENS, MASSACHUSETTS
FILE NO: 10884-072

LOCATION	ROD Established	XJM-94-09X					XJM-94-10X					Equipment Blank XJM-96-02XE
SAMPLING DATE	Clean-up Goals	1/10/2007	5/31/2007	9/28/2007	12/13/2007	12/9/2008	1/11/2007	5/31/2007	9/28/2007	12/14/2007	12/5/2008	1/15/2007
LAB SAMPLE ID	(ug/L) [4.]	L0700476-03	L0707912-03	L0714319-02	L0718643-01	L0818014-02	L0700557-01	L0707912-04	L0714319-04	L0718643-04	L0817904-01	L0700693-05
UNIT SCREENED				overburden					overburden			-
Volatile Organics by MCP 8260B (ug/L)												
Benzene	5	ND(0.25)	ND(0.25)	3.8	**15**	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)	ND(0.25)
Carbon tetrachloride	NA	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)	ND(0.25)
Ethylbenzene	700	ND(0.25)	ND(0.25)	0.81	14	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)	ND(0.25)
Toluene	1000	ND(0.375)	ND(0.375)	8.9	22	ND(0.375)	ND(0.375)	ND(0.375)	ND(0.375)	ND (0.375)	ND(0.375)	ND(0.375)
o-Xylene	NA	ND(0.5)	ND(0.5)	7.1	23	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	ND(0.5)	ND(0.5)
p/m-Xylene	NA	ND(0.5)	ND(0.5)	6.8	21	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	ND(0.5)	ND(0.5)
Total Xylenes	10000	ND(0.5)	ND(0.5)	13.9	44	-	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	-	ND(0.5)
Total BTEX	NA	ND(0.5)	ND(0.5)	27.41	95	-	ND(0.5)	ND(0.5)	ND(0.5)	ND(0.5)	-	ND(0.5)
Volatile Petroleum Hydrocarbons (ug/L)												
C5-C8 Aliphatics, Adjusted	400	ND(25)	ND(25)	ND(25)	**532**	ND(25)	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	-
C5-C8 Aliphatics, Unadjusted	NA	ND(25)	ND(25)	ND(25)	553	ND(25)	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	-
C9-C10 Aromatics	200	ND(25)	ND(25)	ND(25)	81.2	ND(25)	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	-
C9-C12 Aliphatics, Adjusted	4000	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	-
C9-C12 Aliphatics, Unadjusted	NA	ND(25)	ND(25)	ND(25)	135	ND(25)	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)	-
Total VPHs		ND	ND	ND	613.2	ND	ND	ND	ND	ND	ND	
Dissolved Metals by MCP 6000/7000 series (ug/L)												
Arsenic, Dissolved	10	ND(2.5)	ND(2.5)	ND(2.5)	ND (5)	ND(2.5)	ND(2.5)	ND(2.5)	ND(2.5)	ND (5)	ND(2.5)	-
Iron, Dissolved	9100	ND(25)	ND(25)	ND(25)	80	ND(25)	ND(25)	ND(25)	ND(25)	100	ND(25)	-
Manganese, Dissolved	291	ND(5)	ND(5)	53	**1100**	12	ND(5)	ND(5)	11	77	ND(5)	-
Methane (ug/L)	NA	-	-	-	-	1.94	-	-	-	-	0.344	-
Nitrogen, Nitrate (ug/L)	NA	ND(50)	ND(50)	ND(50)	ND (50)	110	ND(50)	ND(50)	ND(50)	ND (50)	ND(50)	-
Nitrogen, Nitrite (ug/L)	NA	-	-	ND(50)	ND (50)	ND(25)	-	-	ND(50)	ND (50)	ND(25)	
Sulfate (ug/L)	NA	12000	12000	13000	ND (5000)	11000	16000	14000	17000	12000	19000	-
Total Organic Carbon (ug/L)	NA	-	-	-	-	-	-	-	-	-	-	-
Field Parameters												
Conductivity (umhos/cm)	NA	65	52	85	**145**	125	189	232	304	523	171	-
Temperature (° Celsius)	NA	9.38	10.65	13.96	**11.44**	11.07	8.72	11.65	13.07	11.87	10.78	
Dissolved Oxygen (mg/L)	NA	0.98	5.57	2.16	**0.98**	5.06	0.73	1.92	1.66	2.04	5.99	-
Oxidation Reduction Potential (ORP) (mV)	NA	151.9	118.7	89.1	**92**	120.9	-66.1	7.8	61.3	35.8	107.6	-
pH	NA	5.7	5.7	6.31	**6.64**	5.24	6.4	7.01	6.76	8.63	5.93	-
Ferrous Iron (mg/L)	NA	0.0	-	-	-	ND	0.0	-	-	-	ND	-
Turbidity (NTU)	NA	-	-	-	-	2.87	-	-	-	-	4.08	-

Notes and Abbreviations:
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2007 GROUNDWATER ANALYTICAL DATA
ANNUAL MONITORING EVENT
AOC 43J
DEVENS, MASSACHUSETTS
FILE NO: 10884-072

LOCATION	ROD Established	XJM-97-11X					XJM-97-12X						Duplicate
SAMPLING DATE	Clean-up Goals	1/10/2007	6/1/2007	9/28/2007	12/13/2007	12/10/2008	1/16/2007	6/6/2007	10/3/2007	10/3/2007	12/20/2007	12/11/2008	12/11/2008
LAB SAMPLE ID	(ug/L) [4.]	L0700476-04	L0707938-01	L0714319-03	L0718643-02	L0818149-03	L0700748-01	L0708099-05	L0714597-03	L0714597-04	L0718933-01	L0818237-02	L0818237-01
UNIT SCREENED				bedrock						bedrock			
Volatile Organics by MCP 8260B (ug/L)													
Benzene	5	ND(0.25)	ND(0.25)	ND(0.25)	3.6	ND(0.25)	**13**	**12**	ND(2.5)	**7.3**	ND (2.5)	ND(2.5)	**ND(25)**
Carbon tetrachloride	NA	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)	ND(6)	ND(0.25)	ND(2.5)	ND(2.5)	ND (2.5)	ND(2.5)	ND(25)
Ethylbenzene	700	ND(0.25)	ND(0.25)	ND(0.25)	12	0.77	**760**	**1100**	**1400**	**1200**	**2000**	**3100**	**3300**
Toluene	1000	ND(0.375)	ND(0.375)	ND(0.375)	7.3	ND(0.375)	160	200	190	160	130	85	120
o-Xylene	NA	ND(0.5)	ND(0.5)	ND(0.5)	5.9	ND(0.5)	34	150	51	54	530	510	730
p/m-Xylene	NA	ND(0.5)	ND(0.5)	ND(0.5)	14	ND(0.5)	1000	1200	1400	810	2800	4500	4800
Total Xylenes	10000	ND(0.5)	ND(0.5)	ND(0.5)	19.9	-	1034	1350	1451	864	3330	5010	5530
Total BTEX	NA	ND(0.5)	ND(0.5)	ND(0.5)	42.8	0.77	1967	2662	3041	2231.3	5460	7600	8950
Volatile Petroleum Hydrocarbons (ug/L)													
C5-C8 Aliphatics, Adjusted	400	ND(25)	ND(25)	**1440**	**1060**	77.2	**7220**	**4080**	**4700**	-	**8440**	**7640**	**6150**
C5-C8 Aliphatics, Unadjusted	NA	ND(25)	ND(25)	1460	1080	77.2	7410	4230	4780	-	8570	7730	6220
C9-C10 Aromatics	200	ND(25)	ND(25)	178	**236**	ND(25)	**3130**	**2430**	**1310**	-	**4780**	**3710**	**2960**
C9-C12 Aliphatics, Adjusted	4000	ND(25)	ND(25)	78.2	66.2	ND(25)	887	1070	718	-	2910	3010	2450
C9-C12 Aliphatics, Unadjusted	NA	ND(25)	ND(25)	269	328	ND(25)	5740	5200	3100	-	13500	11800	9480
Total VPHs		ND	ND	1440	1060	77.2	7220	4080	4700	-	8440	23150	18590
Dissolved Metals by MCP 6000/7000 series (ug/L)													
Arsenic, Dissolved	10	ND(2.5)	ND(2.5)	ND(2.5)	ND (5)	ND(2.5)	**54**	**47**	**74**	-	**105**	**96**	-
Iron, Dissolved	9100	ND(25)	ND(25)	ND(25)	190	ND(50)	**13000**	**12000**	**14000**	-	**44000**	**51000**	-
Manganese, Dissolved	291	ND(5)	ND(5)	**1360**	**2140**	ND(5)	**4640**	**4590**	**5120**	-	**11500**	**11700**	-
Methane (ug/L)	NA	-	-	-	-	3.09	-	-	-	-	-	856	-
Nitrogen, Nitrate (ug/L)	NA	1200	1400	ND(50)	ND (50)	1300	ND(50)	100	ND(50)	-	2100	ND(500)	-
Nitrogen, Nitrite (ug/L)	NA	-	-	ND(50)	ND (50)	ND(25)	-	-	ND(50)	-	ND (50)	ND(25)	-
Sulfate (ug/L)	NA	11000	12000	ND(5000)	ND (5000)	12000	ND(5000)	ND(5000)	ND(5000)	-	ND (5000)	ND(5000)	-
Total Organic Carbon (ug/L)	NA	-	-	-	-	-	-	11000	-	-	-	-	-
Field Parameters													
Conductivity (umhos/cm)	NA	76	251	187	275	350	275	240	333	-	318	461	-
Temperature (° Celsius)	NA	10.65	10.87	13.08	11.08	11.66	12.68	13.44	17.10		11.48	13.94	-
Dissolved Oxygen (mg/L)	NA	0.78	5.19	1.07	0.21	4.24	0.08	0.27	NA	-	1.32	0.23	-
Oxidation Reduction Potential (ORP) (mV)	NA	101.6	46.3	19	-34.3	108.6	-26.6	-135.3	-125	-	-189.3	-96.7	-
pH	NA	6.9	7.28	6.99	7.23	7.06	6.2	6.74	6.01	-	6.51	6.33	-
Ferrous Iron (mg/L)	NA	0.0	-	-	-	ND	3.3	4.2	-	-	-	3.0	-
Turbidity (NTU)	NA	-	-	-	-	1.01	-	-	-	-	-	2.88	-

Notes and Abbreviations:
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2007 GROUNDWATER ANALYTICAL DATA
ANNUAL MONITORING EVENT
AOC 43J
DEVENS, MASSACHUSETTS
FILE NO: 10884-072

LOCATION	**ROD Established**			**XJM-97-13X**		
SAMPLING DATE	**Clean-up Goals**	1/11/2007	6/1/2007	10/1/2007	12/14/2007	12/10/2008
LAB SAMPLE ID	**(ug/L) [4.]**	L0700557-03	L0707938-03	L0714410-02	L0718643-06	L0818149-05
UNIT SCREENED				bedrock		
Volatile Organics by MCP 8260B (ug/L)						
Benzene	5	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)
Carbon tetrachloride	NA	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)
Ethylbenzene	700	ND(0.25)	ND(0.25)	ND(0.25)	ND (0.25)	ND(0.25)
Toluene	1000	ND(0.375)	ND(0.375)	ND(0.375)	ND (0.375)	ND(0.375)
o-Xylene	NA	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	ND(0.5)
p/m-Xylene	NA	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	ND(0.5)
Total Xylenes	10000	ND(0.5)	ND(0.5)	ND(0.5)	ND (0.5)	-
Total BTEX	NA	ND(0.5)	**ND(0.5)**	**ND(0.5)**	ND(0.5)	**-**
Volatile Petroleum Hydrocarbons (ug/L)						
C5-C8 Aliphatics, Adjusted	400	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)
C5-C8 Aliphatics, Unadjusted	NA	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)
C9-C10 Aromatics	200	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)
C9-C12 Aliphatics, Adjusted	4000	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)
C9-C12 Aliphatics, Unadjusted	NA	ND(25)	ND(25)	ND(25)	ND (25)	ND(25)
Total VPHs		ND	ND	ND	ND	ND
Dissolved Metals by MCP 6000/7000 series (ug/L)						
Arsenic, Dissolved	10	ND(2.5)	ND(2.5)	ND(2.5)	ND (5)	ND(2.5)
Iron, Dissolved	9100	ND(25)	ND(25)	ND(25)	90	ND(25)
Manganese, Dissolved	291	13	ND(5)	21	15	12
Methane (ug/L)	NA	**-**	-	-	-	42.9
Nitrogen, Nitrate (ug/L)	NA	ND(50)	ND(50)	ND(50)	ND (50)	100
Nitrogen, Nitrite (ug/L)	NA	**-**	**-**	ND(50)	ND (50)	ND(25)
Sulfate (ug/L)	NA	ND(5000)	ND(5000)	ND(5000)	ND (5000)	ND(5000)
Total Organic Carbon (ug/L)	NA	-	-	-	-	-
Field Parameters						
Conductivity (umhos/cm)	NA	277	268	244	477	349
Temperature (° Celsius)	NA	11.50	14.17	12.80	11.74	12.24
Dissolved Oxygen (mg/L)	NA	0.03	0.47	0.32	0.13	0.21
Oxidation Reduction Potential (ORP) (mV)	NA	-99.8	-66.7	24.7	-118.3	75.2
pH	NA	7.3	7.66	7.65	8.62	7.36
Ferrous Iron (mg/L)	NA	0.0	-	-	-	ND
Turbidity (NTU)	NA	-	-	-	-	0.50

Notes and Abbreviations:
Refer to the end of this table for Notes and Abbreviations.

2007 GROUNDWATER ANALYTICAL DATA
AOC 43J MONITORED NATURAL ATTENUATION ASSESSMENT
PATTON ROAD
DEVENS, MASSACHUSETTS
FILE NO: 10884-072

Notes and Abbreviations:

1. NA: Not Applicable.
2. ND(2.5): Not detected; number in parentheses is one-half the laboratory detection limit
3. _ : Not analyzed
4. Clean-up Goals as established in the Record of Decision (ROD), October 1996.
5. Samples designated with a "D" indicate a duplicate sample at the sample location.
6. **Bold** values exceed ROD Clean-up Goal criteria.
7. Field parameters conductivity, dissolved oxygen, temperature, ORP, pH, and Turbidity monitored with a YSI 556 meter and flow-through cell. Ferrous iron monitored with a Hach Colorimetric kit.
8. * : Well pumped dry during low-flow parameter monitoring. Sample parameters listed do not represent low-flow conditions.
9. **: Post Filter

TABLE I
GROUNDWATER ANALYTICAL DATA
ANNUAL MONITORING EVENT
AOC 43J
DEVENS, MASSACHUSETTS
FILE NO: 10884-072

LOCATION	ROD Established	Tank		2446-02									2446-03		2446-04		
SAMPLING DATE	Clean-up Goals	12/17/2009	12/23/2009	11/18/2009	12/17/2009	12/23/2009	12/31/2009	1/7/2010	1/14/2010	1/22/2010	2/5/2010	2/23/2010	11/16/2009	12/17/2009	11/13/2009	12/17/2009	12/23/2009
UNIT SCREENED		-	-				Overburden						Overburden			Overburden	
LOCATION		Injection Well					Injection Well						Outside IW			Outside MW-0	
DTW					5.2	-	-	-	-	-	5.83	6.84	9.12	7.23	9.89	8.37	-
Volatile Organics by MCP 8260B (ug/L)																	
Carbon tetrachloride	NA	-	-	-	-	-	-	-	-	-	-	-	ND(1)	-	ND(0.5)	-	-
Volatile Petroleum Hydrocarbons (ug/L)																	
C5-C8 Aliphatics, Adjusted	400	-	-	7370	-	-	-	-	-	-	792	5790	3030	-	2200	-	-
C5-C8 Aliphatics, Unadjusted	NA	-	-	7820	-	-	-	-	-	-	804	5870	3030	-	2200	-	-
C9-C10 Aromatics	200	-	-	3580	-	-	-	-	-	-	812	4920	1480	-	504	-	-
C9-C12 Aliphatics, Adjusted	4000	-	-	ND(500)	-	-	-	-	-	-	ND(25)	3780	529	-	ND(125)	-	-
C9-C12 Aliphatics, Unadjusted	NA	-	-	6970	-	-	-	-	-	-	1430	12300	2680	-	794	-	-
Benzene	5	-	-	ND(20)	-	-	-	-	-	-	ND(1)	ND(10)	ND(10)	-	ND(5)	-	-
Ethylbenzene	700	-	-	1460	-	-	-	-	-	-	202	1270	440	-	13.3	-	-
Toluene	1000	-	-	453	-	-	-	-	-	-	11.4	85.7	ND(10)	-	ND(5)	-	-
o-Xylene	NA	-	-	1140	-	-	-	-	-	-	91.8	449	57.5	-	17.3	-	-
p/m-Xylene	NA	-	-	1620	-	-	-	-	-	-	311	1880	170	-	39.4	-	-
Total Xylenes	10000	-	-	2760	-	-	-	-	-	-	402.8	2329	227.5	-	56.7	-	-
Methyl tert butyl ether	NA	-	-	ND(30)	-	-	-	-	-	-	ND(1.5)	ND(15)	ND(15)	-	ND(7.5)	-	-
Naphthalene	NA	-	-	231	-	-	-	-	-	-	48.4	330	121	-	ND(25)	-	-
Total BTEX	NA	-	-	4673	-	-	-	-	-	-	616.2	3684.7	667.5	-	70	-	-
Dissolved Metals by MCP 6000/7000 series (ug/L)																	
Arsenic, Dissolved	10	-	-	87	-	-	-	-	-	-	-	-	84	-	106	-	-
Iron, Dissolved	9100	-	-	73000	-	-	-	-	-	-	-	-	47000	-	52000	-	-
Manganese, Dissolved	291	-	-	26300	-	-	-	-	-	-	-	-	11000	-	13200	-	-
Methane (ug/L)	NA	-	-	1200D	-	-	-	-	-	-	-	-	4320D	-	2170D	-	-
Nitrogen, Nitrate (ug/L)	NA	-	-	ND(50)	-	-	-	-	-	-	-	-	ND(50)	-	ND(50)	-	-
Nitrogen, Nitrite (ug/L)	NA	-	-	ND(25)	-	-	-	-	-	-	-	-	ND(25)	-	ND(25)	-	-
Sulfate (mg/L)	NA	-	1600	ND(5)	-	-	-	-	-	-	88	170	ND(5)	-	ND(5)	-	-
Bromide (mg/L)		-	110	0.12	-	-	-	-	-	-	5.6	20	0.06	-	0.07	-	-
Alkalinity, Total (mg $CaCO_3$/L)		-	-	130	-	-	-	-	-	-	120	190	150	-	170	-	-
Field Parameters																	
Conductivity (mS/cm)	NA	-	-	2.146	-	-	-	-	-	-	0.538	1.719	1.189	-	1.103	-	-
Temperature (° Celsius)	NA	-	-	16.6	-	-	-	-	-	-	8.44	8.3	16.72	-	15.89	-	-
Dissolved Oxygen (mg/L)	NA	-	-	0.28	-	-	-	-	-	-	0.28	0.1	0.38	-	0.98	-	-
Oxidation Reduction Potential (ORP) (mV)	NA	-	-	-52.2	-	-	-	-	-	-	59.9	-108.1	56.4	-	-79.2	-	-
pH	NA	-	-	6.22	-	-	-	-	-	-	5.98	6.26	6.41	-	6.52	-	-
Turbidity (NTU)	NA	-	-	5.2	-	-	-	-	-	-	3.81	3.51	2.49	-	4.71	-	-
Bromide (mg/L using bromide field sensor)	NA	160	-	-	67.5	560	27.7	108	27.5	21.7	11.6	26.4	-	218	-	2.8	8.1
Sulfate (mg/L using Hach kit)	NA	-	-	-		-	-	-	>200	-	75	85	-	-	-	-	-
Sulfate:Bromide (using laboratory results for each)			14.5								15.7	8.5					

TABLE I
GROUNDWATER ANALYTICAL DATA
ANNUAL MONITORING EVENT
AOC 43J
DEVENS, MASSACHUSETTS
FILE NO: 10884-072

LOCATION	ROD Established Clean-up Goals	HA-5S									HA-6B								
SAMPLING DATE		11/18/2009	12/17/2009	12/23/2009	12/31/2009	1/7/2010	1/14/2010	1/22/2010	2/5/2010	2/23/2010	11/17/2009	12/17/2009	12/23/2009	12/31/2009	1/7/2010	1/14/2010	1/22/2010	2/5/2010	2/23/2010
UNIT SCREENED		Overburden									Bedrock								
LOCATION		Pilot Test Monitoring Well									Pilot MW-B								
DTW		8.44	5.64	5.3	5.3	6.4	7.12	6.92	6.28	7.29	7.97	6.48	-	-	-	-	-	7.03	7.55
Volatile Organics by MCP 8260B (ug/L)																			
Carbon tetrachloride	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Volatile Petroleum Hydrocarbons (ug/L)																			
C5-C8 Aliphatics, Adjusted	400	6430	-	-	804	3270	-	5860	3490	10600	2380	-	-	-	-	-	-	6050	8270
C5-C8 Aliphatics, Unadjusted	NA	6760	-	-	828	3490	-	6570	3690	11400	2380	-	-	-	-	-	-	6050	8340
C9-C10 Aromatics	200	4050	-	-	313	1820	-	2320	1220	2680	884	-	-	-	-	-	-	2570	2150
C9-C12 Aliphatics, Adjusted	4000	ND(500)	-	-	208	ND(250)	-	2190	1170	3210	ND(250)	-	-	-	-	-	-	ND(1250)	1620
C9-C12 Aliphatics, Unadjusted	NA	9440	-	-	786	3580	-	7790	4020	10300	1630	-	-	-	-	-	-	5920	5150
Benzene	5	ND(20)	-	-	ND(1)	ND(10)	-	ND(20)	ND(20)	ND(10)	ND(10)	-	-	-	-	-	-	ND(50)	ND(25)
Ethylbenzene	700	2170	-	-	77	512	-	914	463	1370	219	-	-	-	-	-	-	819	724
Toluene	1000	330	-	-	24.1	214	-	708	202	797	ND(10)	-	-	-	-	-	-	ND(50)	72.5
o-Xylene	NA	1300	-	-	81.8	542	-	1070	537	1330	ND(10)	-	-	-	-	-	-	ND(50)	73.2
p/m-Xylene	NA	3260	-	-	106	685	-	1300	629	1720	137	-	-	-	-	-	-	788	589
Total Xylenes	10000	4560	-	-	187.8	1227	-	2370	1166	3050	137	-	-	-	-	-	-	788	662.2
Methyl tert butyl ether	NA	ND(30)	-	-	ND(1.5)	ND(15)	-	ND(30)	ND(30)	ND(15)	ND(15)	-	-	-	-	-	-	ND(75)	ND(37.5)
Naphthalene	NA	351	-	-	15	ND(50)	-	ND(100)	ND(100)	201	ND(50)	-	-	-	-	-	-	ND(250)	ND(125)
Total BTEX	NA	7060	-	-	288.9	1953	-	3992	1831	5217	356	-	-	-	-	-	-	1607	1458.7
Dissolved Metals by MCP 6000/7000 series (ug/L)																			
Arsenic, Dissolved	10	17	-	-	-	-	-	-	-	-	7	-	-	-	-	-	-	-	-
Iron, Dissolved	9100	11000	-	-	-	-	-	-	-	-	4600	-	-	-	-	-	-	-	-
Manganese, Dissolved	291	18900	-	-	-	-	-	-	-	-	6060	-	-	-	-	-	-	-	-
Methane (ug/L)	NA	576	-	-	-	-	-	-	-	-	759	-	-	-	-	-	-	-	-
Nitrogen, Nitrate (ug/L)	NA	ND(50)	-	-	-	-	-	-	-	-	ND(50)	-	-	-	-	-	-	-	-
Nitrogen, Nitrite (ug/L)	NA	ND(25)	-	-	-	-	-	-	-	-	ND(25)	-	-	-	-	-	-	-	-
Sulfate (mg/L)	NA	ND(5)	-	1100	610	220	210	120	130	130	ND(5)	-	-	-	-	-	-	ND(5)	ND(5)
Bromide (mg/L)		0.09	-	89	38	17	19	20	13	14	0.09	-	-	-	-	-	-	0.06	0.5
Alkalinity, Total (mg $CaCO_3$/L)		170	-	-	130	170	170	150	160	180	230	-	-	-	-	-	-	170	190
Field Parameters																			
Conductivity (mS/cm)	NA	1.271	-	2.19	2.23	1.27	1.02	1.32	0.774	1.674	1.179	-	-	-	-	-	-	0.519	1.082
Temperature (° Celsius)	NA	14.6	-	10.78	10.34	11.6	10.97	10.37	8.99	8.6	15.62	-	-	-	-	-	-	11.27	12.43
Dissolved Oxygen (mg/L)	NA	0.41	-	0.9	0.27	2.1	0.83	0.5	0.28	0.69	0.44	-	-	-	-	-	-	0.32	0.32
Oxidation Reduction Potential (ORP) (mV)	NA	-15.9	-	-162	-0.3	-71.2	-139	-133	30.7	-82.3	-79.4	-	-	-	-	-	-	-66.9	-120.1
pH	NA	6.44	-	8.24	6.19	6.52	7.63	5.1	6.11	6.23	7.06	-	-	-	-	-	-	6.75	6.6
Turbidity (NTU)	NA	6.47	-	-	1000+	>1000	>1000	254	286	311	70.6	-	-	-	-	-	-	16.9	19
Bromide (mg/L using bromide field sensor)	NA	-	3.7	335.3	92	10.9	16.8	14.9	16.7	39/45.4	-	2.8	5.2	2.9	1.7	1.8	0.9	1	7/6.4
Sulfate (mg/L using Hach kit)	NA	-		>200	>200	-	Turbidity too high	Turbidity too high	Turbidity too high	100	-		-	-	-	<50	-	<50	<50
Sulfate:Bromide (using laboratory results for each)				12.4	16.1	12.9	11.1	6.0	10.0	9.3									

TABLE I
GROUNDWATER ANALYTICAL DATA
ANNUAL MONITORING EVENT
AOC 43J
DEVENS, MASSACHUSETTS
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LOCATION	ROD Established Clean-up Goals	INJ-O1									INJ-O2								
SAMPLING DATE		11/18/2009	12/17/2009	12/23/2009	12/31/2009	1/7/2010	1/14/2010	1/22/2010	2/5/2010	2/23/2010	11/18/2009	12/17/2009	12/23/2009	12/31/2009	1/7/2010	1/14/2010	1/22/2010	2/5/2010	2/23/2010
UNIT SCREENED		Overburden									Overburden								
LOCATION		IW									IW								
DTW			5.06	4.8	-	-	-	-	-	-		5.05	-	-	-	-	-	-	-
Volatile Organics by MCP 8260B (ug/L)																			
Carbon tetrachloride	NA	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Volatile Petroleum Hydrocarbons (ug/L)																			
C5-C8 Aliphatics, Adjusted	400	4070	-	-	-	-	-	-	-	-	5590	-	-	-	-	-	-	-	-
C5-C8 Aliphatics, Unadjusted	NA	4140	-	-	-	-	-	-	-	-	5640	-	-	-	-	-	-	-	-
C9-C10 Aromatics	200	3460	-	-	-	-	-	-	-	-	3680	-	-	-	-	-	-	-	-
C9-C12 Aliphatics, Adjusted	4000	ND(125)	-	-	-	-	-	-	-	-	ND(250)	-	-	-	-	-	-	-	-
C9-C12 Aliphatics, Unadjusted	NA	5570	-	-	-	-	-	-	-	-	5370	-	-	-	-	-	-	-	-
Benzene	5	ND(5)	-	-	-	-	-	-	-	-	ND(10)	-	-	-	-	-	-	-	-
Ethylbenzene	700	693	-	-	-	-	-	-	-	-	702	-	-	-	-	-	-	-	-
Toluene	1000	67.6	-	-	-	-	-	-	-	-	54.7	-	-	-	-	-	-	-	-
o-Xylene	NA	540	-	-	-	-	-	-	-	-	356	-	-	-	-	-	-	-	-
p/m-Xylene	NA	1500	-	-	-	-	-	-	-	-	1260	-	-	-	-	-	-	-	-
Total Xylenes	10000	2040	-	-	-	-	-	-	-	-	1616	-	-	-	-	-	-	-	-
Methyl tert butyl ether	NA	ND(7.5)	-	-	-	-	-	-	-	-	ND(15)	-	-	-	-	-	-	-	-
Naphthalene	NA	160	-	-	-	-	-	-	-	-	149	-	-	-	-	-	-	-	-
Total BTEX	NA	2800.6	-	-	-	-	-	-	-	-	2372.7	-	-	-	-	-	-	-	-
Dissolved Metals by MCP 6000/7000 series (ug/L)																			
Arsenic, Dissolved	10	22	-	-	-	-	-	-	-	-	33	-	-	-	-	-	-	-	-
Iron, Dissolved	9100	4000	-	-	-	-	-	-	-	-	11000	-	-	-	-	-	-	-	-
Manganese, Dissolved	291	7290	-	-	-	-	-	-	-	-	4780	-	-	-	-	-	-	-	-
Methane (ug/L)	NA	581	-	-	-	-	-	-	-	-	1460D	-	-	-	-	-	-	-	-
Nitrogen, Nitrate (ug/L)	NA	ND(50)	-	-	-	-	-	-	-	-	ND(50)	-	-	-	-	-	-	-	-
Nitrogen, Nitrite (ug/L)	NA	ND(25)	-	-	-	-	-	-	-	-	ND(25)	-	-	-	-	-	-	-	-
Sulfate (mg/L)	NA	15	-	480	-	-	-	-	-	-	ND(5)	-	-	-	-	-	-	-	-
Bromide (mg/L)		0.07	-	63	-	-	-	-	-	-	0.13	-	-	-	-	-	-	-	-
Alkalinity, Total (mg $CaCO_3$/L)		230	-	-	-	-	-	-	-	-	230	-	-	-	-	-	-	-	-
Field Parameters																			
Conductivity (mS/cm)	NA	1.397	-	1.292	-	-	-	-	-	-	1.206	-	-	-	-	-	-	-	-
Temperature (° Celsius)	NA	14.15	-	10.33	-	-	-	-	-	-	15.27	-	-	-	-	-	-	-	-
Dissolved Oxygen (mg/L)	NA	0.63	-	0.81	-	-	-	-	-	-	0.58	-	-	-	-	-	-	-	-
Oxidation Reduction Potential (ORP) (mV)	NA	-13.5	-	-136.5	-	-	-	-	-	-	-60.9	-	-	-	-	-	-	-	-
pH	NA	6.43	-	8.3	-	-	-	-	-	-	6.56	-	-	-	-	-	-	-	-
Turbidity (NTU)	NA	4.3	-	-	-	-	-	-	-	-	4.6	-	-	-	-	-	-	-	-
Bromide (mg/L using bromide field sensor)	NA	-	133.7	300.5	44.7	3.8	4.4	2.1	1	4/1.6	-	240	272	43.7	28.7	26.1	22.6	12.6	34/19.9
Sulfate (mg/L using Hach kit)	NA	-		-	-	-	73	-	<50	<50	-		-	-	-	200	-	<50	60
Sulfate:Bromide (using laboratory results for each)				7.6															

TABLE I
GROUNDWATER ANALYTICAL DATA
ANNUAL MONITORING EVENT
AOC 43J
DEVENS, MASSACHUSETTS
FILE NO: 10884-072

LOCATION	ROD Established Clean-up Goals	XJM-93-01X						XJM-93-03X		
SAMPLING DATE		11/17/2009	1/7/2010	1/14/2010	1/22/2010	2/5/2010	2/23/2010	11/12/2009	12/17/2009	12/23/2009
UNIT SCREENED				Overburden					Overburden	
LOCATION				Upgradient					Outside MW-O	
DTW		7.41	6.49	7.18	7.41	-	7.95	8.18	6.95	7.6
Volatile Organics by MCP 8260B (ug/L)										
Carbon tetrachloride	NA	-	-	-	-	-	-	-	-	-
Volatile Petroleum Hydrocarbons (ug/L)										
C5-C8 Aliphatics, Adjusted	400	ND(25)	ND(25)	-	-	-	-	80.7	-	-
C5-C8 Aliphatics, Unadjusted	NA	ND(25)	ND(25)	-	-	-	-	80.7	-	-
C9-C10 Aromatics	200	ND(25)	ND(25)	-	-	-	-	ND(25)	-	-
C9-C12 Aliphatics, Adjusted	4000	ND(25)	ND(25)	-	-	-	-	54.7	-	-
C9-C12 Aliphatics, Unadjusted	NA	ND(25)	ND(25)	-	-	-	-	54.7	-	-
Benzene	5	ND(1)	ND(1)	-	-	-	-	ND(1)	-	-
Ethylbenzene	700	ND(1)	ND(1)	-	-	-	-	ND(1)	-	-
Toluene	1000	ND(1)	ND(1)	-	-	-	-	ND(1)	-	-
o-Xylene	NA	ND(1)	ND(1)	-	-	-	-	ND(1)	-	-
p/m-Xylene	NA	ND(1)	ND(1)	-	-	-	-	ND(1)	-	-
Total Xylenes	10000	ND	ND	-	-	-	-	ND	-	-
Methyl tert butyl ether	NA	ND(1.5)	ND(1.5)	-	-	-	-	ND(1.5)	-	-
Naphthalene	NA	ND(5)	ND(5)	-	-	-	-	ND(5)	-	-
Total BTEX	NA	ND	ND	-	-	-	-	ND	-	-
Dissolved Metals by MCP 6000/7000 series (ug/L)										
Arsenic, Dissolved	10	ND(2.5)	-	-	-	-	-	18	-	-
Iron, Dissolved	9100	ND(25)	-	-	-	-	-	2800	-	-
Manganese, Dissolved	291	188	-	-	-	-	-	1850	-	-
Methane (ug/L)	NA	0.879	-	-	-	-	-	53.8	-	-
Nitrogen, Nitrate (ug/L)	NA	120	-	-	-	-	-	ND(50)	-	-
Nitrogen, Nitrite (ug/L)	NA	ND(25)	-	-	-	-	-	ND(25)	-	-
Sulfate (mg/L)	NA	12	18	18	18	-	16	ND(5)	-	<10
Bromide (mg/L)		ND(0.025)	ND(0.025)	ND(0.025)	ND(0.025)	-	ND(0.025)	ND(0.025)	-	ND(0.025)
Alkalinity, Total (mg $CaCO_3$/L)		180	99	100	91	-	63	92	-	-
Field Parameters										
Conductivity (mS/cm)	NA	0.985	0.386	0.318	0.387	-	0.248	0.431	-	0.325
Temperature (° Celsius)	NA	14	9.37	8.98	8.91	-	7.81	16.33	-	13.1
Dissolved Oxygen (mg/L)	NA	0.85	4.62	6.98	8.38	-	6.4	1.26	-	3.98
Oxidation Reduction Potential (ORP) (mV)	NA	60.4	14.6	-47	60.3	-	120.6	3.4	-	-100
pH	NA	7.24	6.68	6.98	5.53	-	6.25	6.41	-	7.95
Turbidity (NTU)	NA	3.4	2	4.86	5.13	-	4.16	8.7	-	-
Bromide (mg/L using bromide field sensor)	NA	-	1.9	3.8	0.5	0.2	0.5	-	0.4	23.8
Sulfate (mg/L using Hach kit)	NA	-	<50	<50	<50	<50	<50	-	-	<50
Sulfate:Bromide (using laboratory results for each)										

TABLE I
GROUNDWATER ANALYTICAL DATA
ANNUAL MONITORING EVENT
AOC 43J
DEVENS, MASSACHUSETTS
FILE NO: 10884-072

LOCATION	ROD Established Clean-up Goals	XJM-93-04X							XJP-94-01X[NOTE 3]		
SAMPLING DATE		11/17/2009	12/31/2009	1/7/2010	1/14/2010	1/22/2010	2/5/2010	2/23/2010	12/17/2009	12/23/2009	12/31/2009
UNIT SCREENED					Bedrock					Overburden	
LOCATION					Upgradient					Pilot MW-OP	
DTW		8.81	5.35	6.79	7.35	3.71	-	-	6.31	-	-
Volatile Organics by MCP 8260B (ug/L)											
Carbon tetrachloride	NA	-	-	-	-	-	-	-	-	-	-
Volatile Petroleum Hydrocarbons (ug/L)											
C5-C8 Aliphatics, Adjusted	400	ND(25)	-	-	-	-	-	-	-	-	-
C5-C8 Aliphatics, Unadjusted	NA	ND(25)	-	-	-	-	-	-	-	-	-
C9-C10 Aromatics	200	ND(25)	-	-	-	-	-	-	-	-	-
C9-C12 Aliphatics, Adjusted	4000	ND(25)	-	-	-	-	-	-	-	-	-
C9-C12 Aliphatics, Unadjusted	NA	ND(25)	-	-	-	-	-	-	-	-	-
Benzene	5	ND(1)	-	-	-	-	-	-	-	-	-
Ethylbenzene	700	ND(1)	-	-	-	-	-	-	-	-	-
Toluene	1000	ND(1)	-	-	-	-	-	-	-	-	-
o-Xylene	NA	ND(1)	-	-	-	-	-	-	-	-	-
p/m-Xylene	NA	ND(1)	-	-	-	-	-	-	-	-	-
Total Xylenes	10000	ND	-	-	-	-	-	-	-	-	-
Methyl tert butyl ether	NA	ND(1.5)	-	-	-	-	-	-	-	-	-
Naphthalene	NA	ND(5)	-	-	-	-	-	-	-	-	-
Total BTEX	NA	ND	-	-	-	-	-	-	-	-	-
Dissolved Metals by MCP 6000/7000 series (ug/L)											
Arsenic, Dissolved	10	ND(2.5)	-	-	-	-	-	-	-	-	-
Iron, Dissolved	9100	150	-	-	-	-	-	-	-	-	-
Manganese, Dissolved	291	15	-	-	-	-	-	-	-	-	-
Methane (ug/L)	NA	ND(0.25)	-	-	-	-	-	-	-	-	-
Nitrogen, Nitrate (ug/L)	NA	230	-	-	-	-	-	-	-	-	-
Nitrogen, Nitrite (ug/L)	NA	ND(25)	-	-	-	-	-	-	-	-	-
Sulfate (mg/L)	NA	38	39	24	19	30	-	-	-	-	-
Bromide (mg/L)		ND(0.025)	ND(0.025)	ND(0.025)	ND(0.025)	ND(0.025)	-	-	-	-	-
Alkalinity, Total (mg $CaCO_3$/L)		100	71	86	100	75	-	-	-	-	-
Field Parameters											
Conductivity (mS/cm)	NA	0.379	0.28	0.248	0.256	0.305	-	-	-	-	-
Temperature (° Celsius)	NA	11.53	7.45	7.7	7.63	5.44	-	-	-	-	-
Dissolved Oxygen (mg/L)	NA	7.37	4.2	2.41	3.27	9.25	-	-	-	-	-
Oxidation Reduction Potential (ORP) (mV)	NA	275.3	48.7	5.2	-52.6	47.1	-	-	-	-	-
pH	NA	6.96	6.79	6.85	7.18	5.59	-	-	-	-	-
Turbidity (NTU)	NA	4.93	24	23.4	43.5	41.3	-	-	-	-	-
Bromide (mg/L using bromide field sensor)	NA	-	2.4	1.9	4	0.2	0.3	1.5	3.5	10.2	3.2
Sulfate (mg/L using Hach kit)	NA	-	60	<50	<50	<50	<50	<50		-	-
Sulfate:Bromide (using laboratory results for each)											

TABLE I
GROUNDWATER ANALYTICAL DATA
ANNUAL MONITORING EVENT
AOC 43J
DEVENS, MASSACHUSETTS
FILE NO: 10884-072

originally labeled as
XJM-97-12X

LOCATION	**ROD Established Clean-up Goals**	**XJM-94-05X**						**XJM-94-07X**	**XJM-94-08X**	**XJM-94-09X**	
SAMPLING DATE		11/11/2009	1/7/2010	1/14/2010	1/22/2010	2/5/2010	2/23/2010	11/19/2009	11/16/2009	11/17/2009	12/31/2009
UNIT SCREENED				Overburden				Overburden	Overburden	Overburden	
LOCATION				Pilot MW-O						Upgradient/cross-gradient	
DTW		8.41	6.35	6.85	7.17	6.83	7.41		11.83	10.4	7.43
Volatile Organics by MCP 8260B (ug/L)											
Carbon tetrachloride	NA	-	-	-		-	-	-	-	-	-
Volatile Petroleum Hydrocarbons (ug/L)											
C5-C8 Aliphatics, Adjusted	400	5310	-	-	-	5930	6900	ND(25)	ND(25)	ND(25)	-
C5-C8 Aliphatics, Unadjusted	NA	5310	-	-	-	6150	7040	ND(25)	ND(25)	ND(25)	-
C9-C10 Aromatics	200	1500	-	-	-	2100	1910	ND(25)	ND(25)	ND(25)	-
C9-C12 Aliphatics, Adjusted	4000	1330	-	-	-	1270	1300	ND(25)	ND(25)	ND(25)	-
C9-C12 Aliphatics, Unadjusted	NA	4410	-	-	-	4510	4090	ND(25)	ND(25)	ND(25)	-
Benzene	5	ND(20)	-	-	-	ND(20)	ND(10)	ND(1)	ND(1)	ND(1)	-
Ethylbenzene	700	750	-	-	-	475	454	ND(1)	ND(1)	ND(1)	-
Toluene	1000	ND(20)	-	-	-	225	135	ND(1)	ND(1)	ND(1)	-
o-Xylene	NA	54.4	-	-	-	67.6	52.6	ND(1)	ND(1)	ND(1)	-
p/m-Xylene	NA	777	-	-	-	588	369	ND(1)	ND(1)	ND(1)	-
Total Xylenes	10000	831.4	-	-	-	655.6	421.6	ND	ND	ND	-
Methyl tert butyl ether	NA	ND(30)	-	-	-	ND(30)	ND(15)	ND(1.5)	ND(1.5)	ND(1.5)	-
Naphthalene	NA	ND(100)	-	-	-	ND(100)	114	ND(5)	ND(5)	ND(5)	-
Total BTEX	NA	1581.4	-	-	-	1355.6	1010.6	ND	ND	ND	-
Dissolved Metals by MCP 6000/7000 series (ug/L)											
Arsenic, Dissolved	10	78	-	-	-	-	-	ND(2.5)	ND(2.5)	ND(2.5)	-
Iron, Dissolved	9100	98000	-	-	-	-	-	ND(25)	120	ND(25)	-
Manganese, Dissolved	291	28500	-	-	-	-	-	ND(5)	421	ND(5)	-
Methane (ug/L)	NA	728	-	-	-	-	-	4.98	216	ND(0.25)	-
Nitrogen, Nitrate (ug/L)	NA	310	-	-	-	-	-	ND(50)	ND(50)	ND(50)	-
Nitrogen, Nitrite (ug/L)	NA	ND(25)	-	-	-	-	-	ND(25)	ND(25)	ND(25)	-
Sulfate (mg/L)	NA	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	10	11
Bromide (mg/L)		0.05	0.32	0.73	1	0.96	1.3	ND(0.025)	ND(0.025)	ND(0.025)	<0.05
Alkalinity, Total (mg $CaCO_3$/L)		140	150	180	180	170	170	74	190	26	23
Field Parameters											
Conductivity (mS/cm)	NA	0.871	0.883	0.887	1.19	0.694	1.161	0.542	0.391	0.115	0.103
Temperature (° Celsius)	NA	15.96	12.04	11.97	11.61	10.07	10.18	11.3	13.8	11.45	9.51
Dissolved Oxygen (mg/L)	NA	0.41	0.11	1.66	0.23	0.23	0.26	3.03	0.7	5.19	6.31
Oxidation Reduction Potential (ORP) (mV)	NA	-46.7	-155	-254	-162	-61	-111.2	150.7	18.8	350.1	84.3
pH	NA	6.09	6.57	8.8	5.38	6.45	6.31	6.36	7.38	6	5.74
Turbidity (NTU)	NA	4.05	4.04	10.4	20.4	3.87	3.21	4.72	3	3.71	1.49
Bromide (mg/L using bromide field sensor)	NA	-	3.7	2.6	5	0.8	12/12.8	-	-	-	0.4
Sulfate (mg/L using Hach kit)	NA	-	<50	<50	<50	<50	<50	-	-	-	<50
Sulfate:Bromide (using laboratory results for each)											

TABLE I
GROUNDWATER ANALYTICAL DATA
ANNUAL MONITORING EVENT
AOC 43J
DEVENS, MASSACHUSETTS
FILE NO: 10884-072

originally labeled as
XJM-94-05X

LOCATION	**ROD Established Clean-up Goals**	**XJM-97-12X**								
SAMPLING DATE		11/11/2009	12/17/2009	12/23/2009	12/31/2009	1/7/2010	1/14/2010	1/22/2010	2/5/2010	2/23/2010
UNIT SCREENED		Bedrock								
LOCATION		Pilot MW-B								
DTW		8.08	5.9	6.04	5.52	6.1	6.9	7.06	6.54	7.25
Volatile Organics by MCP 8260B (ug/L)										
Carbon tetrachloride	NA	ND(25)	-	-	-	-	-	-	-	-
Volatile Petroleum Hydrocarbons (ug/L)										
C5-C8 Aliphatics, Adjusted	400	12100	-	-	-	-	-	-	8110	9590
C5-C8 Aliphatics, Unadjusted	NA	12200	-	-	-	-	-	-	8430	9840
C9-C10 Aromatics	200	4920	-	-	-	-	-	-	2630	2850
C9-C12 Aliphatics, Adjusted	4000	3280	-	-	-	-	-	-	1980	2010
C9-C12 Aliphatics, Unadjusted	NA	14100	-	-	-	-	-	-	6380	6650
Benzene	5	ND(20)	-	-	-	-	-	-	ND(20)	ND(20)
Ethylbenzene	700	2210	-	-	-	-	-	-	749	774
Toluene	1000	139	-	-	-	-	-	-	320	259
o-Xylene	NA	555	-	-	-	-	-	-	85.5	82.9
p/m-Xylene	NA	3180	-	-	-	-	-	-	943	935
Total Xylenes	10000	3735	-	-	-	-	-	-	1028.5	1017.9
Methyl tert butyl ether	NA	ND(30)	-	-	-	-	-	-	ND(30)	ND(30)
Naphthalene	NA	535	-	-	-	-	-	-	ND(100)	ND(100)
Total BTEX	NA	6084	-	-	-	-	-	-	2097.5	2050.9
Dissolved Metals by MCP 6000/7000 series (ug/L)										
Arsenic, Dissolved	10	132	-	-	-	-	-	-	-	-
Iron, Dissolved	9100	110000	-	-	-	-	-	-	-	-
Manganese, Dissolved	291	25000	-	-	-	-	-	-	-	-
Methane (ug/L)	NA	862	-	-	-	-	-	-	-	-
Nitrogen, Nitrate (ug/L)	NA	310	-	-	-	-	-	-	-	-
Nitrogen, Nitrite (ug/L)	NA	ND(25)	-	-	-	-	-	-	-	-
Sulfate (mg/L)	NA	ND(5)	-	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)	ND(5)
Bromide (mg/L)		0.07	-	0.12	0.29	0.59	1.2	1.5	1.3	1.9
Alkalinity, Total (mg $CaCO_3$/L)		130	-	-	160	180	180	180	170	190
Field Parameters										
Conductivity (mS/cm)	NA	1.003	-	1.395	1.233	1.12	0.928	1.35	0.721	1.273
Temperature (° Celsius)	NA	16.4	-	14.38	13.82	14.07	14.02	13.54	12.09	12.25
Dissolved Oxygen (mg/L)	NA	0.25	-	2.3	0.3	0.1	0.84	0.17	0.18	0.22
Oxidation Reduction Potential (ORP) (mV)	NA	-51	-	-311.6	-152.7	-180	-268	-189	-119	-159
pH	NA	6.28	-	9.55	6.48	6.55	8.76	5.29	6.4	6.35
Turbidity (NTU)	NA	1.29	-	-	1.85	0.56	0.82	0.68	2.41	1.63
Bromide (mg/L using bromide field sensor)	NA	-	3.3	7.8	1	5.1	1.9	2	1.2	3/16.3
Sulfate (mg/L using Hach kit)	NA	-		-	<50	<50	<50	<50	<50	<50
Sulfate:Bromide (using laboratory results for each)				-	-					

ARARs

TABLE 10
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2A: INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	LOCATION SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority		No location-specific ARARs will be triggered.			
State Regulatory Authority		No location-specific ARARs will be triggered.			

TABLE 10
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2A: INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	CHEMICAL SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority	Groundwater (Also applicable as an Action Specific ARAR)	SDWA, National Primary Drinking Water Standards, MCLs [40 CFR Parts 141.11 - 141.16 and 141.50 - 141.52]	Relevant and Appropriate	The NPDWR establishes MCLs for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques.	Biodegradation of organic contaminants exceeding MCLs is believed to be occurring under existing conditions. MCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program will achieve MCLs at completion of remedy.
Federal Regulatory Authority	Groundwater	USEPA Reference Dose	TBC		
Federal Regulatory Authority	Groundwater	USEPA HAs	TBC		.

TABLE 10
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2A: INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	CHEMICAL SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
	Groundwater (Also applicable as an Action Specific ARAR)	Massachusetts Drinking Water Standards and Guidelines [310 CMR 22.0].	Relevant and Appropriate	The Massachusetts Drinking Water Standards and Guidelines list MMCLs which apply to water delivered to any user of a public water supply system as defined in 310 CMR 22.00. Private residential wells are not subject to the requirements of 310 CMR 22.00; however, the standards are often used to evaluate private residential contamination especially in CERCLA activities.	Biodegradation of organic contaminants exceeding MMCLs is believed to be occurring under existing conditions. MMCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program.

(continued)

TABLE 10
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2A:
INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	ACTION SPECIFIC	REQUIREMENTS	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority		RCRA Subtitle C Subpart F	Relevant and Appropriate	Groundwater protection standard.	
State Regulatory Authority	Groundwater	Massachusetts Groundwater Quality Standards [314 CMR 6.00]	Applicable	Massachusetts Groundwater Quality Standards designate and assign uses for which groundwater of the Commonwealth shall be maintained and protected and set forth water quality criteria necessary to maintain the designated uses. Groundwater at Fort Devens is classified as Class 1. Groundwater assigned to this class are fresh groundwater designated as a source of potable water supply.	Biodegradation of organic contaminants exceeding MMCLs is believed to be occurring under existing conditions. MMCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program.

(continued)

TABLE 10
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2A: INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	ACTION SPECIFIC	REQUIREMENTS	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
State Regulatory Authority	Groundwater Monitoring	Massachusetts Hazardous Waste Management Rules (MHWMR) Groundwater Protection; [310 CMR 30.660-30.679]	Relevant and Appropriate	Groundwater monitoring is required during and following remedial actions.	A long-term groundwater monitoring program is to be implemented to monitor the progress of remediation.

Notes:

CERCLA = Comprehensive Environmental Response, Compensation and Liability Act
MCLs = Maximum Contaminant Levels
MHWMR = Massachusetts Hazardous Waste Management Rules
MMCLs = Massachusetts Maximum Contaminant Levels
NPDWR = National Primary Drinking Water Standards
SDWA = Safe Drinking Water Act

TABLE 11
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2B: INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	LOCATION SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority		No location-specific ARARs will be triggered.			
State Regulatory Authority		No location-specific ARARs will be triggered.			

TABLE 11
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2B: INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	CHEMICAL SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority	Groundwater (Also applicable as an Action Sp ecific ARAR)	SDWA, National Primary Drinking Water Standards, MCLs [40 CFR Parts 141.11 - 141.16 and 141.50 - 141.52]	Relevant and Appropriate	The NPDWR establishes MCLs for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques.	Biodegradation of organic contaminants exceeding MCLs is believed to be occurring under existing conditions. MCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program will achieve MCLs at completion of remedy.
Federal Regulatory Authority	Groundwater	USEPA Reference Dose	TBC		
Federal Regulatory Authority	Groundwater	USEPA HAs	TBC		

TABLE 11
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2B: INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	CHEMICAL SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Continued	Groundwater (Also applicable as an Action Specific ARAR)	Massachusetts Drinking Water Standards and Guidelines [310 CMR 22.0].	Relevant and Appropriate	The Massachusetts Drinking Water Standards and Guidelines list MMCLs which apply to water delivered to any user of a public water supply system as defined in 310 CMR 22.00. Private residential wells are not subject to the requirements of 310 CMR 22.00; however, the standards are often used to evaluate private residential contamination especially in CERCLA activities.	Biodegradation of organic contaminants exceeding MMCLs is believed to be occurring under existing conditions. MMCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program.

TABLE 11
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2B: INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	ACTION SPECIFIC	REQUIREMENTS	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
	Disposal of treatment residues	RCRA, Land Disposal Restrictions [40 CFR 268]	Applicable	Land disposal of RCRA hazardous wastes without specified treatment is restricted. LDRs require that wastes must be treated either by a treatment technology or to a specific concentration prior to disposal in a RCRA Subtitle C permitted facility.	SVE carbon would be tested to evaluate characteristics for proper disposal/reactivation.

TABLE 11
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2B: INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	ACTION SPECIFIC	REQUIREMENTS	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
	Groundwater	Massachusetts Groundwater Quality Standards [314 CMR 6.00]	Applicable	Massachusetts Groundwater Quality Standards designate and assign uses for which groundwater of the Commonwealth shall be maintained and protected and set forth water quality criteria necessary to maintain the designated uses. Groundwater at Fort Devens is classified as Class 1. Groundwater assigned to this class are fresh groundwater designated as a source of potable water supply.	Biodegradation of organic contaminants exceeding MMCLs is believed to be occurring under existing conditions. MMCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program.
State Regulatory Authority	Groundwater Monitoring	Massachusetts Hazardous Waste Management Rules (MHWMR) Groundwater Protection; [310 CMR 30.660-30.679]	Relevant and Appropriate	Groundwater monitoring is required during and following remedial actions.	A long-term groundwater monitoring program is to be implemented to monitor the progress of remediation.

TABLE 11
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2B: INTRINSIC BIOREMEDIATION
AOC 43G - HISTORIC GAS STATION G/AAFES GAS STATION

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	ACTION SPECIFIC	REQUIREMENTS	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Continued	SVE Treatment	Massachusetts Air Pollution Control Regulations [310 CMR 6.00 - 7.00]	Applicable	SVE system must reduce VOCs in air effluent stream by at least 95% by weight.	Emissions will be managed through engineering controls.

Notes:

CERCLA = Comprehensive Environmental Response, Compensation and Liability Act
MCLs = Maximum Contaminant Levels
MHWMR = Massachusetts Hazardous Waste Management Rules
MMCLs = Massachusetts Maximum Contaminant Levels
NPDWR = National Primary Drinking Water Standards
SDWA = Safe Drinking Water Act

TABLE 12
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2:
INTRINSIC BIOREMEDIATION
AOC 43J - HISTORIC GAS STATION J

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	LOCATION SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority		No location-specific ARARs will be triggered.			
State Regulatory Authority		No location-specific ARARs will be triggered.			

TABLE 12
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2:
INTRINSIC BIOREMEDIATION
AOC 43J - HISTORIC GAS STATION J

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	CHEMICAL SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority	Groundwater (Also applicable as an Action Specific ARAR)	SDWA, National Primary Drinking Water Standards, MCLs [40 CFR Parts 141.11 - 141.16 and 141.50 - 141.52]	Relevant and Appropriate	The NPDWR establishes MCLs for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques.	Biodegradation of organic contaminants exceeding MCLs is believed to be occurring under existing conditions. MCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program will achieve MCLs at completion of remedy.
Federal Regulatory Authority	Groundwater	USEPA Reference Dose	TBC		
Federal Regulatory Authority	Groundwater	USEPA HAs/TBC	TBC		

TABLE 12
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2:
INTRINSIC BIOREMEDIATION
AOC 43J - HISTORIC GAS STATION J

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	CHEMICAL SPECIFIC	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
State Regulatory Authority	Groundwater (Also applicable as an Action Specific ARAR)	Massachusetts Drinking Water Standards and Guidelines [310 CMR 22.0].	Relevant and Appropriate	The Massachusetts Drinking Water Standards and Guidelines list MMCLs which apply to water delivered to any user of a public water supply system as defined in 310 CMR 22.00. Private residential wells are not subject to the requirements of 310 CMR 22.00; however, the standards are often used to evaluate private residential contamination especially in CERCLA activities.	Biodegradation of organic contaminants exceeding MMCLs is believed to be occurring under existing conditions. MMCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program.

(continued)

TABLE 12
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2:
INTRINSIC BIOREMEDIATION
AOC 43J - HISTORIC GAS STATION J

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	ACTION SPECIFIC	REQUIREMENTS	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal Regulatory Authority		RCRA Subtitle C Subpart F	Relevant and Appropriate	Groundwater protection standards.	
	Groundwater	Massachusetts Groundwater Quality Standards [314 CMR 6.00]	Applicable	Massachusetts Groundwater Quality Standards designate and assign uses for which groundwater of the Commonwealth shall be maintained and protected and set forth water quality criteria necessary to maintain the designated uses. Groundwater at Fort Devens is classified as Class 1. Groundwater assigned to this class are fresh groundwater designated as a source of potable water supply.	Biodegradation of organic contaminants exceeding MMCLs is believed to be occurring under existing conditions. MMCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program.

(continued)

TABLE 12
SYNOPSIS OF FEDERAL AND STATE ARARS FOR ALTERNATIVE 2:
INTRINSIC BIOREMEDIATION
AOC 43J - HISTORIC GAS STATION J

RECORD OF DECISION
FORT DEVENS, MA

AUTHORITY	ACTION SPECIFIC	REQUIREMENTS	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
State Regulatory Authority	Groundwater Monitoring	Massachusetts Hazardous Waste Management Rules (MHWMR) Groundwater Protection; [310 CMR 30.660-30.679]	Relevant and Appropriate	Groundwater monitoring is required during and following remedial actions.	A long-term groundwater monitoring program is to be implemented to monitor the progress of remediation.

Notes:

CERCLA = Comprehensive Environmental Response, Compensation and Liability Act
MCLs = Maximum Contaminant Levels
MHWMR = Massachusetts Hazardous Waste Management Rules
MMCLs = Massachusetts Maximum Contaminant Levels
NPDWR = National Primary Drinking Water Standards
SDWA = Safe Drinking Water Act

PHOTO LOGS

May 2010
South entrance to newly built commercial property for Bristol-Myers Squibb.

May 2010
View of the Bristol-Myers Squibb building, from the east, along Queenstown Road.

X:/OMA010/Ft_Devens/Maps/DO501/2010_5-Year_Review/CDR/AOC43GJ_photolog.cdr
07/08/10 CNL

AOC 43G and AOC 43J
Photograph Log
2010

May 2010
View of the undeveloped portion of AOC 43J, adjacent to the southwest from Bristol-Myers Squibb building.

May 2010
Well XJM-94-08X, adjacent to fencing surrounding undeveloped area.

X:/OMA010/Ft_Devens/Maps/DO501/2010_5-Year_Review/CDR/AOC43GJ_photolog.cdr
07/08/10 CNL

AOC 43G and AOC 43J
Photograph Log
2010

May 2010
Looking south toward undeveloped portion of the property.

May 2010
Looking northeast toward undeveloped area. Bristol-Myers Squibb building is noted in the background.

X:/OMA010/Ft_Devens/Maps/DO501/2010_5-Year_Review/CDR/AOC43GJ_photolog.cdr
07/08/10 CNL

AOC 43G and AOC 43J
Photograph Log
2010

May 2010
View of well XGM-94-03X, downgradient to the southeast from source area (former gas station).

May 2010
View of well XGM-94-07X, downgradient to the east from source area.

X:/OMA010/Ft_Devens/Maps/DO501/2010_5-Year_Review/CDR/AOC43GJ_photolog.cdr
07/08/10 CNL

AOC 43G and AOC 43J
Photograph Log
2010

May 2010
View of well XGM-94-10X, located southwest from source area.

May 2010
Flush-mounted wells located in paved areas at AOC 43G.

X:/OMA010/Ft_Devens/Maps/DO501/2010_5-Year_Review/CDR/AOC43GJ_photolog.cdr
07/08/10 CNL

AOC 43G and AOC 43J
Photograph Log
2010

APPENDIX E

SOUTH POST IMPACT AREA
(AOCS 25, 26, 27, AND 41) (GROUNDWATER)

GROUNDWATER ANALYTICAL RESULTS
(2005-2009)

KEY FOR TABLES

General Terms

AOC	Area of Contamination
CMR	Code of Massachusetts Regulations
E&E	Ecology & Environment, Inc.
HLA	Harding Lawson Associates
LTMP	long-term monitoring plan
MCP	Massachusetts Contingency Plan
μg/L	Micrograms per liter
mg/L	Milligrams per liter
μS/cm	Microsiemens per centimeter
mV	Millivolts
NA	Not analyzed/available
NC	Not collected
NS	No standard established
NTU	Nephelometric turbidity units
ORP	Oxidation-reduction potential
ROD	Record of Decision
SPIA	South Post Impact Area
SW(number)	Analytical method from the SW-846 method series (EPA, 2005)
VOC	volatile organic compounds

Result Indicators (Laboratory Results Only)

Bold Text	Indicates a detected result above a background level.
Bold Text	Indicates a detected result above the associated site cleanup goal or GW-1 Standard.
Bold Text	Indicates a detected result above GW-3 Standard.

Data Qualifiers

J	Estimated detection
U	Not detected (at associated reporting limit)
UJ	Not detected; reporting limit is an estimate
R	Rejected due to serious deficiencies in associated QC. The presence or absence of the analyte cannot be verified.
EJ	Detected result reported at a concentration above the calibrated range of the instrument and is considered an estimate.

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SPIA Area of Contamination 26
November 2005

Method	Analyte	Units	Groundwater Standard [1]	Baseline Comparison Values [2,3]	26M-92-02X	26M-92-03X	26M-92-04X	26M-92-04X Duplicate	26M-97-08X	26M-97-08X Duplicate
Explosives - SW8330	1,3,5-Trinitrobenzene	µg/L	500	NS	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
Explosives - SW8330	1,3-Dinitrobenzene	µg/L	1,000	1	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
Explosives - SW8330	2,4,6-Trinitrotoluene	µg/L	1,000	2	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
Explosives - SW8330	2,4-Dinitrotoluene	µg/L	30	30	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
Explosives - SW8330	2,6-Dinitrotoluene	µg/L	1,000	NS	0.25 U	0.25 U	1.4	1.4	0.25 U	0.25 U
Explosives - SW8330	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
Explosives - SW8330	2-Nitrotoluene	µg/L	5,000	NS	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
Explosives - SW8330	3-Nitrotoluene	µg/L	5,000	NS	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
Explosives - SW8330	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	0.25 U	0.25 U	0.73	0.71	0.25 U	0.25 U
Explosives - SW8330	4-Nitrotoluene	µg/L	5,000	NS	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
Explosives - SW8330	HMX	µg/L	200 [4]	400	0.25 U	1.1	44	43	15	14
Explosives - SW8330	Tetryl	µg/L	1,000	NS	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
Explosives - SW8330	Nitrobenzene	µg/L	5,000	NS	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
Explosives - SW8330	RDX	µg/L	0.8 [4]	2	0.25 U	17	210	210	41	40
Metals - SW6010B	Aluminum, total	µg/L	NS	6,870	2,470	54.6 U	54.6 U	54.6 U	224	NA
Metals - SW6010B	Antimony, total	µg/L	6	3.03	12.6 U	12.6 U	12.6 U	12.6 U	12.6 U	NA
Metals - SW6010B	Arsenic, total	µg/L	10	10.5	9.4 B	5.2 U	5.2 U	5.2 U	5.2 U	NA
Metals - SW6010B	Barium, total	µg/L	2,000	39.6	15.3 U	15.3 U	15.3 U	15.3 U	15.3 U	NA
Metals - SW6010B	Beryllium, total	µg/L	4	5	0.20 U	0.20 U	0.27 B	0.20 U	0.66 B	NA
Metals - SW6010B	Cadmium, total	µg/L	4	4.01	0.60 U	0.60 U	0.60 U	0.60 U	1.4 B	NA
Metals - SW6010B	Calcium, total	µg/L	NS	14,700	2,830 B	3,510 B	8,320	8,400	2,960 B	NA
Metals - SW6010B	Chromium, total	µg/L	100	14.7	42.1	1.5 U	1.5 U	1.5 U	3.2 B	NA
Metals - SW6010B	Cobalt, total	µg/L	5,000	25	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	NA
Metals - SW6010B	Copper, total	µg/L	10,000	8.09	10.3 B	3.1 U	3.1 U	3.1 U	9.3 B	NA
Metals - SW6010B	Iron, total	µg/L	NS	9,100	2,830	84.3 U	84.3 U	84.3 U	221	NA
Metals - SW6010B	Lead, total	µg/L	15	4.25	3.3 B	2.9 U	2.9 U	2.9 U	2.9 U	NA
Metals - SW6010B	Magnesium, total	µg/L	NS	3,480	1,470 B	406 U	1,020 B	1,020 B	406 U	NA
Metals - SW6010B	Manganese, total	µg/L	NS	291	34.2	4.0 B	19.2	18.3	7.5 B	NA
Mercury - SW7470A	Mercury, total	µg/L	2	0.243	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	NA
Metals - SW6010B	Nickel, total	µg/L	100	34.3	28.9 B	4.5 U	4.5 U	4.5 U	4.5 U	NA
Metals - SW6010B	Potassium, total	µg/L	NS	2,370	926 B	1,000 B	987 B	1,030 B	736 B	NA
Metals - SW6010B	Selenium, total	µg/L	50	3.02	4.0 U	4.0 U	5.7 B	4.0 U	4.0 U	NA
Metals - SW6010B	Silver, total	µg/L	7	4.6	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	NA
Metals - SW6010B	Sodium, total	µg/L	NS	10,800	3,610 B	1,520 B	3,020 B	2,850 B	1,540 B	NA
Metals - SW6010B	Thallium, total	µg/L	2	6.99	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	NA
Metals - SW6010B	Vanadium, total	µg/L	30	11	4.8 U	4.8 U	4.8 U	4.8 U	4.8 U	NA
Metals - SW6010B	Zinc, total	µg/L	900	21.1	16.8 B	3.7 B	5.7 B	4.4 B	6.0 B	NA
Field Parameter	Dissolved oxygen	mg/L	NS	NS	7.1	11.3	9.2	9.2	10.5	10.5
Field Parameter	ORP	mV	NS	NS	353	326	-208	-208	-236	-236
Field Parameter	pH	Standard units	NS	NS	5.7	5.5	5.5	5.5	5.5	5.5
Field Parameter	Specific conductance	µS/cm	NS	NS	42	41	80	80	34	34
Field Parameter	Turbidity	NTU	NS	NS	30.8	0.3	1.0	1.0	5.2	5.2

[1] From the MCP GW1 Standards (310 CMR 40 Subpart P) unless otherwise indicated.
[2] Baseline comparison values for metals from HLA, 2000
[3] Baseline comparison values for explosives are from E&E, 1994.
[4] Proposed amended limit from Public Hearing Draft, 310 CMR 40, MCP, 20 September 2004.

SPIA Area of Contamination 26
November 2005

Method	Analyte	Units	Groundwater Standard [1]	Baseline Comparison Values [2,3]	27M-92-01X	27M-93-05X	27M-93-06X	27M-93-08X
Explosives - SW8330	1,3,5-Trinitrobenzene	µg/L	500	NS	0.25 U	0.25 U	0.25 U	0.25 U
Explosives - SW8330	1,3-Dinitrobenzene	µg/L	1,000	1	0.25 U	0.25 U	0.25 U	0.25 U
Explosives - SW8330	2,4,6-Trinitrotoluene	µg/L	1,000	2	0.25 U	0.25 U	0.25 U	0.25 U
Explosives - SW8330	2,4-Dinitrotoluene	µg/L	30	30	0.25 U	0.25 U	0.25 U	0.25 U
Explosives - SW8330	2,6-Dinitrotoluene	µg/L	1,000	NS	0.25 U	0.25 U	0.25 U	0.25 U
Explosives - SW8330	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	0.25 U	0.25 U	0.25 U	0.25 U
Explosives - SW8330	2-Nitrotoluene	µg/L	5,000	NS	0.25 U	0.25 U	0.25 U	0.25 U
Explosives - SW8330	3-Nitrotoluene	µg/L	5,000	NS	0.25 U	0.25 U	0.25 U	0.25 U
Explosives - SW8330	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	0.25 U	0.25 U	0.25 U	0.25 U
Explosives - SW8330	4-Nitrotoluene	µg/L	5,000	NS	0.25 U	0.25 U	0.25 U	0.25 U
Explosives - SW8330	HMX	µg/L	200 [4]	400	0.25 U	0.25 U	0.37	0.25 U
Explosives - SW8330	Tetryl	µg/L	1,000	NS	0.25 U	0.25 U	0.25 U	0.25 U
Explosives - SW8330	Nitrobenzene	µg/L	5,000	NS	0.25 U	0.25 U	0.25 U	0.25 U
Explosives - SW8330	RDX	µg/L	0.8 [4]	2	0.25 U	0.48	1.5	0.25 U
Metals - SW6010B	Aluminum, total	µg/L	NS	6,870	405	380	58.8 B	54.6 U
Metals - SW6010B	Antimony, total	µg/L	6	3.03	12.6 U	12.6 U	12.6 U	12.6 U
Metals - SW6010B	Arsenic, total	µg/L	10	10.5	5.2 U	5.2 U	5.2 U	5.2 U
Metals - SW6010B	Barium, total	µg/L	2,000	39.6	15.3 U	15.3 U	15.3 U	15.3 U
Metals - SW6010B	Beryllium, total	µg/L	4	5	0.20 U	0.20 U	0.20 U	0.20 U
Metals - SW6010B	Cadmium, total	µg/L	4	4.01	0.60 U	0.60 U	0.60 U	0.60 U
Metals - SW6010B	Calcium, total	µg/L	NS	14,700	4,830 B	4,700 B	3,920 B	6,290
Metals - SW6010B	Chromium, total	µg/L	100	14.7	4.6 B	1.5 U	1.5 U	1.5 U
Metals - SW6010B	Cobalt, total	µg/L	5,000	25	4.0 U	4.0 U	4.0 U	4.0 U
Metals - SW6010B	Copper, total	µg/L	10,000	8.09	3.1 U	3.1 U	4.7 B	5.1 B
Metals - SW6010B	Iron, total	µg/L	NS	9,100	365	383	84.3 U	84.3 U
Metals - SW6010B	Lead, total	µg/L	15	4.25	2.9 U	2.9 U	2.9 U	2.9 U
Metals - SW6010B	Magnesium, total	µg/L	NS	3,480	467 B	1,650 B	993 B	1,400 B
Metals - SW6010B	Manganese, total	µg/L	NS	291	7.8 B	11.2 B	3.7 B	8.8 B
Mercury - SW7470A	Mercury, total	µg/L	2	0.243	0.10 U	0.10 U	0.10 U	0.10 U
Metals - SW6010B	Nickel, total	µg/L	100	34.3	4.5 U	4.5 U	4.5 U	4.5 U
Metals - SW6010B	Potassium, total	µg/L	NS	2,370	965 B	1,040 B	787 B	1,840 B
Metals - SW6010B	Selenium, total	µg/L	50	3.02	4.0 U	4.0 U	4.0 U	4.0 U
Metals - SW6010B	Silver, total	µg/L	7	4.6	1.9 U	1.9 U	1.9 U	1.9 U
Metals - SW6010B	Sodium, total	µg/L	NS	10,800	8,320	3,780 B	1,870 B	4,160 B
Metals - SW6010B	Thallium, total	µg/L	2	6.99	2.4 U	2.4 U	2.4 U	2.4 U
Metals - SW6010B	Vanadium, total	µg/L	30	11	4.8 U	4.8 U	4.8 U	4.8 U
Metals - SW6010B	Zinc, total	µg/L	900	21.1	6.5 B	6.2 B	6.8 B	4.8 B
Field Parameter	Dissolved oxygen	mg/L	NS	NS	7.5	7.29	11.15	9.28
Field Parameter	ORP	mV	NS	NS	-133	475.1	328	235.2
Field Parameter	pH	Standard units	NS	NS	6.0	6.88	5.98	5.94
Field Parameter	Specific conductance	µS/cm	NS	NS	71	62	45	73
Field Parameter	Turbidity	NTU	NS	NS	4.5	10.4	2.14	0.9

[1] From the MCP GW1 Standards (310 CMR 40 Subpart P) unless otherwise indicated.
[2] Baseline comparison values for metals from HLA, 2000
[3] Baseline comparison values for explosives are from E & E, 1994.
[4] Proposed amended limit from Public Hearing Draft, 310 CMR 40, MCP, 20 September 2004.

SPIA Area of Contamination 26
November 2005

Method	Analyte	Units	Groundwater Standard [1]	Baseline Comparison Values [2]	41M-93-04X	41M-94-09A	41M-94-09B	41M-94-11X	41M-94-12X	41M-94-13X	41M-94-14X	41M-94-14X Duplicate
VOCs - SW8260B	1,1,2-Trichloroethane	µg/L	5	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	cis-1,2-Dichloroethene	µg/L	70	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	Carbon tetrachloride	µg/L	2	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	Carbon disulfide	µg/L	1,000	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	Tetrachloroethene	µg/L	5	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	trans-1,2-Dichloroethene	µg/L	90	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	Trichloroethene	µg/L	5	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	Toluene	µg/L	1,000	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
VOCs - SW8260B	Vinyl chloride	µg/L	2	NS	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Explosives - SW8330	1,3,5-Trinitrobenzene	µg/L	500	NS	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA
Explosives - SW8330	1,3-Dinitrobenzene	µg/L	1,000	1	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA
Explosives - SW8330	2,4,6-Trinitrotoluene	µg/L	1,000	2	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA
Explosives - SW8330	2,4-Dinitrotoluene	µg/L	30	30	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA
Explosives - SW8330	2,6-Dinitrotoluene	µg/L	1,000	NS	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA
Explosives - SW8330	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA
Explosives - SW8330	2-Nitrotoluene	µg/L	5,000	NS	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA
Explosives - SW8330	3-Nitrotoluene	µg/L	5,000	NS	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA
Explosives - SW8330	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA
Explosives - SW8330	4-Nitrotoluene	µg/L	5,000	NS	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA
Explosives - SW8330	HMX	µg/L	200 [3]	400	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA
Explosives - SW8330	Tetryl	µg/L	1,000	NS	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA
Explosives - SW8330	Nitrobenzene	µg/L	5,000	NS	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA
Explosives - SW8330	RDX	µg/L	0.8 [3]	2	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA
Field Parameter	Dissolved oxygen	mg/L	NS	NS	0.9	11.5	11.2	5.2	3.4	5.2	6.9	6.9
Field Parameter	ORP	mV	NS	NS	315	205	359	-73	270	199	-168	-168
Field Parameter	pH	Standard units	NS	NS	5.5	5.9	6.1	7.1	7.3	6.2	5.6	5.6
Field Parameter	Specific conductance	µS/cm	NS	NS	57	42	35	51	119	66	44	44
Field Parameter	Turbidity	NTU	NS	NS	2.1	0.7	0.5	18.9	2.6	165	0.2	0.2

[1] From the MCP GW1 Standards (310 CMR 40 Subpart P) unless otherwise indicated.
[2] Baseline comparison values for explosives are from E&E, 1994.

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Method	Analyte	Units	Groundwater Standard [1]	Baseline Comparison Values [2,3]	D - 1	SPM-93-06X	SPM-93-08X	SPM-93-10X	SPM-93-12X	SPM-93-16X	SPM-93-16X Duplicate	SPM-97-23X	SPM-97-24X
Explosives - SW8330	1,3,5-Trinitrobenzene	µg/L	500	NS	NA	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA	0.25 U	0.25 U
Explosives - SW8330	1,3-Dinitrobenzene	µg/L	1,000	1	NA	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA	0.25 U	0.25 U
Explosives - SW8330	2,4,6-Trinitrotoluene	µg/L	1,000	2	NA	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA	0.25 U	0.25 U
Explosives - SW8330	2,4-Dinitrotoluene	µg/L	30	30	NA	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA	0.25 U	0.25 U
Explosives - SW8330	2,6-Dinitrotoluene	µg/L	1,000	NS	NA	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA	0.25 U	0.25 U
Explosives - SW8330	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NA	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA	0.25 U	0.25 U
Explosives - SW8330	2-Nitrotoluene	µg/L	5,000	NS	NA	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA	0.25 U	0.25 U
Explosives - SW8330	3-Nitrotoluene	µg/L	5,000	NS	NA	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA	0.25 U	0.25 U
Explosives - SW8330	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NA	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA	0.25 U	0.25 U
Explosives - SW8330	4-Nitrotoluene	µg/L	5,000	NS	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA	0.25 U	0.25 U
Explosives - SW8330	HMX	µg/L	200 [2]	400	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA	0.25 U	0.25 U
Explosives - SW8330	Tetryl	µg/L	1,000	NS	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA	0.25 U	0.25 U
Explosives - SW8330	Nitrobenzene	µg/L	5,000	NS	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA	0.25 U	0.25 U
Explosives - SW8330	RDX	µg/L	0.8 [2]	2	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA	0.25 U	0.25 U
Metals - SW6010B	Aluminum, total	µg/L	NS	6,870	NA	583	65.3 U	65.3 U	54.6 U	65.3 U	NA	119 B	65.3 U
Metals - SW6010B	Antimony, total	µg/L	6	3.03	NA	12.6 U	12.6 U	12.6 U	12.6 U	13.8 B	NA	12.6 U	12.6 U
Metals - SW6010B	Arsenic, total	µg/L	10	10.5	NA	35.2	5.2 U	13.2	5.2 U	5.5 B	NA	5.2 U	7.9 B
Metals - SW6010B	Barium, total	µg/L	2,000	39.6	NA	49.0 B	15.3 U	15.3 U	15.3 U	15.3 U	NA	15.3 U	15.3 U
Metals - SW6010B	Beryllium, total	µg/L	4	5	NA	0.20 U	0.55 B	0.20 U	0.20 U	0.20 U	NA	0.73 B	0.20 U
Metals - SW6010B	Cadmium, total	µg/L	4	4.01	NA	0.60 U	0.60 U	0.60 U	0.60 U	0.60 U	NA	0.60 U	0.60 U
Metals - SW6010B	Calcium, total	µg/L	NS	14,700	NA	41,600	2,800 B	3,250 B	6,580	2,560 B	NA	4,500 B	9,760
Metals - SW6010B	Chromium, total	µg/L	100	14.7	NA	3.9 B	2.4 B	4.1 B	3.2 B	1.5 U	NA	1.5 U	1.5 U
Metals - SW6010B	Cobalt, total	µg/L	5,000	25	NA	4.0 U	4.0 U	4.0 U	4.7 B	4.0 U	NA	4.0 U	4.0 U
Metals - SW6010B	Copper, total	µg/L	10,000	8.09	NA	4.0 B	3.1 U	4.3 B	3.1 U	4.6 B	NA	9.1 B	3.1 U
Metals - SW6010B	Iron, total	µg/L	NS	9,100	NA	94.4 B	84.3 U	139 B	84.3 U	84.3 U	NA	212	84.3 U
Metals - SW6010B	Lead, total	µg/L	15	4.25	NA	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U	NA	2.9 U	2.9 U
Metals - SW6010B	Magnesium, total	µg/L	NS	3,480	NA	406 U	406 U	937 B	2,200 B	680 B	NA	1,030 B	4,040 B
Metals - SW6010B	Manganese, total	µg/L	NS	291	NA	26.6	1.9 U	3.5 B	4.8 B	1.9 U	NA	79.3	1.9 U
Mercury - SW7470A	Mercury, total	µg/L	2	0.243	NA	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U	NA	0.10 U	0.10 U
Metals - SW6010B	Nickel, total	µg/L	100	34.3	NA	4.5 U	4.5 U	4.5 U	4.5 U	4.5 U	NA	4.5 U	4.5 U
Metals - SW6010B	Potassium, total	µg/L	NS	2,370	NA	6,060	660 U	660 U	1270 B	660 U	NA	697 B	1,200 B
Metals - SW6010B	Selenium, total	µg/L	50	3.02	NA	4.0 U	4.0 U	4.0 U	6.6 J	4.0 U	NA	4.0 U	4.0 U
Metals - SW6010B	Silver, total	µg/L	7	4.6	NA	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U U	NA	1.9 U	1.9 U
Metals - SW6010B	Sodium, total	µg/L	NS	10,800	NA	6,600	1,650 B	1,830 B	4,700 B	2,070 B	NA	2,970 B	2,530 B
Metals - SW6010B	Thallium, total	µg/L	2	6.99	NA	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	NA	2.4 U	2.4 U
Metals - SW6010B	Vanadium, total	µg/L	30	11	NA	4.8 U	4.8 U	4.8 U	4.8 U	4.8 U	NA	4.8 U	4.8 U
Metals - SW6010B	Zinc, total	µg/L	900	21.1	NA	8.7 B	4.2 B	7.7 B	10.5 B	4.6 B	NA	4.8 B	4.0 B
Perchlorate - SW8321A	Perchlorate	µg/L	2 [5]	NS	0.098 J	0.20 U	0.20 U	0.10 J	0.27	0.41	0.41	0.12 J	0.066 J
Field Parameter	Dissolved oxygen	mg/L	NS	NS	NA	1.92	11	10.96	4.29	12.21	12.21	10.6	4.26
Field Parameter	ORP	mV	NS	NS	NA	95.3	204.3	438.8	-241.8	-233.4	-233.4	378.5	138.7
Field Parameter	pH	Standard units	NS	NS	NA	10.77	6.57	6.85	6.54	6.39	6.39	6.16	7.55
Field Parameter	Specific conductance	µS/cm	NS	NS	NA	157	36	39	79	33	33	54	96
Field Parameter	Turbidity	NTU	NS	NS	NA	0.75	0.55	1.88	0.88	0.85	0.85	0.36	0.52

[1] From the MCP GW1 Standards (310 CMR 40 Subpart P) unless otherwise indicated.
[2] Baseline comparison values for metals from HLA, 2000.
[3] Baseline comparison values for explosives are from E&E, 1994.
[4] Proposed amended limit from Public Hearing Draft, 310 CMR 40, MCP, 20 September 2004.
[5] From final changes to the MCP-310 CMR 40.0000, July 28, 2006.

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Method	Analyte	Units	Groundwater Standard[1]	Baseline Comparison Values[2,3]	26M-92-02X	26M-92-03X	26M-92-03X Duplicate	26M-92-04X	26M-92-04X Duplicate	26M-97-08X	26M-97-08X Duplicate	26WP-06-01[5]
Perchlorate - 332.0	Perchlorate	µg/L	2	NS	NA	NA	NA	2.27	2.28	NA	NA	3.05
Explosives - 8330	1,3,5-Trinitrobenzene	µg/L	500	NS	0.275 U	0.272 U	0.269 U	0.272 U	0.278 U	0.263 U	0.269 U	NC
Explosives - 8330	1,3-Dinitrobenzene	µg/L	1,000	1	0.275 U	0.272 U	0.269 U	0.272 U	0.278 U	0.263 U	0.269 U	NC
Explosives - 8330	2,4,6-Trinitrotoluene	µg/L	1,000	2	0.275 U	0.272 U	0.269 U	0.272 U	0.278 U	0.263 U	0.269 U	NC
Explosives - 8330	2,4-Dinitrotoluene	µg/L	30	30	0.275 U	0.272 U	0.269 U	0.272 U	0.278 U	0.263 U	0.269 U	NC
Explosives - 8330	2,6-Dinitrotoluene	µg/L	1,000	NS	0.275 U	0.272 U	0.269 U	1.96	2.02	0.263 U	0.269 U	NC
Explosives - 8330	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	0.275 U	0.272 U	0.269 U	0.272 U	0.278 U	0.263 U	0.269 U	NC
Explosives - 8330	2-Nitrotoluene	µg/L	5,000	NS	0.275 U	0.272 U	0.269 U	0.272 U	0.278 U	0.263 U	0.269 U	NC
Explosives - 8330	3-Nitrotoluene	µg/L	5,000	NS	0.275 U	0.272 U	0.269 U	0.272 U	0.278 U	0.263 U	0.269 U	NC
Explosives - 8330	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	0.275 U	0.272 U	0.269 U	0.657	0.673	0.263 U	0.269 U	NC
Explosives - 8330	4-Nitrotoluene	µg/L	5,000	NS	0.275 U	0.272 U	0.269 U	0.272 U	0.278 U	0.263 U	0.269 U	NC
Explosives - 8330	RDX	µg/L	0.84	2	0.169 J	7.79	8.06	196	201	45.1	44	NC
Explosives - 8330	Tetryl	µg/L	1,000	NS	0.275 U	0.272 U	0.269 U	0.272 U	0.278 U	0.263 U	0.269 U	NC
Explosives - 8330	Nitrobenzene	µg/L	5,000	NS	0.275 U	0.272 U	0.269 U	0.272 U	0.278 U	0.263 U	0.269 U	NC
Explosives - 8330	HMX	µg/L	2004	400	0.275 U	2.66	2.79	32.4	32.9	9.84	10	NC
Metals - 6010B	Aluminum	µg/L	NS	6,870	280 U	100 U	100 U	100 U	100 U	100 U	100 U	NC
Metals - 6010B	Antimony	µg/L	6	3.03	50 U	50 U	50 U	50 U	50 U	50 U	50 U	NC
Metals - 6010B	Arsenic	µg/L	10	10.5	7	5 U	5 U	5 U	5 U	5 U	5 U	NC
Metals - 6010B	Barium	µg/L	2,000	39.6	2 J	7 J	7 J	9 J	9 J	7 J	7 J	NC
Metals - 6010B	Beryllium	µg/L	4	5	5 U	5 U	5 U	0.5 J	5 U	5 U	5 U	NC
Metals - 6010B	Cadmium	µg/L	4	4.01	5 U	5 U	5 U	5 U	5 U	5 U	5 U	NC
Metals - 6010B	Calcium	µg/L	NS	14,700	2,400	2,500	2,400	7,800	7,900	2,700	2,700	NC
Metals - 6010B	Chromium	µg/L	100	14.7	1 J	10 U	10 U	10 U	10 U	10 U	10 U	NC
Metals - 6010B	Cobalt	µg/L	5,000	25	20 U	20 U	20 U	20 U	20 U	20 U	20 U	NC
Metals - 6010B	Copper	µg/L	1,300	8.09	1 0 U	1 0 U	1 0 U	1 0 U	1 0 U	1 0 U	1 0 U	NC
Metals - 6010B	Iron	µg/L	NS	9,100	370	50 U	50 U	50 U	50 U	44 J	35 J	NC
Metals - 6010B	Lead	µg/L	15	4.25	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NC
Metals - 6010B	Magnesium	µg/L	NS	3,480	1,000	310	300	860	860	270	270	NC
Metals - 6010B	Manganese	µg/L	NS	291	6 J	10 U	10 U	10 U	10 U	10 U	10 U	NC
Mercury - 7470A	Mercury	µg/L	2	0.243	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NC
Metals - 6010B	Nickel	µg/L	100	34.3	2.7 J	25 U	25 U	25 U	25 U	25 U	25 U	NC
Metals - 6010B	Potassium	µg/L	NS	2,370	260 J	540 J	550 J	670 J	640 J	190 J	370 J	NC
Metals - 6010B	Selenium	µg/L	50	3.02	5 U	5 U	5 U	5 U	5 U	5 U	5 U	NC
Metals - 6010B	Silver	µg/L	7	4.6	7 U	7 U	7 U	7 U	7 U	7 U	7 U	NC
Metals - 6010B	Sodium	µg/L	NS	10,800	2,600	960 J	1,000 J	2,200	2,200	1,000 J	1,000 J	NC
Metals - 6010B	Thallium	µg/L	2	6.99	20 U	20 U	20 U	20 U	20 U	20 U	20 U	NC
Metals - 6010B	Vanadium	µg/L	30	11	10 U	10 U	10 U	10 U	10 U	10 U	10 U	NC
Metals - 6010B	Zinc	µg/L	900	21.1	50 U	50 U	50 U	50 U	50 U	50 U	50 U	NC
Field Parameter	Dissolved Oxygen	mg/L	NS	NS	4.3	9.05	NA	7.87	NA	9	NA	4.09
Field Parameter	ORP	mV	NS	NS	28.9	334.1	NA	348	NA	258.1	NA	107.8
Field Parameter	pH	Standard units	NS	NS	6.13	5.88	NA	5.68	NA	6.48	NA	5.78
Field Parameter	Specific Conductance	µS/cm	NS	NS	38	29	NA	75	NA	30	NA	68
Field Parameter	Turbidity	NTU	NS	NS	5.2	0.08	NA	0.2	NA	0.66	NA	3.15

Notes:
[1] From the MCP GW1 Standards (310 CMR 40 Subpart P) unless otherwise indicated.
[2] Baseline comparison values for metals are background levels from HLA, 2000
[3] Baseline comparison values for explosives are from E&E, 1994.
[4] Proposed amended limit from Public Hearing Draft, 310 CMR 40, MCP, 20 September 2004.
[5] Well point 26WP-06-01 was sampled for perchlorate only in 2006. The draft LTMP (HGL,2007) inadvertently included explosives and metals as sample methods for this location.
All general terms, laboratory indicators and data qulaifiers are defined on the Key for Tables found at the beginning of this section.

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Method	Analyte	Units	Groundwater Standard[1]	Baseline Comparison Values[2,3]	27M-92-01X	27M-93-05X	27M-93-06X	27M-93-08X
Explosives - 8330	1,3,5-Trinitrobenzene	µg/L	500	NS	0.269 U	0.269 U	0.263 U	0.263 U
Explosives - 8330	1,3-Dinitrobenzene	µg/L	1,000	1	0.269 U	0.269 U	0.263 U	0.263 U
Explosives - 8330	2,4,6-Trinitrotoluene	µg/L	1,000	2	0.269 U	0.269 U	0.263 U	0.263 U
Explosives - 8330	2,4-Dinitrotoluene	µg/L	30	30	0.269 U	0.269 U	0.263 U	0.263 U
Explosives - 8330	2,6-Dinitrotoluene	µg/L	1,000	NS	0.269 U	0.269 U	0.263 U	0.263 U
Explosives - 8330	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	0.269 U	0.269 U	0.263 U	0.263 U
Explosives - 8330	2-Nitrotoluene	µg/L	5,000	NS	0.269 U	0.269 U	0.263 U	0.263 U
Explosives - 8330	3-Nitrotoluene	µg/L	5,000	NS	0.269 U	0.269 U	0.263 U	0.263 U
Explosives - 8330	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	0.269 U	0.269 U	0.263 U	0.263 U
Explosives - 8330	4-Nitrotoluene	µg/L	5,000	NS	0.269 U	0.269 U	0.263 U	0.263 U
Explosives - 8330	RDX	µg/L	0.8[4]	2	0.269 U	0.269 U	3.38	0.263 U
Explosives - 8330	Tetryl	µg/L	1,000	NS	0.269 U	0.269 U	0.263 U	0.263 U
Explosives - 8330	Nitrobenzene	µg/L	5,000	NS	0.269 U	0.269 U	0.263 U	0.263 U
Explosives - 8330	HMX	µg/L	200[4]	400	0.269 U	0.269 U	0.768	0.263 U
Metals - 6010B	Aluminum	µg/L	NS	6,870	450	840	160 U	100 U
Metals - 6010B	Antimony	µg/L	6	3.03	50 U	50 U	50 U	50 U
Metals - 6010B	Arsenic	µg/L	10	10.5	3 J	7	2.8 J	5 U
Metals - 6010B	Barium	µg/L	2,000	39.6	5 J	9 J	2 J	3 J
Metals - 6010B	Beryllium	µg/L	4	5	5 U	5 U	5 U	5 U
Metals - 6010B	Cadmium	µg/L	4	4.01	5 U	5 U	5 U	5 U
Metals - 6010B	Calcium	µg/L	NS	14,700	6,500	14,000	4,000	6,100
Metals - 6010B	Chromium	µg/L	100	14.7	1 J	2 J	1 J	1 J
Metals - 6010B	Cobalt	µg/L	5,000	25	20 U	3 J	20 U	20 U
Metals - 6010B	Copper	µg/L	1,300	8.09	10 U	6 J	10 U	10 U
Metals - 6010B	Iron	µg/L	NS	9,100	420	740	170	38 J
Metals - 6010B	Lead	µg/L	15	4.25	10 U	2.1 J	3.2 J	10 U
Metals - 6010B	Magnesium	µg/L	NS	3,480	630	1,600	1,100	1,500
Metals - 6010B	Manganese	µg/L	NS	291	10	20	6 J	10
Mercury - 7470A	Mercury	µg/L	2	0.243	0.2 U	0.2 U	0.2 U	0.2 U
Metals - 6010B	Nickel	µg/L	100	34.3	1.8 J	1.7 J	25 U	25 U
Metals - 6010B	Potassium	µg/L	NS	2,370	790 J	2,000 J	390 J	1,200 J
Metals - 6010B	Selenium	µg/L	50	3.02	5 U	5 U	5 U	5 U
Metals - 6010B	Silver	µg/L	7	4.6	7 U	7 U	7 U	7 U
Metals - 6010B	Sodium	µg/L	NS	10,800	6,400	5,400	1,900 J	3,900
Metals - 6010B	Thallium	µg/L	2	6.99	20 U	20 U	20 U	20 U
Metals - 6010B	Vanadium	µg/L	30	11	1 J	4 J	10 U	10 U
Metals - 6010B	Zinc	µg/L	900	21.1	50 U	13 J	50 U	50 U
Field Parameter	Dissolved Oxygen	mg/L	NS	NS	5.13	21.8	10.62	7.68
Field Parameter	ORP	mV	NS	NS	15.7	139.1	268.9	296
Field Parameter	pH	Standard units	NS	NS	6	9.8	6.35	6.03
Field Parameter	Specific Conductance	µS/cm	NS	NS	73	138	44	72
Field Parameter	Turbidity	NTU	NS	NS	5.4	11.3	4.7	1.5

Notes:
[1] From the MCP GW1 Standards (310 CMR 40 Subpart P) unless otherwise indicated.
[2] Baseline comparison values for metals are background levels from HLA, 2000.
[3] Baseline comparison values for explosives are from E&E, 1994.
[4] Proposed amended limit from Public Hearing Draft, 310 CMR 40, MCP, 20 September 2004.
All general terms, laboratory indicators and data qulaifiers are defined on the Key for Tables found at the beginning of this section.

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Method	Analyte	Units	Groundwater Standard[1]	Baseline Comparison Values[2]	41M-93-04X	41M-94-09A	41M-94-09B	41M-94-11X	41M-94-12X	41M-94-13X	41M-94-14X	41M-94-14X Duplicate
VOCs - 8260B	1,1,2-Trichloroethane	µg/L	5	NS	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
VOCs - 8260B	cis-1,2-Dichloroethene	µg/L	70	NS	0.82	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Carbon tetrachloride	µg/L	5	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	Carbon disulfide	µg/L	1,000	NS	5 U	5 U	5 U	5 U	5 U	0.15 J	5 U	5 U
VOCs - 8260B	Tetrachloroethene	µg/L	5 (ROD)	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
VOCs - 8260B	trans-1,2-Dichloroethene	µg/L	100	NS	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
VOCs - 8260B	Trichloroethene	µg/L	5	NS	**9.1**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.3	1.6
VOCs - 8260B	Toluene	µg/L	1,000	NS	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
VOCs - 8260B	Vinyl chloride	µg/L	2	NS	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Explosives - 8330	1,3,5-Trinitrobenzene	µg/L	500	NS	0.272 U	0.275 U	0.269 U	0.266 U	0.272 U	0.272 U	0.269 U	0.272 U
Explosives - 8330	1,3-Dinitrobenzene	µg/L	1,000	1	0.272 U	0.275 U	0.269 U	0.266 U	0.272 U	0.272 U	0.269 U	0.272 U
Explosives - 8330	2,4,6-Trinitrotoluene	µg/L	1,000	2	0.272 U	0.275 U	0.269 U	0.266 U	0.272 U	0.272 U	0.269 U	0.272 U
Explosives - 8330	2,4-Dinitrotoluene	µg/L	30	30	0.272 U	0.275 U	0.269 U	0.266 U	0.272 U	0.272 U	0.269 U	0.272 U
Explosives - 8330	2,6-Dinitrotoluene	µg/L	1,000	NS	0.272 U	0.275 U	0.269 U	0.266 U	0.272 U	0.272 U	0.269 U	0.272 U
Explosives - 8330	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	0.272 U	0.275 U	0.269 U	0.266 U	0.272 U	0.272 U	0.269 U	0.272 U
Explosives - 8330	2-Nitrotoluene	µg/L	5,000	NS	0.272 U	0.275 U	0.269 U	0.266 U	0.272 U	0.272 U	0.269 U	0.272 U
Explosives - 8330	3-Nitrotoluene	µg/L	5,000	NS	0.272 U	0.275 U	0.269 U	0.266 U	0.272 U	0.272 U	0.269 U	0.272 U
Explosives - 8330	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	0.272 U	0.275 U	0.269 U	0.266 U	0.272 U	0.272 U	0.269 U	0.272 U
Explosives - 8330	4-Nitrotoluene	µg/L	5,000	NS	0.272 U	0.275 U	0.269 U	0.266 U	0.272 U	0.272 U	0.269 U	0.272 U
Explosives - 8330	RDX	µg/L	0.8[3]	2	0.177 J	0.198 J	0.118 J	0.266 U	0.205 J	0.272 U	0.154 J	0.272 U
Explosives - 8330	Tetryl	µg/L	1,000	NS	0.272 U	0.275 U	0.269 U	0.266 U	0.272 U	0.272 U	0.269 U	0.272 U
Explosives - 8330	Nitrobenzene	µg/L	5,000	NS	0.272 U	0.275 U	0.269 U	0.266 U	0.272 U	0.272 U	0.269 U	0.272 U
Explosives - 8330	HMX	µg/L	200[3]	400	0.272 U	0.275 U	0.269 U	0.266 U	0.272 U	0.272 U	0.269 U	0.272 U
Field Parameter	Dissolved Oxygen	mg/L	NS	NS	2	5.67	5.62	5.6	28.9	5.64	15.8	NA
Field Parameter	ORP	mV	NS	NS	52	63.9	58.6	160.5	159.9	269.9	237.7	NA
Field Parameter	pH	Standard units	NS	NS	5.41	6.12	6.18	7.04	7.23	6.27	5.69	NA
Field Parameter	Specific Conductance	µS/cm	NS	NS	30	39	34	46	117	61	31	NA
Field Parameter	Turbidity	NTU	NS	NS	0.29	0.28	0	3	2.22	2.4	12.5	NA

Notes:
[1] From the MCP GW1 Standards (310 CMR 40 Subpart P) unless otherwise indicated.
[2] Baseline comparison values for explosives are from E&E, 1994.
[3] Proposed amended limit from Public Hearing Draft, 310 CMR 40, MCP, 20 September 2004.
All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

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Method	Analyte	Units	Groundwater Standard[1]	Baseline Comparison Values[2,3]	D-1	SPM-93-06X	SPM-93-08X	SPM-93-10X	SPM-93-12X	SPM-93-16X	SPM-97-23X[4]	SPM-97-24X
Explosives - 8330	1,3,5-Trinitrobenzene	µg/L	500	NS	0.266 U	0.281 U	0.263 U	0.278 U	0.312 U	0.272 U	NC	0.275 U
Explosives - 8330	1,3-Dinitrobenzene	µg/L	1,000	1	0.266 U	0.281 U	0.263 U	0.278 U	0.312 U	0.272 U	NC	0.275 U
Explosives - 8330	2,4,6-Trinitrotoluene	µg/L	1,000	2	0.266 U	0.281 U	0.263 U	0.278 U	0.312 U	0.272 U	NC	0.275 U
Explosives - 8330	2,4-Dinitrotoluene	µg/L	30	30	0.266 U	0.281 U	0.263 U	0.278 U	0.312 U	0.272 U	NC	0.275 U
Explosives - 8330	2,6-Dinitrotoluene	µg/L	1,000	NS	0.266 U	0.281 U	0.263 U	0.278 U	0.312 U	0.272 U	NC	0.275 U
Explosives - 8330	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	0.266 U	0.281 U	0.263 U	0.278 U	0.312 U	0.272 U	NC	0.275 U
Explosives - 8330	2-Nitrotoluene	µg/L	5,000	NS	0.266 U	0.281 U	0.263 U	0.278 U	0.312 U	0.272 U	NC	0.275 U
Explosives - 8330	3-Nitrotoluene	µg/L	5,000	NS	0.266 U	0.281 U	0.263 U	0.278 U	0.312 U	0.272 U	NC	0.275 U
Explosives - 8330	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	0.266 U	0.281 U	0.263 U	0.278 U	0.312 U	0.272 U	NC	0.275 U
Explosives - 8330	4-Nitrotoluene	µg/L	5,000	NS	0.266 U	0.281 U	0.263 U	0.278 U	0.312 U	0.272 U	NC	0.275 U
Explosives - 8330	RDX	µg/L	0.8[5]	2	0.176 J	0.281 U	0.168 J	0.278 U	0.312 U	0.272 U	NC	0.101 J
Explosives - 8330	Tetryl	µg/L	1,000	NS	0.266 U	0.281 U	0.263 U	0.278 U	0.312 U	0.272 U	NC	0.275 U
Explosives - 8330	Nitrobenzene	µg/L	5,000	NS	0.266 U	0.281 U	0.263 U	0.278 U	0.312 U	0.272 U	NC	0.275 U
Explosives - 8330	HMX	µg/L	200[5]	400	0.266 U	0.281 U	0.263 U	0.278 U	0.312 U	0.272 U	NC	0.275 U
Metals - 6010B	Aluminum	µg/L	NS	6,870	NA	260 U	25 J	100	160	100 U	NC	55 J
Metals - 6010B	Antimony	µg/L	6	3.03	NA	50 U	50 U	50 U	50 U	50 U	NC	50 U
Metals - 6010B	Arsenic	µg/L	10	10.5	NA	24	5 U	7	5 U	5 U	NC	4.2 J
Metals - 6010B	Barium	µg/L	2,000	39.6	NA	30	10 U	2 J	3 J	10 U	NC	2 J
Metals - 6010B	Beryllium	µg/L	4	5	NA	5 U	5 U	5 U	5 U	5 U	NC	5 U
Metals - 6010B	Cadmium	µg/L	4	4.01	NA	5 U	5 U	5 U	5 U	5 U	NC	5 U
Metals - 6010B	Calcium	µg/L	NS	14,700	NA	17,000	2,600	3,100	6,400	2,300	NC	8,500
Metals - 6010B	Chromium	µg/L	100	14.7	NA	10 U	1 J	3 J	3 J	10 U	NC	1 J
Metals - 6010B	Cobalt	µg/L	5,000	25	NA	20 U	20 U	20 U	20 U	2 U	NC	20 U
Metals - 6010B	Copper	µg/L	1,300	8.09	NA	10 U	10 U	10 U	10 U	10 U	NC	10 U
Metals - 6010B	Iron	µg/L	NS	9,100	NA	50 U	50 U	160	200	18 J	NC	120
Metals - 6010B	Lead	µg/L	15	4.25	NA	10 U	10 U	10 U	10 U	10 U	NC	10 U
Metals - 6010B	Magnesium	µg/L	NS	3,480	NA	300	350	880	2,200	62,000	NC	3,400
Metals - 6010B	Manganese	µg/L	3,500	291	NA	10 U	6 J	4 J	10	1 J	NC	30
Mercury - 7470A	Mercury	µg/L	2	0.243	NA	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NC	0.2 U
Metals - 6010B	Nickel	µg/L	100	34.3	NA	25 U	25 U	25 U	25 U	25 U	NC	25 U
Metals - 6010B	Potassium	µg/L	NS	2,370	NA	6.2	566 J	650 J	72 J	200 J	NC	854 J
Metals - 6010B	Selenium	µg/L	50	3.02	NA	5 U	5 U	5 U	4 J	5 U	NC	5 U
Metals - 6010B	Silver	µg/L	7	4.6	NA	7 U	1.2 J	7 U	7 U	7 U	NC	7 U
Metals - 6010B	Sodium	µg/L	NS	10,800	NA	6,400	2,630	2,400	4,500	1,800 J	NC	2,720
Metals - 6010B	Thallium	µg/L	2	6.99	NA	20 U	20 U	20 U	20 U	20 U	NC	20 U
Metals - 6010B	Vanadium	µg/L	30	11	NA	1 J	10 U	1 J	10 U	10 U	NC	10 U
Metals - 6010B	Zinc	µg/L	900	21.1	NA	50 U	50 U	50 U	25 J	50 U	NC	50 U
Field Parameter	Dissolved Oxygen	µg/L	NS	NS	NA	0.55	10.15	11.96	2.61	5.59	NA	3.45
Field Parameter	ORP	mV	NS	NS	NA	140.7	230.4	209	19.3	59.6	NA	-18.2
Field Parameter	pH	Standard units	NS	NS	NA	10.33	6.69	7.39	6.82	6.62	NA	7.56
Field Parameter	Specific Conductance	µS/cm	NS	NS	NA	148	28	33	66	25	NA	77
Field Parameter	Turbidity	NTU	NS	NS	NA	1.17	2.1	1.4	1.8	0.12	NA	0.2

[1] From the MCP GW1 Standards (310 CMR 40 Subpart P) unless otherwise indicated.
[2] Baseline comparison values for metals are background levels from HLA, 2000
[3] Baseline comparison values for explosives are from E&E, 1994.
[4] Samples were not collected from monitoring well SPM-97-23X because it was under water.
[5] Proposed amended limit from Public Hearing Draft, 310 CMR 40, MCP, 20 September 2004.
All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

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Method	Analyte	Units	GW-1 Groundwater Standard	GW-3 Groundwater Standard	Background[1]	26M-92-02X	Qual	26M-92-03X	Qual	26M-92-03X Duplicate	Qual	26M-92-04X	Qual	26M-92-04X Duplicate	Qual	26M-97-08X	Qual	26M-97-08X Duplicate	Qual	26WP-06-01	Qual
Perchlorate - 332.0	Perchlorate	µg/L	2	1,000	NS	NA		NA		NA		1.83		1.87		NA		NA		**5.59**	
Explosives - 8330	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.215	U	0.215	U	0.215	U	0.222	U	NA		0.215	U	0.215	U	0.213	R
Explosives - 8330	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.215	U	0.215	U	0.215	U	0.222	U	NA		0.215	U	0.215	U	0.213	R
Explosives - 8330	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.215	U	0.215	U	0.215	U	0.222	U	NA		0.215	U	0.215	U	0.213	R
Explosives - 8330	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.215	U	0.215	U	0.215	U	0.222	U	NA		0.215	U	0.215	U	0.213	R
Explosives - 8330	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.215	U	0.215	U	0.215	U	1.0	U	NA		0.215	U	0.215	U	0.213	R
Explosives - 8330	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.215	U	0.215	U	0.215	U	0.222	U	NA		0.215	U	0.215	U	0.213	R
Explosives - 8330	2-Nitrotoluene	µg/L	NS	NS	NS	0.215	U	0.215	U	0.215	U	0.222	U	NA		0.215	U	0.215	U	0.213	R
Explosives - 8330	3-Nitrotoluene	µg/L	NS	NS	NS	0.215	U	0.215	U	0.215	U	0.222	U	NA		0.215	U	0.215	U	0.213	R
Explosives - 8330	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	0.215	U	0.215	U	0.215	U	0.289	U	NA		0.215	U	0.215	U	0.213	R
Explosives - 8330	4-Nitrotoluene	µg/L	NS	NS	NS	0.215	U	0.215	U	0.215	U	0.222	U	NA		0.215	U	0.215	U	0.213	R
Explosives - 8330	RDX	µg/L	1[2]	50,000	NS	0.215	U	**12.9**		**14.9**		**184**		NA		**44**		**43.6**		**349**	J
Explosives - 8330	Tetryl	µg/L	NS	NS	NS	0.215	U	0.215	U	0.215	U	0.222	U	NA		0.215	U	0.215	U	0.213	R
Explosives - 8330	Nitrobenzene	µg/L	NS	NS	NS	0.215	U	0.215	U	0.215	U	0.222	U	NA		0.215	U	0.215	U	0.213	R
Explosives - 8330	HMX	µg/L	200[2]	50,000	NS	0.215	U	1.74		1.95		24.7		NA		11.8		11.8		43.3	J
Metals - SW6010B	Aluminum, Total	µg/L	NS	NS	6,870	52	J	100	U	100	U	100	U	NA		100	U	100	U	39	J
Metals - SW6020A	Antimony, Total[3,4]	µg/L	6	8,000	3.03	50.0	U	50.0	U	50.0	U	50.0	U	NA		50.0	U	50.0	U	50.0	U
Metals - SW6010B	Arsenic, Total	µg/L	10	900	10.5	7.0	U	5.0	U	5.0	U	5.0	U	NA		5.0	U	5.0	U	5.0	U
Metals - SW6010B	Barium, Total	µg/L	2,000	50,000	39.6	1.2	J	10.0		8.5	J	9.3	J	NA		8	J	7.6	J	18	
Metals - SW6010B	Beryllium, Total[3]	µg/L	4	200	5	5.0	U	5.0	U	5.0	U	5.0	U	NA		5.0	U	5.0	U	0.6	J
Metals - SW6010B	Cadmium, Total[4,5]	µg/L	5[2]	4	4.01	5.0	U	5.0	U	5.0	U	5.0	U	NA		5.0	U	5.0	U	5.0	U
Metals - SW6010B	Calcium, Total	µg/L	NS	NS	14,700	2,500		3,400		3,400		8,400		NA		3,300		3,300		9,000	
Metals - SW6010B	Chromium, Total	µg/L	100	300	14.7	10.0	U	10.0	U	10.0	U	10.0	U	NA		10.0	U	10.0	U	2	J
Metals - SW6010B	Cobalt, Total	µg/L	NS	NS	25	20.0	U	20.0	U	20.0	U	20.0	U	NA		20.0	U	20.0	U	1.4	J
Metals - SW6010B	Copper, Total[4]	µg/L	NS	NS	8.09	1.3	J	10.0	U	10.0	U	10.0	U	NA		10.0	U	10.0	U	10.0	U
Metals - SW6010B	Iron, Total	µg/L	NS	NS	9,100	90		50.0	U	50.0	U	50.0	U	NA		50.0	U	50.0	U	**35,000**	
Metals - SW6010B	Lead, Total[4]	µg/L	15	10	4.25	10.0	U	10.0	U	10.0	U	10.0	U	NA		10.0	U	10.0	U	10.0	U
Metals - SW6010B	Magnesium, Total	µg/L	NS	NS	3,480	980		400		400		870		NA		240		260		1,000	
Metals - SW6010B	Manganese, Total	µg/L	NS	NS	291	1.2	J	2.9	J	2.5	J	13		NA		2.3	J	2.1	J	78	
Metals - SW6010B	Nickel, Total	µg/L	100	200	34.3	2.0	J	25.0	U	25.0	U	25.0	U	NA		25.0	U	25.0	U	2.2	J
Metals - SW6010B	Potassium, Total	µg/L	NS	NS	2,370	2,500	U	2,500	U	2,500	U	2,500	U	NA		2,500	U	2,500	U	2,500	U
Metals - SW6010B	Selenium, Total[4]	µg/L	50	100	3.02	10.0	U	10.0	U	10.0	U	10.0	U	NA		10.0	U	10.0	U	10.0	U
Metals - SW6010B	Silver, Total[5]	µg/L	100[2]	7	4.6	7.0	U	7.0	U	7.0	U	7.0	U	NA		7.0	U	7.0	U	7.0	U
Metals - SW6010B	Sodium, Total	µg/L	NS	NS	10,800	2,900		860	J	960	J	2,300		NA		1,000	J	900	J	2,900	
Metals - SW6020A	Thallium, Total[3,4]	µg/L	2	3,000	6.99	20.0	U	20.0	U	20.0	U	20.0	U	NA		20.0	U	20.0	U	20.0	U
Metals - SW6010B	Vanadium, Total	µg/L	30	4,000	11	10.0	U	10.0	U	10.0	U	10.0	U	NA		10.0	U	10.0	U	1.5	J
Metals - SW6010B	Zinc, Total[4]	µg/L	5,000[2]	900	21.1	50.0	U	50.0	U	50.0	U	50.0	U	NA		50.0	U	50.0	U	**2,850**	
Mercury - 7470A	Mercury, Total	µg/L	2	20	0.243	0.2	U	0.2	U	0.2	U	0.2	U	NA		0.2	U	0.2	U	0.2	U
Field Parameter	Dissolved Oxygen	mg/L	NS	NS	NS	6.44		9.96		NA		16.52		16.52		9.89		NA		5.63	
Field Parameter	ORP	mV	NS	NS	NS	95.8		112.8		NA		90.1		90.1		117.6		NA		-60.1	
Field Parameter	pH	Standard units	NS	NS	NS	5.56		5.31		NA		5.55		5.55		5.29		NA		4.90	
Field Parameter	Specific Conductance	µS/cm	NS	NS	NS	31		29		NA		62		62		24		NA		92	
Field Parameter	Turbidity	NTU	NS	NS	NS	3.0		0.0		NA		0.21		0.21		0.0		NA		130	

Notes:
[1] Background levels for metals are from HLA, 2000.
[2] Revised GW-1 or GW-3 standard effective February 14, 2008.
[3] Reporting limit above GW-1 standard.
[4] Reporting limit above background level.
[5] Reporting limit above GW-3 standard.
All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

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Method	Analyte	Units	GW-1 Groundwater Standard	GW-3 Groundwater Standard	Background	Hydrant D-1	Qual	SPM-93-06X	Qual	SPM-93-08X	Qual	SPM-93-10X	Qual	SPM-93-12X	Qual	SPM-93-16X	Qual	SPM-97-23X	Qual	SPM-97-24X	Qual	41M-93-04X	Qual	41M-93-04X Duplicate	Qual
Explosives - 8330	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.215	U	0.215	U	0.217	U	0.215	U	0.217	U	0.213	U	0.213	U	0.215	U	0.215	U	NA	
Explosives - 8330	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.215	U	0.215	U	0.217	U	0.215	U	0.217	U	0.213	U	0.213	U	0.215	U	0.215	U	NA	
Explosives - 8330	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.215	U	0.215	U	0.217	U	0.215	U	0.217	U	0.213	U	0.213	U	0.215	U	0.215	U	NA	
Explosives - 8330	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.215	U	0.215	U	0.217	U	0.215	U	0.217	U	0.213	U	0.213	U	0.215	U	0.215	U	NA	
Explosives - 8330	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.215	U	0.215	U	0.217	U	0.215	U	0.217	U	0.213	U	0.213	U	0.215	U	0.215	U	NA	
Explosives - 8330	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.215	U	0.215	U	0.217	U	0.215	U	0.217	U	0.213	U	0.213	U	0.215	U	0.215	U	NA	
Explosives - 8330	2-Nitrotoluene	µg/L	NS	NS	NS	0.215	U	0.215	U	0.217	U	0.215	U	0.217	U	0.213	U	0.213	U	0.215	U	0.215	U	NA	
Explosives - 8330	3-Nitrotoluene	µg/L	NS	NS	NS	0.215	U	0.215	U	0.217	U	0.215	U	0.217	U	0.213	U	0.213	U	0.215	U	0.215	U	NA	
Explosives - 8330	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	0.215	U	0.215	U	0.217	U	0.215	U	0.217	U	0.213	U	0.213	U	0.215	U	0.215	U	NA	
Explosives - 8330	4-Nitrotoluene	µg/L	NS	NS	NS	0.215	U	0.215	U	0.217	U	0.215	U	0.217	U	0.213	U	0.213	U	0.215	U	0.215	U	NA	
Explosives - 8330	RDX	µg/L	1[2]	NS	NS	0.215	U	0.215	U	0.217	U	0.215	U	0.217	U	0.213	U	0.213	U	0.215	U	0.215	U	NA	
Explosives - 8330	Tetryl	µg/L	NS	NS	NS	0.215	U	0.215	U	0.217	U	0.215	U	0.217	U	0.213	U	0.213	U	0.215	U	0.215	U	NA	
Explosives - 8330	Nitrobenzene	µg/L	NS	NS	NS	0.215	U	0.215	U	0.217	U	0.215	U	0.217	U	0.213	U	0.213	U	0.215	U	0.215	U	NA	
Explosives - 8330	HMX	µg/L	200[2]	NS	NS	0.215	U	0.215	U	0.217	U	0.215	U	0.217	U	0.213	U	0.213	U	0.215	U	0.215	U	NA	
Metals - SW6010B	Aluminum, Total	µg/L	NS	NS	6,870	NA		100		100	U	340		110		30	J	58	J	100	U	NA		NA	
Metals - SW6010B	Antimony, Total[3,4]	µg/L	6	8,000	3.03	NA		**7.8**	J	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	NA		NA	
Metals - SW6010B	Arsenic, Total	µg/L	10	900	10.5	NA		**31**		5.0	U	5		5.0	U	5.0	U	5.0	U	6		NA		NA	
Metals - SW6010B	Barium, Total	µg/L	2,000	50,000	39.6	NA		27		1.2	J	2.7	J	3	J	0.7	J	0.7	J	1.4	J	NA		NA	
Metals - SW6010B	Beryllium, Total[3]	µg/L	4	200	5	NA		5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	NA		NA	
Metals - SW6010B	Cadmium, Total[4,5]	µg/L	5[2]	4	4.1	NA		5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	NA		NA	
Metals - SW6010B	Calcium, Total	µg/L	NS	NS	14,700	NA		10,000		2,500		3,200		6,500		2,300		4,200		7,500		NA		NA	
Metals - SW6010B	Chromium, Total	µg/L	100	300	14.7	NA		10.0	U	10.0	U	4	J	4	J	10.0	U	10.0	U	10.0	U	NA		NA	
Metals - SW6010B	Cobalt, Total	µg/L	NS	NS	25	NA		20.0	U	20.0	U	20.0	U	20.0	U	20.0	U	20.0	U	20.0	U	NA		NA	
Metals - SW6010B	Copper, Total[4]	µg/L	NS	NS	8.09	NA		10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	NA		NA	
Metals - SW6010B	Iron, Total	µg/L	NS	NS	9,100	NA		50.0	U	50.0	U	500		180		50		140		50.0	U	NA		NA	
Metals - SW6010B	Lead, Total[4]	µg/L	15	10	4.25	NA		10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	NA		NA	
Metals - SW6010B	Magnesium, Total	µg/L	NS	NS	3,480	NA		290		320		950		2,200		590		920		3,000		NA		NA	
Metals - SW6010B	Manganese, Total	µg/L	NS	NS	291	NA		3.1	J	1	J	12		6.5	J	1.4	J	29		10.0	U	NA		NA	
Mercury - 7470A	Mercury, Total	µg/L	2	20	0.243	NA		0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	NA		NA	
Metals - SW6010B	Nickel, Total	µg/L	100	200	34.3	NA		25.0	U	25.0	U	2.1	J	9.2	J	25.0	U	25.0	U	25.0	U	NA		NA	
Metals - SW6010B	Potassium, Total[4]	µg/L	NS	NS	2,370	NA		**9,800**		2,500	U	2,500	U	2,500	U	2,500	U	2,500	U	990	J	NA		NA	
Metals - SW6010B	Selenium, Total[4]	µg/L	50	100	3.02	NA		10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	NA		NA	
Metals - SW6010B	Silver, Total[4]	µg/L	100[2]	7	4.6	NA		7.0	U	7.0	U	7.0	U	7.0	U	7.0	U	4.4	J	7.0	U	NA		NA	
Metals - SW6010B	Sodium, Total	µg/L	NS	NS	10,800	NA		10,000		1,600	J	3,100	U	4,900		2,000	U	2,800	U	2,300		NA		NA	
Metals - SW6010B	Thallium, Total[3,4]	µg/L	2	3,000	7	NA		20.0	U	20.0	U	20.0	U	20.0	U	20.0	U	20.0	U	20.0	U	NA			
Metals - SW6010B	Vanadium, Total	µg/L	30	4,000	11	NA		1.9	J	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	NA		NA	
Metals - SW6010B	Zinc, Total[4]	µg/L	5,000[2]	900	21.1	NA		50.0	U	50.0	U	12.6	J	50.0	U	5.2	J	50.0	U	50.0	U	NA		NA	
VOCs - 8260B	1,1,2-Trichloroethane	µg/L	5	50,000	NS	NA		NA		NA		NA		NA		NA		NA		NA		0.75	U	0.75	U
VOCs - 8260B	Carbon Disulfide	µg/L	NS	NS	NS	NA		NA		NA		NA		NA		NA		NA		NA		5.0	U	5.0	U
VOCs - 8260B	Carbon Tetrachloride	µg/L	5	5,000	NS	NA		NA		NA		NA		NA		NA		NA		NA		0.5	U	0.5	U
VOCs - 8260B	Cis-1,2-Dichloroethene	µg/L	70	100	NS	NA		NA		NA		NA		NA		NA		NA		NA		0.5	U	0.5	U
VOCs - 8260B	Tetrachloroethene	µg/L	5	30,000	NS	NA		NA		NA		NA		NA		NA		NA		NA		0.5	U	0.5	U
VOCs - 8260B	Toluene	µg/L	1,000	40,000	NS	NA		NA		NA		NA		NA		NA		NA		NA		0.75	U	0.75	U
VOCs - 8260B	Trans-1,2-Dichloroethene	µg/L	100	50,000	NS	NA		NA		NA		NA		NA		NA		NA		NA		0.75	U	0.75	U
VOCs - 8260B	Trichloroethene	µg/L	5	5,000	NS	NA		NA		NA		NA		NA		NA		NA		NA		0.5	U	0.5	U
VOCs - 8260B	Vinyl Chloride	µg/L	2	50,000	NS	NA		NA		NA		NA		NA		NA		NA		NA		1.0	U	1.0	U
Field Parameter	Dissolved Oxygen	mg/L	NS	NS	NS	7.06		N/A		10.49		8.76		0.32		10.71		9.2		5.11		0.53		NA	
Field Parameter	ORP	mV	NS	NS	NS	58.2		N/A		48.0		4.0		-58.6		35.2		75.2		21.0		-92.1		NA	
Field Parameter	pH	Standard units	NS	NS	NS	6.88		N/A		6.59		7.23		10.14		6.36		5.85		7.73		5.66		NA	
Field Parameter	Specific Conductance	µS/cm	NS	NS	NS	47		N/A		23		31		118		24		36		66		47		NA	
Field Parameter	Turbidity	NTU	NS	NS	NS	0.0		N/A		0.5		5.62		0.0		1.5		0.6		0.2		2.0		NA	

Notes:
[1] Background levels for metals are from HLA, 2000
[2] Revised GW-1 or GW-3 standard effective February 14, 2008.
[3] Reporting limit above GW-1standard.
[4] Reporting limit above background level.
[5] Reporting limit above GW-3 standard.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

2008 Groundwater Analytical Results

SPIA Area of Contamination 26
October 2008

Method	Analyte	Units	GW-1 Groundwater Standard	GW-3 Groundwater Standard	Background[1]	26M-92-02X	Qual	26M-92-03X	Qual	26M-92-03X Duplicate	Qual	26M-92-04X	Qual	26M-92-04X Duplicate	Qual	26M-97-08X	Qual	26M-97-08X Duplicate	Qual	26WP-06-01	Qual	26WP-08-02	Qual
Perchlorate - 332.0	Perchlorate	µg/L	2	1,000	NS	NA		NA		NA		1.67		1.72		NA		NA		**133**		0.050	U
Explosives - 8330	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.217	U	0.215	U	0.210	U	0.215	U	NA		0.213	U	0.210	U	0.215	U	0.215	U
Explosives - 8330	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.217	U	0.215	U	0.210	U	0.215	U	NA		0.213	U	0.210	U	0.215	U	0.215	U
Explosives - 8330	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.217	U	0.215	U	0.210	U	0.215	U	NA		0.213	U	0.210	U	0.215	U	0.215	U
Explosives - 8330	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.217	U	0.215	U	0.210	U	0.215	U	NA		0.213	U	0.210	U	0.215	U	0.215	U
Explosives - 8330	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.217	U	0.215	U	0.210	U	0.215	U	NA		0.213	U	0.210	U	0.215	U	0.215	U
Explosives - 8330	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.217	U	0.215	U	0.210	U	0.215	U	NA		0.213	U	0.210	U	0.215	U	0.215	U
Explosives - 8330	2-Nitrotoluene	µg/L	NS	NS	NS	0.217	U	0.215	U	0.210	U	0.215	U	NA		0.213	U	0.210	U	0.215	U	0.215	U
Explosives - 8330	3-Nitrotoluene	µg/L	NS	NS	NS	0.217	U	0.215	U	0.210	U	0.215	U	NA		0.213	U	0.210	U	0.215	U	0.215	U
Explosives - 8330	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	0.217	U	0.215	U	0.210	U	0.647		NA		0.213	U	0.210	U	0.215	U	0.215	U
Explosives - 8330	4-Nitrotoluene	µg/L	NS	NS	NS	0.217	U	0.215	U	0.210	U	0.215	U	NA		0.213	U	0.210	U	0.215	U	0.215	U
Explosives - 8330	RDX	µg/L	1[2]	50,000	NS	0.217	U	**12.5**		**13.1**		**165**		NA		**32.8**		**32.5**		**190**		0.215	U
Explosives - 8330	Tetryl	µg/L	NS	NS	NS	0.217	U	0.215	U	0.210	U	0.215	U	NA		0.213	U	0.210	U	0.215	U	0.215	U
Explosives - 8330	Nitrobenzene	µg/L	NS	NS	NS	0.217	U	0.215	U	0.210	U	0.215	U	NA		0.213	U	0.210	U	0.215	U	0.215	U
Explosives - 8330	HMX	µg/L	200[2]	50,000	NS	0.217	U	2.22		2.45		29.3		NA		9.68		8.88		49.5		0.215	U
Metals - SW6010B	Aluminum, Total	µg/L	NS	NS	6,870	100		100	U	100	U	100	U	NA		100	U	100	U	100	U	3,600	
Metals - SW6020A	Antimony, Total[3,4]	µg/L	6	8,000	3.03	50.0	U	50	U	50	U	50	U	NA		50	U	50	U	50	U	50	U
Metals - SW6010B	Arsenic, Total	µg/L	10	900	10.5	6.0		5.0	U	5.0	U	5.0	U	NA		5.0	U	5.0	U	5.0	U	**128**	
Metals - SW6010B	Barium, Total	µg/L	2,000	50,000	39.6	10	U	5.8	J	5.6	J	8.6	J	NA		7.0	J	6.6	J	13		33	
Metals - SW6010B	Beryllium, Total[3]	µg/L	4	200	5	5.0	U	5.0	U	5.0	U	5.0	U	NA		5.0	U	5.0	U	5.0	U	5.0	U
Metals - SW6010B	Cadmium, Total[4,5]	µg/L	5[2]	4	4.01	5.0	U	5.0	U	5.0	U	5.0	U	NA		5.0	U	5.0	U	5.0	U	5.0	U
Metals - SW6010B	Calcium, Total	µg/L	NS	NS	14,700	2,500		2,900		2,700		8,500		NA		3,400		3,300		9,400		3,600	
Metals - SW6010B	Chromium, Total	µg/L	100	300	14.7	5.0	J	10	U	10	U	10	U	NA		10	U	2.0	J	8.0	J	6.0	J
Metals - SW6010B	Cobalt, Total	µg/L	NS	NS	25	20	U	20	U	20	U	20	U	NA		20	U	20	U	20	U	6.6	J
Metals - SW6010B	Copper, Total[4]	µg/L	NS	NS	8.09	10	U	10	U	10	U	10	U	NA		10	U	10	U	4.2	J	**8.5**	J
Metals - SW6010B	Iron, Total	µg/L	NS	NS	9,100	200		50	U	50	U	50	U	NA		50	U	22	J	**18,000**		**28,000**	
Metals - SW6010B	Lead, Total[4]	µg/L	15	10	4.25	10	U	10	U	10	U	10	U	NA		10	U	10	U	10	U	**20**	
Metals - SW6010B	Magnesium, Total	µg/L	NS	NS	3,480	1,000		340		330		1,000		NA		250		240		950		960	
Metals - SW6010B	Manganese, Total	µg/L	NS	NS	291	10	U	10	U	10	U	12		NA		10	U	10	U	48		226	
Metals - SW6010B	Nickel, Total	µg/L	100	200	34.3	25	U	25	U	25	U	25	U	NA		25	U	25	U	3.3	J	6.5	J
Metals - SW6010B	Potassium, Total	µg/L	NS	NS	2,370	2,500	U	2,500	U	2,500	U	2,500	U	NA		2,500	U	2,500	U	910	J	1,200	J
Metals - SW6010B	Selenium, Total[4]	µg/L	50	100	3.02	10	U	10	U	10	U	10	U	NA		10	U	10	U	10	U	10	U
Metals - SW6010B	Silver, Total[5]	µg/L	100[2]	7	4.6	7.0	U	7.0	U	7.0	U	7.0	U	NA		7.0	U	7.0	U	7.0	U	7.0	U
Metals - SW6010B	Sodium, Total	µg/L	NS	NS	10,800	3,300		1,300	J	1,200	J	2,700		NA		1,300	J	1,200	J	2,000		2,000	
Metals - SW6020A	Thallium, Total[3,4]	µg/L	2	3,000	6.99	20	U	20	U	20	U	20	U	NA		20	U	20	U	20	U	20	U
Metals - SW6010B	Vanadium, Total	µg/L	30	4,000	11	10	U	10	U	10	U	10	U	NA		10	U	10	U	10	U	5.8	J
Metals - SW6010B	Zinc, Total[4]	µg/L	5,000[2]	900	21.1	7.2	J	50	U	50	U	50	U	NA		50	U	50	U	1,220		2,610	
Mercury - SW7470A	Mercury, Total	µg/L	2	20	0.243	0.2	U	0.2	U	0.2	U	0.2	U	NA		0.2	U	0.2	U	0.2	U	0.2	U
Field Parameter	Dissolved Oxygen	mg/L	NS	NS	NS	4.89		7.85		NA		8.79		NA		8.19		NA		3.1		0.13	
Field Parameter	ORP	mV	NS	NS	NS	107.6		136		NA		208.3		NA		135.9		NA		44.2		-161.8	
Field Parameter	pH	Standard units	NS	NS	NS	6.59		6.8		NA		4.96		NA		6.45		NA		5.77		6.51	
Field Parameter	Specific Conductance	µS/cm	NS	NS	NS	34		25		NA		68		NA		25		NA		82		100	
Field Parameter	Turbidity	NTU	NS	NS	NS	2.4		0.9		NA		0		NA		0.8		NA		80		55	

Notes:
[1] Background levels for metals are from HLA, 2000.
[2] Revised GW-1 or GW-3 standard effective February 14, 2008.
[3] Reporting limit above GW-1 standard.
[4] Reporting limit above background level.
[5] Reporting limit above GW-3 standard.
All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

SPIA Area of Contamination 27
October 2008

Method	Analyte	Units	GW-1 Groundwater Standard	GW-3 Groundwater Standard	Background[1]	27M-92-01X	Qual	27M-93-05X	Qual	27M-93-06X	Qual	27M-93-08X	Qual
Explosives - 8330	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.220	U	0.210	U	0.220	U	0.215	UJ
Explosives - 8330	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.220	U	0.210	U	0.220	U	0.215	UJ
Explosives - 8330	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.220	U	0.210	U	0.220	U	0.215	UJ
Explosives - 8330	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.220	U	0.210	U	0.220	U	0.215	UJ
Explosives - 8330	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.220	U	0.210	U	0.220	U	0.215	UJ
Explosives - 8330	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.220	U	0.210	U	0.220	U	0.215	UJ
Explosives - 8330	2-Nitrotoluene	µg/L	NS	NS	NS	0.220	U	0.210	U	0.220	U	0.215	UJ
Explosives - 8330	3-Nitrotoluene	µg/L	NS	NS	NS	0.220	U	0.210	U	0.220	U	0.215	UJ
Explosives - 8330	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	0.220	U	0.210	U	0.220	U	0.215	UJ
Explosives - 8330	4-Nitrotoluene	µg/L	NS	NS	NS	0.220	U	0.210	U	0.220	U	0.215	UJ
Explosives - 8330	RDX	µg/L	1[2]	50,000	NS	0.220	U	0.210	U	**1.84**		0.215	UJ
Explosives - 8330	Tetryl	µg/L	NS	NS	NS	0.220	U	0.210	U	0.220	U	0.215	UJ
Explosives - 8330	Nitrobenzene	µg/L	NS	NS	NS	0.220	U	0.210	U	0.220	U	0.215	UJ
Explosives - 8330	HMX	µg/L	200[2]	50,000	NS	0.220	U	0.210	U	0.684		0.215	UJ
Metals - SW6010B	Aluminum, Total	µg/L	NS	NS	6,870	290		830		110		100	U
Metals - SW6020A	Antimony, Total[3,4]	µg/L	6	8,000	3.03	50	U	50	U	50	U	50	U
Metals - SW6010B	Arsenic, Total	µg/L	10	900	10.5	5.0	U	5.0		5.0	U	5.0	U
Metals - SW6010B	Barium, Total	µg/L	2,000	50,000	39.6	5.2	J	6.5	J	10	U	6.6	J
Metals - SW6010B	Beryllium, Total[3]	µg/L	4	200	5	5.0	U	5.0	U	5.0	U	5.0	U
Metals - SW6010B	Cadmium, Total[4,5]	µg/L	5[2]	4	4.01	5.0	U	5.0	U	5.0	U	5.0	U
Metals - SW6010B	Calcium, Total	µg/L	NS	NS	14,700	6,000		11,000		4,300		6,900	
Metals - SW6010B	Chromium, Total	µg/L	100	300	14.7	2.0	J	3.0	J	2.0	J	2.0	J
Metals - SW6010B	Cobalt, Total	µg/L	NS	NS	25	20	U	20	U	20	U	20	U
Metals - SW6010B	Copper, Total[4]	µg/L	NS	NS	8.09	10	U	4.2	J	10	U	10	U
Metals - SW6010B	Iron, Total	µg/L	NS	NS	9,100	310		890		140		50	U
Metals - SW6010B	Lead, Total[4]	µg/L	15	10	4.25	2.3	J	3.1	J	**7.8**	J	10	U
Metals - SW6010B	Magnesium, Total	µg/L	NS	NS	3,480	570		1,400		1,100		1,700	
Metals - SW6010B	Manganese, Total	µg/L	NS	NS	291	8.8	J	32		16		3.3	J
Metals - SW6010B	Nickel, Total	µg/L	100	200	34.3	6.0	J	5.6	J	25	U	25	U
Metals - SW6010B	Potassium, Total	µg/L	NS	NS	2,370	2,500	U	**2,600**		2,500	U	1,400	J
Metals - SW6010B	Selenium, Total[4]	µg/L	50	100	3.02	10	U	10	U	10	U	10	U
Metals - SW6010B	Silver, Total[4]	µg/L	100[2]	7	4.6	7.0	U	7.0	U	7.0	U	7.0	U
Metals - SW6010B	Sodium, Total	µg/L	NS	NS	10,800	7,600		3,800		1,900	J	5,100	
Metals - SW6020A	Thallium, Total[3,4]	µg/L	2	3,000	6.99	20	U	20	U	20	U	20	U
Metals - SW6010B	Vanadium, Total	µg/L	30	4,000	11	10	U	3.6	J	10	U	10	U
Metals - SW6010B	Zinc, Total[4]	µg/L	5,000[2]	900	21.1	**25**	J	10.9	J	5.3	J	50	U
Mercury - SW7470A	Mercury, Total	µg/L	2	20	0.243	0.2	U	0.2	U	0.2	U	0.2	U
Field Parameter	Dissolved Oxygen	mg/L	NS	NS	NS	5.32		0.68		10.15		5.4	
Field Parameter	ORP	mV	NS	NS	NS	181.7		-6.1		136.4		108.2	
Field Parameter	pH	Standard units	NS	NS	NS	5.14		9.93		5.62		6.69	
Field Parameter	Specific Conductance	µS/cm	NS	NS	NS	63		94		37		67	
Field Parameter	Turbidity	NTU	NS	NS	NS	4.4		4.0		3.8		1.0	

Notes:
[1] Background levels for metals are background levels from HLA, 2000.
[2] Revised GW-1 or GW-3 standard effective February 14, 2008.
[3] Reporting limit above GW-1 standard.
[4] Reporting limit above background level.
[5] Reporting limit above GW-3 standard.
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SPIA South Post Monitoring Wells
October 2008

Method	Analyte	Units	GW-1 Groundwater Standard	GW-3 Groundwater Standard	Background	Hydrant D-1	Qual	SPM-93-06X	Qual	SPM-93-08X	Qual	SPM-93-10X	Qual	SPM-93-12X	Qual	SPM-93-16X	Qual	SPM-97-23X	Qual	SPM-97-24X	Qual	41M-93-04X	Qual	41M-93-04X Duplicate	Qual
Explosives - 8330	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.215	U	0.210	U	0.215	U	0.210	U	0.213	U	0.215	U	0.215	U	0.213	U	0.210	U	NA	
Explosives - 8330	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.215	U	0.210	U	0.215	U	0.210	U	0.213	U	0.215	U	0.215	U	0.213	U	0.210	U	NA	
Explosives - 8330	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.215	U	0.210	U	0.215	U	0.210	U	0.213	U	0.215	U	0.215	U	0.213	U	0.210	U	NA	
Explosives - 8330	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.215	U	0.210	U	0.215	U	0.210	U	0.213	U	0.215	U	0.215	U	0.213	U	0.210	U	NA	
Explosives - 8330	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.215	U	0.210	U	0.215	U	0.210	U	0.213	U	0.215	U	0.215	U	0.213	U	0.210	U	NA	
Explosives - 8330	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.215	U	0.210	U	0.215	U	0.210	U	0.213	U	0.215	U	0.215	U	0.213	U	0.210	U	NA	
Explosives - 8330	2-Nitrotoluene	µg/L	NS	NS	NS	0.215	U	0.210	U	0.215	U	0.210	U	0.213	U	0.215	U	0.215	U	0.213	U	0.210	U	NA	
Explosives - 8330	3-Nitrotoluene	µg/L	NS	NS	NS	0.215	U	0.210	U	0.215	U	0.210	U	0.213	U	0.215	U	0.215	U	0.213	U	0.210	U	NA	
Explosives - 8330	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	0.215	U	0.210	U	0.215	U	0.210	U	0.213	U	0.215	U	0.215	U	0.213	U	0.210	U	NA	
Explosives - 8330	4-Nitrotoluene	µg/L	NS	NS	NS	0.215	U	0.210	U	0.215	U	0.210	U	0.213	U	0.215	U	0.215	U	0.213	U	0.210	U	NA	
Explosives - 8330	RDX	µg/L	1[2]	50,000	NS	0.215	U	0.210	U	0.215	U	0.210	U	0.213	U	0.215	U	0.215	U	0.213	U	0.210	U	NA	
Explosives - 8330	Tetryl	µg/L	NS	NS	NS	0.215	U	0.210	U	0.215	U	0.210	U	0.213	U	0.215	U	0.215	U	0.213	U	0.210	U	NA	
Explosives - 8330	Nitrobenzene	µg/L	NS	NS	NS	0.215	U	0.210	U	0.215	U	0.210	U	0.213	U	0.215	U	0.215	U	0.213	U	0.210	U	NA	
Explosives - 8330	HMX	µg/L	200[2]	50,000	NS	0.215	U	0.210	U	0.215	U	0.210	U	0.213	U	0.215	U	0.215	U	0.213	U	0.210	U	NA	
Metals - SW6010B	Aluminum, Total	µg/L	NS	NS	6,870	NA		560		100	U	75	J	290		100	U	45	J	100	U	NA		NA	
Metals - SW6010B	Antimony, Total[3,4]	µg/L	6	8,000	3.03	NA		50.0	U	50	U	50	U	50	U	50	U	50	U	50	U	NA		NA	
Metals - SW6010B	Arsenic, Total	µg/L	10	900	10.5	NA		**27**		5.0	U	7.0		5.0	U	5.0	U	5.0	U	4.6	J	NA		NA	
Metals - SW6010B	Barium, Total	µg/L	2,000	50,000	39.6	NA		**50**		10	U	1.9	J	4.6	J	10	U	10	U	10	U	NA		NA	
Metals - SW6010B	Beryllium, Total[3]	µg/L	4	200	5	NA		5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	NA		NA	
Metals - SW6010B	Cadmium, Total[4,5]	µg/L	5[2]	4	4.1	NA		5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	5.0	U	NA		NA	
Metals - SW6010B	Calcium, Total	µg/L	NS	NS	14,700	NA		**28,000**		2,400		3,000		6,900		2,300		4,300		8,000		NA		NA	
Metals - SW6010B	Chromium, Total	µg/L	100	300	14.7	NA		10	U	10	U	3.0	J	4	J	10	U	10	U	2.0	J	NA		NA	
Metals - SW6010B	Cobalt, Total	µg/L	NS	NS	25	NA		20	U	20	U	20	U	20	U	20	U	20	U	20	U	NA		NA	
Metals - SW6010B	Copper, Total[4]	µg/L	NS	NS	8.09	NA		10	U	10	U	10	U	10	U	10	U	10	U	10	U	NA		NA	
Metals - SW6010B	Iron, Total	µg/L	NS	NS	9,100	NA		50	U	50	U	100		400	J	50	U	150	J	50	U	NA		NA	
Metals - SW6010B	Lead, Total[4]	µg/L	15	10	4.25	NA		10	U	10	U	10	U	10	U	10	U	10	U	10	U	NA		NA	
Metals - SW6010B	Magnesium, Total	µg/L	NS	NS	3,480	NA		380		340		980		2,400		650		950		3,300		NA		NA	
Metals - SW6010B	Manganese, Total	µg/L	NS	NS	291	NA		3.4	J	10	U	10	U	11		10	U	22		10	U	NA		NA	
Metals - SW6010B	Nickel, Total	µg/L	100	200	34.3	NA		25	U	25	U	25	U	6.2	J	25	U	25	U	25	U	NA		NA	
Metals - SW6010B	Potassium, Total[4]	µg/L	NS	NS	2,370	NA		**12,000**		2,500	U	2,500	U	940	J	2,500	U	2,500	U	1,100	J	NA		NA	
Metals - SW6010B	Selenium, Total[4]	µg/L	50	100	3.02	NA		10	U	10	U	10	U	10	U	10	U	10	U	10	U	NA		NA	
Metals - SW6010B	Silver, Total[4]	µg/L	100[2]	7	4.6	NA		7.0	U	7.0	U	7.0	U	7.0	U	7.0	U	7.0	U	7.0	U	NA		NA	
Metals - SW6010B	Sodium, Total	µg/L	NS	NS	10,800	NA		**12,000**		2,000		2,900		5,400		2,300		2,800		3,100		NA		NA	
Metals - SW6010B	Thallium, Total[3,4]	µg/L	2	3,000	7	NA		20	U	20	U	20	U	20	U	20	U	20	U	20	U	NA		NA	
Metals - SW6010B	Vanadium, Total	µg/L	30	4,000	11	NA		1.8	J	10	U	10	U	10	U	10	U	10	U	10	U	NA		NA	
Metals - SW6010B	Zinc, Total[4]	µg/L	5,000[2]	900	21.1	NA		50	U	50	U	50	U	7.4	J	50	U	5.4	J	50	U	NA		NA	
Mercury - SW7470A	Mercury, Total	µg/L	2	20	0.243	NA		0.03	J	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U	NA		NA	
VOCs - 8260B	1,1,2-Trichloroethane	µg/L	5	50,000	NS	NA		NA		NA		NA		NA		NA		NA		NA		0.75	U	0.75	U
VOCs - 8260B	*cis*-1,2-Dichloroethene	µg/L	70	100	NS	NA		NA		NA		NA		NA		NA		NA		NA		0.5	U	0.5	U
VOCs - 8260B	*trans*-1,2-Dichloroethene	µg/L	100	50,000	NS	NA		NA		NA		NA		NA		NA		NA		NA		0.75	U	0.75	U
VOCs - 8260B	Carbon Disulfide	µg/L	NS	NS	NS	NA		NA		NA		NA		NA		NA		NA		NA		5.0	U	5.0	U
VOCs - 8260B	Carbon Tetrachloride	µg/L	5	5,000	NS	NA		NA		NA		NA		NA		NA		NA		NA		0.5	U	0.5	U
VOCs - 8260B	Tetrachloroethene	µg/L	5	30,000	NS	NA		NA		NA		NA		NA		NA		NA		NA		0.5	U	0.5	U
VOCs - 8260B	Toluene	µg/L	1,000	40,000	NS	NA		NA		NA		NA		NA		NA		NA		NA		0.75	U	0.75	U
VOCs - 8260B	Trichloroethene	µg/L	5	5,000	NS	NA		NA		NA		NA		NA		NA		NA		NA		0.5	U	0.5	U
VOCs - 8260B	Vinyl Chloride	µg/L	2	50,000	NS	NA		NA		NA		NA		NA		NA		NA		NA		1.0	U	1.0	U
Field Parameter	Dissolved Oxygen	mg/L	NS	NS	NS	5.59		0.74		10.56		8.69		3.43		11.18		7.5		4.26		1.98		NA	
Field Parameter	ORP	mV	NS	NS	NS	38.6		31.3		175.6		90.7		61.2		160.4		84.9		43.8		5.9		NA	
Field Parameter	pH	Standard units	NS	NS	NS	8.11		10.67		5.33		6.5		7.49		5.77		7.91		8.45		5.57		NA	
Field Parameter	Specific Conductance	µS/cm	NS	NS	NS	60		218		26		35		69		35		42		72		38		NA	
Field Parameter	Turbidity	NTU	NS	NS	NS	12.4		0		0.0		1.0		1.0		0		2		0.70		1.3		NA	

Notes:
[1] Background levels for metals are from HLA, 2000
[2] Revised GW-1 or GW-3 standard effective February 14, 2008.
[3] Reporting limit above GW-1standard.
[4] Reporting limit above background level.
[5] Reporting limit above GW-3 standard.
All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

SPIA Area of Contamination 26
May 2009

Method	Analyte	Units	GW-1 Groundwater Standard[1]	GW-3 Groundwater Standard[1]	Background	26WP-06-01	Qual	26WP-06-01 Duplicate	Qual	26WP-08-02	Qual	26M-92-04X	Qual
Perchlorate - 332.0	Perchlorate	µg/L	2	1,000	NS	**305**		**300**		0.050	U	1.5	
Field Parameter	Temperature, initial	°C	NS	NS	NS	9.56		NA		10.16		10.30	
	Temperature, final	°C	NS	NS	NS	9.24		NA		9.61		10.14	
	ORP	mV	NS	NS	NS	49.3		NA		-86.1		257.5	
	pH	standard units	NS	NS	NS	5.62		NA		6.28		4.66	
	Specific Conductance	µS/cm	NS	NS	NS	106		NA		53		73	
	Dissolved Oxygen	mg/L	NS	NS	NS	3.75		NA		0.20		6.98	
	Turbidity	NTU	NS	NS	NS	4.2		NA		4.20		0.00	

Notes:

[1] GW-1 or GW-3 standard effective June 26, 2009.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

2009 Groundwater Analytical Results
SPIA South Post Monitoring Wells
November 2009

Method	Analyte	Units	GW-1 Groundwater Standard[1]	GW-3 Groundwater Standard[1]	Background[2]	Hydrant D-1	Qual	SPM-93-06X	Qual	SPM-93-08X	Qual	SPM-93-10X	Qual	SPM-93-12X	Qual	SPM-93-16X	Qual	SPM-97-23X	Qual
Explosives - 8330	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.217	U	0.222	U	0.225	U	0.204	U	0.225	U	0.200	U	0.230	U
	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.217	U	0.222	U	0.225	U	0.204	U	0.225	U	0.200	U	0.230	U
	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.217	U	0.222	U	0.225	U	0.204	U	0.225	U	0.200	U	0.230	U
	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.217	U	0.222	U	0.225	U	0.204	U	0.225	U	0.200	U	0.230	U
	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.217	U	0.222	U	0.225	U	0.204	U	0.225	U	0.200	U	0.230	U
	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.217	U	0.222	U	0.225	U	0.204	U	0.225	U	0.200	U	0.230	U
	2-Nitrotoluene	µg/L	NS	NS	NS	0.217	U	0.222	U	0.225	U	0.204	U	0.225	U	0.200	U	0.230	U
	3-Nitrotoluene	µg/L	NS	NS	NS	0.217	U	0.222	U	0.225	U	0.204	U	0.225	U	0.200	U	0.230	U
	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	0.217	U	0.222	U	0.225	U	0.204	U	0.225	U	0.200	U	0.230	U
	4-Nitrotoluene	µg/L	NS	NS	NS	0.217	U	0.222	U	0.225	U	0.204	U	0.225	U	0.200	U	0.230	U
	RDX	µg/L	1	50,000	NS	0.217	U	0.222	U	0.225	U	0.204	U	0.225	U	0.200	U	0.230	U
	Tetryl	µg/L	NS	NS	NS	0.217	U	0.222	U	0.225	U	0.204	U	0.225	U	0.200	U	0.230	U
	Nitrobenzene	µg/L	NS	NS	NS	0.217	U	0.222	U	0.225	U	0.204	U	0.225	U	0.200	U	0.230	U
	HMX	µg/L	200	50,000	NS	0.217	U	0.222	U	0.225	U	0.204	U	0.225	U	0.200	U	0.230	U
Metals - SW6010B	Aluminum, Total	µg/L	NS	NS	6,870	NA		790		100	U	74	J	100	U	100	U	10	U
	Antimony, Total[3,4]	µg/L	6	8,000	3.03	NA		50	U	50	U	50	U	50	U	**8.5**	J	50	U
	Arsenic, Total	µg/L	10	900	10.5	NA		**11**		5	U	5	U	5	U	5	U	5	U
	Barium, Total	µg/L	2,000	50,000	39.6	NA		**68**		10	U	10	U	1.9	J	10	U	10	U
	Beryllium, Total[3]	µg/L	4	200	5	NA		5	U	5	U	5	U	5	U	5	U	5	U
	Cadmium, Total[4,5]	µg/L	5	4	4.1	NA		3.5	J	5	U	5	U	5	U	5	U	5	U
	Calcium, Total	µg/L	NS	NS	14,700	NA		**31,000**		2,400		3,100		6,400		2,600		4,000	
	Chromium, Total	µg/L	100	300	14.7	NA		10	U	1	J	3	J	6	J	10	U	10	U
	Cobalt, Total	µg/L	NS	NS	25	NA		20	U	20	U	20	U	20	U	20	U	20	U
	Copper, Total[4]	µg/L	NS	NS	8.09	NA		10	U	10	U	10	U	10	U	10	U	10	U
	Iron, Total	µg/L	NS	NS	9,100	NA		50	U	50	U	100		39	J	50	U	80	
	Lead, Total[4]	µg/L	15	10	4.25	NA		10	U	10	U	10	U	10	U	10	U	10	U
	Magnesium, Total	µg/L	NS	NS	3,480	NA		100	U	300		880		2,100		660		850	
	Manganese, Total	µg/L	NS	NS	291	NA		10	U	10	U	10	U	3.7	J	10	U	15	
	Nickel, Total	µg/L	100	200	34.3	NA		25	U	25	U	25	U	19	J	25	U	25	U
	Potassium, Total[4]	µg/L	NS	NS	2,370	NA		**14,000**		990	J	2500	U	2,500	U	2,500	U	2,500	U
	Selenium, Total[4]	µg/L	50	100	3.02	NA		10	U	10	U	10	U	10	U	10	U	10	U
	Silver, Total[4]	µg/L	100	7	4.6	NA		7	U	7	U	7	U	7	U	7	U	7.0	U
	Sodium, Total	µg/L	NS	NS	10,800	NA		**14,000**		2,200		2,800		5,100		2,500		2,700	
	Thallium, Total[3,4]	µg/L	2	3,000	7	NA		20	U	20	U	20	U	20	U	20	U	20	U
	Vanadium, Total	µg/L	30	4,000	11	NA		1.4	J	10	U	10	U	10	U	10	U	10	U
	Zinc, Total[4]	µg/L	5,000	900	21.1	NA		50	U	50	U	50	U	4.8	J	50	U	50	U
Mercury - SW7470A	Mercury, Total	µg/L	2	20	0.243	NA		0.0002	U	0.0002	U	0.0002	U	0.0002	U	0.0002	U	0.0002	U
VOCs - 8260B	1,1,2-Trichloroethane	µg/L	5	50,000	NS	NA		NA		NA		NA		NA		NA		NA	
	cis -1,2-Dichloroethene	µg/L	70	100	NS	NA		NA		NA		NA		NA		NA		NA	
	trans -1,2-Dichloroethene	µg/L	100	50,000	NS	NA		NA		NA		NA		NA		NA		NA	
	Carbon Disulfide	µg/L	NS	NS	NS	NA		NA		NA		NA		NA		NA		NA	
	Carbon Tetrachloride	µg/L	5	5,000	NS	NA		NA		NA		NA		NA		NA		NA	
	Tetrachloroethene	µg/L	5	30,000	NS	NA		NA		NA		NA		NA		NA		NA	
	Toluene	µg/L	1,000	40,000	NS	NA		NA		NA		NA		NA		NA		NA	
	Trichloroethene	µg/L	5	5,000	NS	NA		NA		NA		NA		NA		NA		NA	
	Vinyl Chloride	µg/L	2	50,000	NS	NA		NA		NA		NA		NA		NA		NA	
Field Parameter	Temperature, Initial	° Celsius	NS	NS	NS	12.04		9.18		8.78		9.88		9.99		9.95		9.97	
	Temperature, Final	° Celsius	NS	NS	NS	12.4		9.27		8.57		9.92		10.1		9.68		9.95	
	Dissolved Oxygen	mg/L	NS	NS	NS	8.32		11.94		6.72		7.34		6.87		6.07		6.5	
	ORP	mV	NS	NS	NS	88.4		520		31.0		44.0		76		31		44	
	pH	Standard units	NS	NS	NS	9.02		-21.2		187.2		68.9		93.4		49.6		139.3	
	Specific Conductance	µS/cm	NS	NS	NS	883		1.26		12.19		10.24		5.08		10.54		10.88	
	Turbidity	NTU	NS	NS	NS	1.4		0.05		0.0		1.77		0.18		2.8		0.53	

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] GW-1 or GW-3 standard effective June 26, 2009.

[2] Background levels for metals are from HLA, 2000

SPIA South Post Monitoring Wells
November 2009

Method	Analyte	Units	GW-1 Groundwater Standard[1]	GW-3 Groundwater Standard[1]	Background[2]	SPM-97-24X	Qual	41M-93-04X	Qual	41M-93-04X Duplicate	Qual
Explosives - 8330	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.215	U	0.217	U	NA	
	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.215	U	0.217	U	NA	
	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.215	U	0.217	U	NA	
	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.215	U	0.217	U	NA	
	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.215	U	0.217	U	NA	
	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.215	U	0.217	U	NA	
	2-Nitrotoluene	µg/L	NS	NS	NS	0.215	U	0.217	U	NA	
	3-Nitrotoluene	µg/L	NS	NS	NS	0.215	U	0.217	U	NA	
	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	0.215	U	0.217	U	NA	
	4-Nitrotoluene	µg/L	NS	NS	NS	0.215	U	0.217	U	NA	
	RDX	µg/L	1	50,000	NS	0.215	U	0.217	U	NA	
	Tetryl	µg/L	NS	NS	NS	0.215	U	0.217	U	NA	
	Nitrobenzene	µg/L	NS	NS	NS	0.215	U	0.217	U	NA	
	HMX	µg/L	200	50,000	NS	0.215	U	0.217	U	NA	
Metals - SW6010B	Aluminum, Total	µg/L	NS	NS	6,870	100	U	NA		NA	
	Antimony, Total[3,4]	µg/L	6	8,000	3.03	50	U	NA		NA	
	Arsenic, Total	µg/L	10	900	10.5	4	J	NA		NA	
	Barium, Total	µg/L	2,000	50,000	39.6	10	U	NA		NA	
	Beryllium, Total[3]	µg/L	4	200	5	5.0	U	NA		NA	
	Cadmium, Total[4,5]	µg/L	5	4	4.1	5.0	U	NA		NA	
	Calcium, Total	µg/L	NS	NS	14,700	7,400		NA		NA	
	Chromium, Total	µg/L	100	300	14.7	10	U	NA		NA	
	Cobalt, Total	µg/L	NS	NS	25	20	U	NA		NA	
	Copper, Total[4]	µg/L	NS	NS	8.09	10	U	NA		NA	
	Iron, Total	µg/L	NS	NS	9,100	50	U	NA		NA	
	Lead, Total[4]	µg/L	15	10	4.25	10	U	NA		NA	
	Magnesium, Total	µg/L	NS	NS	3,480	3,000		NA		NA	
	Manganese, Total	µg/L	NS	NS	291	10	U	NA		NA	
	Nickel, Total	µg/L	100	200	34.3	25	U	NA		NA	
	Potassium, Total[4]	µg/L	NS	NS	2,370	1,100	J	NA		NA	
	Selenium, Total[4]	µg/L	50	100	3.02	10	U	NA		NA	
	Silver, Total[4]	µg/L	100	7	4.6	7.0	U	NA		NA	
	Sodium, Total	µg/L	NS	NS	10,800	3,100		NA		NA	
	Thallium, Total[3,4]	µg/L	2	3,000	7	20	U	NA		NA	
	Vanadium, Total	µg/L	30	4,000	11	10	U	NA		NA	
	Zinc, Total[4]	µg/L	5,000	900	21.1	50	U	NA		NA	
Mercury - SW7470A	Mercury, Total	µg/L	2	20	0.243	0.0002	U	NA		NA	
VOCs - 8260B	1,1,2-Trichloroethane	µg/L	5	50,000	NS	NA		0.75	U	0.75	U
	cis -1,2-Dichloroethene	µg/L	70	100	NS	NA		0.50	U	0.5	U
	trans -1,2-Dichloroethene	µg/L	100	50,000	NS	NA		0.75	U	0.75	U
	Carbon Disulfide	µg/L	NS	NS	NS	NA		5.0	U	5.0	U
	Carbon Tetrachloride	µg/L	5	5,000	NS	NA		0.5	U	0.5	U
	Tetrachloroethene	µg/L	5	30,000	NS	NA		0.5	U	0.5	U
	Toluene	µg/L	1,000	40,000	NS	NA		0.75	U	0.75	U
	Trichloroethene	µg/L	5	5,000	NS	NA		0.5	U	0.5	U
	Vinyl Chloride	µg/L	2	50,000	NS	NA		1.0	U	1.0	U
Field Parameter	Temperature, Initial	° Celsius	NS	NS	NS	6.24		11.6		NA	
	Temperature, Final	° Celsius	NS	NS	NS	9.84		11.4		NA	
	Dissolved Oxygen	mg/L	NS	NS	NS	7.61		5.4		NA	
	ORP	mV	NS	NS	NS	77.0		52		NA	
	pH	Standard units	NS	NS	NS	-3.1		-11.6		NA	
	Specific Conductance	µS/cm	NS	NS	NS	6.45		1.85		NA	
	Turbidity	NTU	NS	NS	NS	2.1		3.8		NA	

Notes:
All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this secti

[1] GW-1 or GW-3 standard effective June 26, 2009.

[2] Background levels for metals are from HLA, 2000

SPIA Area of Contamination 26
November 2009

Method	Analyte	Units	GW-1 Groundwater Standard[2]	GW-3 Groundwater Standard[2]	Background[1]	26M-92-02X	Qual	26M-92-03X	Qual	26M-92-03X Duplicate	Qual	26M-92-04X	Qual	26M-92-04X Duplicate	Qual	26M-97-08X	Qual	26M-97-08X Duplicate	Qual	26WP-06-01	Qual
Perchlorate 332.0	Perchlorate	µg/L	2	1,000	NS	NA		NA		NA		**2.98**		**2.96**		NA		NA		**114**	
Explosives 8330	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.232	U	0.208	U	0.206	U	0.230	U	NA		0.206	U	0.206	U	0.225	U
	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.232	U	0.208	U	0.206	U	0.230	U	NA		0.206	U	0.206	U	0.225	U
	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.232	U	0.208	U	0.206	U	0.230	U	NA		0.206	U	0.206	U	0.225	U
	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.232	U	0.208	U	0.206	U	0.230	U	NA		0.206	U	0.206	U	0.225	U
	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.232	U	0.208	U	0.206	U	0.637		NA		0.206	U	0.206	U	0.225	U
	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.232	U	0.208	U	0.206	U	0.230	U	NA		0.206	U	0.206	U	0.225	U
	2-Nitrotoluene	µg/L	NS	NS	NS	0.232	U	0.208	U	0.206	U	0.230	U	NA		0.206	U	0.206	U	0.225	U
	3-Nitrotoluene	µg/L	NS	NS	NS	0.232	U	0.208	U	0.206	U	0.230	U	NA		0.206	U	0.206	U	0.225	U
	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	0.232	U	0.208	U	0.206	U	0.805		NA		0.206	U	0.206	U	0.225	U
	4-Nitrotoluene	µg/L	NS	NS	NS	0.232	U	0.208	U	0.206	U	0.230	U	NA		0.206	U	0.206	U	0.225	U
	RDX	µg/L	1	50,000	NS	0.232	U	**17.3**		**18.4**		**172**		NA		**26.7**		**22.6**		**134.0**	
	Tetryl	µg/L	NS	NS	NS	0.232	U	0.208	U	0.206	U	0.230	U	NA		0.206	U	0.206	U	0.225	U
	Nitrobenzene	µg/L	NS	NS	NS	0.232	U	0.208	U	0.206	U	0.230	U	NA		0.206	U	0.206	U	0.225	U
	HMX	µg/L	200	50,000	NS	0.232	U	4.76		5.24		29.3		NA		5.22		5.55		49.9	
Metals SW6010B	Aluminum, Total	µg/L	NS	NS	6,870	100	U	100	U	100	U	100	U	NA		100	U	100	U	100	U
	Antimony, Total	µg/L	6	8,000	3.03	50.0	U	50	U	50	U	50	U	NA		50	U	50	U	50	U
	Arsenic, Total	µg/L	10	900	10.5	0.0038	J	5.0	U	5.0	U	5.0	U	NA		5.0	U	5.0	U	5.0	U
	Barium, Total	µg/L	2,000	50,000	39.6	10	U	5.2	J	5.1	J	8.6	J	NA		7.0	J	7.1	J	14	
	Beryllium, Total	µg/L	4	200	5	5.0	U	5.0	U	5.0	U	5.0	U	NA		5.0	U	5.0	U	5.0	U
	Cadmium, Total	µg/L	5	4	4.01	5.0	U	5.0	U	5.0	U	5.0	U	NA		5.0	U	5.0	U	5.0	U
	Calcium, Total	µg/L	NS	NS	14,700	2,300		2,100		2,200		8,400		NA		2,900		2,800		12,000	
	Chromium, Total	µg/L	100	300	14.7	7.0	J	10	U	10	U	10	U	NA		4	J	4.0	J	10.0	U
	Cobalt, Total	µg/L	NS	NS	25	20	U	20	U	20	U	20	U	NA		20	U	20	U	20	U
	Copper, Total	µg/L	NS	NS	8.09	10	U	10	U	10	U	10	U	NA		10	U	10	U	10.0	U
	Iron, Total	µg/L	NS	NS	9,100	90		50	U	50	U	50	U	NA		40	J	37	J	**10,000**	
	Lead, Total	µg/L	15	10	4.25	10	U	10	U	10	U	10	U	NA		10	U	10	U	10	U
	Magnesium, Total	µg/L	NS	NS	3,480	910		210		230		790		NA		180		170		1,000	
	Manganese, Total	µg/L	NS	NS	291	10	U	10	U	10	U	13		NA		0.0026	J	2.8	J	47	
	Nickel, Total	µg/L	100	200	34.3	25	U	25	U	25	U	25	U	NA		25	U	25	U	25	U
	Potassium, Total	µg/L	NS	NS	2,370	2,500	U	2,500	U	2,500	U	2,500	U	NA		2,500	U	2,500	U	2,500	U
	Selenium, Total	µg/L	50	100	3.02	10	U	10	U	10	U	10	U	NA		10	U	10	U	10	U
	Silver, Total	µg/L	100	7	4.6	7.0	U	7.0	U	7.0	U	7.0	U	NA		7.0	U	7.0	U	7.0	U
	Sodium, Total	µg/L	NS	NS	10,800	3,200		1,200	J	1,200	J	2,600		NA		1,200	J	1,200	J	2,100	
	Thallium, Total	µg/L	2	3,000	6.99	20	U	20	U	20	U	20	U	NA		20	U	20	U	20	U
	Vanadium, Total	µg/L	30	4,000	11	10	U	10	U	10	U	10	U	NA		10	U	10	U	10	U
	Zinc, Total	µg/L	5,000	900	21.1	**48.8**	**J**	50	U	10	J	50	U	NA		50	U	50	U	**359**	
Mercury SW7470A	Mercury, Total	µg/L	2	20	0.243	0.2	U	0.2	U	0.2	U	0.2	U	NA		0.2	U	0.2	U	0.2	U
Field Parameter	Temperature, Initial	°C	NS	NS	NS	9.73		9.58		NA		9.56		NA		9.77		NA		10.33	
	Temperature, Final	°C	NS	NS	NS	9.58		9.55		NA		9.77		NA		9.65		NA		10.56	
	pH	mg/L	NS	NS	NS	5.9		5.55		NA		5.71		NA		5.48		NA		6.3	
	Specific Conductance	mV	NS	NS	NS	36		23		NA		73		NA		26		NA		126	
	ORP	Standard units	NS	NS	NS	10.4		13.8		NA		233.9		NA		20.8		NA		72.5	
	Dissolved Oxygen	µS/cm	NS	NS	NS	7.6		12.02		NA		9.18		NA		12.31		NA		2.88	
	Turbidity	NTU	NS	NS	NS	2.5		0.0		NA		0.0		NA		0.2		NA		12.9	

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] Background levels for metals are from HLA, 2000.

[2] GW-1 or GW-3 standard effective June 26, 2009.

SPIA Area of Contamination 26
November 2009

Method	Analyte	Units	GW-1 Groundwater Standard[2]	GW-3 Groundwater Standard[2]	Background[1]	26WP-08-02	Qual	26WP-09-01	Qual	26WP-09-02	Qual	26WP-09-03	Qual
Perchlorate 332.0	Perchlorate	µg/L	2	1,000	NS	0.0157	J	0.050	U	0.051		0.05	U
Explosives 8330	1,3,5-Trinitrobenzene	µg/L	NS	NS	NS	0.210	U	NA		NA		NA	
	1,3-Dinitrobenzene	µg/L	NS	NS	NS	0.210	U	NA		NA		NA	
	2,4,6-Trinitrotoluene	µg/L	NS	NS	NS	0.210	U	NA		NA		NA	
	2,4-Dinitrotoluene	µg/L	30	50,000	NS	0.210	U	NA		NA		NA	
	2,6-Dinitrotoluene	µg/L	NS	NS	NS	0.210	U	NA		NA		NA	
	2-Amino-4,6-dinitrotoluene	µg/L	NS	NS	NS	0.210	U	NA		NA		NA	
	2-Nitrotoluene	µg/L	NS	NS	NS	0.210	U	NA		NA		NA	
	3-Nitrotoluene	µg/L	NS	NS	NS	0.210	U	NA		NA		NA	
	4-Amino-2,6-dinitrotoluene	µg/L	NS	NS	NS	0.210	U	NA		NA		NA	
	4-Nitrotoluene	µg/L	NS	NS	NS	0.210	U	NA		NA		NA	
	RDX	µg/L	1	50,000	NS	0.210	U	NA		NA		NA	
	Tetryl	µg/L	NS	NS	NS	0.210	U	NA		NA		NA	
	Nitrobenzene	µg/L	NS	NS	NS	0.210	U	NA		NA		NA	
	HMX	µg/L	200	50,000	NS	0.210	U	NA		NA		NA	
Metals SW6010B	Aluminum, Total	µg/L	NS	NS	6,870	37	J	NA		NA		NA	
	Antimony, Total	µg/L	6	8,000	3.03	50	U	NA		NA		NA	
	Arsenic, Total	µg/L	10	900	10.5	**46**		NA		NA		NA	
	Barium, Total	µg/L	2,000	50,000	39.6	6.7	J	NA		NA		NA	
	Beryllium, Total	µg/L	4	200	5	5.0	U	NA		NA		NA	
	Cadmium, Total	µg/L	5	4	4.01	5.0	U	NA		NA		NA	
	Calcium, Total	µg/L	NS	NS	14,700	3,500		NA		NA		NA	
	Chromium, Total	µg/L	100	300	14.7	10	U	NA		NA		NA	
	Cobalt, Total	µg/L	NS	NS	25	20	U	NA		NA		NA	
	Copper, Total	µg/L	NS	NS	8.09	10.0	U	NA		NA		NA	
	Iron, Total	µg/L	NS	NS	9,100	**15,000**		NA		NA		NA	
	Lead, Total	µg/L	15	10	4.25	10	U	NA		NA		NA	
	Magnesium, Total	µg/L	NS	NS	3,480	700		NA		NA		NA	
	Manganese, Total	µg/L	NS	NS	291	142		NA		NA		NA	
	Nickel, Total	µg/L	100	200	34.3	25	U	NA		NA		NA	
	Potassium, Total	µg/L	NS	NS	2,370	2,500	U	NA		NA		NA	
	Selenium, Total	µg/L	50	100	3.02	10	U	NA		NA		NA	
	Silver, Total	µg/L	100	7	4.6	7.0	U	NA		NA		NA	
	Sodium, Total	µg/L	NS	NS	10,800	1,500	J	NA		NA		NA	
	Thallium, Total	µg/L	2	3,000	6.99	20	U	NA		NA		NA	
	Vanadium, Total	µg/L	30	4,000	11	10	U	NA		NA		NA	
	Zinc, Total	µg/L	5,000	900	21.1	**11,000**		NA		NA		NA	
Mercury SW7470A	Mercury, Total	µg/L	2	20	0.243	0.2	U	NA		NA		NA	
Field Parameter	Temperature, Initial	°C	NS	NS	NS	10.9		10.95		11.38		NA	
	Temperature, Final	°C	NS	NS	NS	11.55		10.9		11.16		NA	
	pH	mg/L	NS	NS	NS	6.78		5.56		5.21		NA	
	Specific Conductance	mV	NS	NS	NS	119		40		26		NA	
	ORP	Standard units	NS	NS	NS	-260.3		-23		229.9		NA	
	Dissolved Oxygen	µS/cm	NS	NS	NS	0.82		0.15		7.59		NA	
	Turbidity	NTU	NS	NS	NS	5.2		38.5		7.2		NA	

Notes:

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[1] Background levels for metals are from HLA, 2000.

[2] GW-1 or GW-3 standard effective June 26, 2009.

TRAINING AMMUNITIONS USAGE BY FACILITY REPORT

Training Ammunition Usage by Facilities Report

29/07/09

From: 01/01/2004 To: 31/12/2004

Facility	DODIC	Nomenclature	Quantity Fired	DUD
RG Z1	A554	50 BALL	37	0
	G900	GREN HAND INC AN-M14	16	0
	K002	ACT AT MINE MI (Prac	6	0
	K051	FUZE MINE AT PRAC M6	6	0
	K143	MINE AP DIR M18A1 CL	1	0
	M000	SHEET EXPLOSIVES	4	0
	M023	CHG DEMO C4 1-1/4LB	443	0
	M025	CHG, DEMO LINEAR M58	12	0
	M028	DEMO KIT BANG TORPED	3	0
	M030	CHG DEMO TNT 1/4 LB	263	0
	M031	TNT 1/2 LB M1A4	13	0
	M032	CHG DEMO TNT 1 LB	142	0
	M039	CHG DEMO 40LB CRATER	9	0
	M130	CAP BLAST ELEC M6	233	0
	M131	CAP BLAST NONELEC M7	292	0
	M174	CTG,IMPULSE	21	0
	M327	COUPLING BASE FRNG D	52	0
	M420	CHG DEMO SHAPED 15 L	16	0
	M456	CORD DET REINFORCED	9,030	0
	M591	DYNAMITE MILITARY M1	15	0
	M670	FUSE BLASTING TIME M	3,268	0
	M757	CHG ASSY DEMO M183	8	0
	M766	IGNITER FUSE BL TIME	284	0
	M980	CHG, DEMO SHEET 38 F	1	0
	M981	CHG, DEMO SHEET 25 F	6	0
	M997	CHG DEMO ORD DISP MK	8	0
	ML03	FIRING DEV MULTIPURP	9	0
	ML04	CUTTER HE MK23-0	4	0
	ML05	CUTTER,MK 24-0	5	0
	ML15	CHG DEMO LINFLEX 225	5	0
	ML16	CHG DEMO LINFLEX 300	10	0
	ML17	CHG DEMO LINFLEX 400	3	0
	ML18	CHG DEMO LINFLEX 500	3	0
	ML19	CHG DEMO LINFLEX 600	3	0
	ML45	HLDR BLST CP S/TUBM9	87	0
	ML47	CAPBLST NON-E M11W11	2	0
	ML83	CAP, BLASTING, ELEC	12	0
	MN02	CAPBLST NON-E M12 W	96	0
	MN03	CAPBLST NON-E M13 W	44	0
	MN06	CAPBLST DELAY M14 (S	53	0
	MN08	IGNBLST FUSM81 S/TUB	50	0
	MN68	BOOSTER DEMO 10FT DE	40	0
	MN69	BOOSTER DEMO 30FT DE	40	0
	MU42	CORD DETONATINGR.	145	0

Training Ammunition Usage by Facilities Report

29/07/09

From: 01/01/2004 To: 31/12/2004

Facility	DODIC	Nomenclature	Quantity Fired	DUD
RG Z2	G881	GREN HAND FRAG M67	120	0
		Total:	**14,920**	**0**

Training Ammunition Usage by Facilities Report

29/07/09

From: 01/01/2005 To: 31/12/2005

Facility	DODIC	Nomenclature	Quantity Fired	DUD
RG Z1	M000	SHEET EXPLOSIVES	2	0
	M023	CHG DEMO C4 1-1/4LB	55	0
	M024	CHG DEMO BLK M118 PE	8	0
	M028	DEMO KIT BANG TORPED	1	0
	M030	CHG DEMO TNT 1/4 LB	48	0
	M032	CHG DEMO TNT 1 LB	80	0
	M039	CHG DEMO 40LB CRATER	1	0
	M130	CAP BLAST ELEC M6	209	0
	M131	CAP BLAST NONELEC M7	17	0
	M420	CHG DEMO SHAPED 15 L	3	0
	M421	CHG DEMO SHAPED 40 L	2	0
	M455	CORD DETON REINFOR	1	0
	M456	CORD DET REINFORCED	3,348	0
	M585	DYNAMITE, AN 40%	20	0
	M587	DYNAMITE F/SCENT KIT	100	0
	M613	CORD, DET	100	0
	M670	FUSE BLASTING TIME M	100	0
	M757	CHG ASSY DEMO M183	2	0
	M855	CAP, BLASTING ELEC	22	0
	ML04	CUTTER HE MK23-0	6	0
	ML05	CUTTER,MK 24-0	6	0
	ML15	CHG DEMO LINFLEX 225	5	0
	ML18	CHG DEMO LINFLEX 500	3	0
	ML83	CAP, BLASTING, ELEC	22	0
	MN02	CAPBLST NON-E M12 W	24	0
	MN03	CAPBLST NON-E M13 W	24	0
	MN08	IGNBLST FUSM81 S/TUB	40	0
	MOO7	SHEET EXPLOSIVES	10	0
	NONE	NOT APPLICABLE	16	0
RG Z2	G881	GREN HAND FRAG M67	59	0
		Total:	**4,334**	**0**

Training Ammunition Usage by Facilities Report

29/07/09

From: 01/01/2006 To: 31/12/2006

Facility	DODIC	Nomenclature	Quantity Fired	DUD
RG Z1	G881	GREN HAND FRAG M67	1	0
	K143	MINE AP DIR M18A1 CL	72	0
	K145	MINE AP DIRECTIONAL	18	0
	M023	CHG DEMO C4 1-1/4LB	791	0
	M030	CHG DEMO TNT 1/4 LB	51	0
	M031	TNT 1/2 LB M1A4	60	0
	M032	CHG DEMO TNT 1 LB	70	0
	M110	CAP BL ELEC	28	0
	M130	CAP BLAST ELEC M6	236	0
	M131	CAP BLAST NONELEC M7	97	0
	M420	CHG DEMO SHAPED 15 L	8	0
	M421	CHG DEMO SHAPED 40 L	3	0
	M456	CORD DET REINFORCED	9,140	0
	M591	DYNAMITE MILITARY M1	74	0
	M670	FUSE BLASTING TIME M	250	0
	M766	IGNITER FUSE BL TIME	34	0
	M980	CHG, DEMO SHEET 38 F	13	0
	M994	CHG, DEMO SHEET 76 F	37	0
	ML04	CUTTER HE MK23-0	6	0
	ML05	CUTTER,MK 24-0	8	0
	ML15	CHG DEMO LINFLEX 225	6	0
	ML18	CHG DEMO LINFLEX 500	4	0
	MN02	CAPBLST NON-E M12 W	10	0
	MN06	CAPBLST DELAY M14 (S	14	0
	MN08	IGNBLST FUSM81 S/TUB	61	0
	MN68	BOOSTER DEMO 10FT DE	120	0
	MN90	CAP, BLASTING: IN-LI	60	0
		Total:	**11,272**	**0**

Training Ammunition Usage by Facilities Report

29/07/09

From: 01/01/2007 To: 31/12/2007

Facility	DODIC	Nomenclature	Quantity Fired	DUD
RG Z1	000	37MM SMOKE PROJECTIL	50	0
	0015	Commercial Dynamite	200	0
	0016	Commercial Electric	16	0
	K143	MINE AP DIR M18A1 CL	5	0
	M005	PETN	40	0
	M023	CHG DEMO C4 1-1/4LB	346	0
	M028	DEMO KIT BANG TORPED	1	0
	M030	CHG DEMO TNT 1/4 LB	34	0
	M032	CHG DEMO TNT 1 LB	441	0
	M039	CHG DEMO 40LB CRATER	4	0
	M098	DDI, CAP BLAST ELECT	72	0
	M109	CAP BLAST ELEC NO6	18	0
	M110	CAP BL ELEC	16	0
	M130	CAP BLAST ELEC M6	205	0
	M131	CAP BLAST NONELEC M7	83	0
	M327	COUPLING BASE FRNG D	40	0
	M456	CORD DET REINFORCED	1,050	0
	M585	DYNAMITE, AN 40%	103	0
	M591	DYNAMITE MILITARY M1	60	0
	M613	CORD, DET	200	0
	ML04	CUTTER HE MK23-0	6	0
	ML05	CUTTER,MK 24-0	6	0
	MM29	CHG,DEMO.EXP SHEET 4	20	0
	MM30	CHARGE, DEMOLITION	18	0
	MN06	CAPBLST DELAY M14 (S	30	0
	MN07	CAPBLST NN-ELCDLYM15	8	0
	MN08	IGNBLST FUSM81 S/TUB	35	0
	MOO7	SHEET EXPLOSIVES	4	0
		Total:	**3,111**	**0**

Training Ammunition Usage by Facilities Report

29/07/09

From: 01/01/2008 To: 31/12/2008

Facility	DODIC	Nomenclature	Quantity Fired	DUD
RG Z1	0015	Commercial Dynamite	675	0
	0016	Commercial Electric	180	0
	0017	Commercial Det Cord	1,486	0
	0018	Commercial Non-El Bl	27	0
	AA62	PAN ULTRA VELOCITY S	40	0
	AA63	PAN AVON ROUND	40	0
	AA66	PAN COMM BLACK POWDE	35	0
	DWED	PAN CUSTOM STEEL SLU	40	0
	DWEE	PAN ALUMINUM SLUG	40	0
	K143	MINE AP DIR M18A1 CL	25	0
	M023	CHG DEMO C4 1-1/4LB	91	0
	M028	DEMO KIT BANG TORPED	2	0
	M030	CHG DEMO TNT 1/4 LB	75	0
	M032	CHG DEMO TNT 1 LB	86	0
	M039	CHG DEMO 40LB CRATER	3	0
	M130	CAP BLAST ELEC M6	150	0
	M131	CAP BLAST NONELEC M7	302	0
	M420	CHG DEMO SHAPED 15 L	5	0
	M421	CHG DEMO SHAPED 40 L	8	0
	M456	CORD DET REINFORCED	9,503	0
	M670	FUSE BLASTING TIME M	2,536	0
	M757	CHG ASSY DEMO M183	5	0
	M986	CHG, DEMO SHEET 9 FT	1	0
	ML15	CHG DEMO LINFLEX 225	60	0
	ML45	HLDR BLST CP S/TUBM9	117	0
	MM50	CHG DEMO SHAPED CLIP	36	0
	MN06	CAPBLST DELAY M14 (S	78	0
	MN07	CAPBLST NN-ELCDLYM15	52	0
	MN08	IGNBLST FUSM81 S/TUB	619	0
	MN68	BOOSTER DEMO 10FT DE	100	0
	MN69	BOOSTER DEMO 30FT DE	160	0
	MN88	CAP, BLASTING: IN-LI	80	0
	MN90	CAP, BLASTING: IN-LI	8	0
RG Z2	G878	FUZE HAND GREN PRAC	500	0
	G881	GREN HAND FRAG M67	893	7
		Total:	**18,058**	**8**

Training Ammunition Usage by Facilities Report

29/07/09

From: 01/01/2009 To: 29/07/2009

Facility	DODIC	Nomenclature	Quantity Fired	DUD
RG Z1	0016	Commercial Electric	50	0
	0017	Commercial Det Cord	200	0
	AA63	PAN AVON ROUND	10	0
	AA64	PAN LOW VELOCITY BLA	10	0
	AA66	PAN COMM BLACK POWDE	10	0
	DWEC	PAN ENHANCED BLANK	10	0
	DWED	PAN CUSTOM STEEL SLU	10	0
	DWEE	PAN ALUMINUM SLUG	10	0
	G881	GREN HAND FRAG M67	4	0
	K143	MINE AP DIR M18A1 CL	4	0
	K181	MINE AT M21 W/F M607	2	0
	M023	CHG DEMO C4 1-1/4LB	300	0
	M030	CHG DEMO TNT 1/4 LB	69	0
	M031	TNT 1/2 LB M1A4	24	0
	M060	CHG DEMO ROLL	30	0
	M097	DDI, CAP BLAST NON E	40	0
	M130	CAP BLAST ELEC M6	130	0
	M131	CAP BLAST NONELEC M7	130	0
	M174	CTG,IMPULSE	20	0
	M420	CHG DEMO SHAPED 15 L	10	0
	M421	CHG DEMO SHAPED 40 L	3	0
	M456	CORD DET REINFORCED	7,550	0
	M591	DYNAMITE MILITARY M1	10	0
	M613	CORD, DET	1,000	0
	M670	FUSE BLASTING TIME M	700	0
	ML14	CHG DEMO LINFLEX 125	15	0
	ML45	HLDR BLST CP S/TUBM9	20	0
	ML47	CAPBLST NON-E M11W11	52	0
	MN06	CAPBLST DELAY M14 (S	15	0
	MN07	CAPBLST NN-ELCDLYM15	10	0
	MN08	IGNBLST FUSM81 S/TUB	165	0
	MN41	CAP.BLS NON-ELE DELY	10	0
	MN69	BOOSTER DEMO 30FT DE	10	0
	MN88	CAP, BLASTING: IN-LI	10	0
	MN90	CAP, BLASTING: IN-LI	30	0
RG Z2	G881	GREN HAND FRAG M67	296	2
	K143	MINE AP DIR M18A1 CL	6	0
		Total:	**10,975**	**3**

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CHEMICALS OF POTENTIAL CONCERN

Table 8-5

CHEMICALS OF POTENTIAL CONCERN
AOC 25 - EOD RANGE

Chemical	Surface Soils	Subsurface Soils	Groundwater
Metals			
Aluminum	X		X
Antimony	X		X
Arsenic			X
Barium			X
Beryllium	X	X	X
Calcium			X
Chromium			X
Cobalt	X	X	X
Copper	X	X	X
Iron	X	X	X
Lead			X
Magnesium			X
Manganese	X	X	X
Mercury	X		
Nickel	X	X	X
Potassium			X
Selenium	X		
Sodium			X
Vanadium			X
Zinc	X	X	X
Explosives			
Nitrocellulose	X		
Nitroglycerin	X		
2,4,6-Trinitrotoluene			X
Cyclonite (RDX)			X
PETN			X
HMX			X
Volatile Organics			
Tetrachloroethene		X	
Other Organics			
Total petroleum hydrocarbons	X	X	

Note: Groundwater COPC selection is based on unfiltered groundwater data.

Key:

X = Selected as COPC for the human health risk assessment.

Source: Ecology and Environment, Inc., 1994.

Table 8-7

CHEMICALS OF POTENTIAL CONCERN
AOC 26 - ZULU RANGE

Chemical	Surface Soil	Subsurface Soil	Sediment	Surface Water	Groundwater
Metals					
Aluminum			X	X	X
Antimony	X				
Arsenic					X
Barium			X	X	X
Beryllium	X		X		
Cadmium			X		
Calcium	X	X	X		X
Chromium			X		X
Cobalt			X		
Copper	X	X	X		X
Iron			X	X	
Lead	X	X	X	X	X
Magnesium			E		X
Manganese					X
Mercury			E		
Nickel			X		X
Potassium			E		X
Selenium			X		X
Silver		X			
Sodium			X		X
Vanadium			E		X
Zinc	X	X	X		X
Explosives					
4-Amino-2,6-dinitrotoluene					X
1,3-Dinitrobenzene					X
2,6-Dinitrotoluene					X
2-Nitrotoluene					X

Key at end of table.

Table 8-7

CHEMICALS OF POTENTIAL CONCERN
AOC 26 - ZULU RANGE

Chemical	Surface Soil	Subsurface Soil	Sediment	Surface Water	Groundwater
3-Nitrotoluene					
2,4,6 Trinitrotoluene			X		
Nitroglycerin			X		X
Cyclonite (RDX)	X	X	X	X	X
HMX	X	X		X	X
Tetryl		X			
PETN					X
Pesticides/PCBs					
PCB 1254	X				
p,p'-DDD			X	X	
p,p'-DDE	X				
p,p'-DDT	X	X	X		
Heptachlor		X			
alpha-chlordane		X			
alpha-Benzene hexachloride		X			
beta-Benzene hexachloride		X			
Semivolatile Organics					
2,4-Dimethylphenol		X			
4-Methylphenol		X			
Acenaphthylene	X				
Anthracene	X	X			
Benzo(a)anthracene	X				
Benzo(a)pyrene	X				
Benzo(b)fluoranthene	X				
Benzo(k)fluoranthene	X				
Chrysene	X				
Fluoranthene	X	X			
Phenanthrene	X				

Key at end of table.

Table 8-7

CHEMICALS OF POTENTIAL CONCERN
AOC 26 - ZULU RANGE

Chemical	Surface Soil	Subsurface Soil	Sediment	Surface Water	Groundwater
Pyrene	X	X			
Volatile Organics					
Acetone			X		
Ethylbenzene			X		
1,1,2-Trichloroethane				X	
Toluene	X	X	X		
Trichlorofluoromethane			X		
Carbon disulfide					X
Carbon tetrachloride					X
Other Organics					
Total petroleum hydrocarbons	X		X		X
Butyl-carbitol					X
2-Ethyl-1-hexanol					X
Benzothiazole					X
Tetracosane					X

Note: Groundwater COPC selection is based on unfiltered groundwater data.

Key:

E = Elevated above sediment background levels but not soil background levels.
X = Selected as a COPC for the human health risk assessment.

Source: Ecology and Environment, Inc., 1994.

Table 8-6

CHEMICALS OF POTENTIAL CONCERN
AOC 27 - HOTEL RANGE

Chemical	Soils	Sediment	Surface Water	Groundwater
Metals				
Aluminum		E		X
Antimony	X	X		X
Arsenic		X		X
Barium	X	X		X
Beryllium	X	E		X
Calcium	X			X
Chromium	X	E		X
Cobalt	X	X		X
Copper	X	X		X
Iron	X	E		X
Lead		X	X	X
Magnesium				X
Manganese	X			X
Mercury	X	X		
Nickel	X	X		X
Potassium	X	E		X
Selenium		X		
Silver				X
Sodium	X	X		X
Vanadium	X	X		X
Zinc	X	X		X
Explosives				
Cyclonite (RDX)				X
1,3-Dinitrobenzene				X
HMX				X
Volatile Organics				
Acetone		X		
2-Butanone		X		
Tetrachloroethene	X	X		
Toluene	X			
Semivolatile Organics				
Benzo(b)fluoranthene		X		
Pyrene		X		
Trichlorofluoromethane	X			
Pesticides				
delta-BHC				X
Endosulfan A	X			

Table 8-6

CHEMICALS OF POTENTIAL CONCERN
AOC 27 - HOTEL RANGE

Chemical	Soils	Sediment	Surface Water	Groundwater
Methoxychlor		X		
p,p'-DDE	X	X		
p,p'-DDT	X	X		
p,p'-DDD		X		
Other Organic Chemicals				
Total petroleum hydrocarbons	X	X		X

Note: Groundwater COPC selection is based on unfiltered groundwater data.

Key:

E = Elevated above sediment background levels but not significantly above soil background levels.
X = Selected as COPC for the human health risk assessment.

Source: Ecology and Environment, Inc., 1994.

PHOTO LOG

April 2010
View to the southeast from AOC 25, EOD-1.

April 2010
Looking west from 27M-93-08X located in the area of AOC 27.

X:/OMA010/Ft_Devens/Maps/DO501/2010_5-Year_Review/CDR/
spia_photolog.cdr
06/28/10 CNL

SPIA
Photograph Log
2010

April 2010
View to the southeast from 41M-94-03B located in the AOC41 area.

April 2010
View to the southeast from 26WP-09-02, located in the AOC 26 area.

X:/OMA010/Ft_Devens/Maps/DO501/2010_5-Year_Review/CDR/
spia_photolog.cdr
06/28/10 CNL

SPIA
Photograph Log
2010

April 2010
Proposed new well location at AOC 26. View is to the south.

April 2010
View is from the north shore of New Cranberry Pond to the south.

X:/OMA010/Ft_Devens/Maps/DO501/2010_5-Year_Review/CDR/spia_photolog.cdr
06/28/10 CNL

SPIA
Photograph Log
2010

April 2010
View to the south from SPM-93-08X and SPM-93-07X, located in the AOC 41 area.

April 2010
SPIA entry point.

X:/OMA010/Ft_Devens/Maps/DO501/2010_5-Year_Review/CDR/spia_photolog.cdr
06/28/10 CNL

SPIA
Photograph Log
2010

APPENDIX F

AOCS 32 AND 43A

GROUNDWATER ANALYTICAL RESULTS
(2006-2009)

Key for Tables

General Terms

AOC	Area of Contamination
COC	chain of custody
COD	chemical oxygen demand
CMR	Code of Massachusetts Regulations
EPH	extractable petroleum hydrocarbons
MADEP	Massachusetts Department of Environmental Protection; indicates MADEP-derived analytical methods (MADEP, 2004a and 2004b)
MCP	Massachusetts Contingency Plan
μg/L	Micrograms per liter
mg/L	Milligrams per liter
μS/cm	Microsiemens per centimeter
msl	mean sea level
mV	Millivolts
NA	Not analyzed/available
ORP	Oxidation-reduction potential
ROD	Record of Decision
SVOC	semi-volatile organic compound
SW(number)	Analytical method from the SW-846 method series (EPA, 2005)
VPH	volatile petroleum hydrocarbons
VOC	volatile organic compounds

Result Indicators (Laboratory Results Only)

Bold Text	Indicates a detected result above a background level.
Bold Text	Indicates a detected result above the associated site cleanup goal or GW-1 Standard.
Bold Text	Indicates a detected result above USEPA Water Quality Criteria.

Data Qualifiers

J	Estimated detection
U	Not detected (at associated reporting limit)
UJ	Not detected; reporting limit is an estimate
R	Rejected due to serious deficiencies in associated QC. The presence or absence of the analyte cannot be verified.
EJ	Detected result reported at a concentration above the calibrated range of the instrument and is considered an estimate.

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Groundwater Analytical Results
Area of Contamination 32/43A
June 2006

Method	Analyte	Units	Cleanup Goal[1]	SHL-15	32M-92-01X	32Z-99-02X	32M-01-13XBR	32M-01-14XOB	32M-01-14XBR	32M-01-15XBR	32M-01-16XBR	32M-01-17XBR	32M-01-18XBR	32M-01-18XBR Duplicate
Metals - SW6010B	Arsenic, Total	µg/L	10 [2]	9	5 U	5 U	5 U	**59**	5 U	5 U	5 U	2.8 J	**30**	**30**
Metals - SW6010B	Lead, Total	µg/L	15	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Metals - SW6010B	Manganese, Total	µg/L	3,500	120	30 U	20 U	10 U	2,800	10 U	30 U	10 U	10 U	**18,000**	**19,000**
Metals - SW6010B	Arsenic, Dissolved	µg/L	10 [2]	6	5 U	5 U	5 U	**65**	5 U	2.8 J	2.7 J	5 U	**33**	**31**
Metals - SW6010B	Lead, Dissolved	µg/L	15	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Metals - SW6010B	Manganese, Dissolved	µg/L	3,500	120	30 U	10 U	10 U	3,400	10 U	20 U	10 U	10 U	**19,000**	**18,000**
VOCs - SW8260B	1,1,1,2-Tetrachloroethane	µg/L	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - SW8260B	1,1,1-Trichloroethane	µg/L	5 [3]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - SW8260B	1,1,2,2-Tetrachloroethane	µg/L	2	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - SW8260B	1,1,2-Trichloroethane	µg/L	5	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	75 U	75 U
VOCs - SW8260B	1,1-Dichloroethane	µg/L	70	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	75 U	75 U
VOCs - SW8260B	1,1-Dichloroethene	µg/L	7	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - SW8260B	1,1-Dichloropropene	µg/L	0.5	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - SW8260B	1,2,3-Trichlorobenzene	µg/L	NS	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - SW8260B	1,2,3-Trichloropropane	µg/L	1,000	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	500 U	500 U
VOCs - SW8260B	1,2,4-Trichlorobenzene	µg/L	70	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - SW8260B	1,2,4-Trimethylbenzene	µg/L	10,000	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - SW8260B	1,2-Dibromo-3-chloropropane	µg/L	100	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - SW8260B	1,2-Dibromoethane	µg/L	0.02	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	200 U	200 U
VOCs - SW8260B	1,2-Dichlorobenzene	µg/L	600	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	0.67 U	2.5 U	35	**5,900**	**6,500**
VOCs - SW8260B	1,2-Dichloroethane	µg/L	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - SW8260B	1,2-Dichloropropane	µg/L	3	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	180 U	180 U
VOCs - SW8260B	1,3,5-Trimethylbenzene	µg/L	100	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - SW8260B	1,3-Dichlorobenzene	µg/L	40	2.5 U	2.5 U	2.5	0.44 J	2.5 U	2.5 U	0.51 J	0.54 J	9.5	**750**	**820**
VOCs - SW8260B	1,3-Dichloropropane	µg/L	5,000	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - SW8260B	1,4-Dichlorobenzene	µg/L	5 [2]	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	3	**490**	**540**
VOCs - SW8260B	2,2-Dichloropropane	µg/L	NS	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 UJ	250 U	250 U
VOCs - SW8260B	2-Butanone	µg/L	400	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	500 U	500 U
VOCs - SW8260B	2-Hexanone	µg/L	1,000	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	500 U	500 U
VOCs - SW8260B	4-Chlorotoluene	µg/L	NS	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - SW8260B	4-Isopropyltoluene	µg/L	1,000	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - SW8260B	4-Methyl-2-pentanone	µg/L	350	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	500 U	500 U
VOCs - SW8260B	Acetone	µg/L	3,000	12 U	5 U	5 U	8.5	100 UJ	6.8	5 U	5 U	5 U	500 U	500 U
VOCs - SW8260B	Benzene	µg/L	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - SW8260B	Bromobenzene	µg/L	1,000	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - SW8260B	Bromochloromethane	µg/L	NS	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - SW8260B	Bromodichloromethane	µg/L	3	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	**19 J**	**19 J**
VOCs - SW8260B	Bromoform	µg/L	4	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	200 U	200 U
VOCs - SW8260B	Bromomethane	µg/L	2	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	100 U	100 U
VOCs - SW8260B	Carbon disulfide	µg/L	1,000	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	500 U	500 U
VOCs - SW8260B	Carbon tetrachloride	µg/L	2	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - SW8260B	Chlorobenzene	µg/L	100	0.5 U	0.5 U	0.5 U	0.51	0.5 U	0.5 U	0.5 U	0.5 U	2.8	**900**	**940**
VOCs - SW8260B	Chloroethane	µg/L	1,000	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	100 U	100 U
VOCs - SW8260B	Chloroform	µg/L	5	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	**39 J**	**41 J**
VOCs - SW8260B	Chloromethane	µg/L	1,000	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - SW8260B	cis-1,2-Dichloroethene	µg/L	55 [3]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.53	0.5 U	22 J	21 J
VOCs - SW8260B	cis-1,3-Dichloropropene	µg/L	0.5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U

Groundwater Analytical Results
Area of Contamination 32/43A
June 2006

Method	Analyte	Units	Cleanup Goal[1]	SHL-15	32M-92-01X	32Z-99-02X	32M-01-13XBR	32M-01-14XOB	32M-01-14XBR	32M-01-15XBR	32M-01-16XBR	32M-01-17XBR	32M-01-18XBR	32M-01-18XBR Duplicate
VOCs - SW8260B	Dibromochloromethane	µg/L	2	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - SW8260B	Dibromomethane	µg/L	5,000	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	500 U	500 U
VOCs - SW8260B	Dichlorodifluoromethane	µg/L	10,000	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	500 U	500 U
VOCs - SW8260B	Ethylbenzene	µg/L	700	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - SW8260B	Hexachlorobutadiene	µg/L	0.6	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	60 U	60 U
VOCs - SW8260B	Isopropylbenzene	µg/L	10,000	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - SW8260B	Methyl tert-butyl ether	µg/L	70	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	100 U	100 U
VOCs - SW8260B	Methylene chloride	µg/L	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	500 U	500U
VOCs - SW8260B	n-Butylbenzene	µg/L	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - SW8260B	n-Propylbenzene	µg/L	1,000	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - SW8260B	Naphthalene	µg/L	140	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - SW8260B	o-Chlorotoluene	µg/L	1,000	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - SW8260B	m,p-Xylene	µg/L	NS	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	100 U	100 U
VOCs - SW8260B	o-Xylene	µg/L	NS	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	100 U	100 U
VOCs - SW8260B	Total Xylenes	µg/L	10,000	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	100 U	100 U
VOCs - SW8260B	sec-Butylbenzene	µg/L	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - SW8260B	Styrene	µg/L	100	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	100 U	100 U
VOCs - SW8260B	tert-Butylbenzene	µg/L	1,000	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - SW8260B	Tetrachloroethene	µg/L	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - SW8260B	Toluene	µg/L	1,000	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	75 U	75 U
VOCs - SW8260B	trans-1,2-Dichloroethene	µg/L	55	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	75U	75 U
VOCs - SW8260B	trans-1,3-Dichloropropene	µg/L	0.5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - SW8260B	Trichloroethene	µg/L	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.41 J	0.46 J	50 U	50 U
VOCs - SW8260B	Trichlorofluoromethane	µg/L	10,000	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - SW8260B	Vinyl chloride	µg/L	2	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	100 U	100 U
VPH - MADEP	Benzene	µg/L	5	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	40 U	40 U
VPH - MADEP	C5-C8 Aliphatics	µg/L	300	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	1,000 U	1,000 U
VPH - MADEP	C5-C8 Aliphatics, Adjusted	µg/L	300	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	1,000 U	1,000 U
VPH - MADEP	C9-C10 Aromatics	µg/L	200	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	**5,850**	**6,040**
VPH - MADEP	C9-C12 Aliphatics	µg/L	4,000	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	**5,180**	**5,310**
VPH - MADEP	C9-C12 Aliphatics, Adjusted	µg/L	4,000	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	1,000 U	1,000 U
VPH - MADEP	Ethylbenzene	µg/L	700	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	40 U	40 U
VPH - MADEP	Methyl tert-butyl ether	µg/L	70	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	60 U	60 U
VPH - MADEP	Naphthalene	µg/L	140	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	200 U	200 U
VPH - MADEP	m/p-Xylene	µg/L	NS	0.2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	40 U	40 U
VPH - MADEP	o-Xylene	µg/L	NS	0.2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	0.268 J	40 U	40 U
VPH - MADEP	Total Xylenes	µg/L	10,000	0.2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	0.268 J	40 U	40 U
VPH - MADEP	Toluene	µg/L	1,000	0.2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	40 U	40 U
EPH - MADEP	2-Methylnaphthalene	µg/L	10	0.4 U	0.408 U	0.412 U	0.412 U	0.435 U	0.417 U	0.421 U	0.408 U	0.44 U	0.52	0.629
EPH - MADEP	Acenaphthene	µg/L	20	0.4 U	0.408 U	0.412 U	0.412 U	0.435 U	0.417 U	0.421 U	0.408 U	0.44 U	0.479	0.603
EPH - MADEP	Acenaphthylene	µg/L	300	0.4 U	0.408 U	0.412 U	0.412 U	0.435 U	0.417 U	0.421 U	0.408 U	0.44 U	0.408 U	0.408 U
EPH - MADEP	Anthracene	µg/L	2,000	0.4 U	0.408 U	0.412 U	0.412 U	0.435 U	0.417 U	0.421 U	0.408 U	0.44 U	0.408 U	0.408 U
EPH - MADEP	Benzo(a)anthracene	µg/L	1	0.4 U	0.408 U	0.412 U	0.412 U	0.435 U	0.417 U	0.421 U	0.408 U	0.44 U	0.408 U	0.408 U
EPH - MADEP	Benzo(a)pyrene	µg/L	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.217 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
EPH - MADEP	Benzo(b)fluoranthene	µg/L	1	0.4 U	0.408 U	0.412 U	0.412 U	0.435 U	0.417 U	0.421 U	0.408 U	0.44 U	0.408 U	0.408 U
EPH - MADEP	Benzo(ghi)perylene	µg/L	300	0.4 U	0.408 U	0.412 U	0.412 U	0.435 U	0.417 U	0.421 U	0.408 U	0.44 U	0.408 U	0.408 U
EPH - MADEP	Benzo(k)fluoranthene	µg/L	1	0.4 U	0.408 U	0.412 U	0.412 U	0.435 U	0.417 U	0.421 U	0.408 U	0.44 U	0.408 U	0.408 U
EPH - MADEP	C11-C22 Aromatics	µg/L	200	100 U	102 U	103 U	103 U	109 U	104 U	105 U	102 U	110 U	102 U	102 U

Groundwater Analytical Results
Area of Contamination 32/43A
June 2006

Method	Analyte	Units	Cleanup Goal[1]	SHL-15	32M-92-01X	32Z-99-02X	32M-01-13XBR	32M-01-14XOB	32M-01-14XBR	32M-01-15XBR	32M-01-16XBR	32M-01-17XBR	32M-01-18XBR	32M-01-18XBR Duplicate
EPH - MADEP	C11-C22 Aromatics, Adjusted	µg/L	200	100 U	102 U	103 U	103 U	109 U	104 U	105 U	102 U	110 U	102 U	102 U
EPH - MADEP	C19-C36 Aliphatics	µg/L	5,000 [3]	100 U	102 U	103 U	103 U	109 U	104 U	105 U	102 U	110 U	102 U	102 U
EPH - MADEP	C9-C18 Aliphatics	µg/L	4,000	100 U	102 U	103 U	103 U	109 U	104 U	105 U	102 U	110 U	1,340	1,240
EPH - MADEP	Chrysene	µg/L	2	0.4 U	0.408 U	0.412 U	0.412 U	0.435 U	0.417 U	0.421 U	0.408 U	0.44 U	0.408 U	0.408 U
EPH - MADEP	Dibenzo(a,h)anthracene	µg/L	0.5	0.4 U	0.408 U	0.412 U	0.412 U	0.435 U	0.417 U	0.421 U	0.408 U	0.44 U	0.408 U	0.408 U
EPH - MADEP	Fluoranthene	µg/L	90	0.4 U	0.408 U	0.412 U	0.412 U	0.435 U	0.417 U	0.421 U	0.408 U	0.44 U	0.408 U	0.408 U
EPH - MADEP	Fluorene	µg/L	300	0.4 U	0.408 U	0.412 U	0.412 U	0.435 U	0.417 U	0.421 U	0.408 U	0.44 U	0.687 J	0.901 J
EPH - MADEP	Indeno(1,2,3-cd)Pyrene	µg/L	0.5	0.4 U	0.408 U	0.412 U	0.412 U	0.435 U	0.417 U	0.421 U	0.408 U	0.44 U	0.408 U	0.408 U
EPH - MADEP	Naphthalene	µg/L	150	0.4 U	0.408 U	0.412 U	0.412 U	0.435 U	0.417 U	0.421 U	0.408 U	0.44 U	2.46	2.7
EPH - MADEP	Phenanthrene	µg/L	50	0.4 U	0.408 U	0.412 U	0.412 U	0.435 U	0.417 U	0.421 U	0.408 U	0.44 U	0.814	0.992
EPH - MADEP	Pyrene	µg/L	20	0.4 U	0.408 U	0.412 U	0.412 U	0.435 U	0.417 U	0.421 U	0.408 U	0.44 U	0.408 U	0.408 U
Field Parameter	Temperature, initial	° C	NS	12.07	12.61	12.28	13.46	13.95	15.7	13.68	13.41	12.38	13.25	NA
Field Parameter	Temperature, final	° C	NS	11.38	11.4	12.56	11.9	14.47	12.89	13.78	13.21	12.15	12.72	NA
Field Parameter	ORP	mV	NS	30.2	243	392.4	241	54.9	-78.5	7.1	325.1	19.2	-2.0	NA
Field Parameter	pH	standard units	NS	7.23	6.13	5.74	6.06	6.28	6.81	7.82	6.07	7.29	6.32	NA
Field Parameter	Specific Conductance	µS/cm	NS	142	179	146	477	502	635	646	518	506	639	NA
Field Parameter	Dissolved oxygen	mg/L	NS	0.49	3.67	8.79	5.24	0.41	3.91	3.9	3.4	11.28	0.36	NA
Field Parameter	Turbidity	NTU	NS	1.4	0.15	3.4	0.15	5.3	0.85	1.0	0.0	1.0	0.10	NA

Notes:
[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW1 Standard (310 CMR 40 Subpart P).
[2] The groundwater standard is lower than the site-specific cleanup goal.
[3] The site-specific cleanup goal is lower than the groundwater standard.
All general terms, laboratory indicators and data qulaifiers are defined on the Key for Tables found at the beginning of this section.

Groundwater Analytical Results
Area of Contamination 32/43A
October 2006

Method	Analyte	Units	Cleanup Goal[1]	SHL-15	32M-92-01X	32Z-99-02X	32M-01-13XBR	32M-01-14X0B	32M-01-14XBR	32M-01-15XBR	32M-01-16XBR	32M-01-17XBR	32M-01-18XBR	32M-01-18XBR Duplicate
Metals - 6010B	Arsenic, total	µg/l	10 [2]	**11**	0.5 U	5.0 U	5.0 U	**49**	5.0 U	5.0 U	5.0 U	5.0 U	**15**	**14**
Metals - 6010B	Lead, total	µg/l	15	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Metals - 6010B	Manganese, total	µg/l	3,500	160	20 U	9.0 J	70	3,200	10 U	130	20 U	10 U	**16,000**	**16,000**
VOCs - 8260B	1,1,1,2-Tetrachloroethane	µg/l	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - 8260B	1,1,1-Trichloroethane	µg/l	5 [3]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - 8260B	1,1,2,2-Tetrachloroethane	µg/l	2	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - 8260B	1,1,2-Trichloroethane	µg/l	5	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	75 U	75 U
VOCs - 8260B	1,1-Dichloroethane	µg/l	70	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	75 U	75 U
VOCs - 8260B	1,1-Dichloroethene	µg/l	7	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - 8260B	1,1-Dichloropropene	µg/l	0.5	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - 8260B	1,2,3-Trichlorobenzene	µg/l	NS	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - 8260B	1,2,3-Trichloropropane	µg/l	1,000	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	500 U	500 U
VOCs - 8260B	1,2,4-Trichlorobenzene	µg/l	70	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - 8260B	1,2,4-Trimethylbenzene	µg/l	10,000	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - 8260B	1,2-Dibromo-3-chloropropane	µg/l	100	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - 8260B	1,2-Dibromoethane	µg/l	0.02	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	200 U	200 U
VOCs - 8260B	1,2-Dichlorobenzene	µg/l	600	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	48	2.5 U	61 J	**2,800**	**3,000**
VOCs - 8260B	1,2-Dichloroethane	µg/l	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - 8260B	1,2-Dichloropropane	µg/l	3	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	180 U	180 U
VOCs - 8260B	1,3,5-Trimethylbenzene	µg/l	100	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - 8260B	1,3-Dichlorobenzene	µg/l	40	2.5 U	2.5 U	2.5 U	0.41 J	0.27 J	0.23 J	14	2.5 U	13	**360**	**400**
VOCs - 8260B	1,3-Dichloropropane	µg/l	5,000	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - 8260B	1,4-Dichlorobenzene	µg/l	5 [2]	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	0.2 J	**5.5**	2.5 U	**5.1**	**210 J**	**250**
VOCs - 8260B	2,2-Dichloropropane	µg/l	NS	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - 8260B	2-Butanone	µg/l	400	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	500 U	500 U
VOCs - 8260B	2-Chlorotoluene	µg/l	1,000	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - 8260B	2-Hexanone	µg/l	1,000	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	500 U	500 U
VOCs - 8260B	4-Chlorotoluene	µg/l	NS	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - 8260B	4-Isopropyltoluene	µg/l	1,000	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - 8260B	4-Methyl-2-pentanone	µg/l	350	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	500 U	500 U
VOCs - 8260B	Acetone	µg/l	3,000	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	500 U	500 U
VOCs - 8260B	Benzene	µg/l	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - 8260B	Bromobenzene	µg/l	1,000	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - 8260B	Bromochloromethane	µg/l	NS	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - 8260B	Bromodichloromethane	µg/l	3	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - 8260B	Bromoform	µg/l	4	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	200 U	200 U
VOCs - 8260B	Bromomethane	µg/l	2	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	100 U	100 U
VOCs - 8260B	Carbon disulfide	µg/l	1,000	5 U	5 U	5 U	5 U	0.51 J	5 U	5 U	5 U	5 U	500 U	500 U
VOCs - 8260B	Carbon tetrachloride	µg/l	2	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - 8260B	Chlorobenzene	µg/l	100	0.5 U	0.5 U	0.5 U	0.12 J	0.5 U	0.5 U	4.9	0.5 U	5.8	**480**	**500**
VOCs - 8260B	Chloroethane	µg/l	1,000	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	100 U	100 U
VOCs - 8260B	Chloroform	µg/l	5	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	75 U	75 U
VOCs - 8260B	Chloromethane	µg/l	1,000	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - 8260B	cis-1,2-Dichloroethene	µg/l	55 [3]	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.36 J	0.5 U	0.33 J	50 U	50 U
VOCs - 8260B	cis-1,3-Dichloropropene	µg/l	0.5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - 8260B	Dibromochloromethane	µg/l	2	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - 8260B	Dibromomethane	µg/l	5,000	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	500 U	500 U
VOCs - 8260B	Dichlorodifluoromethane	µg/l	10,000	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	500 U	500 U

Groundwater Analytical Results
Area of Contamination 32/43A
October 2006

Method	Analyte	Units	Cleanup Goal[1]	SHL-15	32M-92-01X	32Z-99-02X	32M-01-13XBR	32M-01-14X0B	32M-01-14XBR	32M-01-15XBR	32M-01-16XBR	32M-01-17XBR	32M-01-18XBR	32M-01-18XBR Duplicate
VOCs - 8260B	Ethylbenzene	µg/l	700	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - 8260B	Hexachlorobutadiene	µg/l	0.6	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	100 U	100 U
VOCs - 8260B	Isopropylbenzene	µg/l	10,000	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - 8260B	m,p-Xylene	µg/l	NS	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	100 U	100 U
VOCs - 8260B	o-Xylene	µg/l	NS	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	100 U	100 U
VOCs - 8260B	Total Xylenes	µg/l	10,000	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	100 U	100 U
VOCs - 8260B	Methyl tert-butyl ether	µg/l	70	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	100 U	100 U
VOCs - 8260B	Methylene chloride	µg/l	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	500 U	500 U
VOCs - 8260B	Naphthalene	µg/l	140	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - 8260B	n-Butylbenzene	µg/l	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - 8260B	n-Propylbenzene	µg/l	1,000	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - 8260B	sec-Butylbenzene	µg/l	NS	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - 8260B	Styrene	µg/l	100	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	100 U	100 U
VOCs - 8260B	tert-Butylbenzene	µg/l	1,000	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - 8260B	Tetrachloroethene	µg/l	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - 8260B	Toluene	µg/l	1,000	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	75 U	75 U
VOCs - 8260B	trans-1,2-Dichloroethene	µg/l	90	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	75 U	75 U
VOCs - 8260B	trans-1,3-Dichloropropene	µg/l	0.5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	50 U
VOCs - 8260B	Trichloroethene	µg/l	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.52	0.19 J	0.43 J	50 U	50 U
VOCs - 8260B	Trichlorofluoromethane	µg/l	10,000	2.5 U	2.5 U	0.44 J	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	250 U	250 U
VOCs - 8260B	Vinyl chloride	µg/l	2	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	100 U	100 U
EPH (MADEP)	2-Methylnaphthalene	µg/l	10	0.426 U	0.426 U	0.454 U	0.421 U	0.421 U	0.421 U	0.421 U	0.412 U	0.426 U	0.242 J	0.194 J
EPH (MADEP)	Acenaphthene	µg/l	20	0.426 U	0.426 U	0.454 U	0.421 U	0.421 U	0.421 U	0.421 U	0.412 U	0.426 U	0.368 J	0.296 J
EPH (MADEP)	Acenaphthylene	µg/l	300	0.426 U	0.426 U	0.454 U	0.421 U	0.421 U	0.421 U	0.421 U	0.412 U	0.426 U	0.426 U	0.435 U
EPH (MADEP)	Anthracene	µg/l	2,000	0.426 U	0.426 U	0.454 U	0.421 U	0.421 U	0.421 U	0.421 U	0.412 U	0.426 U	0.115 J	0.106 J
EPH (MADEP)	Benzo(a)anthracene	µg/l	1	0.426 U	0.426 U	0.454 U	0.421 U	0.421 U	0.421 U	0.421 U	0.412 U	0.426 U	0.426 U	0.435 U
EPH (MADEP)	Benzo(a)pyrene	µg/l	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
EPH (MADEP)	Benzo(b)fluoranthene	µg/l	1	0.426 U	0.426 U	0.454 U	0.421 U	0.421 U	0.421 U	0.421 U	0.412 U	0.426 U	0.426 U	0.435 U
EPH (MADEP)	Benzo(g,h,i)perylene	µg/l	300	0.426 U	0.426 U	0.454 U	0.421 U	0.421 U	0.421 U	0.421 U	0.412 U	0.273 J	0.426 U	0.435 U
EPH (MADEP)	Benzo(k)fluoranthene	µg/l	1	0.426 U	0.426 U	0.454 U	0.421 U	0.421 U	0.421 U	0.421 U	0.412 U	0.426 U	0.426 U	0.435 U
EPH (MADEP)	C11-C22 Aromatics (Adjusted)	µg/l	200	106 U	106 U	114 U	105 U	105 U	105 U	105 U	103 U	106 U	106 U	109 U
EPH (MADEP)	C11-C22 Aromatics (Unadjusted)	µg/l	200	106 U	106 U	114 U	105 U	105 U	105 U	105 U	103 U	106 U	106 U	109 U
EPH (MADEP)	C19-C36 Aliphatics	µg/l	5,000 [3]	106 U	106 U	114 U	105 U	105 U	105 U	105 U	103 U	106 U	106 U	109 U
EPH (MADEP)	C9-C18 Aliphatics	µg/l	4,000	106 U	106 U	114 U	105 U	105 U	105 U	105 U	103 U	106 U	785	699
EPH (MADEP)	Chrysene	µg/l	2	0.426 U	0.426 U	0.454 U	0.421 U	0.421 U	0.421 U	0.421 U	0.412 U	0.426 U	0.426 U	0.435 U
EPH (MADEP)	Dibenzo(a,h)anthracene	µg/l	0.5	0.426 U	0.426 U	0.454 U	0.421 U	0.421 U	0.421 U	0.421 U	0.412 U	0.255 J	0.426 U	0.435 U
EPH (MADEP)	Fluoranthene	µg/l	90	0.426 U	0.426 U	0.454 U	0.421 U	0.421 U	0.421 U	0.421 U	0.412 U	0.426 U	0.134 J	0.143 J
EPH (MADEP)	Fluorene	µg/l	300	0.426 U	0.426 U	0.454 U	0.421 U	0.421 U	0.421 U	0.421 U	0.412 U	0.426 U	0.681	0.561
EPH (MADEP)	Indeno(1,2,3-cd)pyrene	µg/l	0.5	0.426 U	0.426 U	0.454 U	0.421 U	0.421 U	0.421 U	0.421 U	0.412 U	0.254 J	0.426 U	0.435 U
EPH (MADEP)	Naphthalene	µg/l	140	0.426 U	0.426 U	0.454 U	0.421 U	0.421 U	0.421 U	0.421 U	0.412 U	0.426 U	0.928 U	0.797 U
EPH (MADEP)	Phenanthrene	µg/l	50	0.426 U	0.426 U	0.454 U	0.421 U	0.421 U	0.421 U	0.421 U	0.412 U	0.426 U	0.656	0.545
EPH (MADEP)	Pyrene	µg/l	20	0.426 U	0.426 U	0.454 U	0.421 U	0.421 U	0.421 U	0.421 U	0.412 U	0.426 U	0.0996 J	0.0941 J
VPH (MADEP)	Benzene	µg/l	5	2 U	2 U	0.306 J	2 U	2 U	2 U	2 U	2 U	2 U	40 U	40 U
VPH (MADEP)	C5-C8 Aliphatics (Adjusted)	µg/l	400	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	1,000 U	1,000 U
VPH (MADEP)	C5-C8 Aliphatics (Unadjusted)	µg/l	400	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	1,000 U	1,000 U
VPH (MADEP)	C9-C10 Aromatics	µg/l	200	50 U	50 U	50 U	50 U	50 U	50 U	57.9	50 U	72.4	**4,120**	**4,150**
VPH (MADEP)	C9-C12 Aliphatics (Adjusted)	µg/l	4,000	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	1,000 U	1,000 U
VPH (MADEP)	C9-C12 Aliphatics (Unadjusted)	µg/l	4,000	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	57.4	3,370	3,460

Groundwater Analytical Results
Area of Contamination 32/43A
October 2006

Method	Analyte	Units	Cleanup Goal[1]	SHL-15	32M-92-01X	32Z-99-02X	32M-01-13XBR	32M-01-14X0B	32M-01-14XBR	32M-01-15XBR	32M-01-16XBR	32M-01-17XBR	32M-01-18XBR	32M-01-18XBR Duplicate
VPH (MADEP)	Ethylbenzene	µg/l	500	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	40 U	40 U
VPH (MADEP)	m,p-Xylene	µg/l	NS	2 U	0.689 J	2 U	2 U	2 U	2 U	2 U	2 U	2 U	14.2 J	11.7 J
VPH (MADEP)	o-Xylene	µg/l	NS	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	6.28 J	4.79 J
VPH (MADEP)	Total xylenes	µg/l	10,000	2 U	0.689 J	2 U	2 U	2 U	2 U	2 U	2 U	2 U	20.48	16.49
VPH (MADEP)	Methyl tert-butyl ether	µg/l	70	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	3 U	60 U	60 U
VPH (MADEP)	Naphthalene	µg/l	140	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	200 U	200 U
VPH (MADEP)	Toluene	µg/l	1,000	2 U	0.352 J	0.33 J	2 U	2 U	2 U	2 U	2 U	2 U	40 U	40 U
Field Parameter	Temperature, initial	° C	NS	12.99	13.28	13.77	11.42	12.2	12.14	13.39	13.45	9.94	12.57	NA
Field Parameter	Temperature, final	° C	NS	12.32	12.96	12.79	12.52	11.96	11.80	13.67	14.05	9.81	12.87	NA
Field Parameter	ORP	mV	NS	100.2	249.1	91.2	130.5	-21.9	-25.4	80.2	200.1	124.9	14.9	NA
Field Parameter	pH	standard units	NS	5.97	6.1	5.84	6.19	6.26	6.66	6.92	6.32	7.12	6.36	NA
Field Parameter	Specific Conductance	µS/cm	NS	176	158	235	685	484	578	694	565	543	7.47	NA
Field Parameter	Dissolved oxygen	mg/L	NS	0.18	4.4	5.84	2.05	0.32	1.33	0.23	1.90	3.30	0.95	NA
Field Parameter	Turbidity	NTU	NS	0.70	1.4	4.5	0.17	1.37	0.54	1.0	0.35	1.5	0.65	NA

Notes:
[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW1 Standard (310 CMR 40 Subpart P).
[2] The groundwater standard is lower than the site-specific cleanup goal.
[3] The site-specific cleanup goal is lower than the groundwater standard.
All general terms, laboratory indicators and data qulaifiers are defined on the Key for Tables found at the beginning of this section.

2007 Groundwater Analytical Results
Areas of Contamination 32 and 43A
May 2007

Method	Analyte	Units	Cleanup Goal[1]	GW-3 Groundwater Standard	32Z-99-02X	Qual	32M-01-13XBR	Qual	32M-01-14XOB	Qual	32M-01-14XBR	Qual	32M-01-15XBR	Qual	32M-01-16XBR	Qual	32M-01-17XBR	Qual	32M-01-18XBR	Qual	32M-01-18XBR 32M-DUP1	Qual
Metals - SW6010B	Arsenic, Total	µg/L	10[2]	900	2.1	J	5.0	U	45		5.0	U	5.0	U	5.0	U	5.0	U	51		51	
Metals - SW6010B	Lead, Total	µg/L	15	10	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U
Metals - SW6010B	Manganese, Total	µg/L	3,500	NS	14		28		1,500		6	J	46		15		10.0	U	18,200		18,300	
VOCs - 8260B	1,1,1-Trichloroethane	µg/L	5[3]	20,000	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.36	J	0.34	J
VOCs - 8260B	1,2-Dichlorobenzene	µg/L	600	2,000	2.5	U	2.5	U	2.5	U	2.5	U	8.5		2.5	U	23		6,100		6,100	
VOCs - 8260B	1,3-Dichlorobenzene	µg/L	40[2]	50,000	2.5	U	2.5	U	2.5	U	2.5	U	4.2		0.64	J	7.8		850		820	
VOCs - 8260B	1,4-Dichlorobenzene	µg/L	5[2]	8,000	2.5	U	2.5	U	2.5	U	0.38	J	0.78	J	2.5	U	2.1	J	550		530	
VOCs - 8260B	Benzene	µg/L	5	10,000	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	2.2		2.2	
VOCs - 8260B	Bromodichloromethane	µg/L	3	50,000	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U
VOCs - 8260B	Chlorobenzene	µg/L	100	1,000	0.5	U	0.5	U	0.4	J	0.12	J	0.89		0.5	U	1.8		1,200		1,300	
VOCs - 8260B	Chloroform	µg/L	70[4]	20,000[4]	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U
VOCs - 8260B	Cis-1,2-Dichloroethene	µg/L	55[3]	50,000	0.5	U	0.5	U	0.5	U	0.5	U	0.29	J	0.47	J	0.21	J	22		22	
VOCs - 8260B	Trans-1,2-Dichloroethene	µg/L	55[2]	50,000	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	1.1		0.85	
VOCs - 8260B	Trichloroethene	µg/L	5	5,000	0.5	U	0.5	U	0.5	U	0.5	U	0.47	J	0.4	J	0.41	J	4.2		4.5	
VOCs - 8260B	Vinyl Chloride	µg/L	2	50,000	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
VPH (MADEP)	C5-C8 Aliphatics (Adjusted)	µg/L	300[4]	50,000[4]	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	500[5]	U	500[5]	U
VPH (MADEP)	C9-C10 Aromatics	µg/L	200	50,000[4]	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	6,050		6,250	
VPH (MADEP)	C9-C12 Aliphatics (Adjusted)	µg/L	700[2,4]	50,000[4]	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	500	U	500	U
VPH (MADEP)	Benzene	µg/L	5	10,000	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.5	J	2.57	J
VPH (MADEP)	Ethylbenzene	µg/L	500[3]	5,000[4]	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	20.0	U	20.0	U
VPH (MADEP)	m,p-Xylenes	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	20.0	U	20.0	U
VPH (MADEP)	O-Xylene	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	20.0	U	20.0	U
VPH (MADEP)	Total Xylenes	µg/L	10,000	5,000[4]	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	20.0	U	20.0	U
VPH (MADEP)	Toluene	µg/L	1,000	40,000[4]	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	20.0	U	20.0	U
EPH (MADEP)	C11-C22 Aromatics (Unadjusted)	µg/L	200	5,000[4]	105	U	114	U	104	U	105	U	102	U	111	U	103	U	105	U	104	U
EPH (MADEP)	C19-C36 Aliphatics	µg/L	5,000	50,000[4]	105	U	114	U	104	U	105	U	102	U	111	U	103	U	105	U	104	U
EPH (MADEP)	C9-C18 Aliphatics	µg/L	700[2,4]	50,000[4]	105	U	114	U	104	U	105	U	102	U	111	U	103	U	854		742	
Field Parameter	Temperature, initial	°C	NS	NS	18.43		13.95		12.74		15.48		14.95		14.31		13.85		14.03		NA	
Field Parameter	Temperature, final	°C	NS	NS	14.28		11.46		13.42		13.42		13.03		13.01		12.45		13.11		NA	
Field Parameter	ORP	mV	NS	NS	286.7		240.1		-67.8		105.9		106.8		254.6		175.5		-30.9		NA	
Field Parameter	pH	standard units	NS	NS	5.47		7.73		5.85		6.45		6.74		6.05		9.50		6.28		NA	
Field Parameter	Specific Conductance	µS/cm	NS	NS	92		306		541		606		698		606		546		697		NA	
Field Parameter	Dissolved Oxygen	mg/L	NS	NS	9.74		6.87		0.42		0.76		1.50		4.03		1.90		0.43		NA	
Field Parameter	Turbidity	NTU	NS	NS	7.6		2.53		0.5		0.01		0.1		0.0		1.64		1.9		NA	

Notes:

[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The groundwater standard is lower than the site-specific cleanup goal.

[3] The site-specific cleanup goal is lower than the groundwater standard.

[4] Revised GW-1 or GW-3 standard effective February 14, 2008.

[5] Reporting limit above Cleanup Goal.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

2007 Groundwater Analytical Results
Areas of Contamination 32 and 43A
October 2007

Method	Analyte	Units	Cleanup Goal[1]	GW-3 Groundwater Standard	32Z-99-02X	Qual	32M-01-13XBR	Qual	32M-01-14XOB	Qual	32M-01-14XBR	Qual	32M-01-15XBR	Qual	32M-01-16XBR	Qual	32M-01-17XBR	Qual	32M-01-18XBR	Qual	32M-01-18XBR 32M-DUP1	Qual
Metals - SW6010B	Arsenic, Total	µg/L	10[2]	900	3.2	J	5.0	U	**69**		5.0	U	5.0	U	5.0	U	5.0	U	3.1	J	5.0	
Metals - SW6010B	Lead, Total	µg/L	15	10	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U
Metals - SW6010B	Manganese, Total	µg/L	3,500	NS	11.0	U	19.0	U	3,420		12.0	U	91		10.0	U	10.0	U	**10,200**		**11,300**	
VOCs - 8260B	1,1,1-Trichloroethane	µg/L	5[3]	20,000	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	10.0	UJ	10.0	UJ
VOCs - 8260B	1,2-Dichlorobenzene	µg/L	600	2,000	2.5	U	0.46	J	0.46	J	2.5	U	47		0.45	J	53		**690**	J	**730**	J
VOCs - 8260B	1,3-Dichlorobenzene	µg/L	40[2]	50,000	2.5	U	0.32	J	0.26	J	0.22	J	12		2.5	U	12		**120**	J	**120**	J
VOCs - 8260B	1,4-Dichlorobenzene	µg/L	5[2]	8,000	2.5	U	2.5	U	2.5	U	0.4	J	**5.1**		2.5	U	4.2		**67**	J	**70**	J
VOCs - 8260B	Benzene	µg/L	5	10,000	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	10.0	UJ	10.0	UJ
VOCs - 8260B	Bromodichloromethane	µg/L	3	50,000	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	10.0	UJ	10.0	UJ
VOCs - 8260B	Chlorobenzene	µg/L	100	1,000	0.5	U	0.5	U	0.5	U	0.2	J	4.6		0.5	U	4.7		**110**	J	120	J
VOCs - 8260B	Chloroform	µg/L	70[4]	20,000[4]	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	15	UJ	15	UJ
VOCs - 8260B	Cis-1,2-Dichloroethene	µg/L	55[3]	50,000	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.27	J	10.0	UJ	10.0	UJ
VOCs - 8260B	Trans-1,2-Dichloroethene	µg/L	55[2]	50,000	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	15.0	UJ	15.0	UJ
VOCs - 8260B	Trichloroethene	µg/L	5	5,000	0.5	U	0.5	U	0.5	U	0.5	U	0.31	J	0.5	U	0.39	J	10.0	UJ	10.0	UJ
VOCs - 8260B	Vinyl Chloride	µg/L	2	50,000	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	20.0	UJ	20.0	UJ
VPH (MADEP)	C5-C8 Aliphatics (Adjusted)	µg/L	300[4]	50,000[4]	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	125	U	125	U
VPH (MADEP)	C9-C10 Aromatics	µg/L	200	50,000[4]	50.0	U	50.0	U	50.0	U	50.0	U	53.1		50.0	U	62.3		**952**		**875**	
VPH (MADEP)	C9-C12 Aliphatics (Adjusted)	µg/L	700[2,4]	50,000[4]	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	125	U	125	U
VPH (MADEP)	Benzene	µg/L	5	10,000	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	5.0	U	5.0	U
VPH (MADEP)	Ethylbenzene	µg/L	500[3]	5,000[4]	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	5.0	U	5.0	U
VPH (MADEP)	m,p-Xylenes	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	5.0	U	5.0	U
VPH (MADEP)	O-Xylene	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	5.0	U	5.0	U
VPH (MADEP)	Total Xylenes	µg/L	10,000	5,000[4]	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	5.0	U	5.0	U
VPH (MADEP)	Toluene	µg/L	1,000	40,000[4]	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	5.0	U	5.0	U
EPH (MADEP)	C11-C22 Aromatics (Unadjusted)	µg/L	200	5,000[4]	103	U	105	U	111	U	100	U	101	U	104	U	111	U	105	U	105	U
EPH (MADEP)	C19-C36 Aliphatics	µg/L	5,000	50,000[4]	103	U	105	U	111	U	100	U	101	U	104	U	111	U	105	U	105	U
EPH (MADEP)	C9-C18 Aliphatics	µg/L	700[2,4]	50,000[4]	103	U	105	U	111	U	100	U	101	U	104	U	111	U	158		176	
Field Parameter	Temperature, initial	°C	NS	NS	15.50		14.62		13.35		12.34		14.23		14.30		12.73		15.39		NA	
Field Parameter	Temperature, final	°C	NS	NS	13.81		15.07		12.43		11.96		14.16		14.04		12.62		14.93		NA	
Field Parameter	ORP	mV	NS	NS	215.2		69.8		-175.2		45.1		32.0		96.0		17.9		1.5		NA	
Field Parameter	pH	standard units	NS	NS	5.05		6.22		5.88		6.53		6.70		5.96		7.09		6.18		NA	
Field Parameter	Specific Conductance	µS/cm	NS	NS	196		564		552		619		746		577		563		819		NA	
Field Parameter	Dissolved Oxygen	mg/L	NS	NS	9.04		2.69		0.23		1.50		0.41		2.52		0.49		0.71		NA	
Field Parameter	Turbidity	NTU	NS	NS	1.7		0.0		1.4		0.0		0.77		0.0		0.5		0.4		NA	

Notes:

[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The groundwater standard is lower than the site-specific cleanup goal.

[3] The site-specific cleanup goal is lower than the groundwater standard.

[4] Revised GW-1 or GW-3 standard effective February 14, 2008.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

2008 Groundwater Analytical Results
Area of Contamination 57 - Areas 2 and 3
June 2008

						AREA 2												AREA 3					
Method	**Analyte**	**Units**	**Cleanup Goal[1]**	**GW-3 Groundwater Standard**	**Background[2]**	**57M-03-01X**	**Qual**	**57M-03-02X**	**Qual**	**57M-03-02X Duplicate**	**Qual**	**57M-03-03X**	**Qual**	**57M-03-04X**	**Qual**	**57M-03-05X**	**Qual**	**57M-95-03X**	**Qual**	**57M-96-11X**	**Qual**	**57M-96-11X Duplicate**	**Qual**
Metals - SW6010B	Arsenic, Total	µg/L	10	900	10.5	NA		**13**		NA		5.0	U	5.0	U	**11**		**23**		**160**		**159**	
Metals - SW6010B	Iron, Total	µg/L	NS	NS	9,100	NA		**11,000**		NA		50.0	U	5.0	U	4,900		1,900		**37,000**		**37,000**	
Metals - SW6010B	Manganese, Total	µg/L	NS	NS	291	NA		**1,130**		NA		130		239		**2,380**		77		**2,400**		**2,410**	
VOCs - 8260B	1,4-Dichlorobenzene	µg/L	5 (ROD)	8,000	NS	NA		2.5	U	NA		2.5	U	2.5	U	2.5	U	0.93	J	**5.1**		5.0	
VOCs - 8260B	*cis* -1,2-Dichloroethene	µg/L	70	50,000	NS	NA		5.3		NA		0.5	U	0.27	J	0.5	U	0.97		6.2		6.2	
VOCs - 8260B	Chlorobenzene	µg/L	100	1,000	NS	NA		0.5	U	NA		0.5	UJ	0.50	U	0.5	U	0.50	U	0.50	U	0.50	U
VOCs - 8260B	Tetrachloroethene	µg/L	5 (ROD)	30,000	NS	NA		3.7		NA		0.66		0.27	J	0.5	U	0.61		0.82		0.81	
VOCs - 8260B	Trichloroethene	µg/L	5	5,000	NS	NA		**6.2**		NA		0.23	J	0.50	U	0.5	U	0.5	U	2.3		2.3	
VOCs - 8260B	Vinyl Chloride	µg/L	2	50,000	NS	NA		1.0	U	NA		1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U
EPH (MADEP)	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000[3]	NS	NA		103	U	105	U	106	U	103	U	108	U	NA		NA		NA	
Field Parameter	ORP	mV	NS	NS	NS	237.0		-29.1		NA		119.6		145.5		35.8		-189		-61.1		NA	
Field Parameter	Dissolved Oxygen	mg/L	NS	NS	NS	9.17		0.83		NA		1.10		0.34		0.25		0.67		0.62		NA	
Field Parameter	Turbidity	NTU	NS	NS	NS	0.00		2.0		NA		0.00		0.97		4.38		1.3		2.61		NA	

Notes:

[1] From the MCP "GW-1" Standards (310 CMR 40 Subpart P) unless identified as from the ROD.

[2] From the RI.

[3] Revised GW-3 standard effective February 14, 2008.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

2008 Surface Water Analytical Results
Area of Contamination 57 - Areas 2 and 3
June 2008

Method	Analyte	Units	USEPA Water Quality Criteria *	57-AREA2-SW2	Qual	57-AREA2-SW2 Duplicate	Qual	57-AREA2-SW3	Qual	57-AREA3-SW1	Qual
Metals - SW6010B	Arsenic, Total	µg/L	150	6.0		8.0		6.0		11	
Metals - SW6010B	Iron, Total	µg/L	1,000	*2,600*	*J*	*2,100*	*J*	*1,500*		*6,800*	
Metals - SW6010B	Manganese, Total	µg/L	NS	248		230		266		1,850	
VOCs - 8260B	1,4-Dichlorobenzene	µg/L	NS	2.5	U	2.5	U	2.5	U	2.5	U
VOCs - 8260B	*cis* -1,2-Dichloroethene	µg/L	NS	0.5	U	0.5	U	0.5	U	0.5	U
VOCs - 8260B	Chlorobenzene	µg/L	NS	0.5	U	0.5	U	0.5	U	0.5	U
VOCs - 8260B	Tetrachloroethene	µg/L	NS	0.5	U	0.5	U	0.5	U	0.5	U
VOCs - 8260B	Trichloroethene	µg/L	NS	0.5	U	0.5	U	0.5	U	0.5	U
VOCs - 8260B	Vinyl Chloride	µg/L	NS	1.0	U	1.0	U	1.0	U	1.0	U
EPH (MADEP)	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	NS	112	U	105	U	108	U	NA	
Field Parameters	ORP	mV	NS	102.9		NA		105.9		-15.6	
Field Parameters	Dissolved Oxygen	mg/L	NS	6.12		NA		8.26		6.84	
Field Parameters	Turbidity	NTU	NS	15.0		NA		16.0		20.0	

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

* = Criterion Continuous Concentration

Water Quality Criteria published by USEPA pursuant to Section 304(a) of the Clean Water Act and provide guidance for states and tribes to use in adopting water quality standards.

For Contaminants of Concern (COCs) without Water Quality Criteria a qualitative comparison will be made between the detected concentrations in groundwater and COC concentrations in surface water to determine if groundwater discharge is impacting surface water.

2008 Groundwater Analytical Results
Areas of Contamination 32 and 43A
June 2008

Method	Analyte	Units	Cleanup Goal[1]	GW-3 Groundwater Standard	32Z-99-02X	Qual	32M-01-13XBR	Qual	32M-01-14XOB	Qual	32M-01-14XBR	Qual	32M-01-15XBR	Qual	32M-01-16XBR	Qual	32M-01-17XBR	Qual	32M-01-18XBR	Qual	32M-01-18XBR 32M-DUP1	Qual
Metals - SW6010B	Arsenic, Total	µg/L	10[2]	900	5.0	U	5.0	U	**50**		5.0	U	5.0	U	5.0	U	5.0	U	**38**		**39**	
Metals - SW6010B	Manganese, Total	µg/L	3,500	NS	23		6.3	J	2,760		11		31		4.0	J	21		**14,800**		**14,500**	
VOCs - 8260B	1,1,1-Trichloroethane	µg/L	5[3]	20,000	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	10	U	10	U
VOCs - 8260B	1,1,2-Trichloroethane	µg/L	5	50,000	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	15	U	15	U
VOCs - 8260B	1,2-Dichlorobenzene	µg/L	600	2,000	2.5	U	2.5	U	2.5	U	2.5	U	76		2.5	U	11		**2,700**		**2,800**	
VOCs - 8260B	1,3-Dichlorobenzene	µg/L	40[2]	50,000	2.5	U	2.5	U	0.24	J	0.33	J	19		2.5	U	3.5		**450**		**480**	
VOCs - 8260B	1,4-Dichlorobenzene	µg/L	5[2]	8,000	2.5	U	2.5	U	2.5	U	0.35	J	**7.9**		2.5	U	1.0	J	**270**		**290**	
VOCs - 8260B	*cis* -1,2-Dichloroethene	µg/L	55[3]	50,000	0.5	U	0.5	U	0.5	U	0.5	U	0.19	J	0.5	U	0.5	U	10	U	10	U
VOCs - 8260B	*trans* -1,2-Dichloroethene	µg/L	100	50,000	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	15	U	15	U
VOCs - 8260B	Benzene	µg/L	5	10,000	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	10	U	10	U
VOCs - 8260B	Chlorobenzene	µg/L	100	1,000	0.5	U	0.5	U	0.5	U	0.5	U	14		0.5	U	0.94		**850**		**880**	
VOCs - 8260B	Ethylbenzene	µg/L	700	5,000	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	0.5	U	10	U	10	U
VOCs - 8260B	Toluene	µg/L	1,000	40,000	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	0.75	U	15	U	15	U
VOCs - 8260B	Trichloroethene	µg/L	5	5,000	0.5	U	0.5	U	0.5	U	0.5	U	0.23	J	0.2	J	0.28	J	10	U	10	U
VOCs - 8260B	Vinyl Chloride	µg/L	2	50,000	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	20	U	20	U
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300[4]	50,000[4]	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	500	U	500	U
VPH (MADEP)	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[2,4]	50,000[4]	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	500	U	500	U
VPH (MADEP)	C_9-C_{10} Aromatics	µg/L	200	50,000[4]	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	84.0		**3,230**		**3,030**	
VPH (MADEP)	Benzene	µg/L	5	10,000	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	20.0	U	2.67	J
VPH (MADEP)	Ethylbenzene	µg/L	700	5,000[4]	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	20.0	U	20.0	U
VPH (MADEP)	Toluene	µg/L	1,000	40,000[4]	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	20.0	U	20.0	U
VPH (MADEP)	*m,p*- xylenes	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	20.0	U	20.0	U
VPH (MADEP)	*o*- xylenes	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	20.0	U	20.0	U
VPH (MADEP)	Total xylenes	µg/L	10,000	5,000	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	20.0	U	20.0	U
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700[2,4]	50,000[4]	106	U	100	U	105	U	105	U	105	U	105	U	105	U	430		523	
EPH (MADEP)	C_{19}-C_{36} Aliphatics	µg/L	5,000[3]	50,000[4]	106	U	100	U	105	U	105	U	105	U	105	U	105	U	12.6	J	25.2	J
EPH (MADEP)	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000[4]	106	U	100	U	93.7	J	69.6	J	65.9	J	105	U	105	U	62.2	J	105	U
Field Parameter	Temperature, initial	°C	NS	NS	17.84		12.98		12.73		14.49		14.18		15.55		13.6		16.24		NA	
Field Parameter	Temperature, final	°C	NS	NS	14.48		12.80		12.61		14.39		14.19		13.87		12.85		13.81		NA	
Field Parameter	ORP	mV	NS	NS	176.3		118.9		-62.6		158.9		70.9		136.2		155.8		-40.1		NA	
Field Parameter	pH	standard units	NS	NS	8.12		6.26		6.11		6.50		6.67		6.03		7.30		10.48		NA	
Field Parameter	Specific Conductance	µS/cm	NS	NS	205		676		570		664		823		728		619		833		NA	
Field Parameter	Dissolved Oxygen	mg/L	NS	NS	8.62		3.20		0.25		2.18		2.30		5.26		7.27		1.03		NA	
Field Parameter	Turbidity	NTU	NS	NS	2.0		0.05		4.35		0.16		3.0		0.0		4.25		0.00		NA	

Notes:

[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The groundwater standard is lower than the site-specific cleanup goal.

[3] The site-specific cleanup goal is lower than the groundwater standard.

[4] Revised GW-1 or GW-3 standard effective February 14, 2008.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

2008 Groundwater Analytical Results
Areas of Contamination 32 and 43A
October 2008

Method	Analyte	Units	Cleanup Goal[1]	GW-3 Groundwater Standard	32M-01-13XBR	Qual	32M-01-14XOB	Qual	32M-01-15XBR	Qual	32M-01-16XBR	Qual	32M-01-17XBR	Qual	32M-01-18XBR	Qual	32M-01-18XBR 32M-DUP1	Qual
Metals - SW6010B	Arsenic, Total	µg/L	10[2]	900	5.0	U	**70**		5.0	U	5.0	U	5.0	U	**34**		**35**	
Metals - SW6010B	Manganese, Total	µg/L	3,500	NS	10.0	U	**5,050**		116		10.0	U	10.0	U	**18,900**		**18,600**	
VOCs - 8260B	1,1,1-Trichloroethane	µg/L	5[3]	20,000	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	50	U	50	U
VOCs - 8260B	1,1,2-Trichloroethane	µg/L	5	50,000	0.75	UJ	0.75	UJ	0.75	UJ	0.75	UJ	0.75	UJ	75	U	75	U
VOCs - 8260B	1,2-Dichlorobenzene	µg/L	600	2,000	2.5	UJ	2.5	UJ	61	J	2.5	UJ	18	J	**4,100**		**4,000**	
VOCs - 8260B	1,3-Dichlorobenzene	µg/L	40[2]	50,000	2.5	UJ	2.5	UJ	15	J	2.5	UJ	5.0	J	**580**		**570**	
VOCs - 8260B	1,4-Dichlorobenzene	µg/L	5[2]	8,000	2.5	UJ	2.5	UJ	**5.7**	J	2.5	UJ	1.8	J	**390**		**380**	
VOCs - 8260B	*cis* -1,2-Dichloroethene	µg/L	55[3]	50,000	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	50	U	50	U
VOCs - 8260B	*trans* -1,2-Dichloroethene	µg/L	100	50,000	0.75	UJ	0.75	UJ	0.75	UJ	0.75	UJ	0.75	UJ	75	U	75	U
VOCs - 8260B	Benzene	µg/L	5	10,000	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	50	U	50	U
VOCs - 8260B	Chlorobenzene	µg/L	100	1,000	0.5	UJ	0.5	UJ	9.6	J	0.5	UJ	1.4	J	**1,600**		**1,600**	
VOCs - 8260B	Ethylbenzene	µg/L	700	5,000	0.50	UJ	0.50	UJ	0.50	UJ	0.50	UJ	0.50	UJ	50	U	50	U
VOCs - 8260B	Toluene	µg/L	1,000	40,000	0.75	UJ	0.75	UJ	0.75	UJ	0.75	UJ	0.75	UJ	75	U	75	U
VOCs - 8260B	Trichloroethene	µg/L	5	5,000	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ	0.27	J	50	U	50	U
VOCs - 8260B	Vinyl Chloride	µg/L	2	50,000	1.0	UJ	1.0	UJ	1.0	UJ	1.0	UJ	1.0	UJ	100	U	100	U
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300[4]	50,000[4]	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	1,250	U	1,250	U
VPH (MADEP)	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[2,4]	50,000[4]	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	1,250	U	1,250	U
VPH (MADEP)	C_9-C_{10} Aromatics	µg/L	200	50,000[4]	50.0	U	50.0	U	68.4		50.0	U	50.0	U	**3,660**		**3,550**	
VPH (MADEP)	Benzene	µg/L	5	10,000	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	50.0	U	50.0	U
VPH (MADEP)	Ethylbenzene	µg/L	700	5,000[4]	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	50.0	U	50.0	U
VPH (MADEP)	Toluene	µg/L	1,000	40,000[4]	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	50.0	U	50.0	U
VPH (MADEP)	*m,p*- xylenes	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	50.0	U	50.0	U
VPH (MADEP)	*o*- xylenes	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	50.0	U	50.0	U
VPH (MADEP)	Total xylenes	µg/L	10,000	5,000	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U	50.0	U	50.0	U
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700[2,4]	50,000[4]	103	U	103	U	100	U	100	U	102	U	455	J	587	J
EPH (MADEP)	C_{19}-C_{36} Aliphatics	µg/L	5,000[3]	50,000[4]	103	U	103	U	100	U	100	U	102	U	8.8	J	19.2	J
EPH (MADEP)	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000[4]	103	U	103	U	100	U	100	U	102	U	103	U	100	U
Field Parameter	Temperature, initial	°C	NS	NS	14.06		10.21		13.26		14.06		10.89		14.42		NA	
Field Parameter	Temperature, final	°C	NS	NS	14.89		9.93		13.33		13.39		11.38		14.63		NA	
Field Parameter	ORP	mV	NS	NS	177.5		-73.1		132.0		179.6		54.8		60.9		NA	
Field Parameter	pH	standard units	NS	NS	6.35		5.59		7.08		6.38		6.70		6.73		NA	
Field Parameter	Specific Conductance	µS/cm	NS	NS	535		566		829		728		591		935		NA	
Field Parameter	Dissolved Oxygen	mg/L	NS	NS	2.00		0.31		0.75		2.38		4.07		0.72		NA	
Field Parameter	Turbidity	NTU	NS	NS	1.0		5.9		0.90		0.00		1.47		3.0		NA	

Notes:

[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The groundwater standard is lower than the site-specific cleanup goal.

[3] The site-specific cleanup goal is lower than the groundwater standard.

[4] Revised GW-1 or GW-3 standard effective February 14, 2008.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Groundwater Analytical Results
Areas of Contamination 32 and 43A
March 2009

Method	Analyte	Units	Cleanup Goal[1,4]	GW-3 Groundwater Standard[4]	32M-01-13XBR	Qual	32M-01-15XBR	Qual	32M-01-16XBR	Qual	32M-01-17XBR	Qual	32M-01-18XBR	Qual
Metals - SW6010B	Arsenic, Total	µg/L	10[2]	900	NA		NA		NA		NA		**174**	
	Manganese, Total	µg/L	3,500	NS			NA		NA		NA		2,170	
VOCs - 8260B	1,1,1-Trichloroethane	µg/L	5[3]	20,000	0.5	U	0.5	U	0.5	U	0.5	U	5.0	U
	1,1,2-Trichloroethane	µg/L	5	50,000	0.75	U	0.75	U	0.75	U	0.75	U	7.5	U
	1,2-Dichlorobenzene	µg/L	600	2,000	2.5	U	0.52	J	0.4	J	22.0		330	
	1,3-Dichlorobenzene	µg/L	40[2]	50,000	2.5	U	0.26	J	0.44	J	6.7		62	
	1,4-Dichlorobenzene	µg/L	5[2]	8,000	0.5	U	2.5	UJ	2.5	U	2.0	U	41	
	cis -1,2-Dichloroethene	µg/L	55[3]	50,000	0.75	U	0.5	UJ	0.5	U	0.5	U	5.0	U
	trans -1,2-Dichloroethene	µg/L	100	50,000	0.5	U	0.75	UJ	0.75	U	0.75	U	7.5	U
	Benzene	µg/L	5	10,000	0.5	U	0.16	J	0.5	U	0.5	U	5.0	U
	Chlorobenzene	µg/L	100	1,000	0.5	U	0.5	UJ	0.22	J	2.5		93	
	Ethylbenzene	µg/L	700	5,000	0.5	U	0.5	UJ	0.5	U	0.5	U	5.0	U
	Toluene	µg/L	1,000	40,000	0.75	U	0.75	UJ	0.75	U	0.75	U	7.5	U
	Trichloroethene	µg/L	5	5,000	0.5	U	0.5	UJ	0.5	U	0.33	J	5.0	U
	Vinyl Chloride	µg/L	2	50,000	1.0	U	1.0	UJ	1.0	U	1.0	U	10.0	U
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300	50,000	50.0	U	500.0	R	50.0	U	50.0	U	250.0	UJ
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[2]	50,000	50.0	U	500.0	R	50.0	U	32.8	J	272.0	J
	C_9-C_{10} Aromatics	µg/L	200	50,000	50.0	U	500.0	R	50.0	U	29.3	J	292	J
	Benzene	µg/L	5	10,000	2.0	U	20.0	R	2.0	U	2.0	U	10.0	U
	Ethylbenzene	µg/L	700	5,000	2.0	U	20.0	R	2.0	U	2.0	U	10.0	U
	Toluene	µg/L	1,000	40,000	2.0	U	20.0	R	2.0	U	2.0	U	10.0	U
	m,p- xylenes	µg/L	NS	NS	2.0	U	20.0	R	2.0	U	2.0	U	10.0	U
	o- xylenes	µg/L	NS	NS	2.0	U	20.0	R	2.0	U	2.0	U	10.0	U
	Total xylenes	µg/L	10,000	5,000	2.0	U	20.0	R	2.0	U	2.0	U	10.0	U
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700[2]	50,000	104	UJ	104	U	105	U	112	U	101	J
	C_{19}-C_{36} Aliphatics	µg/L	5,000[3]	50,000	104	UJ	104	U	105	U	112	U	45.5	J
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	104	UJ	104	U	105	U	112	U	94.4	J
Field Parameter	Temperature, initial	°C	NS	NS	9.99		12.58		13.06		12.96		11.46	
	Temperature, final	°C	NS	NS	9.64		12.43		12.67		12.19		11.48	
	ORP	mV	NS	NS	294.2		444.5		303.8		291.3		431.7	
	pH	standard units	NS	NS	5.71		12.63		6.05		7.01		7.34	
	Specific Conductance	µS/cm	NS	NS	279		87,500		776		724		14,476	
	Dissolved Oxygen	mg/L	NS	NS	6.52		52.30		4.79		1.41		17.13	
	Turbidity	NTU	NS	NS	2.40		9.3		0		0.96		17.70	

Notes:

[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The groundwater standard is lower than the site-specific cleanup goal.

[3] The site-specific cleanup goal is lower than the groundwater standard.

[4] GW-1 or GW-3 standard effective June 26, 2009

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

2009 Groundwater Analytical Results
Areas of Contamination 32 and 43A
May 2009

Method	Analyte	Units	Cleanup Goal[1,3]	GW-3 Groundwater Standard[3]	32Z-99-02X	Qual	32M-01-13XBR	Qual	32M-01-14XOB	Qual	32M-01-14XBR	Qual	32M-01-15XBR
Metals - SW6010B	Arsenic, Total	µg/L	10	900	5.0	U	5.0	U	**66**		5.0	U	**180**
	Manganese, Total	µg/L	3,500	NS	11.0		12.0		**3,660**		27		21
VOCs - 8260B	1,1,1-Trichloroethane	µg/L	5[2]	20,000	0.5	U	0.5	U	0.5	U	0.5	U	0.5
	1,1,2-Trichloroethane	µg/L	5	50,000	0.75	U	0.75	U	0.75	U	0.75	U	0.75
	1,2-Dichlorobenzene	µg/L	600	2,000	2.5	U	2.5	U	2.5	U	2.5	U	2.5
	1,3-Dichlorobenzene	µg/L	40	50,000	2.5	U	2.5	U	2.5	U	2.5	U	2.5
	1,4-Dichlorobenzene	µg/L	5	8,000	2.5	U	2.5	U	2.5	U	2.5	U	2.5
	cis -1,2-Dichloroethene	µg/L	55[2]	50,000	0.5	U	0.5	U	0.5	U	0.5	U	0.5
	trans -1,2-Dichloroethene	µg/L	100	50,000	0.75	U	0.75	U	0.75	U	0.75	U	0.75
	Benzene	µg/L	5	10,000	0.5	U	0.5	U	0.5	U	0.5	U	0.5
	Chlorobenzene	µg/L	100	1,000	0.5	U	0.5	U	0.5	U	0.18	J	0.5
	Ethylbenzene	µg/L	700	5,000	0.5	U	0.5	U	0.5	U	0.5	U	0.5
	Toluene	µg/L	1,000	40,000	0.75	U	0.75	U	0.75	U	0.75	U	0.75
	Trichloroethene	µg/L	5	5,000	0.5	U	0.5	U	0.5	U	0.5	U	0.5
	Vinyl Chloride	µg/L	2	50,000	1.0	U	1.0	U	1.0	U	1.0	U	1.0
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300	50,000	50.0	U	50.0	U	50.0	U	50.0	U	250.0
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700	50,000	50.0	U	50.0	U	50.0	U	50.0	U	250.0
	C_9-C_{10} Aromatics	µg/L	200	50,000	50.0	U	50.0	U	50.0	U	50.0	U	250.0
	Benzene	µg/L	5	10,000	2.0	U	2.0	U	2.0	U	2.0	U	10.0
	Ethylbenzene	µg/L	700	5,000[4]	2.0	U	2.0	U	2.0	U	2.0	U	10.0
	Toluene	µg/L	1,000	40,000	2.0	U	2.0	U	2.0	U	2.0	U	10.0
	m,p- xylenes	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.0	U	10.0
	o- xylenes	µg/L	NS	NS	2.0	U	2.0	U	2.0	U	2.0	U	10.0
	Total xylenes	µg/L	10,000	5,000	2.0	U	2.0	U	2.0	U	2.0	U	10.0
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700	50,000	105	U	100	U	102	U	102	U	105
	C_{19}-C_{36} Aliphatics	µg/L	5,000[2]	50,000	105	U	100	U	102	U	102	U	105
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	105	U	100	U	102	U	102	U	105
Field Parameter	Temperature, initial	°C	NS	NS	10.65		11.58		12.36		12.70		13.03
	Temperature, final	°C	NS	NS	10.85		10.99		11.56		12.17		13.18
	ORP	mV	NS	NS	161.6		165.9		-29.0		23.7		435.6
	pH	standard units	NS	NS	5.39		6.00		5.48		6.06		12.38
	Specific Conductance	µS/cm	NS	NS	109		243		514		672		27,818
	Dissolved Oxygen	mg/L	NS	NS	9.06		6.90		0.18		0.49		39.17
	Turbidity	NTU	NS	NS	9.96		2.31		1.31		0.00		3.9

Notes:

[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The site-specific cleanup goal is lower than the groundwater standard.

[3] Revised GW-1 or GW-3 standard effective June 26, 2009.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

2009 Groundwater Analytical Results
Areas of Contamination 32 and 43A
May 2009

Method	Analyte	Units	Cleanup Goal[1,3]	GW-3 Groundwater Standard[3]	Qual	32M-01-16XBR	Qual	32M-01-17XBR	Qual	32M-01-18XBR	Qual	32M-01-18XBR 32M-DUP1	Qual
Metals - SW6010B	Arsenic, Total	µg/L	10	900		5.0	U	5.0	U	**51**		**53**	
	Manganese, Total	µg/L	3,500	NS		10.0	U	10	U	**29,400**		**29,600**	
VOCs - 8260B	1,1,1-Trichloroethane	µg/L	5[2]	20,000	U	0.5	U	0.5	U	5	U	50	U
	1,1,2-Trichloroethane	µg/L	5	50,000	U	0.75	U	0.75	U	7.5	U	75	U
	1,2-Dichlorobenzene	µg/L	600	2,000	R	2.5	U	46		**1,700**	J	**2,600**	J
	1,3-Dichlorobenzene	µg/L	40	50,000	R	2.5	U	8.6		**270**	J	**420**	J
	1,4-Dichlorobenzene	µg/L	5	8,000	R	2.5	U	3.4		**180**	J	**290**	J
	cis -1,2-Dichloroethene	µg/L	55[2]	50,000	U	0.5	U	0.5	U	5	U	50	U
	trans -1,2-Dichloroethene	µg/L	100	50,000	U	0.75	U	0.75	U	7.5	U	75	U
	Benzene	µg/L	5	10,000	R	0.5	U	0.5	U	5	U	50	U
	Chlorobenzene	µg/L	100	1,000	R	0.5	U	0.5	U	**540**	J	**770**	J
	Ethylbenzene	µg/L	700	5,000	R	0.5	U	0.5	U	5	U	50	U
	Toluene	µg/L	1,000	40,000	R	0.75	U	0.75	U	7.5	U	75	U
	Trichloroethene	µg/L	5	5,000	U	0.5	U	0.29	J	5	U	50	U
	Vinyl Chloride	µg/L	2	50,000	U	1.0	U	1.0	U	10	U	100	U
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300	50,000	UJ	50.0	U	50.0	U	50.0	U	250	U
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700	50,000	UJ	50.0	U	48.5	J	132.0	J	251	U
	C_9-C_{10} Aromatics	µg/L	200	50,000	UJ	50.0	U	47.6	J	**1,890**		**1,850**	
	Benzene	µg/L	5	10,000	UJ	2.0	U	2.0	U	2.0	U	10.0	U
	Ethylbenzene	µg/L	700	5,000[4]	UJ	2.0	U	2.0	U	2.0	U	10.0	U
	Toluene	µg/L	1,000	40,000	UJ	2.0	U	2.0	U	2.0	U	10.0	U
	m,p- xylenes	µg/L	NS	NS	UJ	2.0	**U**	2.0	U	2.0	U	10.0	U
	o- xylenes	µg/L	NS	NS	UJ	2.0	U	2.0	U	2.0	U	10.0	U
	Total xylenes	µg/L	10,000	5,000	UJ	2.0	U	2.0	U	2.0	U	10.0	U
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700	50,000	U	100	U	18.4	J	470	J	300	J
	C_{19}-C_{36} Aliphatics	µg/L	5,000[2]	50,000	U	100	U	30.2	J	11.7	J	9.46	J
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	U	57.6	J	100	U	100	U	103	U
Field Parameter	Temperature, initial	°C	NS	NS		12.72		11.5		11.46		NA	
	Temperature, final	°C	NS	NS		12.56		11.61		11.48		NA	
	ORP	mV	NS	NS		296.8		234.8		431.7		NA	
	pH	standard units	NS	NS		5.88		6.81		7.34		NA	
	Specific Conductance	µS/cm	NS	NS		795		860		14476		NA	
	Dissolved Oxygen	mg/L	NS	NS		4.28		0.31		17.13		NA	
	Turbidity	NTU	NS	NS		0.8		2.91		17.70		NA	

Notes:

[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The site-specific cleanup goal is lower than the groundwater standard.

[3] Revised GW-1 or GW-3 standard effective June 26, 2009.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

2009 Groundwater Analytical Results
Areas of Contamination 32 and 43A
November 2009

Method	Analyte	Units	Cleanup Goal[1,3]	GW-3 Groundwater Standard[3]	32M-01-13XBR	Qual	SHL-25	Qual	32M-01-15XBR	Qual	32M-01-16XBR	Qual	32M-01-17XBR	Qual
Metals - SW6010B	Arsenic, Total	µg/L	10	900	NA		NA		NA		NA		5	U
	Manganese, Total	µg/L	3,500	NS	NA		NA		NA		NA		10	U
VOCs - 8260B	1,1,1-Trichloroethane	µg/L	5[2]	20,000	0.5	U	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ
	1,1,2-Trichloroethane	µg/L	5	50,000	0.75	U	0.75	UJ	0.75	UJ	0.75	UJ	0.75	UJ
	1,2-Dichlorobenzene	µg/L	600	2,000	2.5	U	3.9		2.5	UJ	2.5	UJ	78	J
	1,3-Dichlorobenzene	µg/L	40	50,000	2.5	U	1.5	J	2.5	UJ	2.5	UJ	14	J
	1,4-Dichlorobenzene	µg/L	5	8,000	2.5	U	0.82	J	2.5	UJ	2.5	UJ	**8.2**	J
	cis -1,2-Dichloroethene	µg/L	55[2]	50,000	0.5	U	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ
	trans -1,2-Dichloroethene	µg/L	100	50,000	0.75	U	0.75	UJ	0.75	UJ	0.75	UJ	0.75	UJ
	Benzene	µg/L	5	10,000	0.5	U	0.5	UJ	0.5	UJ	0.5	UJ	0.5	UJ
	Chlorobenzene	µg/L	100	1,000	0.5	U	0.69		0.50	UJ	0.5	UJ	8.0	J
	Ethylbenzene	µg/L	700	5,000	0.50	U	0.50	UJ	0.50	UJ	0.50	UJ	0.50	UJ
	Toluene	µg/L	1,000	40,000	0.75	U	0.75	UJ	0.75	UJ	0.75	UJ	0.75	UJ
	Trichloroethene	µg/L	5	5,000	0.5	U	0.5	UJ	0.5	UJ	0.5	UJ	0.23	J
	Vinyl Chloride	µg/L	2	50,000	1.0	U	1.0	UJ	1.0	UJ	1.0	UJ	1.0	UJ
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300	50,000	50.0	U	50.0	U	50.0	UJ	50.0	U	50.0	U
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700	50,000	50.0	U	2.5	J	50.0	UJ	50.0	U	50.0	U
	C_9-C_{10} Aromatics	µg/L	200	50,000	50.0	U	50.0	U	50.0	UJ	50.0	U	85.2	J
	Benzene	µg/L	5	10,000	2.0	U	2.0	U	2.0	UJ	2.0	U	2.0	U
	Ethylbenzene	µg/L	700	5,000	2.0	U	1.0	J	2.0	UJ	2.0	U	8.55	J
	Toluene	µg/L	1,000	40,000	2.0	U	2.0	U	2.0	UJ	2.0	U	2.0	U
	m,p- xylenes	µg/L	NS	NS	2.0	U	2.0	U	2.0	UJ	2.0	U	2.0	UJ
	o- xylenes	µg/L	NS	NS	2.0	U	0.6	J	2.0	UJ	2.0	U	2.0	UJ
	Total xylenes	µg/L	10,000	5,000	2.0	U	2.0	U	2.0	UJ	2.0	U	2.0	U
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700	50,000	11	J	110	U	107	U	113	U	31	J
	C_{19}-C_{36} Aliphatics	µg/L	5,000[2]	50,000	105	U	110	U	107	U	113	U	106	U
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	105	U	110	U	107	U	113	U	106	U
Field Parameter	Temperature, initial	°C	NS	NS	15.49		12.44		14.73		15.03		12.40	
	Temperature, final	°C	NS	NS	15.78		12.29		14.77		14.65		12.40	
	pH	mV	NS	NS	5.9		5.9		10.52		5.8		6.81	
	Specific Conductance	standard units	NS	NS	293.00		700		52460		624		1,580	
	ORP	µS/cm	NS	NS	282		23		282		1.8		246.7	
	Dissolved Oxygen	mg/L	NS	NS	7.26		6		34.11		4.89		9.02	
	Turbidity	NTU	NS	NS	0.87		0.0		7.64		0.25		1.41	

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The site-specific cleanup goal is lower than the groundwater standard.

[3] GW-1 or GW-3 standard effective June 26, 2009

2009 Groundwater Analytical Results
Areas of Contamination 32 and 43A
November 2009

Method	Analyte	Units	Cleanup Goal[1,3]	GW-3 Groundwater Standard[3]	32M-01-18XBR	Qual	32M-01-18XBR 32M-DUP1	Qual
Metals - SW6010B	Arsenic, Total	µg/L	10	900	**18**		**20**	
	Manganese, Total	µg/L	3,500	NS	**6,970**		**6,890**	
VOCs - 8260B	1,1,1-Trichloroethane	µg/L	5[2]	20,000	10	UJ	10	UJ
	1,1,2-Trichloroethane	µg/L	5	50,000	15	UJ	15	UJ
	1,2-Dichlorobenzene	µg/L	600	2,000	**730**	J	**720**	J
	1,3-Dichlorobenzene	µg/L	40	50,000	**150**	J	**150**	J
	1,4-Dichlorobenzene	µg/L	5	8,000	**100**	J	**100**	J
	cis -1,2-Dichloroethene	µg/L	55[2]	50,000	10	UJ	10	U
	trans -1,2-Dichloroethene	µg/L	100	50,000	15	UJ	15	UJ
	Benzene	µg/L	5	10,000	10	UJ	10	UJ
	Chlorobenzene	µg/L	100	1,000	**200**	J	**190**	J
	Ethylbenzene	µg/L	700	5,000	10	UJ	10	UJ
	Toluene	µg/L	1,000	40,000	15	UJ	15	UJ
	Trichloroethene	µg/L	5	5,000	10	UJ	10	UJ
	Vinyl Chloride	µg/L	2	50,000	20	UJ	20	UJ
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300	50,000	250	U	10.2	J
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700	50,000	250	U	250	U
	C_9-C_{10} Aromatics	µg/L	200	50,000	**837**		**700**	
	Benzene	µg/L	5	10,000	10	U	2	U
	Ethylbenzene	µg/L	700	5,000	226		225	
	Toluene	µg/L	1,000	40,000	10	U	2	U
	m,p- xylenes	µg/L	NS	NS	10	U	2	U
	o- xylenes	µg/L	NS	NS	10	U	2	U
	Total xylenes	µg/L	10,000	5,000	10	U	2	U
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700	50,000	246		208	
	C_{19}-C_{36} Aliphatics	µg/L	5,000[2]	50,000	107	U	104	U
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000	40.3	J	45.7	J
Field Parameter	Temperature, initial	°C	NS	NS	15.04		NA	
	Temperature, final	°C	NS	NS	14.98		NA	
	pH	mV	NS	NS	5.69		NA	
	Specific Conductance	standard units	NS	NS	4,436		NA	
	ORP	µS/cm	NS	NS	120.7		NA	
	Dissolved Oxygen	mg/L	NS	NS	2.15		NA	
	Turbidity	NTU	NS	NS	2.40		NA	

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The site-specific cleanup goal is lower than the groundwater standard.

[3] GW-1 or GW-3 standard effective June 26, 2009

ARARS

Table 24
Synopsis of Federal and State ARARs for Monitored Natural Attenuation
Area of Contamination 32 and 43A
Devens, Massachusetts

Location Specific

Authority	Location Specific	Requirement	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Federal Regulatory Authority		No location-specific ARARs will be triggered.			
State Regulatory Authority		No location-specific ARARs will be triggered.			

Table 24
Synopsis of Federal and State ARARs for Monitored Natural Attenuation
Area of Contamination 32 and 43A
Devens, Massachusetts

Chemical Specific

Authority	Chmical Specific	Requirement	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Federal Regulatory Authority	Groundwater (Also applicable as an Action Specific ARAR)	SDWA, National Primary Drinking Water Standards, MCLs [40 CFR Parts 141.11 - 141.16 and 141.50 - 141.52]	Relevant and Appropriate	The NPDWR establishes MCLs for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques.	Biodegradation of organic contaminants exceeding MCLs is believed to be occurring under existing conditions. MCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program will achieve MCLs at completion of remedy.
Federal Regulatory Authority	Groundwater	USEPA Reference Dose	TBC		
Federal Regulatory Authority	Groundwater	USEPA HAs	TBC		
State Regulatory Authority	Groundwater(Also applicable as an Action Specific ARAR)	Massachusetts Drinking Water Standards and Guidelines [310 CMR 22.0].	Relevant and Appropriate	The Massachusetts Drinking Water Standards and Guidelines list MMCLs which apply to water delivered to any user of a public water supply system as defined in 310 CMR 22.00. Private residential wells are not subject to the requirements of 310 CMR 22.00; however, the standards are often used to evaluate private residential contamination especially in CERCLA activities.	Biodegradation of organic contaminants exceeding MMCLs is believed to be occurring under existing conditions. MMCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program.

Table 24
Synopsis of Federal and State ARARs for Monitored Natural Attenuation
Area of Contamination 32 and 43A
Devens, Massachusetts

Action Specific

Authority	Action Specific	Requirement	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Federal Regulatory Authority		RCRA Subtitle C Subpart F	Relevant and Appropriate	Groundwater protection standard.	
State Regulatory Authority	Groundwater	Massachusetts Groundwater Quality Standards [314 CMR 6.00]	Applicable	Massachusetts Groundwater Quality Standards designate and assign uses for which groundwater of the Commonwealth shall be maintained and protected and set forth water quality criteria necessary to maintain the designated uses. Groundwater at Fort Devens is classified as Class 1. Groundwater assigned to this class are fresh groundwater designated as a source of potable water supply.	Biodegradation of organic contaminants exceeding MMCLs is believed to be occurring under existing conditions. MMCLs will be used to evaluate the performance of this alternative through implementation of a long-term groundwater monitoring program.
State Regulatory Authority	Groundwater Monitoring	Massachusetts Hazardous Waste Management Rules (MHWMR) Groundwater Protection; [310 CMR 30.660-30.679]	Relevant and Appropriate	Groundwater monitoring is required during and following remedial actions.	A long-term groundwater monitoring program is to be implemented to monitor the progress of remediation.

Notes:

CERCLA = Comprehensive Environmental Response, Compensation and Liability Act
MCLs = Maximum Contaminant Levels
MHWMR = Massachusetts Hazardous Waste Management Rules
MMCLs = Massachusetts Maximum Contaminant Levels
NPDWR = National Primary Drinking Water Standards
SDWA = Safe Drinking Water Act

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Table 25
Synopsis of Federal and State ARARs for Excavation and Off-site Disposal
Area of Contamination 32 and 43A
Devens, Massachusetts

Location Specific

Authority	Location Specific	Requirement	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Federal Regulatory Authority		There are no location specific ARARs for the DRMO Yard.			
State Regulatory Authority		There are no location specific ARARs for the DRMO Yard.			

Table 25
Synopsis of Federal and State ARARs for Excavation and Off-site Disposal
Area of Contamination 32 and 43A
Devens, Massachusetts

Chemical Specific

Authority	Chemical Specific	Requirement	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Federal Regulatory Authority	For surface soil (0 to 10 inches) For subsurface soil (below 10 inches)	Toxic Substance Control Act (TSCA) 40 CFR 761.125(c)(4)	TBC	Unrestricted access with less than 1 mg/kg PCBs. Unrestricted access with less than 10 mg/kg PCBs.	
Federal Regulatory Authority	Soil	EPA Region III Risk Based Concentration Table	TBC	Exposure levels to numerous chemicals under specific scenarios.	
Federal Regulatory Authority	Soil	Resource Conservation and Recovery Act (RCRA) Corrective Action Levels 55 FR 30798, July 1990.	TBC	To establish the need for a corrective measure study. Numerous chemicals.	
Federal Regulatory Authority	Soil	Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. EPA OSWER Directive 9355.4-12, July 1994	TBC		
State Regulatory Authority	Soil	Background levels for soil.	TBC		
State Regulatory Authority	Soil	Massachusetts Contingency Plan (MCP) 310 CMR 40.09705(6)(a)	TBC	Total petroleum hydrocarbons not to exceed 500 mg/kg.	

PHOTO LOG

April 2010
View to the northeast from the western entrance to the parking lot on Independence Drive, south of the warehouse building.

April 2010
View to the northeast of the southwest corner of the warehouse.

X:/OMA010/Ft_Devens/Maps/DO501/2010_5-Year_Review/CDR/AOC_32_43_photolog.cdr
06/30/10 CNL

HGL HydroGeoLogic, Inc

AOC 32 and AOC 43
Photograph Log
2010

April 2010
View to the northeast through the security gate entrance on the west side of the warehouse property.

April 2010
View to the north from the security gate located on the east side of the warehouse property.

X:/OMA010/Ft_Devens/Maps/DO501/2010_5-Year_Review/CDR/
AOC_32_43_photolog.cdr
06/30/10 CNL

AOC 32 and AOC 43
Photograph Log
2010

April 2010
View from the north. Note the building to the right, newly constructed recycling center.

April 2010
View to the northeast from the former road, west of the warehouse perimeter fence.
Well 32Z-99-02X is just northeast of the far right pine tree line.

X:/OMA010/Ft_Devens/Maps/DO501/2010_5-Year_Review/CDR/
AOC_32_43_photolog.cdr
06/30/10 CNL

HGL HydroGeoLogic, Inc

AOC 32 and AOC 43
Photograph Log
2010

APPENDIX G

AOC 69W

GROUNDWATER ANALYTICAL RESULTS
(2005-2009)

Key for Tables

General Terms

AOC	Area of Contamination
COC	chain of custody
CMR	Code of Massachusetts Regulations
EPH	extractable petroleum hydrocarbons
HLA	Harding Lawson Associates
MADEP	Massachusetts Department of Environmental Protection; indicates MADEP-derived analytical methods (MADEP, 2004a and 2004b)
MCP	Massachusetts Contingency Plan
μg/L	Micrograms per liter
mg/L	Milligrams per liter
μS/cm	Microsiemens per centimeter
msl	mean sea level
mV	Millivolts
NA	Not analyzed/available
NC	Not collected
NS	No standard established
NTU	Nephelometric turbidity units
ORP	Oxidation-reduction potential
ROD	Record of Decision
SW(number)	Analytical method from the SW-846 method series (EPA, 2005)
VPH	volatile petroleum hydrocarbons
VOC	volatile organic compounds

Result Indicators (Laboratory Results Only)

Bold Text	Indicates a detected result above a background level.
Bold Text	Indicates a detected result above the associated site cleanup goal or GW-1 Standard.
Bold Text	Indicates a detected result above GW-3 Standard.

Data Qualifiers

J	Estimated detection
U	Not detected (at associated reporting limit)
UJ	Not detected; reporting limit is an estimate
R	Rejected due to serious deficiencies in associated QC. The presence or absence of the analyte cannot be verified.
EJ	Detected result reported at a concentration above the calibrated range of the instrument and is considered an estimate.

2005 Groundwater Analytical Results
Area of Contamination AOC 69W
November 2005

Method	Analyte	Units	Groundwater Standard[1]	Background[2]	69W-94-13	69W-94-14	ZWM-95-15X	ZWM-95-17X	ZWM-95-18X	ZWM-99-22X	ZWM-99-22X Duplicate	ZWM-99-23X	ZWM-99-24X	ZWM-01-25X	ZWM-01-26X
VPH - MADEP	C_5 - C_8 Aliphatics	µg/L	400	—	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
VPH - MADEP	C_9 - C_{12} Aliphatics	µg/L	1,000	—	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
VPH - MADEP	C_9 - C_{10} Aromatics	µg/L	200	—	110	100 U	100 U	100 U	100 U	**460**	**480**	100	100 U	100 U	100 U
EPH - MADEP	C_9 - C_{18} Aliphatics	µg/L	1,000	—	100 U	110 U	100 U	100 U	110 UJ	100 U	100 U	110 U	110 U	100 U	110 U
EPH - MADEP	C_{19} - C_{36} Aliphatics	µg/L	5,000	—	100 U	110 U	100 U	100 U	110 UJ	100 U	100 U	110 U	110 U	100 U	110 U
EPH - MADEP	C_{11} - C_{22} Aromatics	µg/L	200	—	100 U	110 U	100 U	100 U	110 U	**320**	**300**	110 U	110 U	100 U	110 U
Arsenic - E206.2	Arsenic dissolved, total	µg/L	10	10.5	**56**	2.6 J	5.0 U	5.0 U	5.0 U	**120**	**140**	**46**	5.0 U	5.0 U	5.0 U
Metals - E200.7	Iron dissolved, total	µg/L	9,100 [3]	9,100	**11,000**	690	450	25 J	24 J	**24,000**	**26,000**	**13,000**	44 J	38 J	22 J
Metals - E200.7	Manganese dissolved, total	µg/L	375	291	**3,000**	140	**850**	2.3 J	6.1 J	**3,400**	**3,600**	**5,200**	21	140	9.5 J
Field Parameter	ORP	mV	NS	—	-14.5	93.8	176.8	208.6	251.1	-57.8	NA	15.3	311.8	202.1	270.5
Field Parameter	Dissolved oxygen	mg/L	NS	—	0.62	0.78	1.21	7.88	6.03	0.21	NA	0.18	3.98	3.88	3.61

[1] From the MCP GW1 Standards (310 CMR 40 Subpart P), unless otherwise indicated.
[2] From the RI.
[3] The background value (from HLA, 2000); iron is no longer considered a COC but will be used as an indicator of remediation efficacy.
[4] Remediation goal established in the ROD.

2005 Groundwater Analytical Results
Area of Contamination AOC 69W
November 2005

Method	Analyte	Units	Groundwater Standard[1]	Background[2]	69W-94-13	69W-94-14	ZWM-95-15X	ZWM-95-17X	ZWM-95-18X	ZWM-99-22X	ZWM-99-22X Duplicate	ZWM-99-23X	ZWM-99-24X	ZWM-01-25X	ZWM-01-26X
VPH - MADEP	C_5 - C_8 Aliphatics	µg/L	400	—	100 U	100 U	100 U	NC	NC	100 U	100 U	100 U	100 U	100 U	NC
VPH - MADEP	C_9 - C_{12} Aliphatics	µg/L	1,000	—	100 U	100 U	100 U	NC	NC	100 U	100 U	100 U	100 U	100 U	NC
VPH - MADEP	C_9 - C_{10} Aromatics	µg/L	200	—	140	100 U	100 U	NC	NC	**460**	**470**	100 U	100 U	100 U	NC
EPH - MADEP	C_9 - C_{18} Aliphatics	µg/L	1,000	—	100 U	100 U	100 U	NC	NC	110 U	100 U	100 U	110 U	100 U	NC
EPH - MADEP	C_{19} - C_{36} Aliphatics	µg/L	5,000	—	100 U	100 U	100 U	NC	NC	110 U	100 U	100 U	110 U	100 U	NC
EPH - MADEP	C_{11} - C_{22} Aromatics	µg/L	200	—	100 U	100 U	100 U	NC	NC	**280**	**240**	100 U	110 U	100 U	NC
Arsenic - E206.2	Arsenic, dissolved	µg/L	10	10.5	**60**	5.0 U	5.0 U	NC	NC	**120**	**120**	**47**	5.0 U	5.0 U	NC
Metals - E200.7	Iron, dissolved	µg/L	9,100 [3]	9,100	5,400	540	66	NC	NC	**16,000**	**16,000**	8,600	25 J	160	NC
Metals - E200.8	Manganese, dissolved	µg/L	375	291	**1,600**	160	130	NC	NC	**3,900**	**3,600**	**2,500**	22	**490**	NC
Field Parameter	ORP	mV	NS	—	-120.2	-41.3	156.7	NC	NC	-61.4	NA	0.7	20.2	1.2	NC
Field Parameter	Dissolved oxygen	mg/L	NS	—	0.30	2.49	5.73	NC	NC	0.58	NA	1.03	0.30	4.10	NC

[1] From the MCP GW1 Standards (310 CMR 40 Subpart P), unless otherwise indicated.

[2] From the RI.

[3] The background value (from HLA, 2000); iron is no longer considered a COC but will be used as an indicator of remediation efficacy.

[4] Remediation goal established in the ROD.

Area of Contamination 69W
June 2006

Method	Analyte	Units	Cleanup Goal[1]	Background	69W-94-13	69W-94-14	ZWM-95-15X	ZWM-95-17X	ZWM-95-18X	ZWM-99-22X	ZWM-99-22X Duplicate	ZWM-99-23X	ZWM-99-24X	ZWM-01-25X	ZWM-01-26X
VPH - MADEP	C_5 - C_8 Aliphatics	µg/L	400	NS	50 U	50 U	50 U	NC	50 U	50 U	50 U	50 U	50 U	50 U	NC
VPH - MADEP	C_5 - C_8 Aliphatics, Adjusted	µg/L	400	NS	50 U	50 U	50 U	NC	50 U	50 U	50 U	50 U	50 U	50 U	NC
VPH - MADEP	C_9 - C_{12} Aliphatics	µg/L	1,000	NS	130	50 U	50 U	NC	50 U	482 J	359 J	62.7	50 U	50 U	NC
VPH - MADEP	C_9 - C_{12} Aliphatics, Adjusted	µg/L	1,000	NS	50 U	50 U	50 U	NC	50 U	152 J	54.2 J	62.7	50 U	50 U	NC
VPH - MADEP	C_9 - C_{10} Aromatics	µg/L	200	NS	83.7	50 U	50 U	NC	50 U	**330**	**305**	50 U	50 U	50 U	NC
EPH - MADEP	C_9 - C_{18} Aliphatics	µg/L	1,000	NS	106 U	100 U	101 U	NC	111 U	103 U	102 U	103 U	100 U	102 U	NC
EPH - MADEP	C_{19} - C_{36} Aliphatics	µg/L	5,000	NS	106 U	100 U	101 U	NC	111 U	103 U	102 U	103 U	100 U	102 U	NC
EPH - MADEP	C_{11} - C_{22} Aromatics	µg/L	200	NS	**209**	100 U	101 U	NC	111 U	**627**	**640**	174	100 U	102 U	NC
EPH - MADEP	C_{11} - C_{22} Aromatics, Adjusted	µg/L	200	NS	**203**	100 U	101 U	NC	111 U	**518**	**528**	171	100 U	102 U	NC
Arsenic - E206.2	Arsenic, Dissolved	µg/L	10	10.5	**69**	2.8 J	5	NC	5 U	**159**	**160**	**56**	5 U	3 J	NC
Metals - E200.7	Iron, Dissolved	µg/L	NS	9,100 [2]	**15,000**	570	420	NC	50 U	**28,000**	**28,000**	9,000	26 J	520	NC
Metals - E200.8	Manganese, Dissolved	µg/L	375	291	**2,600**	150	**860**	NC	10 U	**3,700**	**3,700**	**2,700**	30	**1,400**	NC
Field Parameter	ORP	mV	NS	NS	-23.2	84.3	115	139.3	229.2	-36.8	NA	9.8	208.6	230.2	412.3
Field Parameter	Dissolved oxygen	mg/L	NS	NS	0.12	0.71	1.26	7.51	6.45	0.18	NA	0.33	2.19	1.56	1.78
Field Parameter	Turbidity	NTU	NS	NS	7.0	1.0	2.0	0.00	0.00	3.65	NA	2.7	0.25	1.53	3.63

Notes:
[1] Cleanup value as identified in the ROD using the MCP GW-1/GW-2 Groundwater Standards.
[2] The background value (from HLA, 2000); iron is no longer considered a COC but will be used as an indicator of remediation efficacy and compared to the background level.
All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Area of Contamination 69W
October 2007

Method	Analyte	Units	Cleanup Goal[1]	Background	69W-94-13	Qual	69W-94-14	Qual	ZWM-95-15X	Qual	ZWM-95-17X	Qual	ZWM-95-18X[3]	Qual
VPH - MADEP	C_5 - C_8 Aliphatics, Adjusted	µg/L	300[4]	NS	69.7	U	50.0	U	50.0	U	NC		50.0	U
VPH - MADEP	C_9 - C_{12} Aliphatics, Adjusted	µg/L	700[4]	NS	65.2		50.0	U	50.0	U	NC		50.0	U
VPH - MADEP	C_9 - C_{10} Aromatics	µg/L	200	NS	144		50.0	U	50.0	U	NC		50.0	U
EPH - MADEP	C_9 - C_{18} Aliphatics	µg/L	700[4]	NS	100	U	102	U	103	U	NC		104	U
EPH - MADEP	C_{19} - C_{36} Aliphatics	µg/L	14,000[4]	NS	100	U	102	U	103	U	NC		104	U
EPH - MADEP	C_{11} - C_{22} Aromatics, Unadjusted	µg/L	200	NS	**311**		102	U	103	U	NC		104	U
Arsenic - SW6010B	Arsenic, Dissolved	µg/L	10	10.5	**142**		5.0	U	**16**		NC		5.0	U
Metals - SW6010B	Iron, Dissolved	µg/L	NS	9,100 [2]	8,500		120	U	6,300		NC		50.0	U
Metals - SW6010B	Manganese, Dissolved	µg/L	375	291	**1,120**		126		**1,230**		NC		2.9	J
Field Parameter	ORP	mV	NS	NS	-159.9		82.5		-20.0		109.3		179.2	
Field Parameter	Dissolved Oxygen	mg/L	NS	NS	0.16		1.88		1.02		15.39		2.84	
Field Parameter	Turbidity	NTU	NS	NS	4.40		6.5		15.0		0.0		0.0	

Notes:

[1] Cleanup value as identified in the ROD using the MCP GW-1/GW-2 Groundwater Standards.

[2] The background value (from HLA, 2000); iron is no longer considered a COC but will be used as an indicator of remediation efficacy and compared to the background level.

[3] ZWM-95-18X collected during a separate sampling event held on January 30, 2008.

[4] Revised GW-1 standard effective February 14, 2008.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Area of Contamination 69W
October 2007

Method	Analyte	Units	Cleanup Goal[1]	Background	ZWM-99-22X	Qual	ZWM-99-22X Duplicate	Qual	ZWM-99-23X	Qual	ZWM-99-24X	Qual	ZWM-01-25X	Qual	ZWM-01-26X	Qual
VPH - MADEP	C_5 - C_8 Aliphatics, Adjusted	µg/L	300[4]	NS	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	NC	
VPH - MADEP	C_9 - C_{12} Aliphatics, Adjusted	µg/L	700[4]	NS	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U	NC	
VPH - MADEP	C_9 - C_{10} Aromatics	µg/L	200	NS	113		93.1		50.0	U	50.0	U	50.0	U	NC	
EPH - MADEP	C_9 - C_{18} Aliphatics	µg/L	700[4]	NS	102	U	100	U	106	U	110	U	105	U	NC	
EPH - MADEP	C_{19} - C_{36} Aliphatics	µg/L	14,000[4]	NS	102	U	100	U	106	U	110	U	105	U	NC	
EPH - MADEP	C_{11} - C_{22} Aromatics, Unadjusted	µg/L	200	NS	166		174		107		110	U	105	U	NC	
Arsenic - SW6010B	Arsenic, Dissolved	µg/L	10	10.5	**244**		**236**		**56**		5.0	U	5.0		NC	
Metals - SW6010B	Iron, Dissolved	µg/L	NS	9,100 [2]	**12,000**		**12,000**		5,800		80.0	U	500		NC	
Metals - SW6010B	Manganese, Dissolved	µg/L	375	291	**3,120**		**2,990**		**1,320**		10		**3,210**		NC	
Field Parameter	ORP	mV	NS	NS	-150.6		NA		-98.2		72.3		10.0		86.9	
Field Parameter	Dissolved Oxygen	mg/L	NS	NS	0.45		NA		6.78		1.39		8.32		3.20	
Field Parameter	Turbidity	NTU	NS	NS	0.40		NA		6.8		0.80		0.77		5.40	

Notes:

[1] Cleanup value as identified in the ROD using the MCP GW-1/GW-2 Groundwater Standards.

[2] The background value (from HLA, 2000); iron is no longer considered a COC but will be used as an indicator of remediation efficacy and compared to the background level.

[3] ZWM-95-18X collected during a separate sampling event held on January 30, 2008.

[4] Revised GW-1 standard effective February 14, 2008.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Area of Contamination 69W
October 2008

Method	Analyte	Units	Cleanup Goal[1]	GW-3 Groundwater Standard	Background	69W-94-13	Qual	69W-94-14	Qual	ZWM-95-15X	Qual	ZWM-95-17X	Qual	ZWM-99-22X	Qual	ZWM-99-22X Duplicate	Qual
Metals - SW6010B	Arsenic, Dissolved	µg/L	10	900	10.5	**73**		5.0	U	5.0	U	NC		**223**		**213**	
Metals - SW6010B	Iron, Dissolved	µg/L	NS	NS	9,100[2]	7,700		390		1,100		NC		**24,000**		**23,000**	
Metals - SW6010B	Manganese, Dissolved	µg/L	375	NS	291	**1,940**		164		**438**		NC		**3,790**		**3,600**	
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300[3]	50,000[3]	NS	50.0	U	50.0	U	50.0	U	NC		50.0	U	50.0	U
VPH (MADEP)	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[3]	50,000[3]	NS	36.8	J	50.0	U	50.0	U	NC		96.3		89.5	
VPH (MADEP)	C_9-C_{10} Aromatics	µg/L	200	50,000[3]	NS	80.8		50.0	U	50.0	U	NC		**217**		198	
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700[3]	50,000[3]	NS	67.4	J	103	U	102	U	NC		37.9	J	36.5	J
EPH (MADEP)	C_{19}-C_{36} Aliphatics	µg/L	14,000[3]	50,000[3]	NS	14.1	J	103	U	102	U	NC		6.84	J	27	J
EPH (MADEP)	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000[3]	NS	152		103	U	102	U	NC		**356**		**360**	
Field Parameter	Temperature, initial	°C	NS	NS	NS	13.68		14.42		12.95		11.19		16.20		NA	
Field Parameter	Temperature, final	°C	NS	NS	NS	14.70		14.80		13.09		11.46		16.91		NA	
Field Parameter	ORP	mV	NS	NS	NS	30.1		245.4		205.4		266.0		-32.2		NA	
Field Parameter	pH	standard units	NS	NS	NS	6.81		5.44		5.51		6.06		6.80		NA	
Field Parameter	Specific Conductance	µS/cm	NS	NS	NS	686		492		730		267		831		NA	
Field Parameter	Dissolved Oxygen	mg/L	NS	NS	NS	1.02		0.77		1.19		7.76		0.60		NA	
Field Parameter	Turbidity	NTU	NS	NS	NS	30.3		1.42		10.97		NA		4.00		NA	

Notes:

[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The background value (from HLA, 2000); iron is no longer considered a COC but will be used as an indicator of remediation efficacy and compared to the background level.

[3] Revised GW-1 or GW-3 standard effective February 14, 2008.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Area of Contamination 69W
October 2008

Method	Analyte	Units	Cleanup Goal[1]	GW-3 Groundwater Standard	Background	ZWM-99-23X	Qual	ZWM-99-24X	Qual	ZWM-01-25X	Qual	ZWM-01-26X	Qual	ZWM-95-18X	Qual	69WP-08-01	Qual
Metals - SW6010B	Arsenic, Dissolved	µg/L	10	900	10.5	**52**		5.0	U	2.3	J	NC		5.0	U	NA	
Metals - SW6010B	Iron, Dissolved	µg/L	NS	NS	9,100[2]	6,500		50	U	190		NC		50	U	NA	
Metals - SW6010B	Manganese, Dissolved	µg/L	375	NS	291	**2,500**		20		**1,320**		NC		10	U	174	
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300[3]	50,000[3]	NS	50.0	U	50.0	U	50.0	U	NC		50.0	U	NA	
VPH (MADEP)	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[3]	50,000[3]	NS	44.2	J	50.0	U	50.0	U	NC		50.0	U	NA	
VPH (MADEP)	C_9-C_{10} Aromatics	µg/L	200	50,000[3]	NS	27.7	J	50.0	U	50.0	U	NC		50.0	U	NA	
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700[3]	50,000[3]	NS	103	U	102	U	103	U	NC		102	U	NA	
EPH (MADEP)	C_{19}-C_{36} Aliphatics	µg/L	14,000[3]	50,000[3]	NS	103	U	102	U	103	U	NC		102	U	NA	
EPH (MADEP)	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000[3]	NS	80.2	J	102	U	103	U	NC		102	U	NA	
Field Parameter	Temperature, initial	°C	NS	NS	NS	14.72		13.38		14.19		12.91		13.08		13.79	
Field Parameter	Temperature, final	°C	NS	NS	NS	14.89		13.95		14.69		13.59		13.28		13.83	
Field Parameter	ORP	mV	NS	NS	NS	57.6		273.4		165.2		191.5		293.7		-63.9	
Field Parameter	pH	standard units	NS	NS	NS	6.53		5.52		6.13		5.75		5.79		5.74	
Field Parameter	Specific Conductance	µS/cm	NS	NS	NS	480		476		289		241		526		485	
Field Parameter	Dissolved Oxygen	mg/L	NS	NS	NS	0.52		0.12		1.25		1.39		5.39		0.46	
Field Parameter	Turbidity	NTU	NS	NS	NS	3.0		0.67		2.0		0.85		0.95		80.0	

Notes:

[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The background value (from HLA, 2000); iron is no longer considered a COC but will be used as an indicator of remediation efficacy and compared to the

[3] Revised GW-1 or GW-3 standard effective February 14, 2008.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Area of Contamination 69W
November 2009

Method	Analyte	Units	Cleanup Goal[1]	Groundwater Standard	Background	69W-94-13	Qual	69W-94-14	Qual	ZWM-95-15X	Qual	ZWM-95-17X	Qual	ZWM-99-22X
Metals - SW6010B	Arsenic, Dissolved	µg/L	10	900	10.5	**86**		5	U	5	U	NA		**408**
	Iron, Dissolved	µg/L	NS	NS	9,100[2]	**9,900**		320		1,900		NA		**16,000**
	Manganese, Dissolved	µg/L	375	NS	291	**2,110**		177		**502**		NA		**2,660**
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300[3]	50,000	NS	50.0	U	50.0	U	50.0	U	NA		50.0
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[3]	50,000	NS	60.2		50.0	U	50.0	U	NA		73.4
	C_9-C_{10} Aromatics	µg/L	200	50,000	NS	105		50.0	U	50.0	U	NA		120.0
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700[3]	50,000	NS	105	U	106	U	108	U	NA		100
	C_{19}-C_{36} Aliphatics	µg/L	14,000[3]	50,000	NS	105	U	106	U	108	U	NA		100
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000[3]	NS	**225**		106	U	108	U	NA		**276**
Field Parameter	Temperature, initial	°C	NS	NS	NS	15.15		16.01		13.40		11.96		16.30
	Temperature, final	°C	NS	NS	NS	15.61		16.01		13.19		11.74		16.98
	ORP	mV	NS	NS	NS	-36.5		342.9		2.0		247.9		-141.6
	pH	standard units	NS	NS	NS	6.49		4.91		5.56		6.09		6.57
	Specific Conductance	µS/cm	NS	NS	NS	964		559		1,119		351		799
	Dissolved Oxygen	mg/L	NS	NS	NS	0.61		1.04		2.10		8.99		2.33
	Turbidity	NTU	NS	NS	NS	17.9		4.53		7.71		5.1		4.05

Notes:

[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The background value (from HLA, 2000); iron is no longer considered a COC but will be used as an indicator of remediation efficacy and compared to the background level.

[3] GW-3 standard effective June 26, 2009.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Area of Contamination 69W
November 2009

Method	Analyte	Units	Cleanup Goal[1]	Groundwater Standard	Background	Qual	ZWM-99-22X Duplicate	Qual	ZWM-99-23X	Qual	ZWM-99-24X	Qual	ZWM-01-25X	Qual
Metals - SW6010B	Arsenic, Dissolved	µg/L	10	900	10.5		**418**		**62**		5	U	2	J
	Iron, Dissolved	µg/L	NS	NS	9,100[2]		**17,000**		8,600		50	U	160	
	Manganese, Dissolved	µg/L	375	NS	291		**2,680**		**3,080**		8.9	J	**5,830**	
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300[3]	50,000	NS	U	50.0	U	50.0	U	50.0	U	50.0	U
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[3]	50,000	NS		70.9		56.5		50.0	U	50.0	U
	C_9-C_{10} Aromatics	µg/L	200	50,000	NS		122.0		35.2		50.0	U	50.0	U
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700[3]	50,000	NS	U	100	U	100	U	111	U	100	U
	C_{19}-C_{36} Aliphatics	µg/L	14,000[3]	50,000	NS	U	100	U	100	U	111	U	100	U
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000[3]	NS		**293**		129	U	111	U	100	U
Field Parameter	Temperature, initial	°C	NS	NS	NS		NA		15.26		13.86		15.91	
	Temperature, final	°C	NS	NS	NS		NA		15.06		13.83		15.50	
	ORP	mV	NS	NS	NS		NA		-61.9		178.2		141.5	
	pH	standard units	NS	NS	NS		NA		6.38		5.78		5.67	
	Specific Conductance	µS/cm	NS	NS	NS		NA		716		561		646	
	Dissolved Oxygen	mg/L	NS	NS	NS		NA		0.62		0.76		1.71	
	Turbidity	NTU	NS	NS	NS		NA		6.3		4.10		5.2	

Notes:

[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The background value (from HLA, 2000); iron is no longer considered a COC but will be used as an indicator of remediation efficacy and compared to the background level.

[3] GW-3 standard effective June 26, 2009.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Area of Contamination 69W
November 2009

Method	Analyte	Units	Cleanup Goal[1]	Groundwater Standard	Background	ZWM-01-26X	Qual	ZWM-95-18X	Qual	69WP-08-01	Qual
Metals - SW6010B	Arsenic, Dissolved	µg/L	10	900	10.5	NA		5	U	NA	
	Iron, Dissolved	µg/L	NS	NS	9,100[2]	NA		50	U	NA	
	Manganese, Dissolved	µg/L	375	NS	291	NA		5	J	89	
VPH (MADEP)	C_5-C_8 Aliphatics (Adjusted)	µg/L	300[3]	50,000	NS	NA		50.0	U	NA	
	C_9-C_{12} Aliphatics (Adjusted)	µg/L	700[3]	50,000	NS	NA		50.0	U	NA	
	C_9-C_{10} Aromatics	µg/L	200	50,000	NS	NA		50.0	U	NA	
EPH (MADEP)	C_9-C_{18} Aliphatics	µg/L	700[3]	50,000	NS	NA		100	U	NA	
	C_{19}-C_{36} Aliphatics	µg/L	14,000[3]	50,000	NS	NA		100	U	NA	
	C_{11}-C_{22} Aromatics (Unadjusted)	µg/L	200	5,000[3]	NS	NA		100	U	NA	
Field Parameter	Temperature, initial	°C	NS	NS	NS	14.56		13.79		14.95	
	Temperature, final	°C	NS	NS	NS	14.58		13.36		14.23	
	ORP	mV	NS	NS	NS	302.9		229.7		134.8	
	pH	standard units	NS	NS	NS	5.41		5.79		5.83	
	Specific Conductance	µS/cm	NS	NS	NS	411		772		666	
	Dissolved Oxygen	mg/L	NS	NS	NS	3.38		5.17		3.86	
	Turbidity	NTU	NS	NS	NS	4.59		3.57		15.5	

Notes:

[1] Cleanup goal is based upon the lower of the site-specific cleanup goal or the MCP GW-1 Standard (310 CMR 40 Subpart P).

[2] The background value (from HLA, 2000); iron is no longer considered a COC but will be used as an indicator of remediation efficacy and compared to the background level.

[3] GW-3 standard effective June 26, 2009.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

ARARs

TABLE 5
CHEMICAL-, LOCATION-, AND ACTION-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE
AOC 69W

RECORD OF DECISION
DEVENS, MASSACHUSETTS

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
GROUNDWATER Federal	Safe Drinking Water Act (SDWA) - Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs; 40 CFR 141.11-141.16 and 141.50-141.52	Relevant and Appropriate	MCLs are enforceable standards (based in part on the availability and cost of treatment) that specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLGs are non-enforceable health based goals that specify the maximum concentration at which no known or anticipated adverse effects on humans will occur.	Long-term groundwater monitoring will ensure that site contaminants do not migrate off-site. Implementation of Institiutional Controls prohibiting installation of drinking water wells at the site will prevent exposure. In addition, arsenic concentrations are expected to decrease following the soil removal which eliminated the majority of the source of the aquifers reducing conditions.
State	Massachusetts Groundwater Quality Standards; 310 CMR 6.00	Relevant and Appropriate	These standards designate and assign uses for which groundwaters of the Commonwealth shall be maintained and protected, and set forth water quality criteria necessary to maintain the designated uses. Groundwater at AOC 69W is classified as Class I, fresh groundwaters designated as a source of potable water supply.	Long-term groundwater monitoring will ensure that site contaminants do not migrate off-site. Implementation of Institiutional Controls prohibiting installation of drinking water wells at the site will prevent exposure. In addition, arsenic concentrations are expected to decrease following the soil removal which eliminated the majority of the source of the

TABLE 5
CHEMICAL-, LOCATION-, AND ACTION-SPECIFIC ARARS, CRITERIA, ADVISORIES, AND GUIDANCE
AOC 69W

RECORD OF DECISION
DEVENS, MASSACHUSETTS

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
	Massachusetts Drinking Water Regulations; 310 CMR 22.00	Relevant and Appropriate	These regulations list Massachusetts MCLs which apply to drinking water distributed through a public water system.	Long-term groundwater monitoring will ensure that site contaminants do not migrate off-site. Implementation of Institiutional Controls prohibiting installation of drinking water wells at the site will prevent exposure. In addition, arsenic concentrations are expected to decrease following the soil removal which eliminated the
	Massachusetts Hazardous Waste Management Regulations; 310 CMR 30.300	Applicable	These regulations contain requirements for generators including testing of wastes to determine if they are hazardous wastes and accumulation of hazardous waste prior to disposal.	Any hazardous waste (soils or groundwater) generated from long-term monitoring or excavation at AOC 69W will be managed in accordance with these regulations. Institutional Controls will limit contact to in-situ

PHOTO LOG

April 2010
View to the north from Francis Charter Essential School parking lot.
Well 69W-94-13 is noted in the photo.

April 2010
View to the northeast from the entrance of the school, located on Antietam Street.

X:/OMA010/Ft_Devens/Maps/DO501/2010_5-Year_Review/CDR/AOC_69W_photolog.cdr
06/29/10 CNL

AOC 69W
Photograph Log
2010

April 2010
View to the east in the school's parking lot. Flush mount wells are located in the parking lot area.

April 2010
View to the northwest from the school parking lot. Willow Brook is located beyond the tree line noted in the photo.

X:/OMA010/Ft_Devens/Maps/DO501/2010_5-Year_Review/CDR/AOC_69W_photolog.cdr
06/29/10 CNL

AOC 69W
Photograph Log
2010

April 2010
View to the southeast near the southeast corner of the school's building.
Well ZWM-95-17X is noted in the central portion of the photo.

April 2010
View is to the north from well ZWM-95-17X.
The school's new addition to the building (in 2008), is featured in the photo.

X:/OMA010/Ft_Devens/Maps/DO501/2010_5-Year_Review/CDR/AOC_69W_photolog.cdr
06/29/10 CNL

AOC 69W
Photograph Log
2010

April 2010
View is to the west from near the southeast corner of the school's building.

April 2010
View is the east from the entrance of school, located on Antietam Street.

X:/OMA010/Ft_Devens/Maps/DO501/2010_5-Year_Review/CDR/AOC_69W_photolog.cdr
06/29/10 CNL

AOC 69W
Photograph Log
2010

APPENDIX H

DEVENS CONSOLIDATION LANDFILL
(AOCS 9, 40, AND SA 13)

GROUNDWATER ANALYTICAL RESULTS
(2005-2009)

Key for Tables

General Terms

COD	chemical oxygen demand
CMR	Code of Massachusetts Regulations
DTW	depth to water
EPH	extractable petroleum hydrocarbons
MCP	Massachusetts Contingency Plan
μg/L	Micrograms per liter
mg/L	Milligrams per liter
μS/cm	Microsiemens per centimeter
mV	Millivolts
NAE	National Academy of Engineering
NA	Not Analyzed
ORP	Oxidation-reduction potential
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyls
ROD	Record of Decision
SHAW	The Shaw Group, Inc.
SHE	Standard Hydrogen Electrode
SW(number)	Analytical method from the SW-846 method series (EPA, 2005)
TDS	total dissolved solids
VPH	volatile petroleum hydrocarbons

Result Indicators (Laboratory Results Only)

Bold Text Indicates a detected result above the associated site cleanup goal or GW-1 Standard.

Data Qualifiers

J	Estimated detection
U	Not detected (at associated reporting limit)
UJ	Not detected; reporting limit is an estimate

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Devens Consolidation Landfill
(SHEET 1 of 4)

	Well No.	Reporting Limit				
PARAMETERS	**MCP GW-1**	ug/L				
	Standard					**LFM-99-07**
	ug/L		**LFM-99-02B**	**LFM-99-05A**	**LFM-99-07**	**DUP**
VOLATILE PETROLEUM HYDROCARBONS			ug/L	ug/L	ug/L	ug/L
C5-C8 Aliphatic Hydrocarbons	400	100	50 U	50 U	50 U	50 U
C9-C12 Aliphatic Hydrocarbons (GW-2)	1,000	100	50 U	50 U	50 U	50 U
C9-C10 Aromatic Hydrocarbons	200	100	50 U	50 U	50 U	50 U
Methyl tert-butyl ether	70	1.0	5 U	5 U	5 U	5 U
Benzene	5	1.0	5 U	5 U	5 U	5 U
Toluene	1,000	1.0	5 U	5 U	5 U	5 U
Ethylbenzene	700	1.0	5 U	5 U	5 U	5 U
m,p-Xylene *	6,000	1.0	5 U	5 U	5 U	5 U
o-Xylene *	6,000	1.0	5 U	5 U	5 U	5 U
Naphthalene	20	1.0	10 U	10 U	10 U	10 U

Shaded area with bold numbers indicates MCP GW-1 standard exceedance. - **25**

U = Indicates that the analyte was analyzed for, but not detected at or above the reporting limit.

J = Estimated value less than the reporting limit, but greater than the method detection limit.

*** MCP GW-1 Standard is for total xylenes.**

Devens Consolidation Landfill
(SHEET 2 of 4)

	Well No.	Reporting Limit	LFM-99-02B	LFM-99-05A	LFM-99-07	LFM-99-07 DUP
PARAMETERS	**MCP GW-1**	ug/L	ug/L	ug/L	ug/L	ug/L
	Standard					
	ug/L					
Extractable Petroleum Hydrocarbons						
EPH Ranges						
C9 - C18 Aliphatics	1,000	100	61 UJ	62 UJ	62 UJ	62 UJ
C19 - C36 Aliphatics	5,000	100	82 UJ	82 UJ	82 UJ	82 UJ
C11-C22 Aromatics	200	100	170 UJ	180 UJ	180 UJ	180 UJ
Target PAH Analytes						
2-Methylnaphthalene	10	10	10 UJ	10 UJ	10 UJ	10 UJ
Acenaphthene	20	10	10 UJ	10 UJ	10 UJ	10 UJ
Acenaphthylene	300	10	10 UJ	10 UJ	10 UJ	10 UJ
Anthracene	2,000	10	10 UJ	10 UJ	10 UJ	10 UJ
Benzo(a)anthracene *	1	10	10 UJ	10 UJ	10 UJ	10 UJ
Benzo(a)pyrene	0.2	10	10 UJ	10 UJ	10 UJ	10 UJ
Benzo(b)fluoranthene	1	10	10 UJ	10 UJ	10 UJ	10 UJ
Benzo(g,h,i)perylene	300	10	10 UJ	10 UJ	10 UJ	10 UJ
Benzo(k)fluoranthene	1	10	10 UJ	10 UJ	10 UJ	10 UJ
Chrysene	2	10	10 UJ	10 UJ	10 UJ	10 UJ
Dibenzo(a,h)anthracene	0.5	10	10 UJ	10 UJ	10 UJ	10 UJ
Fluoranthene (GW-3)	200	10	10 UJ	10 UJ	10 UJ	10 UJ
Fluorene	300	10	10 UJ	10 UJ	10 UJ	10 UJ
Indeno(1,2,3-cd)pyrene	0.5	10	10 UJ	10 UJ	10 UJ	10 UJ
Naphthalene	20	10	10 UJ	10 UJ	10 UJ	10 UJ
Phenanthrene (GW-3)	50	10	10 UJ	10 UJ	10 UJ	10 UJ
Pyrene	200	10	10 UJ	10 UJ	10 UJ	10 UJ

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Shaded area with bold numbers indicates MCP GW-1 standard exceedance.

U = Indicates that the analyte was analyzed for, but not detected at or above the reporting limit.

J = Estimated value less than the reporting limit, but greater than the method detection limit.

MCP Standard: The more stringent or lower value of the GW-1 or GW-3 standard, from Massachusetts Contingency Plan (310 CMR 40.0974(2) of the MCP) was the standard used.

Devens Consolidation Landfill
(SHEET 3 of 4)

	Well No.	Reporting Limit	LFM-99-02B	LFM-99-05A	LFM-03-07	LFM-03-07-DUP
PARAMETERS	**MCP GW-1**	ug/L	ug/L	ug/L	ug/L	ug/L
	Standard					
	ug/L					
PESTICIDES						
METHOD SW-846 8081A						
Hexachlorobenzene	1					
4,4'-DDD	0.1	0.1	0.1 UJ	0.1 U	0.1 U	0.1 UJ
4,4'-DDE	0.1	0.1	0.1 UJ	0.1 U	0.1 U	0.1 UJ
4,4'-DDT	0.3	0.1	0.1 UJ	0.1 U	0.1 U	0.1 UJ
Aldrin	0.5	0.05	0.05 UJ	0.05 U	0.05 U	0.05 UJ
alpha-BHC (note 3)	-	0.05	0.05 UJ	0.05 U	0.05 U	0.05 UJ
alpha-Chlordane (note 1)	2	0.05	0.05 UJ	0.05 U	0.05 U	0.05 UJ
beta-BHC (note 3)	-	0.05	0.05 UJ	0.05 U	0.05 U	0.05 UJ
delta-BHC (note 3)	-	0.05	0.05 UJ	0.05 U	0.05 U	0.05 UJ
Dieldrin	0.1	0.1	0.1 UJ	0.1 U	0.1 U	0.1 UJ
Endosulfan I (GW-3)	0.1	0.05	0.05 UJ	0.05 U	0.05 U	0.05 UJ
Endosulfan II (note 2)	40	0.1	0.1 UJ	0.1 U	0.1 U	0.1 UJ
Endosulfan sulfate (note 3)	-	0.1	0.1 UJ	0.1 U	0.1 U	0.1 UJ
Endrin	2	0.1	0.1 UJ	0.1 U	0.1 U	0.1 UJ
Endrin aldehyde (note 3)	-	0.1	0.1 UJ	0.1 U	0.1 U	0.1 UJ
Endrin ketone (note 3)	-	0.1	0.1 UJ	0.1 U	0.1 U	0.1 UJ
gamma-BHC (Lindane)	0.2	0.05	0.05 UJ	0.05 U	0.05 U	0.05 UJ
gamma-Chlordane (note 1)	2	0.05	0.05 UJ	0.05 U	0.05 U	0.05 UJ
Heptachlor	0.4	0.05	0.05 UJ	0.05 U	0.05 U	0.05 UJ
Heptachlor epoxide	0.2	0.05	0.05 UJ	0.05 U	0.05 U	0.05 UJ
Methoxychlor	2	0.5	0.5 UJ	0.5 U	0.5 U	0.5 UJ
Chlordane (note 1)	2	0.50	0.5 UJ	0.5 U	0.5 U	0.5 UJ
Toxaphene (note 3)	-	5	5 UJ	5 U	5 U	5 UJ
PCBs by SW-846 8082 (aroclors to GW-3)						
Aroclor 1016 (note4)	0.3	0.51	0.51 U	0.51 U	0.51 U	0.51 U
Aroclor 1221 (note 4)	0.3	0.51	0.51 U	0.51 U	0.51 U	0.51 U
Aroclor 1232 (note 4)	0.3	0.51	0.51 U	0.51 U	0.51 U	0.51 U
Aroclor 1242 (note 4)	0.3	0.51	0.51 U	0.51 U	0.51 U	0.51 U
Aroclor 1248 (note 4)	0.3	0.51	0.51 U	0.51 U	0.51 U	0.51 U
Aroclor 1254 (note 4)	0.3	0.51	0.51 U	0.51 U	0.51 U	0.51 U
Aroclor 1260 (note 4)	0.3	0.51	0.51 U	0.51 U	0.51 U	0.51 U
Aroclor 1262 (note 4)	0.3	0.51	0.51 U	0.51 U	0.51 U	0.51 U
Aroclor 1268 (note 4)	0.3	0.51	0.51 U	0.51 U	0.51 U	0.51 U

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Shaded area with bold numbers indicates MCP GW-1 Standard exceedance.

U = Indicates that the analyte was analyzed for, but not detected at or above the reporting limit.

J = Estimated value less than the reporting limit, but greater than the method detection limit.

1: Chlordane: MCP GW-1 Standard is based on technical chlordane or total chlordane (the sum of all multi-component isomers, including the alpha and gamma chlordane isomers, found in technical chlordane).

2: Endosulfan II: MCP standard is for endosulfan GW-3.

3: Alpha-BHC, beta-BHC, delta-BHC, Endrin aldehyde, Endrin ketone, Endosulfan sulfate, Toxaphene: no MCP standard.

4: PCB Aroclors: MCP GW-1 and GW-3 Standards are based on Total PCBs or the sum of all the aroclors reported.

Devens Consolidation Landfill
(SHEET 4 of 4)

	Well No.	Reporting Limit	Highest Pre-Landfill Concentration	LFM-99-02B	LFM-99-05A	LFM-03-07	LFM-03-07 DUP
PARAMETERS	**MCP GW-1 Standard**	**ug/L**	**ug/L; # locations**	ug/L	ug/L	**ug/L**	**ug/L**
ICP METALS (6010B); Mercury by 7470A	ug/L						
Arsenic	50	5	18; 1	4.2 U	4.2 B	4.2 U	4.2 U
Barium	2000	200	0.2; 1	8.4 U	14.8 B	15 B	14.5 B
Cadmium	5	5	NR	0.6 U	0.6 U	0.6 U	0.6 U
Chromium	100	10	69; 2	12 U	6 B	7.4 B	5 B
Copper	-	25	57; 1	2.6 U	2.6 U	2.6 U	2.6 U
Iron	-	100	24,000; 6	38 U	666	630	408
Lead	15	5.0	17; 3	3.1	2.9 U	2.9 U	2.9 U
Manganese	-	15	82; 6	5.2 B	33.9	22.8	22.8
Silver (GW-3)	7	7.0	NR	1.8 U	1.8 U	1.8 U	1.8 U
Selenium	50	5.0	NR	3.8 U	3.8 U	3.8 U	3.8 U
Zinc (GW-3)	900	20		1.6 U	1.8 B	1.6 U	1.6 U
Mercury (SW 7470) (GW-3)	1	0.20	NR	0.1 U	0.1 U	0.1 U	0.1 U
WET CHEMISTRY (mg/l)	RLs	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**
TDS (160.1)							
Solids, Total Dissolved	-	10,000	NR	151	321	524	529
ANIONS (300)							
Chloride	-	25 mg/L	246 mg/l; 9	35.6	69.3	184	182
Nitrate (as N)	-	0.2 mg/L	1.5 mg/l; 7	0.36 J-	1	1.20	1.20
Nitrite	-			NA	NA	NA	NA
Sulfate	-	1 mg/L	27.7 mg/l; 8	29.9	40.6	45.6	27.5
ALKALINITY, TOTAL							
as CaCO3 (mg/L)	-	10 mg/L	140 mg/L; 8	42.6	121	81.7	78.8
CYANIDE (335.4)							
Cyanide, Total (mg/L)	10 ug/L	0.01 mg/L	NR	0.010 U	0.010 U	0.010 U	0.010 U
PHOSPHORUS, FORMS (365.2)							
Phosphorus, Total Orthophosphate	-	0.2	NR	0.2 U	0.27 U	0.2 U	0.2 U
COD (410.4)							
Chemical Oxygen Demand (mg/L)	-	50 mg/L	6.7	20 U	20 U	20 U	31
FIELD PARAMETERS							
Temperature initial (Celsius)	-	-	NR	8.73	11.18	10.03	10.03
Temperature final (Celsius)	-	-	NR	8.74	13.67	10.19	10.19
pH (std units)	-	-	NR	5.97	6.17	6.15	6.15
Specific Conductance	-	-	NR	246	466	712	712.00
ORP/Eh (Oxidation -Reduction Potential) (mV)	-	-	NR	266.3	141.3	237.5	237.5
Dissolved Oxygen (mg/L)	-		NR	7.91	1.56	4.72	4.72
Turbidity (NTU)	-	-	NR	0.37	26.2	0.25	0.25

Shaded area with bold numbers indicates MCP GW standard exceedance. - **25**

U = Indicates that the analyte was analyzed for, but not detected at or above the reporting limit.

J = Estimated value less than the reporting limit, but greater than the method detection limit.

B = Analyte was also detected in the associated method blank or equipment blank as well as in the sample.

= Exceeded the duplicate precision of 25% RPD

* **MCP Standard: The more stringent or lower value of the GW-1 or GW-3 standard, from Massachusetts Contingency Plan (310 CMR 40.0974(2) of the MCP) was the standard used.**

NR = Pre-landfill results: Not Recorded in 2003 Remedial Action Closure Report.

Historical Devens Consolidation Landfill Groundwater Data

Method / Analyte	Units	MCP GW-1 Standard	LFM-99-02B					
			2-Jun-03	25-Nov-03	18-May-04	20-Oct-04	27-May-05	22-May-06
Extractable Petroleum Hydrocarbon (EPH) test								
Polycyclic Aromatic Hydrocarbons (PAHs)								
Naphthalene	µg/L	20	1.0 U	5.1 U	2.4 U	2.1 U	10 U	0.2 U
Pesticides								
Aldrin	µg/L	0.5	0.0064 U	0.0067 U	0.0076 U	0.0076 U	0.05 UJ	0.05 U
Dieldrin	µg/L	0.1	0.013 U	0.0013 U	0.015 U	0.014 U	0.1 U	0.05 U
alpha-Chlordane (note 1)	µg/L	2	0.0064 U	0.0067 U	0.0076 U	0.071 U	0.05 U	0.05 U
gamma-Chlordane (note 1)	µg/L	2	0.0064 U	0.0053 J	0.0076 U	0.071 U	0.05 U	0.05 U
gamma-BHC (Lindane)	µg/L	0.2	0.0064 U	0.0067 U	0.0076 U	0.0076 U	0.05 U	0.05 U
Metals (Total)								
Arsenic	µg/L	10	5.0 U	50 U	5.0 U	5.0 U	4.2 U	2.5 U
Chromium	µg/L	100	28	1.7 J	0.96 J	1.07 J	12 U	10 U
Iron	µg/L	--	NA	100 U	17 J	100 U	38 U	50 U
Lead	µg/L	15	5.0 U	8.5 J	5.0 U	5.0 U	3.1	2.5 U
Manganese	µg/L	--	NA	2.4 J	1.5 J	12.7 J	5.2 J	10 U
Zinc	µg/L	900	NA	5.9 J	7.1 J	5.57 J	1.6 U	NA
Wet Chemistry								
Cyanide	mg/L	0.01	0.01 U	0.0040 J	0.010 U	0.0050 J	0.010 U	0.05 U
Nitrate	mg/L	--	0.21	1.4	0.66	0.796	0.36 J	0.45
Chemical Oxygen Demand (COD)	mg/L	--	170	50 U	15 J	50 U	20 U	10 U
Water Quality Parameters								
pH	std units	--	6.2	6.38	6.09	6.38	5.97	6.32
Oxidation-Reduction Potential (ORP)	mV	--	NA	204.7	243.3	308.4	266.3	223.6
Turbidity	NTU	--	NA	0.40	0.8	0.55	0.37	0.18

Note 1: Chlordane: MCP GW-1 Standard is based on technical chlordane or total chlordane (the sum of all multi-component isomers, including the alpha and gamma chlordane isomers, found in technical chlordane).

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Select Historical Devens Consolidation Landfill Groundwater Data

Lindane (gamma-BHC), µg/L

MCP GW-1 Standard = 0.2 µg/L

Date	Well Number			Sampled by:
	LFM-99-02B	LFM-99-05A	LFM-03-07	
Jun-03	0.0064 U	0.0064 U	0.0064 U	SHAW
Nov-03	0.0067 U	0.0067 U	0.0071 U	NAE
May-04	0.0076 U	0.0072 U	0.0067 U	NAE
Oct-04	0.0076 U	0.0072 U	0.0070 U	NAE
May-05	0.05 U	0.05 U	0.05 U	NAE
May-06	0.05 U	0.05 U	0.05 U	NAE

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Select Historical Devens Consolidation Landfill Groundwater Data

Naphthalene, µg/L

MCP GW-1 Standard = 20 µg/L

Date	Well Number			Sampled by:
	LFM-99-02B	LFM-99-05A	LFM-03-07	
Jun-03	1.0 U	1.0 U	1.0 U	SHAW
Nov-03	5.1 U	5.1 U	5.4 U	NAE
May-04	2.4 U	2.4 U	2.4 U	NAE
Oct-04	2.1 U	2.1 U	2.2 U	NAE
May-05	10 U	10 U	10 U	NAE
May-06	0.2 U	0.2 BJ	0.2 BJ	NAE

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Select Historical Devens Consolidation Landfill Groundwater Data

Arsenic, µg/L

MCP GW-1 Standard = 10 µg/L

Date	Well Number			Sampled by:
	LFM-99-02B	LFM-99-05A	LFM-03-07	
Jun-03	5.0 U	7.5	7.9	SHAW
Nov-03	5.0 U	6.9 J	29 J	NAE
May-04	5.0 U	5.0 U	5.0 U	NAE
Oct-04	5.0 U	5.0 U	1.7 J	NAE
May-05	4.2 U	4.2 J	4.20	NAE
May-06	2.5 U	2.5 U	2.5 U	NAE

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Select Historical Devens Consolidation Landfill Groundwater Data

Chromium, µg/L

MCP GW-1 Standard = 100 µg/L

Date	Well Number			Sampled by:
	LFM-99-02B	LFM-99-05A	LFM-03-07	
Jun-03	28	10 U	10 U	SHAW
Nov-03	1.7 J	1.6 J	35	NAE
May-04	0.96	7.7 J	8.1 J	NAE
Oct-04	1.07 J	1.37 J	5.38 J	NAE
May-05	12 U	6 J	7.4 J	NAE
May-06	10 U	10 U	10 U	NAE

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Select Historical Devens Consolidation Landfill Groundwater Data

Lead, µg/L

MCP GW-1 Standard = 15 µg/L

Date	Well Number			Sampled by:
	LFM-99-02B	LFM-99-05A	LFM-03-07	
Jun-03	5.0 U	9.3	13	SHAW
Nov-03	8.5 J	9.5 J	**17 J**	NAE
May-04	5.0 U	5.0 U	5.0 U	NAE
Oct-04	5.0 U	5.0 U	5.0 U	NAE
May-05	3.1	2.9 U	2.9 U	NAE
May-06	2.5 U	2.5 U	2.5 U	NAE

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Devens Consolidation Landfill
May 2007

Method / Analyte	MCP GW-1 Standard[1]	MCP GW-3 Standard	Units	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-06A	Qual	LFM-03-07	Qual	LFM-03-07 Duplicate	Qual
Volatile Petroleum Hydrocarbons (VPH-04-1.1)													
C5-C8 Aliphatic Hydrocarbons	300[2]	50,000[2]	µg/L	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
C9-C12 Aliphatic Hydrocarbons	700[2]	50,000[2]	µg/L	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
C9-C10 Aromatic Hydrocarbons	200	50,000[2]	µg/L	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
Methyl tert-butyl ether	70	50,000	µg/L	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U
Benzene	5	10,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
Toluene	1,000	40,000[2]	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
Ethylbenzene	700	5,000[2]	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	0.386	J
m,p-Xylenes[1]	10,000	5,000[2]	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
o-Xylene [1]	10,000	5,000[2]	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
Naphthalene	140	20,000	µg/L	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U

Notes:
[1] Regulatory standard is for total xylenes.
[2] Revised GW-1 or GW-3 standard effective February 14, 2008.
All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Devens Consolidation Landfill
May 2007

Method / Analyte	MCP GW-1 Standard	MCP GW-3 Standard	Units	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-06A	Qual	LFM-03-07	Qual	LFM-03-07 Duplicate	Qual
Extractable Petroleum Hydrocarbons (EPH-04-01)													
EPH Ranges													
C9 - C18 Aliphatic Hydrocarbons	700[1]	50,000[1]	µg/L	115	U	105	U	108	U	115	U	106	U
C19 - C36 Aliphatic Hydrocarbons	5,000	50,000[1]	µg/L	115	U	105	U	108	U	115	U	106	U
C11-C22 Aromatic Hydrocarbons	200	5,000[1]	µg/L	115	U	105	U	108	U	115	U	106	U
Target PAH Analytes													
2-Methylnaphthalene	10	20,000[1]	µg/L	0.46	U	0.421	U	0.43	U	0.46	U	0.426	U
Acenaphthene	20	6,000[1]	µg/L	0.46	U	0.421	U	0.43	U	0.46	U	0.426	U
Acenaphthylene	30[1]	40[1]	µg/L	0.46	U	0.421	U	0.43	U	0.46	U	0.426	U
Anthracene	60[1]	30[1]	µg/L	0.46	U	0.421	U	0.43	U	0.46	U	0.426	U
Benzo(a)anthracene	1	1,000	µg/L	0.46	U	0.421	U	0.43	U	0.46	U	0.426	U
Benzo(a)pyrene	0.2	500	µg/L	0.23	U	0.21	U	0.215	U	0.23	U	0.213	U
Benzo(b)fluoranthene	1	400	µg/L	0.46	U	0.421	U	0.43	U	0.46	U	0.426	U
Benzo(g,h,i)perylene	50[1]	20[1]	µg/L	0.46	U	0.421	U	0.43	U	0.46	U	0.426	U
Benzo(k)fluoranthene	1	100	µg/L	0.46	U	0.421	U	0.43	U	0.46	U	0.426	U
Chrysene	2	70[1]	µg/L	0.46	U	0.421	U	0.43	U	0.46	U	0.426	U
Dibenzo(a,h)anthracene	0.5	40	µg/L	0.46	U	0.421	U	0.43	U	0.46	U	0.426	U
Fluoranthene	90	200	µg/L	0.46	U	0.421	U	0.43	U	0.46	U	0.426	U
Fluorene	30[1]	40[1]	µg/L	0.46	U	0.421	U	0.43	U	0.46	U	0.426	U
Indeno(1,2,3-cd)pyrene	0.5	100	µg/L	0.46	U	0.421	U	0.43	U	0.46	U	0.426	U
Naphthalene	140	20,000	µg/L	0.46	U	0.421	U	0.43	U	0.46	U	0.426	U
Phenanthrene	40[1]	10,000[1]	µg/L	0.46	U	0.421	U	0.43	U	0.46	U	0.426	U
Pyrene	80	20	µg/L	0.46	U	0.421	U	0.43	U	0.46	U	0.426	U

Notes:

[1] Revised GW-1 or GW-3 standard effective February 14, 2008.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Devens Consolidation Landfill
May 2007

Method / Analyte	MCP GW-1 Standard	MCP GW-3 Standard	Units	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-06A	Qual	LFM-03-07	Qual	LFM-03-07 Duplicate	Qual
PESTICIDES													
METHOD SW-846 8081A													
Hexachlorobenzene[1]	1	6,000	µg/L	NA		NA		NA		NA		NA	
4,4'-DDD	0.2	50	µg/L	0.0435	U	0.043	U	0.0426	U	0.04	U	0.0421	U
4,4'-DDE	0.05[8]	400	µg/L	0.0435	U	0.043	U	0.0426	U	0.04	U	0.0421	U
4,4'-DDT	0.3	1	µg/L	0.0435	U	0.043	U	0.0426	U	0.04	U	0.0421	U
Aldrin	0.5	20	µg/L	0.0217	U	0.0215	U	0.0213	U	0.02	U	0.021	U
alpha-BHC	500	NS	µg/L	0.022	UJ	0.0215	U	0.0213	U	0.02	U	0.021	U
alpha-Chlordane[2]	2	2	µg/L	0.0217	U	0.0215	U	0.0213	U	0.02	U	0.021	U
beta-BHC	100	NS	µg/L	0.0217	U	0.0215	U	0.0213	U	0.02	U	0.021	U
delta-BHC	100	NS	µg/L	0.0217	U	0.0215	U	0.0213	U	0.02	U	0.021	U
Dieldrin	0.1	0.5	µg/L	0.0435	U	0.043	U	0.0426	U	0.04	U	0.0421	U
Endosulfan I	0.1	NS	µg/L	0.0217	U	0.0215	U	0.0213	U	0.02	U	0.021	U
Endosulfan II[3]	10	2	µg/L	0.0435	U	0.043	U	0.0426	U	0.04	U	0.0421	U
Endosulfan sulfate[4]	0.1	NS	µg/L	0.0435	U	0.043	U	0.0426	U	0.04	U	0.0421	U
Endrin	2	5	µg/L	0.0435	U	0.043	U	0.0426	U	0.04	U	0.0421	U
Endrin aldehyde[5]	100	NS	µg/L	0.0435	U	0.043	U	0.0426	U	0.04	U	0.0421	U
Endrin ketone[6]	100	NS	µg/L	0.0435	U	0.043	U	0.0426	U	0.04	U	0.0421	U
gamma-BHC (1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer or Lindane)	0.2	4	µg/L	0.0217	U	0.0215	U	0.0213	U	0.02	U	0.021	U
gamma-Chlordane[2]	2	2	µg/L	0.0217	U	0.0215	U	0.0213	U	0.02	U	0.021	U
Heptachlor	0.4	1	µg/L	0.0217	U	0.0215	U	0.0213	U	0.02	U	0.021	U
Heptachlor epoxide	0.2	2	µg/L	0.0217	U	0.0215	U	0.0213	U	0.02	U	0.021	U
Methoxychlor	40	10	µg/L	0.0217	U	0.0215	U	0.0213	U	0.02	U	0.21	U
Total Chlordane[2]	2	2	µg/L	0.0215	U	0.0215	U	0.0213	U	0.02	U	0.021	U
Toxaphene[7]	100	NS	µg/L	0.543	U	0.538	U	0.532	U	0.5	U	0.526	U

Notes:

[1] Hexachlorobenzene was inadvertently left off of the analyte list for the May 2007 sampling event but will be reinstated for future events.

[2] Technical Chlordane: MCP GW-1 Standard is based on technical chlordane or total chlordane (the sum of all multi-component isomers found in technical chlordane).

[3] Endosulfan II: MCP standard is for endosulfan.

[4] Endosulfan sulfate: no current MCP standard; listed value is from 1995 MCP.

[5] Endrin aldehyde: no current MCP standard; listed value is from 1995 MCP.

[6] Endrin ketone: no MCP standard: listed value is for endrin aldehyde

[7] Toxaphene: no current MCP standard; listed value is from 1995 MCP.

[8] Revised GW-1 or GW-3 standard effective February 14, 2008.

Devens Consolidation Landfill
May 2007

Method / Analyte	MCP GW-1 Standard[1]	MCP GW-3 Standard	Units	Landfill Concentration	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-06A	Qual	LFM-03-07	Qual	LFM-03-07 Duplicate	Qual
ICP TOTAL METALS (6010B)				**Result; # locations**										
Arsenic (SW-846 method 7060A)	10	900	µg/L	18; 1	5	U	2.4	J	5	U	2.3	J	5	U
Barium	2,000	50,000	µg/L	0.2; 1	5.1	J	9.4	J	1.4	J	5.3	J	5.6	J
Cadmium	5	4	µg/L	NR	5	U	5	U	5	U	5	U	5	U
Chromium	100	300	µg/L	69; 2	10	U	10	U	10	U	10	U	10	U
Copper	NS	NS	µg/L	57; 1	10	U	10	U	10	U	2.6	J	10	U
Iron	NS	NS	µg/L	24,000; 6	50	U	70		100		50	U	50	U
Lead (SW-846 method 7421)	15	10	µg/L	17; 3	10	U	10	U	10	U	10	U	10	U
Manganese	NS	NS	µg/L	82; 6	1.1	J	3.9	J	29		0.7	J	0.7	J
Silver	100	7	µg/L	NR	7	U	7	U	7	U	7	U	7	U
Selenium	50	100	µg/L	NR	10	U	10	U	10	U	10	U	2.9	J
Mercury (SW-846 method 7470A)	2	20	µg/L	NR	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
WET CHEMISTRY	RLs													
TDS (160.1)														
Solids, Total Dissolved	NS	NS	mg/L	NR	250	J	180	J	470	J	270	J	260	J
ANIONS (300)			mg/L											
Chloride	NS	NS	mg/L	246 mg/L; 9	56		34		85		62		62	
Sulfate	NS	NS	mg/L	27.7 mg/L; 8	32		24		31		32		32	
Nitrate/Nitrite (353.2)			mg/L											
Nitrate/Nitrite (as N)	NS	NS	mg/L	1.5 mg/L; 7	0.5		0.46		0.64		0.93		0.91	
ALKALINITY, TOTAL (2320B)			mg/L											
as CaCO3 (mg/L)	NS	NS	mg/L	140 mg/L; 8	74		54		150		82		81	
CYANIDE (335.2)			mg/L											
Cyanide, Total (mg/L)	0.2	0.03	mg/L	NR	0.01	UJ	0.01	UJ	0.01	UJ	0.01	UJ	0.01	UJ
COD (410.4)			mg/L											
Chemical Oxygen Demand (mg/L)	NS	NS	mg/L	6.7	20	UJ	20	UJ	20	UJ	20	UJ	20	UJ
FIELD PARAMETERS														
Temperature, initial	NS	NS	° Celsius	NR	11.13		11.50		10.95		12.12		NA	
Temperature, final	NS	NS	° Celsius	NR	9.91		10.56		9.50		10.96		NA	
pH	NS	NS	Std units	NR	6.15		5.81		7.38		6.06		NA	
Specific Conductance	NS	NS	µS/cm	NR	184		253		285		401		NA	
ORP/Eh[2]	NS	NS	mV	NR	200.8		220.0		192.1		169.0		NA	
Dissolved Oxygen	NS	NS	mg/L	NR	10.28		6.68		8.95		3.72		NA	
Turbidity	NS	NS	NTU	NR	0.00		3.60		0.60		0.50		NA	

Notes:

[1] MCP Standard: smaller of the 2003 Massachusetts groundwater standards GW-1 or GW-3; previous version of the MCP dated January 1995 did include RCGW-1 standards which were used when the listed GW-1 and GW-3 standards omitted the chemical.

[2] ORP/Eh: Number is from calibrated equipment, without the further post-observation temperature-correction.

NR = Pre-landfill results: Not Recorded in 2003 Remedial Action Closure Report.

Devens Consolidation Landfill
June 2008

Method / Analyte	MCP GW-1 Standard[1]	MCP GW-3 Standard	Units	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-06A	Qual	LFM-03-07	Qual	LFM-03-07 Duplicate	Qual
Volatile Petroleum Hydrocarbons (VPH-04-1.1)													
C5-C8 Aliphatic Hydrocarbons	300[2]	50,000[2]	µg/L	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
C9-C12 Aliphatic Hydrocarbons	700[2]	50,000[2]	µg/L	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
C9-C10 Aromatic Hydrocarbons	200	50,000[2]	µg/L	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
Methyl tert-butyl ether	70	50,000	µg/L	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U
Benzene	5	10,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
Toluene	1,000	40,000[2]	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
Ethylbenzene	700	5,000[2]	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
m,p -Xylenes[1]	10,000	5,000[2]	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
o -Xylene [1]	10,000	5,000[2]	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
Naphthalene	140	20,000	µg/L	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U

Notes:
[1] Regulatory standard is for total xylenes.
[2] Revised GW-1 or GW-3 standard effective February 14, 2008.
All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Devens Consolidation Landfill
June 2008

Method / Analyte	MCP GW-1 Standard	MCP GW-3 Standard	Units	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-06A	Qual	LFM-03-07	Qual	LFM-03-07 Duplicate	Qual
Extractable Petroleum Hydrocarbons (EPH-04-01)													
EPH Ranges													
C9 - C18 Aliphatic Hydrocarbons	700[1]	50,000[1]	µg/L	103	U	102	U	105	U	104	U	104	U
C19 - C36 Aliphatic Hydrocarbons	14,000	50,000[1]	µg/L	103	U	102	U	105	U	104	U	104	U
C11-C22 Aromatic Hydrocarbons	200	5,000[1]	µg/L	103	U	102	U	105	U	104	U	104	U
Target PAH Analytes													
2-Methylnaphthalene	10	20,000[1]	µg/L	0.412	U	0.408	U	0.421	U	0.417	U	0.417	U
Acenaphthene	20	6,000[1]	µg/L	0.412	U	0.408	U	0.421	U	0.417	U	0.417	U
Acenaphthylene	30[1]	40[1]	µg/L	0.412	U	0.408	U	0.421	U	0.417	U	0.417	U
Anthracene	60[1]	30[1]	µg/L	0.412	U	0.408	U	0.421	U	0.417	U	0.417	U
Benzo(a)anthracene	1	1,000	µg/L	0.412	U	0.408	U	0.421	U	0.417	U	0.417	U
Benzo(a)pyrene	0.2	500	µg/L	0.200	U	0.200	U	0.200	U	0.200	U	0.200	U
Benzo(b)fluoranthene	1	400	µg/L	0.412	U	0.408	U	0.421	U	0.417	U	0.417	U
Benzo(g,h,i)perylene	50[1]	20[1]	µg/L	0.412	U	0.408	U	0.421	U	0.417	U	0.417	U
Benzo(k)fluoranthene	1	100	µg/L	0.412	U	0.408	U	0.421	U	0.417	U	0.417	U
Chrysene	2	70[1]	µg/L	0.412	U	0.408	U	0.421	U	0.417	U	0.417	U
Dibenzo(a,h)anthracene	0.5	40	µg/L	0.412	U	0.408	U	0.421	U	0.417	U	0.417	U
Fluoranthene	90	200	µg/L	0.412	U	0.408	U	0.421	U	0.417	U	0.417	U
Fluorene	30[1]	40[1]	µg/L	0.412	U	0.408	U	0.421	U	0.417	U	0.417	U
Indeno(1,2,3-cd)pyrene	0.5	100	µg/L	0.412	U	0.408	U	0.421	U	0.417	U	0.417	U
Naphthalene	140	20,000	µg/L	0.412	U	0.408	U	0.421	U	0.417	U	0.417	U
Phenanthrene	40[1]	10,000[1]	µg/L	0.412	U	0.408	U	0.421	U	0.417	U	0.417	U
Pyrene	80	20	µg/L	0.412	U	0.408	U	0.421	U	0.417	U	0.417	U

Notes:

[1] Revised GW-1 or GW-3 standard effective February 14, 2008.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Devens Consolidation Landfill
June 2008

Method / Analyte	MCP GW-1 Standard	MCP GW-3 Standard	Units	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-06A	Qual	LFM-03-07	Qual	LFM-03-07 Duplicate	Qual
Organochlorine Pesticides (SW-846 8081A)													
Hexachlorobenzene[1]	1	6,000	µg/L	NA		NA		NA		NA		NA	
4,4'-DDD	0.2	50	µg/L	0.043	UJ	0.040	UJ	0.040	UJ	0.048	UJ	0.040	UJ
4,4'-DDE	0.05[8]	400	µg/L	0.043	UJ	0.040	UJ	0.040	UJ	0.048	UJ	0.040	UJ
4,4'-DDT	0.3	1	µg/L	0.043	UJ	0.040	UJ	0.040	UJ	0.048	UJ	0.040	UJ
Aldrin	0.5	20	µg/L	0.021	UJ	0.020	UJ	0.020	UJ	0.024	UJ	0.020	UJ
alpha-BHC	500	NS	µg/L	0.021	UJ	0.020	UJ	0.020	UJ	0.024	UJ	0.020	UJ
alpha-Chlordane[2]	2	2	µg/L	0.021	UJ	0.020	UJ	0.020	UJ	0.024	UJ	0.020	UJ
beta-BHC	100	NS	µg/L	0.021	UJ	0.020	UJ	0.020	UJ	0.024	UJ	0.020	UJ
delta-BHC	100	NS	µg/L	0.021	UJ	0.020	UJ	0.020	UJ	0.024	UJ	0.020	UJ
Dieldrin	0.1	0.5	µg/L	0.043	UJ	0.040	UJ	0.040	UJ	0.048	UJ	0.040	UJ
Endosulfan I	0.1	NS	µg/L	0.021	UJ	0.020	UJ	0.020	UJ	0.024	UJ	0.020	UJ
Endosulfan II[3]	10	2	µg/L	0.043	UJ	0.040	UJ	0.040	UJ	0.048	UJ	0.040	UJ
Endosulfan sulfate[4]	0.1	NS	µg/L	0.043	UJ	0.040	UJ	0.040	UJ	0.048	UJ	0.040	UJ
Endrin	2	5	µg/L	0.043	UJ	0.040	UJ	0.040	UJ	0.048	UJ	0.040	UJ
Endrin aldehyde[5]	100	NS	µg/L	0.043	UJ	0.040	UJ	0.040	UJ	0.048	UJ	0.040	UJ
Endrin ketone[6]	100	NS	µg/L	0.043	UJ	0.040	UJ	0.040	UJ	0.048	UJ	0.040	UJ
gamma-BHC (1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer or Lindane)	0.2	4	µg/L	0.021	UJ	0.020	UJ	0.020	UJ	0.024	UJ	0.020	UJ
gamma-Chlordane[2]	2	2	µg/L	0.021	UJ	0.020	UJ	0.020	UJ	0.024	UJ	0.020	UJ
Heptachlor	0.4	1	µg/L	0.021	UJ	0.020	UJ	0.020	UJ	0.024	UJ	0.020	UJ
Heptachlor epoxide	0.2	2	µg/L	0.021	UJ	0.020	UJ	0.020	UJ	0.024	UJ	0.020	UJ
Methoxychlor	40	10	µg/L	0.213	UJ	0.200	UJ	0.200	UJ	0.238	UJ	0.202	UJ
Total Chlordane[2]	2	2	µg/L	0.021	UJ	0.020	UJ	0.020	UJ	0.024	UJ	0.020	UJ
Toxaphene[7]	100	NS	µg/L	0.532	UJ	0.500	UJ	0.500	UJ	0.595	UJ	0.505	UJ

Notes:

[1] Hexachlorobenzene was inadvertently left off of the analyte list for the June 2008 sampling event but will be reinstated for future events.

[2] Technical Chlordane: MCP GW-1 Standard is based on technical chlordane or total chlordane (the sum of all multi-component isomers found in technical chlordane).

[3] Endosulfan II: MCP standard is for endosulfan.

[4] Endosulfan sulfate: no current MCP standard; listed value is from 1995 MCP.

[5] Endrin aldehyde: no current MCP standard; listed value is from 1995 MCP.

[6] Endrin ketone: no MCP standard: listed value is for endrin aldehyde

[7] Toxaphene: no current MCP standard; listed value is from 1995 MCP.

[8] Revised GW-1 or GW-3 standard effective February 14, 2008.

Devens Consolidation Landfill
June 2008

Method / Analyte	MCP GW-1 Standard[1]	MCP GW-3 Standard	Units	Highest Pre-Landfill Concentration	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-06A	Qual	LFM-03-07	Qual	LFM-03-07 Duplicate	Qual
ICP TOTAL METALS (6010B)				**Result; # locations**										
Arsenic	10	900	µg/L	18; 1	5	U	5	U	2.7	J	5	U	5	U
Barium	2,000	50,000	µg/L	0.2; 1	6.1	J	7.7	J	10	U	12		12	
Cadmium	5	4	µg/L	NR	5	U	5	U	5	U	5	U	5	U
Chromium	100	300	µg/L	69; 2	10	U	10	U	10	U	10	U	10	U
Copper	NS	NS	µg/L	57; 1	10	U	10	U	10	U	10	U	10	U
Iron	9,100	NS	µg/L	24,000; 6	50	U	50	U	50	U	50	U	50	U
Lead	15	10	µg/L	17; 3	10	U	10	U	10	U	10	U	10	U
Manganese	291	NS	µg/L	82; 6	10	U	10	U	47		10	U	10	U
Selenium	50	100	µg/L	NR	10	U	10	U	10	U	10	U	10	U
Silver	100	7	µg/L	NR	7	U	7	U	7	U	7	U	7	U
Mercury (SW-846 method 7470A)	2	20	µg/L	NR	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
WET CHEMISTRY	RLs													
TDS (160.1)														
Solids, Total Dissolved	NS	NS	mg/L	NR	240		220		330		570		570	
ANIONS (300)														
Chloride	NS	NS	mg/L	246 mg/L; 9	74		57		64		200		220	
Sulfate	NS	NS	mg/L	27.7 mg/L; 8	20		21		29		29		29	
Nitrate/Nitrite (353.2)														
Nitrate/Nitrite (as N)	NS	NS	mg/L	1.5 mg/L; 7	0.43	J	0.60	J	0.38	J	1.3	J	1.3	J
ALKALINITY, TOTAL (2320B)														
Alkalinity as $CaCO_3$	NS	NS	mg/L	140 mg/L; 8	83		79		160		85		84	
CYANIDE (335.2)														
Cyanide, Total	0.2	0.03	mg/L	NR	0.005	U	0.005	U	0.005	U	0.005	U	0.005	U
COD (410.4)														
Chemical Oxygen Demand	NS	NS	mg/L	6.7	20	U	20	U	20	U	12	J	20	U
FIELD PARAMETERS														
Temperature, initial	NS	NS	° Celsius	NR	11.76		12.49		11.58		16.04		NA	
Temperature, final	NS	NS	° Celsius	NR	11.03		10.98		9.87		12.85		NA	
pH	NS	NS	Std units	NR	6.32		6.09		7.28		8.14		NA	
Specific Conductance	NS	NS	µS/cm	NR	416		4		5		843		NA	
ORP/Eh[2]	NS	NS	mV	NR	160.7		116.1		57.2		130.0		NA	
Dissolved Oxygen	NS	NS	mg/L	NR	8.71		7.89		9.70		8.00		NA	
Turbidity	NS	NS	NTU	NR	2.80		0.58		0.23		2.00		NA	

Notes:

[1] MCP Standard: smaller of the 2003 Massachusetts groundwater standards GW-1 or GW-3; previous version of the MCP dated January 1995 did include RCGW-1 standards [illegible] were used when the listed GW-1 and GW-3 standards omitted the chemical.

[2] ORP/Eh: Number is from calibrated equipment, without the further post-observation temperature-correction.

NR = Pre-landfill results: Not Recorded in 2003 Remedial Action Closure Report.

Devens Consolidation Landfill
October 2008

Table 4.17	MCP GW-1 Standard[1]	MCP GW-3 Standard	Units	LFM-99-02B	Qual	LFM-99-05A	Qual	05A Duplicate	Qual	LFM-99-06A	Qual	LFM-03-07	Qual
Volatile Petroleum Hydrocarbons (VPH-04-1.1)													
C5-C8 Aliphatic Hydrocarbons	300[2]	50,000[2]	µg/L	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
C9-C12 Aliphatic Hydrocarbons	700[2]	50,000[2]	µg/L	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
C9-C10 Aromatic Hydrocarbons	200	50,000[2]	µg/L	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
Methyl tert-butyl ether	70	50,000	µg/L	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U
Benzene	5	10,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
Toluene	1,000	40,000[2]	µg/L	2.0	U	2.0	U	0.271	J	2.0	U	2.0	U
Ethylbenzene	700	5,000[2]	µg/L	0.324	J	2.0	U	2.0	U	2.0	U	2.0	U
m,p -Xylenes[1]	10,000	5,000[2]	µg/L	1.34	J	1.64	J	1.13	J	0.991	J	1.14	J
o -Xylene [1]	10,000	5,000[2]	µg/L	0.598	J	0.314	J	2.0	U	0.438	J	1.17	J
Naphthalene	140	20,000	µg/L	10.0	U	0.635	J	10.0	U	10.0	U	10.0	U

Notes:
[1] Regulatory standard is for total xylenes.
[2] Revised GW-1 or GW-3 standard effective February 14, 2008.
All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Devens Consolidation Landfill
October 2008

Method / Analyte	MCP GW-1 Standard	MCP GW-3 Standard	Units	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-05A Duplicate	Qual	LFM-99-06A	Qual	LFM-03-07	Qual
Extractable Petroleum Hydrocarbons (EPH-04-01)													
EPH Ranges													
C9 - C18 Aliphatic Hydrocarbons	700[1]	50,000[1]	µg/L	10.5	J	8.64	J	8.52	J	16.3	J	11.5	J
C19 - C36 Aliphatic Hydrocarbons	14,000	50,000[1]	µg/L	32.3	J	13.6	J	15	J	29.6	J	21.1	J
C11-C22 Aromatic Hydrocarbons	200	5,000[1]	µg/L	49	J	108	U	108	U	38.5	J	106	U
Target PAH Analytes													
2-Methylnaphthalene	10	20,000[1]	µg/L	0.430	U	0.430	U	0.430	U	0.400	U	0.426	U
Acenaphthene	20	6,000[1]	µg/L	0.430	U	0.430	U	0.430	U	0.400	U	0.426	U
Acenaphthylene	30[1]	40[1]	µg/L	0.430	U	0.430	U	0.430	U	0.400	U	0.426	U
Anthracene	60[1]	30[1]	µg/L	0.430	U	0.430	U	0.430	U	0.400	U	0.426	U
Benzo(a)anthracene	1	1,000	µg/L	0.430	U	0.430	U	0.430	U	0.400	U	0.426	U
Benzo(a)pyrene	0.2	500	µg/L	0.200	U	0.200	U	0.200	U	0.200	U	0.200	U
Benzo(b)fluoranthene	1	400	µg/L	0.430	U	0.430	U	0.430	U	0.400	U	0.426	U
Benzo(g,h,i)perylene	50[1]	20[1]	µg/L	0.430	U	0.430	U	0.430	U	0.400	U	0.426	U
Benzo(k)fluoranthene	1	100	µg/L	0.430	U	0.430	U	0.430	U	0.400	U	0.426	U
Chrysene	2	70[1]	µg/L	0.430	U	0.430	U	0.430	U	0.400	U	0.426	U
Dibenzo(a,h)anthracene	0.5	40	µg/L	0.430	U	0.430	U	0.430	U	0.400	U	0.426	U
Fluoranthene	90	200	µg/L	0.430	U	0.430	U	0.430	U	0.400	U	0.426	U
Fluorene	30[1]	40[1]	µg/L	0.430	U	0.430	U	0.430	U	0.400	U	0.426	U
Indeno(1,2,3-cd)pyrene	0.5	100	µg/L	0.430	U	0.430	U	0.430	U	0.400	U	0.426	U
Naphthalene	140	20,000	µg/L	0.430	U	0.218	U	0.430	U	0.218	J	0.426	U
Phenanthrene	40[1]	10,000[1]	µg/L	0.430	U	0.430	U	0.430	U	0.400	U	0.426	U
Pyrene	80	20	µg/L	0.430	U	0.430	U	0.430	U	0.400	U	0.426	U

Notes:

[1] Revised GW-1 or GW-3 standard effective February 14, 2008.

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Devens Consolidation Landfill
October 2008

Method / Analyte	MCP GW-1 Standard	MCP GW-3 Standard	Units	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-05A Duplicate	Qual	LFM-99-06A	Qual	LFM-03-07	Qual
Organochlorine Pesticides (SW-846 8081A)													
Hexachlorobenzene[1]	1	6,000	µg/L	NA		NA		NA		NA		NA	
4,4'-DDD	0.2	50	µg/L	0.042	UJ	0.042	U	0.040	UJ	0.041	U	0.043	U
4,4'-DDE	0.05[8]	400	µg/L	0.042	UJ	0.042	U	0.040	UJ	0.041	U	0.043	U
4,4'-DDT	0.3	1	µg/L	0.042	UJ	0.042	U	0.040	UJ	0.041	U	0.043	U
Aldrin	0.5	20	µg/L	0.021	UJ	0.021	U	0.020	UJ	0.020	U	0.021	U
alpha-BHC	500	NS	µg/L	0.021	UJ	0.021	U	0.020	UJ	0.020	U	0.021	U
alpha-Chlordane[2]	2	2	µg/L	0.021	UJ	0.021	U	0.020	UJ	0.020	U	0.021	U
beta-BHC	100	NS	µg/L	0.021	UJ	0.021	U	0.020	UJ	0.020	U	0.021	U
delta-BHC	100	NS	µg/L	0.021	UJ	0.021	U	0.020	UJ	0.020	U	0.021	U
Dieldrin	0.1	0.5	µg/L	0.042	UJ	0.042	U	0.040	UJ	0.041	U	0.043	U
Endosulfan I	0.1	NS	µg/L	0.021	UJ	0.021	U	0.020	UJ	0.020	U	0.021	U
Endosulfan II[3]	10	2	µg/L	0.042	UJ	0.042	U	0.040	UJ	0.041	U	0.043	U
Endosulfan sulfate[4]	0.1	NS	µg/L	0.042	UJ	0.042	U	0.040	UJ	0.041	U	0.043	U
Endrin	2	5	µg/L	0.042	UJ	0.042	U	0.040	UJ	0.041	U	0.043	U
Endrin aldehyde[5]	100	NS	µg/L	0.042	UJ	0.042	U	0.040	UJ	0.041	U	0.043	U
Endrin ketone[6]	100	NS	µg/L	0.042	UJ	0.042	U	0.040	UJ	0.041	U	0.043	U
gamma-BHC (1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer or Lindane)	0.2	4	µg/L	0.021	UJ	0.021	U	0.020	UJ	0.020	U	0.021	U
gamma-Chlordane[2]	2	2	µg/L	0.021	UJ	0.021	U	0.020	UJ	0.020	U	0.021	U
Heptachlor	0.4	1	µg/L	0.021	UJ	0.021	U	0.020	UJ	0.020	U	0.021	U
Heptachlor epoxide	0.2	2	µg/L	0.021	UJ	0.021	U	0.020	UJ	0.020	U	0.021	U
Methoxychlor	40	10	µg/L	0.208	UJ	0.210	U	0.200	UJ	0.204	U	0.213	U
Total Chlordane[2]	2	2	µg/L	0.021	UJ	0.021	U	0.020	UJ	0.020	U	0.021	U
Toxaphene[7]	100	NS	µg/L	0.521	UJ	0.526	U	0.500	UJ	0.510	U	0.532	U

Notes:

[1] Hexachlorobenzene was inadvertently left off of the analyte list for the October 2008 sampling event but will be reinstated for future events.

[2] Technical Chlordane: MCP GW-1 Standard is based on technical chlordane or total chlordane (the sum of all multi-component isomers found in technical chlordane).

[3] Endosulfan II: MCP standard is for endosulfan.

[4] Endosulfan sulfate: no current MCP standard; listed value is from 1995 MCP.

[5] Endrin aldehyde: no current MCP standard; listed value is from 1995 MCP.

[6] Endrin ketone: no MCP standard: listed value is for endrin aldehyde

[7] Toxaphene: no current MCP standard; listed value is from 1995 MCP.

[8] Revised GW-1 or GW-3 standard effective February 14, 2008.

Devens Consolidation Landfill
October 2008

Method / Analyte	MCP GW-1 Standard[1]	MCP GW-3 Standard	Units	Highest Pre-Landfill Concentration	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-05A Duplicate	Qual	LFM-99-06A	Qual	LFM-03-07	Qual
ICP TOTAL METALS (6010B)				**Result; # locations**										
Arsenic	10	900	µg/L	18; 1	5	U	5	U	5	U	2.5	J	5	U
Barium	2,000	50,000	µg/L	0.2; 1	5.8	J	12		11		2.4	J	11	
Cadmium	5	4	µg/L	NR	5	U	5	U	5	U	5	U	5	U
Chromium	100	300	µg/L	69; 2	10	U	10	U	10	U	10	U	10	U
Copper	NS	NS	µg/L	57; 1	10	U	10	U	10	U	10	U	10	U
Iron	9,100	NS	µg/L	24,000; 6	28	J	70		42	J	110		50	U
Lead	15	10	µg/L	17; 3	10	U	10	U	10	U	10	U	10	U
Manganese	291	NS	µg/L	82; 6	10	U	2.4	J	10	U	183		10	U
Selenium	50	100	µg/L	NR	10	U	10	U	10	U	10	U	10	U
Silver	100	7	µg/L	NR	7	U	7	U	7	U	7	U	7	U
Mercury (SW-846 method 7470A)	2	20	µg/L	NR	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
WET CHEMISTRY	RLs													
TDS (160.1)														
Solids, Total Dissolved	NS	NS	mg/L	NR	250		260		280		360		390	
ANIONS (300)														
Chloride	NS	NS	mg/L	246 mg/L; 9	77		64		65		79		140	
Sulfate	NS	NS	mg/L	27.7 mg/L; 8	17		21		21		28		28	
Nitrate/Nitrite (353.2)														
Nitrate/Nitrite (as N)	NS	NS	mg/L	1.5 mg/L; 7	1.9		0.57		0.58		0.41		0.94	
ALKALINITY, TOTAL (2320B)														
Alkalinity as $CaCO_3$	NS	NS	mg/L	140 mg/L; 8	84		110		105		160		89	
CYANIDE (335.2)														
Cyanide, Total	0.2	0.03	mg/L	NR	0.005	U	0.005	UJ	0.005	UJ	0.005	U	0.005	UJ
COD (410.4)														
Chemical Oxygen Demand	NS	NS	mg/L	6.7	12	J	20	U	20	U	9.4	J	20	U
FIELD PARAMETERS														
Temperature, initial	NS	NS	° Celsius	NR	12.19		11.28		NA		12.09		14.92	
Temperature, final	NS	NS	° Celsius	NR	11.84		10.97		NA		11.54		13.47	
pH	NS	NS	Std units	NR	7.00		6.93		NA		7.15		5.97	
Specific Conductance	NS	NS	µS/cm	NR	417		424		NA		6		654	
ORP/Eh[2]	NS	NS	mV	NR	55.2		61.8		NA		24.2		146.8	
Dissolved Oxygen	NS	NS	mg/L	NR	5.01		3.78		NA		7.07		5.97	
Turbidity	NS	NS	NTU	NR	1.00		2.33		NA		2.89		3.40	

Notes:

[1] MCP Standard: smaller of the 2003 Massachusetts groundwater standards GW-1 or GW-3; previous version of the MCP dated January 1995 did include RCGW-1 standards [illegible] were used when the listed GW-1 and GW-3 standards omitted the chemical.

[2] ORP/Eh: Number is from calibrated equipment, without the further post-observation temperature-correction.

NR = Pre-landfill results: Not Recorded in 2003 Remedial Action Closure Report.

Devens Consolidation Landfill
May 2009

Method	Analyte	MCP GW-1 Standard[1]	MCP GW-3 Standard[1]	Units	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-05A Duplicate	Qual	LFM-99-06A	Qual	LFM-03-07	Qual
Volatile Petroleum Hydrocarbons (VPH-04-1.1)	C5-C8 Aliphatic Hydrocarbons	300	50,000	µg/L	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	C9-C12 Aliphatic Hydrocarbons	700	50,000	µg/L	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	C9-C10 Aromatic Hydrocarbons	200	50,000	µg/L	50.0	U	50.0	U	50.0	U	50.0	U	50.0	U
	Methyl tert-butyl ether	70	50,000	µg/L	3.0	U	3.0	U	3.0	U	3.0	U	3.0	U
	Benzene	5	10,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Toluene	1,000	40,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Ethylbenzene	700	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	m,p -Xylenes	10,000	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	o -Xylene	10,000	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U
	Naphthalene	140	20,000	µg/L	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U
Extractable Petroleum Hydrocarbons (EPH-04-01)	C9 - C18 Aliphatic Hydrocarbons	700	50,000	µg/L	104	U	100	U	116	U	105	U	114	U
	C19 - C36 Aliphatic Hydrocarbons	14,000	50,000	µg/L	104	U	100	U	116	U	105	U	114	U
	C11-C22 Aromatic Hydrocarbons	200	5,000	µg/L	104	U	100	U	116	U	105	U	114	U
Target PAH Analytes	2-Methylnaphthalene	10	20,000	µg/L	0.414	U	0.400	U	0.465	U	0.419	U	0.454	U
	Acenaphthene	20	6,000	µg/L	0.414	U	0.400	U	0.465	U	0.419	U	0.454	U
	Acenaphthylene	30	40	µg/L	0.414	U	0.400	U	0.465	U	0.419	U	0.454	U
	Anthracene	60	30	µg/L	0.414	U	0.400	U	0.465	U	0.419	U	0.454	U
	Benzo(a)anthracene	1	1,000	µg/L	0.414	U	0.400	U	0.465	U	0.419	U	0.454	U
	Benzo(a)pyrene	0.2	500	µg/L	0.200	U	0.200	U	0.200	U	0.200	U	0.200	U
	Benzo(b)fluoranthene	1	400	µg/L	0.414	U	0.400	U	0.465	U	0.419	U	0.454	U
	Benzo(g,h,i)perylene	50	20	µg/L	0.414	U	0.400	U	0.465	U	0.419	U	0.454	U
	Benzo(k)fluoranthene	1	100	µg/L	0.414	U	0.400	U	0.465	U	0.419	U	0.454	U
	Chrysene	2	70	µg/L	0.414	U	0.400	U	0.465	U	0.419	U	0.454	U
	Dibenzo(a,h)anthracene	0.5	40	µg/L	0.414	U	0.400	U	0.465	U	0.419	U	0.454	U
	Fluoranthene	90	200	µg/L	0.414	U	0.400	U	0.465	U	0.419	U	0.454	U
	Fluorene	30	40	µg/L	0.414	U	0.400	U	0.465	U	0.419	U	0.454	U
	Indeno(1,2,3-cd)pyrene	0.5	100	µg/L	0.414	U	0.400	U	0.465	U	0.419	U	0.454	U
	Naphthalene	140	20,000	µg/L	0.414	U	0.400	U	0.465	U	0.419	U	0.454	U
	Phenanthrene	40	10,000	µg/L	0.414	U	0.400	U	0.465	U	0.419	U	0.454	U
	Pyrene	80	20	µg/L	0.414	U	0.400	U	0.465	U	0.419	U	0.454	U
Organochlorine Pesticides (SW-846 8081A)	Hexachlorobenzene	1	6,000	µg/L	0.200	U	0.0089	U	0.0087	J	0.220	U	0.0115	J
	4,4'-DDD	0.2	50	µg/L	0.040	UJ	0.044	U	0.047	UJ	0.044	UJ	0.046	U
	4,4'-DDE	0.05	400	µg/L	0.040	UJ	0.044	U	0.047	UJ	0.044	UJ	0.046	U
	4,4'-DDT	0.3	1	µg/L	0.040	UJ	0.044	U	0.047	UJ	0.044	UJ	0.046	U
	Aldrin	0.5	20	µg/L	0.020	UJ	0.022	U	0.024	UJ	0.021	UJ	0.023	U
	alpha-BHC	500	NS	µg/L	0.020	UJ	0.022	U	0.024	UJ	0.022	UJ	0.023	U
	alpha-Chlordane[2]	2	2	µg/L	0.020	UJ	0.022	UJ	0.024	UJ	0.022	UJ	0.023	U

Devens Consolidation Landfill
May 2009

Method	Analyte	MCP GW-1 Standard[1]	MCP GW-3 Standard[1]	Units	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-05A Duplicate	Qual	LFM-99-06A	Qual	LFM-03-07	Qual
Organochlorine Pesticides (SW-846 8081A) (continued)	beta-BHC	100	NS	µg/L	0.020	UJ	0.022	UJ	0.024	UJ	0.022	UJ	0.023	UJ
	delta-BHC	100	NS	µg/L	0.020	UJ	0.022	U	0.024	UJ	0.022	UJ	0.023	U
	Dieldrin	0.1	0.5	µg/L	0.040	UJ	0.044	U	0.047	UJ	0.044	UJ	0.046	U
	Endosulfan I	0.1	NS	µg/L	0.020	UJ	0.022	U	0.024	UJ	0.022	UJ	0.023	U
	Endosulfan II[3]	10	2	µg/L	0.040	UJ	0.044	U	0.047	UJ	0.044	UJ	0.046	U
	Endosulfan sulfate[4]	0.1	NS	µg/L	0.040	UJ	0.044	UJ	0.047	UJ	0.044	UJ	0.046	UJ
	Endrin	2	5	µg/L	0.040	UJ	0.044	U	0.047	UJ	0.044	UJ	0.046	U
	Endrin aldehyde[5]	100	NS	µg/L	0.040	UJ	0.044	UJ	0.047	UJ	0.044	UJ	0.046	UJ
	Endrin ketone[6]	100	NS	µg/L	0.040	UJ	0.044	UJ	0.047	UJ	0.044	UJ	0.046	UJ
	gamma-BHC (1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer or Lindane)	0.2	4	µg/L	0.020	UJ	0.022	U	0.024	UJ	0.022	UJ	0.023	U
	gamma-Chlordane[2]	2	2	µg/L	0.020	UJ	0.022	U	0.024	UJ	0.022	UJ	0.023	UJ
	Heptachlor	0.4	1	µg/L	0.020	UJ	0.022	U	0.024	UJ	0.022	UJ	0.023	U
	Heptachlor epoxide	0.2	2	µg/L	0.020	UJ	0.022	U	0.024	UJ	0.022	UJ	0.023	U
	Methoxychlor	40	10	µg/L	0.200	UJ	0.022	U	0.235	UJ	0.022	UJ	0.230	U
	Total Chlordane[2]	2	2	µg/L	0.020	UJ	0.022	U	0.024	UJ	0.022	UJ	0.023	U
	Toxaphene[7]	100	NS	µg/L	0.500	UJ	0.556	U	0.588	UJ	0.549	UJ	0.575	U
ICP TOTAL METALS (6010B)	Arsenic	10	900	µg/L	5	U	2	J	2.2	J	5	U	5	U
	Barium	2,000	50,000	µg/L	4.6	J	9.9	J	10	J	10	U	9.6	J
	Cadmium	5	4	µg/L	5	U	5	U	5	U	5	U	5	U
	Chromium	100	300	µg/L	10	U	20		20		10	U	2	J
	Copper	NS	NS	µg/L	10	U	10	U	10	U	10	U	10	U
	Iron	9,100	NS	µg/L	50	U	510		520		100		50	U
	Lead	15	10	µg/L	10	U	2	J	1.9	J	10	U	1.9	J
	Manganese	291	NS	µg/L	10	U	21		22		15		10	U
	Selenium	50	100	µg/L	10	U	10	U	10	U	10	U	10	U
	Silver	100	7	µg/L	7	U	7	U	7	U	7	U	7	U
	Mercury (SW-846 method 7470A)	2	20	µg/L	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Polychlorinated Biphenyls (PCBs) (73,8082)	Aroclor 1016	NS	NS	µg/L	0.258	U	0.298	U	0.287	U	0.278	U	0.287	U
	Aroclor 1221	NS	NS	µg/L	0.258	U	0.298	U	0.287	U	0.278	U	0.287	U
	Aroclor 1232	NS	NS	µg/L	0.258	U	0.298	U	0.287	U	0.278	U	0.287	U
	Aroclor 1242	NS	NS	µg/L	0.258	U	0.298	U	0.287	U	0.278	U	0.287	U
	Aroclor 1248	NS	NS	µg/L	0.258	U	0.298	U	0.287	U	0.278	U	0.287	U
	Aroclor 1254	NS	NS	µg/L	0.258	U	0.298	U	0.287	U	0.278	U	0.287	U
	Aroclor 1260	NS	NS	µg/L	0.258	U	0.298	U	0.287	U	0.278	U	0.287	U
WET CHEMISTRY TDS (160.1)	Solids, Total Dissolved	NS	NS	mg/L	250		220		200		300		360	

Devens Consolidation Landfill
May 2009

Method	Analyte	MCP GW-1 Standard[1]	MCP GW-3 Standard[1]	Units	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-05A Duplicate	Qual	LFM-99-06A	Qual	LFM-03-07	Qual
ANIONS (300)	Chloride	NS	NS	mg/L	91		56		55		78		140	
	Sulfate	NS	NS	mg/L	17		20		20		27		28	
Nitrate/Nitrite (353.2)	Nitrate/Nitrite (as N)	NS	NS	mg/L	0.92		0.55		0.57		0.41		1	J
ALKALINITY, TOTAL (2320B)	Alkalinity as $CaCO_3$	NS	NS	mg/L	64		91		92		140		82	
CYANIDE (335.2)	Cyanide, Total	0.2	0.03	mg/L	0.005	U	0.020	J	0.005	U	0.005	U	0.005	U
COD (410.4)	Chemical Oxygen Demand	NS	NS	mg/L	20	U	8.1	J	20	U	10	J	20	U
FIELD PARAMETERS	Temperature, initial	NS	NS	° Celsius	9.02		10.34		NA		8.20		9.38	
	Temperature, final	NS	NS	° Celsius	8.79		10.19		NA		8.08		9.12	
	pH	NS	NS	Std units	5.57		6.08		NA		7.34		5.96	
	Specific Conductance	NS	NS	μS/cm	480		459		NA		627		731	
	ORP/Eh	NS	NS	mV	215.4		122		NA		75.70		125.10	
	Dissolved Oxygen	NS	NS	mg/L	3.50		4.51		NA		8.85		7.10	
	Turbidity	NS	NS	NTU	0.00		4.1		NA		4.40		3.18	

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] GW-1 or GW-3 standard effective June 26, 2009.

[2] Technical Chlordane: MCP GW-1 Standard is based on technical chlordane or total chlordane (the sum of all multi-component isomers found in technical chlordane).

[3] Endosulfan II: MCP standard is for endosulfan.

[4] Endosulfan sulfate: no current MCP standard; listed value is from 1995 MCP.

[5] Endrin aldehyde: no current MCP standard; listed value is from 1995 MCP.

[6] Endrin ketone: no MCP standard: listed value is for endrin aldehyde.

[7] Toxaphene: no current MCP standard; listed value is from 1995 MCP.

Devens Consolidation Landfill
November 2009

Method	Analyte	MCP GW-1 Standard[1]	MCP GW-3 Standard[1]	Units	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-05A Duplicate	Qual	LFM-99-06A	Qual
Volatile Petroleum Hydrocarbons (VPH-04-1.1)	C5-C8 Aliphatic Hydrocarbons	300	50,000	µg/L	50.0	U	50.0	U	50.0	U	50.0	U
	C9-C12 Aliphatic Hydrocarbons	700	50,000	µg/L	5.0	J	22.5	J	50.0	U	21.7	J
	C9-C10 Aromatic Hydrocarbons	200	50,000	µg/L	50.0	U	2.95	J	50.0	U	2.3	J
	Methyl tert-butyl ether	70	50,000	µg/L	3.0	U	3.0	U	3.0	U	3.0	U
	Benzene	5	10,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U
	Toluene	1,000	40,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U
	Ethylbenzene	700	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U
	m,p -Xylenes	10,000	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U
	o -Xylene	10,000	5,000	µg/L	2.0	U	2.0	U	2.0	U	2.0	U
	Naphthalene	140	20,000	µg/L	1.66	J	10.0	U	10.0	U	0.879	J
Extractable Petroleum Hydrocarbons (EPH-04-01)	C9 - C18 Aliphatic Hydrocarbons	700	50,000	µg/L	271		15.6	J	102	J	104	U
	C19 - C36 Aliphatic Hydrocarbons	14,000	50,000	µg/L	175		53.5	J	1080	J	104	U
	C11-C22 Aromatic Hydrocarbons	200	5,000	µg/L	**398**		105	U	**473**	J	104	U
Target PAH Analytes	2-Methylnaphthalene	10	20,000	µg/L	0.400	U	0.421	UJ	0.421	U	0.417	U
	Acenaphthene	20	6,000	µg/L	0.400	U	0.421	UJ	0.421	U	0.417	U
	Acenaphthylene	30	40	µg/L	0.400	U	0.421	UJ	0.421	U	0.417	U
	Anthracene	60	30	µg/L	0.400	U	0.421	UJ	0.421	U	0.417	U
	Benzo(a)anthracene	1	1,000	µg/L	0.400	U	0.421	UJ	**1.04**	J	0.417	U
	Benzo(a)pyrene	0.2	500	µg/L	0.200	U	0.200	UJ	**1.20**	J	0.200	U
	Benzo(b)fluoranthene	1	400	µg/L	0.400	U	0.421	UJ	**1.42**	J	0.417	U
	Benzo(g,h,i)perylene	50	20	µg/L	0.400	U	0.421	UJ	0.911	J	0.417	U
	Benzo(k)fluoranthene	1	100	µg/L	0.400	U	0.421	UJ	**1.02**	J	0.417	U
	Chrysene	2	70	µg/L	0.400	U	0.421	UJ	1.24	J	0.417	U
	Dibenzo(a,h)anthracene	0.5	40	µg/L	0.400	U	0.421	UJ	0.638		0.417	U
	Fluoranthene	90	200	µg/L	0.400	U	0.421	UJ	3.09	J	0.417	U
	Fluorene	30	40	µg/L	0.400	U	0.421	UJ	0.421	U	0.417	U
	Indeno(1,2,3-cd)pyrene	0.5	100	µg/L	0.400	U	0.421	UJ	1.17	J	0.417	U
	Naphthalene	140	20,000	µg/L	0.400	U	0.421	UJ	0.421	U	0.417	U
	Phenanthrene	40	10,000	µg/L	0.400	U	0.421	UJ	1.6	J	0.417	U
	Pyrene	80	20	µg/L	0.400	U	0.421	UJ	2.35	J	0.417	U
Organochlorine Pesticides (SW-846 8081A)	Hexachlorobenzene	1	6,000	µg/L	0.02	UJ	0.022	UJ	0.021	UJ	0.022	UJ
	4,4'-DDD	0.2	50	µg/L	0.040	UJ	0.044	UJ	0.042	UJ	0.044	UJ
	4,4'-DDE	0.05[8]	400	µg/L	0.040	UJ	0.044	UJ	0.042	UJ	0.044	UJ
	4,4'-DDT	0.3	1	µg/L	0.040	UJ	0.044	UJ	0.042	UJ	0.044	UJ
	Aldrin	0.5	20	µg/L	0.020	UJ	0.022	UJ	0.021	UJ	0.022	UJ
	alpha-BHC	500	NS	µg/L	0.020	UJ	0.022	UJ	0.021	UJ	0.022	UJ
	alpha-Chlordane[2]	2	2	µg/L	0.020	UJ	0.022	UJ	0.021	UJ	0.022	UJ
	beta-BHC	100	NS	µg/L	0.020	UJ	0.022	UJ	0.021	UJ	0.022	UJ

Devens Consolidation Landfill
November 2009

Method	Analyte	MCP GW-1 Standard[1]	MCP GW-3 Standard[1]	Units	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-05A Duplicate	Qual	LFM-99-06A	Qual
Organochlorine Pesticides (SW-846 8081A) (continued)	delta-BHC	100	NS	µg/L	0.020	UJ	0.022	UJ	0.021	UJ	0.022	UJ
	Dieldrin	0.1	0.5	µg/L	0.040	UJ	0.044	UJ	0.042	UJ	0.044	UJ
	Endosulfan I	0.1	NS	µg/L	0.020	UJ	0.022	UJ	0.021	UJ	0.022	UJ
	Endosulfan II[3]	10	2	µg/L	0.040	UJ	0.044	UJ	0.042	UJ	0.044	UJ
	Endosulfan sulfate[4]	0.1	NS	µg/L	0.040	UJ	0.044	UJ	0.042	UJ	0.044	UJ
	Endrin	2	5	µg/L	0.040	UJ	0.044	UJ	0.042	UJ	0.044	UJ
	Endrin aldehyde[5]	100	NS	µg/L	0.040	UJ	0.044	UJ	0.042	UJ	0.044	UJ
	Endrin ketone[6]	100	NS	µg/L	0.040	UJ	0.044	UJ	0.042	UJ	0.044	UJ
	gamma-BHC (1,2,3,4,5,6-hexachlorocyclohexane, gamma isomer or Lindane)	0.2	4	µg/L	0.020	UJ	0.022	UJ	0.021	UJ	0.022	UJ
	gamma-Chlordane[7]	2	2	µg/L	0.020	UJ	0.022	UJ	0.021	UJ	0.022	UJ
	Heptachlor	0.4	1	µg/L	0.020	UJ	0.022	UJ	0.021	UJ	0.022	UJ
	Heptachlor epoxide	0.2	2	µg/L	0.020	UJ	0.022	UJ	0.021	UJ	0.022	UJ
	Methoxychlor	40	10	µg/L	0.200	UJ	0.217	UJ	0.210	UJ	0.217	UJ
	Total Chlordane[7]	2	2	µg/L	0.020	UJ	0.022	UJ	0.021	UJ	0.022	UJ
	Toxaphene[8]	100	NS	µg/L	0.500	UJ	0.543	UJ	0.526	UJ	0.543	UJ
ICP TOTAL METALS (6010B)	Arsenic	10	900	µg/L	5	U	5	U	5	U	3.7	J
	Barium	2,000	50,000	µg/L	NA		NA		NA		NA	
	Cadmium	5	4	µg/L	5	U	5	U	5	U	0.8	J
	Chromium	100	300	µg/L	NA		NA		NA		NA	
	Copper	NS	NS	µg/L	NA		NA		NA		NA	
	Iron	9,100	NS	µg/L	32	J	20	J	19	J	4900	
	Lead	15	10	µg/L	10	U	10	U	10	U	10	U
	Manganese	291	NS	µg/L	10	U	10	U	10	U	253	
	Selenium	50	100	µg/L	NA		NA		NA		NA	
	Silver	100	7	µg/L	NA		NA		NA		NA	
	Mercury (SW-846 method 7470A)	2	20	µg/L	NA		NA		NA		NA	
WET CHEMISTRY TDS (160.1)	Solids, Total Dissolved	NS	NS	mg/L	300	J	340	J	340	J	450	
ANIONS (300)	Chloride	NS	NS	mg/L	120		130		130		160	
	Sulfate	NS	NS	mg/L	21		19		19		27	
Nitrate/Nitrite (353.2)	Nitrate/Nitrite (as N)	NS	NS	mg/L	0.64	J	0.46	J	0.46	J	0.41	J
ALKALINITY, TOTAL (2320B)	Alkalinity as $CaCO_3$	NS	NS	mg/L	96		100		100		150	
CYANIDE (335.2)	Cyanide, Total	0.2	0.03	mg/L	0.005	U	0.005	U	0.005	U	0.005	U
COD (410.4)	Chemical Oxygen Demand	NS	NS	mg/L	20	U	20	U	20	U	20	U

Devens Consolidation Landfill
November 2009

Method	Analyte	MCP GW-1 Standard[1]	MCP GW-3 Standard[1]	Units	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-05A Duplicate	Qual	LFM-99-06A	Qual
Polychlorinated biphenyl (PCBs) (73, 8082)	Arochlor 1016	NS	NS	µg/L	0.250	U	0.266	U	0.263	U	0.260	U
	Arochlor 1221	NS	NS	µg/L	0.250	U	0.266	U	0.263	U	0.260	U
	Arochlor 1232	NS	NS	µg/L	0.250	U	0.266	U	0.263	U	0.260	U
	Arochlor 1242	NS	NS	µg/L	0.250	U	0.266	U	0.263	U	0.260	U
	Arochlor 1248	NS	NS	µg/L	0.250	U	0.266	U	0.263	U	0.260	U
	Arochlor 1254	NS	NS	µg/L	0.250	U	0.266	U	0.263	U	0.260	U
	Arochlor 1260	NS	NS	µg/L	0.250	U	0.266	U	0.263	U	0.260	U
FIELD PARAMETERS	Temperature, initial	NS	NS	° Celsius	12.69		12.97		NA		14.4	
	Temperature, final	NS	NS	° Celsius	12.03		11.57		NA		12.4	
	pH	NS	NS	Std units	6.17		5.89		NA		7.12	
	Specific Conductance	NS	NS	µS/cm	615		666		NA		829	
	ORP/Eh[2]	NS	NS	mV	311.3		173.70		NA		270.5	
	Dissolved Oxygen	NS	NS	mg/L	5.5		4.2		NA		5.81	
	Turbidity	NS	NS	NTU	3.82		4.67		NA		6.97	

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] GW-1 or GW-3 standard effective June 26, 2009.

[2] Regulatory Standard is for total xylenes.

[3] Endosulfan II: MCP standard is for endosulfan.

[4] Endosulfan sulfate: no current MCP Standar; listed value is from the 1995 MCP.

[5] Endrin aldehyde: no current MCP standard; listed value is from 1995 MCP.

[6] Endrin ketone: no MCP standard: listed value is for endrin aldehyde.

[7] Technical Chlordane: MCP GW-1 Standard is based on technical chlordane or total chlordane (the sum of all multi-component isomers found in technical chlordane).

[8] Toxaphene: no current MCP standard: listed value is from 1995 MCP.

NR= pre-landfill results: Not recorded in 2003 Remedial Action Closure Report.

Devens Consolidation Landfill
January 2010

Method	Analyte	MCP GW-1 Standard[1]	MCP GW-3 Standard[1]	Units	LFM-99-02B	Qual	LFM-99-05A	Qual	LFM-99-05A Duplicate	Qual	LFM-99-06A	Qual
Extractable Petroleum Hydrocarbons (EPH-04-01)	C9 - C18 Aliphatic Hydrocarbons	700	50,000	µg/L	105	U	100	U	100	U	NA	
	C19 - C36 Aliphatic Hydrocarbons	14,000	50,000	µg/L	105	U	100	U	100	U	NA	
	C11-C22 Aromatic Hydrocarbons	200	5,000	µg/L	105	U	100	U	100	U	NA	
Target PAH Analytes	2-Methylnaphthalene	10	20,000	µg/L	0.421	U	0.400	U	0.400	U	NA	
	Acenaphthene	20	6,000	µg/L	0.421	U	0.400	U	0.400	U	NA	
	Acenaphthylene	30	40	µg/L	0.421	U	0.400	U	0.400	U	NA	
	Anthracene	60	30	µg/L	0.421	U	0.400	U	0.400	U	NA	
	Benzo(a)anthracene	1	1,000	µg/L	0.421	U	0.400	U	0.400	U	NA	
	Benzo(a)pyrene	0.2	500	µg/L	0.200	U	0.200	U	0.200	U	NA	
	Benzo(b)fluoranthene	1	400	µg/L	0.421	U	0.400	U	0.400	U	NA	
	Benzo(g,h,i)perylene	50	20	µg/L	0.421	U	0.400	U	0.400	U	NA	
	Benzo(k)fluoranthene	1	100	µg/L	0.421	U	0.400	U	0.400	U	NA	
	Chrysene	2	70	µg/L	0.421	U	0.400	U	0.400	U	NA	
	Dibenzo(a,h)anthracene	0.5	40	µg/L	0.421	U	0.400	U	0.400	U	NA	
	Fluoranthene	90	200	µg/L	0.421	U	0.400	U	0.400	U	NA	
	Fluorene	30	40	µg/L	0.421	U	0.400	U	0.400	U	NA	
	Indeno(1,2,3-cd)pyrene	0.5	100	µg/L	0.421	U	0.400	U	0.400	U	NA	
	Naphthalene	140	20,000	µg/L	0.421	U	0.400	U	0.400	U	NA	
	Phenanthrene	40	10,000	µg/L	0.421	U	0.400	U	0.400	U	NA	
	Pyrene	80	20	µg/L	0.421	U	0.400	U	0.400	U	NA	
ICP TOTAL METALS (6010B)	Arsenic	10	900	µg/L	5	U	5	U	5	U	3.6	J
	Barium	2,000	50,000	µg/L	7.6	J	14		14		1.9	J
	Cadmium	5	4	µg/L	5	U	5	U	5	U	5	U
	Chromium	100	300	µg/L	10	U	40		40		**170**	
	Copper	NS	NS	µg/L	10	U	10	U	10	U	10	U
	Iron	9,100	NS	µg/L	50	U	380		340		1,500	
	Lead	15	10	µg/L	10	U	10	U	10	U	10	U
	Manganese	291	NS	µg/L	10	U	9.1	J	8.1	J	88	
	Selenium	50	100	µg/L	10	U	10	U	10	U	10	U
	Silver	100	7	µg/L	7	U	7	U	7	U	7	U
	Mercury (SW-846 method 7470A)	2	20	µg/L	0.2	U	0.2	U	0.2	U	0.2	U
FIELD PARAMETERS	Temperature, initial	NS	NS	° Celsius	9.73		9.67		NA		7.1	
	Temperature, final	NS	NS	° Celsius	9.85		9.92		NA		7.7	
	pH	NS	NS	Std units	6.22		6.37		NA		7.1	
	Specific Conductance	NS	NS	µS/cm	622		598		NA		328.0	
	ORP/Eh	NS	NS	mV	112.6		68.70		NA		51.0	
	Dissolved Oxygen	NS	NS	mg/L	7.8		5.0		NA		11.0	
	Turbidity	NS	NS	NTU	0.00		6.20		NA		18.0	

Notes:

All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

[1] GW-1 or GW-3 standard effective June 26, 2009.

SITE INSPECTION

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: Devens Consolidation Landfill	**Date of inspection:** 4/29/10
Location and Region: Devens, MA	**EPA ID:** MAT210025154
Company leading the five-year review: Hydrogeologic, Inc	**Weather/temperature:** ~60°F, sunny + windy

Remedy Includes: (Check all that apply)

- X Landfill cover/containment
- Access controls
- X Institutional controls
- Groundwater pump and treatment
- Surface water collection and treatment
- X Other leachate collection + transfer to POTW
- Monitored natural attenuation
- Groundwater containment
- Vertical barrier walls

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Peter Dack (Name) Project Manager (Title) 5/27/10 (Date)
   Interviewed at site (at office) by phone Phone no. _____
   Problems, suggestions; Report attached No problems/issues.

2. **O&M staff** Michael Jackson (Name) Geologist (Title) 5/27/10 (Date)
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; Report attached No problems/issues

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency Devens Fire Dept.
Contact Adams (Name) Deputy Fire Chief (Title) 5/27/10 (Date) 978-772-4600 (Phone no.)
Problems; suggestions; Report attached no problems to date.

Agency MA State Police @ Devens
Contact (Name) (Title) 5/27/10 (Date) 978-772-7200 (Phone no.)
Problems; suggestions; Report attached deferred to Devens Fire Dept.

Agency ~~Ayer~~ Harvard Board of Health response pending
Contact (Name) (Title) (Date) 978-772-8213 (Phone no.)
Problems; suggestions; Report attached

Agency
Contact (Name) (Title) (Date) (Phone no.)
Problems; suggestions; Report attached

4. **Other interviews** (optional) Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1.	**O&M Documents**			
	O&M manual	X Readily available	X Up to date	N/A
	As-built drawings	X Readily available	X Up to date	N/A
	Maintenance logs	X Readily available	X Up to date	N/A
	Remarks			
2.	**Site-Specific Health and Safety Plan**	X Readily available	X Up to date	N/A
	Contingency plan/emergency response plan	X Readily available	X Up to date	N/A
	Remarks			
3.	**O&M and OSHA Training Records**	X Readily available	X Up to date	N/A
	Remarks			
4.	**Permits and Service Agreements**			
	Air discharge permit	Readily available	Up to date	N/A
	Effluent discharge	Readily available	Up to date	N/A
	Waste disposal, POTW	X Readily available	X Up to date	N/A
	Other permits	Readily available	Up to date	N/A
	Remarks			
5.	**Gas Generation Records**	Readily available	Up to date	N/A
	Remarks			
6.	**Settlement Monument Records**	X Readily available	X Up to date	N/A
	Remarks			
7.	**Groundwater Monitoring Records**	X Readily available	X Up to date	N/A
	Remarks			
8.	**Leachate Extraction Records**	X Readily available	X Up to date	N/A
	Remarks			
9.	**Discharge Compliance Records**			
	Air	Readily available	Up to date	N/A
	Water (effluent)	X Readily available	X Up to date	N/A
	Remarks			
10.	**Daily Access/Security Logs**	X Readily available	X Up to date	N/A
	Remarks			

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented — Yes (No) N/A
Site conditions imply ICs not being fully enforced — Yes (No) N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Visual inspection and telephone interviews but supplemented
Frequency Annual with monthly + semiannual visits for other work
Responsible party/agency Army via OHM contractor or USACE personnel
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date — (Yes) No N/A
Reports are verified by the lead agency — (Yes) No N/A

Specific requirements in deed or decision documents have been met — (Yes) No N/A
Violations have been reported — Yes No (N/A)
Other problems or suggestions: Report attached

2. **Adequacy** X ICs are adequate ICs are inadequate N/A
Remarks

D. General

1. **Vandalism/trespassing** Location shown on site map X No vandalism evident
Remarks

2. **Land use changes on site** (N/A)
Remarks except for Charter trailer near Patton Rd for BMS construction site nearby

3. **Land use changes off site** (N/A)
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads (Applicable) N/A

1. **Roads damaged** Location shown on site map X Roads adequate N/A
Remarks

B. Other Site Conditions

Remarks_____

VII. LANDFILL COVERS (Applicable) N/A

A. Landfill Surface

1. **Settlement** (Low spots) Location shown on site map X Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** Location shown on site map X Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** Location shown on site map X Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** Location shown on site map X Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** X Grass X Cover properly established No signs of stress
   Trees/Shrubs (indicate size and locations on a diagram)
   Remarks However, there are some areas where vegetation is sparse or where moss is prevalent.

6. **Alternative Cover (armored rock, concrete, etc.)** (N/A)
   Remarks_____

7. **Bulges** Location shown on site map X Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8. **Wet Areas/Water Damage** X Wet areas/water damage not evident
   - Wet areas — Location shown on site map — Areal extent_____
   - Ponding — Location shown on site map — Areal extent_____
   - Seeps — Location shown on site map — Areal extent_____
   - Soft subgrade — Location shown on site map — Areal extent_____

   Remarks_____

9. **Slope Instability** Slides — Location shown on site map — X No evidence of slope instability
   Areal extent_____
   Remarks_____

B. Benches (Applicable) N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** — Location shown on site map — (N/A or okay)
   Remarks_____

2. **Bench Breached** — Location shown on site map — (N/A or okay)
   Remarks_____

3. **Bench Overtopped** — Location shown on site map — (N/A or okay)
   Remarks_____

C. Letdown Channels (Applicable) N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** — Location shown on site map — X No evidence of settlement
   Areal extent_____ Depth_____
   Remarks_____

2. **Material Degradation** — Location shown on site map — X No evidence of degradation
   Material type_____ Areal extent_____
   Remarks_____

3. **Erosion** — Location shown on site map — X No evidence of erosion
   Areal extent_____ Depth_____
   Remarks_____

4. **Undercutting** Location shown on site map X No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ X No obstructions
Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
X No evidence of excessive growth
Vegetation in channels does not obstruct flow
Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations (Applicable) N/A

1. **Gas Vents** Active X Passive
Properly secured/locked X Functioning X Routinely sampled X Good condition
Evidence of leakage at penetration Needs Maintenance
N/A
Remarks_____

2. **Gas Monitoring Probes**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance (N/A)
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance (N/A)
Remarks_____

4. **Leachate Extraction Wells**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance (N/A)
Remarks_____

5. **Settlement Monuments** X Located X Routinely surveyed N/A
Remarks_____

E. Gas Collection and Treatment Applicable (N/A)

1. **Gas Treatment Facilities**
   Flaring Thermal destruction Collection for reuse
   Good condition Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   Good condition Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   Good condition Needs Maintenance N/A
   Remarks_____

F. Cover Drainage Layer (Applicable) N/A

1. **Outlet Pipes Inspected** (Functioning) N/A
   Remarks_____

2. **Outlet Rock Inspected** (Functioning) N/A
   Remarks_____

G. Detention/Sedimentation Ponds (Applicable) N/A

1. **Siltation** Areal extent_____ Depth_____ (N/A)
   Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   X Erosion not evident
   Remarks_____

3. **Outlet Works** (Functioning) N/A
   Remarks_____

4. **Dam** Functioning (N/A)
   Remarks_____

H. Retaining Walls Applicable (N/A)

1. **Deformations** Location shown on site map Deformation not evident
Horizontal displacement_____ Vertical displacement_____
Rotational displacement_____
Remarks_____

2. **Degradation** Location shown on site map Degradation not evident
Remarks_____

I. Perimeter Ditches/Off-Site Discharge (Applicable) N/A

1. **Siltation** Location shown on site map X Siltation not evident
Areal extent_____ Depth_____
Remarks_____

2. **Vegetative Growth** Location shown on site map N/A
X Vegetation does not impede flow
Areal extent_____ Type_____
Remarks under control by periodic vegetation control activities

3. **Erosion** Location shown on site map X Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Discharge Structure** (Functioning) N/A
Remarks_____

VIII. VERTICAL BARRIER WALLS Applicable (N/A)

1. **Settlement** Location shown on site map Settlement not evident
Areal extent_____ Depth_____
Remarks_____

2. **Performance Monitoring** Type of monitoring_____
Performance not monitored
Frequency_____ Evidence of breaching
Head differential_____
Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES

Applicable (N/A) Except for leachate transfer system

A. Groundwater Extraction Wells, Pumps, and Pipelines

Applicable N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   X Good condition All required wells properly operating Needs Maintenance N/A
   Remarks

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   X Good condition Needs Maintenance
   Remarks

3. **Spare Parts and Equipment**
   X Readily available Good condition Requires upgrade Needs to be provided
   Remarks

B. Surface Water Collection Structures, Pumps, and Pipelines

Applicable (N/A)

1. **Collection Structures, Pumps, and Electrical**
   Good condition Needs Maintenance
   Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks

Leachate Transfer

C. ~~Treatment~~ System (Applicable) N/A

1. **Treatment Train** (Check components that apply)
   Metals removal Oil/water separation Bioremediation
   Air stripping Carbon adsorbers
   Filters ____
   Additive (*e.g.*, chelation agent, flocculent) ____
   Others ____
   Good condition Needs Maintenance
   Sampling ports properly marked and functional
   Sampling/maintenance log displayed and up to date
   Equipment properly identified ✓ leachate transferred
   Quantity of ~~groundwater treated~~ annually 240,000 to 415,000 gallons
   Quantity of surface water treated annually ____
   Remarks collection sump for transfer to POTW

2. **Electrical Enclosures and Panels** (properly rated and functional)
   N/A X Good condition Needs Maintenance
   Remarks ____

3. **Tanks, Vaults, Storage Vessels**
   N/A X Good condition Proper secondary containment Needs Maintenance
   Remarks ____

4. **Discharge Structure and Appurtenances**
   N/A X Good condition Needs Maintenance
   Remarks ____

5. **Treatment Building(s)**
   N/A X Good condition (esp. roof and doorways) Needs repair
   Chemicals and equipment properly stored
   Remarks small fiberglass enclosure

6. **Monitoring Wells** (pump and treatment remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance (N/A)
   Remarks ____

D. Monitoring Data

1. Monitoring Data
   X Is routinely submitted on time X Is of acceptable quality

2. Monitoring data suggests: Not applicable but leachate quality within POTW standards, leachate volume decreasing over time.
   Groundwater plume is effectively contained Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A
   Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy is to contain waste within a landfill and cover system and transfer leachate to the local POTW. Remedy is effective and operating as designed.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

No issues related to the O&M activities. Long- and short-term protectiveness are ensured by the landfill and the O&M activities.

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. Some corrective measures were required shortly after the landfill construction but have not been required since that time period. No recent unexpected changes or higher than expected O+M costs.

D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. The landfill cover system could be enhanced by the use of lime or another agent to ~~reduce~~ increase the pH of the soil cover material and promote better vegetative growth on the cap.

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LANDFILL GAS MONITORING FORMS
(2005-2009)

TABLE 3
Landfill Gas Monitoring – June 2005
Devens Consolidation Landfill

INSPECTORS: Michalak/Kullberg TITLE: Civil Engineers DATE: 02 June 2005

ORGANIZATION: CENAE-EP-EG WEATHER: Sunny 65 ^{o}F with southerly breezes

BAROMETER: 30.0 in. Hg TIME: 0945 BAROMETER: 29.9 in. Hg TIME: 1400

Vent No.	VOC ppm PID	H_2S ppm ISMG	LEL % ISMG	CO ppm ISMG	O_2 % ISMG	O_2 % GA-90	CO_2 % GA-90	CH_4 % GA-90	LEL % GA-90	Remarks
V-1	0.0	0.0	0.0	5	17.3	17.0	2.3	0.0	0.0	
V-2	0.0	0.0	0.0	0.0	19.6	19.4	0.7	0.0	0.0	
V-3	0.0	0.0	47	13	8.7	8.3	5.4	1.0	20.0	
V-4	1.9	0.0	0.0	0.0	17.6	17.2	1.6	0.0	0.0	
V-5	0.0	0.0	31	5	8.7	8.6	5.2	0.8	16	
V-6	0.0	0.0	+OR	19	2.1	1.3	6.0	30.6	608	
V-7	3.3	0.0	0.0	0.0	20.1	20.4	0.2	0.0	0.0	
V-8	4.5	0.0	0.0	0.0	19.0	20.6	0.0	0.0	0.0	
V-9	0.0	0.0	+OR	4	6.9	0.8	10.8	6.2	124	
V-10	2.5	0.0	0.0	0.0	19.6	19.5	0.6	0.1	2.0	
V-11	8.4	0.0	0.0	2	17.6	17.1	2.4	0.1	2.0	

CALIBRATION INFORMATION:
Instrument: Thermo 580B PID SN#: 239
Calibrated by: US Environmental Co. 31 May 2005
Calibrated With: 100 ppm isobutylene (R.F.=1.0)

Instrument: Industrial Scientific Multi-Gas Meter MG-140 SN#: 0211289-051
Calibrated by: US Environmental Co
Calibrated With: 100 ppm CO, 25 H_2S, 25% LEL Pentane, 20.9% O_2

Instrument: Landtech GA-90 Serial#: G1166
Calibrated by: US Environmental Co. 31 May 2005
Calibrated With: 15% CH_4, 15% CO_2, 20.9% O_2

TABLE 4
Landfill Gas Monitoring – November 2005
Devens Consolidation Landfill

INSPECTORS: Michalak/Kullberg TITLE: Civil Engineers DATE: 09 November 2005

ORGANIZATION: CENAE-EP-EG WEATHER: Sunny 40 ^{o}F with east-southeasterly breezes

BAROMETER: 1025.0 millibars (30.27 in. Hg) TIME: 0952
BAROMETER: 1021.5 millibars (30.16 in Hg) TIME: 1252

Vent No.	VOC ppm PID	H_2S ppm ISTMX	LEL % ISTMX	CO ppm ISTMX	O_2 % ISTMX	O_2 % GEM500	CO_2 % GEM500	CH_4 % GEM500	LEL % GEM500	Remarks
V-1	0.0	0.0	0.0	0.0	17.8	13.9	5.1	0.0	0.0	
V-2	0.0	0.0	0.0	0.0	18.1	16.8	3.2	0.0	0.0	
V-3	0.0	0.0	9	0.0	16.4	8.2	6.0	1.5	30.0	
V-4	0.0	0.0	0.0	0.0	19.0	17.9	2.1	0.0	0.0	
V-5	0.0	0.0	43	0.0	9.9	7.0	6.4	2.9	58	
V-6	0.0	0.0	+OR	0.0	6.4	0.3	6.9	30.2	604	
V-7	0.0	0.0	4	0.0	17.6	15.2	4.5	0.3	6.0	
V-8	0.0	0.0	0.0	0.0	19.9	18.6	2.3	0.0	0.0	
V-9	0.0	0.0	+OR	0.0	10.8	1.3	10.3	8.0	160	
V-10	0.0	0.0	0.0	0.0	19.6	19.0	2.1	0.0	0.0	
V-11	0.0	0.0	21	0.0	12.6	9.8	7.6	1.3	26.0	

CALIBRATION INFORMATION:
Instrument: Thermo 580B PID SN#: 182
Calibrated by: US Environmental Co. 7 November 2005
Calibrated With: 100 ppm isobutylene (R.F.=1.0)

Instrument: Industrial Scientific TMX412 SN#: 98090009-447
Calibrated by: US Environmental Co 8 November 2005
Calibrated With: 50 ppm CO, 25 H_2S, 50% LEL Methane, 20.9% O_2

Instrument: Landtech GEM500 Serial#: E-0904
Calibrated by: US Environmental Co. 7 November 2005
Calibrated With: 15% CH_4, 15% CO_2, 20.9% O_2

Note: Barometric pressures were obtained from NOAA National Weather Service Office Boston, MA at http://www.erh.noaa.gov/box/stationobs.html for the nearest available reporting station at the airport in Fitchburg, MA for the sample date 10 November 2005.

Landfill Gas Monitoring – October 2006

Devens Consolidation Landfill

INSPECTORS: JS + PB TITLE: Engineer/Engineer DATE: 10/18/06

ORGANIZATION: HGL ~~USACE~~ NAE WEATHER: overcast + occasional light rain ~50°F

BAROMETER: _____ millibars (29.29 in. Hg) TIME: 1615

BAROMETER: _____ millibars (29.30 in Hg) TIME: 1720

Vent No.	VOC ppm PID	H_2S ppm ~~IST MX~~ MG 140	LEL % ~~IST MX~~ MG 140	CO ppm ~~IST MX~~ MG 140	O_2 % ~~IST MX~~ MG 140	O_2 % GEM500	CO_2 % GEM500	CH_4 % GEM500	LEL % GEM500	Remarks	GEM 500 H2S
1624 V-1	0.5	0	0	10	20.9	20.4	0.4	0	0		
V-2	0.6	0	0	11	20.9	21.2	0	0	0		
(PB) V-9 ~~V-3~~	0.5	0	0	11	21.0	21.2	0	0.2	1%	IS MG 140 reading for O2 fell to 20.9 after 5 min	
V-4	0.5	0	0	12	20.9	21.2	0.0	0.0	0	20.9 to 21.1 on MG 140 fluctuation	(PB) 20.9 to 21.1 in MG
V-5	0.5	0	0	12	21.0	21.1	0	0	0		
V-6	0.2	0	0	11	20.9	20.0	0.2	1.9	46 (hundreds)	fluctuating up to 46	
V-7	0.4	0-2 say 1	0	9	20.7	20.9	0.0	0.0	0%		
V-8	0.4	3	0	9	20.9	~~17.3~~ (20.8)	0.0	0.0	0%	GEM SAY OVERPRESSURE SO RE DID O2 BY GEM	NA no reading on probe.
(PB) V-3 ~~V-8~~	0.4	0	5	10	20.9	17.4	1.7	1.7	46%	GEM alarm	
V-10	0.5	0	0	12	21.0	21.2	0	0	0	PID 0.4 to 0.6	
V-11	0.5	0	0	12	21.0	21.4	0	0.0	0		

DTW in sump (pre-sample): 20.01*

Leachate samples: 1045 start 1130 end

* from inner lip (lowered ~0.25" from outer lip)

PB - distilled H_2O jug bailer

JS - bottle handling / labeling

CALIBRATION INFORMATION:

Instrument: Mini Rae PID SN#:

Calibrated by: M. Jackson Date: 10/18/06

Calibrated With: 100 ppm isobutylene (R.F.=1.0)

Instrument: Industrial Scientific TMX412 SN#:

Calibrated by: US Environmental Rental Date: 10/18/06

Calibrated With: 50 ppm CO, 25 H_2S, 50% LEL Methane, 20.9% O_2

Instrument: Landtech GEM500 Serial#:

Calibrated by: R. Mackay Date: 10/18/06

Calibrated With: 15% CH_4, 18% CO_2, 20.9% O_2

Land Tec GEM500

Note: Barometric pressures were obtained from ~~NOAA National Weather Service Office Boston, MA at http://www.erh.noaa.gov/box/stationobs.html for the nearest available reporting station at the airport in Fitchburg, MA for the sample date of~~ _____.

PID ppm	Time	Well ID	DTW (ft)	Notes
0.0		LFM-99-01B	26.70	Concrete at base has some cracks. (PB)
0.0		LFM-99-02B	19.62	Construction @ road: Caused vibrations through ground.
0.0		LFM-99-03B	43.93	Had to break the lock. Replacement lock expected to be temporary (PB)
0.0	1400	LFM-99-05A	25.49	Well is hidden behind vegetation. Lock could not be replaced so was left in place, loose. (PB)
0.0	1350	LFM-99-05B	23.21	Concrete at base is cracked. (PB)
0.0	1500	LFM-99-06A	14.40	Concrete at base needs repair/replacement (PB)
0.0	1340	LFM-03-01	20.87	Concrete at base is cracked. (PB)
				New lock installed. (PB)

10/19/06: DCL locks replaced w/ same keyed locks (PB)

Landfill Gas Monitoring – ~~October 2006~~

Devens Consolidation Landfill

INSPECTORS: J. Skaarup TITLE: Engineer DATE: 5/24/07

ORGANIZATION: HGL WEATHER: Sunny, mild breeze ~65°F

BAROMETER: _____ millibars (_____ in. Hg) TIME: 0910

BAROMETER: _____ millibars (29.85 in Hg) TIME: 1129

Vent No.	VOC ppm PID	H_2S ppm ~~ISTMX~~ MX0	LEL % ~~ISTMX~~ MX0	CO ppm ~~ISTMX~~ MX0	O_2 % ~~ISTMX~~ MX0	O_2 % GEM500	CO_2 % GEM500	CH_4 % GEM500	LEL % GEM500	Remarks
~~V-1~~ V-2	1.0	0	0	-5	20.9	21.1	0.1	0.0	0	0942
~~V-2~~ V-1	0.0	0	0	0	19.0	19.6	2.2	0.0	0	1110
V-3	0.0	0	3	0	11.5	11.8	3.9	0.1	1	1103
V-4	0.1	0	0	-4	19.4	19.2	1.0	0.0	0	1001
V-5	1.1	0	5	-4	19.5	18.2	1.1	0.1	1	0951
V-6	0.0	0	15	0	13.9	7.5	4.3	13.5	>>>	1035 exceeds LEL on both meters
V-7	0.2	0	0	0	17.8	17.7	1.6	0.0	0	1117
V-8	0.1	0	0	0	17.8	20.8	0.0	0.0	0	1123 screen showing water should replace in fall '07
V-9	0.0	0	8	-3	~~17.0~~ 19.0	19.0	1.8	0.3	5	1027
V-10	0.0	0	0	-4	20.0	20.1	0.6	0.0	0	1011
V-11	0.2	0	0	-3	19.4	20.3	0.4	0.0	0	1019

CALIBRATION INFORMATION:

Instrument: Mini RAE 2000 PID SN#: _____

Calibrated by: R. Mackay Date: 5/24/07

Calibrated With: 100 ppm isobutylene (R.F.=1.0)

Instrument: Industrial Scientific TMX412 SN#: _____

Calibrated by: US Environmental Rental Date: _____

Calibrated With: 50 ppm CO, 25 H_2S, 50% LEL Methane, 20.9% O_2

Instrument: Landtech GEM500 Serial#: _____

Calibrated by: R. Mackay Date: 5/24/07

Calibrated With: 15% CH_4, 15% CO_2, 20.9% O_2

Note: Barometric pressures were obtained from ~~NOAA National Weather Service Office Boston, MA at http://www.erh.noaa.gov/box/stationobs.html for the nearest available reporting station at the airport in Fitchburg, MA for the sample date of _____.~~ LandTec GEM500 JRS

Landfill Gas Monitoring – October 2007

Devens Consolidation Landfill

INSPECTORS: JAS / RDG TITLE: Eng / Sci DATE: 10/24/07

ORGANIZATION: HGL WEATHER: Light Rain + ~60°F

BAROMETER: _____ millibars (_____ in. Hg) TIME: 0950

BAROMETER: _____ millibars (_____ in Hg) TIME: 1100

Vent No.	VOC ppm PID	H_2S ppm ISTMX	LEL % ISTMX	CO ppm ISTMX	O_2 % ISTMX	O_2 % GEM500	CO_2 % GEM500	CH_4 % GEM500	LEL % GEM500	Remarks
V-1	0.1	0.0	-2	-14.0	21.6	20.9	0.0	0.0	0	
V-2	0.0	0.0	0	-14.0	21.6	21.0	0.0	0.0	0	
V-3	0.1	0.0	0	-14.0	21.5	20.8	0.1	0.0	0	
V-4	0.0	0.0	0	-13.0	21.5	21.0	0.0	0.0	0	
V-5	0.0	0.0	0	-14.0	21.5	20.9	0.1	0.0	0	
V-6	0.2	0.0	46	-13.0	18.9	17.9	1.5	1.9	34	
V-7	0.0	0.0	0	-13.0	21.5	21.0	0.0	0.0	0	
V-8	0.0	0.0	0	-13.0	21.5	21.1	0.0	0.0	0	
V-9	0.0	0.0	0	-13.0	21.5	21.0	0.0	0.0	0	
V-10	0.0	0.0	0	-13.0	21.5	21.0	0.0	0.0	0	
V-11	0.0	0.0	0	-13.0	21.5	21.0	0.0	0.0	0	

CALIBRATION INFORMATION:

HGL
Instrument: _____ PID SN#: _____
Calibrated by: R. Garrett Date: 10/23/07
Calibrated With: 100 ppm isobutylene (R.F.=1.0)

IS M40 SN = GA0-90
Instrument: Industrial Scientific ~~TMX412~~ ITX310 SN#: 980315
Calibrated by: US Environmental Rental Date: 10/23/07
Calibrated With: 50 ppm CO, 25 H_2S, 50% LEL Methane, 20.9% O_2

US ENV
Instrument: Landtech GEM500 Serial#: E0782
Calibrated by: U.S. Environmental Date: 10/23/07
Calibrated With: 15% CH_4, 15% CO_2, 20.9% O_2

Note: Barometric pressures were obtained from NOAA National Weather Service Office Boston, MA at http://www.erh.noaa.gov/box/stationobs.html for the nearest available reporting station at the airport in Fitchburg, MA for the sample date of _____.

Landfill Gas Monitoring – June 2008
Devens Consolidation Landfill

INSPECTORS: John Skaarup TITLE: Engineer DATE: 6/23/08

ORGANIZATION: HGC WEATHER: Sunny, ~80°F, slight breeze

BAROMETER (start): _____ millibars (29.47 in. Hg) TIME: 1350

BAROMETER (end): _____ millibars (29.47 in Hg) TIME: 1500

Vent No.	VOC ppm PID	H_2S ppm ISTMX	LEL % ISTMX	CO ppm ISTMX	O_2 % ISTMX	O_2 % GEM500	CO_2 % GEM500	CH_4 % GEM500	LEL % GEM500	Remarks
V-1	0.0	0	13	10	21.4	22.3	0.2	0.3	0.4	
V-2	0.0	0	13	9	21.4	22.5	0.2	0.3	0.5	
V-3	0.0	0	12	9	21.3	22.1	0.3	0.3	0.6	
V-4	0.0	0	3	4	17.2	12.9	4.2	0.0	0.0	
V-5	0.0	0	8	8	21.2	21.8	0.4	0.5	0.0	
V-6	0.0	0	OR	3	10.9	12.0	3.4	16.3	OR	
V-7	0.0	0	7	3	9.9	11.0	7.8	0.1	0.1	
V-8	0.0	0	11	0	8.3	9.5	9.1	0.0	0.0	
V-9	0.0	0	OR	8	5.4	21.2	0.4	0.0	0.0	slight methane odor
V-10	0.0	0	0	5	19.0	20.9	0.8	0.0	0.0	
V-11	0.0	0	3	7	15.8	21.3	0.5	0.0	0.0	

CALIBRATION INFORMATION:

Instrument: MiniRae 2000 PID SN#:
Calibrated by: J Skaarup Date: 6/23/08
Calibrated With: 100 ppm isobutylene (R.F.=1.0)

Instrument: Industrial Scientific TMX412 SN#: 990201 0-489
Calibrated by: US Environmental Rental Date: 6/ /08
Calibrated With: 50 ppm CO, 25 H_2S, 50% LEL Methane, 20.9% O_2

Instrument: Landtech GEM500 Serial#: GM07161
Calibrated by: US Env. Rental Date: 6/ /08
Calibrated With: 15% CH_4, 15% CO_2, 20.9% O_2

w/ barometric pressure

Note: Barometric pressures were obtained from NOAA National Weather Service Office Boston, MA at http://www.erh.noaa.gov/box/stationobs.html for the nearest available reporting station at the airport in Fitchburg, MA for the sample date of _____.

ISTMX412

CO	H_2S
O_2	LEL

US Army Corps of Engineers
New England District

APPENDIX B

Devens Consolidation Landfill
Landfill Gas Monitoring

INSPECTOR: Kullberg TITLE: Civil Engineer DATE: 11 June 2009

ORGANIZATION: CENAE-EP-WG WEATHER: Cloudy 60°F calm

BAROMETER*: 29.7 in Hg TIME: 0915
BAROMETER*: 29.6 in Hg TIME: 1015
BAROMETER*: 29.6 in Hg TIME: 1145

Vent No.	VOC ppm PID	H_2S ppm ISTMX	LEL % ISTMX	CO ppm ISTMX	O_2 % ISTMX	O_2 % GEM500	CO_2 % GEM500	CH_4 % GEM500	LEL % GEM500	Remarks
V-1	0.0	0.0	0.0	0.0	20.7	14.4	0.0	0.0	0.0	
V-2	0.0	0.0	0.0	0.0	16.5	20.8	3.2	0.0	0.0	
V-3	0.0	0.0	8.0	0.0	7.5	10.4	8.0	0.3	0.4	
V-4	0.0	0.0	0.0	0.0	18.7	20.7	1.6	0.0	0.0	
V-5	0.0	0.0	9.0	0.0	8.6	20.7	5.8	0.9	18.0	
V-6	0.0	0.0	+OR	0.0	6.4	12.5	5.1	21.8	422	
V-7	0.0	0.0	0.0	0.0	15.5	9.8	4.3	0.0	0.0	
V-8	0.0	0.0	0.0	0.0	15.8	8.9	4.3	0.0	0.0	
V-9	0.0	0.0	+OR	8.0	1.2	10.1	5.0	33.1	644	
V-10	0.0	0.0	0.0	0.0	21.1	20.6	0.0	0.0	0.0	
V-11	0.0	0.0	0.0	0.0	21.0	20.7	0.0	0.0	0.0	

CALIBRATION INFORMATION:
Instrument: Thermo Environmental 580B PID 10.6
Calibrated by: US Environmental Rental Co. 10 June 2009
Calibrated With: 100 ppm isobutylene (R.F. = 1.0)

Instrument: Industrial Scientific MG 140
Sampling Pump: Industrial Scientific Sampling Pump SP402
Calibrated by: US Environmental Rental Co. 10 June 2009
Calibrated With: 50 ppm CO, 25 H_2S, 2.5% Pentane, 20.9% O_2

Instrument: Landtec GA 90
Calibrated by: US Environmental Rental Co. 10 June 2009
Calibrated With: 15% CH_4, 15% CO_2, 20.9% O_2

* Note: Barometric Pressures were obtained from the Landtec GA 90

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DCL LEACHATE DISCHARGE
(2002-2009)

Table 6.1
Devens Consolidation Landfill Leachate Quarterly Discharge Quantities

Period	Discharge Quantities (Gallons)[1]							
	2002 [2]	2003 [3]	2004	2005	2006	2007	2008	2009 [4]
January to March	0	284,308	115,065	109,315	116,826	75,294	32,260	54,689
April to June	134,143	285,000	135,734	103,441	88,065	93,427	103,388	64,890
July to September	513,540	232,365	98,261	69,946	83,060	38,261	81,782	64,785
October to December	612,183	158,721	124,742	132,156	102,134	70,645	87,118	53,619
Annual Total	**1,259,866**	**960,394**	**473,802**	**414,858**	**390,085**	**277,626**	**304,547**	**237,983**
Total Leachate Discharge Quantity (2002 - 2009)								**4,319,161**

Notes:

[1] Quarterly sums of monthly readings collected by MassDevelopment from pump house flow meter.

[2] Startup during April to June period.

[3] April to June period is estimated due to broken meter.

[4] Value on Flow Meter Reading was reset during June calibration

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DCL LEACHATE RESULTS
(2002-2009)

Table 11
Quarterly Leachate Sampling Results: Sheet 1 of 4

MassDevelopment Industrial Wastewater Discharge Permit No. 017 (Summary)
Validated Sampling Results for 9 February 2005 Sampling Event (1st Quarter)

Analytical Fraction	Parameter	Limitations	Winter 2005- First Quarter Sampling Event Date Sampled: 2/9/2005 Report submission must, by permit, be before 5 April 2005: *Concentrations (mg/L or as stated):*
Metals composite	**Aluminum**	~ ~	**0.0635 J**
	Antimony	10 mg/L	**0.020 U**
	Arsenic	0.30 mg/L	**0.00600**
	Beryllium	0.30 mg/l	**0.000348 J**
	Chromium	2.0 mg/L	**0.00857 J**
	Cadmium	0.038 mg/L	**0.000700 J**
	Copper	1.0 mg/L	**0.00944 J**
	Lead	0.25 mg/L	**0.0050 U**
	Nickel	1.0 mg/L	**0.00361 J**
	Silver	0.0146 mg/L	**0.00342 J**
	Zinc	0.75 mg/L	**0.0207**
	Selenium	2.5 mg/L	**0.0050 UJ**
	Mercury	0.001 mg/L	**0.00020 U**
Cyanide *grab sample*	**Cyanide (total)**	0.30 mg/L	**0.010 U**
BOD	**Total BOD_5**	400 mg/L	**2.0 U**
TSS	**Total Suspended Solids**	400 mg/L	**12**
TTO *	**Total Toxic Organics**	5.0 mg/L	**0.0118**
TPH	**Total Petroleum Hydrocarbons**	100 mg/L	**1.7 B**
O&G *grab sample*	**Fats, Oils and Grease**	100 mg/L	**5.0 U**
pH *grab sample*	**pH (units)**	5.5 – 9.5	**6.6 std pH units**
Heptachlor composite (mg/L)			**0.000018**
Phenol composite (mg/L)			**0.019 J**

U: The target analyte was not detected at or above the laboratory reporting limit.
B: The target analyte was also detected in the associated method blank or equipment blank.
J: Indicates a value greater than or equal to the method detection limit, but less than the quantitation limit.

* **TTO T**otal **T**oxic **O**rganics: Sum of VOCs, SVOCs, Pesticides, PCBs.

Table 11
Quarterly Leachate Sampling Results: Sheet 2 of 4

MassDevelopment Industrial Wastewater Discharge Permit No. 017 (Summary)
Validated Sampling Results for 17 May 2005 Sampling Event (2nd Quarter)

"Analytical Fraction"	**Parameter**	**Limitations**	**Spring- Second Quarter Sampling Event**
			Date Sampled: 5/17/2005
			Report submission must, by permit, be before 5 July 2005:
			Concentrations (mg/L or as stated):
Metals composite	**Aluminum**	~ ~	**0.0614**
	Antimony	10 mg/L	(Not required this sampling event.)
	Arsenic	0.30 mg/L	**0.00376 J**
	Beryllium	0.30 mg/l	(Not required this sampling event.)
	Chromium	2.0 mg/L	(Not required this sampling event.)
	Cadmium	0.038 mg/L	(Not required this sampling event.)
	Copper	1.0 mg/L	**0.00911 J**
	Lead	0.25 mg/L	**0.0050 U**
	Nickel	1.0 mg/L	**0.00312 J**
	Silver	0.0146 mg/L	**0.0070 U**
	Zinc	0.75 mg/L	**0.0169 J**
	Selenium	2.5 mg/L	(Not required this sampling event.)
	Mercury	0.001 mg/L	**0.00020 U**
Cyanide *grab sample*	Cyanide (total)	0.30 mg/L	(Not required this sampling event.)
BOD	**Total BOD_5**	400 mg/L	**2.0 U**
TSS	**Total Suspended Solids**	400 mg/L	**4.0**
TTO *	Total Toxic Organics	5.0 mg/L	(Annual -- not required this sampling event)
TPH	Total Petroleum Hydrocarbons	100 mg/L	(Annual -- not required this sampling event)
O&G *grab sample*	**Fats, Oils and Grease**	100 mg/L	**5.0 U**
pH *grab sample*	**pH (units)**	5.5 – 9.5	**6.6 std pH units**
Heptachlor composite (mg/L)			**0.0000066 U**
Phenol composite (mg/L)			**0.041 J**

U: The target analyte was not detected at or above the laboratory reporting limit.
B: The target analyte was also detected in the associated method blank or equipment blank.
J: Indicates a value greater than or equal to the method detection limit, but less than the quantitation limit.

* **TTO T**otal **T**oxic **O**rganics: Sum of VOCs, SVOCs, Pesticides, PCBs.

Table 11
Quarterly Leachate Sampling Results: Sheet 3 of 4

MassDevelopment Industrial Wastewater Discharge Permit No. 017 (Summary)
Sampling Results for 22 August 2005 Sampling Event (3rd Quarter)

"Analytical Fraction"	Parameter	Limitations	Summer 2005
			Date Sampled: 8/22/2005
			Report submission must, by permit, be before 5 October 2005:
			Concentrations (mg/L or as stated):
Metals composite	Aluminum	~ ~	0.336 U
	Antimony	10 mg/L	0.020 U
	Arsenic	0.30 mg/L	0.00649
	Beryllium	0.30 mg/l	0.000226 JB
	Chromium	2.0 mg/L	0.0100 U
	Cadmium	0.038 mg/L	0.0050 U
	Copper	1.0 mg/L	0.025UB
	Lead	0.25 mg/L	0.0016 JB
	Nickel	1.0 mg/L	0.00271 J
	Silver	0.0146 mg/L	0.000527 J
	Zinc	0.75 mg/L	0.00261 JB
	Selenium	2.5 mg/L	0.0050 U
	Mercury	0.001 mg/L	0.00020 U
Cyanide *grab sample*	Cyanide (total)	0.30 mg/L	0.0030 J
BOD	Total BOD_5	400 mg/L	2.0 U
TSS	Total Suspended Solids	400 mg/L	66
TTO *	Total Toxic Organics	5.0 mg/L	(Annual -- not required this sampling event)
TPH	Total Petroleum Hydrocarbons	100 mg/L	(Annual -- not required this sampling event)
O&G *grab sample*	Fats, Oils and Grease	100 mg/L	5.0 U
pH *grab sample*	pH (units)	5.5 – 9.5	6.5 std pH units
Heptachlor composite (mg/L)			0.0000064 U
Phenol composite (mg/L)			0.068

U: The target analyte was not detected at or above the laboratory reporting limit.
B: The target analyte was also detected in the associated method blank or equipment blank.
J: Indicates a value greater than or equal to the method detection limit, but less than the quantitation limit.
* **TTO T**otal **T**oxic **O**rganics: Sum of VOCs, SVOCs, Pesticides, PCBs.

Table 11
Quarterly Leachate Sampling Results: Sheet 4 of 4

MassDevelopment Industrial Wastewater Discharge Permit No. 017 (Summary)
Validated Sampling Results for 3 November 2005 Sampling Event (4th Quarter)

"Analytical Fraction"	**Parameter**	**Limitations**	**Fall 2005- Fourth Quarter Sampling Event**
			Date Sampled: 11/3/2005
			Report submission must, by permit, be before 5 January 2006:
			Concentrations (mg/L or as stated):
Metals composite	**Aluminum**	~ ~	**0.254**
	Antimony	10 mg/L	(Not required this sampling event.)
	Arsenic	0.30 mg/L	**0.0105**
	Beryllium	0.30 mg/l	(Not required this sampling event.)
	Chromium	2.0 mg/L	(Not required this sampling event.)
	Cadmium	0.038 mg/L	(Not required this sampling event.)
	Copper	1.0 mg/L	**0.025 U**
	Lead	0.25 mg/L	**0.0030 UJ**
	Nickel	1.0 mg/L	**0.040 U**
	Silver	0.0146 mg/L	**0.00189 J**
	Zinc	0.75 mg/L	**0.00349 J**
	Selenium	2.5 mg/L	(Not required this sampling event.)
	Mercury	0.001 mg/L	**0.00020 U**
Cyanide *grab sample*	Cyanide (total)	0.30 mg/L	(Not required this sampling event.)
BOD	**Total BOD_5**	400 mg/L	**2.0 U**
TSS	**Total Suspended Solids**	400 mg/L	**36**
TTO *	Total Toxic Organics	5.0 mg/L	(Annual -- not required this sampling event)
TPH	Total Petroleum Hydrocarbons	100 mg/L	(Annual -- not required this sampling event)
O&G *grab sample*	**Fats, Oils and Grease**	100 mg/L	**5.0 U**
pH *grab sample*	**pH (units)**	5.5 – 9.5	**6.4 std pH units**
Heptachlor composite (mg/L)			**0.0000067 U**
Phenol composite (mg/L)			**0.016 J**

U: The target analyte was not detected at or above the laboratory reporting limit.
B: The target analyte was also detected in the associated method blank or equipment blank.
J: Indicates a value greater than or equal to the method detection limit, but less than the quantitation limit.
* **TTO T**otal **T**oxic **O**rganics: Sum of VOCs, SVOCs, Pesticides, PCBs.

Table 4.19
Leachate Analytical Results
Devens Consolidation Landfill
2006

"Analytical Fraction"	Parameter	Units	Limitations	Winter 2006 First Quarter Sampling Event	Spring 2006 Second Quarter Sampling Event	Fall 2006 Fourth Quarter Sampling Event
				Date Sampled: 03/01/2006	Date Sampled: 5/22/2006	Date Sampled: 10/18/2006
Metals composite	Aluminum	mg/L	NS	0.0432 J	0.250 U	0.1 U
	Arsenic	mg/L	0.30	0.00242 J	0.025 U	0.006 J
	Copper	mg/L	1.0	0.025 U	0.010 U	0.002 J
	Cadmium	mg/L	0.038	0.005 U	NA	0.005 U
	Chromium	mg/L	2.0	0.010 U	NC	0.006 J
	Lead	mg/L	0.25	0.003 U	0.025 U	0.01 U
	Nickel	mg/L	1.0	0.040 U	0.010 U	0.0018 J
	Silver	mg/L	0.0146	0.007 U	0.002 U	0.0052 J
	Zinc	mg/L	0.75	0.00415 J	0.025 U	0.05 U
	Mercury	mg/L	0.001	0.0002 U	0.0005 U	0.001 R
	Selenium	mg/L	2.5	0.010 U	NA	NA
Cyanide, total		mg/L	0.30	0.0040 J	NA	0.0031
TSS	Total Suspended Solids	mg/L	400	46	10	82 J
TTO	Total Toxic Organics	mg/L	5	0.018 J-	NA	0.00314
TPH	Total Petroleum Hydrocarbons	mg/L	100	1.6	NA	0.510 U
O&G *grab sample*	Fats, Oils and Grease	mg/L	100	5.0 U	NA	NA
BOD	Total BOD_5	mg/L	400	2.0 U	NA	NA
pH *grab sample*	pH	standard units	5.5 – 9.5	7	6.6	7
Heptachlor composite (mg/L)				0.0000048 J	0.00005 U	0.0000204 U
Phenol composite (mg/L)				0.036 J	0.10 U	0.0068 U

Note:
The third quarter sampling event was canceled due to an August 23, 2006 MassDevelopment approval for the reduction in leachate sampling to an annual frequency.
*** TTO T**otal **T**oxic **O**rganics: Sum of VOCs, SVOCs, Pesticides and PCBs.
NC = Not Collected
All general terms, laboratory indicators and data qualifiers are defined on the Key for Tables found at the beginning of this section.

Table 4.18
Leachate Analytical Results – Devens Consolidation Landfill
MassDevelopment Industrial Wastewater Discharge Permit No. 017 (Summary)

"Analytical Fraction"	Parameter	Units	Limitations	Fall 2007 - Annual Sampling Event
				Date Sampled: 10/23/2007
Total metals	Aluminum	mg/L	NS	0.052 J
	Arsenic	mg/L	0.3	0.009
	Cadmium	mg/L	0.038	0.005 U
	Chromium	mg/L	2.0	0.004 J
	Copper	mg/L	1.0	0.0041 J
	Lead	mg/L	0.25	0.01 U
	Nickel	mg/L	1.0	0.0032 J
	Silver	mg/L	0.0146	0.007 U
	Zinc	mg/L	0.75	0.05 U
	Mercury	mg/L	0.001	0.0002 U
Cyanide, total		mg/L	0.3	0.0035 J
TSS	Total Suspended Solids	mg/L	400	83
TTO	Total Toxic Organics	mg/L	5	0.047
TPH	Total Petroleum Hydrocarbons	mg/L	100	0.510 U
pH *grab sample*	pH	standard units	5.5 – 9.5	6.9
Heptachlor composite (mg/L)				0.0000206 U
Phenol composite (mg/L)				0.15 U

Note:

*** TTO T**otal **T**oxic **O**rganics: Sum of VOCs, SVOCs, Pesticides and PCBs.

Table 4.20
Leachate Analytical Results – Devens Consolidation Landfill
MassDevelopment Industrial Wastewater Discharge Permit No. 017 (Summary)

"Analytical Fraction"	Parameter	Units	Limitations	Fall 2008 - Annual Sampling Event
				Date Sampled: 10/27/2008
Total metals	Aluminum	mg/L	NS	0.038 J
	Arsenic	mg/L	0.3	0.0023 J
	Cadmium	mg/L	0.038	0.005 U
	Chromium	mg/L	2.0	0.002 J
	Copper	mg/L	1.0	0.010 U
	Lead	mg/L	0.25	0.010 U
	Nickel	mg/L	1.0	0.025 U
	Silver	mg/L	0.0146	0.007 U
	Zinc	mg/L	0.75	0.050 U
	Mercury	mg/L	0.001	0.0002 U
Cyanide, total		mg/L	0.3	0.005 U
TSS	Total Suspended Solids	mg/L	400	41
TTO	Total Toxic Organics	mg/L	5	0.00849
TPH	Total Petroleum Hydrocarbons	mg/L	100	0.277 J
pH *grab sample*	pH	standard units	5.5 – 9.5	7.0
Heptachlor composite (mg/L)				0.000021 U
Phenol composite (mg/L)				0.01 J

Note:

*** TTO T**otal **T**oxic **O**rganics: Sum of VOCs, SVOCs, Pesticides and PCBs.

Table 4.20
Leachate Analytical Results - Devens Consolidation Landfill
MassDevelopment Industrial Wastewater Discharge Permit No. 017 (Summary)

"Analytical Fraction"	Parameter	Units	Limitations	Fall 2009 - Annual Sampling Event
				Date Sampled: 10/23/2009
Total metals	Arsenic	mg/L	0.3	0.005U
	Cadmium	mg/L	0.038	0.0011J
	Chromium	mg/L	2.0	0.01 U
	Copper	mg/L	1.0	0.010 U
	Lead	mg/L	0.25	0.010 U
	Nickel	mg/L	1.0	0.0064 J
	Silver	mg/L	0.0146	0.007 U
	Zinc	mg/L	0.75	0.0157 J
	Mercury	mg/L	0.001	0.0010 U
TSS	Total Suspended Solids	mg/L	400	35
TTO	Total Toxic Organics	mg/L	5	0.011069 J
pH *grab sample*	pH	standard units	5.5 – 9.5	7.2

Note:

*** TTO T**otal **T**oxic **O**rganics: Sum of VOCs, SVOCs, Pesticides and PCBs.

ARARs

TABLE B.1
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 4C

RECORD OF DECISION
SAs 6, 12, AND 13 AND AOCS 9, 11, 40 AND 41
DEVENS, MA

Regulatory Authority	Location Characteristic	Requirement	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Federal	Floodplains	Floodplain Management Executive Order 11988 [40 CFR Part 6, Appendix A]	Applicable AOC 9 AOC 11 AOC 40	Requires federal agencies to evaluate the potential adverse effects associated with direct and indirect development of a floodplain. Alternatives that involve modification/construction within a floodplain may not be selected unless a determination is made that no practicable alternative exists. If no practicable alternative exists, potential harm must be minimized and action taken to restore and preserve the natural and beneficial values of the floodplain.	Drum removal and hot-spot sediment removal will be designed to minimize alteration/destruction of floodplain area. If this alternative is chosen, wetlands adversely affected by remedial action will be restored to the extent necessary.
	Wetlands	Protection of Wetlands Executive Order 11990 [40 CFR Part 6, Appendix A]	Applicable AOC 9 AOC 11 AOC 40	Under this Order, federal agencies are required to minimize the destruction, loss, or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands. If remediation is required within wetland areas, and no practical alternative exists, potential harm must be minimized and action taken to restore natural and beneficial values.	Drum removal and hot-spot sediment removal will be designed to minimize alteration/destruction of floodplain area. If this alternative is chosen, wetlands adversely affected by remedial action will be restored to the extent necessary.
	Wetlands, Aquatic Ecosystem	Clean Water Act, Dredge or Fill Requirements Section 404 [40 CFR Part 230]	Relevant and Appropriate AOC 9 AOC 11 AOC 40	Section 404 of the Clean Water Act regulates the discharge of dredged or fill materials to U.S. waters, including wetlands. Filling wetlands would be considered a discharge of fill materials. Guidelines for Specification of Disposal Sites for Dredged or Fill material at 40 CFR Part 230, promulgated under Clean Water Act Section 404(b)(1), maintain that no discharge of dredged or fill material will be permitted if there is a practical alternative that would have less effect on the aquatic ecosystem. If adverse impacts are unavoidable, action must be taken to restore, or create alternative wetlands.	The removal of drums/sediments will be designed to minimize placement of fill in wetland areas. If this alternative is chosen, the affected areas will be restored to the extent necessary.

TABLE B.1
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 4C

RECORD OF DECISION
SAs 6, 12, AND 13 AND AOCS 9, 11, 40 AND 41
DEVENS, MA

Regulatory Authority	Location Characteristic	Requirement	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Federal	Surface Waters, Endangered Species, Migratory Species	Fish and Wildlife Coordination Act [16 USC 661 et. seq.]	Relevant and Appropriate AOC 9 AOC 11 AOC 40 SA 13	Actions that affect species/habitat require consultation with U.S. Department of Interior, U.S. Fish and Wildlife Service, National Marine Fisheries Service, and/or state agencies, as appropriate, to ensure that proposed actions do not jeopardize the continued existence of the species or adversely modify or destroy critical habitat. The effects of water-related projects on fish and wildlife resources must be considered. Action must be taken to prevent, mitigate, or compensate for project-related damages or losses to fish and wildlife resources. Consultation with the responsible agency is also strongly recommended for on-site actions. Under 40 CFR Part 300.38, these requirements apply to all response activities under the National Contingency Plan.	To the extent necessary, actions will be taken to develop measures to prevent, mitigate, or compensate for project related impacts to habitat and wildlife. The U.S. Fish and Wildlife Service, acting as a review agency for the USEPA, will be kept informed of proposed remedial actions.
	Endangered Species	Endangered Species Act [50 CFR Parts 17.11-17.12]	Applicable AOC 9 AOC 11 AOC 40 SA 13 Consolidation Facility	This act requires action to avoid jeopardizing the continued existence of listed endangered or threatened species or modification of their habitat.	The protection of endangered species and their habitat will be considered during excavation activities and cover installation.
	Atlantic Flyway, Wetlands, Surface Waters	Migratory Bird Treaty Act [16 USC 703 et seq.]	Relevant and Appropriate AOC 11	The Migratory Bird Treaty Act protects migratory birds, their nests, and eggs. A depredation permit is required to take, possess, or transport migratory birds or disturb their nests, eggs, or young.	Remedial actions will be performed to protect migratory birds, their nests, and eggs.

TABLE B.2
SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS FOR ALTERNATIVE 4C

RECORD OF DECISION
SAs 6, 12, AND 13 AND AOCS 9, 11, 40 AND 41
DEVENS, MA

Regulatory Authority	Location Characteristic	Requirement	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Federal	Surface water	Clean Water Act, Ambient Water Quality Criteria [40 CFR 131; Quality Criteria for Water 1986]	Relevant and Appropriate AOC 11 AOC 40	Federal Ambient Water Quality Criteria (AWQC) include (1) health-based criteria developed for 95 carcinogenic and noncarcinogenic compounds and (2) acute and chronic toxicity values for the protection of aquatic life. AWQC for the protection of human health provide protective concentrations for exposure from ingesting contaminated water and contaminated aquatic organisms, and from ingesting contaminated aquatic organisms alone. Remedial actions involving contaminated surface water or discharge of contaminants to surface water must consider the uses of the water and the circumstances of the release or threatened release.	Remedial actions will be performed in a manner to prevent AWQC exceedances in surface water. Activities at AOC 11 will be performed to prevent AWQC exceedances in the Nashua River. Removal of sediment at AOC 40 will be performed in a manner to prevent AWQC exceedances in Cold Spring Brook Pond. Supernatant from dredged spoil will be monitored to prevent AWQC exceedances in Cold Spring Brook Pond.
	Groundwater	Safe Drinking Water Act, National Primary Drinking Water Regulations, MCLs and MCLGs [40 CFR Parts 141.60 - 141.63 and 141.50 - 141.52]	Relevant and Appropriate AOC 40	The National Primary Drinking Water Regulations establish Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations of contaminants in public drinking water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques. MCLGs specify the maximum concentration at which no known or anticipated adverse effect on humans will occur. MCLGs are non-enforceable health based goals set equal to or lower than MCLs.	At AOC 40 the MCL for bis(2-ethylhexyl)phthalate will be met under average scenario, and the MCL for arsenic will be met under average and maximum scenario. MCLs are not exceeded at Patton Well.

TABLE B.2
SYNOPSIS OF FEDERAL AND STATE CHEMICAL-SPECIFIC ARARS FOR ALTERNATIVE 4C

RECORD OF DECISION
SAs 6, 12, AND 13 AND AOCS 9, 11, 40 AND 41
DEVENS, MA

Regulatory Authority	Location Characteristic	Requirement	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
State	Surface water	Massachusetts Surface Water Quality Standards [314 CMR 4.00]	Relevant and Appropriate AOC 11 AOC 40	Massachusetts Surface Water Quality Standards designate the most sensitive uses for which surface waters of the Commonwealth are to be enhanced, maintained, and protected, and designate minimum water quality criteria for sustaining the designated uses. Surface waters at Fort Devens are classified as Class B. Surface waters assigned to this class are designated as habitat for fish, other aquatic life and wildlife, and for primary and secondary contact recreation. These criteria supersede federal AWQC only when they are more stringent (more protective) than the AWQC.	At AOC 11 activities will be performed in a manner to prevent exceedances of surface water quality in the Nashua River. At AOC 40 sediment removal will be performed in a manner to prevent exceedances of Surface Water Quality Standards in Cold Spring Brook Pond. Supernatant from dredged spoil dewatering will be monitored to prevent exceedances in the pond. To the extent necessary, Surface Water Quality Standards will be used to develop discharge limitations.
	Groundwater	Massachusetts Groundwater Quality Standards [314 CMR 6.00]	Relevant and Appropriate AOC 40	These standards designate and assign uses for which groundwaters of the Commonwealth shall be maintained and protected, and set forth water quality criteria necessary to maintain the designated uses. Groundwater at Fort Devens is classified as Class I, fresh groundwaters designated as a source of potable water supply.	At AOC 40 the MCL for bis(2-ethylhexyl)phthalate will be met under average scenario, and the MCL for arsenic will be met under average and maximum scenario. MCLs are not exceeded at Patton Well.
	Groundwater	Massachusetts Drinking Water Regulations [310 CMR 22.00]	Relevant and Appropriate AOC 40	These regulations list Massachusetts MCLs which apply to drinking water distributed through a public water system.	At AOC 40 the MCL for bis(2-ethylhexyl)phthalate will be met under average scenario, and the MCL for arsenic will be met under average and maximum scenario. MCLs are not exceeded at Patton Well.

Notes:

AWQC = Ambient Water Quality Criteria
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Rules
CWA = Clean Water Act
MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
MMCL = Massachusetts Maximum Contaminant Level
NPDWR = National Primary Drinking Water Regulations
SDWA = Safe Drinking Water Act
SMCL = Secondary Maximum Contaminant Level

Note: A Record Notice of Landfill Operation for AOC 11 is not necessary with Alternative 4c.

TABLE B.3
SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE 4C

RECORD OF DECISION
SAs 6, 12, AND 13 AND AOCS 9, 11, 40 AND 41
DEVENS, MA

Regulatory Authority	Location Characteristic	Requirement	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
Federal	Construction over/in navigable waters	Rivers and Harbors Act of 1899 [33 USC 401 et seq.]	Relevant and Appropriate AOC 40 AOC 11	Section 10 of the Rivers and Harbors Act of 1899 requires an authorization from the Secretary of the Army, acting through the U.S. Army Corps of Engineers (USACE), for the construction of any structure in or over any "navigable water of the U.S."; the excavation from or deposition of material in such waters, or any obstruction of alteration in such waters.	Excavating, filling, and disposal activities will be conducted to meet the substantive criteria and standards of these regulations.
	Control of surface water runoff, Direct discharge to surface water	Clean Water Act NPDES Permit Program [40 CFR 122,125]	Relevant and Appropriate AOC 9 AOC 11 AOC 40 SA 13 Consolidation Facility	The National Pollutant Discharge Elimination System (NPDES) permit program specifies the permissible concentration or level of contaminants in the discharge from any point source, including surface runoff, to waters of the United States.	Construction activities will be controlled to meet USEPA discharge requirements. On-site discharges will meet the substantive requirements of these regulations.
	Land Disposal of Hazardous Wastes	Resource Conservation and Recovery Act (RCRA), Land Disposal Restrictions (LDRs); (40 CFR Part 268)	Applicable AOC 9 AOC 11 AOC 40 SA 13	Land disposal of RCRA hazardous wastes without specified treatment is restricted. Remedial actions must be evaluated to determine if they constitute "placement" and if LDRs are applicable. The LDRs require that wastes must be treated either by a treatment technology or to a specific concentration prior to disposal in a RCRA Subtitle C permitted facility.	If it is determined that materials excavated from AOCs 9, 11, 40, or SA 13 are hazardous materials subject to LDRs, the materials will be handled and disposed of in compliance with these regulations.
	Disposal of PCB-contaminated wastes	Toxic Substance Control act Regulations [40 CFR Part 761]	Applicable AOC 9 AOC 11 AOC 40 SA 13	Established prohibitions of and requirements for the manufacturing, processing, distribution in commerce, use, disposal, storage, and marking of PCB items. Sets forth the "PCB Spill Cleanup Policy."	If it is determined that materials excavated from AOCs 9, 11, 40 or SA 13 are contaminated with PCBs at concentrations of 50 ppm or greater, the materials will be handled and disposed of in compliance with these regulations
State	Solid Waste Landfill Siting	Massachusetts Solid Waste Facilities Site Regulations [310 CMR 16.00]	Applicable Consolidation Facility	These regulations outline the requirements for selecting the site of a new solid waste landfill for the Commonwealth of Massachusetts.	The consolidation facility will be sited in accordance with these regulations.

TABLE B.3
SYNOPSIS OF FEDERAL AND STATE ACTION-SPECIFIC ARARS FOR ALTERNATIVE 4C

RECORD OF DECISION
SAs 6, 12, AND 13 AND AOCS 9, 11, 40 AND 41
DEVENS, MA

Regulatory Authority	Location Characteristic	Requirement	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
State	Solid Waste Landfill Construction, Operation. Closure, and Post-Closure Care	Massachusetts Solid Waste Management Regulations [310 CMR 19.000]	Relevant and Appropriate AOC 9,AOC 11, SA 12,,SA 13 Consolidation Facility	These regulations outline the requirements for construction, operation, closure, and post closure at solid waste management facilities in the Commonwealth of Massachusetts.	Final closure and post-closure plans will be prepared and submitted to satisfy the requirements of 310 CMR 19.021 for AOCs 9, 11, and 40, and SAs 12 and 13. The consolidation landfill will be constructed, operated, and closed in conformance with the regulations at 310 CMR 19.000. A Record Notice of Landfill Operation will be filed for AOC 11 in accordance with 310 CMR 19.141.
	Activities that potentially affect surface water quality	Massachusetts Water Quality Certification and Certification for Dredging [314 CMR 9.00]	Relevant and Appropriate AOC 40	For activities that require a MADEP Wetlands Order of Conditions to dredge or fill navigable waters or wetlands, a Chapter 91 Waterways License, a USACE permit or any major permit issued by USEPA (e.g., Clean Water Act NPDES permit), a Massachusetts Division of Water Pollution Control Water Quality Certification is required pursuant to 314 CMR 9.00.	Excavation, filling, and disposal activities will meet the substantive criteria and standards of these regulations. Remedial activities will be designed to attain and maintain Massachusetts Water Quality Standards in affected waters.
	Activities that affect ambient air quality	Massachusetts Air Pollution Control Regulations [310 CMR 7.00]	Applicable AOC 9 AOC 11 AOC 40 SA 13 Consolidation Facility	These regulations pertain to the prevention of emissions in excess of Massachusetts ambient air quality standards.	Remedial activities will be conducted to meet the standards for Visible Emissions (310 CMR 7.06); Dust, Odor, Construction and Demolition (310 CMR 7.09); Noise (310 CMR 7.10); and Volatile Organic Compounds (310 CMR 7.18).

Notes:

CFR = Code of Federal Regulations
CMR = Code of Massachusetts Rules
CWA = Clean Water Act
MADEP = Massachusetts Department of Environmental Protection
MGL = Massachusetts General Laws
NPDES = National Pollutant Discharge Elimination System
RCLA = Comprehensive Environmental Response, Compensation, and Liability Act
USACE = U.S. Army Corps of Engineers
USC = United States Code

Note: A Record Notice of Landfill Operation for AOC 11 is not necessary with Alternative 4c.

TABLE B.1
SYNOPSIS OF FEDERAL AND STATE LOCATION-SPECIFIC ARARS FOR ALTERNATIVE 4C

RECORD OF DECISION
SAs 6, 12, AND 13 AND AOCS 9, 11, 40 AND 41
DEVENS, MA

Regulatory Authority	Location Characteristic	Requirement	Status	Requirement Synopsis	Action To Be Taken To Attain Requirement
State	Floodplains, Wetlands, Surface Waters	Massachusetts Wetland Protection Act and regulations [MGL c. 131 s. 40; 310 CMR 10.00]	Applicable AOC 9 AOC 11 AOC 40 SA 13	These regulations include standards on dredging, filling, altering, or polluting inland wetlands and protected areas (defined as areas within the 100-year floodplain). A Notice of Intent (NOI) must be filed with the municipal conservation commission and a Final Order of Conditions obtained before proceeding with the activity. A Determination of Applicability or NOI must be filed for activities such as excavation within a 100 foot buffer zone. The regulations specifically prohibit loss of over 5,000 square feet of bordering vegetated wetland. Loss may be permitted with replication of any lost area within two growing seasons.	All work to be performed within wetlands and the 100 foot buffer zone will be in accordance with the substantive requirements of these regulations.
	Endangered Species	Massachusetts Endangered Species Regulations [321 CMR 8.00]	Applicable AOC 9 AOC 11 AOC 40 SA 13 Consolidation Facility	Actions must be conducted in a manner that minimizes the impact to Massachusetts-listed rare, threatened, or endangered species, and species listed by the Massachusetts Natural Heritage Program.	The protection of state listed endangered species (in particular the Grasshopper Sparrow at the Consolidation Facility) will be considered during the design and implementation of this alternative.

Notes:

AWQC = Ambient Water Quality Criteria
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Rules
CWA = Clean Water Act
DOI = Department of the Interior
FWS = Fish and Wildlife Service
MEPA = Massachusetts Environmental Policy Act
MGL = Massachusetts General Laws
NMFS = National Maine Fisheries Service
USC = United States Code

Note: A Record Notice of Landfill Operation for AOC 11 is not necessary with Alternative 4c.

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PHOTOLOG

May 2010
South entrance to Devens Consolidation Landfill (DCL).

May 2010
View of southwest slope of the DCL, looking toward (from left to right) V4, V5, and V2.

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dcl_photolog.cdr
07/07/10 CNL

DCL
Photograph Log
2010

May 2010
View north along western perimeter toe-drain.

May 2010
Looking north along western side of landfill.

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dcl_photolog.cdr
07/07/10 CNL

DCL
Photograph Log
2010

May 2010
Top of the southern gabion slope drain looking down the drainage channel.

May 2010
Looking east from the northern point of the landfill.

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dcl_photolog.cdr
07/07/10 CNL

DCL
Photograph Log
2010

May 2010
Looking north from the top ridge of the landfill.

May 2010
Looking south from the top ridge of the landfill.

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dcl_photolog.cdr
07/07/10 CNL

DCL
Photograph Log
2010

May 2010
View northeast of the landfill slope, looking down drainage channel.

May 2010
View of the detention basin from the eastern slope of the landfill.

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dcl_photolog.cdr
07/07/10 CNL

DCL
Photograph Log
2010

May 2010
View south from the northeast portion of the landfill.

May 2010
View of the DCL pump station.

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DCL
Photograph Log
2010

APPENDIX I

AOC 50

GROUNDWATER ANALYTICAL RESULTS
(2001-2009)

Key for Tables

ABC®	Anaerobic BioChem
amsl	above mean sea level
bgs	below ground surface
°C	degrees Celsius
COC	contaminant of concern
dd-mm-yy	day-month-year
DO	dissolved oxygen
DTW	depth to water
ERD	enhanced reductive dechlorination
ft	feet
gal	gallon
gpm	gallons per minute
hh:mm	hours:minutes
IWS	In-Well Stripping System
lbs	pounds
lbs/day	pounds per day
µg/L	micrograms per liter
mg/L	milligrams per liter
mS/cm	milli siemens per centimeter
mV	millivolts
NA	Not available
NC	Not collected
NS	No standard established
NTU	nephelometric turbidity units
ORP	oxidation-reduction potential
%	percent
PCE	tetrachloroethene
psi	
PVC	polyvinyl chloride
SU	standard units
SW(number)	Analytical method from the SW-846 method series (EPA, 2005)
TOC	top of casing
VOC	volatile organic compound

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Area of Contamination 50
Groundwater Analytical Results
(2001-2009)

			Laboratory Parameters																		Field Parameters					
Area of Concern	Well ID	Date	PCE	TCE	*cis* -1,2-DCE	*trans* -1,2-DCE	1,1-DCE	VC	TOC	Alkalinity	Nitrate	Sulfate	Sulfide	Phos	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane	pH	DO	ORP	SpC	Turbidity	Temp
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)			(SU)	(mg/L)	(mV)	(mS/cm)	(NTUs)	°C
North Plume	G6M-96-22A	10/16/2001	2U	2U	2U	2U	1U	2U													5.50	5.1	210	2	0	12.6
	G6M-96-22A	2/28/2002	2U	2U	2U	2U	1U	2U			0.10U										5.70	8.37	183.5	1.78	0.5	9.54
	G6M-96-22A	9/21/2004	2U	2U	2U	2U	1U	2U							5U	1U	54				5.75	6.73	187.9	1.885	1.59	13.42
	G6M-96-22A	9/29/2005	2U	2U	2U	2U	1U	2U							5U	1U	52				5.95	4.9	223.1	3.18	0.38	14.15
	G6M-96-22A	9/20/2006	2U	2U	2U	2U	1U	2U							5U	0.10U	42				5.68	4.78	176.3	1.814	1.85	14.3
	G6M-96-22A	9/12/2007	2U	2U	2U	2U	1U	2U							6U	0.1U	78				5.50	6.95	-101.1	1.404	5	12.73
	G6M-96-22A	10/17/2008	0.55	0.5U	0.5U	0.5U	0.5U	0.5U							8U	0.2U	2,240				5.57	1.41	123.8	1.378	1.8	12.63
	G6M-96-22A	10/16/2009	0.25J	29	0.27J	0.5U	0.5U	0.5U							8U	0.2U	7,120				5.91	0.25	228.5	2.288	0	10.88
North Plume	G6M-96-22B	10/19/2001	2U	2U	2U	2U	1U	2U													6.76	6.95	176	2.09	0.6	12.51
	G6M-96-22B	2/28/2002	2U	2U	2U	2U	1U	2U			0.10U										6.35	7.83	198.5	2.002	1.5	10.08
	G6M-96-22B	1/31/2003	2U	2U	2U	2U	1U	2U																		
	G6M-96-22B	9/21/2004	2U	2U	2U	2U	1U	2U							5U	1U	44				5.83	6.15	193.9	1.941	2.76	13.5
	G6M-96-22B	9/29/2005	2U	2U	2U	2U	1U	2U							5U	1U	48				6.12	5.57	187.7	3.02	1.43	16.38
	G6M-96-22B	9/20/2006	2U	2U	2U	2U	1U	2U							5U	0.10U	44				5.53	6.51	179	2.183	0.67	15.13
	G6M-96-22B	9/12/2007	2U	2U	2U	2U	1U	2U							6U	0.1U	40				5.73	16.11	-112.1	2.618	13.9	13.27
	G6M-96-22B	10/17/2008	0.91	0.5U	0.24J	0.5U	0.5U	0.5U							8U	0.2U	67.3				5.40	1.77	121.3	1.02	0.85	12.5
	G6M-96-22B	10/16/2009	0.3J	23	0.32J	0.5U	0.5U	0.5U							8U	0.135U	25,500				6.08	0.31	209.1	1.683	0.04	11.04
North Plume	G6M-96-24B	10/16/2001	18	2U	2U	2U	1U	2U													6.37	0	81	0.42	19	12.96
	G6M-96-24B	3/1/2002	11	2U	2U	2U	1U	2U													6.35	-6.27	106.7	0.43	2.8	10.53
	G6M-96-24B	1/31/2003	7.5	2U	2U	2U	1U	2U																		
	G6M-96-24B	1/12/2004	11	2U	2U	2U	1U	2U																		
	G6M-96-24B	9/24/2004	13B	2U	2U	2U	1U	2U													6.17	0.2	152.2	0.422	0.44	12.34
	G6M-96-24B	12/17/2004	8.1	2U	2U	2U	1U	2U													6.05	0.46	259.6	0.384	2.43	11.49
	G6M-96-24B	4/13/2005	8.2	1U	2.8	1U	1U	1U													5.32	0.2	216.6	0.429	2.49	10.82
	G6M-96-24B	7/6/2005	7.6	2U	3	2U	1U	2U													5.69	1.34	242.8	0.77	0.02	16.85
	G6M-96-24B	9/30/2005	7.2	2U	3.6	2U	1U	2U													5.77	0.29	198.3	1.022	7.7	10.87
	G6M-96-24B	12/15/2005	7.4	2U	3.1	2U	1U	2U													5.97	0.14	242.8	0.9	2.1	9.71
	G6M-96-24B	3/23/2006	4.2	2U	2U	2U	1U	2U													5.99	0.23	404.5	0.458	1.31	10.91
	G6M-96-24B	6/23/2006	2U	2U	2U	2U	1U	2U													4.62	0.85	526.9	0.443	0.88	15.95
	G6M-96-24B	9/22/2006	2U	2U	2U	2U	1U	2U													5.93	0.3	141	0.407	4.23	12.41
	G6M-96-24B	12/14/2006	2U	2U	2U	2U	1U	2U													5.54	0.17	74.8	0.56	0.2	11.59
	G6M-96-24B	3/30/2007	2U	2U	2U	2U	1U	2U													5.90	0.5	-43.6	0.62	0.15	10.75
	G6M-96-24B	6/13/2007	2U	2U	2U	2U	1U	2U													6.10	0.16	138.9	0.727	220.2	11.03
	G6M-96-24B	9/13/2007	2U	2U	2U	2U	1U	2U													6.05	3.93	-95.7	0.689	9.9	12.38
	G6M-96-24B	12/12/2007	2U	2U	2U	2U	1U	2U													6.33	0.3	106.2	0.802	0.8	10.07
	G6M-96-24B	10/7/2008	0.4J	0.5U	0.5U	0.5U	0.5U	0.5U	10U	46	0.13U	10	0.03UJ		8.0U	0.352U	448	1.3U	1.6U	15	6.04	0.54	92.4	0.51	30	11.31
	G6M-96-24B	1/22/2009	1.4U	2.3U	1.8U	1.3U	1.2U	1.3U	10UJ	32	0.13U	9.3	0.03U	0.24J	8.0U	226J	315	1.2U	1.5U	4.2	6.16	0.45	149.6	0.479	65	9.31
	G6M-96-24B	5/11/2009	0.29J	0.5U	0.5U	0.5U	0.5U	0.5U													5.87	0.2	90.8	0.304	23.1	10.13
FDW	G6M-02-08X	5/17/2002	2,300	35	250	2U	1U	5.8																		
	G6M-02-08X	1/31/2003	3,600	46	480	2.3	1U	2.2																		
	G6M-02-08X	3/31/2005	1,300	38J	250	50U	50U	50U	15	62	1.1	6.2	2U		5U	0.3J	770	0.049	0.79	1.2	7.08	9.1	-50	0.563	24.6	11.44
	G6M-02-08X	7/5/2005	1,000	130	1,800	12U	12U	12U	450	350	0.05U	3.7	8.3		33	110	29,000	0.16	0.22	3	4.23	1.66	19.1	1.616	4.72	15.95
	G6M-02-08X	9/27/2005	560	26	1,300	1U	1.8	2.5	1,200	466	0.05U	320J	16		270	310J	75U	0.11	0.25	21	5.03	0.33	-68.6	1.965	3.16	13.04
	G6M-02-08X	12/16/2005	300	24	1,200	4U	2U	4U	1,500	520	0.05U	57	9.4		4.4B	350J*	15U*	0.19	0.36	2.1	5.46	0.03	-31.4	1.999	66.4	7.98
	G6M-02-08X	3/21/2006	180	25	1,300	2U	2.1	2.3	3,000	1,400	1U	245	14		80	470	40,000	0.084	0.24	15	5.46	0.33	-62.5	2.45	6.98	9.64
	G6M-02-08X	6/21/2006	230	30	850	2U	1U	2U	5,700	1,800	1.67	759	40		100	970	44,000	0.14	0.23	19	4.80	1.32	-25.2	4.528	45.4	14.95
	G6M-02-08X	9/20/2006	150	25	1,300	2U	1.6	2U	4,400	1,000	2U	655	16		77	860	29,000	0.072	0.14	11	5.20	1.57	-14.4	4.503	53.4	18.79
	G6M-02-08X	12/12/2006	140	28	910	2U	1.1	2U	6,400			13.6	110		73	1,000	32,000	0.18	0.17	30	4.93	0.67	-38.3	6.436	108.6	9.72
	G6M-02-08X	3/28/2007	60	14	500	2U	1U	2U	7,200			1,170	80		72	1,200	30,000J*	0.31	0.14	62	4.46	0.21	-144.5	7.243	60.9	15.04
	G6M-02-08X	6/13/2007	110	8.4	420	2U	1U	2U	6,800			1,160	82		130	1,200	33,000	0.092	0.11	180	4.70	1.78	24.1	6.948	1328.4	12.38
	G6M-02-08X	9/13/2007	140	74	1,400	2U	1U	2U	4,400	3,000	0.2U	890	200		410	1,100	37,000	0.22	0.17	120	5.34	2.68	-150.5	6.823	28.2	19.59
	G6M-02-08X	12/10/2007	250	66	1,100	2U	2	3.3	7,700			414	120		360	1,200	42,000	0.14	0.23	240	5.17	0.15	-115.7	7.569	10.8	7.42
	G6M-02-08X	3/10/2008	32	5.5	170	2U	1U	2U	11,000			770	16		570	970	20,000	0.36	0.15	280	4.28	0.5	-55.7	7.828	13.8	8.2
	G6M-02-08X	10/6/2008	49	4.5J	81	5U	5U	5U	4,190	1,800	0.13U	610	0.75UJ		103J	598	7,630	6.3U	7.9U	3,000	4.52	-0.12	-25.9	4.495	65	11.74
	G6M-02-08X	1/21/2009	29	18U	39	11U	14U	11U	2,900J	3,000	0.13U	710	0.39	.24J	76	474J	6,650	1.2U	1.5U	3,400	4.76	0.15	39.2	3.739	46.4	9.25
	G6M-02-08X	5/7/2009	25	20U	29	20U	20U	20U	3,000	550J	0.092J	410	0.053	0.5UJ	53.2	356	5,130	1.3U	5.8	3,500	3.97	0.4	71.4	3.538	15.4	11.52
	G6M-02-08X	10/20/2009	0.5U	0.5U	0.31J	0.5U	0.5U	0.5U	2,300	40	1.3U	440	0.3UJ	0.12J	70.6	486	6,840	1.3U	1.6U	2,300J	4.61	1.88	79.4	3.973	20.1	11.11

Area of Contamination 50
Groundwater Analytical Results
(2001-2009)

			Laboratory Parameters																		Field Parameters					
Area of Concern	Well ID	Date	PCE	TCE	*cis* -1,2-DCE	*trans* -1,2-DCE	1,1-DCE	VC	TOC	Alkalinity	Nitrate	Sulfate	Sulfide	Phos	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane	pH	DO	ORP	SpC	Turbidity	Temp
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)			(SU)	(mg/L)	(mV)	(mS/cm)	(NTUs)	°C
FDW	G6M-03-02X	5/12/2003	1,300	2U	4.4	2U	1U	2U																		
	G6M-03-02X	10/11/2004	690	2U	5.6	2U	1U	2U	1U	12	3.7	20	1.7J		5U	1U	17	0.051	0.03	2.6	6.29	8.25	97.4	0.321	12.1	14.82
	G6M-03-02X	12/15/2004	200	2U	5	2U	1U	2U	390	29	2.4	30	2U		5U	1U	610	0.056	0.063	3.4	5.86	1.75	-132.9	0.382	1.93	8.4
	G6M-03-02X	3/29/2005	340	20U	14J	20U	10U	20U	1,300	366	0.2U	230	6.7J*		640	140M	49,000	0.15	0.34	5.1	5.23	0.65	-20.1	1.654	28.7	11.99
	G6M-03-02X	6/29/2005	190	11	91	2.5U	2.5U	2.5U	1,200	431	0.05U	74	11		130	220J*	35,000J*	0.29	0.65	43	4.62	1.13	2.9	1.723	29.1	20.17
	G6M-03-02X	9/29/2005	57	7.8	190	2.5U	2.5U	2.5U	850	345	0.05U	62	16		150	260J	37,000	0.2	0.29	560	4.94	0.53	-73.7	1.752	23.8	16.73
	G6M-03-02X	12/15/2005	39	8U	190	8U	4U	8U	1,100	550	0.05U	66	16		146	290J*	38,000	0.17	0.26	4,300	5.42	4.55	13.9	1.65	19.7	9.6
	G6M-03-02X	3/21/2006	17	2U	140	2U	1U	2U	1,400	1,200	2U	88.4	8.8		140	320	37,000	0.016J	0.14	6,700	5.56	0.16	-47.7	1.731	17.3	13.27
	G6M-03-02X	6/21/2006	8.2	2U	160	2U	1U	2U	1,300	1,000	1U	120	9.6		240	410	23,000	0.044	0.12	10,000	3.21	0.89	140.1	2.428	11.6	18.8
	G6M-03-02X	9/20/2006	9.7	2.3	230	2U	1U	2U	1,300	570	1U	115	8.4		200	440	21,000	0.05	0.2	8,700	5.55	0.71	-27.8	2.029	13.7	13.92
	G6M-03-02X	12/12/2006	6.9	2U	180	2U	1U	2U	890			53	8		170	350	11,000	0.047	0.16	6,800	5.85	1.31	-43.1	2.326	26.7	8.83
	G6M-03-02X	3/28/2007	13	2.2	320	2U	1U	2U	920			74.5	9.2		230	470	14,000J*	0.033	0.11	9,800	5.38	0.17	-62.3	2.523	14.9	12.75
	G6M-03-02X	6/12/2007	11	2U	650	2U	1.4	17	840			39	8.4		200	360	10,000	0.025U	0.14	21,000	5.77	0.38	-59.3	2.268	39.5	15.46
	G6M-03-02X	9/12/2007	12	2.1	800	2U	1U	81	740	790	0.2U	580	20		230	350	12,000	0.006J	0.6	17,000	5.44	10.26	-122.8	2.156	18.1	15.57
	G6M-03-02X	12/10/2007	3.8	2U	720	2U	1.8	94	1,000			24.7	7		290	390	29,000	0.005J	1.4	14,000	5.67	6.03	-80.2	2.802	5.3	11.33
	G6M-03-02X	3/10/2008	2U	2U	590	2U	1.8	50	2,000			50U	4.8		320	410	100,000	0.098	3.4	11,000	5.47	0.51	-55.9	3.113	24.5	12.12
	G6M-03-02X	10/15/2008	5U	5U	260	5U	5U	27	454	860	0.13U	59	0.03UJ		193	366	108,000	1.2U	10	12,000	5.6	0.75	-28.1	2.376	15	13.35
	G6M-03-02X	5/7/2009	4.0U	4.0U	220	4.0U	4.0U	12	900	1,100J	0.13U	44	0.03U		188	396	56,700	1.2U	18	23,000	5.45	0.32	-46.7	1.962	4.81	10.08
	G6M-03-02X	10/19/2009	10U	20U	290	10U	10U	9.5J	290	920	0.13U	300	0.03U		205	423	43,400	1.3U	14	18,000	5.99	2.56	-44.2	1.832	11.9	11.46
FDW	G6M-04-11X	9/20/2004	8.5	2U	2U	2U	1U	2U													6.54	3.42	374.7	0.782	16.8	16.22
	G6M-04-11X	9/26/2005	7.8	2U	2U	2U	1U	2U													6.96	5.14	94.6	0.39	8.7	13.05
	G6M-04-11X	9/20/2006	4	2U	2U	2U	1U	2U													6.24	6	129	0.38	5.99	17.5
	G6M-04-11X	9/11/2007	2.1	2U	2U	2U	1U	2U													6.87	6.59	46.5	0.38	14.8	14.74
	G6M-04-11X	10/17/2008	1.4	0.5U	0.5U	0.5U	0.5U	0.5U													6.53	5.62	98.1	0.302	3.5	10.78
	G6M-04-11X	10/16/2009	1.1	53	1U	1U	1U	1U													6.46	7.04	176	0.225	4.2	10.62
FDW	G6M-04-12X	9/20/2004	310	7.5	56	2U	1U	2U							5U*	1	44				11.03	0.86	102.6	2.003	5.22	15.88
	G6M-04-12X	9/26/2005	250	6.8	49	2U	1U	2U							15	1U	360				8.41	1.05	234.2	1.961	1.65	14.25
	G6M-04-12X	9/18/2006	470	9.4	60	2U	1U	2U							6.5	0.10U	550				7.21	3.22	253.5	1.764	7.11	14.5
	G6M-04-12X	9/10/2007	350	11	50	2U	1U	2U							2U	0.1U	580				6.84	1.73	90.2	2.613	29.8	13.63
	G6M-04-12X	10/16/2008	360	7.7J	35	10U	10U	10U							3.1J	0.2U	360				7.23	1.45	91.2	2.623	2	11.75
	G6M-04-12X	10/19/2009	170	22U	28	10U	10U	10U							2.3J	0.2U	308				6.72	1.8	66.7	2.543	5.91	11.22
FDW	G6M-93-13X	10/15/2001	0.55J	2U	2U	2U	1U	2U													5.30	9.9	355	6	1.2	14.5
	G6M-93-13X	9/20/2004	3.8	2U	2U	2U	1U	2U	1U	23	1.3J*	10	2.7J*		5U	1	15U	0.0081	0.014	0.89	6.14	13.07	250.7	0.059	4.31	16.26
	G6M-93-13X	12/13/2004	2U	2U	2U	2U	1U	2U	5U	20	1.2	9.6M	2U		5U	1U	15U	0.005U	0.005U	3.8	6.16	10.41	192.5	0.08	1.42	12.95
	G6M-93-13X	3/29/2005	2U	2U	2U	2U	1U	2U	0.6J	22	0.2U	9.1	2U		5U	1UM	15U	0.0063	0.28	3.1	6.24	10.4	97.3	0.09	0.64	10.89
	G6M-93-13X	6/28/2005	2U	2U	2U	2U	1U	2U	4.9	41.2	0.081	8.2	1U		2U	1U	10U	0.023	0.02	9.4	11.30	11.43	146.1	0.275	2.46	19.81
	G6M-93-13X	9/26/2005	2U	2U	2U	2U	1U	2U	3.1	27	0.083	9.5	1U		5U	1U	15U	0.006J	0.018J	4.9	6.04	7.98	191.8	0.126	18.2	20.19
	G6M-93-13X	12/13/2005	2U	2U	2U	2U	1U	2U	4.4J	41	3.4	9.4	1U		5U	1U	15U*	0.008J	0.011J	9.3	6.48	9.55	69.6	0.086	0.5	9.22
	G6M-93-13X	3/21/2006	2U	2U	2U	2U	1U	2U	6.8	24	0.2U	6.83	1U		5U	0.1U	19	0.025U	0.046	9.5	6.87	9.55	-9.4	0.058	0.61	7.38
	G6M-93-13X	6/19/2006	2U	2U	2U	2U	1U	2U	1.4J	46	0.2UH	4.42	1U		5U	0.1U	28	0.008J	0.008J	5.3	6.33	9.14	190.1	0.087	1.34	15.55
	G6M-93-13X	9/18/2006	2U	2U	2U	2U	1U	2U	4.6J	22	0.2U	7.76	1U		5U	0.10U	15U	0.006J	0.014J	5	6.22	9.33	173.6	0.062	4.62	16.43
	G6M-93-13X	12/11/2006	2U	2U	2U	2U	1U	2U	5U			6.55	1U		5U	0.1U	15U	0.008J	0.038	11	6.38	10.68	91.3	0.076	2.23	12.81
	G6M-93-13X	3/28/2007	2U	2U	2U	2U	1U	2U	5U*			5.74	1U		5U	0.1U	15U	0.005J	0.014J	9.6	6.14	9.8	-3.1	0.071	8.73	10.93
	G6M-93-13X	6/11/2007	2U	2U	2U	2U	1U	2U	0.4J			8.96	1U		5U	0.1U	15U	0.034	0.3	13	6.64	10.12	125.4	0.121	3.3	13.66
	G6M-93-13X	9/11/2007	3	2U	2U	2U	1U	2U	0.7J	99	0.2U	12	1U		6U	0.1U	15U	0.005J	0.025U	2.8	6.31	9.67	96.7	0.095	7.1	16.01
	G6M-93-13X	12/10/2007	2U	2U	2U	2U	1U	2U	5U*			6.92	1U		5U	0.1U	15U	0.004J	0.007J	1.1	6.25	8.81	71	0.156	0.6	11.56
	G6M-93-13X	3/10/2008	2U	2U	2U	2U	1U	2U	34			100	1U		5U	0.2	12,000	0.008J	0.05	10	6.3	3.84	141	0.953	0	5.69
	G6M-93-13X	10/15/2008	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	10U	110	3.6	34	0.03UJ		8.0U	0.2U	3,270	1.3U	1.6U	5.6	6.31	2.97	116.4	0.304	0	11.98
	G6M-93-13X	5/7/2009	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	10U	67J	0.71	16	0.03U		3.5J	0.2U	50U	1.2U	1.5U	2.2	6.26	6.1	79.6	0.164	1.1	8.03
	G6M-93-13X	10/19/2009	0.5U	15	0.5U	0.5U	0.5U	0.5U	10U	54	0.058J	9.2	0.03UJ		8U	0.142U	50U	1.3U	1.6U	6	6.42	4.79	182	0.110	1.01	10.87

Area of Contamination 50
Groundwater Analytical Results
(2001-2009)

			Laboratory Parameters																		Field Parameters					
Area of Concern	Well ID	Date	PCE	TCE	*cis* -1,2-DCE	*trans* -1,2-DCE	1,1-DCE	VC	TOC	Alkalinity	Nitrate	Sulfate	Sulfide	Phos	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane	pH	DO	ORP	SpC	Turbidity	Temp
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)			(SU)	(mg/L)	(mV)	(mS/cm)	(NTUs)	°C
FDW	G6M-95-19X	10/15/2001	110	6.6	42	1.5J	1U	2U													5.46	6.24	202	2.87	8.5	14.8
	G6M-95-19X	9/20/2004	41	2.9	16	2U	1U	2U							5U	1	210				5.45	7.92	467.5	4.17	3.1	15.91
	G6M-95-19X	9/26/2005	21	2U	5.4	2U	1U	2U							8.3	1U	160				4.00	4.51	595.3	4.361	0.72	13.31
	G6M-95-19X	9/19/2006	12	2U	2U	2U	1U	2U							5U	0.10U	160				3.82	6.77	281	4.236	2.41	15.19
	G6M-95-19X	9/12/2007	21	2U	4	2U	1U	2U							5U	0.1U	200				5.28	7.62	175.1	6.566	0.4	13.7
	G6M-95-19X	10/15/2008	14J	0.39J	1.6J	0.5U	0.5U	0.5U							8U	0.2U	212				5.35	6.63	267.9	5.306	0.9	13
	G6M-95-19X	10/16/2009	20U	540	20U	20U	20U	20U							8U	0.2U	153				5.22	4.53	232	4.529	1.49	11.49
**	G6M-95-19X	1/15/2010	6.9	0.5U	0.46J	0.75U	0.75U	1.0U													5.46	4.09	243.8	4.733	2.17	10.39
FDW	G6M-96-13B	10/15/2001	3,600	39	220	12	1U	1.1J													6.10	2.9	219	0.12	6.8	12.4
	G6M-96-13B	2/25/2002	5,200	34	200	1.4J	1U	1.5J													6.40	3.85	181.5	1.142	6.59	10.96
	G6M-96-13B	1/31/2003	3,800	31	190	2U	1U	2U																		
	G6M-96-13B	9/20/2004	4,500	35	210	2U	1U	2.1	1U	38	5.4J*	19	2		5U	1	15U	0.022	0.12	1.7	6.30	3.57	186.4	1.035	0.5	12.7
	G6M-96-13B	12/13/2004	2,500	24	150	2U	1U	2U	5U	35	5	31M	2U		5U	1U	23	0.05	0.025	24	6.26	2.57	316.5	0.787	2.68	11.05
	G6M-96-13B	3/28/2005	4,500	200U	180J	200U	200U	200U	5.7	47	0.46	17	2UJ*		5U	2.6M	1,600	0.17	0.22	37	6.24	0.87	21.2	0.943	0.68	10.67
	G6M-96-13B	8/10/2005	2,800	190	1,500	3.6	4.8	6.8	140	98.9	0.23	4.6	5.3		32	24J*	8,100	0.15	0.44	2.9	4.35	0.16	-35.6	0.838	3.5	14.53
	G6M-96-13B	9/26/2005	3,700	140	570	5U	5U	5U	200	134	0.28	11	11		44	51J	12,000	0.054	0.33	18	4.98	1.32	-45.9	1.071	4.54	13.39
	G6M-96-13B	12/13/2005	3,400	130	350	10U	5U	10U	140	150	0.05U	11	4.5		46.3	63J*	12,100	0.069	0.35	31	5.51	0.13	-52.1	0.851	0.9	10.65
	G6M-96-13B	3/20/2006	2,100	250	400	2U	1.2	2.5	360	300	0.207	6.77	2.4		38	96	17,000	0.036	0.42	97	5.68	0.17	-161.5	0.759	7.1	9.84
	G6M-96-13B	6/20/2006	1,900	280	370	2U	1U	3.5	110	310	0.2U	4.21	4.8		48J*	100	16,000	0.044	0.27	200	5.46	0.62	-86.8	1.252	2.63	14.08
	G6M-96-13B	9/18/2006	880	370	530	2U	1.3	9.4	300	370	0.262	4.56	3		150	110	20,000	0.022J	0.43	2,400	6.14	0.48	-120.9	1.555	2.19	14.45
	G6M-96-13B	12/11/2006	830	340	620	2U	1.6	7.3	360			6.06	1.2		190	130	27,000	0.020J	0.047	9,000	6.28	14.07	-260	1.93	2.1	11.78
	G6M-96-13B	3/27/2007	940	290	590	2.6	2.1	26	140			4.3	1.6		250	230	35,000J*	0.025U	0.96	22,000	5.71	0.1	-16.8	1.861	1.79	12.46
	G6M-96-13B	6/11/2007	1,200	280	610	2U	1.7	55	260			8.17	2.2		200	200	15U	0.025U	0.68	22,000	6.24	0.15	-97.5	1.87	1322	12.15
	G6M-96-13B	9/10/2007	2,600	130J*	590	2U	1.6	38	270	410	0.2U	580	2.8		240	210	25,000	0.036	6.3	32,000	6.25	0.4	-136.3	1.866	15.5	11.54
	G6M-96-13B	12/11/2007	750	99	830	2U	1.5	110	240			429	2.4		260	230	25,000	0.005J	3.6	26,000	6.11	1.92	-25.7	1.907	8	10.45
	G6M-96-13B	3/10/2008	1,200	140	1,000	2U	1.7	140	210			5U	2		240	240	26,000	0.025U	8.3	29,000	6.18	1.55	-90.2	1.958	6.4	9.77
	G6M-96-13B	10/15/2008	7.3J	6.5J	490	10U	10U	350	91.8U	470	0.13U	21	0.03UJ		172	290	39,500	1.2U	5.7	9,700	6.19	0.9	-59.2	2.046	11	12.69
	G6M-96-13B	5/7/2009	190	75	310	10U	10U	95	74	740J	0.13U	32	0.03U		169	323	38,600	1.2U	13	46,000	6.09	0.1	-97.6	1.909	4	9.91
	G6M-96-13B	10/19/2009	440	140	290	10U	10U	89	54	630	0.022U	53	0.041		173	325	36,000	1.2U	9.2	52,000	6.32	1.53	-93.1	2.054	13.6	10.34
FDW	G6M-96-25B	10/15/2001	360	2U	2U	2U	1U	2U													5.81	5.3	142	0.498	3.9	14.55
	G6M-96-25B	2/25/2002	130	2U	2U	2U	1U	2U													6.70	11.51	158.5	0.15	9.75	11.1
	G6M-96-25B	2/27/2002									7.2															
	G6M-96-25B	1/31/2003	52	2U	2U	2U	1U	2U																		
	G6M-96-25B	9/20/2004	56	2U	2U	2U	1U	2U													4.98	7.63	593	0.589	0	13.13
	G6M-96-25B	9/26/2005	40	2U	2U	2U	1U	2U													5.82	6.74	314.1	0.587	1.1	12.89
	G6M-96-25B	9/19/2006	44	2U	2U	2U	1U	2U													5.20	7.64	223.5	0.496	1.46	13.48
	G6M-96-25B	9/11/2007	16	2U	2U	2U	1U	2U													5.91	6.29	96.6	0.802	9.5	13.86
	G6M-96-25B	10/17/2008	1.7	0.5U	0.5U	0.5U	0.5U	0.5U													6.80	8.41	89.7	0.151	4	11.15
	G6M-96-25B	10/16/2009	1.9	38J	0.5UJ	0.5U	0.5U	0.5U													6.27	8.08	183.5	0.404	4.7	10.19
FDSA	G6M-04-09X	9/24/2004	7,400	4.2	9	2U	1U	2U							5U	1UJ	160				5.15	3.84	637.6	0.495	0.82	17.2
	G6M-04-09X	9/28/2005	3,200	5U	5U	5U	5U	5U							5U	1U	37				5.92	3.41	678.4	0.169	2.07	15.42
	G6M-04-09X	9/21/2006	190	2U	2U	2U	1U	2U							5U	0.10U	50				5.83	8.18	215.6	0.102	5.51	13.18
	G6M-04-09X	9/12/2007	440	22	31	2U	1U	2U							5U	0.83	390				6.22	2.18	49.7	0.179	4.3	14.72
	G6M-04-09X	10/17/2008	4,000	330	410	50U	50U	44							63.4	13.3	5,700				6.23	0.66	-36.2	0.497	9.2	10.24
	G6M-04-09X	10/21/2009	1,600	210	210	50U	50U	51							70.8	13	3,960				5.8	0.58	33.3	0.376	4.53	10.47

Area of Contamination 50
Groundwater Analytical Results
(2001-2009)

			Laboratory Parameters																		Field Parameters					
Area of Concern	Well ID	Date	PCE	TCE	*cis* -1,2-DCE	*trans* -1,2-DCE	1,1-DCE	VC	TOC	Alkalinity	Nitrate	Sulfate	Sulfide	Phos	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane	pH	DO	ORP	SpC	Turbidity	Temp
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)			(SU)	(mg/L)	(mV)	(mS/cm)	(NTUs)	°C
FDSA	G6M-04-10A	9/20/2004	2,900	2.5	3.4	2U	1U	2U	1U	41	4.5J*	22	2		5U	1	170	0.021	0.03	1.1	5.91	3.75	206.5	0.552	1.7	13.59
	G6M-04-10A	12/14/2004	2,400	2U	2U	2U	1U	2U	5U	25	1.7	13	2U		5U	1U	120	0.015	0.096	1500	5.89	2.81	215.4	0.965	2.04	8.84
	G6M-04-10A	3/30/2005	640	40U	40U	40U	40U	40U	52	107	0.33	16	2U		8.4	1.2	8,100	0.33	0.07	1.4	5.90	4.22	68.3	1.01	1.76	10.62
	G6M-04-10A	8/11/2005	380	45	390	2U	2U	2U	240	359	.05U	7.8	1U		77	87J*	50,000J*	0.24	0.23	3.4	5.65	1.84	11.9	0.977	14.9	19.56
	G6M-04-10A	9/27/2005	340	88	260	1U	1U	1U	330	442	0.084	3.0J	5.9		190	230J	76,000	0.08	0.15	110	6.33	1.89	-1.9	1.135	4.3	15.68
	G6M-04-10A	12/14/2005	1,500	180	220	2U	1U	2U	370	480	0.05U	3.7	7.4		179	250J*	32,500	0.048	0.13	6,800	6.41	1.57	-64.8	0.985	1.9	9.54
	G6M-04-10A	3/21/2006	4,400	180	450	2U	1U	8.3	180	390	0.2U	4.08	2		180	220	8,100	0.025U	0.69	20,000	6.72	0.27	-121.4	0.676	7.51	10.21
	G6M-04-10A	6/20/2006	6,100	650	330	2U	1U	27	120	340	0.2U	4.32	3.2		160	220	5,700	0.025U	0.12	16,000	6.34	0.22	-99.8	0.893	9.82	15.4
	G6M-04-10A	9/19/2006	1,000	15	59	2U	1U	14	61	150	0.311	5.2	1.2		170	97	5,000	0.23	0.11	11,000	6.56	1.14	-86.9	0.43	6	14
	G6M-04-10A	12/13/2006	450	37	860	2U	1.2	76	73			1.82	1.6		150	96	4,800	0.025U	0.12	22,000	6.91	0.14	-111	0.662	27.3	10.50
	G6M-04-10A	3/28/2007	1,200J*	230J*	680J*	2U	1.6J*	60J*	130			2.07	1U		380	260	27,000J*	0.65	0.26	20,000	6.1	0.19	-89.9	1.188	15.4	12.35
	G6M-04-10A	6/12/2007	760	140	900	2U	2.1	130	190			1U	2.4		310	260	15,000	0.54	1.1	23,000	6.58	0.19	-145.2	1.295	128.5	11.9
	G6M-04-10A	9/11/2007	2,700	99J*	400	2U	1U	91	220	440	0.2U	54	2.4		240	290	13,000	0.35	0.47	18,000	6.42	1.72	-138.2	0.864	42.3	11.27
	G6M-04-10A	12/11/2007	830	8.8	280	2U	1U	90	270			3.57	3		330	280	12,000	0.3	0.52	31,000	6.4	1.2	-70.1	1.366	8	10.1
	G6M-04-10A	3/10/2008	200	830	670	3.4	1.8	37	210			10	2.2		340	230	35,000	0.34	0.61	25,000	6.53	0.94	-123.8	1.362	24	10.11
	G6M-04-10A	10/6/2008	4,000	450	990	100U	100U	1,400	34	210	0.13U	12	0.03UJ		247	187	9,100	1.3U	11	16,000	6.38	0.21	-168	0.948	15	10.75
	G6M-04-10A	1/21/2009	1,500	390	1,400	1,100U	0.67J	1,200	46J	20U	0.13U	20	0.03UJ	0.10J	250	234J	8	1.2U	9.6	53,000	6.6	0.2	-112.6	0.937	7.02	8.74
	G6M-04-10A	5/7/2009	380	41	390J	10U	10U	420	49	590J	0.13U	24	0.03U	0.13J	292	194	17,200	1.2U	11	34,000	6.4	0.8	-125	1.165	4.2	10
	G6M-04-10A	10/20/2009	2,700	290	2,100	50U	50U	1,400	21	350	0.13U	8.7	0.03U	0.1J	220	127	8,960	1.3U	15	11,000	6.42	0.17	-121.4	0.805	11.43	10.42
FDSA	G6M-04-10X	9/20/2004	70	7.5	32	2U	1U	2U	1U	11	6.7J*	21	3.4		5U	1	260	0.019	0.039	1	5.59	6.87	246.2	0.902	0.95	14.64
	G6M-04-10X	12/14/2004	65	7.8	35	2U	1U	2U	5U	10U	6.6	23	2U		5U	1U	200	0.022	0.053	2.2	5.40	7.57	424.2	0.816	5.5	6.31
	G6M-04-10X	3/31/2005	56	6.8	30	2U	2U	2U	0.4J	10U	1.5	25	2U		5U	1U	190	0.022	0.86	1.1	5.18	7.65	256.7	1.337	0.41	11.18
	G6M-04-10X	7/1/2005	50	5.4	23	2U	1U	2U	5.9	43.5	1.7	12	1U		4.2	1UJ*	10U	0.035	0.05	12	5.33	6.09	265.2	1.502	0.9	15.77
	G6M-04-10X	9/27/2005	48	4.7	23	2U	1U	2U	4	7.7	1.4	26	1U		5U	1U	170	0.010J	0.018J	16	5.26	6.68	450.9	1.123	0.5	13.97
	G6M-04-10X	12/14/2005	67	6.3	27	2U	1U	2U	5U	9.8	1.5	28	1U		5U	1U	164	0.016J	0.034	11	5.49	6.78	205.1	1.032	3.4	10.09
	G6M-04-10X	3/22/2006	76	9.1J*	32	2U	1U	2U	5.6	10U	1.44	23.6	1U		5U	.1U	200	0.015J	0.025J	25	5.57	6.74	195.7	0.94	1.45	9.82
	G6M-04-10X	6/20/2006	87	10	47	2U	1U	2U	5U	10U	1.69	25.2	1U		5U	0.1U	240	0.013J	0.012J	18	5.08	6.23	248.8	1.512	1.9	15.25
	G6M-04-10X	9/19/2006	65	6.8	32	2U	1U	2U	2.2J	8	1.27	22.2	1U		5U	0.10U	240	0.026	0.025J	13	5.21	6.94	273.9	1.66	4.68	14.25
	G6M-04-10X	12/13/2006	64	7.2	35	2U	1U	2U	5U			27	1U		5U	0.1U	280	0.008J	0.011J	28	5.38	7.9	39.3	2.16	0.59	11.25
	G6M-04-10X	3/28/2007	56	5.9	26	2U	1U	2U	5U*			27.9	1U		5U	0.21	290J*	0.017J	0.054	21	5.21	6.37	77.9	1.947	3.71	12.63
	G6M-04-10X	6/12/2007	28	2.4	9.9	2U	1U	2U	5U			31.2	1U		5U	0.1U	250	0.010J	0.065	18	5.35	6.31	230.7	3.15	14	14.71
	G6M-04-10X	9/11/2007	35	3.4	13	2U	1U	2U	5U	10U	1.4	2000	1U		6U	0.1U	270	0.008J	0.010J	13	5.29	8.98	-40.6	2.617	10.5	13.56
	G6M-04-10X	12/11/2007	20	2U	6.4	2U	1U	2U	5U*			34.7	1U		5U	0.1U	230	0.010J	0.028	5.3	5.46	5.62	27.7	3.66	2.8	10.45
	G6M-04-10X	3/11/2008	22	2.1	9.7	2U	1U	2U	5U			28	1U		5U	0.16	250	0.004J	0.010J	4.1	4.99	6.42	213.5	2.89	0	8.25
	G6M-04-10X	10/15/2008	18	1.6	8.4	0.5U	0.5U	0.5U	10U	30	1.4	27	0.03U		8.0U	0.2U	265	1.2U	1.5U	6.1	5.28	6.58	247.1	3.339	1.4	10.96
	G6M-04-10X	5/7/2009	15	1.2	5	0.5U	0.5U	0.5U	10U	20UJ	1.2	33	0.03U		8.0U	0.2U	213	1.3U	1.6U	0.76	5.2	5.86	196.8	2.229	1.53	10.36
	G6M-04-10X	10/20/2009	9.8	4.8	5.2	0.5U	0.5U	0.27J	10U	20U	1.1	29	0.03U		8U	0.139U	197	1.3U	1.6U	19	5.2	5.72	226.2	2.651	2.68	10.6
FDSA	G6M-04-13X	9/21/2004	8	2U	2U	2U	1U	2U							5U	1U	350				5.96	8	551.8	0.138	1.75	14.39
	G6M-04-13X	9/26/2005	2U	2U	2U	2U	1U	2U							5U	1U	15U				6.43	10.5	180	0.042	3.8	10.63
	G6M-04-13X	9/18/2006	2U	2U	2U	2U	1U	2U							5U	0.10U	15U				5.65	8.63	213.9	0.076	12.1	14.35
	G6M-04-13X	9/12/2007	2U	2U	2U	2U	1U	2U							5U	0.1U	15U				6.07	8.7	147.4	140	14.1	11.82
	G6M-04-13X	10/17/2008	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U							8U	0.2U	50U				5.22	9.98	124.4	0.046	45	9.54
	G6M-04-13X	10/20/2009	25U	16J	25U	25U	25U	25U							2J	0.132U	50U				5.78	10.61	283.7	0.049	12.2	9.76
FDSA	G6M-04-15X	9/21/2004	5.2	2U	5.3	2U	1U	2U							5U*	4.8	8,100				5.26	0.82	410	2.64	0.23	14.4
	G6M-04-15X	9/28/2005	9.1	2U	6.4	2U	1U	2U							33	1.8	4,400				5.11	0.39	248.1	0.674	0.29	16.01
	G6M-04-15X	9/20/2006	3.5	2U	5.2	2U	1U	2U							20	2	4,300				4.60	1.07	-100.3	1.555	0.95	17.24
	G6M-04-15X	9/11/2007	2.7	2U	2U	2U	1U	2U							18	0.75	2,100				6.21	3.21	85.1	1.353	3.5	13.33
	G6M-04-15X	10/17/2008	4.8	1.0	2.3	0.5U	0.5U	0.5U							36.3	3.01	3,010				6.34	1.5	-8.1	0.910	4	13.36
	G6M-04-15X	10/19/2009	1.9	14	3	0.5U	0.5U	0.5U							48.9	5	3,130				6.19	0.31	24.4	0.799	4.68	10.56

Area of Contamination 50
Groundwater Analytical Results
(2001-2009)

			Laboratory Parameters																		Field Parameters					
Area of Concern	Well ID	Date	PCE	TCE	*cis* -1,2-DCE	*trans* -1,2-DCE	1,1-DCE	VC	TOC	Alkalinity	Nitrate	Sulfate	Sulfide	Phos	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane	pH	DO	ORP	SpC	Turbidity	Temp
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)			(SU)	(mg/L)	(mV)	(mS/cm)	(NTUs)	°C
FDSA	G6M-94-18X	10/16/2001	2U	2U	2U	2U	1U	2U													5.20	8.4	291	7	6.4	12.6
	G6M-94-18X	2/25/2002	6,400	2U	2U	2U	1U	2U																		
	G6M-94-18X	2/27/2002	2,800								0.91										6.11	8.9	147	0.086	45.3	12.07
	G6M-94-18X	2/4/2003	37,000	2U	2U	2U	1U	2U																		
	G6M-94-18X	9/20/2004	3,400	2U	2U	2U	1U	2U	1U	18	2	11	4		5U	1	15U	0.011	0.022	1.1	6.15	9.03	321.7	0.078	3.8	13.89
	G6M-94-18X	12/15/2004	2,300	2U	2U	2U	1U	2U	5U	110	1.6	10	2U		5U	1U	15U	0.005U	0.0085	9.1	6.00	9.36	441	0.062	64.7	11.35
	G6M-94-18X	3/31/2005	17,000	1,000U	1,000U	1,000U	1,000U	1,000U	1.1J	14.4	0.23	10	2U		5U	1U	15U	0.011	0.71	0.97	6.17	10.34	171.9	0.063	16.6	11.34
	G6M-94-18X	7/1/2005	2,000	2.5U	2.5U	2.5U	2.5U	2.5U	4.7J	14	0.13	9.2	1U		2U	1UJ*	10U	0.051	0.025	2.7	5.77	8.03	247.9	0.083	21.3	18.31
	G6M-94-18X	9/27/2005	710	1U	1U	1U	1U	1U	3.8	15.4	0.071	8.8J	1U		5U	1U	15U	0.032	0.04	0.48	5.72	8.82	228.1	0.054	6	13.78
	G6M-94-18X	12/16/2005	260	2U	2U	2U	1U	2U	6	10	0.068	14	1U		5U	1U	15U	0.042	0.15	0.17	6.21	8.74	188.5	0.096	98.3	11.23
	G6M-94-18X	3/21/2006	66	2U	2U	2U	1U	2U	5.5	12	0.2U	14.6	1U		5U	0.16	15U	0.025U	0.016J	23	6.39	10.48	440.4	0.078	188	10.81
	G6M-94-18X	6/20/2006	46	2U	2U	2U	1U	2U	1.6J	25U*	0.2U	11.3	1U		5U	100U	15U	0.004J	0.008J	6.5	5.43	7.18	1022.5	0.073	5.43	19.03
	G6M-94-18X	9/18/2006	41	2U	2U	2U	1U	2U	4.9J	15	0.2U	9.66	1U		5U	0.10U	15U	0.006J	0.021J	19	5.84	7.15	204.3	0.111	18.2	18.31
	G6M-94-18X	12/12/2006	36	2U	2U	2U	1U	2U	2.2J			10.5	1U		5U	0.10U	15U	0.004J	0.052	15	6.22	6.15	157.3	0.07	354	11.97
	G6M-94-18X	3/29/2007	700	2U	2U	2U	1U	2U	2J			8.59	1U		5U	0.1U	15U	0.004J	0.018J	9.2	6.11	5.32	-27.8	0.087	3.89	11.7
	G6M-94-18X	6/11/2007	2,100	2U	2U	2U	1U	2U	2.4J			11.5	1U		5U	0.1U	15U	0.007J	0.006J	0.22	6.29	7.12	134	0.08	98.6	14.88
	G6M-94-18X	9/12/2007	330	2U	2U	2U	1U	2U	0.6J	25	0.2U	6.1	1U		6U	0.1U	15U	0.025U	0.025U	2.6	6.25	7.46	139.3	0.159	122.9	12.36
FDSA	G6M-95-20X	10/16/2001	4.4	2U	2U	2U	1U	2U													5.90	7.2	212	0.27	4.1	16
	G6M-95-20X	2/25/2002	5	2U	2U	2U	1U	2U													6.59	12.37	155.7	0.171	7.67	15.24
	G6M-95-20X	2/27/2002									4.7															
	G6M-95-20X	9/21/2004	2.8	2U	2U	2U	1U	2U							5U	1U	15U				5.76	8.88	205.5	0.544	0	15.69
	G6M-95-20X	9/26/2005	2.3	2U	2U	2U	1U	2U							5U	1U	15U				5.62	8.75	328.7	0.741	0.95	15.22
	G6M-95-20X	9/19/2006	2.2	2U	42	2U	1U	2U							71	350	39,000				6.31	0.76	-108	2.715	4.19	17.33
	G6M-95-20X	9/12/2007	2U	2U	11	2U	1U	2U							160	110	15,000				6.49	3.19	-114.3	0.74	73.7	18.21
	G6M-95-20X	10/15/2008	0.38J	0.2J	2.5	0.5U	0.5U	0.5U							97.2	45.6	5,250				6.45	0.49	-104.4	0.511	4.2	13.12
	G6M-95-20X	10/16/2009	0.5U	37J	3.1	0.5U	0.5U	0.5U							166	206	7,660				6.61	0.29	-81.4	0.898	8.81	12.14
FDSA	G6M-07-02X	12/12/2007	50	2U	2U	2U	1U	2U	5U*			16.2	1U		5U	0.1U	64	0.024J	0.022J	0.73	5.9	7.54	194.2	0.148	5.4	9.28
	G6M-07-02X	3/11/2008	1,800	2U	2U	2U	1U	2U	5U			26	1U		5U	0.1U	35	0.014J	0.019J	7.1	5.7	7.5	165.5	0.108	0	9.22
	G6M-07-02X	10/15/2008	170	5.0U	5.0U	5.0U	5.0U	5.0U	10U	20U	0.13U	11	0.030UJ		5.5J	0.2U	21.2J	1.2U	10	12,000	5.34	9.25	93.2	0.067	19	10.90
	G6M-07-02X	5/11/2009	46	0.5U	0.5U	0.5U	0.5U	0.5U	5.7J	20U	0.062	8.6J	0.030UJ		7.1	0.2U	5.8J	1.2U	1.5U	7	6.17	9.4	115.7	0.055	4	9.42
	G6M-07-02X	10/20/2009	30J	0.5U	0.5U	0.5U	0.5U	0.5U	10U	20U	0.13U	7.2	0.03UJ		6.6	0.2U	50U	1.3U	1.6U	6.2J	6	9.34	128.9	0.053	9.35	10.26
Area 1	G6M-04-22X	9/21/2004	900	24	110	2U	1U	2U							5U	1U	990				6.30	4.78	192.2	0.897	19	15.24
	G6M-04-22X	9/28/2005	210	6.8	45	2.5	1U	2U							5U	1U	120				5.52	6.13	391.3	0.757	21	14.69
	G6M-04-22X	9/20/2006	200	8.7	54	2U	1U	2U							5U	0.43	4,500				5.68	2.8	197.8	1.048	6.98	14.3
	G6M-04-22X	9/11/2007	95	12	75	2U	1U	9.4							390	250	44,000				6.92	0.28	-160.8	2.25	20.7	13.22
	G6M-04-22X	10/17/2008	18	3.7	53	0.44J	1U	26							439	421	15,900				6.34	0.28	-106.1	2.104	18	11.11
	G6M-04-22X	10/19/2009	7.2	9.7	16	0.5U	0.5U	4.9							320	355	9,360				6.26	1.27	-48.7	2.181	290	10.71
Area 1	G6M-04-31X	9/21/2004	1,600	2U	4.2	2U	1U	2U							5U	1U	190				5.69	5.1	211	1	2.99	16.33
	G6M-04-31X	9/28/2005	1,900	5U	5.2	5U	5U	5U							5U	1U	35				5.63	3.66	305.4	0.388	2.2	15.03
	G6M-04-31X	9/20/2006	600	6.1	2.5	2U	1U	2U							5U	0.10U	15U				6.52	0.28	-108.5	0.729	3.56	15.56
	G6M-04-31X	9/11/2007	340	260	330	2.8	1.3	2U							5U	0.1	890				6.38	5.61	101.6	0.217	6.9	13.11
	G6M-04-31X	10/17/2008	110	72	340	20U	20U	730							103	68.4	9,710				6.43	2	-72.7	0.636	9	11.25
	G6M-04-31X	10/21/2009	86	11	270	10U	10U	560							311	181	16,900				5.82	1.96	-102	0.626	6.23	11.78
Area 1	G6M-03-01X	10/21/2009	380	65	670	25U	25U	25U													6.52	0.88	-153.5	0.559	7.25	11.53
Area 1	G6M-03-04X	10/21/2009	4.2U	4.0U	81	4.0U	4.0U	4.1													6.04	0.7	-99.6	0.635	24.5	11

Area of Contamination 50
Groundwater Analytical Results
(2001-2009)

			Laboratory Parameters																		Field Parameters					
Area of Concern	Well ID	Date	PCE	TCE	*cis* -1,2-DCE	*trans* -1,2-DCE	1,1-DCE	VC	TOC	Alkalinity	Nitrate	Sulfate	Sulfide	Phos	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane	pH	DO	ORP	SpC	Turbidity	Temp
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)			(SU)	(mg/L)	(mV)	(mS/cm)	(NTUs)	°C
Area 2	G6M-02-01X	2/28/2002	11	2U	2U	2U	1U	2U													6.91	4.7	66.6	0.624	14	13.53
	G6M-02-01X	9/23/2004	24B	2U	2U	2U	1U	2U													6.64	2.54	145	0.784	6.11	19.41
	G6M-02-01X	9/30/2005	110	2U	3.1	2U	1U	2U													6.07	3.82	384.8	0.555	10.9	18.04
	G6M-02-01X	9/20/2006	1,300	12	91	2U	1U	2U													6.19	3.68	-108.2	0.708	9.07	17.33
	G6M-02-01X	12/14/2006	1,600	18	120	2U	1U	2U	5U												6.54	3.64	-34.8	0.831	2.81	14.32
	G6M-02-01X	3/30/2007	1,700	19	120	2U	1U	2U	3.3J			9.43	1U		5U	0.1U	120J*	0.012J	0.081		6.64	4.22	-35.3	0.8	0.78	14.06
	G6M-02-01X	6/14/2007	1,700	16	97	2U	1U	2U	1.9J												6.72	3.3	69.6	0.853	10.4	14.82
	G6M-02-01X	9/14/2007	1,900	24	150	2U	1U	2U													6.57	3.32	102.4	0.747	0.1	14.44
	G6M-02-01X	12/13/2007	1,600	21J*	130J*	2U	1U	2U	3.6J												6.61	2.73	128	0.807	0	12.57
	G6M-02-01X	3/14/2008	520	70	600	2U	2.2	2U	180			5U	1U		150	26	23000	0.052	0.16	12	6.45	0.38	-99.2	1.62	2.7	13.35
	G6M-02-01X	10/7/2008	180	49	360	10U	10U	10U	17.7	200	0.13U	11	0.03UJ		141	14.5	5,880	6.3U	9.5	5,000	6.97	0.18	-112.9	1.193	8.4	12.07
	G6M-02-01X	1/21/2009	280	76U	170	1.3U	1.2J	94U	11J	170	0.13U	7.0U	0.03U	0.25J	148	11,200J	4,500	1.3U	24	4,000	7.13	0.39	-142.7	1.279	1.2	11.08
	G6M-02-01X	5/6/2009	610	190	100	10U	10U	54	13	220J	0.059J	8.4	0.03U	0.38J	133	18.7	3,950	1.2U	29	29,000	6.69	0.2	-127.7	1.085	1.15	11.42
	G6M-02-01X	10/20/2009	820	180	76	40U	40U	47	4.6J	130	0.074J	7.6	0.03UJ	0.12J	108	11.8	2,470	1.3U	9	5,000J	6.66	1.24	32.9	0.925	3.52	11.45
Area 2	G6M-04-01X	9/23/2004	250B	3.6	21	2U	1U	2U							5U	1U	220				6.82	3.92	245.2	2.391	9.42	18.11
	G6M-04-01X	9/28/2005	140	2U	9.2	2U	1U	2U							5.1	1U	170				6.49	5.85	202.3	2.699	7.29	18.59
	G6M-04-01X	9/20/2006	150	2U	7.2	2U	1U	2U							5U	0.10U	220				5.87	4.88	-91.4	2.92	3.53	19.1
	G6M-04-01X	9/14/2007	290	2U	8.6	2U	1U	2U							6U	0.1U	130				6.00	5.21	155.3	2.055	35.8	16.25
	G6M-04-01X	10/20/2008	270J	11J	10UJ	10UJ	10UJ	10UJ							8UJ	0.2UJ	53.1J				7.32	3.37	96.2	0.999	3.5	11.33
	G6M-04-01X	10/20/2009	190	130	360	13U	13U	15							8U	0.107U	113				5.79	2.25	342.4	0.908	4.8	12.12
Area 2	G6M-04-03X	9/23/2004	440	2U	3.3	2U	1U	2U	1.4	53	5.1	23	2.2		5U	1U	3,100	0.22	0.036	100	6.37	3.41	446.5	1.236	12.2	18.36
	G6M-04-03X	9/27/2005	680	14	10	1U	1U	1U	6	81.5	0.35	38J	1U		5U	0.6J	3,500	0.19	0.32	52	6.29	0.79	377.5	1.361	9.62	17.15
	G6M-04-03X	9/22/2006	2,600	420	6.3	2U	1U	2U	7.2	190	0.2U	16.6	1U		5U	0.10U	2,900	0.049	0.3	17	6.30	0.43	152.1	0.524	3.52	15.3
	G6M-04-03X	9/14/2007	770	68	2.7	2U	1U	2U	1.6J	100	0.2U	24	1U		38	0.87	2,300	0.062	0.11	3	7.29	0.49	-110.3	0.294	3.6	15.75
	G6M-04-03X	10/16/2008	160	18	7.6	5U	5U	5U	10U	150J	0.10U	8	0.03U		94.8	0.2U	930	1.3U	1.6U	6.2J	10.48	2.01	18	0.539	5.8	14.12
	G6M-04-03X	10/15/2009	16	8.4	8.6	0.5U	0.5U	0.5U	10U	240	0.13U	7U	0.03U		148	2.02	3,270	1.3U	1.6U	2,000	8.80	1.49	-46.9	0.227	5	13
Area 2	G6M-97-08B	10/18/2001	92	6.1	36	1.6J	1U	2U													5.60	4.8	224	0.13	18	15
	G6M-97-08B	2/26/2002	100	5.9	32	2U	1U	2U													5.87	5.13	186.4	1.157	5.3	14.44
	G6M-97-08B	9/22/2004	220	9.3	41	2U	1U	2U	1U	10U	6.1	12	1.5J		5U	1U	26	0.0075	0.005U	1.3	5.69	4.66	252.8	1.516	18.3	17.01
	G6M-97-08B	12/16/2004	200	7.7	41	2U	1U	2U	5U	10U	6.1	12	5.4		5U	1U	25	0.13	0.072	0.92	5.79	8.78	165	1.633	3.81	13.61
	G6M-97-08B	3/30/2005	95	3.4J	16	4U	2U	4U	0.4J	12	0.8	7	2U		5U	1U	21	0.015	0.032	0.54	5.58	8.06	202.8	0.999	9.42	14.41
	G6M-97-08B	6/28/2005	140	8	36	1.4	1U	2U	7.1	16.7	1.4	12	1U		2U	1J	27	0.016	0.041	35	11.30	4.94	173.7	1.506	8.16	19.31
	G6M-97-08B	9/27/2005	180	7.5	42	2U	1U	2U	4.4	15.9	1.3	16	1U		5U	1U	33	0.013J	0.027	0.39	5.60	5.73	319.2	1.713	2.82	15.12
	G6M-97-08B	12/12/2005	120	5.7	27	2U	1U	2U	0.6J	23	0.05UJ*	13	1U		5U	1U	28.1	0.04	0.11	26	5.87	4.19	171.1	1.11	0.7	10.84
	G6M-97-08B	3/23/2006	240	8.8	44	2U	1U	2U	5U	13	1.25	13.7	1U		5U	0.1U	46	0.022J	0.13	12	5.85	5.13	181.5	1.44	3.16	14.12
	G6M-97-08B	6/21/2006	220	11	35	2U	1U	2U	16	66	0.809	13.5	1		5U	0.17	1,300	0.019J	0.086	24	5.90	2.39	141.1	2.015	1.48	16.26
	G6M-97-08B	9/19/2006	190	14	55	2U	1U	2U	270	300	0.2U	23.6	2.8		130	21	13,000	0.078	0.13	18	5.79	1.58	47.6	2.287	4.58	19.14
	G6M-97-08B	12/13/2006	200	11	75	2U	1U	2U	440			49.6	2.8		160	83	20,000	0.004J	0.038	1,700	6.07	1.43	-72.8	3.107	5.21	12.78
	G6M-97-08B	3/30/2007	200	8.5	46	2U	1U	2U	620			126	4.6		130	170	26,000J*	0.028	0.19	6,000	5.36	0.46	14.8	3.626	1.13	15.18
	G6M-97-08B	6/14/2007	140	5.5	37	2U	1U	2U	760			120	6.4		100	370	24,000	0.025U	0.021J	7,900	5.66	1.68	-45.4	3.659	1	16.89
	G6M-97-08B	9/12/2007	170	8.4	43	2U	1U	3	630	650	0.2U	1500	3.2		120	370	18,000	0.004J	0.05	8,400	5.66	2.72	-31.4	3.924	5.5	16.2
	G6M-97-08B	12/14/2007	150J*	5.7J*	31J*	2UJ*	1UJ*	4.5J*	520			92	5.6		150	280	12,000	0.006J	0.054	10,000	5.84	0.75	-45.3	3.673	0	12.58
	G6M-97-08B	3/12/2008	150	6.5	32	2U	1U	6.8	270			38	2.8		160	190	8,100	0.008J	0.15	9,800	5.94	2.15	-66.4	3.091	0	12.48
Area 2	G6M-07-01X	10/15/2008	26	0.24J	0.5U	0.5U	0.5U	0.5U													7.78	2.22	53.9	0.591	608	12.2
	G6M-07-01X	10/20/2009	21	15	0.5U	0.5U	0.5U	0.5U													7.44	4.11	171.9	0.532	283	12.39

Area of Contamination 50
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(2001-2009)

			Laboratory Parameters																		Field Parameters					
Area of Concern	Well ID	Date	PCE	TCE	*cis* -1,2-DCE	*trans* -1,2-DCE	1,1-DCE	VC	TOC	Alkalinity	Nitrate	Sulfate	Sulfide	Phos	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane	pH	DO	ORP	SpC	Turbidity	Temp
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)			(SU)	(mg/L)	(mV)	(mS/cm)	(NTUs)	°C
Area 3	G6M-03-07X	5/12/2003	1,200	7.2	34	2U	1U	2U																		
	G6M-03-07X	9/24/2004	1,700	6.3	31	2U	1U	2U	1U	10U	4.3J*	12	1.6J		5U	1UJ*	20	0.035	0.28	5.7	5.77	7	168.3	0.341	84.6	18.13
	G6M-03-07X	12/16/2004	1,500	6	35	2U	1U	2U	5U	10U	4.2	12	2.9		5U	1U	190	0.026	0.08	0.39	6.02	17.09	321.7	0.348	8.46	13.03
	G6M-03-07X	3/30/2005	1,100	91	140	40U	20U	40U	29	76	0.33	8	2U		18	18	10,000	0.078	0.21	1.8	6.33	1.9	-54.6	0.671	0.7	16.73
	G6M-03-07X	6/29/2005	940	78	940	40U	20U	40U	83	118	0.079	6.4	1U		31	39J*	15,000J*	0.06	0.34	3.9	11.97	1.12	-20.1	0.915	5.93	23.98
	G6M-03-07X	9/29/2005	300	44	1000	2.3	2.7	1U	290	307	0.05U	3.2	12		46	210J	30,000	0.068	0.45	660	6.20	2.7	-62	1.266	7.68	17.97
	G6M-03-07X	12/12/2005	92	22	710	20U	10U	20U	220	320	0.05UJ*	2U	6.2		96.1	190	46,600	0.078	0.13	13,000	6.5	0.22	-82.1	1.038	3.6	10.2
	G6M-03-07X	3/24/2006	110	23	430	2U	2	270	260	590	0.2U	1	8.6		130	280	48,000	0.010J	2	22,000	6.87	0.17	-130.5	1.39	10.1	13.1
	G6M-03-07X	6/21/2006	9.5	3.6	180	2U	1U	310	280	570	0.2U	1U	4.8		140MSA	460	59,000	0.073	21	21,000	5.13	0.7	-170.4	2.258	31.4	19.6
	G6M-03-07X	9/19/2006	47	7.9	260	2U	1U	300	290	460	0.926	1.27	5		140	470	44,000	0.037	9.2	25,000	6.48	0.27	-147.2	2.15	15.1	22.98
	G6M-03-07X	12/14/2006	190	30	310	2U	1.3	160	300			2.44	2.8		220	400	38,000	0.025	5.9	26,000	6.37	0.17	-160	2.155	6.19	12.74
	G6M-03-07X	3/29/2007	2U	2U	35	2U	1U	360	130			1U	4.4		190	420	20,000J*	0.08	5.1	15,000	6.32	2.46	-69.3	1.787	39.6	16.04
	G6M-03-07X	6/14/2007	37	8.1	190	2U	1U	200	310			10.5	2.4		220	490	37,000	0.025U	2.3	25,000	6.40	1.31	-159	2.386	9.7	14.01
	G6M-03-07X	9/13/2007	27	13	290	2.2	1.1	140	72	560	0.2U	420	4.8		210	500	29,000	0.008J	12	26,000	6.26	3.08	-174.9	2.743	117.6	14.14
	G6M-03-07X	12/14/2007	2.6	2U	9.8	3	1U	120	140			10U	4		270	320	12,000	0.010J	34	25,000	6.51	0.99	-123.7	2.138	70.9	8.48
	G6M-03-07X	3/14/2008	2U	2U	2.3	2U	1U	4.3	130			5U	4		210	230	11,000	0.11	26	30,000	6.41	1.06	-85.5	1.897	235.9	14.74
	G6M-03-07X	10/7/2008	5U	2.2J	5U	21	5U	5U	64.3	190	190	24	0.03UJ		246	348	5,370	6.3U	12	14,000	6.24	0.10	-44.4	1.742	16	14.16
	G6M-03-07X	1/22/2009	1.4U	2.3U	1.7J	15	1.7U	3.6	110J	20U	0.13U	37	0.03U	0.10R	227	338J	5,000	1.2U	10	16,000	6.6	1.20	-74.9	1.743	30	11.35
	G6M-03-07X	5/6/2009	0.5U	0.5U	1.8	20	0.5U	2.6	66	720J	0.025J	32	0.03U	0.1UJ	351	361	5,500	1.2U	9.9	28,000	5.88	0.21	-117.9	1.735	20.3	13.04
	G6M-03-07X	10/15/2009	0.27J	0.5U	2.3	19	0.5U	2.2	44	550	0.13U	30	0.03UJ	0.16J	318	251	4,870	1.1U	7.3	16,000	6.25	0.88	-100.4	1.362	5.6	12.69
Area 3	G6M-04-02X	9/23/2004	1,900	2U	3.8	2U	1U	2U							5U	1U	86				6.59	7.25	152.4	0.704	9.52	22.11
	G6M-04-02X	9/28/2005	1,800	5U	5U	5U	5U	5U							5U	1U	15U				5.21	6.54	294	0.607	12	19.6
	G6M-04-02X	9/20/2006	1,100	170	2.2	2U	1U	2U							5U	0.10U	24				5.22	2.88	-101.5	0.696	10.61	19.32
	G6M-04-02X	9/14/2007	710	98	290	21	1U	2U							48	16	13,000				6.52	2.91	-31.3	1.356	2.3	15.38
	G6M-04-02X	10/16/2008	320	47	290	5U	5U	5U							135	56.6	6,530				6.32	0.74	-143.6	1.302	3.8	13.21
	G6M-04-02X	10/15/2009	400	110	15	8U	8U	8U							78.3	20.8	3,580				6.19	0.9	-25	1.011	4	11.85
Area 3	G6M-04-04X	9/24/2004	2,300	7.8	24	2U	1U	2U	1U	10U	5.5	20	2U		5U	1UJ*	560	0.037	0.12	13	5.75	5.05	197.3	1.637	169	15.8
	G6M-04-04X	9/29/2005	1,600	5.4	15	2.5U	2.5U	2.5U	0.5J	5.3	1.4	23	1U		5U	1U	430	0.018J	0.06	0.44	5.34	5.66	295.9	1.666	7.39	18.26
	G6M-04-04X	9/19/2006	1,600	45	260	2U	1U	2U	120	190	0.2U	10.2	1.6		110	84	31,000	0.12	0.095	33	6.22	0.32	-71.5	1.765	7.64	19.03
	G6M-04-04X	9/13/2007	600	130	210	2	1.2	300	63	270	0.2U	890	1.2		280	130	25,000	0.005J	7	18,000	6.57	3.2	-186.6	2.398	3.5	18.12
	G6M-04-04X	10/16/2008	6.0	8.1	48	2.8	2.5U	150J	34.6U	520	0.10U	7	0.03UJ		523	248	19,300	1.3U	62	18,000	6.40	2.39	-106.2	2.239	4	14.05
	G6M-04-04X	10/15/2009	0.5U	0.5U	4.8	5.2	0.5U	6.9	32	520	0.13U	23J	0.03UJ		615	239	16,800	1.3U	61	38,000J	6.47	0.86	-123	1.744	5	12.85
Area 4	G6M-02-03X	2/26/2002	210	2U	2U	2U	1U	2U													11.61	2.21	11	1.154	18.1	16.08
	G6M-02-03X	9/23/2004	48	2U	2U	2U	1U	2U													4.95	1.17	632.1	1.374	3.8	18.88
	G6M-02-03X	9/29/2005	12	2U	2U	2U	1U	2U													5.70	2.9	204.9	1.138	10.67	17.6
	G6M-02-03X	9/18/2006	10	2U	2U	2U	1U	2U													5.20	0.35	219.4	0.993	4.32	17.62
Area 4	G6M-02-04X	2/26/2002	470	0.88J	1.3J	2U	1U	2U													6.47	3.4	189.5	0.26	24	14.39
	G6M-02-04X	9/23/2004	170B	2U	2.9	2U	1U	2U							5U	1U	15U				6.29	3.03	175.5	0.453	8.48	17.99
	G6M-02-04X	9/28/2005	150	2U	6.2	2U	1U	2U							5U	1U	15U				5.61	2.75	302.3	0.502	12.6	19.59
	G6M-02-04X	9/20/2006	48	2U	2U	2U	1U	2U							5U	0.10U	15U				5.84	4.57	189	0.467	8.45	17.26
	G6M-02-04X	9/13/2007	21	4.2	2U	2U	1U	2U							6U	0.1U	15				6.39	3.13	93	0.927	4.8	14.49
	G6M-02-04X	10/16/2008	9.0	2.5U	150	2.5U	2.5U	2.5U							78.2	8.56	7,370				6.91	1.05	-80	1.126	4	14.85
	G6M-02-04X	10/15/2009	5U	17	120	5U	5U	10							309	82	10,900				6.55	1.52	-139.8	0.766	2.18	12.08

Area of Contamination 50
Groundwater Analytical Results
(2001-2009)

			Laboratory Parameters																		Field Parameters					
Area of Concern	Well ID	Date	PCE	TCE	*cis* -1,2-DCE	*trans* -1,2-DCE	1,1-DCE	VC	TOC	Alkalinity	Nitrate	Sulfate	Sulfide	Phos	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane	pH	DO	ORP	SpC	Turbidity	Temp
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)			(SU)	(mg/L)	(mV)	(mS/cm)	(NTUs)	°C
Area 4	G6M-02-13X	8/2/2002	4,600	4	2U	2U	1U	2U							5U						6.17	0.54	141	0.665	7.62	19.7
	G6M-02-13X	9/23/2004	5,000	13	16	2U	1U	2U	1U	31	2.3	17	1.8J		5U	1U	1,200	0.27	0.15	57	6.37	0.34	170.8	0.618	2.14	17.11
	G6M-02-13X	12/13/2004	4,600	14	21	2U	1U	2U	5U	34	2.5	16M	2U		5U	1U	1,300	0.27	0.11	88	5.79	0.89	274.8	0.518	2.63	13.11
	G6M-02-13X	3/30/2005	2,100	64J	210	100U	50U	100U	8.1	60	0.23	13	2U		36	4.2	4,000	0.16	0.11	38	5.97	0.89	-22.6	0.735	2.91	14.37
	G6M-02-13X	8/11/2005	2,300	190	460	5.9	2U	2U	66	230	0.05U	2.3	1U		150	34J*	12,000J*	0.026	0.045	46	5.82	0.74	-68.8	0.897	5.6	21.32
	G6M-02-13X	9/29/2005	3,700	120	470	10U	10U	10U	37	110	0.05U	8.9	2.4		74	22	6,800	0.16	0.12	420	6.41	1.26	-89.1	0.71	6.99	15.51
	G6M-02-13X	12/14/2005	210	50	850	2U	2	2U	290	420	0.083	2U	8.2		477	200J*	36,200	0.057	0.087	11,000	6.6	0.11	-134.4	1.389	0.6	13.71
	G6M-02-13X	3/22/2006	660	37J*	640	2U	1U	2U	280	480	0.2U	8.08	3		320	170	29,000	0.025U	0.009J	21,000	6.67	0.9	-214.4	1.379	2.37	13.98
	G6M-02-13X	6/22/2006	160	8.8	440	2U	1U	280	140	480	0.2U	1.15	20		750	420	30,000	0.025J	0.51	25,000	6.54	0.28	-138.7	2.175	16.1	16.73
	G6M-02-13X	9/18/2006	550	52	160	2U	1U	280	52	140	0.2U	8.09	2.8		420	160	9,900	0.15	1.1	24,000	6.12	0.36	-119.3	1.19	6.9	18.3
	G6M-02-13X	12/14/2006	460	20	190	2U	1U	220	140			4.25	3.6		460	260	12,000	0.025	0.35	23,000	6.49	0.19	-73.7	1.748	8.3	15.02
	G6M-02-13X	3/27/2007	460	39	120	2U	1U	170	37			9.74	1.6		400	170	8,400J*	0.031	3.7	27,000	6.08	0.12	-14.6	1.378	11.2	14.76
	G6M-02-13X	6/13/2007	440	45	48	2U	1U	46	78			12.7	3.6		380	300	9,400	0.025U	6.3	26,000	6.58	0.46	-178.7	1.926	47.5	15.48
	G6M-02-13X	9/13/2007	510	150	120	2U	1U	53	18	74	0.2U	480	1U		230	88	4,800	0.14	26	20,000	6.54	0.45	-145.3	1.332	18.2	15.43
	G6M-02-13X	12/14/2007	690	84J*	58J*	2U	1U	21J*	11			13	1U		210	46	4,500	0.068	21	16,000	6.51	0.27	-133.2	1.133	3.6	14.28
	G6M-02-13X	3/12/2008	130	96	29	2U	1U	12	17			9	1U		260	68	7,600	0.092	35	21,000	6.48	0.57	-140.5	1.221	7.7	14.68
	G6M-02-13X	10/6/2008	5U	9.7	7.9	5U	5U	7.5	24.3	300	0.13U	11	0.03UJ		380	91	4,940	6.5U	8.8	14,000	6.56	0.28	-173.6	1.071	5.2	13.37
	G6M-02-13X	1/21/2009	1.4U	5	5.4	1.3U	1.7U	5.7	11J	200	0.13U	14	0.03U	0.35J	371	72.1J	3,990	.25U	3.8	17,000	6.88	0.28	-121.2	0.821	4	10.99
	G6M-02-13X	5/6/2009	0.5U	5.1	9.8	0.24J	0.5U	6.2	9.4J	300J	0.012J	12	0.03U	0.51J	351	69.4	3,820	1.2U	2.6	26,000	6.01	0.29	-93.4	0.916	2.09	13.81
	G6M-02-13X	10/15/2009	0.92	8.6	16	0.7	0.5U	8.5	7J	370	0.13U	13	0.03UJ	0.26	369	93.3	6,800	1.2U	2.2	7,400	6.47	0.24	-148.8	0.932	1.71	12.34
Area 4	G6M-06-01X	3/30/2006	30	2U	2U	2U	1U	2U													6.03	3.73	-87.8	0.652	70.7	19.25
	G6M-06-01X	3/30/2007	72	2U	2U	2U	1U	2U													5.73	2.87	138.5	1.005	10.21	14.33
	G6M-06-01X	9/13/2007	83	2U	2.1	2U	1U	2U													5.60	10.68	-93.9	0.967	6.3	18.79
	G6M-06-01X	12/14/2007	110	2U	2.3	2U	1U	2U													5.96	2.43	132.9	0.991	3.9	12.98
	G6M-06-01X	10/16/2008	71	1.8	1.4	1U	1U	1U													5.51	3.08	118.6	0.956	20	13.62
	G6M-06-01X	10/15/2009	170	28	6.3J	8U	8U	8U							8U	0.321	50U				5.82	2.69	85.3	0.832	0.13	13.17
Area 5	G6M-02-05X	2/28/2002	130	2U	1.9J	2U	1U	2U													6.15	6.61	181.1	0.597	11	13.1
	G6M-02-05X	1/30/2003	170	2U	2.3	2U	1U	2U																		
	G6M-02-05X	9/30/2005	200	2U	2.6	2U	1U	2U													4.73	3.61	441.8	0.512	7.9	15.72
	G6M-02-05X	9/22/2006	350	2U	2.2	2U	1U	2U													5.52	2.14	94.8	0.543	7.38	16.65
	G6M-02-05X	9/12/2007	510	50	7.9	2U	1U	2U													6.39	0.78	-57.8	0.723	30.6	15.78
	G6M-02-05X	10/20/2008	390	17	4.4J	10U	10U	10U													7.00	1.83	-41.9	0.588	3	12.66
	G6M-02-05X	10/19/2009	370	53	10U	10U	10U	10U	10U	57	0.26	19	0.03U		49.2	3.82	2,490	1.3U	1.6U	410	6.22	0.31	30.6	0.699	1.4	12.27
Area 5	G6M-02-06X	3/1/2002	2U	2U	2U	2U	1U	2U													7.16	8.91	134.8	0.135	32	11.16
	G6M-02-06X	9/24/2004	5.5B	2U	2U	2U	1U	2U													7.33	9.48	152.8	0.09	0.02	14.01
	G6M-02-06X	9/30/2005	2U	2U	2U	2U	1U	2U													7.22	8.22	66.4	0.107	4.39	12.18
	G6M-02-06X	9/21/2006	2U	2U	2U	2U	1U	2U													7.30	7.84	139.3	0.098	10.85	12.31
	G6M-02-06X	9/14/2007	2U	2U	2U	2U	1U	2U													6.94	8.5	-140.7	0.149	7.7	13.26
	G6M-02-06X	10/20/2008	0.47J	0.5U	0.5U	0.5U	0.5U	0.5U													7.09	7.71	88.8	0.109	6.5	11.26
	G6M-02-06X	10/14/2009	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U							8U	0.2U	50U				6.98	8.96	26.1	0.115	0.2	10.88
Area 5	G6M-02-07X	2/26/2002	24	2U	2U	2U	1U	2U													7.34	-0.68	110.3	0.259	46	12.86
	G6M-02-07X	9/23/2004	26B	2U	2U	2U	1U	2U													7.26	1.72	332.8	0.423	25	13.93
	G6M-02-07X	9/30/2005	16	2U	2U	2U	1U	2U													7.69	6.98	121.2	0.389	7.7	12.89
	G6M-02-07X	9/21/2006	11	2U	2U	2U	1U	2U													7.58	3.72	143.6	0.251	14.3	11.54
	G6M-02-07X	9/13/2007	12	2U	2U	2U	1U	2U													7.68	3.78	43.3	0.334	3	12.39
	G6M-02-07X	10/20/2008	9.8J	0.27J	0.5UJ	0.5UJ	0.5UJ	0.5UJ													7.46	3.15	42.8	0.271	12	11.08
	G6M-02-07X	10/15/2009	6.7J	210	10U	10U	10U	10U							8U	0.127U	50U				7.41	1.15	-14	0.413	3	10.8
**	G6M-02-07X	1/15/2010	5.7	0.5U	0.5U	0.75U	0.75U	1.0U													7.53	3.26	150.2	0.344	1.88	10.49

Area of Contamination 50
Groundwater Analytical Results
(2001-2009)

			Laboratory Parameters																			Field Parameters					
Area of Concern	Well ID	Date	PCE	TCE	*cis* -1,2-DCE	*trans* -1,2-DCE	1,1-DCE	VC	TOC	Alkalinity	Nitrate	Sulfate	Sulfide	Phos	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane	pH	DO	ORP	SpC	Turbidity	Temp
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)			(SU)	(mg/L)	(mV)	(mS/cm)	(NTUs)	°C
Area 5	G6M-02-11X	8/1/2002	450	2.8	2U	2U	1U	2U							5U						6.01	0.46	184	0.984	8.13	16.6
	G6M-02-11X	8/28/2002	540J	2U	2U	2U	1U	2U	5U	44					5U						6.05	0.51	173	0.905	6.49	15
	G6M-02-11X	10/29/2002	970	22	3	2U	1U	2U	5U	51	0.10U	17	2.0U		5U	1U	1700				6.02	0.49	51	0.92	5.04	12.1
	G6M-02-11X	2/3/2003	710	22	2U	20U	1U	2U	5U	65					5U	1U					6.22	0.71	178	0.971	12.7	9.8
	G6M-02-11X	7/16/2003	530	54	33	2U	1U	2U	5U	120		16M	2.0U		5U	1U		0.005U	0.014	460	6.31	0.86	166	0.813	11.9	15.4
	G6M-02-11X	9/26/2003	590	31	37	2U	1U	2U	19						5U		1,700	0.005U	0.005U	1,200	6.60	0.41	146	0.921	7.2	13.9
	G6M-02-11X	1/8/2004	300	15	49	2U	1U	2U	5U	150		12J	2.0U		5U	1U	1,900	0.005U	0.0093	2,300	6.29	0	104	0.729	0.6	10.7
	G6M-02-11X	3/10/2004	160	11	53	2U	1U	2U	1.8	130		9.6M	2U		5U	1U	2,200	0.005U	0.068	14,000	6.39	0.82	103	0.847	7.5	13.2
	G6M-02-11X	6/4/2004	440	23	54	2U	1U	2U	2.4J	110		12M	1.9J		5U	1U	1,900	0.005U	0.01	2,300	6.72	12.13	54.5	0.807	21.3	14.12
	G6M-02-11X	9/22/2004	540	50	140	2U	1U	2U	1.2	100	0.5U	12	1.5J		5U	1U	2,400	0.005U	0.005U	13,000	6.19	0.96	412.7	0.996	1.25	16.05
	G6M-02-11X	12/15/2004	760	47	120	2U	1U	2U	5U	95	1	15	2U		5U	1U	2,100	0.005U	0.021	9,700	6.35	1.36	200.1	0.675	21.2	8.61
	G6M-02-11X	3/28/2005	1,100	41	45	40U	40U	40U	3.6J	90	0.2U	13	2UJ*		5U	1UM	2,200	0.005U	0.065	10,000	6.19	1.02	84.3	0.938	48.3	6.55
	G6M-02-11X	7/1/2005	1,500	90	280	10U	10U	10U	9.4	98.4	0.05U	14	1U		2.1	1UJ*	1,800	0.028	0.42	15,000	5.78	0.37	221.6	0.806	6.66	15.58
	G6M-02-11X	9/27/2005	240	78	260	2U	1U	16	3.4	148	0.05U	5.9J	1U		5U	1U	2,500	0.020J	8.1	21,000	5.92	0.4	93.6	0.755	0.69	13.72
	G6M-02-11X	12/12/2005	220	28	50	2U	1U	9.1	5.5	270	1.3J*	3.5	1U		7.8	0.2J	3,100	0.082	29	24,000	6.28	0.18	64.8	1.107	8.9	11.09
	G6M-02-11X	3/21/2006	520	94	230	2.3	1U	60	8.2	120	0.2U	8.81	1U		5U	0.1U	1,500	0.025U	34	17,000	6.45	12	326.6	0.765	7.15	13.83
	G6M-02-11X	6/22/2006	130	44	20	20	1U	9.2	6.1	210	0.2U	2.45	1U		5U	1U*	6,300	0.051	78	22,000	6.19	0.27	59.7	1.231	5.04	16.04
	G6M-02-11X	9/22/2006	37	17	8.6	2.8	1U	4	9.8	180	0.2U	4.87	1U		6.9	0.58	9,300	0.089	15	21,000	5.93	1.22	-158.9	1.079	4.55	14.87
	G6M-02-11X	12/13/2006	45	7.9	3.6	4.4	1U	2U	9.3			1.06	1.2		22	1	16,000	0.24	19	28,000	6.39	0.19	169.6	1.277	6.94	12.998
	G6M-02-11X	3/27/2007	38	21	3.6	9.8	1U	2U	10						120	7.1	24,000J*	6.8	28	23,000	6.25	0.61	-39.6	0.912	19	12.95
	G6M-02-11X	6/13/2007	30	28	12	10	1U	2.8	12			9.62	1.6		310	6.8	18,000	4.8	33	27,000	6.22	0.65	-36.4	1.198	2.1	14.52
	G6M-02-11X	9/11/2007	4.4	24	7.9	12	1U	4.3	14	270	0.2U	470	1U		420	18	18,000	2.8	36	30,000	6.24	3.52	-11.1	1.423	9.7	14.02
	G6M-02-11X	12/13/2007	2.8J*	19J*	6J*	5.5J*	1U	4.4J*	15			5U	1		470	47	18,000	8.3	16	29,000	6.36	0.52	-117.9	1.409	0.5	12.97
	G6M-02-11X	3/11/2008	2U	6.2	2.5	9.7	1U	2U	17			5U	2.8		570	59	27,000	24	5.8	28,000	6.35	0.41	-90.5	1.56	0.3	13.71
	G6M-02-11X	10/16/2008	1.3	7.3	6.9	0.8	0.5U	2.2	21.2U	240	0.10U	9.3	0.03U		1,170	116	8,420	1.2U	5.4	39,000	5.8	1.51	-20.6	0.1535	4	12.57
	G6M-02-11X	5/7/2009	0.5U	0.76	0.47J	0.92	0.5U	0.5U	31	370J	0.13U	17	0.03U		1,060	125	3,950	3.1	3.5	42,000	6.04	0.24	-117.5	1.605	0.32	11.24
	G6M-02-11X	10/14/2009	0.23J	1.4	0.58	0.63	0.5U	0.46J	8.7J	430	0.13U	9.7	0.03U		1,070	126	2,390	1.2U	1.5U	55,000	6.46	0.52	-114.9	1.342	5	10.99
Area 5	G6M-02-12X	8/1/2002	330	2U	2U	2U	1U	2U							5U						6.24	0.64	19	0.924	37.6	18.2
	G6M-02-12X	8/28/2002	520	6.5	2U	2U	1U	2U	5U	54					5U						6.15	0.19	156	0.868	2.96	14.2
	G6M-02-12X	10/29/2002	790	10	2U	2U	1U	2U	2.0J	40	0.10U	17	2.0U		5U	1U	1,100				6.14	0.27	68	0.927	2.08	13.5
	G6M-02-12X	2/3/2003	580	4	2U	2U	1U	2U	5U	52					5U	1U					6.04		78	0.947	5.06	12.8
	G6M-02-12X	7/14/2003							5U																	
	G6M-02-12X	9/22/2004	1,000	43	110	2U	1U	2U	1U	84	0.5U	13	2U		5U	1U	450	0.005U	0.005U	2,900	5.87	0.35	570.2	0.873	4.95	14.83
	G6M-02-12X	9/27/2005	1,100	38	250	1.4	1U	5.4	3.5	106	0.05U	13J	1U		5U	1U	690	0.025U	1.1	14,000	6.11	1.17	238.5	6.92	24.5	14.01
	G6M-02-12X	9/21/2006	190	88	64	23	1U	67	7.6	170	0.2U	5.72	1U		5U	0.37	3,200	0.038	46	15,000	6.23	0.17	78	0.799	60.6	14.12
	G6M-02-12X	9/12/2007	62	50	28	4.4	1U	18	2.6J	180	0.2U	340	1		20U	0.58	5,500	0.4	8.4	11,000	6.52	3.06	52.8	0.934	5.8	14.83
	G6M-02-12X	10/16/2008	0.37J	7.1	18	1.6	0.5U	4.8	10U	310	0.10U	7U	0.03U		174	11.8	15,800	1.2U	3.1	19,000	6.09	0.53	-67.4	1.091	10	12.49
	G6M-02-12X	10/14/2009	0.5U	0.3J	13	0.74	0.5U	1.6	4.6J	350	0.13U	7U	0.03U		540	24.4	11,000	1.3U	1.6U	6,900	6.27	1.27	-40	1.025	1.5	11.03
Area 5	G6M-03-08X	5/14/2003	750	2U	2U	2U	1U	2U							5U	1U										
	G6M-03-08X	9/22/2004	690	6.3	5.4	2U	1U	2U	1U	16	8.3	13	1.5J		5U	1U	15U	0.005U	0.005U	1.8	5.89	1.81	247.6	0.463	3.22	15.28
	G6M-03-08X	12/16/2004	1,100	11	9.6	2U	1U	2U	5U	20	5.7	13	2.9		5U	1U	17	0.069	0.03	4.7	5.93	0.7	135.7	0.495	8.98	9.73
	G6M-03-08X	3/31/2005	340	20U	9.6J	20U	20U	20U	0.3J	12	2.3	17	2U		5U	1U	15U	0.011	0.45	14	5.94	1.96	166.3	0.205	0.93	12.88
	G6M-03-08X	7/6/2005	780	8.2	15	2U	1U	2U	5.5	28.6	1.8	14	1U		4U	1U	10U	0.11	0.068	410	5.85	0.78	236.1	0.463	5.37	15.32
	G6M-03-08X	9/28/2005	620	4.8	14	1U	1U	1U	5U	28.3	1.6	12	1U		5U	1U	15U	0.025U	0.009J	2,400M	5.60	3.56	172.3	0.352	8.3	14.79
	G6M-03-08X	12/14/2005	700	8	17	2U	1U	2U	5U	32	1.2	12	1U		5U	1U	15UJ	0.025U	0.025U	7,000	6.16	0.54	153.8	0.404	3.7	9.71
	G6M-03-08X	3/22/2006	1,100	21J*	34	2.6	1U	2U	6.5	29	0.586	11.7	1U		5U	0.1U	15U	0.025U	0.006J	12,000	6.28	5.43	394.2	0.299	9.75	11.63
	G6M-03-08X	6/21/2006	610	16	48	2U	1U	2U	5U	41J*	0.33	10.2	1U		5U	1.8	42	0.004J	0.14	16,000	5.91	0.29	141.6	0.49	21.4	12.93
	G6M-03-08X	9/21/2006	660	47	110	2U	1U	5.2	3.2J	41	0.228	9.64	1U		5U	0.10U	15U	0.023J	0.55	14,000	6.00	2.36	122.5	0.325	17.1	14.49
	G6M-03-08X	12/12/2006	750	45	120	2U	1U	7.8	5U						5U	.01U	15U	0.013	0.59	16,000	5.98	0.22	145	0.350	7.0	12.30
	G6M-03-08X	3/29/2007	570	37	74	2U	1U	11	5U*						5U	0.1U	15U	0.006J	0.72	14,000	5.79	0.07	21.3	0.392	1.41	13.25
	G6M-03-08X	6/12/2007	740	55	88	2U	1U	14	0.6J						5U	0.1U	15U	0.025U	0.7	15,000	5.93	0.25	135.2	0.413	41.3	14.12
	G6M-03-08X	9/10/2007	520	75	75	2U	1U	21	5U	42	0.2U	200	1U		2U	0.1U	15U	0.025U	1.7	14,000	5.92	2.55	154.2	0.385	9.7	13.25
	G6M-03-08X	12/11/2007	390	53	49	2U	1U	15	5U*						5U	0.1U	20	0.004J	1.6	15,000	5.76	0.23	129.3	0.437	0.8	12.82
	G6M-03-08X	3/13/2008	390	5	10	2U	1U	2U	5U						5U	0.1U	20	0.003J	0.051	2,800	5.89	0.22	111.6	0.195	0.3	13.36
	G6M-03-08X	10/20/2008	290	61	140	5U	5U	26	10U	110	0.13U	14	0.03U		8U	0.2U	33.2	1.3U	2.1	21,000	6.42	1.58	68.9	0.548	2	10.8
	G6M-03-08X	5/6/2009	120	38	150	4.0U	4.0U	15	10U	190J	0.13U	10	0.03U		3.1J	0.2U	144	1.2U	1.6	37,000	5.93	0.32	100.8	0.701	1.5	11.48
	G6M-03-08X	10/14/2009	5U	20	120	5U	5U	11	10U	240	0.13U	8.3	0.03U		8.0U	0.139U	1,470	1.3U	1.6U	7,300J	5.91	0.33	152.3	0.643	2.11	10.71

Area of Contamination 50
Groundwater Analytical Results
(2001-2009)

			Laboratory Parameters																		Field Parameters					
Area of Concern	Well ID	Date	PCE	TCE	*cis* -1,2-DCE	*trans* -1,2-DCE	1,1-DCE	VC	TOC	Alkalinity	Nitrate	Sulfate	Sulfide	Phos	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane	pH	DO	ORP	SpC	Turbidity	Temp
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)			(SU)	(mg/L)	(mV)	(mS/cm)	(NTUs)	°C
Area 5	G6M-03-09X	5/14/2003	2U	2U	2U	2U	1U	2U							5U	1U										
	G6M-03-09X	9/23/2004	3.7B	2U	2U	2U	1U	2U	1U	23	19	15	2.2		5U	1U	15U	0.005U	0.005U	1.9	6.23	8.67	176.2	0.13	4.57	14.33
	G6M-03-09X	12/14/2004	2U	2U	2U	2U	1U	2U	5U	25	11	15	2U		5U	1U	15U	0.015	0.026	2	6.08	8.17	417.6	0.106	12.1	10.23
	G6M-03-09X	3/29/2005	1.5J	2U	2U	2U	1U	2U	0.3J	18	1.5	13	2U		5U	1UM	15U	0.013	0.26	1.4	6.18	6	113.2	0.123	72.4	11.28
	G6M-03-09X	6/30/2005	5.8	2U	2U	2U	1U	2U	15	25.1	1.3	13	1U		2U	1UJ*	10U	0.077	0.032	1.2	5.75	2.81	160.2	0.135	53.6	15.19
	G6M-03-09X	9/28/2005	2U	2U	2U	2U	1U	2U	4J	38.2	3.7	13	1U		5U	1U	15U	0.006J	0.009J	29M	5.90	10.56	181	0.108	7.6	13.06
	G6M-03-09X	12/13/2005	2U	2U	2U	2U	1U	2U	5U*	53	0.05U	13	1U		5U	1U	15U*	0.005J	0.014J	790	6.21	3.06	259.3	172	4.9	11.87
	G6M-03-09X	3/22/2006	2U	2U	2U	2U	1U	2U	7.9	36	1.81	12.1	1U		5U	0.1U	20	0.006J	0.016J	39	6.40	3	415.5	0.102	10.83	11.9
	G6M-03-09X	6/23/2006	2U	2U	2U	2U	1U	2U	5U	39	2.65	13.2	1U		5U	0.1U	15U	0.025U	0.042	390	5.92	4.55	164.9	0.156	16.9	16.01
	G6M-03-09X	9/21/2006	2U	2U	2U	2U	1U	2U	0.8J	36	2.51	9.19	1UJ*		5U	0.10U	15U	0.014J	0.12	140	6.71	2.24	127.6	0.212	4.56	13.03
	G6M-03-09X	12/13/2006	2U	2U	2U	2U	1U	2U	5U						5U	0.10U	15U	0.025U	0.019J	870	6.21	3.38	142.8	0.162	5.6	11.77
	G6M-03-09X	3/29/2007	2U	2U	2U	2U	1U	2U	1.8J						5U	0.1U	15U	0.006J	0.032	1,600	6.08	0.16	16.4	0.217	2.45	12.47
	G6M-03-09X	6/13/2007	3.8	2U	2U	2U	1U	2U	0.5J						5U	0.1U	15U	0.005J	0.011J	870	6.26	0.36	111	0.154	7.6	13.34
	G6M-03-09X	9/10/2007	2U	2U	2U	2U	1U	2U	5U	53	2.01	20	1U		6U	0.1U	15U	0.025U	0.025U	18,000	6.26	2.74	128	0.193	9.9	13.22
	G6M-03-09X	12/11/2007	2U	2U	2U	2U	1U	2U	5U*						5U	0.1U	15U	0.006J	0.022J	2,200	6.03	0.11	110.3	0.19	2.1	12.43
	G6M-03-09X	3/12/2008	2U	2U	2U	2U	1U	2U	5U						5U	0.11	18	0.027	0.016J	5,200	6.33	0.24	24.6	0.159	0.5	13.27
	G6M-03-09X	10/20/2008	0.37J	0.5U	0.5U	0.5U	0.5U	0.5U	10U	48	0.84	19	0.03U		8U	0.2U	50U	1.3U	1.6U	1,600	5.98	0.24	177.8	0.129	6.5	10.23
	G6M-03-09X	5/6/2009	0.78	0.5U	0.5U	0.5U	0.5U	0.5U	10U	52J	0.9	14	0.03U		8U	0.2U	50U	1.2U	1.5U	340	5.99	0.33	104	0.171	1	11.2
	G6M-03-09X	10/14/2009	0.35J	0.5U	0.5U	0.5U	0.5U	0.5U	10U	53	0.32	13	0.03U		8U	0.2U	50U	1.2U	1.5U	230	5.49	0.26	-89.9	161	0	10.62
Area 5	G6M-03-10X	5/14/2003	15	2U	2U	2U	1U	2U							5U	1.0U										
	G6M-03-10X	9/22/2004	27	2U	2U	2U	1U	2U	1U	51	2.8	12	1.5J		5U	1U	340	0.05	0.68	680	6.28	1.28	-77.2	0.539	20.5	15.41
	G6M-03-10X	12/14/2004	19	2U	44	2U	1U	2U	5U	110	3.8	21	2U		5U	1U	880	0.02	0.025	1.9	6.52	0.94	62	0.801	1.57	12.1
	G6M-03-10X	3/29/2005	14	0.98J	68	1.2J	1U	2U	5.9	146	0.2U	12	2U		5U	1UM	1,200	0.005U	0.38	2,600	6.44	0.59	-14.5	0.869	6.77	11.09
	G6M-03-10X	6/30/2005	3.6	2U	2U	2U	1U	2U	19	199	0.1	11	1U		2U	1UJ*	1,900	0.026	0.021	8,600	5.18	0.39	273.2	0.702	5.06	16.6
	G6M-03-10X	9/28/2005	6.7	2U	2U	2U	1U	2U	0.6J	140	0.2	16	1U		5U	1U	720	0.025U	0.020J	1,100M	6.43	4.3	74.1	0.588	7.36	13.41
	G6M-03-10X	12/13/2005	3.4	2U	2U	2U	1U	2U	5U*	250	0.48	8.4	1U		6.9	1U*	3,020	0.009J	0.027	12,000	6.73	0.15	57.2	1.032	1.3	12.12
	G6M-03-10X	3/23/2006	9.9	2U	2U	2U	1U	2U	3.5J	170	0.2U	8.9	1U		5U	0.22	3,800	0.020J	0.052	7,000	6.64	0.67	36.6	0.663	5.39	13.94
	G6M-03-10X	6/22/2006	2.6	2U	2U	2U	1U	2U	5J	200	0.2U	4.44	1U		5U	0.74	7,300	0.004J	0.042	14,000	4.87	0.64	610.8	0.77	0.64	15.96
	G6M-03-10X	9/20/2006	2.2	2U	2U	2U	1U	2U	6	180	0.2U	6.95	1U		5U	0.21	6,200	0.006J	0.14	14,000	6.41	1.26	-140.2	0.856	3.9	14.07
	G6M-03-10X	12/13/2006	2.8	2U	3.4	2U	1U	2U	2J						5U	0.27	8,500	0.025U	0.025U	20,000	6.45	0.26	168.2	0.870	5.0	13.61
	G6M-03-10X	3/29/2007	2.2	2.1	4.2	2U	1U	2U	4.8J						8.6	0.3	9,100J*	0.007J	0.16	24,000	6.20	0.32	-60.7	0.97	2.99	14.16
	G6M-03-10X	6/11/2007	2.5	2U	4.1	2U	1U	2U	6.7						23	1	11,000	0.025U	0.095	29,000	6.27	0.41	45.5	0.947	8.5	15.66
	G6M-03-10X	9/10/2007	2U	2U	3.8	2U	1U	2U	3.5J	150	0.2U	290	1U		29	0.4	8,100	0.1	0.057	620	6.28	0.24	61.3	0.859	13.6	14.23
	G6M-03-10X	12/12/2007	2U	2U	2.8	2U	1U	2U	5.8						26	0.33	9,200	0.025U	0.043	20,000	6.14	0.66	69.8	0.755	7.5	13.06
	G6M-03-10X	3/11/2008	16	8.7	16	2U	1U	4	5J						91	15	9,200	0.04	59	28,000	6.32	0.22	-62.9	1.029	7.3	13.92
	G6M-03-10X	5/6/2009	1	5	9.1	0.5U	0.5U	1.5	11	230J	0.0076J	9.3	0.03U		522	54.4	9,210	1.2U	1.5U	31,000	5.91	0.33	-64	1.04	0.5	12.45
	G6M-03-10X	10/20/2008	1.0	2.0	5.4	0.5U	0.5U	1.0	170	170	0.13U	8.3	0.03U		248	7.07	10,300	1.3U	1.6U	21,000	5.98	0.21	-10.9	0.781	8.2	11.8
	G6M-03-10X	10/14/2009	0.6	3.7	10	0.5U	0.5U	2.2	7.4J	310	0.13U	21	0.03U		518	57.8	7,410	1.3U	1.6U	9,000J	6.32	0.67	-62.2	0.896	1.2	11.31
Area 5	G6M-04-05X	9/22/2004	140	2U	2U	2U	1U	2U	1U	14	4.9	14	2U		5U	1U	15U*	0.005U	0.0092	1.3	6.10	9.68	233.9	0.099	0.68	14.76
	G6M-04-05X	12/15/2004	17	2U	2U	2U	1U	2U	5U	14	7.5	13	2U		5U	1U	15U	0.005U	0.016	1.4	5.87	1.17	228.7	0.098	1.04	12.74
	G6M-04-05X	3/30/2005	130	10U	10U	10U	5U	10U	0.5J	14	1.2	10	2U		5U	1U	15U	0.0074	0.028	15	6.04	2.8	123.1	0.093	1.92	13.84
	G6M-04-05X	6/30/2005	200	2U	2U	2U	1U	2U	2.4	15.9	0.87	8.9	1U		2U	1UJ*	10U	0.041	0.022	96	5.48	0.88	207.1	0.094	8.19	15.41
	G6M-04-05X	9/29/2005	110	2U	2U	2U	1U	2U	5U	3.3	0.98	14	1U		5U	1U	33	0.006J	0.012J	220	6.08	0.2	215.3	0.061	2.1	13.53
	G6M-04-05X	12/14/2005	36	2U	2U	2U	1U	2U	5U	21	1.6	11	1U		5U	1U	15U	0.007J	0.016J	550	6.10	0.23	179.3	0.091	0.3	12.8
	G6M-04-05X	3/22/2006	330	2U	2U	2U	1U	2U	3.4J	13	1.11	9.33	1U		5U	0.1U	15U	0.025U	0.019J	2,200	6.21	0.77	343.3	0.062	0.86	12.51
	G6M-04-05X	6/22/2006	38	2U	2U	2U	1U	2U	5U	22J*	1.82	9.01	1U		5U	0.1U	15U	0.025U	0.082	33	4.40	2.55	760.6	0.083	0	13.87
	G6M-04-05X	9/22/2006	30	2U	2U	2U	1U	2U	5U	15	1.51	10.8	1U		5U	0.10U	15U	0.009J	0.084	140	5.78	1.48	-127.3	0.123	0.34	13.53
	G6M-04-05X	12/12/2006	8.7	2U	2U	2U	1U	2U	5U						5U	0.1U	15U	0.025U	0.010J	850	5.66	0.39	156.7	0.105	0	13.04
	G6M-04-05X	3/29/2007	16	2U	2U	2U	1U	2U	1.4J						5U	0.12	15U	0.025U	0.022J	460	5.79	0.13	57.9	0.185	0.01	13.16
	G6M-04-05X	6/12/2007	12	2U	2U	2U	1U	2U	0.4J						5U	0.1U	15U	0.005J	0.041	330	5.89	0.52	168.2	0.116	4.4	14.24
	G6M-04-05X	9/10/2007	43	2U	2U	2U	1U	2U	5U	20	1.61	17	1U		2U	0.1U	15U	0.24	0.089	340	5.89	2.6	142.8	0.103	3.9	13.59
	G6M-04-05X	12/11/2007	7.2	2U	2U	2U	1U	2U	5U*						5U	0.19	15U	0.025U	0.013J	1,900	5.75	0.23	134.1	0.118	0.6	12.99
	G6M-04-05X	3/13/2008	2.5	2U	2U	2U	1U	2U	5U						5U	0.1U	17	0.009J	0.020J	1,300	5.9	0.18	121	0.129	0.2	14.02
	G6M-04-05X	10/20/2008	3.7	0.5U	0.5U	0.5U	0.5U	0.5U	10U	30	1.5	10	0.03U		8U	0.2U	50U	1.3U	1.6U	3,300	5.92	0.73	80	0.152	0	10.96
	G6M-04-05X	5/6/2009	16	0.38J	0.84	0.5U	0.5U	0.27J	10U	49J	0.37	17	0.03U		8U	0.2U	50U	1.3U	1.6U	2,200	5.72	0.2	125.5	0.187	0	11.41
	G6M-04-05X	10/14/2009	8.2	0.5U	0.29J	0.5U	0.5U	0.5U	10U	29	0.39	15	0.03U		8.0U	0.127U	60U	1.3U	1.6U	2,000J	5.62	0.5	184	0.203	0	10.7

Area of Contamination 50
Groundwater Analytical Results
(2001-2009)

			Laboratory Parameters																		Field Parameters					
Area of Concern	Well ID	Date	PCE	TCE	*cis* -1,2-DCE	*trans* -1,2-DCE	1,1-DCE	VC	TOC	Alkalinity	Nitrate	Sulfate	Sulfide	Phos	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane	pH	DO	ORP	SpC	Turbidity	Temp
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)			(SU)	(mg/L)	(mV)	(mS/cm)	(NTUs)	°C
Area 5	G6M-04-06X	9/22/2004	160	2U	2U	2U	1U	2U	1U	110	5.3	8.7	2U		5U*	1U	15U	0.056	0.005U	3.4	11.01	9.17	-0.6	0.341	1.34	15.84
	G6M-04-06X	12/16/2004	24	2U	2U	2U	1U	2U	5U	54	7.9	10	2.9		21	1U	15U	0.017	0.028	0.47	10.89	9.42	106.9	0.254	2.26	12.77
	G6M-04-06X	3/30/2005	37	2U	2U	2U	1U	2U	5U	37	2	12	2U		7.5	1U	15U	0.0087	0.051	0.58	9.47	10.46	10.6	0.235	0.32	15.25
	G6M-04-06X	7/1/2005	140	2U	2U	2U	1U	2U	2.8J	10.3	1.5	25	1U		2U	1UJ*	190	0.034	0.056	9.7	9.08	9.77	457.2	0.214	0.95	17.23
	G6M-04-06X	9/29/2005	32	2U	2U	2U	1U	2U	5.4	70.4	1.9	12	1U		11	1U	15U	0.009J	0.018J	0.7	9.32	9.43	390.6	0.192	1.99	15.18
	G6M-04-06X	12/15/2005	26	2U	2U	2U	1U	2U	7.6	39	1.9	12	1U		80.9	1U	150	0.009J	0.022J	3.3	9.74	10.17	151.2	0.226	0.3	11.92
	G6M-04-06X	3/23/2006	100	2U	2U	2U	1U	2U	5U	23	1.71	9.29	1U		5U	0.1U	15U	0.006J	0.036	3.1	8.94	9.46	452.5	0.188	1.72	14.07
	G6M-04-06X	6/23/2006	190	2U	2U	2U	1U	2U	5U	41	1.69	9.43	1U		13J*	0.1U	15U	0.012J	0.041	10	8.66	9.75	165.3	0.254	3.55	17.68
	G6M-04-06X	9/21/2006	45	2U	2U	2U	1U	2U	1.9J	31	1.03	10.9	1U		5U	0.10U	15U	0.016J	0.11	6.3	9.46	9.75	66.6	0.347	1.45	15.25
	G6M-04-06X	12/11/2006	37	2U	2U	2U	1U	2U	5U						5U	0.1U	15U	0.010J	0.044	4.3	9.67	9.67	108	0.257	4.4	13.15
	G6M-04-06X	3/29/2007	18	2U	2U	2U	1U	2U	5U*						5U	0.1U	15U	0.011J	0.021J	13	8.99	14.57	150.7	0.137	11.1	14.14
	G6M-04-06X	6/12/2007	25	2U	3.5	2U	1U	2U	5U						5U	0.1U	15U	0.010J	0.061	19	8.82	10.12	118.1	0.272	4.9	14.76
	G6M-04-06X	9/10/2007	23	2U	3	2U	1U	2U	5U	38	1.32	82	1U		8U	0.1U	15U	0.005J	0.007J	0.13	8.14	6.73	50.1	0.248	9.9	14.36
	G6M-04-06X	12/12/2007	22	2U	6.3	2U	1U	2U	5U*						5U	0.1U	15U	0.004J	0.025U	0.21	7.36	12.25	81.7	0.335	0.2	13.2
	G6M-04-06X	3/14/2008	14	2U	2.4	2U	1U	2U	5U						5U	0.1U	15U	0.005J	0.025U	2.8	7.29	10.89	186.9	0.224	0.3	14.17
	G6M-04-06X	10/16/2008	24	0.68	2.2	0.5U	0.5U	0.5U	10U	34	1.47U	11	0.03U		8.5	0.2U	11.5J	1.3U	1.6U	2	7.69	9.11	209.6	0.198	1	12.29
	G6M-04-06X	5/6/2009	13	0.51	1.8	0.5U	0.5U	0.5U	10U	44	1.3	14	0.03U		6.9	0.2U	50U	1.3U	1.6U	1.6	7.35	9.41	9.2	0.209	1.9	11.61
	G6M-04-06X	10/14/2009	10	0.46J	1.8	0.5U	0.5U	0.5U	10U	44	1.3	11	0.03U		7.4U	0.2U	50U	1.3U	1.6U	22J	7.15	9.4	150	0.197	0	11.08
Area 5	G6M-04-07X	9/22/2004	900	2.7	8.4	2U	1U	2U	1U	56	5.4	32	2U		5U	1U	260	0.061	0.12	3.1	7.10	3.42	110.1	0.243	9.28	14.61
	G6M-04-07X	12/17/2004	1,100	2	9.3	2U	1U	2U	0.6J	43	6.4M	14	2U		28	1U	47	0.11	2.2	2.1	7.51	1.98	-38.9	0.246	74.7	10.34
	G6M-04-07X	3/29/2005	240	10U	10U	10U	5U	10U	0.5J	43.2	1.5	14	2U		12	1UM	27	0.031	0.64	1.9	6.88	4.19	22	0.229	4.2	12.76
	G6M-04-07X	7/5/2005	170	2U	2U	2U	1U	2U	5U*	41.1	1.7	14	1U		4	1U	37	0.07	0.042	1.8	5.83	5.44	369.9	0.186	23.4	17.93
	G6M-04-07X	9/29/2005	470	3	8.3	2U	1U	2U	5U	1U	1.9	16	1U		5U	1U	43	0.010J	0.010J	2.4	6.19	0.86	478.3	0.277	6.62	14.21
	G6M-04-07X	12/14/2005	390	2U	2	2U	1U	2U	6.1	40	1.6	13	1U		3.8B	1U	17.9	0.006	0.016	7.9	6.65	4.72	149.3	0.218	34.1	11.92
	G6M-04-07X	3/23/2006	260	2U	2U	2U	1U	2U	5U	36	1.57	13.3	1U		5U	0.1U	15U	0.005J	0.029	250	6.28	2.14	619.7	0.267	4.09	13.9
	G6M-04-07X	6/23/2006	150	2U	2U	2U	1U	2U	0.3J	30	1.28	12.5	1U		5U	0.1U	24	0.005J	0.022J	22	6.29	5.5	117.8	0.24	8.07	16.14
	G6M-04-07X	9/21/2006	110	2U	2U	2U	1U	2U	3.4J	32	2.54	10	1U		5U	0.10U	19	0.014J	0.088	2.4	6.34	4.43	99.8	0.197	2.63	13.66
	G6M-04-07X	12/11/2006	87	2U	2U	2U	1U	2U	5U						5U	0.10U	15	0.007J	0.033	2.2	6.65	6.99	116.4	0.134	10.52	13.13
	G6M-04-07X	3/29/2007	45	2U	2U	2U	1U	2U	5U*						5U	0.1U	17J*	0.006J	0.018J	5.2	6.55	10.3	143.7	0.123	3.71	13.01
	G6M-04-07X	6/12/2007	44	2U	2U	2U	1U	2U	1.2J						5U	0.67	18	0.010J	0.079	46	6.26	8.12	162.7	0.129	16.1	15.25
	G6M-04-07X	9/10/2007	25	2U	2U	2U	1U	2U	5U	19	1.89	45	1U		2U	0.1U	15U	0.006J	0.006J	0.11	6.20	8.68	117.7	0.13	31.2	13.65
	G6M-04-07X	12/12/2007	23	2U	2U	2U	1U	2U	5U*						5U	0.1U	15U	0.004J	0.013J	0.48	6.48	10.14	140.2	0.134	3	12.92
	G6M-04-07X	3/13/2008	19	2U	2U	2U	1U	2U	5U						5.2	0.1U	15U	0.003J	0.025U	1.6	6.54	10.52	83.4	0.143	0.3	14.01
	G6M-04-07X	10/16/2008	11	0.5U	0.5U	0.5U	0.5U	0.5U	10U	28	1.81U	10	0.03U		8.0U	0.2U	15.1J	1.2U	1.5U	390	5.85	1.62	205	0.129	0.45	11.95
	G6M-04-07X	5/6/2009	2.2	0.5U	0.5U	0.5U	0.5U	0.5U	10U	41J	2.3	12	0.03U		2.9J	0.2U	50U	1.3U	1.6U	660	5.9	0.7	119.2	0.103	1.25	11.64
	G6M-04-07X	10/14/2009	1.3	0.5U	0.5U	0.5U	0.5U	0.5U	10U	32	1.9	15	0.03U		8U	0.2U	50U	1.3U	1.6U	2,500J	6	0.35	141.6	0.104	0	10.6
Area 5	G6M-04-08X	9/24/2004	4.2B	2U	2U	2U	1U	2U													7.29	0.81	-75.5	0.632	52.8	14.46
Area 5	G6M-04-14X	11/16/2004	12	2U	2U	2U	1U	2U																		
	G6M-04-14X	9/27/2005	6.9	2U	2U	2U	1U	2U													7.88	1.6	333	0.263	18	12.69
	G6M-04-14X	9/21/2006	9.4	2U	2U	2U	1U	2U													7.98	3	26.1	0.211	15.7	12.19
	G6M-04-14X	10/1/2007	7.1	2U	2U	2U	1U	2U													7.69	2.56	80.4	0.363	13.9	12.44
	G6M-04-14X	10/21/2008	7.1J	0.21J	0.5UJ	0.5UJ	0.5UJ	0.5UJ													7.78	2.51	138.8	0.237	45	11.5
	G6M-04-14X	10/15/2009	4.5J	250	10U	10U	10U	10U													7.56	3.6	-69.7	0.25	4.58	10.62
**	G6M-04-14X	1/15/2010	4.5	0.22J	0.5U	0.75U	0.75U	1.0U													7.73	25.3	166.2	0.293	12.5	10.24

Area of Contamination 50
Groundwater Analytical Results
(2001-2009)

			Laboratory Parameters																		Field Parameters					
Area of Concern	Well ID	Date	PCE	TCE	*cis* -1,2-DCE	*trans* -1,2-DCE	1,1-DCE	VC	TOC	Alkalinity	Nitrate	Sulfate	Sulfide	Phos	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane	pH	DO	ORP	SpC	Turbidity	Temp
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)			(SU)	(mg/L)	(mV)	(mS/cm)	(NTUs)	°C
Area 5	MW-3	10/17/2001	4,300	1,500	540	20U	10U	20U													5.70	0.9	-127	1.4	3.1	14
	MW-3	12/19/2001	26	4,000	2,200	20U	6.5J	20U	92			0.43J									6.28	0.43	-46	0.912	7.28	14.4
	MW-3	1/3/2002							44						180	30		0.063	0.21	18	4.77	1.33	-48	2.795	4.4	13.4
	MW-3	1/31/2002							38												6.64	0	-293	0.999		12
	MW-3	2/13/2002	4,400	1,700	1,600	1.6J	3.7	2U	15		0.10U	14	1.0J		190	20	8,300	0.079	0.29	53	6.65	0.75	-71	0.893	1.3	12
	MW-3	3/13/2002	5,200	640	1,400	1.4J	2.8	2U	7.3		0.10U	15	2.0U		180	16	8,400	0.093	0.37	66	6.72	0.25	-75	0.795	1.04	13.7
	MW-3	4/2/2002	3,100	1,000	1,700	2.2	4	2U	3.3J												6.74	4.28	-120	0.634	2.08	13.8
	MW-3	4/17/2002	1,200	1,300	1,600	1.2J	3.4	2U	6.1		3	7.9J	1.6J		240	37	17,000	0.025	0.087	54	6.60	4.39	-102	0.771	0.81	17
	MW-3	5/15/2002	31	23	2,600	3.5	6.7	2U	96		0.10U	3.9	1.6J		260	42	19,000	0.052	0.24	560	6.66	0.31	-124	1.46	1.68	13.7
	MW-3	6/27/2002	200U	200UJ	1,800	200UJ	100UJ	200UJ*	270		14	4.4J	2.0U		490J*	140	37,000J	0.021	0.082	3,900	6.70	1.64	-107	3.804	2.9	17
	MW-3	7/31/2002							31												6.76	0.15	-225	1.606		12.2
	MW-3	8/26/2002	990	640	580	2.1	4.4	2U	30	320					270			0.053	0.16	14,000	6.83	0.15	-138	1.285	6.5	16.3
	MW-3	10/28/2002	1,900	820	1,700	3.9	4.2	2U	6.3	190	0.10U	10	2.0U		330	39	9,700	0.3	0.23	6,300	6.70	0.4	-129	1.129	5.01	14.5
	MW-3	2/3/2003	3	2U	2,900	2U	7.1	2U	180	580		1.0U			330	120		0.005U	0.26	28,000	6.84	0.3	-159	1.322	6.7	10.5
	MW-3	7/16/2003	2.4	2U	2,700	2U	7.5	2.5	17	450		4.0UB	2.0U		520	170		0.005U	0.1	23,000	7.02	1.09	-138	1.464	39.2	16.3
	MW-3	9/24/2003	670	1,100	1,900	2.4	6.9	2U	5.9						460	89	7,900	0.005U	0.012	22,000	6.10	9.17	-138	1.222	18.9	16.8
	MW-3	1/9/2004	9.7	64	2,000	2U	5.6	2U	130	500J		1.0U	2.0U		530	200J	15,000	0.005U	0.005U	45,000	6.73	0.4	-195	1.347	14.6	12.7
	MW-3	3/11/2004	680	620	4,700	2U	7.6	2U	6.1	200		4.4	2U		420	11	8,400	0.005U	0.005U	27,000	6.58	0.62	-161	0.972	4.3	12.4
	MW-3	6/2/2004	2U	2U	1,800	2U	4.5	2U	290	810		0.98JM	2U		670MSA	150	23,000	0.005U	0.014	31,000	6.95	0.1	-149	1.905	38.7	14.61
	MW-3	9/21/2004	210	250	1,900	2U	5.2	3.5	17	310	1J*	4.3J*	2UM		660	200J*	7,200	0.086	0.005U	28,000	6.66	0.95	-153.6	0.725	2.27	13.76
	MW-3	12/13/2004	2U	2U	750	2U	1U	610	8	210	1.1	1.4M	2U		510	160	5,400	0.092	3.5	17,000	6.62	1.6	-103.3	1.009	15.1	11.07
	MW-3	3/28/2005	23J	16J	1,000	50U	50U	280	21	405	0.2U	1U	7.5J*		670	150M	7,300	0.005U	5.1	25,000	6.49	0.34	-134.9	1.26	2.37	12.46
	MW-3	8/10/2005	440	80	120	2U	5.1	760	43	338	0.05U	2U	8		680	180	4,400	0.061J*	13	22,000	11.13	0.71	-118.5	1.401	28.9	18.92
	MW-3	9/27/2005	1,100	240	180	1.8	9.1	360	5.6	96.8	0.05U	9.9J	3.4		480	71J	2,500	0.020J	40	22,000	6.36	0.21	-91.2	0.66	2.8	14.17
	MW-3	12/12/2005	37	67	52	20U	10U	480	18	180	0.083J*	2U	5.6		566	100		0.055	100	26,000	6.66	0.11	-152.7	1.087	8	12.77
	MW-3	3/20/2006	620	350	120	3.1	3.9	220	13	110	0.2U	6.31	1U		440	85	3,600	0.025U	130	25,000	6.95	0.77	-106.2	0.871	3.71	12.89
	MW-3	6/22/2006	2U	2U	4	7.6	1U	6.1	4J	98	0.2U	1U	1U		520	87	3,300	0.023J	180	20,000	6.40	0.22	-127	1.012	4.18	16.41
	MW-3	9/20/2006	360	420	130	12	5.6	200	9.6	70	0.2U	7.88	1.4		580	70	3,300	0.015J	95	17,000	6.52	0.28	-108.5	0.729	3.56	15.56
	MW-3	12/12/2006	2U	3.1	3.1	16	1U	7.1	7.8			1U	1U		490	92	3,700	0.032	170	24,000	6.60	0.17	-116	0.99	4.36	13.88
	MW-3	3/27/2007	2U	31	19	12	1U	27	5.2			3.18	1U		560	110	3,300J*	0.025U	130	18,000	6.28	0.19	21	0.944	2.64	13.47
	MW-3	6/11/2007	2U	5	5.4	15	1U	8	67			12.1	2.2		570	190	5,000	0.038	150	32,000	6.56	0.58	-124.7	1.405	17.3	15.76
	MW-3	9/11/2007	610	470	100	6.4	2.6	97		150	0.2U	400	1U		530	100	3,600				6.76	0.23	-130	1.016	6.8	14.21
	MW-3	10/12/2007							3.8J									0.025U	120	34,000						
	MW-3	12/13/2007	250	180	59	8.8	2.4	78	4.1J			10	1U		420	91	4,400	0.016J	130	30,000	6.6	0.27	-159.8	1.04	15.7	12.47
	MW-3	3/10/2008	2U	2U	2U	8.3	1U	2U	16			5U	2.4		530	140	3,300	18	35	29,000	6.46	0.12	-113	1.402	5.5	13.56
	MW-3	10/6/2008	5U	5U	5U	11	5U	5U	10U	210	0.13U	7.0U	0.03UJ		482	112	3,720	1.3U	72	28,000	6.49	0.24	-158.6	1.070	9.3	12.47
	MW-3	1/21/2009	1.4U	2.3U	1.6J	9.2	1.2U	1.9	10UJ	160	0.13U	7.0U	0.03U	0.15J	556	114J	3,350	3.2	58	40,000	6.69	0.5	-79.9	1.044	4.01	9.9
	MW-3	5/7/2009	2.0U	59	48	17	2.0U	66	7.0J	360J	0.13U	22	0.03U	0.11J	519	115	3,630	1.3	70	47,000	6.26	1.03	-89.9	1.205	4.54	11.04
	MW-3	10/19/2009	2U	35	25	9.4	2U	40	6.7J	490	0.13U	28	0.03UJ	0.36	551	120	5,330	1.2U	36	25,000	6.24	0.6	-62.6	1.494	25.6	11.83

Area of Contamination 50
Groundwater Analytical Results
(2001-2009)

			Laboratory Parameters																		Field Parameters					
Area of Concern	Well ID	Date	PCE	TCE	*cis* -1,2-DCE	*trans* -1,2-DCE	1,1-DCE	VC	TOC	Alkalinity	Nitrate	Sulfate	Sulfide	Phos	Dissolved Arsenic	Dissolved Iron	Dissolved Manganese	Ethane	Ethene	Methane	pH	DO	ORP	SpC	Turbidity	Temp
			(µg/L)						(mg/L)						(µg/L)	(mg/L)	(µg/L)	(µg/L)			(SU)	(mg/L)	(mV)	(mS/cm)	(NTUs)	°C
Area 5	MW-7	2/14/2002	5,900	4.5	2U	2U	1U	2U				20	0.6J		5U	1U	170J	0.12	0.08	8.4	6.12	1.58	104	0.787	90	13.8
	MW-7	3/14/2002	5,700	4.2	2U	2U	1U	2U	2.0J		4.1	22J	2.0U		5U	1U	1,000U	0.094	0.18	5.9J	6.12	2.29	203	0.808	8.85	13.9
	MW-7	4/17/2002	4,200	2.9	2U	2U	1U	2U	5U		4.2	18J	1.6J		2.3J	1U	1,000U	0.072	0.2	6	6.11	0.5	145	0.656	19.5	18.8
	MW-7	5/16/2002	5,700	4.3	2U	2U	1U	2U	5U		4.3	18J	2.0UJ		5U	1U	1,000U	0.097	0.2	9	6.05	0.21	185	0.759	23.9	15.7
	MW-7	6/27/2002	5,300	3.8J*	2UH	2UH	10H	2UH	5U		4.2	19J	2.0U		5U	1U	170UJ				6.13	0.73	163	1.198	100	18.2
	MW-7	8/27/2002	4,700	3.5	2U	2U	1U	2U	5U	29					5U						6.13	0.29	136	0.632	1.86	16.1
	MW-7	10/30/2002	5,400	2.7	2U	2U	1U	2U	5U	23	4.9	16	2.0U		5U	1U	200J	0.047	0.18	20	6.05	0.37	66	0.779	3.63	15.3
	MW-7	12/14/2002							5U																	
	MW-7	1/30/2003	4,700	3.1	2U	2U	1U	2U	5U	19		16			5U	1U		0.044	0.075	23	5.80	2.2	171	0.773	1.08	13.9
	MW-7	9/24/2003	4,200	3.3	2U	2U	1U	2U	5U						5U	1U	140	0.015	0.027	58	3.40	1.43	522	0.691	0.3	15.7
	MW-7	1/8/2004	4,300	2.8	2U	2U	1U	2U	5U	27		14J	2.0U		5U	1U	130	0.011	0.026	25	6.02	0	198	0.481	15	11.1
	MW-7	3/12/2004	3,100	2.7	2U	2U	1U	2U	1U	24		15M	2U		5U	1U	120	0.02	0.28	6.3	6.04	0.47	162	0.556	1	13.9
	MW-7	6/3/2004	2,900	2.6	2U	2U	1U	2U	1.5J	24		15M	2U		5U	1U	110	0.012	0.034	34	5.96	0.31	205.2	0.58	1.92	14.44
	MW-7	9/21/2004	2,900	3.4	3.1	2U	1U	2U							5U	1U	110				5.98	0.21	240.4	0.58	0	15.67
	MW-7	9/27/2005	1,600	3.7	5.8	2.5U	2.5U	2.5U							5U	0.2J	110				4.49	0.93	304.1	0.593	3.39	14.5
	MW-7	9/22/2006	4,400	9.8	7.7	2U	1U	2U							5U	0.10U	100				5.99	1.19	140.9	0.503	3.01	15.7
	MW-7	9/11/2007	1,200	11	22	2U	1U	2U							6U	0.1U	110				5.98	0.32	139.9	0.691	5.9	14.88
	MW-7	10/20/2008	600	40	150	20U	20U	20U							8U	0.2U	166				5.97	1.39	71.9	0.804	2	12.97
	MW-7	10/19/2009	97	33	270	10U	10U	10U							4.2J	1.7	2,170				6.03	0.47	76.7	1.686	1.91	13.28

Notes:

J	Estimated value
B	Detected in laboratory blank
U	Less than the detection limit
H	Sample rerun outside holding time due to "B" detection
M	Recovery poor for MS/MSD
FDW	Former Dry Well Area
FDSA	Former Drum Storage Area
*	Value qualified from reported laboratory data based on data validation results.
**	Analyzed by AlphaLabs. Contract laboratory is Mitkem Labs.

SITE INSPECTION

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: Devens AOC50	**Date of inspection:** 4/29/10
Location and Region:	**EPA ID:** MA7210025154
Company leading the five-year review: Hydrogeologic, Inc	**Weather/temperature:** ~60°F, sunny + windy

Remedy Includes: (Check all that apply)

- Landfill cover/containment
- Access controls
- X Institutional controls
- Groundwater pump and treatment
- Surface water collection and treatment
- X Other in situ enhanced reductive dechlorination
- X Monitored natural attenuation
- Groundwater containment
- Vertical barrier walls

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Peter Dacyk (Name) Project Manager (Title) 5/27/10 (Date)
   Interviewed at site (at office) by phone Phone no. _____
   Problems, suggestions; Report attached _____
   No problems although IWS blower/motor appears to be oversized for the existing application. Could be replaced with smaller, cost effective model.

2. **O&M staff** Michael Jackson (Name) Geologist (Title) 5/27/10 (Date)
   Interviewed at site (at office) by phone Phone no. _____
   Problems, suggestions; Report attached _____
   no problems

2a. Former O+M site manager: Charles Castelluccio, Principal Scientist 5/27/10
Interviewed via phone (978-937-9999 x 316)
No problems, just routine operation and maintenance with the exception of the replacement of a few ERD injection wells.

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency Ayer Police Dept.
Contact Brian Gill (Name) Lt. (Title) 5/27/10 (Date) 978-772-8200 (Phone no.)
Problems; suggestions; Report attached No issues or concerns.

Agency Devens Fire Dept.
Contact Adams (Name) Deputy Fire Chief (Title) 5/27/10 (Date) 978-772-4600 (Phone no.)
Problems; suggestions; Report attached No issues or concerns.

Agency Ayer Board of Health
Contact Michelle Carlisle (Name) Administrative Assistant (Title) 6/1/10 (Date) 978-772-8213 (Phone no.)
Problems; suggestions; Report attached ~~Response Pending~~ No major concerns at present but defer to USEPA, MADEP and Richard Dougherty for P.A.C.E.

Agency
Contact (Name) (Title) (Date) (Phone no.)
Problems; suggestions; Report attached

4. **Other interviews** (optional) Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1.	**O&M Documents**			
	X O&M manual	X Readily available	X Up to date	N/A
	As-built drawings	Readily available	Up to date	N/A
	X Maintenance logs	X Readily available	X Up to date	N/A
	Remarks			
2.	**Site-Specific Health and Safety Plan**	X Readily available	X Up to date	N/A
	Contingency plan/emergency response plan	Readily available	Up to date	N/A
	Remarks			
3.	**O&M and OSHA Training Records**	Readily available	Up to date	N/A
	Remarks			
4.	**Permits and Service Agreements**			
	Air discharge permit	Readily available	Up to date	N/A
	Effluent discharge	Readily available	Up to date	N/A
	Waste disposal, POTW	Readily available	Up to date	N/A
	Other permits	Readily available	Up to date	N/A
	Remarks			
5.	**Gas Generation Records**	Readily available	Up to date	N/A
	Remarks			
6.	**Settlement Monument Records**	Readily available	Up to date	N/A
	Remarks			
7.	**Groundwater Monitoring Records**	X Readily available	X Up to date	N/A
	Remarks			
8.	**Leachate Extraction Records**	Readily available	Up to date	N/A
	Remarks			
9.	**Discharge Compliance Records**			
	Air	Readily available	Up to date	N/A
	Water (effluent)	X Readily available	X Up to date	N/A
	Remarks			
10.	**Daily Access/Security Logs**	X Readily available	X Up to date	N/A
	Remarks			

IV. O&M COSTS

1. **O&M Organization**

State in-house — Contractor for State
PRP in-house — Contractor for PRP
Federal Facility in-house — Contractor for Federal Facility
Other _____

2. **O&M Cost Records**

X Readily available X Up to date
Funding mechanism/agreement in place
Original O&M cost estimate 240,000 but did not include all activities (some things were expended or performed with a greater frequency than estimated) Breakdown attached

Total annual cost by year for review period if available

From (Date)	To (Date)	Total cost	
1/1/05	12/31/05	334,000	Breakdown attached
1/1/06	12/31/06	340,000	Breakdown attached
1/1/07	12/31/07	345,000	Breakdown attached
1/1/08	12/31/08	233,000	Breakdown attached
1/1/09	12/31/09	486,000	Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: None

V. ACCESS AND INSTITUTIONAL CONTROLS (Applicable) N/A

A. Fencing

1. **Fencing damaged** Location shown on site map (Gates secured) N/A
Remarks _____

B. Other Access Restrictions

1. **Signs and other security measures** Location shown on site map (N/A)
Remarks _____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented	Yes	No	N/A
Site conditions imply ICs not being fully enforced	Yes	No	N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____
Frequency _____
Responsible party/agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date	Yes	No	N/A
Reports are verified by the lead agency	Yes	No	N/A
Specific requirements in deed or decision documents have been met	Yes	No	N/A
Violations have been reported	Yes	No	N/A

Other problems or suggestions: Report attached

2. **Adequacy** ICs are adequate ICs are inadequate N/A
Remarks _____

D. General

1. **Vandalism/trespassing** Location shown on site map No vandalism evident
Remarks _____

2. **Land use changes on site** N/A
Remarks _____

3. **Land use changes off site** N/A
Remarks _____

VI. GENERAL SITE CONDITIONS

A. Roads Applicable N/A

1. **Roads damaged** Location shown on site map Roads adequate N/A
Remarks _____

B. Other Site Conditions

Remarks_____

VII. LANDFILL COVERS

Applicable (N/A)

A. Landfill Surface

1. **Settlement** (Low spots) Location shown on site map Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** Location shown on site map Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** Location shown on site map Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** Location shown on site map Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** Grass Cover properly established No signs of stress
   Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** N/A
   Remarks_____

7. **Bulges** Location shown on site map Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8.	**Wet Areas/Water Damage**	Wet areas/water damage not evident	
	Wet areas	Location shown on site map	Areal extent_____
	Ponding	Location shown on site map	Areal extent_____
	Seeps	Location shown on site map	Areal extent_____
	Soft subgrade	Location shown on site map	Areal extent_____
	Remarks_____		
9.	**Slope Instability** Slides	Location shown on site map	No evidence of slope instability
	Areal extent_____		
	Remarks_____		
B. Benches	Applicable	N/A	
	(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	**Flows Bypass Bench**	Location shown on site map	N/A or okay
	Remarks_____		
2.	**Bench Breached**	Location shown on site map	N/A or okay
	Remarks_____		
3.	**Bench Overtopped**	Location shown on site map	N/A or okay
	Remarks_____		
C. Letdown Channels	Applicable	N/A	
	(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	**Settlement**	Location shown on site map	No evidence of settlement
	Areal extent_____	Depth_____	
	Remarks_____		
2.	**Material Degradation**	Location shown on site map	No evidence of degradation
	Material type_____	Areal extent_____	
	Remarks_____		
3.	**Erosion**	Location shown on site map	No evidence of erosion
	Areal extent_____	Depth_____	
	Remarks_____		

4. **Undercutting** Location shown on site map No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ No obstructions
Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
No evidence of excessive growth
Vegetation in channels does not obstruct flow
Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations Applicable N/A

1. **Gas Vents** Active Passive
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance
N/A
Remarks_____

2. **Gas Monitoring Probes**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

4. **Leachate Extraction Wells**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

5. **Settlement Monuments** Located Routinely surveyed N/A
Remarks_____

E. Gas Collection and Treatment	Applicable	N/A

1. **Gas Treatment Facilities**
   Flaring Thermal destruction Collection for reuse
   Good condition Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   Good condition Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   Good condition Needs Maintenance N/A
   Remarks_____

F. Cover Drainage Layer	Applicable	N/A

1. **Outlet Pipes Inspected** Functioning N/A
   Remarks_____

2. **Outlet Rock Inspected** Functioning N/A
   Remarks_____

G. Detention/Sedimentation Ponds	Applicable	N/A

1. **Siltation** Areal extent_____ Depth_____ N/A
   Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   Erosion not evident
   Remarks_____

3. **Outlet Works** Functioning N/A
   Remarks_____

4. **Dam** Functioning N/A
   Remarks_____

H. Retaining Walls Applicable N/A

1. **Deformations** Location shown on site map Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** Location shown on site map Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge Applicable N/A

1. **Siltation** Location shown on site map Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** Location shown on site map N/A
   Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** Location shown on site map Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** Functioning N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS Applicable N/A

1. **Settlement** Location shown on site map Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   Performance not monitored
   Frequency_____ Evidence of breaching
   Head differential_____
   Remarks_____

stripping

IX. GROUNDWATER/SURFACE WATER REMEDIES (Applicable) ~~N/A~~

A. Groundwater ~~Extraction~~ Wells, Pumps, and Pipelines Applicable N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   X Good condition X All required wells properly operating Needs Maintenance N/A
   Remarks_____

2. stripping **~~Extraction~~ System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   X Good condition Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   X Readily available Good condition Requires upgrade Needs to be provided
   Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines Applicable (N/A)

1. **Collection Structures, Pumps, and Electrical**
   Good condition Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks_____

C. Treatment System (Applicable) N/A IWS System

1. **Treatment Train** (Check components that apply)
   Metals removal Oil/water separation Bioremediation
   X Air stripping (in well) Carbon adsorbers
   Filters_____
   Additive (*e.g.*, chelation agent, flocculent)_____
   Others_____
   X Good condition Needs Maintenance
   X Sampling ports properly marked and functional
   X Sampling/maintenance log displayed and up to date
   X Equipment properly identified
   X Quantity of groundwater treated annually about 9.4 to 12.8 million gallons
   Quantity of surface water treated annually_____
   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   N/A X Good condition Needs Maintenance
   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   N/A X Good condition Proper secondary containment Needs Maintenance
   Remarks_____

4. **Discharge Structure and Appurtenances**
   N/A X Good condition Needs Maintenance
   Remarks_____

5. **Treatment Building(s)**
   N/A X Good condition (esp. roof and doorways) Needs repair
   Chemicals and equipment properly stored
   Remarks_____

6. **Monitoring Wells** (~~pump and treatment~~ in well stripping remedy)
   X Properly secured/locked X Functioning X Routinely sampled X Good condition
   X All required wells located Needs Maintenance N/A
   Remarks_____

D. Monitoring Data

1. Monitoring Data
   X Is routinely submitted on time X Is of acceptable quality

2. Monitoring data suggests:
   X Groundwater plume is effectively ~~contained~~ treated X Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
X Properly secured/locked X Functioning X Routinely sampled X Good condition
All required wells located Needs Maintenance N/A
Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The goal of the remedy is to prevent off-site migration of contaminants. The remedy is effective and functioning as designed. HGL modifications to the ERD remedy are starting to reduce the mobilization of arsenic and manganese while continuing to reduce PCE and daughter product concentrations. The IWS system removes VOCs from groundwater before the groundwater migrates off site.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

No issues observed with the implementation of the O&M activities. The activities are safe to implement and are effective while ensuring short-term and long-term protectiveness.

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. No indicators of potential remedy problems.

D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. The ERD remedy has been optimized by HGL (reduction in frequency to semi-annual, reduction in dosing, per-event evaluation of inject/not inject in each Area, change from molasses to ABC® as the substrate). The IWS portion of the remedy could be optimized by the replacement of the blower/motor with a more cost-effective model. The current model appears to be oversized for the application.

OPERATIONS AND MAINTENANCE COSTS
(2005-2009)

Operations and Maintenance Costs
(2005-2009)

Dates		Total Cost Rounded to the Nearest $1,000
From	To	
January 1, 2005	December 31, 2005	$334,000
January 1, 2006	December 31, 2006	$340,000
January 1, 2007	December 31, 2007	$345,000
January 1, 2008	December 31, 2008	$233,000
January 1, 2009	December 31, 2009	$486,000

SUMMARY OF ERD SUBSTRATE INJECTIONS
(2004-2009)

Area of Contamination 50
Summary of ERD Substrate Injections
(2004-2009)

	Well ID	Injection Event (dd-mm-yy)	Solution Injected (gal)	Solution Strength (%)	Carbs Added (lbs)	Hydrated Ferrous Sulfate Added (lbs)	Amonium Polyphosphate Added (gal)	Average Injection Time (hh:mm)	Average Pressure at Wellhead (psi)	Average Flow Rate to Well (gpm)
Injections by ARCADIS	Source Area:	04-Oct-04	2,534	10%	1,292			0:25	3.8	5.5
		04-Nov-04	2,400	13%	1,591			0:13	7.3	9.3
		30-Nov-04	1,600	10%	816			0:10	4.3	8.1
		04-Jan-05	1,600	10%	816			0:10	4.6	7.8
		27-Jan-05	5,000	10%	2,550			0:24	14.4	10.6
		17-Mar-05	2,400	10%	1,224			0:17	12.5	7.6
		15-Apr-05	1,440	10%	734			0:07	6.8	10.9
		20-May-05	1,600	10%	816			0:34	9.7	4.4
		27-Jun-05	2,060	10%	1,051	206		0:16	3.8	6.7
		21-Jul-05	2,060	10%	1,051	206		0:19	2.2	2.2
		25-Aug-05	2,060	10%	1,051	206		0:19	8.5	7.1
		22-Sep-05	2,060	10%	1,051	206		0:11	3.9	9.4
		20-Oct-05	2,060	10%	1,051	206		0:15	3.4	7.3
		16-Nov-05	2,060	10%	1,051	206		0:12	8.8	8.4
		28-Dec-05	2,000	10%	1,020	200		0:11	4.4	9.1
		25-Jan-06	2,400	10%	1,224	240		0:17	8.3	5.6
		23-Feb-06	2,000	10%	1,020	200		0:15	4.5	6.2
		22-Mar-06	2,000	10%	1,020	0	8	0:22	10.7	7.5
		20-Apr-06	2,000	10%	1,020	0	8	0:20	4.7	5.4
		25-May-06	2,000	10%	1,020	200	0	0:21	2.6	6.0
		22-Jun-06	2,000	10%	1,020	200	0	0:22	3.7	5.4
		20-Jul-06	2,000	10%	1,020	200	0	0:18	0.7	6.2
		24-Aug-06	2,000	10%	1,020	0	0	0:15	1.7	6.7
		21-Sep-06	2,000	10%	1,020	0	0	0:16	2.5	6.2
		19-Oct-06	2,000	10%	1,020	0	0	0:15	0.8	6.9
		16-Nov-06	2,000	10%	1,020	0	0	0:13	1.1	8.0
		21-Dec-06	2,000	10%	1,020	0	0	0:15	NA	NA
		18-Jan-07	2,000	10%	1,020	0	0	0:15	NA	7.0
		22-Feb-07	2,000	10%	1,020	0	0	0:11	0.7	8.7
		22-Mar-07	2,000	10%	1,020	0	0	0:09	0.9	9.8
		19-Apr-07	2,000	10%	1,020	0	0	0:18	0.0	7.2
		17-May-07	2,000	10%	1,020	0	0	0:10	0.0	9.5
		21-Jun-07	2,000	10%	1,020	0	0	0:14	NR	8.5
		19-Jul-07	2,075	10%	1,058	0	0	0:10	NR	9.4
		23-Aug-07	2,075	10%	1,058	0	0	0:13	NR	6.9
		26-Sep-07	2,075	10%	1,058	0	0	0:19	NR	13.4
		18-Oct-07	2,000	5%	510	0	0	0:12	NR	9.6
		15-Nov-07	2,000	5%	510	0	0	0:12	NR	8.7
		20-Dec-07	2,310	2.5%	295	0	0	0:27	NR	10.9
		24-Jan-08	2,100	2.5%	268	0	0	0:14	NR	11.0
		13-Mar-08	2,100	2.5%	268	0	0	0:11	NR	11.0
		17-Apr-08	2,100	2.5%	268	0	0	NA	NA	NA
		15-May-08	2,100	2.5%	268	0	0	0:19	6.5	8.4
		19-Jun-08	2,100	2.5%	268	0	0	0:17	2.5	6.8
	Source Area Subtotals:		**92,369**		**41,558**	**2,476**	**16**	**0:15**	**4.6**	**8.1**

	Well ID	Injection Event (dd-mm-yy)	Solution Injected (gal)	Solution Strength (%)	ABC® Added (lbs)			Average Injection Time (hh:mm)	Average Pressure at Wellhead (psi)	Average Flow Rate to Well (gpm)
Injections by HGL	Source Area:	13-Nov-08 and 14-Nov-08	10,290	8.7%	8,169			0:52	4.1	10
		10-Jun-09 and 11-Jun-09	10,290	10.5%	9,745			1:04	4.6	8
		17-Nov-09 and 19-Nov-09	10,290	8.6%	8,169			1:17	4.4	6.5
	Source Area Subtotals:		**30,870**		**26,083**			**1:04**	**4.4**	**8.2**

Area of Contamination 50
Summary of ERD Substrate Injections
(2004-2009)

	Well ID	Injection Event (dd-mm-yy)	Solution Injected (gal)	Solution Strength (%)	Carbs Added (lbs)	Hydrated Ferrous Sulfate Added (lbs)	Amonium Polyphosphate Added (gal)	Average Injection Time (hh:mm)	Average Pressure at Wellhead (psi)	Average Flow Rate to Well (gpm)
Injections by ARCADIS	Area 2:	04-Oct-04	1,770	10%	903			0:28	3.5	13.3
		04-Nov-04	520	13%	345			0:10	0.0	12.2
		30-Nov-04	680	10%	347			0:15	2.5	11.6
		04-Jan-05	680	10%	347			0:07	0.1	24.6
		27-Jan-05	1,240	10%	632			0:25	0.0	0.0
		17-Mar-05	170	10%	87			0:07	0.0	6.1
		15-Apr-05	720	10%	367			0:15	1.3	11.4
		20-May-05	820	10%	418			0:16	1.8	12.8
		27-Jun-05	1,800	10%	918	180		1:35	4.8	5.0
		21-Jul-05	1,800	10%	918	180		0:30	0.0	11.4
		25-Aug-05	1,800	10%	918	180		0:42	0.0	13.6
		22-Sep-05	1,800	10%	918	180		0:43	0.0	13.7
		20-Oct-05	1,800	10%	918	180		0:47	0.5	10.4
		16-Nov-05	1,800	10%	918	180		0:48	0.5	9.9
		28-Dec-05	1,600	10%	816	160		0:34	0.0	11.3
		25-Jan-06	2,000	10%	1,020	200		0:40	0.0	11.7
		23-Feb-06	1,600	10%	816	160		0:43	3.5	9.1
		22-Mar-06	1,600	10%	816	0	6	1:10	0.0	13.9
		20-Apr-06	1,600	10%	816	0	6	0:50	0.0	7.0
		25-May-06	1,600	10%	816	160	0	0:36	0.0	10.1
		22-Jun-06	1,600	10%	816	160	0	0:33	0.0	12.1
		20-Jul-06	1,600	10%	816	160	0	0:41	0.0	9.5
		24-Aug-06	1,600	10%	816	0	0	0:49	0.0	9.0
		21-Sep-06	1,600	10%	816	0	0	0:48	11.1	5.5
		19-Oct-06	1,600	10%	816	0	0	0:40	0.0	8.5
		16-Nov-06	1,600	10%	816	0	0	1:24	0.0	6.6
		21-Dec-06	1,000	10%	510	0	0	1:13	NA	13.4
		18-Jan-07	1,600	10%	816	0	0	0:46	0.0	11.6
		22-Feb-07	1,800	10%	918	0	0	0:33	0.0	10.1
		22-Mar-07	1,800	10%	918	0	0	0:35	0.0	13.2
		19-Apr-07	1,800	10%	918	0	0	0:46	0.0	9.4
		17-May-07	1,800	10%	918	0	0	0:43	0.0	13.9
		21-Jun-07	1,600	10%	816	0	0	0:38	NR	10.3
		19-Jul-07	2,250	10%	1,148	0	0	0:37	NR	11.9
		23-Aug-07	2,250	10%	1,148	0	0	0:48	NR	8.9
		26-Sep-07	2,250	10%	1,148	0	0	0:25	NR	18.1
		18-Oct-07	2,000	5%	510	0	0	0:38	NR	10.8
		15-Nov-07	2,000	5%	510	0	0	0:55	NR	7.0
		20-Dec-07	0	0%	0	0	0	0:00	0.0	0.0
		24-Jan-08	1,650	2.5%	210	0	0	0:51	NR	8.8
		13-Mar-08	1,650	2.5%	210	0	0	0:42	NR	8.0
		17-Apr-08	1,650	2.5%	210	0	0	NA	NA	NA
		15-May-08	1,650	2.5%	210	0	0	NA	4.0	9.0
		19-Jun-08	1,650	2.5%	210	0	0	0:20	1.6	12.1
	Area 2 Subtotals:		**67,400**		**30,278**	**2,080**	**13**	**0:40**	**1.0**	**10.1**

	Well ID	Injection Event (dd-mm-yy)	Solution Injected (gal)	Solution Strength (%)	ABC® Added (lbs)			Average Injection Time (hh:mm)	Average Pressure at Wellhead (psi)	Average Flow Rate to Well (gpm)
Injections by HGL	Area 2:	11-Nov-08	2,450	8.7%	1,945			0:38	4	13
		09-Jun-09	2,450	10.5%	2,324			0:44	4.5	11.2
		18-Nov-09 and 19-Nov-09	2,450	8.6%	1,945			0:55	2.5	9
	Area 2 Subtotals:		**7,350**		**6,214**			**0:45**	**4**	**11**

Area of Contamination 50
Summary of ERD Substrate Injections
(2004-2009)

	Well ID	Injection Event (dd-mm-yy)	Solution Injected (gal)	Solution Strength (%)	Carbs Added (lbs)	Hydrated Ferrous Sulfate Added (lbs)	Amonium Polyphosphate Added (gal)	Average Injection Time (hh:mm)	Average Pressure at Wellhead (psi)	Average Flow Rate to Well (gpm)
Injections by ARCADIS	Area 3:	04-Oct-04	1,800	10%	918			0:29	3.0	8.6
		04-Nov-04	650	13%	431			0:10	0.0	12.2
		30-Nov-04	850	10%	434			0:11	0.0	16.6
		04-Jan-05	850	10%	434			0:17	0.0	9.7
		27-Jan-05	1,250	10%	638			0:54	0.0	4.6
		17-Mar-05	650	10%	332			0:11	5.8	12.2
		15-Apr-05	900	10%	459			0:14	4.0	12.9
		20-May-05	1,025	10%	523			0:32	1.1	6.4
		27-Jun-05	2,425	10%	1,237	243		0:54	0.3	9.1
		21-Jul-05	2,425	10%	1,237	243		0:43	1.5	11.2
		25-Aug-05	2,425	10%	1,237	243		0:56	1.3	7.3
		22-Sep-05	2,425	10%	1,237	243		0:43	0.5	11.7
		20-Oct-05	2,425	10%	1,237	243		0:54	1.2	9.4
		16-Nov-05	2,425	10%	1,237	243		0:43	0.0	11.5
		28-Dec-05	2,000	10%	1,020	200		0:56	0.0	11.5
		25-Jan-06	2,500	10%	1,275	250		0:47	2.0	9.9
		23-Feb-06	2,250	10%	1,148	225		0:48	1.2	6.6
		22-Mar-06	2,250	10%	1,148	0	9	0:35	0.6	13.4
		20-Apr-06	2,250	10%	1,148	0	9	0:43	0.0	10.1
		25-May-06	2,250	10%	1,148	225	0	0:39	0.0	12.1
		22-Jun-06	2,250	10%	1,148	225	0	0:45	0.0	10.5
		20-Jul-06	2,250	10%	1,148	225	0	0:47	0.2	10.0
		24-Aug-06	2,250	10%	1,148	0	0	0:53	0.0	8.1
		21-Sep-06	2,250	10%	1,148	0	0	0:38	0.0	10.7
		19-Oct-06	2,250	10%	1,148	0	0	0:58	0.0	7.8
		16-Nov-06	2,250	10%	1,148	0	0	1:15	0.0	6.0
		21-Dec-06	2,250	10%	1,148	0	0	1:11	0.0	6.4
		18-Jan-07	2,250	10%	1,148	0	0	0:56	0.5	13.5
		22-Feb-07	2,165	10%	1,104	0	0	0:40	0.0	11.4
		22-Mar-07	1,900	10%	969	0	0	0:30	0.0	12.9
		19-Apr-07	2,000	10%	1,020	0	0	0:26	0.0	12.6
		17-May-07	2,000	10%	1,020	0	0	0:42	0.0	9.9
		21-Jun-07	2,336	10%	1,191	0	0	0:51	NR	8.9
		19-Jul-07	2,000	10%	1,020	0	0	0:45	NR	8.7
		23-Aug-07	2,000	10%	1,020	0	0	0:45	NR	10.1
		26-Sep-07	2,257	10%	1,151	0	0	0:30	NR	15.3
		18-Oct-07	2,500	5%	638	0	0	0:49	NR	10.0
		15-Nov-07	2,500	5%	638	0	0	0:50	NR	11.7
		20-Dec-07	2,551	2.5%	325	0	0	0:50	NR	12.6
		24-Jan-08	1,650	2.5%	210	0	0	0:18	NR	11.7
		13-Mar-08	1,650	2.5%	210	0	0	0:39	NR	9.6
		17-Apr-08	1,650	2.5%	210	0	0	NA	NA	NA
		15-May-08	1,650	2.5%	210	0	0	0:52	3.0	7.3
		19-Jun-08	1,650	2.5%	210	0	0	0:27	1.0	12.2
	Area 3 Subtotals:		**86,484**		**38,808**	**2,805**	**18**	**0:41**	**0.8**	**10.3**

Injections by HGL	Well ID	Injection Event (dd-mm-yy)	Solution Injected (gal)	Solution Strength (%)	ABC® Added (lbs)			Average Injection Time (hh:mm)	Average Pressure at Wellhead (psi)	Average Flow Rate to Well (gpm)
	Area 3:	11-Nov-08 and 12-Nov-08	2,450	8.7%	1,945			0:34	2.4	15
		09-Jun-09	2,450	10.5%	2,324	0	0	0:47	4.5	10.5
	Area 3 Subtotals:		**4,900**		**4,269**			**0:40**	**3.45**	**12.75**

Area of Contamination 50
Summary of ERD Substrate Injections
(2004-2009)

	Well ID	Injection Event (dd-mm-yy)	Solution Injected (gal)	Solution Strength (%)	Carbs Added (lbs)	Hydrated Ferrous Sulfate Added (lbs)	Amonium Polyphosphate Added (gal)	Average Injection Time (hh:mm)	Average Pressure at Wellhead (psi)	Average Flow Rate to Well (gpm)
Injections by ARCADIS	Area 4:	04-Oct-04	1,800	10%	918			0:33	1.5	10.5
		04-Nov-04	650	13%	431			0:10	-0.4	12.4
		30-Nov-04	850	10%	434			0:17	0.0	10.1
		04-Jan-05	850	10%	434			0:20	0.0	8.5
		27-Jan-05	1,250	10%	638			0:30	0.0	8.3
		17-Mar-05	650	10%	332			0:13	4.2	9.8
		15-Apr-05	850	10%	434			0:17	2.5	10.0
		20-May-05	1,025	10%	523			0:14	1.5	14.6
		27-Jun-05	2,500	10%	1,275	250		1:08	0.8	7.4
		21-Jul-05	2,500	10%	1,275	250		0:41	0.0	12.8
		25-Aug-05	2,500	10%	1,275	250		0:53	1.9	8.8
		22-Sep-05	2,500	10%	1,275	250		1:16	0.3	6.0
		20-Oct-05	2,500	10%	1,275	250		0:53	0.8	9.6
		16-Nov-05	2,500	10%	1,275	250		0:49	10.0	9.7
		28-Dec-05	2,400	10%	1,224	240		0:40	3.8	7.5
		25-Jan-06	3,000	10%	1,530	300		0:51	0.0	10.2
		23-Feb-06	2,700	10%	1,377	270		1:16	0.8	7.7
		22-Mar-06	2,700	10%	1,377	0	11	1:19	1.4	9.1
		20-Apr-06	2,700	10%	1,377	0	11	0:57	0.0	8.3
		25-May-06	2,700	10%	1,377	270	0	0:56	0.0	7.4
		22-Jun-06	2,700	10%	1,377	270	0	0:54	0.0	3.6
		20-Jul-06	2,700	10%	1,377	270	0	0:25	0.1	8.8
		24-Aug-06	2,700	10%	1,377	0	0	0:51	0.5	9.8
		21-Sep-06	2,700	10%	1,377	0	0	0:43	0.0	10.2
		19-Oct-06	3,355	10%	1,711	0	0	0:43	0.0	10.2
		16-Nov-06	2,700	10%	1,377	0	0	0:44	3.3	8.0
		21-Dec-06	2,700	10%	1,377	0	0	0:46	0.9	8.5
		18-Jan-07	2,400	10%	1,224	0	0	0:51	1.9	10.2
		22-Feb-07	3,100	10%	1,581	0	0	0:31	0.0	13.3
		22-Mar-07	3,200	10%	1,632	0	0	0:34	0.9	12.9
		19-Apr-07	3,200	10%	1,632	0	0	0:38	0.0	12.1
		17-May-07	3,000	10%	1,530	0	0	0:34	0.0	10.9
		21-Jun-07	2,704	10%	1,379	0	0	0:35	NR	10.5
		19-Jul-07	3,008	10%	1,534	0	0	0:47	NR	7.4
		23-Aug-07	3,000	10%	1,530	0	0	0:35	NR	12.5
		26-Sep-07	3,000	10%	1,530	0	0	0:25	NR	14.9
		18-Oct-07	2,500	5%	638	0	0	0:37	NR	9.4
		15-Nov-07	2,500	5%	638	0	0	0:40	NR	8.8
		20-Dec-07	3,200	2.5%	408	0	0	0:41	NR	10.1
		24-Jan-08	2,640	2.5%	337	0	0	0:45	NR	7.6
		13-Mar-08	2,640	2.5%	337	0	0	0:52	NR	10.9
		17-Apr-08	2,640	2.5%	337	0	0	NA	NA	NA
		15-May-08	2,640	2.5%	337	0	0	0:36	4.8	10.8
		19-Jun-08	2,640	2.5%	337	0	0	0:23	1.4	14.1
	Area 4 Subtotals:		**106,692**		**46,970**	**3,120**	**22**	**0:43**	**1.3**	**9.9**

Injections by HGL	Well ID	Injection Event (dd-mm-yy)	Solution Injected (gal)	Solution Strength (%)	ABC® Added (lbs)			Average Injection Time (hh:mm)	Average Pressure at Wellhead (psi)	Average Flow Rate to Well (gpm)
	Area 4:	13-Nov-08	3,920	8.7%	3,112			0:52	4.1	10
		09-Jun-09	3,920	8.6%	3,112			0:46	5	10.8
		18-Nov-09	3,920	8.6%	3,112			0:54	2.5	9.4
	Area 4 Subtotals:		**11,760**		**9,336**			**0:50**	**3.9**	**10.1**

Area of Contamination 50
Summary of ERD Substrate Injections
(2004-2009)

	Well ID	Injection Event (dd-mm-yy)	Solution Injected (gal)	Solution Strength (%)	Carbs Added (lbs)	Hydrated Ferrous Sulfate Added (lbs)	Amonium Polyphosphate Added (gal)	Average Injection Time (hh:mm)	Average Pressure at Wellhead (psi)	Average Flow Rate to Well (gpm)
Injections by ARCADIS	Area 5:	Pilot test:	***36,182***	10%	***18,453***					
		04-Oct-04	2,280	10%	1,163			0:33	1.1	10.7
		04-Nov-04	780	13%	517			0:14	0.0	9.6
		30-Nov-04	1,020	10%	520			0:28	0.8	6.1
		04-Jan-05	1,020	10%	520			0:24	0.0	7.1
		27-Jan-05	1,500	10%	765			0:30	0.0	7.1
		17-Mar-05	780	10%	398			0:11	4.4	12.3
		15-Apr-05	1,020	10%	520			0:16	2.2	10.1
		20-May-05	1,230	5%	314			0:15	0.3	13.7
		27-Jun-05	1,200	10%	612	120		0:29	0.6	6.8
		21-Jul-05	2,400	5%	612	240		0:20	0.5	8.7
		25-Aug-05	2,400	5%	612	240		0:26	1.2	7.6
		22-Sep-05	2,400	5%	612	240		0:29	1.8	11.1
		20-Oct-05	2,400	5%	612	240		1:06	1.1	8.7
		16-Nov-05	2,400	5%	612	240		1:12	0.0	10.9
		28-Dec-05	1,980	10%	1,010	198		1:01	4.0	8.7
		25-Jan-06	0	0%	0	0		0:00	0.0	0.0
		23-Feb-06	2,700	5%	689	270		0:49	1.7	8.9
		22-Mar-06	2,700	5%	689	0	5	0:40	1.3	8.5
		20-Apr-06	2,700	5%	689	0	5	0:49	0.0	7.6
		25-May-06	2,700	5%	689	270	0	0:55	0.0	7.8
		22-Jun-06	2,700	5%	689	270	0	0:48	0.0	8.0
		20-Jul-06	2,700	5%	689	270	0	0:54	0.5	9.2
		24-Aug-06	2,700	5%	689	0	0	1:14	0.3	8.3
		21-Sep-06	2,700	5%	689	0	0	0:58	0.3	9.3
		19-Oct-06	2,817	5%	718	0	0	1:00	0.0	8.6
		16-Nov-06	2,700	5%	689	0	0	0:53	0.0	8.3
		21-Dec-06	2,700	5%	689	0	0	0:59	0.0	9.2
		18-Jan-07	2,700	5%	689	0	0	0:49	NA	9.4
		22-Feb-07	1,650	5%	421	0	0	0:33	NA	10.2
		22-Mar-07	2,553	5%	651	0	0	0:40	0.0	11.6
		19-Apr-07	2,065	5%	527	0	0	0:47	NA	7.9
		17-May-07	2,682	5%	684	0	0	0:59	0.0	9.7
		21-Jun-07	2,700	5%	689	0	0	0:43	NR	8.8
		19-Jul-07	2,700	2.5%	344	0	0	0:55	NR	10.6
		23-Aug-07	2,700	2.5%	344	0	0	0:53	NR	7.1
		26-Sep-07	2,700	2.5%	344	0	0	0:27	NR	14.6
		18-Oct-07	2,000	2.5%	255	0	0	0:49	NR	9.1
		15-Nov-07	2,000	2.5%	255	0	0	0:38	NR	8.4
		20-Dec-07	1,800	2.5%	230	0	0	1:00	NR	8.1
		24-Jan-08	1,980	2.5%	252	0	0	0:31	NR	9.0
		13-Mar-08	1,980	2.5%	252	0	0	0:37	NR	9.3
		17-Apr-08	1,980	2.5%	252	0	0	NA	NA	NA
		15-May-08	1,980	2.5%	252	0	0	0:35	4.5	8.8
		19-Jun-08	1,980	2.5%	252	0	0	0:27	0.9	12.4
	Area 5 Subtotals:		**128,959**		**42,153**	**2,598**	**11**	**0:42**	**0.9**	**9.0**

Pilot Test through June 2008

Totals: 481,904 gallons **199,767** pounds of carbohydrates
13,079 pounds of Hydrated Ferrous Sulfate
79 pounds of Amonium Polyphosphate

	Well ID	Injection Event (dd-mm-yy)	Solution Injected (gal)	Solution Strength (%)	ABC® Added (lbs)			Average Injection Time (hh:mm)	Average Pressure at Wellhead (psi)	Average Flow Rate to Well (gpm)
Injections by HGL	Area 5:	10-Nov-08	2,940	8.7%	2,334			0:51	2.5	10
		18-Nov-09	980	8.6%	778			0:59	2.5	8.5
	Area 5 Subtotals:		**3,920**		**3,112**			**0:55**	**2.5**	**9.25**

November 2008 through November 2009

Totals: 58,800 gallons **49,014** pounds of ABC®

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SUMMARY OF IWS SYSTEM OPERATION AND MASS TRANSFER RATES (2005-2009)

Area of Contamination 50
Summary of IWS System Operation and Mass Transfer Rates
(2005-2009)

Date & Time	Well	Pumping Rate (gpm)	Well Run Time (days)[1]	Groundwater Treated (1,000 gal)[1]	Average Influent PCE (μg/L)	Average Effluent PCE (μg/L)	Average PCE Removal (μg/L)	PCE Mass Transfer		DO Mass Transfer	
								(lbs/day)	(Total lbs)[1]	(lbs/day)	(Total lbs)[1]
Combined IWS Operation:											
1/13/2005	Both	25.6	184	6,538	145	12	133	0.04	7.2	1.846	327.1
2/7/2005	Both	26.4	209	7,489	150	13	138	0.04	8.2	1.903	374.6
4/28/2005	Both	26.7	261	9,807	180	19	161	0.05	11.4	1.925	490.6
5/19/2005	Both	27.2	282	10,631	130	14	117	0.04	12.1	1.96	531.8
6/28/2005	Both	21.9	321	11,865	135	12	123	0.03	13.4	1.578	593.5
7/22/2005	Both	20.1	344	12,557	145	14	131	0.03	14.1	1.447	628.1
8/11/2005	Both	19.6	355	12,992	200	15	185	0.04	14.8	1.412	649.9
9/12/2005	Both	18.3	361	13,128	305	27	278	0.06	15.2	1.32	656.7
10/5/2005	Both	26.1	384	13,800	185	24	162	0.05	16.1	1.88	690.3
11/2/2005	Both	23.7	413	14,452	130	15	115	0.03	16.7	1.705	722.9
12/9/2005	Both	26.6	449	15,610	170	13	157	0.05	18	1.914	780.9

For the period of January 2005 through December 2005:		
Avg. Removal Efficiency:	91%	
Avg. Pumping Rate:	21.85	gpm
Avg. Mass Removal Rate:	0.04	lbs/day
Total Mass Removed:	10.8	lbs
Volume of Groundwater Treated:	9,072	1,000 gallons

Notes:

VOCs in water were determined by analysis with EPA method 8260C.

Dissolved oxygen mass transfer is based on an average IWS well influent DO of 4 mg/L and an effluent DO of 10 mg/L.

NS = Not Sampled

NA = Not Applicable

(1) Cumulative since June 2004 system startup.

(2) Power was off during contract transition.

Area of Contamination 50
Summary of IWS System Operation and Mass Transfer Rates
(2005-2009)

Date & Time	Well	Pumping Rate (gpm)	Well Run Time (days)[1]	Groundwater Treated (1,000 gal)[1]	Average Influent PCE (µg/L)	Average Effluent PCE (µg/L)	Average PCE Removal (µg/L)	PCE Mass Transfer		DO Mass Transfer	
								(lbs/day)	(Total lbs)[1]	(lbs/day)	(Total lbs)[1]
Combined IWS Operation:											
1/6/2006	Both	24.3	477	16,587	125	15	110	0.03	18.9	1.748	829.7
2/10/2006	Both	20.5	512	17,614	175	14	161	0.04	20.2	1.474	881.1
3/20/2006	Both	19.1	550	18,542	235	16	220	0.05	21.8	1.375	927.5
4/12/2006	Both	26.6	571	19,102	210	33	178	0.06	22.8	1.914	955.5
5/12/2006	Both	25.9	588	19,868	230	29	202	0.06	24.1	1.869	993.8
6/30/2006	Both	22.9	607	20,193	360	46	315	0.09	25.2	1.648	1,010.1
7/19/2006	Both	26.6	626	20,551	220	29	191	0.06	25.8	1.914	1,028.0
8/10/2006	Both	26.6	648	20,983	235	30	206	0.06	26.7	1.914	1,049.6
9/19/2006	Both	24.9	685	21,766	230	26	204	0.06	28.2	1.796	1,088.8
10/18/2006	Both	27.2	713	22,620	124	25	100	0.03	29.0	1.96	1,131.5
11/6/2006	Both	27.2	733	23,360	165	20	146	0.05	29.0	1.96	1,168.5
12/6/2006	Both	27.3	763	24,546	140	13	127	0.04	31.1	1.969	1,227.9

For the period of January 2006 through December 2006:		
Avg. Removal Efficiency:	88%	
Avg. Pumping Rate:	25	gpm
Avg. Mass Removal Rate:	0.05	lbs/day
Total Mass Removed:	12.1	lbs
Volume of Groundwater Treated:	7,959	1,000 gallons

Notes:

VOCs in water were determined by analysis with EPA method 8260C.

Dissolved oxygen mass transfer is based on an average IWS well influent DO of 4 mg/L and an effluent DO of 10 mg/L.

NS = Not Sampled

NA = Not Applicable

(1) Cumulative since June 2004 system startup.

(2) Power was off during contract transition.

Area of Contamination 50
Summary of IWS System Operation and Mass Transfer Rates
(2005-2009)

Date & Time	Well	Pumping Rate (gpm)	Well Run Time (days)[1]	Groundwater Treated (1,000 gal)[1]	Average Influent PCE (μg/L)	Average Effluent PCE (μg/L)	Average PCE Removal (μg/L)	PCE Mass Transfer		DO Mass Transfer	
								(lbs/day)	(Total lbs)[1]	(lbs/day)	(Total lbs)[1]
Combined IWS Operation:											
1/5/2007	Both	25.9	793	24,953	155	13	142	0.04	32.4	1.866	1,283.7
2/9/2007	Both	25.9	828	24,697	130	12	118	0.04	33.7	1.866	1,349.0
3/28/2007	Both	20.7	874	24,706	245	20	225	0.05	35.5	1.495	1,395.2
4/27/2007	Both	28.4	904	24,756	123	14	109	0.04	36.6	2.047	1,453.7
6/15/2007	Both	26.8	938	24,810	180	23	158	0.05	38	1.929	1,501.7
7/3/2007	Both	27.5	956	24,840	115	19	97	0.03	38.6	1.98	1,536.9
8/24/2007	Both	26.6	969	24,861	87	18	69	0.02	38.9	1.914	1,571.0
9/7/2007	Both	27.7	983	24,884	116	14	102	0.03	39.4	1.998	1,599.0

For the period of January 2007 through September 2007:		
Avg. Removal Efficiency:	88%	
Avg. Pumping Rate:	26.5	gpm
Avg. Mass Removal Rate:	0.03	lbs/day
Total Mass Removed:	11.4	lbs
Volume of Groundwater Treated:	2,796.4	1,000 gallons

Notes:

VOCs in water were determined by analysis with EPA method 8260C.

Dissolved oxygen mass transfer is based on an average IWS well influent DO of 4 mg/L and an effluent DO of 10 mg/L.

NS = Not Sampled

NA = Not Applicable

(1) Cumulative since June 2004 system startup.

(2) Power was off during contract transition.

Area of Contamination 50
Summary of IWS System Operation and Mass Transfer Rates
(2005-2009)

Date & Time	Well	Pumping Rate (gpm)	Well Run Time (days)[1]	Groundwater Treated (1,000 gal)[1]	Average Influent PCE (μg/L)	Average Effluent PCE (μg/L)	Average PCE Removal (μg/L)	PCE Mass Transfer		DO Mass Transfer	
								(lbs/day)	(Total lbs)[1]	(lbs/day)	(Total lbs)[1]
Combined IWS Operation:											
1/15/2008	Both	27.1	1,113	36,142	60	10	50	0.02	42.0	1.951	1,794.5
2/26/2008	Both	23.0	1,155	37,533	34	8	26	0.01	42.2	1.658	1,863.9
4/7/2008	Both	25.9	1,195	38,916	82	7	75	0.02	42.9	1.868	1,881.0
5/7/2008	Both	27.5	1,225	40,104	40	10	30	0.01	43.2	1.983	1,935.6
6/11/2008	Both	26.6	1,260	41,445	107	10	97	0.03	44.3	1.918	1,986.6
6/30/2008[2]	Off	NA	1,279	42,211	NS	NS	NA	NA	44.3	NA	1,986.6
August 2008[2]	Off	NA	1,282	42,299	NS	NS	NA	NA	44.3	NA	1,986.6
9/2/2008	Both	20.4	1,284	42,358	270	45	225	0.06	45.6	1.471	2,016.6
10/16/2008	Both	19.3	1,328	43,580	62	4.7	57.3	0.01	46.2	1.392	2,043.4
11/20/2008	Both	21.1	1,363	44,644	97	6.3	90.7	0.02	47.0	1.521	2,075.5
12/18/2008	Both	22.3	1,391	45,543	130	8.8	121	0.03	47.9	1.608	2,111.4

For the period of January 2008 through December 2008:		
Avg. Removal Efficiency:	88%	
Avg. Pumping Rate:	23.7	gpm
Avg. Mass Removal Rate:	0.02	lbs/day
Total Mass Removed:	5.9	lbs
Volume of Groundwater Treated:	9,401	1,000 gallons

Notes:

VOCs in water were determined by analysis with EPA method 8260C.

Dissolved oxygen mass transfer is based on an average IWS well influent DO of 4 mg/L and an effluent DO of 10 mg/L.

NS = Not Sampled

NA = Not Applicable

(1) Cumulative since June 2004 system startup.

(2) Power was off during contract transition.

Area of Contamination 50
Summary of IWS System Operation and Mass Transfer Rates
(2005-2009)

Date & Time	Well	Pumping Rate (gpm)	Well Run Time (days)[1]	Groundwater Treated (1,000 gal)[1]	Average Influent PCE (μg/L)	Average Effluent PCE (μg/L)	Average PCE Removal (μg/L)	PCE Mass Transfer		DO Mass Transfer	
								(lbs/day)	(Total lbs)[1]	(lbs/day)	(Total lbs)[1]
Combined IWS Operation:											
1/22/2009[2]	Both	19.3	1,426	46,516	100	6	94	0.02	48.7	1.392	2,138.3
2/13/2009	Both	21.1	1,448	47,184	89	10	79	0.02	49.1	1.522	2,170.4
3/26/2009	Both	23.2	1,489	48,554	100	8	93	0.03	50.2	1.673	2,209.2
4/30/2009	Both	27.5	1,521	49,821	90	5	86	0.03	51.1	1.983	2,263.7
6/2/2009	Both	26.3	1,553	51,033	74	3	71	0.02	51.8	1.896	2,313.6
7/1/2009	Both	25.1	1,583	52,117	86	2	84	0.03	52.6	1.81	2,359.0
8/6/2009	Both	25.7	1,619	53,450	91	7	85	0.03	53.5	1.853	2,406.7
8/26/2009	Both	25.1	1,639	54,172	114	4	110	0.03	54.2	1.81	2,452.8
9/14/2009	Both	24.7	1,657	54,813	98	4	95	0.03	54.7	1.781	2,496.1
10/21/2009	Both	25.6	1,694	56,177	75	2	73	0.02	55.5	1.846	2,543.3
11/20/2009	Both	27.2	1,724	57,352	85	3	83	0.03	55.5	1.961	2,596.7
12/17/2009	Both	27.9	1,751	58,436	77	3	74	0.02	56.2	2.011	2,652.8

For the period of January 2009 through December 2009:		
Avg. Removal Efficiency:	95%	
Avg. Pumping Rate:	24.9	gpm
Avg. Mass Removal Rate:	0.02	lbs/day
Total Mass Removed:	7.5	lbs
Volume of Groundwater Treated:	12,893	1,000 gallons

Notes:

VOCs in water were determined by analysis with EPA method 8260C.

Dissolved oxygen mass transfer is based on an average IWS well influent DO of 4 mg/L and an effluent DO of 10 mg/L.

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COMPARISON OF TOXICITY VALUES USED IN THE HHRA TO CURRENT VALUES

Area of Contamination 50
Comparison of Toxicity Values Used in the HHRA to Current Values

Constituent of Concern	Toxicity Values Used in HHRA				Current Values							
	CSFo $(mg/kg/day)^{-1}$	RfDo (mg/kg/day)	Unit Risk $(ug/m^3)^{-1}$	RC (ug/m^3)	CSFo $(mg/kg/day)^{-1}$		RfDo (mg/kg/day)		Unit Risk $(ug/m^3)^{-1}$		RC (ug/m^3)	
Benzene	2.90E-02	3.00E-03	8.30E-06	6.00E+00	5.50E-02	i	4.00E-03	i	7.80E-03	i	3.00E-01	i
Chloroform	6.10E-03	1.00E-02	2.30E-05	3.00E-01	3.10E-02	c	--		--		9.20E+01	a
1,1-Dichloroethene	6.00E-01	9.00E-03	5.00E-05	NR	ND		5.00E-02	i	ND		2.00E+02	i
1,2-Dichloroethylene (total)	NR	9.00E-03	NR	NR	--		--		--		--	
cis -1,2-Dichloroethylene	NR	1.00E-02	NR	NR	--		--		--		--	
Dichloromethane	7.50E-03	6.00E-02	4.70E-07	3.00E+03	--		--		--		1.00E+03	a
1,2-Dichloropropane	6.80E-02	ND	NR	4.00E+00	3.60E-02	c	9.00E-02	a	1.00E-05	c	4.30E+00	i
Tetrachloroethylene	5.20E-02	1.00E-02	5.90E-06	4.90E+02	5.40E-01	c	--		--		2.70E+02	
Trichloroethylene	1.10E-02	6.00E-03	2.00E-06	NR	5.90E-03	c	NA		--		--	
Vinyl Chloride	1.90E+00	ND	8.40E-05	NR	7.20E-01	i	3.00E-03	i	4.40E-06	i	1.00E+02	i
Xylenes	NR	2.00E-01	NR	NR	--		--		--		1.00E+02	i
Iron	NR	NA	NV	NV	--		7.00E-01	p	--		--	
Manganese	NR	2.40E-02	NV	NV	--		--		--		5.00E-02	i
Nitrate, Nitrite	NR	1.00E-01	NV	NV	--		--		--		--	

NV - not volatile

NR - not reported in original risk assessment

ND - not determined

-- indicates no change to the toxicity value

a - ATSDR

c - Cal EPA

i - USEPA IRIS

p - PPRTV Appendix

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ARARS

TABLE 6
Synopsis of Federal and State ARARs for Remedial Alternative 6
AOC 50, Devens, Massachusetts

ARAR TYPE	MEDIUM	REQUIREMENT	STATUS	SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal					
Chemical	Groundwater	Safe Drinking Water Act, National Primary Drinking Water Regulations, Maximum Contaminant Levels [40 CFR Parts 141.11 - 141.16 and 141.50 - 141.53]	Relevant and Appropriate	The National Primary Drinking Water Regulations (NPDWR) establish maximum contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) for several common organic and inorganic contaminants. MCLs specify the maximum permissible concentrations of contaminants in public drinking-water supplies. MCLs are federally enforceable standards based in part on the availability and cost of treatment techniques. MCLGs specify the maximum concentration at which no known or anticipated adverse effect on humans will occur. MCLGs are non-enforceable health-based goals that are always set equal to or lower than MCLs.	The MCLs for the chemicals of concern (COCs) will be met through active remediation of groundwater in selected areas of the plumes.
Chemical	Surface Water	Clean Water Act, Ambient Water Quality Criteria, 33 USC 1314, 40 CFR 131.36(b)(1), 63 Fed. Reg. 68359	To be considered	National recommended criteria for surface water quality establishes numerous criteria for constituents	Ambient water quality criteria were evaluated during the assessment of potential ecological risks and the development of preliminary remediation goals for AOC 50

TABLE 6
Synopsis of Federal and State ARARs for Remedial Alternative 6
AOC 50, Devens, Massachusetts

ARAR TYPE	MEDIUM	REQUIREMENT	STATUS	SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
State					
Chemical	Groundwater	Massachusetts Groundwater Quality Standards [314 CMR 6.00]	Applicable	Massachusetts Groundwater Quality Standards designate and assign uses for which groundwaters of the Commonwealth shall be maintained and protected and set forth water-quality criteria necessary to maintain the designated uses. Groundwater at Devens RFTA is classified GW-1. Groundwaters assigned to this class are fresh groundwaters designated as a source of potable water supply.	314 CMR 6.00 will be met by achieving MMCLs for COCs. The MMCLs for COCs will be met through active remediation of groundwater plume. Groundwater monitoring will be performed to measure changes in COC. State groundwater quality standards that are more stringent that Federal MCLs will be used as remediation goals.
Chemical	Groundwater	Massachusetts Drinking Water Standards and Guidelines [310 CMR 22.00]	Relevant and Appropriate	The Massachusetts Drinking Water Standards and Guidelines list Massachusetts Maximum Contaminant Level (MMCLs), which apply to water delivered to any user of a public water-supply system as defined in 310 CMR 22.00.	Devens groundwater is classified GW-1 and is designated as a source of potable water supply. State MCLs that are more stringent than Federal MCLs will be used as remediation goals.
State					
Chemical	Surface water	Massachusetts Surface Water Quality Standards [314 CMR 4.00]	Relevant and Appropriate	The Massachusetts Surface Water Quality Standards list Massachusetts surface water standards, which apply to discharge to the waters of the Commonwealth from any source. These standards: designate the most sensitive uses for which the various waters of the Commonwealth shall be enhanced, maintained and protected; prescribe the minimum water quality criteria required to sustain the designated uses; and contain regulations necessary to achieve the designated uses and maintain existing water quality.	Massachusetts Surface Water Quality Standards were considered during the assessment of acceptable risk levels and the development of preliminary remediation goals for AOC 50.

TABLE 6
Synopsis of Federal and State ARARs for Remedial Alternative 6
AOC 50, Devens, Massachusetts

ARAR TYPE	MEDIUM	REQUIREMENT	STATUS	SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal					
Location	Groundwater	Floodplain Management Executive Order No. 11988 [40 CFR Part 6, App. A]	Applicable, if remedial actions are performed within floodplain	Requires federal agencies to evaluate potential adverse effects associated with direct and indirect development of a floodplain. Alternatives that involve modification/ construction within a floodplain may not be selected unless a determination is made that no practicable alternative exists. If no practicable alternative exists, potential harm must be minimized and action taken to restore and preserve the natural and beneficial values of the floodplain.	Monitoring wells may be constructed in the floodplain. All construction in the floodplain will be conducted in a manner that minimizes harm and preserves and restores the natural and beneficial values of the floodplain. Appropriate federal agencies will be contacted and allowed to review the proposed work plan for the remedial action prior to implementation of the action.
Federal					
Location	Wetlands	Protection of Wetland Executive Order 11990 [40 CFR 6, Appendix A]	Applicable, if remedial actions are performed within wetlands	Requires federal agencies to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance natural and beneficial values of wetlands. If remediation is required within the wetland areas, and no practical alternative exists, potential harm must be minimized and action taken to restore natural and beneficial values.	Monitoring wells may be constructed in the wetlands. Construction will be performed in a manner that minimizes adverse effects on wetlands, to the extent practicable.
Location	Wetlands	Clean Water Act, Dredge or Fill Requirements Section 404 [33 CRF Part 230; 40 CRF Part 230]	Applicable if remedial actions are performed in U.S. water or within a floodplain	Section 404 of the CWA regulates the discharge of dredged or fill materials to U.S. waters, including wetlands. Filling wetlands would be considered a discharge of fill materials.	Any construction will be performed to minimize adverse effects on aquatic ecosystem.

TABLE 6
Synopsis of Federal and State ARARs for Remedial Alternative 6
AOC 50, Devens, Massachusetts

ARAR TYPE	MEDIUM	REQUIREMENT	STATUS	SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal (cont.)					
Location	Surface water, Endangered species, Migratory species	Fish and Wildlife Coordination Act [16 USC 661 et seq.; 40 CFR Part 302]	Applicable	Requires that the US Fish and Wildlife Service (USFWS) and National Marine Fisheries Service be consulted in the alteration of a body of water, such as if installation of monitoring wells in a wetland and/or discharge of pollutants into a wetland will occur as a result of off-site remedial activities. Requires consultation with state agencies to devise measures to prevent, mitigate, or compensate for project-related losses to fish and wildlife.	Construction will be performed in a manner that minimizes adverse effects on wildlife resources and habitat. Measures will be developed to prevent or mitigate project-related impacts to habitat and wildlife. The USFWS, acting as a review agency for the USEPA, will be kept informed of proposed remedial actions.
State					
Location	Groundwater	Massachusetts Wetland Protection Act [310 CMR 10.00]	Relevant and Appropriate	These regulations include standards on dredging, filling, altering, or polluting inland wetlands and protected areas (defined as area within the riverfront area or the 100-year floodplain). A Notice of Intent (NOI) must be filed with the municipal conservation commission and a Final Order of Conditions obtained before proceeding with the activity. A Determination of Applicability or NOI must be filed for activities such as excavation within a 100-foot buffer zone. The regulations specifically prohibit loss of over 5,000 square feet or bordering vegetated wetlands. Loss may be permitted with replication of any lost area within two growing seasons.	Any proposed remedial actions within riverfront area (defined as the river's mean annual high-water line measured horizontally outward from the river and a parallel line located 200 feet away), wetlands, or the 100-foot buffer will be developed and evaluated to minimize adverse effects on wetlands and to attain compliance with the substantive requirements of these regulations.

TABLE 6
Synopsis of Federal and State ARARs for Remedial Alternative 6
AOC 50, Devens, Massachusetts

ARAR TYPE	MEDIUM	REQUIREMENT	STATUS	SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
Federal					
Action	Groundwater Injection	Safe Drinking Water Act (SDWA) Regulations, Underground Injection Control Program (40 CFR Parts 144, 146, 147, and 1000)	Relevant and Appropriate	These regulations outline minimum program and performance standards for underground injection programs.	The regulation applies and would be complied with because the alternative includes injection into the aquifer.
Action	Investigation derived waste	USEPA OSWER Publication 9345.303FS, January 1992	To be considered	Management of IDW must ensure protection of human health and the environment.	IDW produced from remedial activities will be managed in compliance with this guidance.
Federal					
Action	Hazardous Waste	RCRA Regulations. Identification and Listing of Hazardous Waste (40 CFR Part 261)	Applicable	Defines listed and characteristic hazardous wastes subject to RCRA. These regulations would apply when determining whether or not waste on site is hazardous either by being listed or exhibiting a hazardous characteristic as described in the regulations.	Groundwater treatment residues will be evaluated against the criteria and definitions of hazardous waste. The criteria and definition of hazardous waste refers to those wastes subject to regulations as hazardous wastes under 40 CFR parts 124 and 264. IDW produced during remedial activities will be managed in accordance with these regulations.
Action	Hazardous Waste	Standards Applicable to Generators of Hazardous Waste (RCRA 40 CFR 262)	Applicable	These regulations establish standards for generators of hazardous waste. RCRA Subtitle C established standards applicable to treatment, storage, and disposal of hazardous waste and closure of hazardous waste facilities.	Treatment residues will be tested to determine whether they contain characteristic hazardous waste. If so, management of the hazardous waste would comply with substantive requirements of these regulations.

TABLE 6
Synopsis of Federal and State ARARs for Remedial Alternative 6
AOC 50, Devens, Massachusetts

ARAR TYPE	MEDIUM	REQUIREMENT	STATUS	SYNOPSIS	ACTION TO BE TAKEN TO ATTAIN REQUIREMENT
State					
Action	Hazardous Waste	Massachusetts Hazardous Waste Management Rules; 310 CMR 30.000	Relevant and Appropriate	This requirement sets standards for generators of hazardous waste that address (1) accumulating waste, (2) preparing hazardous waste for shipment, and (3) preparing the uniform hazardous waste manifest. Massachusetts specifies requirements for very small quantity generators, as well as small and large quantity generators.	If RCRA-characteristic hazardous wastes are generated, the material will be managed in accordance with these requirements.

Notes:
ARARs = Applicable, Relevant and Appropriate Regulations
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
CFR = Code of Federal Regulations
CMR = Code of Massachusetts Regulations
COC= Chemical of Concern
CWA = Clean Water Act
IDW = Investigation derived waste
MCL = Maximum Contaminant Level
MCLG = Maximum Contaminant Level Goal
MMCL = Massachusetts Maximum Contaminant Level
NOI = Notice of Intent
NPDWR = National Primary Drinking Water Regulations
NSDWR = National Secondary Drinking Water Regulations
OSWER = Office of Solid Waste and Emergency Response
RCRA = Resource Conservation and Recovery Act
RFTA=Reserves Forces Training Area
SDWA = Safe Drinking Water Act
SMCL = Secondary Maximum Contaminant Level
USEPA = U.S. Environmental Protection Agency

PHOTOLOG

November 2009
Looking South East at the Area 1 ERD injection well transect,
located along Fitchburg Road/Route 2A.

November 2009
Looking West at the Area 1 ERD injection well transect,
located along Fitchburg Road/Route 2A.

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photolog1.cdr
06/02/10 PD

AOC 50
Photograph Log
2005-2009

June 2009
Looking South at the Area 2 ERD injection well transect,
located within Army's fenced RTS Maintenance Yard.

November 2009
Looking North at the Area 3 ERD injection well transect,
located along the Moore AAF building.

X:/AE10/Ft_Devens/2010_5-Year_Review_AOC50/
photolog2.cdr
06/02/10 PD

HGL HydroGeoLogic, Inc

AOC 50
Photograph Log
2005-2009

April 2010
Looking South East at the Area 4 ERD injection well transect,
located along the decommissioned air strip.

April 2010
Looking South West at the Area 5 ERD injection well transect,
located North East of IWS System Enclosure.

X:/AE10/Ft_Devens/2010_5-Year_Review_AOC50/
photolog3.cdr
06/02/10 PD

AOC 50
Photograph Log
2005-2009

April 2010
Looking South toward fenced enclosured of IWS System.

April 2010
Looking South along pathway which leads to IWS System.

X:/AE10/Ft_Devens/2010_5-Year_Review_AOC50/
photolog4.cdr
06/02/10 PD

AOC 50
Photograph Log
2005-2009

April 2010
Looking West at the IWS System Equipment Shed & associated Transformer.

April 2010
Looking South at IWS System #1.

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photolog5.cdr
04/02/10 PD

AOC 50
Photograph Log
2005-2009

April 2010
Looking West at the IWS System #2.

April 2010
Looking West along the Nashua, down gradient from the IWS System.

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photolog6.cdr
06/02/10 PD

AOC 50
Photograph Log
2005-2009

APPENDIX J

COMMUNITY PARTICIPATION

PUBLIC NOTICES

Ad Number	2000338572
ID:	Public Comment Period
Class:	LEGAL
Begin Date:	5/16/2010
End Date:	5/16/2010

HYDROGEOLOGIC INC.
313 NORTHWAY 10 EXEC PARK
BALLSTON LAKE, NY 12019

To place an ad: **617-929-1500**

The Boston Globe

CERTIFIED

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Thank you!
Boston Globe Advertising

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DEVENS, MA
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JUNE 24, 2010 AT
DEVENS COMMERCE CENTER
33 ANDREWS PARKWAY
DEVENS, MA 01434
QUESTIONS OR
COMMENTS CALL:
1-800-836-8134

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Layout 1 Pages 20, 05/14/10 23:17:47 SE Fitchburg

CYAN YELLOW MAGENTA CYAN 3COLOR

Friends can team up online to tackle objectives or simply explore the massive city of Port Carverton in *Skate 3*.

'Skate 3' adds new tricks, but plays it safe

The world of extreme sports is always searching for the next jaw-dropping trick, but developer Black Box plays it safe with the third edition of its popular skateboarding franchise.

Skate 3 makes steady — albeit unremarkable — upgrades on last year's offering, beefing up online play and environment customization while staying true to the solid gameplay that has kept the series at the front of the pack.

In career mode, players are tasked with building a customer base for their newly formed skateboard company. From head to toe, characters are deeply customizable with myriad clothing options, as well as a face and body editor.

Performing tricks, completing tasks and filming stunts means more sales for your company. The more boards you move, the more clothing options and logos are unlocked.

As players progress, they'll notice company billboards featuring some of their best stunts cropping up around the city of Port Carverton.

Those with a creative itch will find plenty to love about this year's edition. Skate parks can be stripped bare and rebuilt from the ground up in striking detail, then shared with the world over Xbox live and PlayStation Network.

Companies can also expand their reach through online play, recruiting other real-life players and sharing parks and images to earn even more rewards. Whether working together toward a specific goal or simply exploring the scenery, taking your skater online with friends is definitely a highlight of *Skate 3*.

Even offline, the city is a joy to explore. Literally a playground for the skating community, Port Carverton is filled to the brim with winding rails and epic downhill runs. Every twist and turn of the city's streets offers more thrilling challenges that are sure to keep gamers glued to their televisions.

For those who lack skating prowess or simply enjoy a good wipeout, the ever-popular Hall of Meat makes its return. Players are awarded points based on how much damage a crash does to their skater, and some challenges set goals such as which bones need to be broken in the wreck.

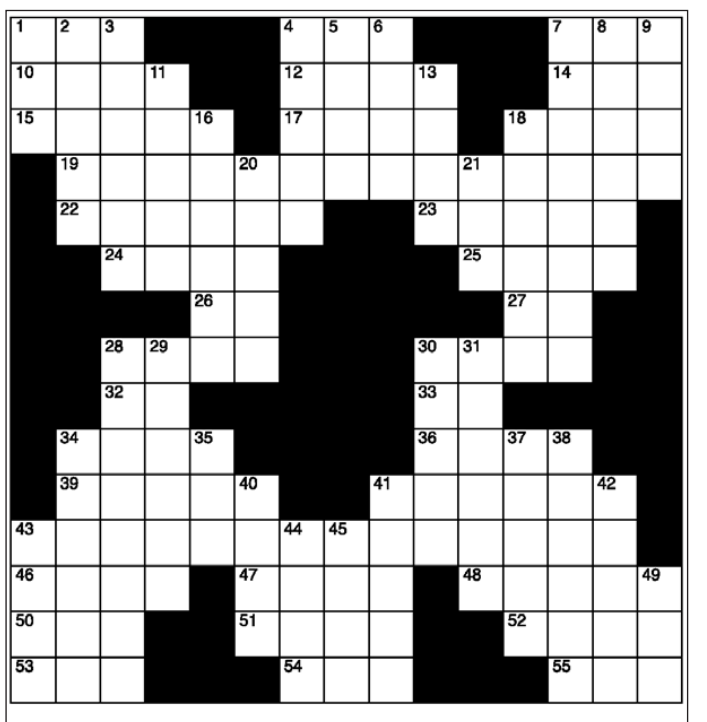
One aspect of the game that remains largely unchanged from last year is the skating itself. Though Black Box has added "easy" and "hardcore" difficulty levels in an effort to make the series palatable to a wider audience, in-game physics remain the same and only a handful of new tricks spice up skaters' repertoires.

Skate 3's approach is a double-edged sword. Players disinterested in online play and park building won't have much reason to drop a large chunk of cash on this year's update. For the co-op skating crowd, the rewards are far greater.

Even with only subtle changes, however, there's no denying that *Skate 3* has made the best skateboarding series on the market a more enjoyable ride.

Final score: 8.5 out of 10.

Solution on Page 20



CLUES ACROSS

1. Manuscripts (abbr.)
4. Small explosive noise
7. Helps little firms
10. Without (French)
12. Macaw genus
14. Ad ___: improvise
15. Actress Eckland
17. Raja's wife
18. Cotillion
19. Make too non-specific
22. Turned down
23. One who is owned by another
24. Wolf (Spanish)
25. Breezed through
26. Anno Domini (in the year of Our Lord)
27. Railroad track
28. Lean-fleshed fish
30. Bachelor quarters
32. Laptop
33. Aluminum (abbr.)
34. Bollard
36. A brief infatuation
39. Wipe out information
41. Shell glyptography
43. Dime store founder
46. Abnormal breathing
47. One of the Greats
48. Curved sword
50. Digested
51. Coarse file
52. Queen of Sparta
53. CNN's founder
54. Gidget actress Sandra
55. Fall back time

CLUES DOWN

1. Mutual savings bank (abbr.)
2. Indian lute
3. Talk in a tearful manner
4. Skinned
5. NW Algerian port
6. A sheet of glass in a window
7. Shrinks up
8. Drank excessively
9. The highest point
11. Takes dictation
13. Gentlemen
16. Nonindustrial society
18. Finished second
20. Hollow stone
21. An insect wing
28. Corkscrewed
29. Hydrocarbon in fuel
30. Genus asimina
31. Poplar trees (Spanish)
34. Angrily rebuke
35. Expression of disappointment
37. Relating to an ecological sere
38. Heated earth
40. Pitcher
41. To call (archaic)
42. Storage structures
43. Male undergraduate social club
44. Towards the oral region
45. Belgian River
49. Long tailed rodent

Growing food in pots can be easier than planting

By Dean Fosdick
For the Associated Press

Two of the hottest trends in gardening are containers and cultivating fresh food, and many savvy families are beginning to combine the two. They're growing their vegetables in pots.

Improvements in potting soils and fertilizers have made this a straightforward and generally successful exercise, said Pamela Crawford, a landscape architect from Canton, Ga., who has written four books about container gardening.

"It's so easy to put a tomato into a pot. It almost grows itself," Crawford said. "It's a whole different ballgame than putting one in the ground. There's less weeding involved and fewer insects to fight. Container gardens are more productive and involve less work."

Shapely pots and colorful plants are a great combination for growing edibles — especially where garden space is lacking. Containers can deliver the goods and in remarkably large quantities.

"I've been able to harvest as many as 236 small spicy peppers all at once from four plants in a 16- to 20-inch container," Crawford said, referring to habaneros. "I've also been able to get my fill of tomatoes from a pot that included a few ornamental sweet potato vines with their large root systems. It's amazing how little ground space plants need to be productive. They can tolerate being crowded."

Mixing flowers with ornamental vegetables makes good container sense.

Cucumbers, coleus and begonias are eye-catching when planted together. Other great potted pairings include rosemary surrounded by lettuce, viola tucked among some long-legged broccoli plants and spinach growing alongside mounded chrysanthemums. Viola and chrysanthemum petals are edible, by the way.

Adding flowers also extends the life of the combos, Crawford said. "In many of my containers, with flowers that lived much longer than the vegetables, I simply cut the dead vegetable branches off and left the flowers to fill in the remaining space," she wrote in her latest book, "Easy Container Combos; Vegetables and Flowers" (Color Garden Publishing, 2010).

Most any kind of container will serve, provided it has the necessary openings for drainage. Having too much water in the soil is almost as deadly as having too little. It rots the plant roots.

Baskets are good choices. So are window boxes, kitchen totes and a whole range of recyclables including old barrels, buckets and milk jugs. Just be careful about colors and breathability.

"I've had good experience with clay pots and plastic pots," said Joseph Masabni, an assistant professor and extension horticulturist with Texas A&M University. "If you live in a hot area, I don't recommend black or dark containers. They can overheat plants. I prefer clay because it breathes if it isn't coated. (Plant) roots are never starved for oxygen."

Vegetable gardening in containers is also a good way to involve children. The size of the project won't be overwhelming, Masabni said.

"Practicality is probably the major consideration. Older people who are still gardeners at heart but who live in apartments also can grow their fill of vegetables or small fruiting shrubs in pots," he said.

Even people with plenty of land find growing in containers easier with certain produce, such as potatoes, he said.

"There's no digging required," Masabni said. "Just tip the pots over and gather up the crop."

❑

On the Net:

For more about growing vegetables in containers, see this University of Arizona Cooperative Extension fact sheet: http://ag.arizona.edu/pubs/garden/mg/vegetable/container.html

US Army Corps of Engineers
New England District

PUBLIC COMMENT PERIOD OPEN FOR FIVE-YEAR REVIEW

FORMER FORT DEVENS SUPERFUND SITE
DEVENS, MASSACHUSETTS

The U.S. Army Corps of Engineers (USACE) is announcing the start of a Five-Year Review for the former Fort Devens Federal Superfund Site, Devens, MA. The purpose of a Five-Year Review is to evaluate whether the cleanup methods put in place at the site are working as designed and continue to remain protective of human health and the environment.

USACE invites the local community to take part in the review process by participating in a community interview; attending a Restoration Advisory Board (RAB) meeting; or submitting comments directly to the Department of the Army. If you are interested in being interviewed, please call 1-800-836-8134 anytime from May 17, 2010 through July 2, 2010. Or, you can attend a RAB meeting on June 24, 2010 at Devens Commerce Center, MassDevelopment Offices, 33 Andrews Parkway, Devens, MA 01434. USACE will be at the meeting to answer any questions or concerns as well as accept comments from the public. To submit written comments, please use the address below.

BACKGROUND

Camp Devens was established in 1917 as a temporary training area for soldiers during World War I. In 1932, the site was named Fort Devens and made a permanent installation with the primary mission of commanding, training, and providing logistical support for non-divisional troop units. After closure in 1996, portions of the property were retained by the Army for reserve forces training, while the remaining sections were transferred to new owners for reuse and redevelopment. The facility is located in the towns of Devens, Ayer, Shirley, Lancaster, and Harvard.

Pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Devens was placed on the National Priorities List (NPL) on December 21, 1989, because of environmental contamination at several locations. The contamination at the former Fort Devens site is associated with historic underground storage tanks/fuel depots and contaminated soils containing petroleum products and chemicals. The principal threats to human health and the environment are primarily groundwater, soil, and sediment contamination. Since its placement on the NPL, long term monitoring and remediation activities have taken place at the contaminated sites, which have proved to be successful.

More detailed information on this site can be found on the U.S. Environmental Protection Agency (EPA) web page at: http://www.epa.gov/ne/superfund/sites/devens/

To submit comments and questions regarding the Five-Year Review process or site clean-up, please contact:
Robert J Simeone
Department of the Army
Base Realignment and Closure Division
U.S. Army Garrison Fort Devens
30 Quebec Street, Unit 100
Devens, MA 01434-4479
Office: 978-796-2205
Email: robert.j.simeone@us.army.mil

New Palin book due out Nov. 23

NEW YORK (AP) — Sarah Palin's new book has a title, *America By Heart: Reflections on Family, Faith and Flag*, and a release date, Nov. 23, publisher HarperCollins announced Tuesday.

The Alaska ex-governor and former GOP vice presidential candidate, whose memoir *Going Rogue* has sold more than 2 million copies, has been working on a tribute to American values.

It will include "selections from classic and contemporary readings that have moved her," according to HarperCollins, along with "the nation's founding documents to great speeches, sermons, letters, literature and poetry, biography, and even some of her favorite songs and movies."

The book is inspired not only by her "strong belief in the importance of family, faith, and patriotism," but by some of the people she met last year while promoting *Going Rogue*. Palin skipped major cities such as Seattle and Los Angeles, traditional stops on most author tours, and instead focused on smaller communities more receptive to her conservative message.

"The book will also include portraits of some of the extraordinary men and women she admires and who embody her deep love of country, her strong rootedness in faith, and her profound love and appreciation of family," the statement from HarperCollins reads.

HarperCollins spokeswoman Tina Andreadis said Palin will likely tour for *America By Heart*, but added that details were still being arranged. The book will have a first printing of 1 million copies — the initial run for *Going Rogue* was 1.5 million — and a list price of $25.99.

As with *Going Rogue*, Palin will have a collaborator, but there are "no specifics to announce yet," Andreadis said. Conservative author Lynn Vincent worked with Palin on her memoir.

While the e-book for *Going Rogue* came out several weeks after the hardcover, the digital edition for "America By Heart" will be available at the same time.

Before the release last month of Apple's iPad, HarperCollins and other publishers had worried that the $9.99 charged for bestsellers on Amazon.com's Kindle reader was too low and would hurt hardcover sales. Publishers have more control over pricing under the sales model negotiated with Apple, with some e-books costing $12.99 to $14.99 when first released.

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CALENDAR

SATURDAY, MAY 22

UCC Car Wash: Overdue for a wash? Stop by the benefit car wash from 10 a.m. to 2 p.m. at Union Congregational Church, 218 Main St. in Groton (across from Filho's Cucina). Donate any amount to help send teens on their mission trip to assist the needy in Scranton, PA, this summer.

The Screening Room at Groton Grange presents — "The Class": 7:30 p.m. One showing only. In an inventive adaptation of his novel about his experiences working in some of the roughest neighborhoods in Paris, Francois Begaudeau stars as a replica of himself — a passionate French teacher who presides over a classroom of diverse young minds. Not your standard drama or documentary but something in between, this Oscar-nominated film used three cameras during a largely improvisational shoot and features real students rather than actors. Rated PG13, free admission. Donations appreciated! Groton Grange is located at 80 Champney St., Groton. Call 978-448-3418 for further information.

This is the last film in this season's Screening Room series of art house films shown in an intimate setting on the big screen. We hope to see you next year! The Screening Room is made possible by a grant from the Groton Cultural Council.

SUNDAY, MAY 23

Democrats meet: 2 p.m. The May meeting of the Democratic Town Committee will be at Legion Hall on Hollis Street. Guest will be Chris Doherty, candidate for State Senate in the First Middlesex District. Governor Patrick will be speaking at the Boxboro Holiday Inn at 4:30 p.m. People will be carpooling from Legion Hall. For more information contact the chair, Jennifer Mieth, at GrotonDTC@gmail.com or on the web at www.grotondemocrats.org.

MONDAY, MAY 24

"Talk with Tom": 10:30 a.m. Tom Hartnett's guest for the next meeting of the Friends of Groton Elders' monthly discussion group will be Michelle Collette, Groton's land use director. The group will meet at the Groton Senior Center. The topic will be planning future land use in Groton for an updated Town Master Plan covering the years 2010 to 2020 and beyond. Will the town be able to sustain its rural aspect? Will it have less or more land for farming? Will public transportation be available for reaching different parts of town, as well as covering longer distances? How large will the population be? This meeting is free and open to all. Please come and talk with Planner Collette about these questions and many others that may arise.

Economic Development Committee: 5 p.m., Town Hall first floor meeting room

Cemetery Commission: 5:30 p.m. ., Legion Hall

Board of Selectmen: 7 p.m., Town Hall first floor meeting room

Comprehensive Master Plan Open Spaces: 7:30 p.m., Town Hall small conference room

Comprehensive Master Plan Sustainablilty Committee: 7:30 p.m., Town Hall lunch room

Comprehensive Master Plan Land Use Advisory: 7:30 p.m., Town Hall second floor meeting room

TUESDAY, MAY 25

Veterans Services Officer: 6 to 9 p.m., Legion Hall, 75 Hollis St., first floor

Carrying On: 7-9 p.m. *Please see below for details.*

"The Woman Who Fell From The Sky": 7 p.m. Jennifer Steil, formerly of Groton, will discuss her memoir, "The Woman Who Fell From the Sky: An American Journalist's Adventures in the Oldest City in the World," at the Groton Public Library. Steil has written a fascinating memoir of her experiences in Sana'a, the capitol city of Yemen, where she worked for a year as the editor of the *Yemen Observer*, and discovered a surprising romance.

Steil was born and raised in Groton where she attended Lawrence Academy. She went on to earn an MS in journalism from Columbia's Graduate School of Journalism and an MFA in creative writing from Sarah Lawrence College. She spent a year as editor of the *Yemen Observer*, a twice-weekly English-language newspaper published in Sana'a, Yemen.

Before moving to Yemen in 2006, Steil was a senior editor at The Week, which she helped to launch in 2001. She has also worked as an editor at *Playgirl* magazine and at *Folio*. Her work has appeared in *Time*, *Life*, *Good Housekeeping*, and *Woman's Day*. She lives in Sana'a, Yemen, with her fiancé, Tim Torlot, the British Ambassador to Yemen.

Her publisher, Random House, says: "Jennifer gives readers a fresh, in-depth, and often surprising look at the Arab mindset and the role of the media in the Muslim culture. She takes readers into the seldom seen everyday life in a conservative Muslim country and illuminates the challenges of living in such a place as a Westerner and as a woman."

The program is free and open to all. Copies of Steil's book will be available for sale and signing. Registration is requested, but not required. To register, visit gpl.org/Calendar or call the library at 978-448-8000.

The Posting Board

Economic Development Committee: 5:30 p.m., Town Hall first floor meeting room

Groton Community Foundation: 5:30 p.m., Legion Hall

Sustainablilty Committee: 7 p.m., Nashua River Watershed Building

Conservation Commission: 7 p.m., Town Hall second floor meeting room

Water Commission: 7:30 p.m., Town Hall lunch room

WEDNESDAY, MAY 26

Well adult clinic: 11:30 a.m. to 1 p.m. Nashoba Associated Boards of Health, in conjunction with the Groton Board of Health, announces that announces that a well adult clinic will be held at the Senior Center, 163 West Main St., Groton. Drop in for Blood Pressure, Pulse Screening and Diet Teaching. No appointment is necessary. For further information, please contact Nashoba Nursing Service & Hospice at 978-425-6675 or 1-800-698-3307 or visit us at www.nashoba.org.

Debtors Anonymous: Wednesdays 6:45 - 8:15 p.m. at First Parish Church of Groton, 1 Powderhouse Road; Route 40 and Route 119. Meeting is in the Parish House, beside church, on second floor. The first half hour of meeting is quiet time to work on numbers. No dues or fees. Everyone welcome! Outreach number is 617-728-1426, http://www.debtorsanonymous.org.

Board of Assessors: 7 p.m., Town Hall small conference room

Great Pond Advisory: 715 p.m., Town Hall first floor meeting room

Board of Appeals: 7:30 p.m., Town Hall second floor meeting room

THURSDAY, MAY 27

Meet New Superintendent at GDEF Grants Celebration: Please help welcome new GDRSD Superintendent Joseph Mastrocola as the Groton Dunstable Education Foundation hosts its Annual Grants Celebration from 3:30-5 p.m. at the Middle School North Library. This annual event honors the innovative teachers and staff members who have been awarded 20 different grants by GDEF this school year, totaling $27,451, and offers a chance to learn about these exciting opportunities for enhancing curriculum for district students. The celebration begins at 3:30 p.m. with a reception and refreshments. Children are also welcome. Grant awards will be presented at approximately 4:15 p.m., along with a special presentation to retiring superintendent Alan Genovese. For more information on GDEF, please visit www.gdefinc.org.

An Evening of Science: 7-9 p.m. Please see below for details.

FRIDAY, MAY 28

Free Dinner, Live Music, and Good Company: All are welcome to the next Groton Community Dinner held at First Parish Church, located at the intersection of Route 40 and Route 119 in Groton. Dinner is served continuously from 5:45-7 p.m. Come for live music, delicious food, and good company. The menu includes salad with homemade dressing, Tuscan herbed chicken (or soy) with white beans, fresh asparagus, bread or rolls & butter, and rhubarb apple crisp. The dinner will be hosted by Groton Local and Christian Union Church. For more information, visit www.grotoncommunitydinners.org or call 978-448-0116.

BRIEFS

Coming: Wednesday, June 9 at 1 p.m.: "Educating Rita" by Willy Russell

At the Senior Center: An English professor with more interest in liquor than in literature.. a young hairdresser eager to cut her ties to the working class... This is the classic tale of a Cockney girl who looks for culture and finds herself along the way. Actor Richard Clark uses wit, wisdom and humor mixed with poignant human drama to create engaging entertainment. There is class warfare in the classroom as an ugly duckling becomes a swan. Dianne Giammarrco joins Richard Clark as his acting partner in this great performance. To reserve your space call 978-448-1170. Lunch will be provided for a $2 donation. This program is supported in part by a grant from Groton Cultural Council.

Well adult clinic

Nashoba Associated Boards of Health, in conjunction with the Groton Board of Health, announces that announces that a Well Adult Clinic will be held on Thursday, June 10, from 11:30 a.m. to 1 p.m. at the Senior Center, 163 West Main St., Groton. Drop in for Blood Pressure, Pulse Screening and Diet Teaching. No appointment is necessary. For further information, please contact Nashoba Nursing Service & Hospice at 978/425-6675 or 1-800-698-3307 or visit us at www.nashoba.org.

Friends of Groton Elders sponsor trip to Tanglewood

The Friends of Groton Elders, Inc. are sponsoring a day trip to Tanglewood on Sunday, July 18, for a matinee performance of the Boston Pops with Conductor Keith Lockhart. The bus will leave from Buckingham Bus Co. on Station Avenue in Groton at 10 a.m. There will be a short snack/rest stop prior to our arrival at Tanglewood. The concert is at 2:30 p.m. in the Koussevitsky Shed. Special guest artist will Arlo Guthrie. Actor Alec Baldwin will narrate "The Dream Lives On: A Portrait of the Kennedy Brothers" written by Composer Peter Boyer and Tony Award winner lyricist Lynn Ahrens.

A grant from the Groton Trust Funds' Lecture Fund toward the cost of reserved seating makes this a special opportunity for seniors.

Following the concert the group will have dinner at Michaels of Stockbridge. The approximate time back in Groton will be 9:30 p.m. The of the trip is $69 and includes bus transportation, concert ticket, dinner and driver's gratuity. Dinner entree choices will be, 1) Baked stuffed chicken with bread stuffing, or 2) Baked Boston Scrod with seasoned bread crumb topping.

To reserve your place sign the sign-up sheet at the Senior Center or call the center at 978-448-1170. For questions call Jean Temple at 978-448-5413 or Corinne Moyle at 978-448-5014.

'What I want my words to do to you'

There will be a screening of the PBS movie "What I want my words to do to you" on Friday, June 11 at 7 p.m., in the First Parish Church of Groton vestry (corner of Rts. 119 and 40), sponsored by the Prison Ministry Team, Our Prison Neighbors, and the Alternatives to Violence Project in Massachusetts (AVP/MA). Admission is free. Refreshments will be served.

"What I want my words to do to you" offers an unprecedented look into the minds and hearts of the women inmates of New York's Bedford Hills Correctional Facility. The film goes inside a writing workshop led by playwright Eve Ensler, consisting of 15 women, who have committed violent crimes. They attempt to answer the question, "If you have committed a violent crime, is it possible to redeem yourself?"

Through a series of exercises and discussions, the women, including former Weather Underground members Kathy Boudin and Judith Clark, delve into and expose their most terrifying realities as they grapple with the nature of their crimes and their own culpability. The film culminates in an emotionally charged prison performance of the women's writing by acclaimed actors Mary Alice, Glenn Close, Hazelle Goodman, Rosie Perez and Marisa Tomei.

After the movie, Nancy Shippen, chairperson of AVP/MA and Executive Director of Our Prison Neighbors, will lead a discussion about the film and discuss the transformative work she does in prisons.

SAVE THE DATE

"Carrying On"

Responding to their personal family losses through suicide in a proactive way, "Carrying On" organizers Steve and Deb Boczenowski, June Johnson and Steve Lieman are pleased to announce the third session of the three session series for Tuesday, May 25, from 7 – 9 p.m. in the Great Room of the Parish House of First Parish Unitarian Church on Powder House Row in Groton.

The third session will be chaired by Barbara Whitcomb, a long time facilitator of a suicide survivor support group based in Littleton.

Twenty-one persons came to the first session with personal losses both recent as well as many years old. You do not have to have come to the first session to come to the second and/or third session. Registration is not necessary, but calling 978-448-2223, or e-mailing june@commongroundmediation.net will help plan the logistics of chairs and refreshments. The series is free and open to any interested person.

An Evening of Science - Power Up With Fuel Cells

GDSTEM (Groton-Dunstable Science, Technology, Engineering and Mathematics) is pleased to be sponsoring the following evening of science: Fuel Cells and Other Electrochemical Technologies with Dr. Michael Kimble, Reactive Innovations, LLC

May 27 at Groton-Dunstable Middle School North, Team Meeting Room (downstairs);

Groton 911 log

Monday, April 26

A.M. 10:53, West Main Street, ambulance;
P.M. 12:47, Boston Road at Sunset Road, domestic related; 2:18, Main Street, animal bite; 6:08, Boston Road, vandalism; 5:09, Old Ayer Road, general services; 5:37, New Pond Road, warrant arrest; 5:39, Pleasant Street, general services; 7:50, New Pond Road, assist citizen; 8:17, Pepperell Road, attempt to serve papers; 8:40, Boathouse Road, warrant arrest; 8:47, School House Road, motor vehicle accident with property damage;

Tuesday, April 27

A.M. 6:57, Boston Road, motor vehicle accident with property damage; 8:18, Martins Pond Road, business alarm;
P.M. 12:45, Martins Pond Road, domestic related; 1:30, Main Street, civil complaint; 6:05. Cow Pond Brook Road, suspicious vehicle; 6:25, Main Street, Motor vehicle accident with property damage; 4:57, Chicopee Row, parking violation; 5:49, Powderhouse Road, larceny over $250; 9:18, Sandy Pond Road, business alarm;

Wednesday. April 28

A.M. 9:00, Old Ayer Road, residential alarm;
P.M. 1:34, Boston Road, vandalized mailbox; 4:23, Chicopee Row, threatening; 4:27, Old Dunstable Road, motor vehicle accident with property damage; 8:17, Flavell Road, ambulance; 9:46, Pepperell Road, ambulance;

Thursday, April 29

A.M. 5:55, West Main Street, ambulance; 8:03, Main Street, ambulance; 8:35, Duck Pond Drive at Little Hollow Lane, suspicious activity; 8:46, Main Street, suspicious activity; 9:41, Indian Road, residential alarm;
P.M. 12:47, Main Street, assist citizen; 5:36, Lowell Road, ambulance;

Friday, April 30

A.M. 12:40, Main Street, suspicious activity; 3:21, Lovers Lane, fire; 7:43, Arrow Trail at Lost Lake Drive, vandalized mailbox; 10:49, Glison Road at Forge Village Road, motor vehicle accident with property damage;
PM 2:55, Hoyts Wharf Road, residential alarm; 3:34, Boston Road, suspicious activity; 3:48, Fairway Drive, residential alarm; 5:34, Pleasant Street, domestic related; 8:43, Nod Road, suspicious vehicle; 8:45, Main Street, fire alarm;

Saturday, May 1

A.M. 12:41, Townsend Road, suspicious vehicle; 2:00, Lowell Road at Main Street, assist other police department; 11:09, Main Street, fire;
P.M. 1:10, Pepperell Road, shooting complaint; 5:21, Boston Road, business alarm;

Sunday, May 2

A.M. 8:43, Townsend Road, person trespassing; 10:09, Bishop Way, ambulance; 11:37, Main Street, property found;
P.M. 1:49, Pepperell Road, ambulance; 2:20, Forge Village Road, assist municipal; 7:36, Townsend Road, annoying phone calls; 8:03, Lovers Lane, suspicious vehicle;

Arrest

Friday, April 30

Patricia Wallace Cone, 53, Groton, domestic assault and battery;

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US Army Corps of Engineers
New England District

PUBLIC COMMENT PERIOD OPEN FOR FIVE-YEAR REVIEW

FORMER FORT DEVENS SUPERFUND SITE
DEVENS, MASSACHUSETTS

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To submit comments and questions regarding the Five-Year Review process or site clean-up, please contact:
Robert J Simeone
Department of the Army
Base Realignment and Closure Division
U.S. Army Garrison Fort Devens
30 Quebec Street, Unit 100
Devens, MA 01434-4479
Office: 978-796-2205
Email: robert.j.simeone@us.army.mil

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CALENDAR

FRIDAY, SATURDAY and MONDAY, MAY 21, 22, 24

Bromfield Drama Society presents new musical: "Duplex" by Peter Fernandez, will be performed May 21, 22 and 24 at 7:30 p.m. in the Cronin Auditorium.

Composer/lyricist Peter Fernandez is a 1989 graduate of The Bromfield School. His initial production of "Duplex" was presented by the Alarm Clock Theater Company in 2005 at the Boston Center for the Arts. In its review, The *Boston Globe* praised Fernandez' "psychological acuity and clever wordplay."

The musical now has a fresh update with five new songs, and the production promises to be even bigger and better than the original. A pop musical for the 21st century, "Duplex" is written in a rock style with a modern attitude and sensibility.

The plot centers on young married couple Suzanne and Gordon played by Molly O'Rourke-Friel and Ted Zayka and their next door tenants, Bobby, an ungrounded 20-something cook (Lewis Pacheco), and his girlfriend, Katie Jane (Rebecca Turner). Job pressure strains the couples' resolve to spend time with each other. Complications arise as an innocent flirtation intensifies forcing each couple to reevaluate their relationship.

The cast includes 20 students from the Drama Society and is rounded out by adult actors from the Harvard Community Theatre. The production is directed by Michael McGarty with music direction by Robert Rucinski. Tickets are $10 for adults and $8 for students and senior citizens and will be available at the door. For information, call 978-456-4152, ext. 557.

SATURDAY, MAY 22

Have a Jessie Day 5K: *Please see below for details.*

Kid's Fair and Touch-a-Truck: 10 a.m. - 2 p.m., Hildreth Elementary School (Rain date: Sunday, May 23). *Please see below for details.*

SUNDAY, MAY 23

Organ Concert at Harvard Historical Society: 6 p.m. Organist and historian Barbara Owen will play and discuss the historic George Stevens pipe organ at the Historical Society's Still River Meeting House. George Stevens was a master organ craftsman in the 19th century. Recently awarded a citation by the Organ Historical Society, the organ was installed in 1870 and is uniquely intact and unaltered. Come enjoy and learn more about this local musical treasure. Admission free, donation suggested. 215 Still River Road, Harvard. www.harvardhistory.org.

MONDAY, MAY 24

School Committee: 7 p.m., Town Hall Meeting Room

TUESDAY, MAY 25

Bromfield School Council: 3 p.m. Bromfield School Library

Devens Enterprise Commission: 6:45 p.m., 33 Andrews Parkway, Devens

Board of Selectmen: 7 p.m., Town Hall meeting room

Board of Health: 7 p.m., Hildreth House

Economic Development Analysis Team: 7:30 p.m., Old Library, downstairs

WEDNESDAY, MAY 26

Energy Advisory Committee: 7:30 p.m., Old Library, main room

Bare Hill Pond Watershed Management Committee: 7:30 p.m., Hildreth House

Zoning Board: 7:30 p.m., Town Hall meeting room

THURSDAY, MAY 27

Conservation Commission: 7 p.m., Town Hall meeting room

The Posting Board

BRIEFS

14th Annual Memorial Day Pancake Breakfast in Harvard

Harvard's 14th Annual Memorial Day Pancake Breakfast will take place on May 31 between 8 and 9:30 a.m. before the parade. Come and join your friends and neighbors at the newly completed Harvard UU Church Fellowship Building for delicious yogurt pancakes, sausages, juice, and beverages. The breakfast is sponsored by the Harvard UU Church members for the benefit of Loaves and Fishes food pantry located at Devens.

Suggested Donations: $8 for adults; $4 for children under 12. All proceeds, plus 100 percent matching funds, will benefit Loaves & Fishes; they received about $1,000 from last year's event.

Bargains in the Belfry half-price sale

Bargains in the Belfry, the resale shop run by the Women's Group of the Harvard Unitarian Universalist Church at the top of the Harvard Town Common, will be holding its Half-Price Sale of Women's and Men's spring and summer clothing from 10 a.m. to 4 p.m. on TUESDAYS, MAY 25 and JUNE 1. The end-of-season $5 a bag sale will be held on TUESDAY, JUNE 8. Come early for best selection. Proceeds help fund church and local charities.

Adult tennis clinics and lessons

The Harvard Parks and Recreation program will be offering adult tennis clinics and private lessons beginning Monday, June 7.

Clinics will be on Mondays from 7-8:30 p.m. at the Harvard tennis courts, behind Bromfield School. They are open to all levels. Come learn, play, practice, exercise and have some fun. Pre-registration is required at www.harvardparkandrec.org.

Take advantage of the reduced rates that Parks and Rec is able to offer town residents.

NEW THIS YEAR: Private and semi private tennis lessons will be offered by Lance Andersen, a PTR Professional, USPTA certified, a member of the National Cardio Tennis Speaker Team and a member of Team Babolat. He is on the tennis staff at the Longfellow Club in Wayland, and at the Tennis Academy of Harvard as the USTA Jr. Tournament Director. Lance was recently named USPTA New England 2010 Regional Pro of the Year and PTR 2010 Massachusetts Member of the Year and is a member of USTA New England Adult Player and EMA Grievance Committees.

Contact Lance directly to schedule a lesson: lance@luckydogtennis.com.

Senior Center wish list

If you can donate any of the following items, it will help us stretch our budget dollars further:

Dell printer ink cartridges (Black J5566 or Color J5567)

8 1/2 x 11 reams of paper, Stamps, Sympathy cards, Paper cups, Paper plates, Plastic silverware, 8 1/2 x 11 ruled note pads. Scrap pads, Paper towels, Murphy Oil Soap, Address labels (30 per sheet), 11 X 17 reams of paper for the newsletter, Clorox wipes, Coffee, Zip lock bags, Large garbage bags.

Any help is appreciated! There is a donation box by the front door of Hildreth House for any contributions.

Bromfield parents survey

The Bromfield School Council would like parents input. The information gathered truly helps guide the thinking and decision making to continually improve your child's experience at The Bromfield School. Please take the survey at: http://www.surveymonkey.com/s/BromfieldParentSurvey.

Creativity for soccer club patch

Harvard Soccer Club needs a new patch. We are looking for volunteers to submit ideas for a new patch design. All you need to do is sketch out an idea for a new patch and place it in one of the boxes displayed at HES or Bromfield. A new design will be chosen by June 8 and the new patch will be handed out starting in September.

SAVE THE DATE

Have a Jessie Day

On Saturday, May 22, at 9 a.m., come run in the Have a Jessie Day 5k Road Race! Sponsored by the Bromfield Class of 2012, the race is a way to honor Jessie Peterson and raise money for the Jessie Peterson Scholarship fund. Go to www.haveajessieday.com to get your registration sheet and sign up now! On race day, registration for the 5K will begin at 7:30 a.m. at the Bromfield School, and the officially timed race, which takes place rain or shine, begins at 9 a.m. (Optional early bib and T-shirt pickup will be available on Friday, May 21, between 2:30 and 3:30 p.m. at The Bromfield School.) The route goes behind the school down Warren Avenue and Tahanto Trail, and continues in a loop up Warren Avenue and back to the school. "Jessie-inspired" awards will be given to the top male and female finishers, as well as to finishers in special categories.

Those who would like to donate directly to the Jessica Peterson Scholarship Fund can do so by writing a check to "Peterson Family Support Fund," c/o The Peterson Family, P.O. Box 513, Harvard, MA 01451 or by visiting http://www.petersonfamilysupport.com.

Kid's Fair and Touch-a-Truck

Saturday, May 22, 10 a.m. - 2 p.m., Hildreth Elementary School (Rain date: Sunday, May 23).

Get on board and join us at a Kid's Fair and Touch-a-Truck event. Climb aboard a fire engine, see the inside of a bus and ambulance, check out police vehicles, farm and construction equipment, All on hand for kids to view and explore. At least a dozen trucks are expected. The kid's fair will feature entertainment, face painting, games, craft tables, a balloon twister, a bouncy house and slide, fire department activities, child safety information, and a number of raffle baskets, in addition to other activities. Live musical performances by Mister Vic (10:15-11 a.m.), Lil' Iguana and Ashley Jordan, and sports clinics led by Teamworks Acton throughout the day. All activities are included in the admission price of $7 per person, $25 max per family (children under 2 are free). Raffle tickets, vendor items and food from Great Brook Farms, Harvard Lions Club, Juniper Farms, and Fiesta Shows available for purchase.

Thank you to our sponsors Nikopoulos Insurance Agency, Alpha Cars, Little Towne Toys and Teamworks Acton. This event is hosted by Village Nursery School, Harvard. Bring the whole family out for a day full of fun. For more information and a full schedule of activities visit: www.villagenurseryschool.org or call 978-456-3993.

Dates on May to remember at the Senior Center

Mondays and Wednesdays, aerobics 9-10 a.m. and 1-2 p.m. at the old library

Tuesdays and Thursdays, Tai Chi 9-10 a.m. at the old library

Tuesdays, Hildreth Café at noon at Hildreth House

Wednesdays, Men's Club 8-9 a.m. at Hildreth House

Thursdays, Mixed Bridge 1 p.m. and Men Only at 7:45 p.m.

Thursdays, Brown Bag lunch @ noon at Hildreth House

Fridays, Yoga 10-11 a.m. at the old library

Friday, May 21 COA LUAU 11:30 a.m. at Hildreth House

Friday, May 21 COA trip to Boston Pops. Leave Hildreth House at 6:30 p.m.

Tuesday, May 25 Music of Your Life 1-2:30 p.m. Session II at Hildreth House

Thursday, May 27 COA trip to the Canterbury Shaker Museum. Leave Hildreth House at 8:15 a.m.

Monday, May 31 Memorial Day — COA office closed.

Harvard 911 Log

Harvard Police, Fire and Ambulance Departments responded to the following incidents from Tuesday, May 4 to Monday, May 10.

Tuesday, May 4

A.M. 1:43, Still River Road, parked motor vehicle; 1:47 to 4:15, town-wide, police conducted building and grounds checks; 2:15, Ayer, mutual aid, police, assisted in search for break and entering suspect in Willard Street area, later apprehended in Ayer; 7:00, Fairbanks Street, medical, ambulance responded to heart attack victim, death at home; 8:56, Ayer Road and Dunkin' Donuts, motor vehicle accident; 11:05, Lancaster County Road, well being check; 11:53, Shaker Road, residential alarm.

P.M. 12:45, Mass Avenue and Slough Road, disabled vehicle reported; 5:15, Prospect Hill Road, tree across roadway; 5:20, Ayer Road and Gebo Lane, same; 5:24, Blanchard Road, tree on wires; 5:26, Stow Road, tree across road; 5:46, Ayer Road, DPW call-out; 9:33, Slough Road, domestic disturbance, arrest, 15-year old female charged with domestic assault and battery, victim was family member, ambulance responded, medical treatment refused; 9:33, Westcott Road; 9:33, Westcott Road, residential burglar alarm; 10:38, police station, request to speak to officer.

Wednesday, May 5

2:14 to 2:55, town-wide, building and grounds checks; 6:00, Still River Road, injured dog, animal control officer notified; 6:39, Route 2W, traffic stop.

P.M. 4:13, Pond Road and beach, request for police, E-911 caller reported teens on swings with marijuana, no motor vehicle but descriptions provided, gone on arrival; 5:27, Still River Road, medical, elderly female with dyspnea, ambulance transport to Emerson Hospital; 5:08, Bolton Road and Abbott Lane, general services, caller reported missing street sign, possibly stolen, DPW to replace it; 5:19, Brown Road, motor vehicle theft; 10:58 to 11:40, Lancaster County Road and McCurdy track, open door, building checked and secure; 11:40, Prospect Hill Road and Fruitlands Museum, lights on in building, checked and secure.

Thursday, May 6

A.M. 12:10 to 3:28, town-wide, police conducted building and grounds checks; 12:56, missing or stolen vehicle recovered; 1:41, Lancaster County Road and McCurdy track, window left open, building checked and secure; 2:12, Ayer Road, parked motor vehicle; 3:00, same; 9:09, police station, request to speak to officer about accident; 2:20, Harvard Road, Bolton, mutual aid, police, open front door, burglar alarm sounding, checked and secure.

P.M. 2:53, Prospect Hill Road and Fruitlands, Fire Dept. extinguished stump fire; 6:01, police station, resident reported he was attacked and bitten by dog on Old Shirley Road, animal control officer notified; 6:52, Lancaster County Road, complaint about contractor, resident dispute with local man about payment for tree work, advised it is civil matter; 6:55, Lancaster County Road, larceny, no details available, police report pending; 8:46, police station, harassment complaint; 11:15, 11:25, Shaker Road and Lancaster County Roads and McCurdy track, building and grounds checks.

Friday, May 7

A.M. 12:45 to 3:41, town-wide, building and grounds checks; 2:17, Old Littleton Road, suspicious activity, motor vehicle with hatch door open, checked and secure; 9:10, police station, request to speak to officer; 10:12, Craggs Road, suspicious motor vehicle; New Hampshire man waiting for school bus to drop off his daughter; 10:19, Prospect Hill Road, commercial alarm; 11:53, Blanchard Road, low-hanging wire.

P.M. 2:00, Mass Avenue, traffic stop; 3:06, Stow Road, medical, woman fell, cut leg, ambulance summoned but could not assemble sufficient crew to respond, Ayer ambulance with ALS on board provided transport to Emerson Hospital; 7:05, Route 2E, medical and Fire Dept. call, Mass State Police requested ambulance to take pregnant woman to Emerson Hospital; 7:09, Lancaster County Road, residential alarm; :7:48, Lancaster County Road, mutual aid, Leominster police requested message delivery; 8:38, Stow Road, general services, talked to parents about alleged underage drinking party; 10:07, Sherry Road, mutual aid, Boxborough police reported gunshots or fireworks heard in area, Harvard police asked to check town-side for possible source; 11:45, Lancaster County Road and McCurdy track, parked vehicle; 11:47, 11:49, 11:56, town-wide, building and grounds checks.

Saturday, May 8

A.M. 12:07, Wilroy Avenue, disturbance, liquor law violation; 12:09, Pond Road and beach, parked vehicles; 1:31, Bromfield School, general police services; 1:49 to 4:30, town-wide, building and grounds checks; 3:26, Ayer Road and Dunkin' Donuts, suspicious activity, early arrival of manager; 8:00, Cleaves Hill Road, loose dog; 8:15, Ayer Road and police station, disabled motor vehicle; 9:18, Willow Road, E-911 hang up call; 9:30, Old Littleton Road, funeral escort; 11:15, South Shaker Road, tree on wires.

P.M. 2:19, Ayer Road, traffic stop; 2:54, police station and town beach, police cruiser towed to Gervais Ford for repairs; 11:33, Lancaster County Road and track, building and grounds checked.

Sunday, May 9

A.M. 12:06, Shaker Road, suspicious activity, objects stacked by a door at golf course, building checked and secure; 1:10 to 2:53, town-wide, building and grounds checks; 2:04, Ayer Road and Dunkin' Donuts, suspicious vehicle, parked and occupied, lost driver, directions given; 8:01, Haskell Lane, residential alarm; 8:55, Still River Road, suspicious person, caller reported man walking on farm land, bicycle chained to tree, police said it was transient individual known to them as visitor and possibly guest at St. Benedict Abbey.

P.M. 3:21, Pinnacle Road, building and grounds check; 3:41, Westcott Road, residential burglar alarm; 4:40, Depot Road and soccer field, parked motor vehicle; 5:35, same; 6:26, Brown Road, domestic incident, arrest; 9:37 to 11:38, town-wide, building and grounds checks; 10:51, Jacob Gates Road, tree in roadway.

Monday, May 10

A.M. 1:45 to 3:00, town-wide, police conducted building and grounds checks; 2:13, Ayer Road, open gate; 2:18, Ayer Road and Route 2, debris in road; 2:26, Prospect Hill Road parked vehicle; 5:58, Stow Road, residential alarm; 8:28, Ayer Road, motor vehicle accident, single vehicle hit utility pole support cable, National Grid notified, no other damage, no injury or citation; 11:11, Brown Road, police requested; 11:57, Ayer and Still River roads, traffic stop.

P.M. 12:24, police station, request to speak to offer about restraining orders; 3:06, Westcott Road, broken pink Nokia cell phone found; 8:26, Police station, restraining order questions.

Arrest

Sunday, May 9

Katie Proctor, 26, of Danvers, charged with domestic assault and battery.

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PUBLIC COMMENT PERIOD OPEN FOR FIVE-YEAR REVIEW

US Army Corps of Engineers
New England District

FORMER FORT DEVENS SUPERFUND SITE
DEVENS, MASSACHUSETTS

The U.S. Army Corps of Engineers (USACE) is announcing the start of a Five-Year Review for the former Fort Devens Federal Superfund Site, Devens, MA. The purpose of a Five-Year Review is to evaluate whether the cleanup methods put in place at the site are working as designed and continue to remain protective of human health and the environment.

USACE invites the local community to take part in the review process by participating in a community interview; attending a Restoration Advisory Board (RAB) meeting; or submitting comments directly to the Department of the Army. If you are interested in being interviewed, please call 1-800-836-8134 anytime from May 17, 2010 through July 2, 2010. Or, you can attend a RAB meeting on June 24, 2010 at Devens Commerce Center, MassDevelopment Offices, 33 Andrews Parkway, Devens, MA 01434. USACE will be at the meeting to answer any questions or concerns as well as accept comments from the public. To submit written comments, please use the address below.

BACKGROUND

Camp Devens was established in 1917 as a temporary training area for soldiers during World War I. In 1932, the site was named Fort Devens and made a permanent installation with the primary mission of commanding, training, and providing logistical support for non-divisional troop units. After closure in 1996, portions of the property were retained by the Army for reserve forces training, while the remaining sections were transferred to new owners for reuse and redevelopment. The facility is located in the towns of Devens, Ayer, Shirley, Lancaster, and Harvard.

Pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Devens was placed on the National Priorities List (NPL) on December 21, 1989, because of environmental contamination at several locations. The contamination at the former Fort Devens site is associated with historic underground storage tanks/fuel depots and contaminated soils containing petroleum products and chemicals. The principal threats to human health and the environment are primarily groundwater, soil, and sediment contamination. Since its placement on the NPL, long term monitoring and remediation activities have taken place at the contaminated sites, which have proved to be successful.

More detailed information on this site can be found on the U.S. Environmental Protection Agency (EPA) web page at: http://www.epa.gov/ne/superfund/sites/devens/

To submit comments and questions regarding the Five-Year Review process or site clean-up, please contact:
Robert J Simeone
Department of the Army
Base Realignment and Closure Division
U.S. Army Garrison Fort Devens
30 Quebec Street, Unit 100
Devens, MA 01434-4479
Office: 978-796-2205
Email: robert.j.simeone@us.army.mil

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CALENDAR

MONDAY, MAY 24

American Redware Pottery performance: 6:30 p.m., Community Center. Please see below for details.

North Middlesex Regional School District Committee: 7 p.m., North Middlesex Regional High School

Board of Selectmen: 7 p.m. Town Hall Conf. Rm. A

Planning Board: 7 p.m., Town Hall Conf. Rm. C

TUESDAY, MAY 25

Board of Health: 7 p.m., Town Hall Conf. Rm. A

BRIEFS

Well adult clinic

Nashoba Associated Boards of Health, in conjunction with the Pepperell Board of Health, announces that a Well Adult Clinic will be held on Wednesday, June 2, from 10 a.m. to noon at the Senior Center on Senior Center Road (off Route 111). Drop in for Blood Pressure, Pulse Screening and Diet Teaching. No appointment is necessary. For further information, please contact Nashoba Nursing Service & Hospice at 978-425-6675 or 1-800-698-3307 or visit us at www.nashoba.org.

Electronics and Appliance Collection Day

Townsend Troop 10 Eagle Scout candidate Adam Reno will hold a collection day for electronics, printer cartridges and appliances on Saturday, June 5, in the back area of the Townsend Common from 9 a.m. to 2 p.m. Volunteers will unloads your car; cash preferred to pay disposal fees.

This collection is to benefit Boy Scout Adam Reno's Eagle Project: The construction of a meditation circle in the Highland Street cemetery.

Will also pick up smaller appliances before the event: Call 978-433-5574 or 603-261-5574.

Fees are: $1 Speakers, Mice, Keyboards; $1 Plugs, Wires $1 Ipods and accessories; $1 Parts/Accessories of Computers; $1 Camera/Video/Audio Equipment, Walkman; $2 Copy/Fax/Scanner/Printers; $2 Phones of any kind and Phone Systems; $2 CD Rom/DVD Drives; $2 Microwaves; $3 DVD Players, Stereos; $3 VCR; $5 Computer monitors; $5 Laptops; $5 Computers, CPUs Servers; $5 UPS (computer battery back up systems); $5 Air Conditioners; $5 Dehumidifiers; $7 Refrigerators; $7 Freezers; $7 Hot Water Tanks and Heaters; $7 Washing Machines; $7 Dryers; $7 Stoves; $7 Dishwashers; $15 TVs - plastic; $20 TVs - wood; $1 Laser or printer cartridges.

The Posting Board

SAVE THE DATE

Middle School Dance, June 4

The new American Youth Football League in Pepperell is sponsoring a second dance for 6th, 7th, and 8th graders on Friday, June 4, from 7-10 p.m. and will be held at the Community Center. Admission is $5/person. Contact Andria Kiluk at 978-433-8760 for more information or to volunteer to chaperone.

Lawrence Library welcomes author Rae Padilla Francoeur on Thursday, June 3, 7 p.m.

Francoeur will read from her new book, "Free Fall: A Late-in-Life Love Affair." Her memoir chronicles a dramatic year in which she quits her career, her mate of 18 years… life as she knows it. She turns to her new lover, her passions and her trust in something as yet undefined to guide her. "Free fall," she says, is a choice: Let go. Be here now. Open up to the possibilities.

Join us for a discussion on passion, fear, trust and difficult choices.

Rae Padilla Francoeur is a journalist and editor. She divides her time between Rockport, MA, and Manhattan, NY.

What's happening at the Senior Center in May…

Love Cards? Mondays at 9:30 a.m. play Hand and Foot; Tuesdays at 10 a.m. is Cribbage and at 12:30 p.m. is Gin Rummy.

Love Yoga? You can come to the center on Tuesdays at 9:30 a.m. for Yoga with Patsy and Thursdays at 9 a.m. for Yoga with Elise.

Wii Sports continues with bowling on Thursdays at 12:30 p.m. and golf on Fridays at 9:30 a.m.

Sing with the Hot Shots is at 9:15 a.m. on Wednesday mornings.

Lunch — Join our lunches on Wednesdays at noon. There is always something delicious to eat!! Follow lunch with a bit of Bingo fun. $1 buys 3 cards.

Exercise — Monday mornings at 10 a.m. and Friday mornings at 11:30 a.m. with Elaine.

Play the harmonica — On Tuesdays at 10 a.m.

Pickled Players Drama Group — Mondays at 1 p.m. New members welcome!

May 20 and 27 at 11 a.m. — Zumba Gold! Erica Donohoe of Rise and Shine Fitness has been Zumba Gold certified. Zumba is a form of Latin dance exercise. The cost for this program is $2 for Pepperell residents and $3 for nonseniors and out of town residents. Come give it a try!!!

May 20 and 27 from 9:30 to 11 a.m. — Decorative Painting begins. Donna Dewberry's One Stroke Painting will be taught by one of Donna Lynch's former students, Maureen Smith. The cost for this program is $15 for Pepperell residents and $25 for nonseniors and out of town residents. Please sign up at the front desk. We must have 6 folks sign up to hold this session!!!

May 21 and 28 at 10: a.m. — Men's Group! Come down to the center for good conversation, coffee and something sweet. We will continue Friday mornings at 10 a.m. Detective Bill Greathead from the Pepperell Police Department will be here to speak on May 14.

May 21 and 28 and June 4 and 11 from 12:30 to 2:30 p.m. — Watercolor workshop continues with Linda Salisbury. The cost for this program is $30 for Pepperell residents and $45 for nonseniors and out of town residents. This cost includes supplies.

May 26 at 10:30 a.m. — Memorial Day Remembrance. Join us as we honor and remember those who have served our country with a very special program featuring the Singing Trooper. Lunch will be served at noon. This program is supported in part by a grant from the Pepperell Cultural Council, a local agency, which is supported by the Massachusetts Cultural Council, a state agency.

Movie Matinee every Friday at 12:30 p.m.

May 14: Couple's Retreat; May 21: The Blind Side; May 28: Old Dogs. Popcorn included! Free of charge!

Pepperell Police Log

The Pepperell Police Department responded to the following incidents between Wednesday, May 5 and Tuesday, May 11.

Wednesday, May 5

A.M. 7:07, Main Street, motor vehicle accident; 7:59, Chace Avenue, traffic control; 8:22, Brookline Street, traffic control; 10:52, Chace Avenue, fire master box alarm; 11:43, Foster Street, medical emergency, transported to hospital.

P.M. 1:05, High Street, medical emergency; 1:30, River Road, motor vehicle complaint; 2:32, school zones, traffic control; 3:01, Shattuck Street, disturbance; 3:03, Groton Street, motor vehicle complaint; 4:43, Main Street, larceny; 4:44, Park Street, traffic control; 5:17, Shirley Street, motor vehicle complaint; 7:24, Lowell Road, domestic disturbance calls resulting in an ambulance transport to the hospital; 7:45, Hollis Street, larceny; 8:33, Main Street, lost and found; 11:51, Foster Street, suspicious activity.

Thursday, May 6

A.M. 2:34, Lowell Street, medical emergency; 8:17, Mt Lebanon Street, traffic control; 9:16, South Road, lost and found; 10:15, Groton Street animal control; 10:58, Nashua Road, traffic control; 11:24, Elm Street, medical emergency, transported to hospital.

P.M. 12:12, Groton and Mill streets, traffic control; 12:29, Hollis Street, disturbance; 1:04, Blood Street, medical emergency, transported to hospital; 4:09, Main Street, automobile fire; 6:17, Oak Hill and Lawrence streets, wires down; 6:18, Dow Street, lockout; 8:31, Haskell Road, welfare check; 10:00, Main Street, animal control.

Friday, May 7

A.M. 5:32, Brookline and Prescott streets, traffic control; 9:27, Nashua Road, lockout; 11:36, Hollis Street, medical emergency, transported to hospital.

P.M. 1:16, Brookline Street, served summons; 1:32, Shirley Street, wires down; 1:45, Main Street, assisted citizen; 4:50, Main Street, vandalism; 8:07, Nashua Road, disturbance; 8:50, Brookline Street, served summons; 10:30, Lowell Road, medical emergency, transported to hospital; 10:35, Nashua Road, disturbance.

Saturday, May 8

A.M. 12:30, Townsend and Mason streets, motor vehicle complaint; 10:41, Nashua Road, traffic control; 11:52, Hollis and Nashua roads, disabled motor vehicle.

P.M. 12:02, Nashua Road, complaint; 2:26, Townsend Street, traffic control; 2:36, Main Street, assisted citizen; 3:13, Tarbell Street, missing person; 4:09, Townsend Street, disabled motor vehicle; 6:59, Hollis Street, complaint; 9:00, Nashua Road, motor vehicle stop; 9:09, Main Street, warrant arrest; 9:52, North Street, fire; 10:06, Blood Street, domestic disturbance call resulting in an arrest; 11:58, Lowell Road, motor vehicle complaint.

Sunday, May 9

A.M. 12:21, Nashoba Valley Medical Center, transport; 1:40, Hollis Street, assisted citizen; Bow Street in Townsend, mutual aid; 8:52, Foster Street, complaint; 8:58, Heald Street, medical emergency, transported to hospital; 10:27, Foster Street, medical emergency, transported to hospital.

P.M. 12:10, Elm and Shirley streets, traffic control; 12:42, Plainfield Road, stolen motor vehicle; 1:31, Hotel and Groton streets, traffic control; 3:11, Main Street, lost and found; 7:40, Prospect Street, medical emergency.

Monday, May 10

A.M. 9:19, Nashua Road, traffic control; 10:19, Haskell Road, assisted citizen; 10:27, River Road, smoke investigation.

P.M. 1:30, Park Street, assisted citizen; 1:50, Hillside and Harbor streets, traffic control; 2:27, Chace Avenue, traffic control; 3:53, Main Street, assisted citizen; 4:06, Main Street, larceny; 6:16, Lawrence and Wheeler streets, motor vehicle complaint; 6:34, Mason Street, medical emergency, transported to hospital; 6:53, Willow Street, complaint; 8:08, Hollis Street, vandalism.

Tuesday, May 11

A.M. 7:04, Chestnut, burglary; 7:54, Hadley Road, medical emergency, transported to hospital; 8:21, Main and Mill streets, disabled motor vehicle; 9:04, South Road, motor vehicle accident; 9:08, Main Street, assisted citizen; 9:13, Shirley Street, suspicious activity; 10:34, Lowell Road, medical emergency, transported to hospital; 10:44, Main Street, motor vehicle accident; 11:16, Chestnut Street, investigation.

P.M. 12:31, Nashua and Mill streets, assisted citizen; 1:33, Hotel Pl, transported to hospital; 4:13, Hollis Street, medical emergency, transported to hospital; 4:39, Franklin Street, complaint.

Arrests

Friday, May 7

Kimberly Brown, 39, of Pepperell. Warrant arrest.

Saturday, May 8

Jeremy Dullea, 32, of Millis. Warrant arrest.

Matthew Collins, 38, of Pepperell. Charged with resisting arrest and assault and battery on a police officer.

Recession hits Castle Hill Day Care hard

RECESSION/From Page 1

centers," he said. "We had one month where we lost four children, due to layoffs."

The loss of four kids translated into a 40 percent drop for Castle Hill, which is licensed to provide care for up to 10 children. While Alan didn't specify their current enrollment situation, he said they're still short of full enrollment after years of carrying a wait-list of parents who wanted spots. Having spoken with each of the families as they've dropped out, Alan said job loss was the main factor, citing Fidelity Investment's 2006 move of 1,500 Massachusetts jobs to North Carolina and other states as a huge blow to their business.

Asked to describe the situation, Castle Hill director Edith said they love working with children, but added their household has had to cut back, because of slowness in the economy.

"We've surviving and being able to pay our bills," she said.

In the big picture, Massachusetts had an unemployment rate 9.3 percent as of March, which was listed as a slight improvement over the 9.5 percent reported in February, according to a late-April press release from the executive office of Labor and Workforce development.

However, statistics from that same website showed Pepperell's unemployment rate as slightly higher than the norm, at 9.6 percent — or 631 unemployed people — as of March, out of a labor force of 6,556.

All told, the U.S. Bureau of Labor Statistics estimates that Massachusetts has a workforce of 3,483,900, of which 323,500 are unemployed, using statistics compiled by surveys of both employers and households. Similarly, those statistics indicate that employment statewide has dropped by 46,600 since last year. The next set of statistics will be available on May 20, at www.mass.gov/lmi.

Macro trends aside, the Minkkinens plan to continue what they're doing for the foreseeable future, saying they've built a reputation as a high-quality childcare operation and they haven't reduced the level of service to their children. However, they did have to lay off a part-time staffer, making the day care even more of a family operation.

Alan said it could have been worse, noting that he's licensed to run a private school for up to 400 children, saying they were seriously thinking about opening that type of facility in Pepperell, shortly before the economy went bad. He said that idea didn't work out because of a disagreement over a playground, adding it turned out to be a huge blessing, saying their situation would doubtless be much worse if they'd taken that path.

At this point, Alan said they're remaining hopeful the economy will turn around, and that better days are ahead for the region's daycare industry.

"We're very optimistic that things will turn around in this part of the county," he said "We're hearing about how the economy is turning around, but its turning slower here."

Located at 19 Powhatan Road, Castle Hill Child Care provides service for children aged infant to 5 years old. It can be contacted by calling 978-433-3100.

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PUBLIC COMMENT PERIOD OPEN FOR FIVE-YEAR REVIEW

US Army Corps of Engineers
New England District

FORMER FORT DEVENS SUPERFUND SITE
DEVENS, MASSACHUSETTS

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USACE invites the local community to take part in the review process by participating in a community interview; attending a Restoration Advisory Board (RAB) meeting; or submitting comments directly to the Department of the Army. If you are interested in being interviewed, please call 1-800-836-8134 anytime from May 17, 2010 through July 2, 2010. Or, you can attend a RAB meeting on June 24, 2010 at Devens Commerce Center, MassDevelopment Offices, 33 Andrews Parkway, Devens, MA 01434. USACE will be at the meeting to answer any questions or concerns as well as accept comments from the public. To submit written comments, please use the address below.

BACKGROUND

Camp Devens was established in 1917 as a temporary training area for soldiers during World War I. In 1932, the site was named Fort Devens and made a permanent installation with the primary mission of commanding, training, and providing logistical support for non-divisional troop units. After closure in 1996, portions of the property were retained by the Army for reserve forces training, while the remaining sections were transferred to new owners for reuse and redevelopment. The facility is located in the towns of Devens, Ayer, Shirley, Lancaster, and Harvard.

Pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Devens was placed on the National Priorities List (NPL) on December 21, 1989, because of environmental contamination at several locations. The contamination at the former Fort Devens site is associated with historic underground storage tanks/fuel depots and contaminated soils containing petroleum products and chemicals. The principal threats to human health and the environment are primarily groundwater, soil, and sediment contamination. Since its placement on the NPL, long term monitoring and remediation activities have taken place at the contaminated sites, which have proved to be successful.

More detailed information on this site can be found on the U.S. Environmental Protection Agency (EPA) web page at: http://www.epa.gov/ne/superfund/sites/devens/

To submit comments and questions regarding the Five-Year Review process or site clean-up, please contact:
Robert J Simeone
Department of the Army
Base Realignment and Closure Division
U.S. Army Garrison Fort Devens
30 Quebec Street, Unit 100
Devens, MA 01434-4479
Office: 978-796-2205
Email: robert.j.simeone@us.army.mil

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The Posting Board

CALENDAR

FRIDAY, MAY 21

Regionalization forum: Sen. Jamie Eldridge is hosting an Ayer forum to gather feedback on the "Final Report of the Regionalization Advisory Commission," which can be read on the Internet at www.mass.gov/governor/regional.

The key question is "How can we find efficiencies in how we do business?" The forum is scheduled for 10 a.m. at Ayer Town Hall. All are welcome.

MONDAY, MAY 24

Veterans agent: 5 p.m., Great Hall

Special Town Election: 7 a.m. to 8 p.m., Town Hall

TUESDAY, MAY 25

"Give up being the live-in servant": 4:30 p.m., Ayer Public Library. *Please see below for details.*

Shirley Middle School orientation for incoming sixth grade — with building tour, 6 to 7 p.m.

Parks Commission: 7 p.m., Town Hall

Personnel Board: 7 p.m., Town Hall

WEDNESDAY, MAY 26

Cruise Night: 6-8 p.m. Postponed from May 19 due to rain. *Please see below for details.*

Finance Committee: 7 p.m., Town Hall

THURSDAY, MAY 27

Personnel Board: 7 p.m., Town Hall

Conservation Commission: 7 p.m., Town Hall

SATURDAY, MAY 29

Memorial Day Parade and Memorial Garden Plaque dedication: 10 a.m., Town Hall

BRIEFS

Mosquito spraying

The Central Mass Mosquito Control Project (CMMCP) will be spraying in our community on: May 24 and June 1, 7, 14, 21 and 28.

Please call CMMCP at 508-393-3055 if you would like to be excluded. Additional information can be found at www.cmmcp.org.

Well adult clinic

Nashoba Associated Boards of Health and D'Ambrosio Eye Care Inc. will hold a Well Adult Clinic on Wednesday, June 23 from 2:30 to 3:30 p.m. at Carlin's Restaurant, 48 Main Street, Ayer. The clinic will include a free Vision Screening. Blood Pressure and Pulse will also be taken. No appointment is necessary. For further information, please contact 978-772-3335 ext. 333.

Well adult clinic

Nashoba Associated Boards of Health, in conjunction with the Ayer Board of Health, announces that a Well Adult Clinic will be held free of charge for the general public on Friday, June 18 from 11 a.m. to 12:30 p.m. at the Senior Center, 18 Pond St., Ayer. Drop in for Blood Pressure, Pulse Screening and Diet Teaching. No appointment is necessary. For further information, please contact Nashoba Nursing Service & Hospice at 978/425-6675 or 1-800-698-3307 or visit us at www.nashoba.org.

Classic Car Nights

Sponsored by the Ayer Downtown Business Alliance with assistance from Gervais Ford, Ayer takes place the third Wednesday of every month thru September from 6 to 8 p.m., or until the sun goes down! Taste the hot dogs and hamburgers for sale. Hear the oldies tunes. See the beautiful classic cars and spread the word. All are welcome. Monies raised fund the alliance's year round activities downtown.

DPW changing hours

Effective through Sept. 10, 2010, the Department of Public Works office will be open to the public Monday through Friday from 6:30 a.m. until 2:30 p.m.

SAVE THE DATE

Give up being the live-in servant!

Tired of doing everything around the house while the kids play video games? Come to a free talk at the Ayer Public Library, 26 E. Main St., Ayer, Tuesday, May 25, 4:30-5:30 p.m. The author of "Raising Able: how chores cultivate capable confident young people," will lead an interactive seminar on how parents can influence children to cook, clean house, do yard work, and more.

To ensure parents have fun this summer, too, Tordella will share her guaranteed cure for boredom. "'When the magic cure is applied, tweens and teens discover their inner resources," said Tordella.

The book describes how parents can retire from being the house servant and empower children. "Chores teach children responsibility, which leads to good decision-making when they become teenagers. Children with responsibility learn to make good decisions when they are 60 miles away going 60 miles an hour," Tordella said.

Chores are an excellent strategy to counteract entitlement, too. "It's impossible to feel entitled when you've cleaned a few toilets," she said.

The book is for parents of children from 2 to 22. "When children start doing chores as young as 2 or 3 years old, they get into the habit of contributing to the household until they leave. They will be more capable, competent and responsible," said Tordella.

As a journalist for five years and a parenting skills workshop leader for eight years, Tordella lived with her four teenagers for 13 years.

"I set up a democratic home to get teens to contribute without yelling, threatening, punishing, beating, grounding or shaming them. It takes time, and family meetings-dinner-and-chores work in the long haul. It's fun to watch a 13 year old run a family meeting and solve problems together," said Tordella.

The event is free and open to the public. Children welcome. For more information call Susan at 978-772-3930 and go towww.raisingable.com.

Fourth annual spaghetti dinner

The Ayer-Shirley Lions Club is having a Spaghetti Dinner on Wednesday, June 9 at Dan's Place, West Main Street, Ayer from 4:30 to 7 p.m. Tickets are $8, children 10 and under and seniors 65 and older $6. There will be a 50/50 raffle and the winner drawn at the end of the dinner. Tickets are available at North Middlesex Savings Bank, Closets By Design, Moore Lumber and at the door. All proceeds donated to Lion Charities.

NASHOBA PUBLISHING/**MARY E. ARATA**

DOUBLE DUTY: Robert Hammond was before the Ayer Board of Selectmen seeking appointment to the board of trustees for the Ayer Council on Aging. While there, he was not only unanimously appointed but was also presented with a plaque thanking him for his dedication to Ayer's Boy Scouts. Hammond was recognized for his 56 years of service to Ayer Boy Scout Troop 2. He joked, "I've spent 56 years trying to keep up with 15-year olds... now see if I can keep up with the senior citizens."From the left are Ayer Selectmen Jim Fay, Gary Luca, Rick Gilles, Hammond and Selectman Carolyn McCreary. Also appointed by the selectmen on Tuesday night was Barry Schwarzel of West Main Street to fill one of two vacancies aboard the Ayer Historical Committee.

Ayer Police Log

Thursday, April 29

AM 1:30, Archer's Mobil Center, Main Street, suspicious activity; 3:39, Oak Ridge Drive, suspicious activity; 7:25, Littleton Road, general services; 7:50, Mango Grill lot, suspicious activity; 9:32, Old Farm Way, burglar alarm; 10:00, North Middlesex Savings Bank, Main Street, identity theft; 11:43, Littleton Road, serve paper work; 11:58, Pingry Hill, Engine 2 respond for CO investigation;
PM 12:25, Nashua Road, Engine 2 respond: 12:40, Markham Circle, general services; 1:02, West Main Street, burglar alarm; 2:15, West Main Street, burglar alarm; 3:41, Sculley Road, general services; 4:11, Washington Street, general services; 9:05, East Main Street, disorderly conduct; 9:34, Westford Road, suspicious activity; 11:33, Washington Street, suspicious activity; 11:33, ALS Ambulance to Shirley;

Friday, April 30

AM 12:51, Old Groton Road,medical, police & Ambulance 1 respond; ; 2:23, Groton School Road, emergency services; 2:38, ALS Ambulance 1 to Harvard; 8:26, Littleton Road, animal complaint; 9:50, Littleton Road serve paper work; 10:10, Hannaford's Fitchburg Road, fire alarm, Engine 2 & Ladder 1 respond: 10:28, Old Farm Way, burglar alarm;
PM 1:14, Sandy Pond Road, general services; ALS Ambulance 1 to Shirley; 1:45, Willard Street, medical, police & Ambulance 2 respond Still alarm station coverage; 2:34, John Cain Company, East Main Street, medical, police & Ambulance 1 respond; ; 3:03, Fitchburg Road, general services; 6:34, Littleton Road, larceny; 8:19, Littleton Road, larceny; 8:48, East Main Street, Engine 2 respond; 9:06, Autumn Ridge Drive, general services; 9:14, Cambridge Street, general services; 9:15, ALS Ambulance 1 to Westford; 111:34, Catania Spagna Corporation, Nemco Way, burglar alarm;

Saturday, May 1

AM 1:03, Washington Street, parking complaint; 1:21, 2:25, Central Avenue, suspicious activity; 4:52, Cumberland Farms, Park Street, burglar alarm; 5:37, Pond Street, medical, police & Ambulance 1 respond; 8:40, Groton School Road, medical, police & ambulance 1 respond; 8:59, Dunkin Donuts, Park Street, motor vehicle accident with property damage, police & Engine 2 respond; 10:48, Engine 2 mutual aid Harvard for brush fire. 11:41, Bubbair Door, Groton Shirley Road, burglar alarm;
PM 1:35, ALS Ambulance 1 to Shirley; 1:55, St. Mary's School, Shirley Street, fire alarm, police & Engine 2 respond; 6:11, Highland Avenue, animal complaint; 4:38, Pearl Street, medical, police & Ambulance 1 respond; 4:42, Douglas Drive, general services; 6:50, ALS Ambulance 1 to Westford; 7:02, Grove Street, serve paper work; 8:01, Groton Harvard Road, general services; 8:48, Great Road, assist other agencies; 9:24, Main Street, general services; 10:00, Ayer High School, Washington Street, general services; 10:30, Jack O Lantern of Ayer, Littleton Road, burglar alarm; 11:09, Willard Street at Myrick Street, disturbance general;

Sunday, May 2

AM 1:14, Cambridge Street, suspicious activity; 1:53, Ayer Rod and Gun Club. Snake Hill Road, suspicious activity; 2:04, Depot Square, disturbance general; 7:52, Sedgeway Way, animal complaint; 9:46, Mango Grill, Littleton Road, burglar alarm; 9:50, ALS Ambulance 1 to Harvard; 11:34, Vitasoy, New England Way, fire alarm, police, Engine 2 & 4, Ladder 1 respond; 11:49, West Street, Larceny;
PM 1:13, Columbia Street, larceny;3:21, Winthrop Avenue, Ambulance 1 respond; 2:46, Fitchburg Road, motor vehicle accident with property damage; 2:58, Main Street at Newton Street. suspicious activity; 3:38, Pirone Park, Bligh Street, parking complaint; 3:52, Pirone Park, Bligh Street, parking complaint; 3:56, Hatch Street, medical, police & Ambulance 1 respond, Still alarm, station coverage; 7:23, Pleasant Street, assist citizen; 7:33, Myrick Street, assist citizen; 9:44, Depot Square, burglary breaking and entering; 9:58, East Main Street, suspicious activity; 11:16, Oak Ridge Drive, assist other agencies;

Monday, May 3

AM 1:03, ALS Ambulance 1 to Harvard; 3:08, Autumn Ridge Drive, suspicious activity; 10:09, Groton Road, motor vehicle accident with personal injury, police. Ambulance 1 & Engine 2 respond; 10:45, West Main Street, suspicious activity; 11:48, Depot Square, incapacitated person, police & Ambulance 1 respond;
PM 2:00, Willard Street., serve restraining order; 3:22, West Main Street, burglar alarm; 6:25, Isaacs Lane, disturbance family; 7:23, East Main Street, disturbance general; 8:09, Washington Street, general services; 8:26, Rail Trail lot, Groton Street, suspicious activity; 9:57, Carlton Circle at East Main Street, general services;

Tuesday, May 4

AM 12:30, Willard Street, Ambulance 1 respond; 2:07, Depot Square, suspicious activity; 2:12, Willard Street, disturbance general; 11:20, Wok N Roll, Park Street, burglar alarm;
PM 12:38, Ayer High School, Washington Street, general services; 2:16, Snake Hill Road, animal complaint; 2:56, Oak Ridge Drive, burglary breaking and entering; 3:03, Park Street Garage, Bishop Road, suspicious activity; 4:10, Groton School Road, general services; 4:10, Littleton Road, disturbance family; 4:46, West Main Street, burglar alarm; 6:02, Westford Road, local ordinances by-laws; 9:23, Littleton Road, disturbance general; 9:39, West Main Street, assist citizen;11:39, Littleton Road, serve paper work;

Wednesday, May 5

AM 12:05, Sandy Pond Road, general services; 12:26, Willard Street, medical; 6:41, West Main Street, disturbance family; 7:01, West Main Street, Ambulance 1 respond; 10:39, Gardner Lane, burglar alarm; 11:29, Littleton Road, serve restraining order; 11:44, Hatch Street, assist other agencies Engine 2 respond for down wires;
PM 1:35, Littleton Road, motor vehicle accident with person injury. police, Engine 2, Ambulance 1 & Service 1 respond; 3:31, Catania Spagna Corporation, Nemco Way, larceny; 3:44, Rosewood Avenue, suspicious activity; 3:54, Willard Street, general services; 4:30, ALS Ambulance 1 to Harvard;4:32, Washington Street, larceny; 6:46, Shaker Road, suspicious activity.

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PUBLIC COMMENT PERIOD OPEN FOR FIVE-YEAR REVIEW

US Army Corps of Engineers
New England District

FORMER FORT DEVENS SUPERFUND SITE
DEVENS, MASSACHUSETTS

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BACKGROUND

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Robert J Simeone
Department of the Army
Base Realignment and Closure Division
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30 Quebec Street, Unit 100
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Office: 978-796-2205
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* offer ends 7/1/2010.

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The Posting Board

CALENDAR

FRIDAY, MAY 21
Town Offices Closed
Meetings held in Town Offices unless otherwise noted, subject to change with 48-hours posted notice.

MONDAY, MAY 24
Board of Health: 5:30 p.m.
Board of Assessors: 6 p.m.
Board of Selectmen: 7 p.m.
Finance Committee: 7 p.m.
Town Clerk, evening office hours: 6 to 8:30 p.m.
Tax Collector, evening hours: 6 to 8:30 p.m.

TUESDAY, MAY 25
Veterans agent: 5:30 to 7 p.m.
Shirley Middle School orientation for incoming sixth grade — with building tour, 6 to 7 p.m.
Town Study Committee: 6 p.m.
Conservation Commission: 7:15 p.m.

WEDNESDAY, MAY 26
There is such a thing as a "Free Lunch": 11 a.m. The Shirley Council on Aging (COA), thanks to a generous grant from the Friends of the Nashoba Valley Medical Center, is offering its next monthly "Free Pizza and Movie" lunch, open to all Shirley Seniors. "Out of Africa" will be shown at the new Senior Center beginning at 11; at 11:45, we will have an intermission where free Pizza, Popcorn and drinks will be available. Once everyone is served, we will resume the movie. It is expected that the movie will be over by about 1 p.m.

The movie describes events from 1914 to 1931 concerning European settlers and the native people in the bush country of Kenya (in British East Africa). It's setting spans from seaside at Mombasa to Nairobi, and from Mount Kenya to Kilimanjaro, as told from the lyrical, poetic viewpoint of Danish Baroness Karen von Blixen-Finecke. The film stars Meryl Streep as the Baroness Karen von Blixen-Finecke; Robert Redford as Denys Finch Hatton; and Klaus Maria Brandauer (as Baron Bror von Blixen-Finecke).

Our thanks to the Movie committee members (Sally Hamel, Vi Burnley and Harold Smith) for their willingness to volunteer, to the Shirley Library for the movie, Pepsi for the drinks and to Village Pizza for helping defray the cost of the Pizzas.

See you all there!!

FRIDAY, MAY 28
Town Offices Closed
Meetings held in Town Offices unless otherwise noted, subject to change with 48-hours posted notice.

BRIEFS

Art Fair, Pizza Party and Concert!

... sponsored by the Shirley School District Early Learning Department, on June 5 in the Shirley Middle School Cafeteria.

Art Fair: 10:30 – 11:30 a.m.; Pizza: 11:30 a.m. to noon; Concert: noon to 1 p.m.

Come have fun and get "messy" with your children at our annual Art Fair. There will be numerous hands-on art activities! Art work will be displayed in the Lobby.

Bring a blanket for your family for our Outdoor concert with Roger Tincknell!

Roger Tincknell has been performing for children and adults throughout the U.S., Canada and Europe for over 30 years. His strong, expressive vocal styles and masterful instrumental skills bring a warmth and versatility to his performances. With over twelve years as a classroom teacher and music specialist in his background, Roger has also worked as an Artist-in-Residence, pioneering programs in multicultural education and special needs curriculum development.

Roger is a two-time Parents' Choice Award-winning recording artist with numerous CDs for children and adults. His albums include multicultural, environmental and family songs. Roger's repertoire includes original and contemporary material, as well as traditional folk styles. Ballads, swing, country blues, bluegrass, and cowboy yodeling are interspersed with Latin American and international folksongs. Roger accompanies himself on guitar, banjo, mandolin, Irish bazouki, Puerto Rican and Venezuelan cuatros, South American charango, Native American Flute, harmonica and piano and percussion.

SAVE THE DATE

Shirley Hoe Down plant sale

Attention all gardeners! Are you interested in supporting Longley Acres Conservation Area while improving the health of your perennial beds?

Consider making a donation of your perennial divisions for the Shirley Hoe Down plant sale! On or before Friday, June 4, pot up and bring your extra divisions to the Longley Acres farmhouse at 27 Whitney Road in Shirley. While you are there, please feel free to look around the property.

Please include identification labels on the plants and leave your name, so we can acknowledge your donation. It is best to divide and pot plants at least a week in advance and keep them in a shady spot, so that the roots will establish and they will look good for the Shirley Hoe Down plant sale on Saturday, June 5. All proceeds from the plant sale support the Longley Acres Maintenance Fund.

We are also looking for donations of items for the silent auction at the Hoe Down booth. If you have an item you would like to contribute, this would be greatly appreciated. Recognition for all donations will be given, and donations are tax exempt.

Also, with June quickly approaching, we will soon be organizing to hay the fields at Longley Acres. We rely on an entirely volunteer effort and are fortunate to have so much community support. If you are interested in volunteering to help "bring in the hay," let us know.

Contact Conservation administrator Chuck Katuska at 978-425-2600, ext. 245, or e-mail conservation@shirley-ma.gov.

4th annual spaghetti dinner

The Ayer-Shirley Lions Club is having a Spaghetti Dinner on Wednesday, June 9 at Dan's Place, West Main Street, Ayer from 4:30 to 7 p.m. Tickets are $8, children 10 and under and seniors 65 and older $6. There will be a 50/50 raffle and the winner drawn at the end of the dinner. Tickets are available at North Middlesex Savings Bank, Closets By Design, Moore Lumber and at the door. All proceeds donated to Lion Charities.

Well adult clinic

Nashoba Associated Boards of Health, in conjunction with the Shirley Board of Health, announces that a Well Adult Clinics will be held on Thursday, June 3 from 10-11 a.m. at the Senior Center, 9 Parker Road, and on Tuesday, June 15 from 9:30–11 a.m. at Shaker Meadows (community room) Harvard Road, Shirley. Drop in for Blood Pressure, Pulse Screening and Diet Teaching. No appointment is necessary. For further information, please contact Nashoba Nursing Service & Hospice at 978/425-6675 or 1-800-698-3307 or visit us at www.nashoba.org.

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Shirley 911 Log

Monday, May 3
A.M. 12:01 to 2:30, town-wide, police conducted 26 building and site checks, all secure; 1:23, Squannacook Road, medical, ambulance transport to Leominster Hospital; 4:01, Tolman Avenue, suspicious motor vehicle; 5:48, Front Street near Citgo station, traffic stop, warning citation; 6:26, Center Road, traffic stop, warning citation; 10:08, police station, walk-in information related to Senior Center; 10:09, Lancaster Road and Lura White School, Fire Dept. service call; 11:24, Moore Drive, police officer wanted.
P.M. 12:16, Moore Drive, police officer wanted; 12:38, Moore Drive, police investigation; 2:23, police station, officer wanted; 2:234, police station, walk-in, no service; 2:58, Groton Road, animal complaint, referred to ACO; 3:22, DPW call; 3:59, Holden Road, safety hazard; 4:44, police station, walk=in services; 5:22, Shaker Road, verbal disturbance, peace restored; 5:24, Leominster Road and fire station, Fire Dept. training; 7:19, police station, walk-in service; 10:09, Patterson Road, warrant arrest attempt, unfounded; 111:50, Front Street and Briarwood Trailer Park, building and site check, secure; 11:50, Ayer Road, animal complaint; 11:55, Fredonian Street, traffic stop, citation issued.

Tuesday, May 4
A.M. 12:09, Leominster Road, domestic disturbance; 12:53, Fredonian Street, suspicious motor vehicle; 1:01, Center Road and Main Street, traffic stop, verbal warning; 1:08, Benjamin Hill pool, building and site checked and secure; 1:13, Front Street and Corporate Resources Group, medical, ambulance transport to Nashoba Valley Medical Center, Ayer; 1:37 to 5:06, building and site checks, secure; 7:50, warrant arrest attempted, unsuccessful; 8:22, police station, officer wanted; 9:15, Lancaster Road and school, Fire Dept. service call; 9:16, police station, officer wanted; 9:42, same; 10:04, Lunenburg Road, Lancaster, assist other police; 10:05, Lunenburg Road, Lancaster, medical, ambulance transport to Leominster Hospital; 11:23, Great Road, domestic disturbance, arrest; 11:54, Peabody Road and Wonderful World of Children day care, animal complaint, referred to ACO
P.M.1:20, Harvard Road and Shaker Meadows, medical, ambulance transport to Nashoba Valley Medical Center; 1:47, police station, walk-in, information related to post office; 1:54, same, related to Center Town Hall; 2:13, Cottage Street, police officer wanted; 4:47, Benjamin Road, safety hazard; 4:49, Main Street, Ayer, mutual aid, police; 5:48, Lancaster Road and school, suspicious activity; 9:53, Keady Way, officer wanted.

Wednesday, May 5
A.M. 12:21 to 3:00, town-wide, police conducted 16 building and site checks, all secure; 1:34, Lancaster Road, traffic stop, warning citation; 2:20, Main Street by post office, traffic stop, verbal warning; 4:52, police station, walk-in, information; 5:26, Townsend Road, traffic stop, warning citation; 6:20, DPW call; 6:32, Leominster Road, traffic stop, warning citation; 8:08, town street, traffic control; 8:35, Great Road, motor vehicle accident, no injury; 10:38, Ayer Road and Phoenix Bar & Grill, Fire Dept. service call; 10:51, Kelsey Lane, Fire Dept. inspection service; 11:01, Shaker Road, same; 11:58, police station, officer wanted.
PM. 2:22, 2:38, police station, walk-ins, officer wanted; 2:42, police station, walk-in, information, 3:06, Amanda Lane, E-911 hang up call investigated; 7:13, Walker Road, suspicious motor vehicle; 7:42, Harvard Road, motor vehicle lockout; 8:02, Chapel Street, parking complaint; 11:47 to 11:59, building and site checks, secure.

Thursday, May 6
A.M. 12:00 to 2:01, town-wide, police conducted 31 building and site checks; all secure; 12:36, Front Street, traffic stop, warning citation; 5:07, Catacunemaug Road, traffic stop, citation issued; 5:56, 6:09, Catacunemaug Road, traffic stops, warning citations; 6:13, Walker Road, traffic stop, verbal warning; 6:33, Benjamin and Ayer roads, traffic stop, verbal warning; 8:11, police station, officer wanted; 8:35, Garrison Road, animal complaint, referred to ACO; 8:59, Chapel Street, police officer wanted; 10:55, Kelsey Lane, Fire Dept. inspection service.
P.M. 12:40, police station, officer wanted; 1:39, Shaker Road, safety hazard; 1:40, Holden Road, residential burglar alarm; 1:50, same; 2;15, Hazen Library, officer wanted; 3:13, Holden Road, residential burglar alarm; 3:52, police station, officer wanted; 4:09, Catacunemaug Road, railroad complaint; 4:19, Front Street, suspicious motor vehicle; 4:54, Main Street, domestic disturbance, peace restored; 4:55, police station, officer wanted; 7:49, police station, walk-in, information related to Hazen and Walker roads; 9:31, Front Street and train station, assisted citizen; 10:20, police station, escort; 11:47, police station, building and site checked and secure; 11:52, Center Road, medical, ambulance transport to Nashoba Valley Medical Center.

Friday, May 7
A.M. 12:06 to 4:10, town-wide, police conducted 39 building and site checks, all secure; 10:29, West Main Street, Ayer, medical, ambulance call, referred to other agency; 11:09, Keady Way, police officer wanted; 11:30, Squannacook Road, police patrol; 11:33, Windsor Road, Fire Dept. service call; 11:50, Lakeview Drive, Fire Dept. inspection service.
P.M. 1:34, Townsend Road, suspicious activity; 4:34, School Street, medical, ambulance call, services rendered; 5:02, Ayer Road, medical, ambulance transport to Leominster Hospital; 9:44, Ayer Road, fire alarm; 9:47, Fredonian Street and Dunkin Donuts, suspicious activity; 11:32, Patterson Road, traffic hazard; 11:43 to 11:51, town-wide, building and site checks, secure; 11:59, Harvard Road, medical, ambulance transport to Leominster Hospital.

Saturday, May 8
A.M. 12:20 to 6:09, town-wide, police conducted 18 building and site checks, all secure; 1:07, Harvard Road, domestic disturbance; 1:17, Lura White School, motor vehicle accident, no injury, vehicle towed; 2:13, Benjamin Hill pool, building and site checked and secure; 5:00, Laurel Circle and K.C.B. Solutions company, burglar alarm; 5:53, 6:03, 6:09, building and site checks, secure; 7:40 Robertson Road, larceny.
P.M. 3:59, Clark Road and Wayside Trailer Park, E-911 hang up call, services rendered; 4:13, Benjamin Hill pool, building and site checked, secure; 4:28, Great Road and Shirley Package Store, building and site checked, secure; 4:35, Little Turnpike Road, traffic stop, verbal warning; 4:44, Walker Road, medical, ambulance transport to Nashoba Valley Medical Center; 7:15, Main Street, traffic stop, warning citation; 5:18, Lancaster Road, traffic stop, warning citation; 5:53, Lancaster Road, medical, ambulance transport to Nashoba Valley Medical Center; 6:08, Lancaster Road, traffic stop, verbal warning; 6:11, Front Street and village area, police foot patrol; 7:00, police station, officer wanted; 8:33, Kelsey Lane, animal complaint; 8:48,m Benjamin Hill recreation area, suspicious activity, gathering disbursed; 8:59 to 9:06, town-wide, building and site checks, secure; 9:15, Walker Road, noise complaint; 9:38, Hazen Road, suspicious activity, building checked and secure; 9:49, Hazen Road, suspicious activity, building checked and secure; 10:07, Lancaster Road, suspicious person; 10:32, Benjamin Road, officer wanted; 10:46, Lawton Road, residential burglar alarm.

Sunday, May 9
A.M. 1:05 to 3:23, town-wide, police conducted 29 building and site checks, all secure; 5:30, Holden Road, residential burglar alarm; 7:00, Horse Pond Road, animal complaint; 11:10, Clark Road and Wayside Trailer Park, medical, ambulance transport to Leominster Hospital.
P.M. 12:02, Center Road, railroad complaint; 12:24, Maple Street, medical, ambulance transport to UMass Medical Center, Worcester; 2:49, Main Street, railroad complaint; 3:17, Clark Road, police officer wanted; 6:30, Andrea Terrace, same; 8:19, Squannacook Road, medical, ambulance call, referred to other agency.

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PUBLIC COMMENT PERIOD OPEN FOR FIVE-YEAR REVIEW

US Army Corps of Engineers
New England District

FORMER FORT DEVENS SUPERFUND SITE
DEVENS, MASSACHUSETTS

The U.S. Army Corps of Engineers (USACE) is announcing the start of a Five-Year Review for the former Fort Devens Federal Superfund Site, Devens, MA. The purpose of a Five-Year Review is to evaluate whether the cleanup methods put in place at the site are working as designed and continue to remain protective of human health and the environment.

USACE invites the local community to take part in the review process by participating in a community interview; attending a Restoration Advisory Board (RAB) meeting; or submitting comments directly to the Department of the Army. If you are interested in being interviewed, please call 1-800-836-8134 anytime from May 17, 2010 through July 2, 2010. Or, you can attend a RAB meeting on June 24, 2010 at Devens Commerce Center, MassDevelopment Offices, 33 Andrews Parkway, Devens, MA 01434. USACE will be at the meeting to answer any questions or concerns as well as accept comments from the public. To submit written comments, please use the address below.

BACKGROUND

Camp Devens was established in 1917 as a temporary training area for soldiers during World War I. In 1932, the site was named Fort Devens and made a permanent installation with the primary mission of commanding, training, and providing logistical support for non-divisional troop units. After closure in 1996, portions of the property were retained by the Army for reserve forces training, while the remaining sections were transferred to new owners for reuse and redevelopment. The facility is located in the towns of Devens, Ayer, Shirley, Lancaster, and Harvard.

Pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Devens was placed on the National Priorities List (NPL) on December 21, 1989, because of environmental contamination at several locations. The contamination at the former Fort Devens site is associated with historic underground storage tanks/fuel depots and contaminated soils containing petroleum products and chemicals. The principal threats to human health and the environment are primarily groundwater, soil, and sediment contamination. Since its placement on the NPL, long term monitoring and remediation activities have taken place at the contaminated sites, which have proved to be successful.

More detailed information on this site can be found on the U.S. Environmental Protection Agency (EPA) web page at: http://www.epa.gov/ne/superfund/sites/devens/

To submit comments and questions regarding the Five-Year Review process or site clean-up, please contact:
Robert J Simeone
Department of the Army
Base Realignment and Closure Division
U.S. Army Garrison Fort Devens
30 Quebec Street, Unit 100
Devens, MA 01434-4479
Office: 978-796-2205
Email: robert.j.simeone@us.army.mil

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The Posting Board

CALENDAR

FRIDAY, MAY 21

Books and Blocks Storytime: 10:30 to 11 a.m. Ages 1-3 in Library Storytime Room.

Renaissance Dance: 7:30 to 9 p.m. Open and free, in Library Meeting Hall A&B.

SATURDAY, MAY 22

Indian Hill Big Band: 7:30 to 9:30 p.m. Concert in Library atrium sponsored by TPL Endowment. Refreshments will be served.

MONDAY, MAY 24

Qi Gong: 9:30 to 10:30 p.m., exercise, in Library Meeting Hall A&B.

North Middlesex Regional School District Committee: 7 p.m., North Middlesex Regional High School

Water Commissioners: 5:30 p.m.,, Water Department

Board of Health: 6:30 p.m.,, Town Hall room 2

TUESDAY, MAY 25

Preschool Storytime and Craft: 11 to 11:45 a.m., ages 3 to 5, in Library Storytime Room

LEGO Club: 6 to 7 p.m. Ages 6 and up, in Library Storytime Room.

WEDNESDAY, MAY 26

Qi Gong: 9:30 to 10:30 p.m., exercise, in Library Meeting Hall A&B.

Senior Bingo: 1:30 to 3 p.m., Library/Senior Center Meeting Hall A&B.

Adult Book Discussion Group: 7:30 -9 p.m. We will be reading and talking about two books (April's and May's) at this session, due to scheduling issues. The first is "Fool" by Christopher Moore. "Pocket, King Lear's fool, sets out to straighten out the mess the mad king has made of the kingdom and the royal family, only to discover the truth about his own heritage." Participants are also encouraged to read "Shades of Grey: a novel," by Jasper Forde for May. Pick up your copy of the books at the library. Location: Library's Historical Meeting Room. Register online.

Zoning Board of Appeals: 6:45 p.m.,, Town Hall room 2

Cemetery & Parks Commission: 7 p.m., Kimball House

Conservation Commission: 7 p.m., Town Hall, Selectmen's Chambers

THURSDAY, MAY 27

Line Dancing: 9:30 to 10:30 a.m. in Library's Meeting Hall A&B. For fees, contact the Senior Center.

Let Go & Lighten Up: 7-9 p.m.: In this interactive, multimedia, energetic event you will learn about the physiological, psychological and spiritual benefits of daily laughter. You will also learn some extraordinary joy-making techniques, including Laughter Meditation, Laughter Yoga and Laffirmations. The program will be presented by Lisa Wessan, LCSW, CLL, RM. She is a motivational author, speaker, counselor, coach and certified laughter yoga and meditation instructor. This program is supported in part by a grant from the Townsend Cultural, a local agency which is supported by the Massachusetts Cultural Council, a state agency. Location: Library's Meeting Hall A&B. Register online.

FRIDAY, MAY 29

Books and Blocks Storytime: 10:30 to 11 a.m. Ages 1-3 in Library Storytime Room.

BRIEFS

Electronics and Appliance Collection Day

Townsend Troop 10 Eagle Scout candidate Adam Reno will hold a collection day for electronics, printer cartridges and appliances on Saturday, June 5 in the back area of the Townsend Common from 9 a.m. to 2 p.m. Volunteers will unloads your car; cash preferred to pay disposal fees.

This collection is to benefit Boy Scout Adam Reno's Eagle Project: The construction of a meditation circle in the Highland Street cemetery.

Will also pick up smaller appliances before the event: Call 978-433-5574 or 603-261-5574.

Fees are: $1 Speakers, Mice, Keyboards; $1 Plugs, Wires $1 iPods and accessories; $1 Parts/Accessories of Computers; $1 Camera/Video/Audio Equipment, Walkman; $2 Copy/Fax/Scanner/Printers; $2 Phones of any kind and Phone Systems; $2 CD Rom/DVD Drives; $2 Microwaves; $3 DVD Players, Stereos; $3 VCR; $5 Computer monitors; $5 Laptops; $5 Computers, CPUs Servers; $5 UPS (computer battery back up systems); $5 Air Conditioners; $5 Dehumidifiers; $7 Refrigerators; $7 Freezers; $7 Hot Water Tanks and Heaters; $7 Washing Machines; $7 Dryers; $7 Stoves; $7 Dishwashers; $15 TVs - plastic; $20 TVs - wood; $1 Laser or printer cartridges.

Parent/Toddler Program director needed

Townsend Recreation-Parent/toddler program at the Kid's Kountry Playground. Counselor will oversee free play, story time, craft time, snack time and games, while parents help. Still seeking person to run this program.

Program will be held June 29, July 1,6,8,13,15,20,22,27,29, Aug. 3 and 5 from 9:30 to 11 a.m. ; $45/child. Parents are responsible for their own child's morning snack. (Playground is located at the corner of Eastman and Turnpike Roads.)

Contact Karen Clement at clem6six@verizon.net or 978-597-5914 to secure a slot. Obtain form and info about other programs at http://www.townsend.ma.us/towngov/culture&rec/recreatn.htm

Friends of the Townsend Seniors Endowment Fund

We are looking for help. We would like to form a Task Force Team to help direct us in the right direction to raising money for our Endowment Fund for the Seniors and their new building. What we need is someone with experience in this field who is willing to help our longest living citizens in town for future years at the Senior Center. Please contact Bill Roberts at 978-597-8587 if you have time to help and interested in this big endeavor.

Seeking nominees

The Friends of the Townsend Seniors are once again seeking the help of the community in nominating that "outstanding individual" in Townsend who has given so much for the growth and betterment of Townsend and its seniors. All nominees for consideration should be submitted no later than May 31, 2010. If someone you have nominated in the past and was not selected, please re-submit that individual for consideration.

Forms for the nomination can be picked up at the Townsend Senior Center. Mail your nominee to: The William E. May Endowment Committee, in care of The Friends of the Townsend Seniors, P. O. Box 972, Townsend, MA 01469.

Completed forms can also be dropped off at the Senior Center but please mark on the envelope, "William E. May Endowment Nominee."

Time, date, location and tickets for the award dinner is not available at this time. For more information call Bill Roberts at 978-597-8587 or Russ Moore at 978-597-0204.

SAVE THE DATE

Ashby 5k Run/walk & Safety Day

Saturday May 22, rain or shine. The runners start at 9:30 a.m. The walkers start at 9:45 a.m. You can register by mail or on the day of the race. Download the registration form at www.ashby5k.org.

Proceeds go to the Girl Scouts Annual Giving Campaign, which provides financial aid to Scouts.

There will be nail-painting, face-painting, RAD kids demo, child watch during the race, first aid demo, and child I.D. cards.

Well adult clinic/Ashby

Nashoba Associated Boards of Health, in conjunction with the Ashby Board of Health, announces that a Well Adult Clinic will be held free of charge for the general public on Tuesday, June 1, 11 a.m. to noon, at the Library, New Ipswich Road, Ashby. Drop in for Blood Pressure, Pulse Screening and Diet Teaching. No appointment necessary. For further information, please contact Nashoba Nursing Service & Hospice at 978/425-6675 or 1-800-698-3307. or visit us at www.nashoba.org.

Well adult clinic/Townsend

Nashoba Associated Boards of Health, in conjunction with the Townsend Board of Health, announces that a Well Adult Clinic will be held on Wednesday, June 2 from 1-3 p.m. at the Senior Center on Dudley Road and Wednesday, June 9 from 9–11 a.m. at Atwood Acres, also on Dudley Road, Townsend. Drop in for Blood Pressure, Pulse Screening and Diet Teaching. No appointment is necessary. For further information, please contact Nashoba Nursing Service & Hospice at 978/425-6675 or 1-800-698-3307 or visit us at www.nashoba.org.

COMING IN JULY...

Townsend to Host Circus

The Townsend Recreation Department has signed a contract with the Kelly Miller Circus for the exhibition of an all new 2010 show. The circus will roll into town to the Hawthorne Brook Middle School Field on Thursday, July 1. Everyone is invited to come out and watch the animals being unloaded and fed, and the elephants raising the big top. Activities will begin at 7:30 a.m., and the tent will be raised at 9 a.m. Guides will be furnished for groups and anyone attending.

The traditional "old style" circus will present two performances at 4:30 and 7:30 p.m. Support the Townsend Recreation Department and enjoy a great show!

Townsend Police Log

Monday, April 19

A.M. 1:18, Route 13 North, motor vehicle complaint; 2:32, Emery Road, ambulance call; 2:49, Main Street West, motor vehicle lockout; 10:55, Route 119 West, motor vehicle complaint. P.M. 12:08, center area, motor vehicle stop; 12"38, Proctor Road, motor vehicle complaint; 2:51, Wallace Hill Road, animal complaint; 5:21, Oak Street, motor vehicle stop; 5:28, Route 119 East, motor vehicle stop; 6:51, Proctor Road, break and enter; 10:50, Main Street East, suspicious activity; 11:43, Fitchburg Road, ambulance call.

Tuesday, April 20

A.M.1:01, Haynes Road, ambulance call; 1:07, Fitchburg Road, suspicious activity; 1:39, Route 13 South, motor vehicle stop; 5:04, Dudley Road, motor vehicle stop; 7:33, Canal Street, motor vehicle stop; 9:40, Bayberry Hill Road, burglar alarm; 10:53, Pierce Road, fire alarm.

P.M. 1:11, Route 119 East, assist citizen; 3:57, Main Street East, assist other agency; 6:42, Proctor Road, suspicious activity; 7:01, Whitcomb Street, fire alarm; 7:36, Route 119 East, motor vehicle stop; 9:17, Main Street West, ambulance call.

Wednesday, April 21

A.M. 12:34, Route 13 South, motor vehicle stop; 12:52, Route 13 South, motor vehicle stop; 5:37, Route 119 East, motor vehicle stop; 6:38, South Street, motor vehicle stop; 6:48, South Street, motor vehicle stop; 9:29, station, officer wanted; 10:30, Haynes Road, officer wanted; 10:31, Bow Street, mental health; 11:53, New Fitchburg Road, ambulance call.

P.M. 3:44, South Street, disabled motor vehicle; 3:46, Pearl Hill State Park, assist other agency; 5:26, Spaulding Street, motor vehicle accident no injury; 7:19, Brookline Road, suspicious activity; 8:06, West Elm Street, ambulance call.

Thursday, April 22

A.M. 12:52, Peach Lane, suspicious activity; 4:41, Route 13 North, motor vehicle stop; 4:58, Route 119/Family Dollar, motor vehicle stop; 7:23. Route 119/center, motor vehicle stop; 8:41, Dudley Road, burglar alarm; 10:10, Dudley Road, suspicious activity.

P.M. 12:13, Fitchburg Road, assist citizen; 1:14, Route 13 North, motor vehicle stop; 1:35, station, assist citizen; 2:17, Route 119 West, motor vehicle stop; 2:28, Old Turnpike Road, officer wanted; 7:44, Canal Street, suspicious activity; 8:07, Route 13 South, motor vehicle stop; 8:43, Main Street East, motor vehicle stop; 9:08, Pine Street, suspicious activity,

Friday, April 23

A.M. 12:34, Brookline Street, motor vehicle stop; 7:00, Dudley Road, motor vehicle stop; 7:11, Dudley Road, motor vehicle stop.

P.M. 12:55, Route 119 East, motor vehicle stop; 2:22, Route 119 East, motor vehicle lockout; 2:56, Elm Circle, motor vehicle complaint; 5:37, Lunenburg Road, motor vehicle stop; 5:42, West Elm Street, motor vehicle stop; 6:42, Route 13 North, motor vehicle stop; 7:44, Sumac Drive, officer wanted; 9:40, Fitchburg Road, ambulance call.

Saturday, April 24

A.M. 12:58, West Elm Street, ambulance call; 1:42, Main Street Center, motor vehicle stop; 11:49, Brookline Road, assist citizen.

P.M. 12:29, Route 13 South, motor vehicle stop; 12:52, Brookline Street, motor vehicle stop; 1:11, Brookline Street, motor vehicle stop; 1:11, Brookline Street, motor vehicle stop; 2:04, Lunenburg Road, motor vehicle stop; 3:34, Ash Street, fire alarm; 5:52, Bow Street, ambulance call; 6:10, Turnpike Road, ambulance call; 9:56, Main Street East, suspicious activity; 10:12, Pepperell police, assist other agency; 10:37, Route 119 West, motor vehicle stop; 11:36, Route 119/center, motor vehicle stop; 11:36, Harbor area, motor vehicle complaint; 11:45, Route 119 East, motor vehicle stop.

Sunday, April 25

A.M. 5:47, Main Street East, motor vehicle stop; 10:25, Brookline Road, assist citizen.

P.M. 12:04, Bow Street, suspicious activity; 12:12, Virgo Lane, ambulance call; 12:31, Bow Street, arrest; 3:10, Route 13 North, motor vehicle stop; 3:46, Brookline Road, assist citizen; 5:35, common, suspicious activity; 5:58, Proctor Road, domestic/family; 6:14, Mason Road, motor vehicle stop; 6:47. Route 119 East, motor vehicle stop; 7:58, Route 13 South, motor vehicle stop; 9:08, Route 13 South, motor vehicle stop; 9:21, Route 119 West, motor vehicle stop.

Monday, April 26

A.M. 7:02, Spaulding Street, ambulance call; 8:39, Route 119 West, motor vehicle stop; 9:59, station, officer wanted; 10:28, Highland Street, assist citizen; 10:51, Terrace Way, ambulance call; 11:05, Burgess Road, animal complaint.

P.M. 12:26, Eastman Street, animal complaint; 12:52, Brookline Road, vandalism; 3:33, West Meadow Estates, assist other agency; 4:51, Route 119 East, motor vehicle stop; 5:21, Route 13 South, motor vehicle stop; 5:26, Warren Road, motor vehicle stop; 5:43, Route 119 East, motor vehicle stop; 5:58, Route 119 East, motor vehicle stop; 6:13, Route 119 West, motor vehicle stop.

Tuesday, April 27

A.M. 1:40, Hickory Drive, suspicious activity; 6:01, Main Street East, animal complaint; 9:28, Route 119 West, assist citizen.

P.M. 12:19, Route 13 North, motor vehicle stop; 1:52, Fitchburg Road, ambulance call; 2:29, Littleton police, assist other agency; 4:08, Main Street East, bank alarm; 5:25, Main Street East, bank alarm.

Wednesday, April 28

A.M. 5:42, Ash Street, ambulance call; 7:37, Haynes Road, motor vehicle stop; 10:48, Brookline Road, suspicious activity.

P.M. 2:26, Highland Street, motor vehicle stop; 3:12, Route 119 West, motor vehicle stop; 3:51, Worcester Road, ambulance call; 3:59. Pheasant Ridge Road, missing person; 6:30, Fitchburg Road, suspicious activity; 8:11, Route 119 West, motor vehicle stop; 9:15, Route 119 West, motor vehicle

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PUBLIC COMMENT PERIOD OPEN FOR FIVE-YEAR REVIEW

US Army Corps of Engineers
New England District

FORMER FORT DEVENS SUPERFUND SITE
DEVENS, MASSACHUSETTS

The U.S. Army Corps of Engineers (USACE) is announcing the start of a Five-Year Review for the former Fort Devens Federal Superfund Site, Devens, MA. The purpose of a Five-Year Review is to evaluate whether the cleanup methods put in place at the site are working as designed and continue to remain protective of human health and the environment.

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BACKGROUND

Camp Devens was established in 1917 as a temporary training area for soldiers during World War I. In 1932, the site was named Fort Devens and made a permanent installation with the primary mission of commanding, training, and providing logistical support for non-divisional troop units. After closure in 1996, portions of the property were retained by the Army for reserve forces training, while the remaining sections were transferred to new owners for reuse and redevelopment. The facility is located in the towns of Devens, Ayer, Shirley, Lancaster, and Harvard.

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More detailed information on this site can be found on the U.S. Environmental Protection Agency (EPA) web page at: http://www.epa.gov/ne/superfund/sites/devens/

To submit comments and questions regarding the Five-Year Review process or site clean-up, please contact:
Robert J Simeone
Department of the Army
Base Realignment and Closure Division
U.S. Army Garrison Fort Devens
30 Quebec Street, Unit 100
Devens, MA 01434-4479
Office: 978-796-2205
Email: robert.j.simeone@us.army.mil

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* offer ends 7/1/2010.

INTERVIEWS

BARNUM ROAD MAINTENANCE YARDS
(AOCS 44 AND 52)

SUPERFUND FIVE-YEAR REVIEW SITE SURVEY		
Site Name: Barnum Rd Maintenance Yards (AOC 44 & 52)		**EPA ID No.:** MA7210025154
Location: Devens, MA		**Date:** August 2010
Contact Made By:		
Name: Vanessa Colloca	**Title:** Assistant Environmental Scientist	**Organization:** Hydrogeologic Inc
Telephone No.: (518) 877-0390	**Street Address:** Northway 10, Executive Park, 313 Ushers Rd	
E-Mail: vcolloca@hgl.com	**City, State, Zip:** Ballston Lake, NY 12019	
Individual Contacted:		
Name: Jim Conway	**Title:** Resident Engineer	**Organization:** CENAE-CO-WRO
Telephone No.: (978)318-8100	**Street Address:** 50 MacArthur Ave, Bldg. 689, Section D	
E-Mail: james.m.conway@usace.army.n	**City, State, Zip:** Devens, MA 01434	
Survey Questions		

The purpose of the five-year review is to evaluate the implementation and performance of the remedy, and to confirm that human health and the environmental continue to be protected by the remedial actions that have been performed at the site. The period covered by this five-year is from completion of the second five-year review in September 2005 to the current completion of this review.

1. What is your overall impression of the remedial action work conducted at the site since the period of the second five-year review (i.e., since September 2005)?

Response:
Unknown, therefore no opinion.

2. From your perspective, what effect has continued remedial operations at the site had on the surrounding community? Are you aware of any ongoing community concerns regarding the site or its operation and maintenance?

Response:
Unknown.

3. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please describe purpose and results.

Response:

My office is administering the Ayer AFRC construction contract and have performed construction inspections over the last two years. We have not performed environmental inspections, except in support of construction activities.

Survey Questions (Continued)

4. Are you aware of any events, incidents, or activities that have occurred at the site, such as dumping, vandalism, or anything that required emergency response from local authorities?
   If so, please give details.

Response:
Multiple occurrances of UXO's being uncovered have occurred. There were one or two instance over the last two years of vandalism to the site wherein local authorities were called in afterward. Theft of property appeared to be the the motive.

5. Are you aware of any problems or difficulties encountered since the first five-year review which have impacted progress or resulted in a change in operations & maintenace procedures?
   Please describe changes and impacts.

Response:
No.

6. Do you have any comments, suggestions, or recommendations regarding the site?

Response:
No.

SUPERFUND FIVE-YEAR REVIEW SITE SURVEY		
Site Name: Barnum Rd Maintenance Yards (AOC 44 & 52)		**EPA ID No.:** MA7210025154
Location: Devens, MA		**Date:** May 2010
Contact Made By:		
Name: Vanessa Colloca	**Title:** Asst Environmental Scientist	**Organization:** HydroGeoLogic, Inc.
Telephone No.: (518) 877-0390	**Street Address:** Northway 10, Executive Park, 313 Ushers Rd.	
E-Mail: vcolloca@hgl.com	**City, State, Zip:** Ballston Lake, NY 12019	
Individual Contacted:		
Name: Mary Ellen Iorio	**Title:** P.E., P.M.P.	**Organization:** USACE
Telephone No.: (978) 318-8433	**Street Address:** 696 Virgina Road	
E-Mail: MaryEllen.Iorio@usace.army.mil	**City, State, Zip:** Concord, MA 01742	
Survey Questions		

The purpose of the five-year review is to evaluate the implementation and performance of the remedy, and to confirm that human health and the environmental continue to be protected by the remedial actions that have been performed at the site. The period covered by this five-year is from completion of the second five-year review in September 2005 to the current completion of this review.

1. What is your overall impression of the remedial action work conducted at the site since the period of the second five-year review (i.e., since September 2005)?

Response: My understanding is that maintenance of this AOC has been turned over.

2. From your perspective, what effect has continued remedial operations at the site had on the surrounding community? Are you aware of any ongoing community concerns regarding the site or its operation and maintenance?

Response: None that I am aware of

3. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please describe purpose and results.

Response: None that I am aware of

Survey Questions (Continued)

4. Are you aware of any events, incidents, or activities that have occurred at the site, such as dumping, vandalism, or anything that required emergency response from local authorities?
   If so, please give details.

Response: None that I am aware of

5. Are you aware of any problems or difficulties encountered since the first five-year review which have impacted progress or resulted in a change in operations & maintenace procedures?
   Please describe changes and impacts.

Response: None that I am aware of

6. Do you have any comments, suggestions, or recommendations regarding the site?

Response: No

INTERVIEWS

SHL
(AOCS 4, 5, AND 18)

SUPERFUND FIVE-YEAR REVIEW SITE SURVEY		
Site Name: Shepley's Hill Landfill Operable Unit (AOCs 4, 5, & 18)		**EPA ID No.:** MA7210025154
Location: Devens, MA		**Date:** May 2010
Contact Made By:		
Name: Vanessa Colloca	**Title:** Asst Environmental Scientist	**Organization:** HydroGeoLogic , Inc.
Telephone No.: (518) 877-0390	**Street Address:** Northway 10, Executive Park, 313 Ushers Rd.	
E-Mail: vcolloca@hgl.com	**City, State, Zip:** Ballston Lake, NY 12019	
Individual Contacted:		
Name: Mary Ellen Iorio	**Title:** P.E., P.M.P.	**Organization:** USACE
Telephone No.: (978) 318-8433	**Street Address:** 696 Virgina Road	
E-Mail: MaryEllen.Iorio@usace.army.mil	**City, State, Zip:** Concord, MA 01742	
Survey Questions		

The purpose of the five-year review is to evaluate the implementation and performance of the remedy, and to confirm that human health and the environmental continue to be protected by the remedial actions that have been performed at the site. The period covered by this five-year is from completion of the second five-year review in September 2005 to the current completion of this review.

1. What is your overall impression of the remedial action work conducted at the site since the period of the second five-year review (i.e., since September 2005)?

Response: This site has been the subject of numerous ongoing investigations including a CSA, FFS investigation to fill data gaps to complete a FFS.

2. From your perspective, what effect has continued remedial operations at the site had on the surrounding community? Are you aware of any ongoing community concerns regarding the site or its operation and maintenance?

Response: Community is actively involved through RAB meeings. Information on SHL is always provided to the community. The community is concerned with the potential of arsenic migrating off site and the cost of on-going pump and treat to contain the arsenic.

3. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please describe purpose and results.

Response: By contract and inhouse, numerous annual reports, sampling, landfill inspections, methane evaluation, investigations and sampling activities.

Survey Questions (Continued)

4. Are you aware of any events, incidents, or activities that have occurred at the site, such as dumping, vandalism, or anything that required emergency response from local authorities?
   If so, please give details.

Response: None that I am aware of

5. Are you aware of any problems or difficulties encountered since the first five-year review which have impacted progress or resulted in a change in operations & maintenace procedures?
   Please describe changes and impacts.

Response: None that I am aware of

6. Do you have any comments, suggestions, or recommendations regarding the site?

Response: no

SUPERFUND FIVE-YEAR REVIEW SITE SURVEY		
Site Name: Shepley's Hill Landfill Operable Unit (AOCs 4, 5, & 18)		**EPA ID No.:** MA7210025154
Location: Devens, MA		**Date:** August 2010
Contact Made By:		
Name: Vanessa Colloca	**Title:** Assistant Environmental Scientist	**Organization:** Hydrogeologic Inc
Telephone No.: (518) 877-0390	**Street Address:** Northway 10, Executive Park, 313 Ushers Rd	
E-Mail: vcolloca@hgl.com	**City, State, Zip:** Ballston Lake, NY 12019	
Individual Contacted:		
Name: Fred Santos	**Title:** Project Manager	**Organization:** ECC
Telephone No.: 508-229-2270	**Street Address:** 33 Boston Post Road West	
E-Mail: fsantos@ecc.net	**City, State, Zip:** Marlborough, MA 01752	
Survey Questions		

The purpose of the five-year review is to evaluate the implementation and performance of the remedy, and to confirm that human health and the environmental continue to be protected by the remedial actions that have been performed at the site. The period covered by this five-year is from completion of the second five-year review in September 2005 to the current completion of this review.

1. What is your overall impression of the remedial action work conducted at the site since the period of the third five-year review (i.e., since September 2005)?

Response: My overall impression is positive. The Army has conducted a significant amount of remedial actions since the September 2005 five-year review and continues to do so through the fourth five-year review in September 2010.

2. From your perspective, what effect has continued remedial operations at the site had on the surrounding community? Are you aware of any ongoing community concerns regarding the site or its operation and maintenance?

Response: ECC's groundwater extraction and treatment system operator travels to the Shepley's Hill Landfill (SHL) site almost on a daily basis. The SHL treatment system abuts an Ayer, MA residential area.
Our operator travels through the neighborhood before arriving at the SHL treatment system. Throughout the years he has maintained a relationship with the owners of the homes.
They seem to understand and accept the Army's existing SHL remedial actions and the operations & maintenance associated with the treatment system and landfill.

3. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please describe purpose and results.

Response: ECC staff is on-site at SHL approximately 20 hrs/wk to perform operation and maintenance activities. The Project Manager based out of the ECC New England office in Marlborough, MA conducts a site visit on a monthly basis.

Survey Questions (Continued)

4. Are you aware of any events, incidents, or activities that have occurred at the site, such as dumping, vandalism, or anything that required emergency response from local authorities?
   If so, please give details.

Response: No incidents have occurred at the site that required an emergency response from any local authority.

5. Are you aware of any problems or difficulties encountered since the first five-year review which have impacted progress or resulted in a change in operations & maintenace procedures?
   Please describe changes and impacts.

Response: ECC continually optimizes the treatment system during the operation and maintenance of the system. At the end of each year, ECC submits an Annual Report on behalf of the Army which summarizes all of the activities that occurred at the site throughout the year.
Please refer to the annual reports for more specific optimization details. I am not aware of any problems or difficulties that have caused major changes to operations and maintenance procedures.

6. Do you have any comments, suggestions, or recommendations regarding the site?

Response: I have no additional comments, suggestions or recommendations at this point in time.

SUPERFUND FIVE-YEAR REVIEW SITE SURVEY		
Site Name: Shepley's Hill Landfill Operable Unit (AOCs 4, 5, & 18)		**EPA ID No.:** MA7210025154
Location: Devens, MA		**Date:** June 2010
Contact Made By:		
Name: John Skaarup	**Title:** Project Engineer	**Organization:** HydroGeoLogic, Inc.
Telephone No.: (518) 877-0390	**Street Address:** Northway 10, Executive Park, 313 Ushers Rd	
E-Mail: jskaarup@hgl.com	**City, State, Zip:** Ballston Lake, NY 12019	
Individual Contacted:		
Name: Ms. Michelle Carlisle	**Title:** Administrative Assistant	**Organization:** Ayer Board of Health
Telephone No.: 978-772-8213	**Street Address:** One Main Street; 3rd floor	
E-Mail: N/A	**City, State, Zip:** Ayer, MA 01432	
Survey Questions		

The purpose of the five-year review is to evaluate the implementation and performance of the remedy, and to confirm that human health and the environmental continue to be protected by the remedial actions that have been performed at the site. The period covered by this five-year is from completion of the second five-year review in September 2005 to the current completion of this review.

1. What is your overall impression of the remedial action work conducted at the site since the period of the third five-year review (i.e., since September 2005)?

Response:
The Board of Health has concerns regarding the remedy (arsenic in groundwater, surface water and possibly drinking water).

2. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please describe purpose and results.

Response:
The Board of Health is informed of site activities through RAB meetings and receives a copy of each report for this site.

3. Do you have any comments, suggestions, or recommendations regarding the site?

Response:
Board of Health concerns, comments, etc. are expressed by Richard Dougherty (PACE), USEPA and MADEP.

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SUPERFUND FIVE-YEAR REVIEW SITE SURVEY		
Site Name: Shepley's Hill Landfill Operable Unit (AOCs 4, 5, & 18)		**EPA ID No.:** MA7210025154
Location: Devens, MA		**Date:** May 2010
Contact Made By:		
Name: John Skaarup	**Title:** Project Engineer	**Organization:** HydroGeoLogic, Inc.
Telephone No.: (518) 877-0390	**Street Address:** Northway 10, Executive Park, 313 Ushers Rd	
E-Mail: jskaarup@hgl.com	**City, State, Zip:** Ballston Lake, NY 12019	
Individual Contacted:		
Name: Mr. Brian Gill	**Title:** Lieutenant	**Organization:** Ayer Police Department
Telephone No.: 978-772-8200	**Street Address:** 54 Park Street	
E-Mail: N/A	**City, State, Zip:** Ayer, MA 01432	
Survey Questions		

The purpose of the five-year review is to evaluate the implementation and performance of the remedy, and to confirm that human health and the environmental continue to be protected by the remedial actions that have been performed at the site. The period covered by this five-year is from completion of the second five-year review in September 2005 to the current completion of this review.

1. What is your overall impression of the remedial action work conducted at the site since the period of the third five-year review (i.e., since September 2005)?

Response:
Favorable. No Police Department actions were required at the site.

2. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please describe purpose and results.

Response:
No Police Department actions were required at the site.

3. Are you aware of any events, incidents, or activities that have occurred at the site, such as dumping, vandalism, or anything that required emergency response from local authorities?
   If so, please give details.

Response:
No Police Department actions were required at the site.

4. Do you have any comments, suggestions, or recommendations regarding the site?

Response:
None at this time.

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SUPERFUND FIVE-YEAR REVIEW SITE SURVEY		
Site Name: Shepley's Hill Landfill Operable Unit (AOCs 4, 5, & 18)		**EPA ID No.:** MA7210025154
Location: Devens, MA		**Date:** May 2010
Contact Made By:		
Name: John Skaarup	**Title:** Project Engineer	**Organization:** HydroGeoLogic, Inc.
Telephone No.: (518) 877-0390	**Street Address:** Northway 10, Executive Park, 313 Ushers Rd	
E-Mail: jskaarup@hgl.com	**City, State, Zip:** Ballston Lake, NY 12019	
Individual Contacted:		
Name: Mr. Adams	**Title:** Deputy Fire Chief	**Organization:** Devens Fire Department
Telephone No.: 978-772-4600	**Street Address:** 182 Jackson Road	
E-Mail: N/A	**City, State, Zip:** Devens, MA 01434	
Survey Questions		

The purpose of the five-year review is to evaluate the implementation and performance of the remedy, and to confirm that human health and the environmental continue to be protected by the remedial actions that have been performed at the site. The period covered by this five-year is from completion of the second five-year review in September 2005 to the current completion of this review.

1. What is your overall impression of the remedial action work conducted at the site since the period of the third five-year review (i.e., since September 2005)?

Response:
Favorable. No issues occurred that required a Fire Department mobilization to the site.

2. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please describe purpose and results.

Response:
Site activities have not required routine activities by the Fire Department.

3. Are you aware of any events, incidents, or activities that have occurred at the site, such as dumping, vandalism, or anything that required emergency response from local authorities?
   If so, please give details.

Response:
No issues occurred that required a Fire Department mobilization to the site.

4. Do you have any comments, suggestions, or recommendations regarding the site?

Response:
None at this time.

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INTERVIEWS

AOC 57

SUPERFUND FIVE-YEAR REVIEW SITE SURVEY		
Site Name: AOC 57		**EPA ID No.:** MA7210025154
Location: Devens, MA		**Date:** May 2010
Contact Made By:		
Name: Vanessa Colloca	**Title:** Assistant Environmental Scientist	**Organization:** Hydrogeologic Inc
Telephone No.: (518) 877-0390	**Street Address:** Northway 10, Executive Park, 313 Ushers Rd	
E-Mail: vcolloca@hgl.com	**City, State, Zip:** Ballston Lake, NY 12019	
Individual Contacted:		
Name: R. OSTROWSKI	**Title:** ENVIRONMENTAL SERVICES	**Organization:** MASS DEVELOPMENT
Telephone No.: 978 784 2936	**Street Address:** 33 ANDREWS PARKWAY	
E-Mail: ROSTROWSKI@MASSDEVELOPMENT.COM	**City, State, Zip:** DEVENS MA. 01434	
Survey Questions		

The purpose of the five-year review is to evaluate the implementation and performance of the remedy, and to confirm that human health and the environmenta continue to be protected by the remedial actions that have been performed at the site. The period covered by this five-year is from completion of the second five-year review in September 2005 to the current completion of this review.

1. What is your overall impression of the remedial action work conducted at the site since the period of the first five-year review (i.e., since September 2005)?

Response: SATISFACTORY AND PROGRESSING FORWARD

2. From your perspective, what effect has continued remedial operations at the site had on the surrounding community? Are you aware of any ongoing community concerns regarding the site or its operation and maintenance?

Response: THE COMMUNITY HAS ALWAYS been concerned with the COLD SPRING AREA AT AOC-57 AND THE PENDING OPERATING PROPERLY AND SUCCESSFUL STATUS will be well RECEIVED.

3. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please describe purpose and results.

Response:

THE ARMY HAS KEPT THE BCT AND PUBLIC INFORMED OF THE PROJECTS STATUS

Survey Questions (Continued)

4. Are you aware of any events, incidents, or activities that have occurred at the site, such as dumping, vandalism, or anything that required emergency response from local authorities?

If so, please give details.

Response:

NONE

5. Are you aware of any problems or difficulties encountered since the first five-year review which have impacted progress or resulted in a change in operations & maintenace procedures? Please describe changes and impacts.

Response:

NONE

6. Do you have any comments, suggestions, or recommendations regarding the site?

Response:

CONTINUE THE POSITIVE WORK TOWARDS ACHEIVING OPS.

SUPERFUND FIVE-YEAR REVIEW SITE SURVEY		
Site Name: AOC 57		**EPA ID No.:** MA7210025154
Location: Devens, MA		**Date:** August 2010
Contact Made By:		
Name: Vanessa Colloca	**Title:** Assistant Environmental Scientist	**Organization:** Hydrogeologic Inc
Telephone No.: (518) 877-0390	**Street Address:** Northway 10, Executive Park, 313 Ushers Rd	
E-Mail: vcolloca@hgl.com	**City, State, Zip:** Ballston Lake, NY 12019	
Individual Contacted:		
Name: Henry Malone	**Title: Manager -** Env, Health, & Safety	**Organization:** Evergreen Solar, Inc
Telephone No.: (978) 266-7344	**Street Address:** 112 Barnum Road	
E-Mail: hmalone@evergreensolar.com	**City, State, Zip:** Devens, MA 01434	
Survey Questions		

The purpose of the five-year review is to evaluate the implementation and performance of the remedy, and to confirm that human health and the environmental continue to be protected by the remedial actions that have been performed at the site. The period covered by this five-year is from completion of the second five-year review in September 2005 to the current completion of this review.

1. What is your overall impression of the remedial action work conducted at the site since the period of the second five-year review (i.e., since September 2005)?

Response:
Our facility is less than two years old, so we have no knowledge of the five-year review.

2. From your perspective, what effect has continued remedial operations at the site had on the surrounding community? Are you aware of any ongoing community concerns regarding the site or its operation and maintenance?

Response:
We aren't aware of any community concerns regarding remedial operations.

3. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please describe purpose and results.

Response:
None.

Survey Questions (Continued)

4. Are you aware of any events, incidents, or activities that have occurred at the site, such as dumping, vandalism, or anything that required emergency response from local authorities?
   If so, please give details.

Response:
In the first year of operation, there were some discharges of hazardous materials. All were properly reported and properly remediated, with no adverse effect on the environment.

5. Are you aware of any problems or difficulties encountered since the first five-year review which have impacted progress or resulted in a change in operations & maintenace procedures?
   Please describe changes and impacts.

Response:
None.

6. Do you have any comments, suggestions, or recommendations regarding the site?

Response:
No.

SUPERFUND FIVE-YEAR REVIEW SITE SURVEY		
Site Name: AOC 57		**EPA ID No.:** MA7210025154
Location: Devens, MA		**Date:** May 2010
Contact Made By:		
Name: Vanessa Colloca	**Title:** Asst Environmental Scientist	**Organization:** HydroGeoLogic, Inc.
Telephone No.: (518) 877-0390	**Street Address:** Northway 10, Executive Park, 313 Ushers Rd.	
E-Mail: vcolloca@hgl.com	**City, State, Zip:** Ballston Lake, NY 12019	
Individual Contacted:		
Name: Mary Ellen Iorio	**Title:** P.E., P.M.P.	**Organization:** USACE
Telephone No.: (978) 318-8433	**Street Address:** 696 Virgina Road	
E-Mail: MaryEllen.Iorio@usace.army.mil	**City, State, Zip:** Concord, MA 01742	
Survey Questions		

The purpose of the five-year review is to evaluate the implementation and performance of the remedy, and to confirm that human health and the environmental continue to be protected by the remedial actions that have been performed at the site. The period covered by this five-year is from completion of the second five-year review in September 2005 to the current completion of this review.

1. What is your overall impression of the remedial action work conducted at the site since the period of the second five-year review (i.e., since September 2005)?

Response: My understanding is this site is operating, properly and meeting all remedial objectives per the ROD.

2. From your perspective, what effect has continued remedial operations at the site had on the surrounding community? Are you aware of any ongoing community concerns regarding the site or its operation and maintenance?

Response: No effect, no concerns.

3. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please describe purpose and results.

Response: USACE completed the Operating, Properly and Successfully Evaluation to allow for transfer of the land.

Survey Questions (Continued)

4. Are you aware of any events, incidents, or activities that have occurred at the site, such as dumping, vandalism, or anything that required emergency response from local authorities?
   If so, please give details.

Response: No

5. Are you aware of any problems or difficulties encountered since the first five-year review which have impacted progress or resulted in a change in operations & maintenace procedures?
   Please describe changes and impacts.

Response: No

6. Do you have any comments, suggestions, or recommendations regarding the site?

Response: No

INTERVIEWS

AOC 43G AND J

SUPERFUND FIVE-YEAR REVIEW SITE SURVEY		
Site Name: AOC 43 G & J		**EPA ID No.:** MA7210025154
Location: Devens, MA		**Date:** May 2010
Contact Made By:		
Name: Vanessa Colloca	**Title:** Asst Environmental Scientist	**Organization:** HydroGeoLogic, Inc.
Telephone No.: (518) 877-0390	**Street Address:** Northway 10, Executive Park, 313 Ushers Rd.	
E-Mail: vcolloca@hgl.com	**City, State, Zip:** Ballston Lake, NY 12019	
Individual Contacted:		
Name: Mary Ellen Iorio	**Title:** P.E., P.M.P.	**Organization:** USACE
Telephone No.: (978) 318-8433	**Street Address:** 696 Virgina Road	
E-Mail: MaryEllen.Iorio@usace.army.mil	**City, State, Zip:** Concord, MA 01742	
Survey Questions		

The purpose of the five-year review is to evaluate the implementation and performance of the remedy, and to confirm that human health and the environmental continue to be protected by the remedial actions that have been performed at the site. The period covered by this five-year is from completion of the second five-year review in September 2005 to the current completion of this review.

1. What is your overall impression of the remedial action work conducted at the site since the period of the second five-year review (i.e., since September 2005)?

Response: I have not been actively involved with this AOC.

2. From your perspective, what effect has continued remedial operations at the site had on the surrounding community? Are you aware of any ongoing community concerns regarding the site or its operation and maintenance?

Response: Not aware of any community concerns.

3. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please describe purpose and results.

Response: No

Survey Questions (Continued)

4. Are you aware of any events, incidents, or activities that have occurred at the site, such as dumping, vandalism, or anything that required emergency response from local authorities?
   If so, please give details.

Response: No

5. Are you aware of any problems or difficulties encountered since the first five-year review which have impacted progress or resulted in a change in operations & maintenace procedures?
   Please describe changes and impacts.

Response: No

6. Do you have any comments, suggestions, or recommendations regarding the site?

Response: No

SUPERFUND FIVE-YEAR REVIEW SITE SURVEY		
Site Name: AOC 43 G & J		**EPA ID No.:** MA7210025154
Location: Devens, MA		**Date:** May 2010
Contact Made By:		
Name: Vanessa Colloca	**Title:** Assistant Environmental Scientist	**Organization:** Hydrogeologic Inc
Telephone No.: (518) 877-0390	**Street Address:** Northway 10, Executive Park, 313 Ushers Rd	
E-Mail: vcolloca@hgl.com	**City, State, Zip:** Ballston Lake, NY 12019	
Individual Contacted:		
Name: Ron Ostrowski	**Title:** Environmental Services	**Organization:** MassDevelopment
Telephone No.: (978) 784-2936	**Street Address:** 33 Andrews Parkway	
E-Mail: r.ostroswski@massdevelopment.com	**City, State, Zip:** Devens, MA 01434	
Survey Questions		

The purpose of the five-year review is to evaluate the implementation and performance of the remedy, and to confirm that human health and the environmental continue to be protected by the remedial actions that have been performed at the site. The period covered by this five-year is from completion of the second five-year review in September 2005 to the current completion of this review.

1. What is your overall impression of the remedial action work conducted at the site since the period of the second five-year review (i.e., since September 2005)?

Response:
Natural attenuation is not progressing in the overburden groundwater at the pace predicted in the 1999 assessment due to changing redox conditions within the overburden aquifer – specifically, oxygen and available electron acceptors are depleted within the plume. Transport modeling results indicate that monitored natural attenuation (MNA) is working, but the Record-of-Decision (ROD) cleanup goals may not be met by 2026, the 30-year target date set forth in the ROD. In the bedrock, particularly, a lack of organic carbon (typical of fractured crystalline bedrock) likely limits the growth of a microbial community.

2. From your perspective, what effect has continued remedial operations at the site had on the surrounding community? Are you aware of any ongoing community concerns regarding the site or its operation and maintenance?

Response:
The remedial operations at the site have not affected the surrounding community, as the extent of the groundwater plume is relatively stable, and is limited principally to the AOC 43J property. The plume has not expanded to any occupied structures and is not, therefore, considered a potential threat to indoor air quality.

3. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please describe purpose and results.

Response:
MassDevelopment holds regular meetings with the Base Closure Team to discuss progress on the site. The project status is also discussed at the Restoration Advisory Board public meetings.

Survey Questions (Continued)

4. Are you aware of any events, incidents, or activities that have occurred at the site, such as dumping, vandalism, or anything that required emergency response from local authorities?
   If so, please give details.

Response:

We are not aware of any such events, incidents or activities at the site.

5. Are you aware of any problems or difficulties encountered since the first five-year review which have impacted progress or resulted in a change in operations & maintenace procedures?
   Please describe changes and impacts.

Response:

Based on the uncertainty regarding the pace of contaminant degradation by MNA (see response to Question 1), MassDevelopment is evaluating sulfate injections as an alternative groundwater remedy.

6. Do you have any comments, suggestions, or recommendations regarding the site?

Response:

MassDevelopment anticipates that a decision regarding the future course of remediation at the Site will be made by February 2011.

SUPERFUND FIVE-YEAR REVIEW SITE SURVEY		
Site Name: AOC 43 G & J		**EPA ID No.:** MA7210025154
Location: Devens, MA		**Date:** August 2010
Contact Made By:		
Name: Vanessa Colloca	**Title:** Assistant Environmental Scientist	**Organization:** Hydrogeologic Inc
Telephone No.: (518) 877-0390	**Street Address:** Northway 10, Executive Park, 313 Ushers Rd	
E-Mail: vcolloca@hgl.com	**City, State, Zip:** Ballston Lake, NY 12019	
Individual Contacted:		
Name: Dan Noberini	**Title:** Associate Director, EHS	**Organization:** Bristol Myers Squibb
Telephone No.: 978-784-6453	**Street Address:** 38 Jackson Rd	
E-Mail: daniel.noberini@bms.com	**City, State, Zip:** Devens MA 01434	
Survey Questions		

The purpose of the five-year review is to evaluate the implementation and performance of the remedy, and to confirm that human health and the environmental continue to be protected by the remedial actions that have been performed at the site. The period covered by this five-year is from completion of the second five-year review in September 2005 to the current completion of this review.

1. What is your overall impression of the remedial action work conducted at the site since the period of the second five-year review (i.e., since September 2005)?

Response:
Appears to be effective.

2. From your perspective, what effect has continued remedial operations at the site had on the surrounding community? Are you aware of any ongoing community concerns regarding the site or its operation and maintenance?

Response:
No effect. Bristol-Myers Squibb is not aware of any community concerns.

3. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please describe purpose and results.

Response:
Site visits conducted when sampling takes place on BMS property.

Survey Questions (Continued)

4. Are you aware of any events, incidents, or activities that have occurred at the site, such as dumping, vandalism, or anything that required emergency response from local authorities?
   If so, please give details.

Response:
No.

5. Are you aware of any problems or difficulties encountered since the first five-year review which have impacted progress or resulted in a change in operations & maintenance procedures?
   Please describe changes and impacts.

Response:
No.

6. Do you have any comments, suggestions, or recommendations regarding the site?

Response:
None at this time.

INTERVIEWS

SOUTH POST IMPACT AREA (SPIA)
(AOCS 25, 26, 27 AND 41)

SUPERFUND FIVE-YEAR REVIEW SITE SURVEY		
Site Name: South Post Impact Area (SPIA) (AOCs 25, 26, 27, and 41)		**EPA ID No.:** MA7210025154
Location: Devens, MA		**Date:** May 2010
Contact Made By:		
Name: Vanessa Colloca	**Title:** Asst Environmental Scientist	**Organization:** HydroGeoLogic, Inc.
Telephone No.: (518) 877-0390	**Street Address:** Northway 10, Executive Park, 313 Ushers Rd.	
E-Mail: vcolloca@hgl.com	**City, State, Zip:** Ballston Lake, NY 12019	
Individual Contacted:		
Name: Mary Ellen Iorio	**Title:** P.E., P.M.P.	**Organization:** USACE
Telephone No.: (978) 318-8433	**Street Address:** 696 Virgina Road	
E-Mail: MaryEllen.Iorio@usace.army.mil	**City, State, Zip:** Concord, MA 01742	
Survey Questions		

The purpose of the five-year review is to evaluate the implementation and performance of the remedy, and to confirm that human health and the environmental continue to be protected by the remedial actions that have been performed at the site. The period covered by this five-year is from completion of the second five-year review in September 2005 to the current completion of this review.

1. What is your overall impression of the remedial action work conducted at the site since the period of the second five-year review (i.e., since September 2005)?

Response: LTM activites are ongoing.

2. From your perspective, what effect has continued remedial operations at the site had on the surrounding community? Are you aware of any ongoing community concerns regarding the site or its operation and maintenance?

Response: None that I am aware of

3. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please describe purpose and results.

Response : Annual reports, data reports by contract.

Survey Questions (Continued)

4. Are you aware of any events, incidents, or activities that have occurred at the site, such as dumping, vandalism, or anything that required emergency response from local authorities?
   If so, please give details.

Response: None that I am aware of

5. Are you aware of any problems or difficulties encountered since the first five-year review which have impacted progress or resulted in a change in operations & maintenace procedures?
   Please describe changes and impacts.

Response: None that I am aware of

6. Do you have any comments, suggestions, or recommendations regarding the site?

Response: No

SUPERFUND FIVE-YEAR REVIEW SITE SURVEY		
Site Name: South Post Impact Area (SPIA) (AOCs 25, 26, 27, and 41)		**EPA ID No.:** MA7210025154
Location: Devens, MA		**Date:** August 2010
Contact Made By:		
Name: Vanessa Colloca	**Title:Assistant Environmental Scientist**	**Organization: Hydrogeologic**
Telephone No.: (518) 877-0390	**Street Address: Northway 10, Executive Park, 313 Ushers Rd**	
E-Mail: vcolloca@hgl.com	**City, State, Zip: Ballston Lake, NY 12019**	
Individual Contacted:		
Name: Thomas F. O'Donnell	**Title:** Range Safety Officer	**Organization:** Range Control
Telephone No.: 978-796-2723	**Street Address:** 57 Queenstown St	
E-Mail:thomas.f.odonnell@us.army.mil	**City, State, Zip:** Devens, MA 01434	
Survey Questions		

The purpose of the five-year review is to evaluate the implementation and performance of the remedy, and to confirm that human health and the environmental continue to be protected by the remedial actions that have been performed at the site. The period covered by this five-year is from completion of the second five-year review in September 2005 to the current completion of this review.

1. What is your overall impression of the remedial action work conducted at the site since the period of the second five-year review (i.e., since September 2005)?

Response: The continued monitoring of the ground water test wells has been performed in a timely manner. No other remedial type work has been performed.

2. From your perspective, what effect has continued remedial operations at the site had on the surrounding community? Are you aware of any ongoing community concerns regarding the site or its operation and maintenance?

Response: No effects have been reported in the surrounding community. No concerns have been reported from the outside community regarding the site.

3. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please describe purpose and results.

Response: No.

Survey Questions (Continued)

4. Are you aware of any events, incidents, or activities that have occurred at the site, such as dumping, vandalism, or anything that required emergency response from local authorities?
   If so, please give details.

Response: No.

5. Are you aware of any problems or difficulties encountered since the first five-year review which have impacted progress or resulted in a change in operations & maintenace procedures?
   Please describe changes and impacts.

Response: No.

6. Do you have any comments, suggestions, or recommendations regarding the site?

Response: Continued monitoring of the ground water should provide conclusive evidence of any future problems and serve to reassure the surrounding communities that no changes have occurred.

INTERVIEWS

AOC 32 AND 43A

SUPERFUND FIVE-YEAR REVIEW SITE SURVEY		
Site Name: AOC 32 & 43A		**EPA ID No.:** MA7210025154
Location: Devens, MA		**Date:** August 2010
Contact Made By:		
Name: Vanessa Colloca	**Title:** Assistant Environmental Scientist	**Organization:** Hydrogeologic Inc
Telephone No.: (518) 877-0390	**Street Address:** Northway 10, Executive Park, 313 Ushers Rd	
E-Mail: vcolloca@hgl.com	**City, State, Zip:** Ballston Lake, NY 12019	
Individual Contacted:		
Name: Brian Poitras	**Title:** Director of Portfolio Management	**Organization:** Calare Properties, Inc
Telephone No.: (978) 568-0100	**Street Address:** 43 Broad Street	
E-Mail: brian@calare.com	**City, State, Zip:** Hudson, MA 01749	
Survey Questions		

The purpose of the five-year review is to evaluate the implementation and performance of the remedy, and to confirm that human health and the environmental continue to be protected by the remedial actions that have been performed at the site. The period covered by this five-year is from completion of the second five-year review in September 2005 to the current completion of this review.

1. What is your overall impression of the remedial action work conducted at the site since the period of the second five-year review (i.e., since September 2005)?

Response:

It appears to be progressing normally.

2. From your perspective, what effect has continued remedial operations at the site had on the surrounding community? Are you aware of any ongoing community concerns regarding the site or its operation and maintenance?

Response:

Not aware of any impact.

3. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please describe purpose and results.

Response:

No.

Survey Questions (Continued)

4. Are you aware of any events, incidents, or activities that have occurred at the site, such as dumping, vandalism, or anything that required emergency response from local authorities?
   If so, please give details.

Response:

No.

5. Are you aware of any problems or difficulties encountered since the first five-year review which have impacted progress or resulted in a change in operations & maintenace procedures?
   Please describe changes and impacts.

Response:

No.

6. Do you have any comments, suggestions, or recommendations regarding the site?

Response:

No.

SUPERFUND FIVE-YEAR REVIEW SITE SURVEY		
Site Name: AOC 32 and 43A		**EPA ID No.:** MA7210025154
Location: Devens, MA		**Date:** May 2010
Contact Made By:		
Name: Vanessa Colloca	**Title:** Assistant Environmental Scientist	**Organization:** HydroGeoLogic, Inc.
Telephone No.: (518) 877-0390	**Street Address:** Northway 10, Executive Park, 313 Ushers Rd	
E-Mail: vcolloca@hgl.com	**City, State, Zip:** Ballston Lake, NY 12019	
Individual Contacted:		
Name: Mary Ellen Iorio	**Title:** P.E., P.M.P.	**Organization:** USACE
Telephone No.: (978) 318-8433	**Street Address:** 696 Virgina Road	
E-Mail: MaryEllen.Iorio@usace.army.mil	**City, State, Zip:** Concord, MA 01742	
Survey Questions		

The purpose of the five-year review is to evaluate the implementation and performance of the remedy, and to confirm that human health and the environmental continue to be protected by the remedial actions that have been performed at the site. The period covered by this five-year is from completion of the second five-year review in September 2005 to the current completion of this review.

1. What is your overall impression of the remedial action work conducted at the site since the period of the second five-year review (i.e., since September 2005)?

Response: ISCO injections and indoor air evaluations have been positive actions to address site contamination and risk.

2. From your perspective, what effect has continued remedial operations at the site had on the surrounding community? Are you aware of any ongoing community concerns regarding the site or its operation and maintenance?

Response: Not aware of any community concerns.

3. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please describe purpose and results.

Response: Vapor intrusion tech memo has been completed to convey the results of the indoor air sampling.

Survey Questions (Continued)

4. Are you aware of any events, incidents, or activities that have occurred at the site, such as dumping, vandalism, or anything that required emergency response from local authorities?
   If so, please give details.

Response: No

5. Are you aware of any problems or difficulties encountered since the first five-year review which have impacted progress or resulted in a change in operations & maintenace procedures?
   Please describe changes and impacts.

Response: No

6. Do you have any comments, suggestions, or recommendations regarding the site?

Response: No

SUPERFUND FIVE-YEAR REVIEW SITE SURVEY		
Site Name: AOC 32 & 43A		**EPA ID No.:** MA7210025154
Location: Devens, MA		**Date:** May 2010
Contact Made By:		
Name: Vanessa Colloca	**Title:** Assistant Environmental Scientist	**Organization:** Hydrogeologic Inc
Telephone No.: (518) 877-0390	**Street Address:** Northway 10, Executive Park, 313 Ushers Rd	
E-Mail: vcolloca@hgl.com	**City, State, Zip:** Ballston Lake, NY 12019	
Individual Contacted:		
Name: R. OSTROWSKI	**Title:** ENVIRONMENTAL SERVICES	**Organization:** MASSDEVELOPMENT
Telephone No.: 978 784 2936	**Street Address:** 33 ANDREWS PARKWAY	
E-Mail: R.OSTROWSKI@MASSDEVELOPMENT.COM	**City, State, Zip:** DEVENS MA. 01434	
Survey Questions		

The purpose of the five-year review is to evaluate the implementation and performance of the remedy, and to confirm that human health and the environmenta continue to be protected by the remedial actions that have been performed at the site. The period covered by this five-year is from completion of the second five-year review in September 2005 to the current completion of this review.

1. What is your overall impression of the remedial action work conducted at the site since the period of the first five-year review (i.e., since September 2005)?

Response: SATISFACTORY PROGRESS AND THE PROBABLE ACHIEVEMENT OF UNRESTRICTED USE OF THE BUILDING BASED ON A MOST CONSERVATIVE MODEL OF THE VAPOR INTRUSION STUDY

2. From your perspective, what effect has continued remedial operations at the site had on the surrounding community? Are you aware of any ongoing community concerns regarding the site or its operation and maintenance?

Response: THERE WAS ALWAYS THE EXPECTATION THAT VAPOR INTRUSION HAD TO BE ADDRESSED BUT THAT IT WOULD NOT LEAD TO AN INSTITUTIONAL CONTROL

3. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please describe purpose and results.

Response: THE ARMY HAS PROVIDED ROUTINE UPDATES ON ACTIVITIES AT THE SITE. MY OFFICE HAS NOT BEEN AT THE SITE.

Survey Questions (Continued)

4. Are you aware of any events, incidents, or activities that have occurred at the site, such as dumping, vandalism, or anything that required emergency response from local authorities?

If so, please give details.

Response: NONE

5. Are you aware of any problems or difficulties encountered since the first five-year review which have impacted progress or resulted in a change in operations & maintenace procedures? Please describe changes and impacts.

Response:

NONE

6. Do you have any comments, suggestions, or recommendations regarding the site?

Response: CONTINUE THE POSITIVE PROGRESS.

INTERVIEWS

AOC 69W

SUPERFUND FIVE-YEAR REVIEW SITE SURVEY		
Site Name: AOC 69W		**EPA ID No.:** MA7210025154
Location: Devens, MA		**Date:** May 2010
Contact Made By:		
Name: Vanessa Colloca	**Title:** Assistant Environmental Scientist	**Organization:** HydroGeoLogic, Inc.
Telephone No.: (518) 877-0390	**Street Address:** Northway 10, Executive Park, 313 Ushers Rd	
E-Mail: vcolloca@hgl.com	**City, State, Zip:** Ballston Lake, NY 12019	
Individual Contacted:		
Name: Mary Ellen Iorio	**Title:** P.E., P.M.P.	**Organization:** USACE
Telephone No.: (978) 318-8433	**Street Address:** 696 Virgina Road	
E-Mail: MaryEllen.Iorio@usace.army.mil	**City, State, Zip:** Concord, MA 01742	
Survey Questions		

The purpose of the five-year review is to evaluate the implementation and performance of the remedy, and to confirm that human health and the environmental continue to be protected by the remedial actions that have been performed at the site. The period covered by this five-year is from completion of the second five-year review in September 2005 to the current completion of this review.

1. What is your overall impression of the remedial action work conducted at the site since the period of the second five-year review (i.e., since September 2005)?

Response: LTM is ongoing. Remedy is working.

2. From your perspective, what effect has continued remedial operations at the site had on the surrounding community? Are you aware of any ongoing community concerns regarding the site or its operation and maintenance?

Response: I know of no concerns.

3. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please describe purpose and results.

Response: I am not aware of any.

Survey Questions (Continued)

4. Are you aware of any events, incidents, or activities that have occurred at the site, such as dumping, vandalism, or anything that required emergency response from local authorities?
   If so, please give details.

Response: I am not aware of any.

5. Are you aware of any problems or difficulties encountered since the first five-year review which have impacted progress or resulted in a change in operations & maintenace procedures?
   Please describe changes and impacts.

Response: I am not aware of any.

6. Do you have any comments, suggestions, or recommendations regarding the site?

Response: No.

SUPERFUND FIVE-YEAR REVIEW SITE SURVEY		
Site Name: AOC 69W *(per telephone conversation)*		**EPA ID No.:** MA7210025154
Location: Devens, MA		**Date:** May 2010
Contact Made By:		
Name: Vanessa Colloca	**Title:** Asst Environmental Scientist	**Organization:** HydroGeoLogic, Inc.
Telephone No.: (518) 877-0390	**Street Address:** Northway 10, Executive Park, 313 Ushers Rd	
E-Mail: vcolloca@hgl.com	**City, State, Zip:** Ballston Lake, NY 12019	
Individual Contacted:		
Name: Ms. Michelle McKenna	**Title:** Business Manager	**Organization:** Charter School
Telephone No.:(978) 772-3293	**Street Address:** 49 Antietam Street	
E-Mail: mmckenna@parker.org	**City, State, Zip:** Devens, MA 01434	
Survey Questions		

The purpose of the five-year review is to evaluate the implementation and performance of the remedy, and to confirm that human health and the environmental continue to be protected by the remedial actions that have been performed at the site. The period covered by this five-year is from completion of the second five-year review in September 2005 to the current completion of this review.

1. What is your overall impression of the remedial action work conducted at the site since the period of the second five-year review (i.e., since September 2005)?

Response: Ms. McKenna feels the remedial actions are working and has no further comment.

2. From your perspective, what effect has continued remedial operations at the site had on the surrounding community? Are you aware of any ongoing community concerns regarding the site or its operation and maintenance?

Response: In 2006/2007 parents were concerned with air quality issues. Air quality testing was completed and no harmful vapors were detected.

3. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please describe purpose and results.

Response: No routine communications or activities by the school, however Ms. McKenna feels well informed concerning site visits, inspections, and reporting activities. She stated she is provided with updated copies of yearly reports and on any correspondance that concerns the school.

Survey Questions (Continued)

4. Are you aware of any events, incidents, or activities that have occurred at the site, such as dumping, vandalism, or anything that required emergency response from local authorities?
   If so, please give details.

Response: No, besides random graffiti.

5. Are you aware of any problems or difficulties encountered since the first five-year review which have impacted progress or resulted in a change in operations & maintenace procedures?
   Please describe changes and impacts.

Response: No.

6. Do you have any comments, suggestions, or recommendations regarding the site?

Response: No.

INTERVIEWS

DEVENS CONSOLIDATION LANDFILL (DCL)
(AOCS 9, 40, AND SA 13)

SUPERFUND FIVE-YEAR REVIEW SITE SURVEY		
Site Name: Devens Consolidation Landfill (DCL) (AOCs 9, 40, SA 13, 41)		**EPA ID No.:** MA7210025154
Location: Devens, MA		**Date:** May 2010
Contact Made By:		
Name: Vanessa Colloca	**Title:** Assistant Environmental Scientist	**Organization:** HydroGeologic, Inc.
Telephone No.: (518) 877-0390	**Street Address:** Northway 10, Executive Park, 313 Ushers Rd	
E-Mail: vcolloca@hgl.com	**City, State, Zip:** Ballston Lake, NY 12019	
Individual Contacted:		
Name: R Ostrowski	**Title:** Environmental Services	**Organization:** MassDevelopment
Telephone No.: 978-784-2936	**Street Address:** 33 Andrews Parkway	
E-Mail: Rostrowski@MassDevelopment.com	**City, State, Zip:** Devens, MA 01434	
Survey Questions		

The purpose of the five-year review is to evaluate the implementation and performance of the remedy, and to confirm that human health and the environmenta continue to be protected by the remedial actions that have been performed at the site. The period covered by this five-year is from completion of the second five-year review in September 2005 to the current completion of this review.

1. What is your overall impression of the remedial action work conducted at the site since the period of the first five-year review (i.e., since September 2005)?

Response: SATISFACTORY

2. From your perspective, what effect has continued remedial operations at the site had on the surrounding community? Are you aware of any ongoing community concerns regarding the site or its operation and maintenance?

Response: THE SITE & GW MAINTENANCE SAMPLING HAVE BEEN NON PROBLEMATIC.

3. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please describe purpose and results.

Response: THE ARMY PROVIDES UPDATES ON THE SITE STATUS PERIODICALLY.

Survey Questions (Continued)

4. Are you aware of any events, incidents, or activities that have occurred at the site, such as dumping, vandalism, or anything that required emergency response from local authorities?

If so, please give details.

Response:

NONE

5. Are you aware of any problems or difficulties encountered since the first five-year review which have impacted progress or resulted in a change in operations & maintenace procedures? Please describe changes and impacts.

Response:

NONE

6. Do you have any comments, suggestions, or recommendations regarding the site?

Response:

NONE

SUPERFUND FIVE-YEAR REVIEW SITE SURVEY		
Site Name: Devens Consolidation Landfill (DCL) (AOCs 9, 40, SA 13, 41)		**EPA ID No.:** MA7210025154
Location: Devens, MA		**Date:** May 2010
Contact Made By:		
Name: Vanessa Colloca	**Title:** Asst Environmental Scientist	**Organization:** HydroGeoLogic, Inc.
Telephone No.: (518) 877-0390	**Street Address:** Northway 10, Executive Park, 313 Ushers Rd	
E-Mail: vcolloca@hgl.com	**City, State, Zip:** Ballston Lake, NY 12019	
Individual Contacted:		
Name: Mary Ellen Iorio	**Title:** P.E., P.M.P.	**Organization:** USACE
Telephone No.: (978) 318-8433	**Street Address:** 696 Virgina Rd	
E-Mail: MaryEllen.Iorio@usace.army.mil	**City, State:** Concord, MA 01742	
Survey Questions		

The purpose of the five-year review is to evaluate the implementation and performance of the remedy, and to confirm that human health and the environmental continue to be protected by the remedial actions that have been performed at the site. The period covered by this five-year is from completion of the second five-year review in September 2005 to the current completion of this review.

1. What is your overall impression of the remedial action work conducted at the site since the period of the second five-year review (i.e., since September 2005)?

Response: LTMM actvites are ongoing.

2. From your perspective, what effect has continued remedial operations at the site had on the surrounding community? Are you aware of any ongoing community concerns regarding the site or its operation and maintenance?

Response: None that I am aware of.

3. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please describe purpose and results.

Response : Yearly landfill inspections, mowing, vegetation clearing, sampling by HGL.

Survey Questions (Continued)

4. Are you aware of any events, incidents, or activities that have occurred at the site, such as dumping, vandalism, or anything that required emergency response from local authorities?
   If so, please give details.

Response: No.

5. Are you aware of any problems or difficulties encountered since the first five-year review which have impacted progress or resulted in a change in operations & maintenace procedures?
   Please describe changes and impacts.

Response: No.

6. Do you have any comments, suggestions, or recommendations regarding the site?

Response: No.

INTERVIEWS

AOC 50

SUPERFUND FIVE-YEAR REVIEW QUESTIONNAIRE		
Site Name: AOC 50		**EPA ID No.:** MA7210025154
Location: Devens, MA		**Date:** May 2010
Contact Made By:		
Name: Vanessa Colloca	**Title:** Assistant Environmental Scientist	**Organization:** Hydrogeologic Inc
Telephone No.: (518) 877-0390	**Street Address:** Northway 10, Executive Park, 313 Ushers Rd	
E-Mail: vcolloca@hgl.com	**City, State, Zip:** Ballston Lake, NY 12019	
Individual Contacted:		
Name: R. OSTROWSKI	**Title:** ENVIRONMENTAL SERVICES	**Organization:** MASS DEVELOPMENT
Telephone No.: 978 784 2936	**Street Address:** 33 ANDREWS PARKWAY	
E-Mail: ROSTROWSKI@MASSDEVELOPMENT.COM	**City, State, Zip:** DEVEND MA. 01434	
Survey Questions		

The purpose of the five-year review is to evaluate the implementation and performance of the remedy, and to confirm that human health and the environmenta continue to be protected by the remedial actions that have been performed at the site. The period covered by this five-year is from completion of the second five-year review in September 2005 to the current completion of this review.

1. What is your overall impression of the remedial action work conducted at the site since the period of the first five-year review (i.e., since September 2005)?

Response: SATISFACTORY AND THE CHANGE OF CONTRACTORS CONDUCTING THE REMEDIATION AT THE SITE WAS A ~~SEALES~~ SEAMLESS TRANSITION. REMEDIATION HAS BEEN ENCOURAGING SINCE, CONCENTRATION LEVELS HAVE BEEN DECREASING.

2. From your perspective, what effect has continued remedial operations at the site had on the surrounding community? Are you aware of any ongoing community concerns regarding the site or its operation and maintenance?

Response: THE REMEDIATION RESULTS HAVE HAD A POSITIVE EFFECT ON THE COMMUNITY SINCE THE CONTAMINATION IS IN A POTENTIALLY PRODUCTIVE AQUIFER.

3. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please describe purpose and results.

Response: THIS SITE IS THE SUBJECT OF MANY RAB AGENDAS AND THE PUBLIC HAS been VERY WELL INFORMED OF THE PROJECTS STATUS.

Survey Questions (Continued)

4. Are you aware of any events, incidents, or activities that have occurred at the site, such as dumping, vandalism, or anything that required emergency response from local authorities?
   If so, please give details.

Response: NONE

5. Are you aware of any problems or difficulties encountered since the first five-year review which have impacted progress or resulted in a change in operations & maintenace procedures?
   Please describe changes and impacts.

Response: NONE

6. Do you have any comments, suggestions, or recommendations regarding the site?

Response: CONTINUE THE POSITIVE REMEDIATION PROGRAM SO ECONOMIC DEVELOPMENT OF THE AREA WILL BE LESS INFLUENCED BY THE LAND USE CONTROLS IMPOSED ON THE SITE.

SUPERFUND FIVE-YEAR REVIEW QUESTIONNAIRE		
Site Name: AOC 50		**EPA ID No.:** MA7210025154
Location: Devens, MA		**Date:** May 2010
Contact Made By:		
Name: Vanessa Colloca	**Title:** Asst Environmental Scientist	**Organization:** Hydrogeologic
Telephone No.: (518) 877-0390	**Street Address:** Northway 10, Executive Park, 313 Ushers Rd	
E-Mail: vcolloca@hgl.com	**City, State, Zip:** Ballston Lake, NY 12019	
Individual Contacted:		
Name: Mary Ellen Iorio	**Title:** P.E., P.M.P.	**Organization:** U.S.A.C.E.
Telephone No.: 978-318-8433	**Street Address:** 696 Virgina Road	
E-Mail: MaryEllen.Iorio@usace.army.mil	**City, State, Zip:** Concord, MA 01742	
Survey Questions		

The purpose of the five-year review is to evaluate the implementation and performance of the remedy, and to confirm that human health and the environmenta continue to be protected by the remedial actions that have been performed at the site. The period covered by this five-year is from completion of the second five-year review in September 2005 to the current completion of this review.

1. What is your overall impression of the remedial action work conducted at the site since the period of the first five-year review (i.e., since September 2005)?

Response: AOC 50 work is no a USACE contract. I have had minimal involvement until Jan 2010

2. From your perspective, what effect has continued remedial operations at the site had on the surrounding community? Are you aware of any ongoing community concerns regarding the site or its operation and maintenance?

Response: This site is often discussed at RAB meetings. I am not aware of community concerns or impact.

3. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please describe purpose and results.

Response: no

Survey Questions (Continued)

4. Are you aware of any events, incidents, or activities that have occurred at the site, such as dumping, vandalism, or anything that required emergency response from local authorities?
   If so, please give details.

Response: none that I am aware of.

5. Are you aware of any problems or difficulties encountered since the first five-year review which have impacted progress or resulted in a change in operations & maintenace procedures?
   Please describe changes and impacts.

Response: none that I am aware of.

6. Do you have any comments, suggestions, or recommendations regarding the site?

Response: no

SUPERFUND FIVE-YEAR REVIEW QUESTIONNAIRE		
Site Name: AOC 50		**EPA ID No.:** MA7210025154
Location: Devens, MA		**Date:** May 2010
Contact Made By:		
Name: Vanessa Colloca	**Title:** Assistant Environmental Scientist	**Organization:** Hydrogeologic Inc
Telephone No.: (518) 877-0390	**Street Address:** Northway 10, Executive Park, 313 Ushers Rd	
E-Mail: vcolloca@hgl.com	**City, State, Zip:** Ballston Lake, NY 12019	
Individual Contacted:		
Name: Libby Herland	**Title: Refuge Manager**	**Organization: U.S.F.W.S.**
Telephone No.: 978-443-4661	**Street Address: 73 Weir Hill Road**	
E-Mail: libby_herland@fws.gov	**City, State, Zip: Sudbury, MA 01776**	
Survey Questions		

The purpose of the five-year review is to evaluate the implementation and performance of the remedy, and to confirm that human health and the environmental continue to be protected by the remedial actions that have been performed at the site. The period covered by this five-year is from completion of the second five-year review in September 2005 to the current completion of this review.

1. What is your overall impression of the remedial action work conducted at the site since the period of the first five-year review (i.e., since September 2005)?

Response:
Appropriate .

2. From your perspective, what effect has continued remedial operations at the site had on the surrounding community? Are you aware of any ongoing community concerns regarding the site or its operation and maintenance?

Response:
I am not aware of any problems with the remediation or any adverse impact on the community.

3. Have there been routine communications or activities (site visits, inspections, reporting activities, etc.) conducted by your office regarding the site? If so, please describe purpose and results.

Response:

I review correspondence I receive about this site. I have been to the treatment area once.
This action has no impact on refuge operations.

Survey Questions (Continued)

4. Are you aware of any events, incidents, or activities that have occurred at the site, such as dumping, vandalism, or anything that required emergency response from local authorities?
   If so, please give details.

Response:
No problems on refuge lands at this site.

5. Are you aware of any problems or difficulties encountered since the first five-year review which have impacted progress or resulted in a change in operations & maintenace procedures?
   Please describe changes and impacts.

Response:
No problems.

6. Do you have any comments, suggestions, or recommendations regarding the site?

Response:

It would be good to know when the cleanup is likely to be completed and the AUL can be lifted.

APPENDIX K

REGULATORY AND COMMUNITY COMMENTS

APPENDIX L

REAL PROPERTY MASTER PLAN LONG RANGE COMPONENT FOR DEVENS RESERVE FORCES TRAINING AREA (JUNE 1999) AND ADDENDUM (SEPTEMBER 2007)

REAL PROPERTY MASTER PLAN

REAL PROPERTY MASTER PLAN

LONG RANGE COMPONENT

for

DEVENS RESERVE FORCES TRAINING AREA

JUNE 1999

Prepared for:

Commander
Devens Reserve Forces Training Area
Devens, Massachusetts

Prepared Under the Guidance of:
U.S. Army Installation Support Center
Director of Facilities Management
Planning and Real Property Division
Alexandria, Virginia

Prepared by:

R&K Engineering
Roanoke and Alexandria, Virginia
and San Antonio, Texas

LAND-USE CONTROLS

APPLICABLE TO

DEVENS

RESERVE FORCES TRAINING AREA

REAL PROPERTY MASTER PLAN

Area A (Main Cantonment)AAFES Gas Station Queenstown Street

- Residual soil and groundwater contamination has been documented for AOC 43G which is undergoing MNA
- Conduct EBS Prior to transfer and incorporate suitable deed restrictions in FOST EPP

Area B (3400 Area)

No applicable land use controls; NFADD's issued for AREE's & SA's

Area C (Range & Training Area)

The ROD is based on Army retention of the South Post and restricted access to the site and groundwater.

- Sample and analyze Well D-1 for explosives and MA and EPA Drinking Water (MMCL/MCL)
- Assure no new drinking water sources are developed within the SPIA monitored area

Area D (Motor Pool Annex)

- Residual soil and groundwater contamination has been documented for AOC 43J which is undergoing MNA
- Conduct EBS Prior to transfer and incorporate suitable deed restrictions in FOST EPP

Area E (Old Commissary 94TH HQ)

No applicable land use controls; NFADD's issued for AREE's

Area F (3700 Area Former Motor Pool)

- Assure the Property is not used for residential purposes and suitable deed restrictions are placed in the FOST EPP prior to transfer.
- Maintain the existing paved areas and stormwater collection systems to prevent long-term worker exposure to residual oil contaminated soils 2-5 feet BGS associated with AOC 44/52.
- Assure that Soil Management Plans and Health and Safety Plans are prepared and executed prior to subsurface excavations.

Area G (3800 Area former Moore AAF Hangers RTC)

Active remediation and monitoring of the AOC 50 chlorinated solvent plume, which is under building 3813 is ongoing. Treatment transects and associated monitoring wells are located in the RTC vehicle storage area and on the Southwest Corner of Building 3813 former hanger, along the axis of the plume through retained Parcel H.

- Provide periodic access to treatment transects and monitoring wells
- Coordinate construction plans with BRAC Environmental Coordinator /BCT to facilitate ongoing remediation and future access to plume areas
- Avoid groundwater extraction or injection for any purpose
- Coordinate construction plans for modifications to stormwater systems with BRAC Environmental Coordinator /BCT including engineered stormwater management plans and hydrologic/ mounding studies. (Continue use of existing stormwater system to direct stormwater away from the plume)

E. ENVIRONMENTAL CONCERNS

Issues

Environmental issues in any region have both positive and negative implications for development. Devens RFTA is unique in that it is designated a National Priority List site under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (Super fund) and a BRAC (base closure) site. These federal actions were combined to identify, investigate, and remediate sites on the former Fort Devens that may pose a threat to human health and the environment. The Devens RFTA has twelve CERCLA sites on retained property that still require action. One site is located in the Area A, one site is located in Area B, and three sites are located in Area C. One site is located in the Area D and six sites are located in the South Post. Any proposed actions in these areas should be coordinated with the environmental office of the DPW or the BRAC environmental office.

National Register Eligibility

The Cemetery and its associated Caretaker's Building (P-3611) is the only historic property within the Devens RFTA that has been evaluated as eligible for listing in the National Register of Historic Places by the Massachusetts State Historical Preservation Office and the U.S. Army. Established in 1939, the Cemetery and Caretaker's Building are significant for their association with the former Fort Devens during its inter-war period of development (1919-1940), which saw the mission of the base change from temporary status to a permanent cantonment. The Cemetery is also significant for its architectural design, which features the extensive use of fieldstone.

Archaeological Sites

Several areas of the Devens RFTA have been evaluated and determined to be archaeologically sensitive. These areas have a potential to contain prehistoric and/or historic period resources that may yield information important to the prehistoric and historic settlement of north central Massachusetts. South Post contains approximately 2,153 acres assessed to be archaeologically sensitive. The southwestern, northwestern, and eastern perimeter sections of the 3400 area are also assessed to be archaeologically sensitive. These areas are subject to further archaeological field investigations to determine potential significance and mitigation alternatives, if the land is to be transferred or developed by the Army. If areas are determined to be of "low archaeological sensitivity," no further investigation is needed. Devens RFTA soils are generally acidic and infertile. They are subject to moderate erosion where denuded or sparsely vegetated.

LEASE IN FURTHERANCE OF CONVEYANCE

OF REAL PROPERTY AND FACILITIES ON

THE FORT DEVENS, MASSACHUSETTS,

MILITARY RESERVATION

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EXHIBITS

Exhibit Number	Title	
A	Lease Premises	
B	Memorandum of Agreement	- Delivered at Closing
C	Survey of Condition	- Delivered at Closing

NO_____

DEPARTMENT OF THE ARMY
LEASE IN FURTHERANCE OF CONVEYANCE
UNDER
BASE REALIGNMENT AND CLOSURE (BRAC)
THE FORT DEVENS, MASSACHUSETTS,
MILITARY RESERVATION

WHEREAS, the United States, acting through the SECRETARY OF THE ARMY, hereinafter referred to as the "Army" or "Lessor", has made a final disposal or reuse decision with regard to property located at the Fort Devens, Massachusetts, Military Reservation (Fort Devens), dated May 9, 1996; and

WHEREAS, pursuant to the Defense Base Closure and Realignment Act of 1990 (PL 101-510), as amended, (Base Closure Law) Fort Devens must close not later than July 10, 1997; and

WHEREAS, pursuant to Chapter 498 of the Massachusetts Acts of 1993, as amended, the Government Land Bank (Land Bank), hereinafter referred to as the "Land Bank" or "Lessee", was granted the authority to oversee and implement the civilian reuse of Fort Devens in accordance with a locally-approved reuse plan; and

WHEREAS, on December 7, 1994, the Reuse Plan and associated Bylaws for Fort Devens (Reuse Plan) were approved by the towns of Ayer, Harvard and Shirley; and

WHEREAS, the Land Bank, a Local Reuse Authority, has made an application for an Economic Development Conveyance (EDC) to the

Department of the Army for the purchase of portions of the property that formerly comprised Fort Devens; and

WHEREAS, the Army, as authorized by the Base Closure Law, has determined that the Land Bank's application meets the criteria for conveyance to assist economic development and has accepted the application; and an offer to purchase/sell has been negotiated and accepted by Army and the Land Bank, in a Memorandum of Agreement (the MOA), dated May 9, 1996, regarding the transfer to the Land Bank of certain portions of Fort Devens not being retained by the Army or transferred to federal agencies, for the purpose of implementing the Reuse Plan; and

WHEREAS, due to the ongoing environmental cleanup and the unexploded ordnance (UXO) clearance process at Fort Devens being undertaken by the Army, in order to implement the intentions of the Army and the Land Bank as set forth in the MOA, certain parcels will be leased rather than conveyed pending completion of the environmental cleanup and UXO clearance by the Army, said parcels being more particularly described in Exhibit A, hereinafter referred to as the "Lease Premises."

WHEREAS, as soon as a Finding of Suitability to Transfer (FOST) is executed by the Army for the Leased Premises, or a portion of said Leased Premises, and said Leased Premises may be conveyed consistent with the requirements of the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. 9620 (h), as amended, and other legal and policy requirements, the Secretary of the Army intends to convey the same to the Land Bank by one or more quitclaim deeds, as provided for in the MOA, and the Land Bank agrees to accept such conveyance(s) as soon as the above-referenced conditions are met; and

WHEREAS, the Army and the Land Bank have agreed to a Lease pending conveyance(s) so as to provide immediate possession of the Lease Premises to the Land Bank; and

WHEREAS, the parties hereto find, acknowledge, and agree that: (a) the public interest will be served by this Lease because interim use of the Lease Premises will facilitate economic recovery and reuse of the property and create new jobs in the region, thereby helping to offset the impacts of the closure of Fort Devens in a manner that will not interfere with or delay the environmental remediation and UXO clearance of the Lease Premises; (b) the Lease will relieve the Secretary of the expense of continued care, custody, control, operation and maintenance of the property and (c) under said circumstances obtaining fair market value for leasing the Lease Premises is not compatible with the public interest.

AND WHEREAS, the Secretary has determined in accordance with the authority contained in 10 U.S.C. 2667(f), that the surplus property hereby leased would facilitate state or local economic adjustment efforts; would be advantageous to the United States and be in the public interest; and that obtaining fair market value is not compatible with the public benefit;

NOW THEREFORE,

WITNESSETH

This lease (Lease) is made as of the 9th day of May, 1996, on behalf of the United States, between THE SECRETARY OF THE ARMY (Army), by the authority of Title 10, United States Code, Section 2667, having an address for purposes of the Lease at Department of the Army, C/O Commander and Division Engineer, United States

Army Corps of Engineers, New England Division, Frederick C. Murphy Federal Building, 424 Trapelo Road, Waltham, MA 02254-9149, and THE GOVERNMENT LAND BANK (Land Bank), a Massachusetts body corporate and politic created by Chapter 212 of the Acts of 1975, as amended, having its principal office at 75 Federal Street, 10th Floor, Boston, Massachusetts 02110.

THIS LEASE is granted subject to the following terms and conditions:

ARTICLE 1

LEASE; LEASE TERM; USE OF LEASE PREMISES

1.01 To have and to hold for a term commencing May 9, 1996 and ending on May 9, 2046 (Lease Term), unless sooner terminated or conveyed in fee pursuant to the terms hereof or of the Memorandum of Agreement between the United States of America and the Government Land Bank for the Conveyance of Fort Devens, Massachusetts, dated May 9, 1996 (MOA), attached as Exhibit B, the Army hereby leases to the Land Bank, and the Land Bank hereby leases from the Army, the Lease Premises (Exhibit A herein), including all buildings, facilities and improvements thereon and rights appurtenant thereto. If due to default by the Land Bank or termination of the MOA, the Land Bank is not entitled to conveyance of the Leased Premises at the time the Army is able to convey in fee, then the Lease shall terminate on the date of execution of a Finding of Suitability to Transfer (FOST) by the Army with respect to that portion of the Leased Premises covered by the FOST. The Lessor reserves the use and occupancy of the following buildings, including all facilities and areas currently used by the Lessor in connection therewith, and the right of ingress and egress thereto, until July 10, 1997: T-204, ASP

Operations; T-3701, Administrative; P-3748, Warehouse; T-3758, TASC Warehouse; P-3759, Warehouse; P-3773, Reserve Center; P-3774, Organization Maintenance Shop; P-3775, Oil Storage Building; P-3776 Dispatch Building; P-3631 thru 3642, 3644, 3647, 3649, 3653, collectively the ASP; and Housing Units at 80 Walnut St., 822 Plum Street, and 540 Oak St. The Lessor may vacate said buildings and facilities at any time prior to July 10, 1997, after 30 days written notice to the Lessee.

1.02 As provided in paragraph 1.03 of the MOA, the Lease Premises, or portions thereof, shall be conveyed in accordance with and pursuant to the terms of the MOA to the Land Bank upon execution of a FOST by the Army.

1.03 The Land Bank and any sublessees, subtenants or licensees under this Lease (collectively "sublessees") may use the Lease Premises for all uses as may be permitted by the Reuse Plan or, upon approval of the Army, amendments to the Reuse Plan. If the Army reasonably determines any such amendment of the Reuse Plan allows a use or uses not adequately analyzed in the Fort Devens Disposal/Reuse Environmental Impact Statement (EIS), the Land Bank shall provide additional environmental analysis and documentation, at the Land Bank's expense, to the Army as the Army deems necessary to comply with the National Environmental Policy Act of 1969 and implementing regulations and other applicable environmental laws and regulations, prior to any use under such amendment. The Land Bank shall be solely responsible for complying with the Massachusetts Environmental Policy Act (MEPA).

1.04 Except as otherwise specifically provided, any reference herein to "Lessor" or "Army" shall include their duly authorized representatives. Any reference to "Lessee" or "Land Bank" shall

include successors and assigns, and their duly authorized representatives.

ARTICLE 2
RENT

2.01 The Land Bank shall provide the Army as rent (Rent) hereunder, (a) protection, repair and maintenance of, and assumption of sole operating responsibility for the Lease Premises, except with regard to Army operations undertaken in furtherance of or related to the environmental clean-up or UXO clearance of the Lease Premises, and (b) payment of utility charges, as provided in the Utilities Agreement contained in the MOA. The Land Bank agrees that monetary rent received by the Land Bank from any Sublessee of the Land Bank under this Lease will be applied to costs incurred by the Land Bank for protection, maintenance, operation, repair and improvement of the Lease Premises, as may be necessary to cover such costs.

ARTICLE 3
CONDITION OF LEASE PREMISES; REPAIRS; UTILITIES; HISTORIC PRESERVATION

3.01 The Land Bank has inspected and knows and accepts the condition and state of repair of the Lease Premises. It is understood and agreed that the Lease Premises are leased in an "as is," "where is" condition, without any representation or warranty by the Army concerning the state of repair or condition of the Lease Premises, and without obligation on the part of the Army to make any alterations, repairs or additions, except as may be specifically provided herein. The Land Bank acknowledges that

the Army has made no representation or warranty concerning the condition and state of repair of the Lease Premises nor any agreement or promise to alter, improve, adapt or repair the Lease Premises which has not been fully set forth in this Lease or the MOA. The parties specifically agree that the provisions of this paragraph in no way alter the indemnification and other obligations of the Army set forth in Article 5 of the MOA.

3.02 The Army and the Land Bank will jointly conduct an inventory and condition survey of the Lease Premises, to include the environmental condition, prior to lease execution by either party. The inventory and condition survey will be documented in a survey report (Survey) prepared by the Army, signed by the duly authorized representatives of both parties, and attached as Exhibit C to this Lease. The Survey will refer to and incorporate by reference the Environmental Baseline Survey (EBS), dated March 8, 1996, prepared by the Army, as well as any other environmental conditions that may not be specifically identified in the EBS. The Land Bank hereby acknowledges receipt of a copy of the EBS. At the conclusion of the Lease Term, the Army and the Land Bank will jointly conduct a close-out survey. The Army will prepare a close-out report based upon the close-out survey. The close-out survey and report will include an updated EBS prepared in accordance with Article 16.11.a of this Lease. All significant variances from the initial Survey shall be clearly documented in the close-out report. The close-out survey and report will constitute the basis for settlement by the parties for any leased property shown to be lost, damaged, contaminated, or destroyed during the lease term and restoration of the property as required under this Lease.

3.03 The Land Bank shall keep the Leased Premises in good order and in a clean, safe condition at the Land Bank's sole cost and

expense. The Land Bank shall exercise due diligence in the protection of all property located on the Leased Premises against fire, casualty, or damage from any and all causes, excepting: (i) reasonable wear and tear, (ii) alterations, construction, site preparation or demolition undertaken pursuant to Article 12; and (iii) alterations or damage done in conjunction with environmental remediation or UXO clearance activities conducted by the Army or its contractors. For any Leased property that is not conveyed to the Land Bank upon termination or expiration of this lease; is not covered by the above exceptions; and that is damaged or destroyed by the Land Bank without written permission of the Army; the Land Bank shall be repair or replace said property to the reasonable satisfaction of the Army; or, in lieu of such repair or replacement, the Land Bank shall, at the Army's election, pay to the Army money in an amount sufficient to compensate for the loss sustained by the Army by reason of said damages or destruction. It is understood and agreed by the parties, however, that portions of the Lease Premises, as determined by the Land Bank, may be maintained at the minimal level necessary to prevent deterioration and diminution of value, pending reuse thereof by the Land Bank.

3.04 The Land Bank shall provide, at its sole cost and expense, janitorial, building maintenance and repair and grounds maintenance services at the Lease Premises, as may be required by the Land Bank in the operation of the Lease Premises.

3.05 In accordance with and if authorized by the Utilities Agreement contained in the MOA, the Land Bank may request, and the Army shall provide to the Lease Premises, electricity, natural gas, water, sewer, and telephone services, on a reimbursable basis during the period that the Army retains operation of said systems. Furthermore, if the Land Bank obtains

utility services from sources other than the Army, the charges and method of payment for each utility or service will be determined by the appropriate supplier of said utility or service in accordance with applicable laws or regulations, on such basis as the appropriate supplier and the Land Bank may agree.

3.06 The Lease Premises include historic buildings eligible for listing on the National Register of Historic Places, as described in the Programmatic Agreement attached to the MOA (Exhibit B herein). These buildings will be maintained by the Lessee in accordance with the Secretary of the Interior's Standards for Rehabilitation and Illustrated Guidelines for Rehabilitating Historic Buildings (U.S. Department of the Interior, National Park Service 1992)(hereinafter Secretary's Standards). Lessee will notify the Army and the State Historic Preservation Officer (SHPO) of any proposed rehabilitations, structural or landscape alterations to these buildings prior to undertaking said rehabilitations/ alterations. If the Lessee does not receive a written objection from the Army or SHPO within 30 days, the Lessee may proceed with the proposed rehabilitations or alterations. Any approved rehabilitations, structural or landscape alterations to these buildings must adhere to the Secretary's Standards.

ARTICLE 4
COMPLIANCE WITH LAWS

4.01 Throughout the term of the Lease, the Land Bank shall, with regard to the Lease Premises, at its own cost and expense, promptly observe and comply with all applicable laws, orders, regulations, rules, ordinances, and requirements of the federal, state, county and local governments and of all of their

administrative departments, bureaus and officials and of the Devens Enterprise Commission established pursuant to Chapter 498 of the Massachusetts Acts of 1993, as amended. The Land Bank shall pay all costs, expenses, claims, fines, penalties and damages that may in any manner arise out of or be imposed because of the failure of the Land Bank to comply with said laws. The provisions of this paragraph shall (a) in no way compromise the Army's obligation under applicable legal requirements to complete the environmental clean-up of the Lease Premises or the clearance of UXO thereon, or to indemnify the Land Bank, as provided for in the MOA; (b) not obligate the Land Bank to complete the environmental clean-up of the Lease Premises being undertaken by the Army as required under CERCLA, the National Contingency Plan (NCP), the FFA, the MOA, and deeds from the Army to the Land Bank.

ARTICLE 5
INDEMNIFICATION OF THE ARMY

5.01 The indemnification provided by the Land Bank to the Army under this Article 5 is subject to the indemnification provided by the Army to the Land Bank under Article 5 of the MOA and in the event of conflict or inconsistency between the provisions of Article 5 of this Lease and said provisions of Article 5 of the MOA, said provisions of Article 5 of the MOA shall control.

5.02 The Army shall not be responsible for damages to property or injuries or death to persons which may arise from or be attributable or incident to the condition or state of repair of the Lease Premises, or the use and occupation of them, or for damages to the property of the Land Bank, or for damages to the property or injuries or death to the person of the Land Bank's

officers, agents, contractors, servants or employees, or others who may be on the Lease Premises at their invitation or the invitation of any one of them. This paragraph shall not apply to damage to property or injuries or death to persons caused by or attributable to the actions of the United States in conducting environmental remediation or other activities on the Lease Premises.

5.03 The Land Bank agrees to assume all risks of loss or damage to property and injury or death to persons by reason of or incident to its possession and/or use of the Lease Premises or the activities conducted under this Lease. The Land Bank expressly waives all claims against the United States for any such loss, damage, personal injury or death caused by or occurring as a consequence of such possession and/or use of the Lease Premises by the Land Bank, or the conduct of activities or the performance of responsibilities under this Lease by the Land Bank. The Land Bank further agrees, to the extent permitted under state law, to indemnify and hold harmless the Army, its officers, agents and employees, from and against all suits, claims, demands or actions, liabilities, judgments, costs and attorneys' fees arising out of, or in any manner predicated upon, personal injury, death or property damage resulting from, related to, caused by or arising out of the possession and/or use of the Lease Premises by the Land Bank. The indemnification obligations of the Land Bank contained herein do not extend to damages, claims, suits, liabilities, judgments, costs and attorney's fees arising out of, caused by or predicated upon (a) the gross negligence or willful misconduct of the Army or its officers, agents or employees, without contributory fault on the part of the Land Bank or any other person, firm, or corporation, or (b) activities undertaken by the Army in relation to the CERCLA clean-up or UXO clearance of the Lease Premises. The Army will

give the Land Bank notice of any claim against it covered by this indemnity as soon after learning of such claim as practicable.

5.04 The Land Bank shall indemnify and hold harmless the United States from any costs, expenses, liabilities, fines, or penalties resulting from discharges, releases, emissions, spills, storage, disposal, or any other action by the Land Bank giving rise to United States liability, civil or criminal, or responsibility under Federal, state or local environmental laws.

5.05 This Article 5 and the obligations of the Land Bank hereunder shall survive the expiration or termination of the lease and the conveyance of the Leased Premises to the Land Bank. The Land Bank's obligation hereunder shall apply whenever the United States incurs costs or liabilities for the Land Bank's actions giving rise to liability under this Article.

ARTICLE 6
ASSIGNMENT; SUBLETTING

6.01 Without the prior written consent of the Army through the Corps of Engineers, New England Division, the Land Bank shall not sublease, license, or grant any interest under this lease, except as provided for in Article 9 (Mortgaging). The Army's consent shall not be unreasonably withheld or delayed and shall be deemed granted if a response is not received by the Land Bank within twenty-one (21) days of the receipt by the Army of a written request for consent. Every sublease shall specifically identify and require compliance with the Environmental Protection provisions set out in Article 16 of this Lease and shall state that it is subject to the terms and conditions of this lease and that, in case of any conflict between the instruments, this lease

will control. The Land Bank shall provide each sublessee with, and make available as appropriate to licensees, a copy of this Lease and MOA.

6.02 The Land Bank may not assign this Lease without the prior written consent of the Army, which consent shall not be unreasonably withheld or delayed, and no assignment shall be valid unless the assignee shall, by an instrument in a form sufficient for recording, enter into an assumption agreement and assume all of the Land Bank's obligations under this Lease. A duplicate original of that assumption agreement will be delivered to the Army within thirty (30) days after the making of the assignment. Upon compliance with the foregoing condition, but not otherwise, the Land Bank shall be released and discharged from any and all liability under the Lease that may accrue from and after the date of the assignment. The assignee shall have no rights under the MOA and shall not be entitled to a conveyance of the Leased Premises upon execution of a FOST by the Army for the Leased Premises or a portion thereof.

6.03 Upon request of the Lessee, the Lessor shall consider attorning to a particular sublease, where the terms of said sublease are consistent with standard Government lease terms and applicable law, regulation, and policy.

ARTICLE 7
TAXES

7.01 The Land Bank shall pay to the proper authority, when and as the same become due and payable, all taxes, assessments and similar charges, which at any time during the term of this Lease,

may be taxed, assessed or imposed upon the Property or interest of the Land Bank with respect to or upon the Lease Premises.

ARTICLE 8
DEFAULTS

8.01 The following shall be deemed a default by either the Army or the Land Bank and a breach of the Lease: a party's failure to observe or perform any of its obligations under the terms, covenants or conditions of the Lease, which failure persists after the expiration of ninety (90) days from the date the aggrieved party gives written notice to the party calling attention to the existence of that failure. However, if the default is one relating to a matter that exposes occupants or the public to an imminent danger to safety or health of which the public authorities have given due notice to the party, then such shorter notice to the party, whether written or otherwise, shall be sufficient notice of default under this Lease.

8.02 In the event of a default, as provided in 8.01, the aggrieved party may, at its option, following the expiration of applicable notice and grace periods: (a) seek injunctive relief, monetary damages, or both; (b) take such measures as the aggrieved party deems reasonable to mitigate the effects of or cure such default, and assess all costs incurred for such mitigation to the defaulting party; (c) terminate this Lease; or (d) avail itself of any combination of said remedies.

8.03 Any action taken by either party under this Article 8 shall not waive any right that the party would otherwise have against the other party who shall remain responsible for any loss and damage suffered by reason of the default or breach.

8.04 If the Land Bank shall have made any sublease hereunder and if any Sublessee thereunder shall have given to the Army a notice (Sublessee Notice), specifying the name and address of the Sublessee, the Army shall give to the Sublessee a copy of each notice of default by the Land Bank at the same time as and whenever any such notice of default shall thereafter be given by the Army to the Land Bank, addressed to the Sublessee at the address last furnished to the Army. No notice of default by the Army shall be deemed to have been given to the Land Bank unless and until a copy thereof shall have been so given to the Sublessee. The Sublessee shall then have a period of ten (10) days more, after service of the notice upon it, for remedying the default or causing it to be remedied, than is given the Land Bank hereunder after service of such notice upon it, except in the case of imminent danger to safety or health.

8.05 The Army will accept performance by any Sublessee hereunder of any covenant, condition or agreement to be performed under the Lease by the Land Bank, with the same force and effect as though performed by the Land Bank.

8.06 From and after receiving a Sublessee Notice, the Army and the Land Bank will not materially modify or amend the Lease without giving each Sublessee that gave a Sublessee Notice to the Army hereunder thirty (30) days written notice thereof.

8.07 Other than under the provisions of this Article 8, the Army shall have no legal responsibility or obligation to the Land Bank's sublessees or licensees.

ARTICLE 9
MORTGAGING

9.01 The Land Bank or any Sublessee may make a mortgage or mortgages on its interest in the Lease. The provisions of this Article 9 shall be fully applicable to Sublessees of the Land Bank.

9.02 If the Land Bank shall have made any mortgage (sometimes referred to as a Leasehold Mortgage) and if a Leasehold Mortgagee (the holder of any Leasehold Mortgage) shall have given to the Army a notice (Leasehold Mortgagee's Notice) specifying the name and address of the Leasehold Mortgagee, the Army shall give to the Leasehold Mortgagee a copy of each notice of default by the Land Bank at the same time as and whenever any such notice of default shall thereafter be given by the Army to the Land Bank, addressed to the Leasehold Mortgagee at the address last furnished to the Army. No notice of default by the Army shall be deemed to have been given to the Land Bank unless and until a copy thereof shall have been so given to the Leasehold Mortgagee. The Leasehold Mortgagee shall then have a period of ten (10) days more after service of notice upon it, for remedying the default or causing it to be remedied, than is given the Land Bank under paragraph 8.01 herein, except in case of imminent danger to safety or health. The Leasehold Mortgagee, in case the Land Bank shall be in default, shall, within the period provided for in this paragraph 9.02 and, if applicable, 9.04, have the right to remedy the default or cause it to be remedied.

9.03 The Army will accept performance by the Leasehold Mortgagee of any covenant, condition, or agreement to be performed under

the Lease by the Land Bank with the same force and effect as though performed by the Land Bank.

9.04 Except where the default is one relating to a matter that exposes occupants or the public to an imminent danger to safety or health of which the public authorities have given due notice to the Land Bank, whether written or otherwise, the time of the Leasehold Mortgagee to cure any default by the Land Bank that reasonably requires the Leasehold Mortgagee be in possession of the Lease Premises to do so, shall be deemed extended to include the period of time required by the Leasehold Mortgagee to obtain possession and foreclose expeditiously and with due diligence.

9.05 From and after receiving the Leasehold Mortgagee's Notice, the Army and the Land Bank will not materially modify or amend the Lease in any respect without the prior consent of the Leasehold Mortgagee, which consent shall not be unreasonably withheld or delayed. In the event the Leasehold Mortgagee fails to respond to a notice of material modification or amendment of the Lease within thirty (30) days after service of notice, the Leasehold Mortgagee will be deemed to have given its consent.

9.06 No Leasehold Mortgagee shall become liable under the Lease unless a Leasehold Mortgagee becomes the owner of the leasehold estate, and in such event shall be liable only for as long as such Leasehold Mortgagee remains the owner of the leasehold estate.

9.07 If a Leasehold Mortgagee acquires the Land Bank's interest in the Lease as a result of a sale under its Leasehold Mortgage pursuant to a judgment of foreclosure and sale, or through any transfer in lieu of foreclosure, or through settlement of or

arising out of any pending or contemplated foreclosure action, the following provisions of this paragraph shall apply, namely:

a. The Leasehold Mortgagee must assume the Lease and the Leasehold Mortagee shall have no right with respect to the Lease Premises unless said Leasehold Mortgagee assumes and delivers to the Army a duplicate original of the assumption agreement (to be executed in form for recording) within ten (10) days after said Leasehold Mortgagee acquires title to all or a portion of the Land Bank's interest in the Lease.

b. The Leasehold Mortgagee may transfer its interest in the Lease to a nominee or a wholly-owned subsidiary corporation without the prior consent of the Army, provided, however, that the Leasehold Mortgagee shall deliver to the Army in due form for recording within ten (10) days after the date of the transfer a duplicate original of the instrument of assignment and an instrument of assumption by the transferee of all of the Land Bank's obligations under the Lease, and provided further that the Army shall be given prior written notice of such transfer, and that the transferee shall use the Lease Premises in a manner that conforms to the Reuse Plan. The Leasehold Mortgagee shall be relieved of any further liability under the Lease after the transfer.

9.08 Any purchaser at a foreclosure sale must assume the Lease and said purchaser shall have no right with respect to the Lease Premises unless said purchaser so assumes and delivers to the Army a duplicate original of the assumption agreement (to be executed in form for recording) within ten (10) days after said purchaser acquires title to all or a portion of the Land Bank's interest in the Lease.

ARTICLE 10
QUIET ENJOYMENT

10.01 The Land Bank, upon performing its obligations under the Lease shall and may, at all times during the Lease Term, peaceably and quietly have, hold, and enjoy the Lease Premises, subject to the rights of the Army under this Lease and the MOA.

ARTICLE 11
SUCCESSORS AND ASSIGNS

11.01 The covenants and agreements contained in the Lease inure to the benefit of and are binding upon the parties to the Lease, their successors and assigns, but this Article does not modify the provisions governing assignment, as elsewhere provided for in the Lease.

ARTICLE 12
IMPROVEMENTS; RESTORATION

12.01 The Land Bank shall have the right to make improvements to the Lease Premises, which improvements may include, without limitation, the demolition of existing buildings and the construction of new buildings and facilities, as provided for in the Reuse Plan and that do not violate the terms of this Lease. If the lease expires or terminates without conveyance of the Lease Premises to the Land Bank pursuant to the terms of the MOA, all improvements to the Lease Premises will become the property of the United States, and the Land Bank shall not be entitled to any compensation therefor.

12.02 If, on or before the date of expiration of this Lease or its termination by the Land Bank or the Army in accordance with the terms hereof, the Land Bank shall vacate the Lease Premises, the Land Bank will remove any personal property of the Land Bank therefrom, and restore the Lease Premises to as good order and condition as that existing upon the date of commencement of the term of this Lease, except for: (a) alterations, site preparation, improvements or demolition undertaken -- (i) pursuant to this Article 12, Article 16, or otherwise hereunder by the Army in conjunction with environmental remediation or UXO clearance activities, or (ii) with the permission of the Army; or (b) due to fair wear and tear. If this Lease is terminated by the Army in accordance with the terms hereof, the Land Bank shall vacate the Lease Premises, remove personal property therefrom, and restore the Lease Premises to the condition aforesaid within such reasonable time as the Army may designate. In either event, if the Land Bank does not remove said personal property and so restore the Lease Premises, then, at the option of the Army, said personal property shall either become the property of the United States, without compensation therefor, or the Army may cause it to be removed and the Lease Premises to be restored at the expense of the Land Bank, and no claim for damages against the United States or its officers or agents shall be created by or made on account of such removal and/or restoration work.

ARTICLE 13
NOTICES

13.01 All notices to the parties shall be addressed to them at the respective addresses first given for them in this Lease, or to such other address of which either of them, as the case may

be, shall notify the other in the manner stated in this Article 13 for giving notice. Notices must be given by either registered mail, return receipt requested, or by certified mail, return receipt requested. The service of the notice shall be deemed complete upon the receipt of said notice, or the refusal thereof, by the applicable party.

ARTICLE 14

NO WAIVER

14.01 The failure of the Army or the Land Bank to insist in any one or more instances, upon a strict performance of any of the covenants of the Lease, or to exercise any option contained in the Lease, shall not be construed as a waiver of or relinquishment for the future of the performance of that covenant, or the right to exercise that option, but the same shall continue and remain in full force and effect.

ARTICLE 15

REMEDIES CUMULATIVE

15.01 The rights and remedies given to the Land Bank or the Army upon the breach of any of the terms of the Lease are distinct, separate and cumulative remedies, and no one of them, whether exercised or not, shall be deemed to be in exclusion of any of the others.

ARTICLE 16

ENVIRONMENTAL AND SAFETY PROVISIONS

16.01 The parties acknowledge that Fort Devens has been identified as a National Priorities List Site under CERCLA. The Land Bank acknowledges that the Army has provided it with a copy of the FFA and will provide the Land Bank with a copy of any amendments thereto. The Land Bank agrees to abide by the applicable terms of the FFA and any documents originating therefrom, and further agrees that should any conflict arise between the terms of the FFA, as it may be amended, and the Lease, the FFA shall take precedence. The Land Bank further agrees that, except as provided in the provisions of Article 5 of the MOA, the Army assumes no liability to the Land Bank should implementation of the FFA interfere with the Land Bank's use of the Leased Premises, provided, however, that the Army shall, to the extent reasonable, practical, and without additional costs, minimize interference with such use. The Land Bank shall have no claim on account of any such interference against the Army or any officer, agent, employee or contractor thereof, other than for abatement of rent.

16.02 The United States' rights under this Lease specifically include the right for United States officials to inspect, upon reasonable notice, the Leased Premises for compliance with environmental, safety, and occupational health laws and regulations, whether or not the United States is responsible for enforcing them. Such inspections are without prejudice to the right of duly constituted enforcement officials to make such inspections. The United States normally will give the Lessee twenty-four (24) hours prior notice of its intention to enter the Leased Premises unless the United States determines earlier entry is required for safety, environmental, operations, or security purposes. The Lessee shall have no claim on account of any entries against the United States, the Commonwealth, or any officer, agent, employee, or contractor thereof.

16.03 The Land Bank shall not construct or make or permit its sublessees to construct or make any substantial alterations, additions, or improvements to or installations upon or otherwise modify or alter the Leased Premises in any way which may adversely affect the cleanup, human health, or the environment without the prior written consent of the Army. Such consent may include a requirement to provide the Army with a performance and payment bond satisfactory to it in all respects and other requirements deemed necessary to protect the interests of the United States. For construction or alterations, additions, modifications, improvements, or installations in the proximity of operable units that are part of a National Priorities List (NPL) site, such consent may include a requirement for written approval by the United States' Remedial Project Manager.

16.04 The Army, EPA and the Massachusetts Department of Environmental Protection (DEP), their officers, agents, employees, contractors and subcontractors have the right, upon reasonable notice to the Land Bank, and to parties in possession, to enter upon the Leased Premises for purposes consistent with the applicable provisions of the FFA, and for the following purposes:

a. to conduct investigations and surveys, including, where necessary, drilling, soil and water sampling, test pitting, soil boring tests and other activities required under the FFA;

b. to inspect field activities of the Army and its employees, agents, contractors and subcontractors in implementing the FFA;

c. to conduct any test or survey required by EPA or DEP relating to the implementation of the FFA or environmental conditions at the Leased Premises, or to verify any data submitted to the EPA or DEP by the Army relating to such conditions; and

d. to construct, operate, maintain or undertake any other response or remedial action as required or necessary under the FFA, including, but not limited to, monitoring wells, soil removal, pumping wells and treatment facilities;

provided that the Leased Premises are restored in a reasonable manner to their condition prior to the exercise of the above rights, and provided further that any such inspection, survey, investigation or other response or remedial action will, to the extent reasonable, practical and without significant additional cost, be coordinated with a representative of the Land Bank and be performed in a manner that will minimize interference with the operations of the Land Bank. The Land Bank agrees to comply with the provisions of any health or safety plan in effect during the course of the above-described response or remedial actions.

16.05 The Land Bank or any agent or contractor of the Land Bank shall not undertake subsurface excavation, drilling, digging or other substantial disturbance of the surface of the ground, or construction, alterations, additions, modifications, improvements or installations that may adversely affect the clean up being undertaken on the Leased Premises or other portions of the Fort Devens NPL site, without: (a) seven (7) days prior written notice to the Army, EPA and DEP; and (b) prior written consent of the Army, which consent shall not be unreasonably withheld or delayed, and which consent may include a requirement for written approval by the EPA and DEP. Such consent may involve a requirement to provide the Army with a performance and payment bond satisfactory to it in all respects and other requirements deemed necessary to protect the interests of the Army. No groundwater will be extracted for any purpose.
Excavation of garbage or landfill materials is prohibited.

16.06 The Land Bank hereunder shall be solely responsible for obtaining, at its cost and expense, any environmental permits required for its operations under the Lease, independent of any

existing permits, provided however, that the Army shall, where permitted by applicable law or regulation, and at no cost to the Army, assign any such permits to the Land Bank, if so requested by the Land Bank, except where such assignment is prohibited by regulations or written policy of the Army.

16.07 The Land Bank shall have a plan approved by the Army for responding to hazardous waste, fuel and other chemical spills prior to commencement of operations on the Leased Premises, which approval shall not be unreasonably withheld or delayed. Such plan shall be independent of Fort Devens or its successors and shall not rely on use of installation personnel or equipment. Should the Army provide any personnel or equipment, spill containment, either on request of the Land Bank, or because the Land Bank was not, in the reasonable opinion of the Army, conducting timely cleanup actions, the Land Bank agrees to reimburse the Army for its costs.

16.08 The Land Bank shall comply with: (i) the requirement of 10 U.S.C. § 2692 to obtain the necessary Army approval for any storage of toxic or hazardous materials on the Leased Premises and (ii) the hazardous waste permit requirements under the Resource Conservation and Recovery Act (RCRA) and its Massachusetts equivalent. Except as specifically authorized by the Army in writing, the Land Bank must provide, at its own expense, any hazardous waste management facilities, required by applicable laws and regulations. Hazardous waste management facilities of the Army will not be available to the Land Bank.

16.09 Any Army accumulation points for hazardous and other wastes will not be used by the Land Bank. The Land Bank will not permit their hazardous waste to be commingled with hazardous waste of the Army.

16.10 The Land Bank acknowledges that the Leased Premises are being leased subject to a Finding of Suitability to Lease (FOSL), dated March 28, 1996, which has been provided to the Land Bank.

The parties hereto acknowledge and agree that the Leased Premises consist of parcels identified by the Army and EPA as parcels that require further environmental remediation, or documentation of the completion of remediation, by the Army, and include areas designated as Areas of Contamination, Study Areas, and Areas Requiring Environmental Evaluation.

16.11 Notices

a. Preceding expiration, revocation or termination of this lease, the Lessee shall fully fund the Army's preparation of an updated EBS that will document the environmental condition of the property at that time in conjunction with the close-out survey and report, as described in Article 3.02 of this Lease. The updated EBS will serve to support the FOST for the transfer or conveyance of the property or, if the termination is not for purposes of conveying said property, a comparison of the initial and close-out surveys will assist the Division Engineer in determining any environmental restoration requirements, to be completed by the Lessee in accordance with the condition Article 12 of this Lease.

b. NOTICE OF HAZARDOUS SUBSTANCES. To the extent such information is available on the basis of a complete search of Army files, notice regarding hazardous substances stored for one year or more, known to have been released, or disposed of on the Leased Premises is provided in the notice attached to the MOA (Exhibit B herein). The Land Bank should consult the EBS for more detailed information.

c. NOTICE OF THE PRESENCE OF ASBESTOS. The Leased Premises are known to contain certain amounts of asbestos, such as in, but not limited to, the floor tile, linoleum and associated mastic, asbestos-containing pipe and tank insulation, heating, ventilating and air conditioning vibration joint cloths, exhaust flues, acoustic ceiling treatment, siding, and roofing materials.

The Lessee covenants and agrees that in its use and occupancy of the property, it will comply with all applicable laws relating to asbestos, and the Army assumes no liability for damages for personal injury, illness, disability, or death to the Lessee, its successors or assigns, or to any other person including members of the general public, arising from or incident to the purchase, transportation, removal, handling, alteration, renovations, use, disposition or other activity causing or leading to contact of any kind whatsoever with asbestos on the property described in this Lease, regardless of whether the Lessee, its successors, or assigns, have properly warned or failed to properly warn the individual(s) injured.

d. NOTICE OF THE PRESENCE OF LEAD-BASED PAINT. The Lessee is hereby informed and does acknowledge that all buildings on the Lease Premises, which were constructed or rehabilitated prior to 1978, are presumed to contain lead-based paint. Lead from paint, paint chips, and dust can pose health hazards if not managed properly. Lead exposure is especially harmful to young children and pregnant woman. Before renting pre-1978 housing (target housing) lessors and sublessors must disclose to sublessees the presence of lead-based paint and/or lead-based paint hazards in the dwelling. "Target housing" means any housing constructed prior to 1978, except housing for the elderly or persons with disabilities (unless any child who is less than 6 years of age resides or is expected to reside in such housing) or any 0-bedroom dwelling.

(1) Available information concerning known lead-based paint and/or lead-based paint hazards, the location of lead-based paint and/or lead-based paint hazards, and the condition of painted surfaces is contained in the EBS, dated March 8, 1996, and the Finding of Suitability to Lease, dated March 28, 1996,

which have been provided to the Lessee. All lessees and sublessees must also receive the federally approved pamphlet on lead poisoning prevention. The Lessee hereby acknowledges receipt of the information described in this paragraph.

(2) The Lessee and its sublessees, successors, and assigns, shall not permit the occupancy of any target housing without complying with this section 16.07d and all applicable federal, state, and local laws and regulations pertaining to lead-based paint and/or lead-based paint hazards. Prior to permitting the occupancy of target housing, if required by law or regulation, the Lessee will abate and eliminate lead-based paint hazards by treating any defective lead-based paint surface in accordance with all applicable laws and regulations.

e. NOTICE OF THE PRESENCE OF RADON. Buildings on the Lease Premises may contain unhealthy levels of radon. Available and relevant radon assessment data pertaining to the Lease Premises are in the EBS. Prior to the use of any building for residential use or 24-hour per day occupancy, the Lessee, at its expense, must take appropriate measures to reduce the radon level to safe levels, in accordance with EPA guidelines.

f. NOTICE OF THE PRESENCE OF UXO. Certain portions of the Lease Premises, as designated as A2, A21, and A22 in Exhibit A herein (UXO Parcels), are subject to further UXO clearance by the Army, which clearance shall be undertaken by the Army promptly and at Army expense, subject to availability of funds. The Army will inform the Land Bank in writing when the clearance has been completed.

16.12 Each sublease, tenancy or license agreement made by the Land Bank hereunder shall contain provisions that will ensure the continuing compliance of the Land Bank, and the grantee

thereunder, with the FFA, CERCLA, and this Article 16. Furthermore, the Land Bank shall provide to the EPA and DEP, by certified mail, a copy of each sublease or license of the Leased Premises (as the case may be) within fourteen (14) days after the effective date of such transaction. The Land Bank may delete the financial terms and any other proprietary information from the copy of any sublease or license furnished pursuant to this paragraph.

16.13 The Lessee shall not occupy or use parcels A.1 and A.20 of the Leased Premises as described in Exhibit A without the written consent of the Army.

16.14 As contemplated in 40 CFR 51.853 (c)(xix) and 93.153(c)(xix) governing the conduct of General Conformity determinations, implementing Clean Air Act § 176(c), this lease is in furtherance of the transfer of the property through an EDC application and, as soon as the Finding of Suitability to Transfer (FOST) is issued and said property can be conveyed in accordance the requirements of the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. 9620(h)(3), as amended, and other legal and policy requirements, the Army is legally obligated to convey to the Land Bank by one or more quitclaim deeds, the Lease Premises. The Army does not intend to and does not retain continuing authority to control air pollutant emissions associated with activities conducted on the Leased Premises pending the conveyance(s) within the meaning of 40 CFR 51.853(c)(xix) and 91.153(c)(xix).

ARTICLE 17
DISPUTES CLAUSE

17.01 Except as provided in the Contract Disputes Act of 1978 (41 U.S.C. 601-613) (the Act), all disputes arising under or relating to this lease shall be resolved under this clause and the provisions of the Act.

17.02 "Claim", as used in this clause, means a written demand or written assertion by the Land Bank seeking, as a matter of right, the payment of money in a sum certain, the adjustment of interpretation of lease terms, or other relief arising under or relating to this lease. A claim arising under this lease, unlike a claim relating to this lease, is a claim that can be resolved under a lease clause that provides for the relief sought by the Land Bank. However, a written demand or written assertion by the Land Bank seeking the payment of money exceeding $100,000 is not a claim under the Act until certified as required by section 17.04 below.

17.03 A claim by the Land Bank shall be made in writing and submitted to the Division Engineer for a written decision. A claim by the United States against the Land Bank shall be subject to a written decision by the Division Engineer.

17.04 For Land Bank claims exceeding $100,000, the Land Bank shall submit with the claim a certification that (i) the claim is made in good faith; and (ii) supporting data are accurate and complete to the best of the Land Bank's knowledge and belief; (iii) and the amount requested accurately reflects the lease adjustment for which the Land Bank believes the United States is liable.

17.05 The certification shall be executed by (i) a senior company official in charge of the Land Bank's location involved; or (ii) an officer or general partner of the Land Bank having overall responsibility of the conduct of the Land Bank's affairs.

17.06 For Land Bank claims of $100,000 or less, the Division Engineer must, if requested in writing by the Land Bank, render a decision within 60 days of the request. For Land Bank-certified claims over $100,000, the Division Engineer must, within 60 days, decide the claim or notify the Land Bank of the date by which the decision will be made.

17.07 The Division Engineer's decision shall be final unless the Land Bank appeals or files a suit as provided in the Act.

17.08 At the time a claim by the Land Bank is submitted to the Division Engineer or a claim by the United States is presented to the Land Bank, the parties, by mutual consent, may agree to use alternative means of dispute resolution. When using alternate dispute resolution procedures, any claim, regardless of amount, shall be accompanied by the certificate described in section 17.04 of this Article, and executed in accordance with section 17.05 of this clause.

17.09 The United States shall pay interest or the amount found due and unpaid by the United States from (1) the date the Division Engineer received the claim (properly certified if required), or (2) the date payment otherwise would be due, if that date is later, until the date of payment. Simple interest on claims shall be paid at the rate, fixed by the Secretary of the Treasury as provided in the Act, which is applicable to the period during which the Division Engineer receives the claim and

then at the rate applicable for each 6-month period as fixed by the Treasury Secretary during the pendency of the claim.

17.10 The Land Bank shall proceed diligently with the performance of the lease, pending final resolution of any request for relief, claim, or action arising under the lease, and comply with any decision of the Division Engineer.

ARTICLE 18
MISCELLANEOUS

18.01 Both parties acknowledge and agree that a Notice of Lease will be recorded in the public records, which Notice shall be signed by the parties hereto and identify the Lease Premises.

18.02 The Lease is subject to all existing easements and rights of way of record.

18.03 The provisions of this Lease are not subject to 10 U.S.C. §2662.

18.04 This Lease contains the entire agreement between the parties regarding the lease of the Lease Premises to the Land Bank, and any agreement hereafter made shall not operate to change, modify or discharge this Lease in whole or in part unless that agreement is in writing and signed by the party sought to be charged with it.

18.05 No member or delegate to Congress or Resident Commissioner shall be admitted to any share or part of this Lease or to any benefit to arise therefrom. Nothing herein contained, however,

shall be construed to extend to any incorporated company, if the Lease be for the general benefit of such corporation or company.

18.06 Nothing contained in this Lease will make or will be construed to make the parties hereto partners or joint venturers with each other, it being understood and agreed that the only relationship between the Army and the Land Bank hereunder is that of lessor and lessee. Neither will anything in this Lease render or be construed to render either of the parties hereto liable to any third party for debts or obligations of the other party hereto.

18.07 The brief headings or titles preceding each Article are merely for purposes of identification, convenience and ease of reference and will be completely disregarded in the construction of this Lease.

18.08 This Lease is executed in two (2) counterparts, each of which is deemed an original of equal dignity with the others and which is deemed one and the same instrument as the other.

18.09 All personal pronouns used in this Lease, whether used in the masculine, feminine or neuter gender, will include all other genders.

18.10 This Lease shall terminate upon the transfer of all of the Lease Premises to the Land Bank in fee, or otherwise as provided for herein.

18.11 If any provision of this Lease is declared or found to be illegal, unenforceable or void, then both parties shall be relieved of all obligations under that provision. The remainder

of this Lease shall remain enforceable to the fullest extent permitted by law.

18.12 Discrimination.

a. The Lessee shall not discriminate against any person or persons or exclude them from participation in the Lessee's operations, programs or activities conducted on the Leased Premises, because of race, color, religion, sex, age, handicap, or national origin.

b. The Lessee, by acceptance of this lease, is receiving a type of Federal assistance and, therefore, hereby gives assurance that it will comply with the provisions of Title VI of the Civil Rights Act of 1964, as amended (42 U.S.C. § 2000d); the Age Discrimination Act of 1975 (42 U.S.C. § 6102); and the Rehabilitation Act of 1973, as amended (29 U.S.C. § 794). This assurance shall be binding on the Lessee, its agents, successors, transferees, sub-lessees and assignees.

Article 19
Insurance

19.01. At the commencement of this lease, the Land Bank shall obtain, from a reputable insurance company, or companies, comprehensive liability insurance. The insurance shall provide an amount not less than a combined single limit of $1,000,000 for any number of persons or claims arising from any one incident with respect to bodily injuries or death resulting therefrom, property damage, or both, suffered or alleged to have been suffered by any person or persons resulting from the operations of the Lessee under the terms of this lease.

19.02 The liability insurance policy shall insure the hazards of the demised premises and operations conducted in and on the demised premises, independent contractors, contractual liability (covering the indemnity included in this leases agreement), and shall name the United States as an insured party. Each policy will provide that any losses shall be payable notwithstanding any act or failure to act or negligence of the Land Bank or the United States or any other person; provide that the insurer will have no right of subrogation against the United States; and be reasonably satisfactory to the United States in all respects. Under no circumstances will the Land Bank be entitled to assign to any third party rights of action that it may have against the United States arising out of this Lease. The Land Bank shall require that the insurance company give the Division Engineer thirty (30) days written notice of any cancellation or change in such insurance. The Division Engineer may require closure of any or all of the Lease Premises during any period for which the Lessee does not have the required insurance coverage. The Land Bank shall require its insurance company to furnish to the Division Engineer a copy of the policy or policies, or if acceptable to the Division Engineer, certificates of insurance evidencing the purchase of such insurance. The minimum amount of liability insurance coverage is subject to revision by the Division Engineer every three years or upon renewal or modification of this lease.

19.03 It is the Buyer/Lessee's option to obtain insurance on the structures and improvements of the Lease Premises, for such periods as the Lessee is in possession of the Lease Premises pursuant to this lease, to protect its interest. Nothing herein contained shall be construed as an obligation upon the United States to repair, restore or replace the Lease Premises or any

part thereof should it be diminished in value, damaged or destroyed. The purchase price will not be altered should such damage occur and the Lessee has failed to obtain insurance. Any proceeds paid to the United States shall be applied to the purchase price.

19.04 The Land Bank shall maintain worker compensation and employer's liability insurance as required by the Commonwealth of Massachusetts.

IN WITNESS WHEREOF, the parties have executed the Lease as of the day and year first above written.

UNITED STATES OF AMERICA

By: Paul W. Johnson

Paul W. Johnson
Deputy Assistant Secretary of the Army
(Installations and Housing)

THE GOVERNMENT LAND BANK

By: Michael P. Hogan

Michael P. Hogan
Executive Director

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ADDENDUM

REAL PROPERTY MASTER PLAN
LONG RANGE COMPONENT
FOR
DEVENS RESERVE FORCES TRAINING AREA

ADDENDUM – SEPTEMBER 2007

This addendum applies to Chapter 4.C. (Land Use Policies and Constraints) and Chapter 5.E. (Environmental Concerns) of the *Real Property Master Plan, Long Range Component for Devens Reserves Forces Training Area, June 1999.* The addendum provides supplemental information on Land-Use Controls (LUCs) established under BRAC and CERCLA programs that are applicable to the following areas:

Area A (Main Cantonment)

The CERCLA remedy for the former AAFES Gas Station located on Queenstown Street is addressed in the Record of Decision (ROD) for Area of Contamination (AOC) 43G. The remedy is based on Army retention of this area and continued restricted access to groundwater; however, any proposed actions that affect this property must consider the following ROD requirements and site environmental conditions:

- Assure that the Property is not used for residential purposes and prohibit the use of groundwater beneath the site. If the Army changes the land-use within the AOC, then additional assessment and/or possible remedial action may be needed based upon the possible resultant changed risk factors.

- If the Army transfers this property by lease or deed, an Environmental Baseline Assessment (EBS) will be conducted to ensure that the remedy remains protective by incorporating all necessary environmental protection provisions within the Finding of Suitability to Transfer (FOST) and the property transfer deed.

- Any intrusive construction work must consider that residual soil and groundwater contamination has been documented for AOC 43G and that such actions should be coordinated with the DPW, the BRAC Environmental Office and the BRAC Clean-up Team (BCT).

Area C (Range & Training Area)

The CERCLA remedy for the South Post range and training areas is addressed in the ROD for the South Post Impact Area (SPIA) and AOCs 25, 26, 27 and 41. The “no action” remedy is based on Army retention of the South Post; however, any proposed actions that affect this property must consider the following ROD requirements:

- If the Army should close or transfer or change the use of this property, an Environmental Baseline Survey (EBS) will be conducted, and the "no action" decision in the ROD will be re-examined in light of the changed use and risk factors resulting from this closure/transfer.

- The Army will not develop new drinking water sources within the SPIA monitored area.

Area F (3700 Area – Barnum Road Maintenance Yards)

The CERCLA remedy for the former Cannibalization Yard and TDA Maintenance Yard is addressed in the ROD for AOCs 44 and 52, respectively. The remedy is based on Army retention of this property; however, any proposed actions that affect this property must consider the following ROD requirements:

- Assure the Property is not used for residential purposes. If the Army transfers this property by lease or deed, an EBS will be conducted to ensure that the remedy remains protective by incorporating all necessary environmental protection provisions within the FOST and the property transfer deed.

- Maintain the existing paved areas and storm water collection systems to prevent long-term worker exposure to residual oil contaminated soils 2-5 feet BGS associated with AOC 44/52 remedy.

- Assure that Soil Management Plans and Health and Safety Plans are prepared and executed prior to subsurface excavations.

- Any intrusive construction work must consider that residual soil contamination has been documented for AOC 44/52 and that such actions should be coordinated with the DPW, the BRAC Environmental Office and the BCT.

Area G (3800 Area – RTS Maintenance)

The CERCLA remedy for the former Moore Army Airfield is addressed in the ROD for AOC 50. Active remediation and monitoring of the AOC 50 chlorinated solvent plume, which is under building 3813 is ongoing. Treatment transects and associated monitoring wells are located in the RTC vehicle storage area and on the Southwest Corner of Building 3813 former hanger, along the axis of the plume through Army retained Parcel H. Any proposed actions that affect this property must consider the following ROD requirements:

- Provide continued access to treatment transects and monitoring wells and access to install additional injection or monitoring wells, if necessary.

- Coordinate construction plans with the BCT to facilitate ongoing remediation and future access to plume areas

- No groundwater extraction or injection for any purpose

- Coordinate construction plans for modifications to storm water systems with the BCT including engineered storm water management plans and hydrologic/ mounding studies. (Continue use of existing storm water system to direct storm water away from the plume)

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